Studies on Angiosperm flora and Bio – monitoring of Walayar hill ranges of Southern Western Ghats, Kerala, India

Thesis submitted to the University of Calicut

In partial fulfilment of the requirement for the degree of

DOCTOR OF PHILOSOPHY

IN

BOTANY

By

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UO. No. 124/ 2018/ Admn dated 04.01.2018

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PALAKKAD

December 2023

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CERTIFICATE

This is to certify that the thesis entitled '**Studies on Angiosperm flora and Bio – monitoring of Walayar hill ranges of Southern Western Ghats, Kerala, India**' submitted to the University of Calicut by Ms. Aswani V J. in partial fulfillment for the award of the Degree of Doctor of Philosophy in Botany is a bonafide record of the research work carried out by her at this centre under the guidance of Prof. (Dr.) Maya C. Nair, Professor and Principal, Govt. Arts and Science College, Tholanur, Palakkad. No part of this work has formed the basis for the award of any degree or diploma previously.

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DECLARATION

I, hereby declare that the thesis entitled ***'Studies on Angiosperm flora and Bio – monitoring of Walayar hill ranges of Southern Western Ghats, Kerala, India'*** *submitted by me for the award of the degree of Doctor of Philosophy in Botany under University of Calicut is an original research work carried out by me at Post Graduate and Research Department of Botany, Govt. Victoria College, Palakkad under the guidance of Prof. (Dr.) Maya C. Nair. No part of the work has formed the basis for the award of any other degree or diploma.*

Aswani V. J.

December 2023

ACKNOWLEDGEMENTS

I would like to express my sincere gratitude to my Research Guide, Prof. (Dr.) Maya C. Nair, Principal, Govt. Arts and Science College, Tholanur for providing me an opportunity to start my research career and for her excellent guidance throughout the period of research. Her critical evaluation of my research work has made the materialization of this thesis in a successful manner and I am deeply indebted to her for understanding me and standing by my side in my difficult times of research life.

I would like to thank Dr. Maya Nair, the Principal of Govt. Victoria College, Palakkad and Director, Collegiate Education, Govt. of Kerala for the infrastructural facilities and administrative support throughout the research period. Further, I would like to extend my sincere gratitude to Dr. Rasmi A. R., Associate Professor and Head, PG and Research Department of Botany for her assistance and support for completing the research work.

I am thankful to the KSCSTE, Govt. of Kerala for the financial assistance through the Taxonomy Research Fellowship which aided in the successful completion of my research work.

I am grateful to the Department of Forests, Govt. of Kerala for providing necessary permissions and assistance for field explorations in the interior forest areas of Walayar, under Palakkad Forest Division.

I am really thankful to Dr. Prabhukumar K.M., Senior Scientist, CSIR-National Botanical Research Institute, Lucknow for his constant support and help in field trips and in confirming the identity of many specimens.

I express my sincere gratitude towards Dr. Sunil C.N., former Professor, S. N. M. College, Maliyankara and Dr. Naveenkumar V., Terrestrial ecologist in the Center for Environment and Marine Studies, RI-KFUPM., Saudi Arabia for their guidance in identifying grasses and sedges and technical assistance in confirming the identity of doubtful grass species.

I express my sincere gratitude to Dr. N. Sasidharan, Former Scientist, KFRI, Peechi for his help in identification of doubtful taxa, herbarium reference as well as in providing valuable suggestions regarding the field explorations.

I express my sincere thanks to Dr. Sabu M. and Dr. Hareesh V. S for collaborative field visits and for their valuable suggestions during floristic explorations in hill ranges of Walayar.

I am really grateful to Mr. Anand Sebastian, Head and Scientist, Centre for Geoinformatics, IRTC and Mr. Vivek S., research assistant who assisted me in working with GIS mapping.

I am really grateful to the then forest officials of Walayar forest range Mr. Jiljith, Mr. Vinoop, Mr. Prathyush, Mr. Galeel, Mr. Praveen, Mr. Bhadhusha, Mr. Martin, Mr. Hussain, Mr. Lakshmi Das, Mr. Girish, Mr. Krishnakumar, Mr. Subair, Mr. Tharush, Mr. Abdul Salam, Mr. Jacob and others who were really supportive when approached for the field trips and arranged all the facilities for the safer field trips throughout the period of research. I would like to give special thanks to all the forest watchers especially Mr. Vellan, Mr. Sudhakaran, Mr.Sreekumar, Mr. Rangappan, Mr. James, Mr. Aaruchaami, Mr. Murugan, Mr. Chadayan, Mr. Krishnan, Mr. Manikandan, Mr. Ayyappan, Mr. Reghu, Mr. Sukumaran and others who accompanied me on various field trips and helped me to finish my field explorations in a very safe and successful manner in an area with regular animal interventions.

I would like to thank the teaching and non-teaching staff of the PG and Research Department of Botany, Govt. Victoria College, Palakkad for their encouragement and constant support throughout the period of my studentship at the department.

I am extremely thankful to my fellow scholars and my colleagues, Dr. Rekha Vasudevan A., Dr. Sowmya M., Dr. Jisha K., Dr. Arabhi P., Dr. Jabeena M K., Mrs. Remya S., Mrs. Muhsina A.A., Mrs. Kanakambika G., Mrs. Athira S., Mrs. Smitha, M. Mrs. Maya Ammathil Manoharan, Mrs. Ambika, Ms. Snehalatha V. R., Mr. Ashfak Ahammed, Ms. Ummu Habeeba, Mrs. Reshma, Mrs. Jayaleshmi, Ms. Gayathri, Ms. Abhilash and other research scholars of the department for their support, assistance and for critical suggestions throughout the research period.

I would like to thank Mr. Vishnuram, Mr. Midhun, Mr. Rampradeep S., Mr. Ranjith R, Mr. Jaseer, Mr. Laiju, Mr. Sreeprabhav, Mr. Aromal, Ms. Amritha, Mr. Vipin and Ms. Amrutha for accompanying in my field trips and for the helps and support in my thesis work.

I am really thankful to Ms. Geetha, who gave me financial assistance during the initial period of my research work. I am also thankful to Dr. Seethalakshmi K. K., Dr. K. Haridasan and the alumni members of VIBA, who have supported me in one way or other during my research career. Further, I would like to express my great thanks to Mrs. Vrinda, Senior Superintendent and other office staff for their generous help in the document work throughout my research period. Other names, which deserve special

mention, are Mr. Vishnu. P. R. and Mr. Naveeth for their enormous help and assistance in the preparation of photoplates for the thesis.

I could not have completed this research work without the strong support I received from my family. With deep love and respect, I would like to give my heartful thanks and love to my mother - in Law, Ms. Vasanthi K. S., whose only support made me confident enough to complete this thesis on time. My kids, Aarav. N. A. and Aaroh. N. A. needs special mention for understanding and adjusting during my thesis preparation. Words will not be enough to express my thanks and heartful love to my beloved husband Mr. Abhijith N. C., whose strong desire, wish and support made me confident enough to step into the world of research and his generous help in field trips, technical assistance in handling various analytical work of thesis and assistance in herbarium preparation. The moral and mental support he provided me during the hard days of my research cannot be forgotten in my life. I would like to further extend my thanks to Mr. Avinash. N. C. and Ms. Sabna and their kids for the support provided throughout my research period.

Further, I would like to mention specially Ms. Mesmi Yasin, Mr. Yasin, Mr. Mesmar M. and Ms. Pushpamani whose support and care helped me in my final days of thesis compilation and they together stood along with me as a strong support to reach my dream of fulfilling a doctoral degree. I would like to remember Mr. (Late) Chenthamarakshan N. K. and Dr. (Late) Premalatha Ramachandran (Retd. Asst. Director - CIFNET) for the blessings showered upon me.

Above all, the very existence of mine is the bliss from my beloved parents and without them I would not have been there to write this thesis and I remember them with prayers. I am thankful to God Almighty for the blessings showered upon me which gave me strength and ability to take up this research and complete it successfully in a satisfactory manner.

Aswani V. J.

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PREFACE

Western Ghats, one of the hottest hotspots in the World, though explored in an exhaustive manner, lacks location specific scientific documentation at micro ecosystem levels. The present study emphases on one of the major hill tracts of southern Western Ghats, Walayar hills which lies to the North-western side of the Palghat Gap at the extreme end of Nilgiri Biosphere reserve. This study comprehends the knowledgebase on diversity of angiosperms existing in main hills and discrete hillocks in the range, their seasonal monitoring, mapping of floral resources and threat factors operating in the ecosystems of the range. The data in the thesis is summarized under five chapters.

The first chapter deals with the introduction to the topic of research giving emphasis to the floristic wealth in Western Ghats. The Palghat gap features and the previous studies in the gap region are highlighted with the basic information on Walayar forest range and highlights the need for the taxonomic study with aim of the present study, objectives and relevance of the documentation.

The second chapter deals with a review on previous works including studies on floristic wealth in India and specifically Western Ghats, giving attention to the floristic studies in Southern Western Ghats and Kerala. The chapter also deals with the review on the revisionary studies, studies on riparian vegetation, low altitude outcrops, endemism, phytogeographical affinities, ethnobotany, resource mapping, alien - invasive elements, and new plant discoveries along with distributional and rediscovery records from Kerala.

Third chapter provides the details of the study area and the methodology adopted for achieving the objectives set for the thesis. The fourth chapter deals with the results obtained from the study and is divided into 16 different sections. In the first section, angiosperm diversity of Walayar forest range is enumerated according to the APG IV system of classification along with artificial keys at family, generic and species level. In the systematic enumeration of each taxon, a nomenclatural paragraph with current accepted name with author citation along with the citations included in various regional floras such as *Flora of Presidency of Madras, Flora of British India, Flora of Palghat district* and available local floras are included. Basionym of the taxon if present is also included followed by habit, habitat, phytogeography, IUCN category, ecology, Raunkiaer life form, distribution frequency along study area and altitude preference along with details of specimen examined.

The second section deals with habitat diversity and vegetation analysis in main hill tracts along with the hillock system. The chapter further emphasizes the various microhabitats in the forest as well as in rocky outcrops. The next section deals with the cross analysis of plants recorded from the Walayar hill ranges based on the various habit forms, their general distribution trends with altitudinal gradients and finally the analysis of Raunkiaer life forms.

The fourth section enumerates the floristic diversity recorded from the granitic rocky outcrops of Walayar hills along with critical analysis of various microhabitats present and the plant composition in them, phenological studies and Raunkiaer life form analysis along with various adaptive features of the plants in the study area is also provided. Fifth section focuses on the biomonitoring and phenological studies of taxa in the hill ranges with changing seasons. These sections are followed by details of endemic and threatened taxa and their phytogeographical affinity. The next section gives a short note on the plant novelties, taxonomic note on the newly reported taxa in hill ranges along with the recollections, addition to district flora and analysis of similarity using PAST software. This is followed by documentation of anemophilous and anemochorous taxa, medicinal plants, wild genetic resources, wild edibles and wild ornamentals. Interspecific diversity along with intraspecific diversity giving focus on the morphotypic variations observed among various taxa are dealt in the tenth section. Taxonomic singularity and monotypism, incidence of alien - invasive taxa, ethnobotanical knowledge, mapping of Walayar hills along with the vegetation analysis were also included. The documentation of the post flood monitoring focusing on effects of landslides on the forest vegetation and biomonitoring of the landslide struck sites were dealt in the following section. The last section deals with the threats and biodiversity loss happening in the hill ranges and all the sections were provided with photographic support data.

The final chapter summarizes the views on the results obtained by correlating the data along with concluding remarks. Few recommendations were suggested for maintenance of the health of the ecosystem at Walayar Forest range. This is followed by Annexures, references used in the thesis along with an index to the species.

For ease and purpose of binding, the thesis is arranged in two parts and part one includes all the contents except chapter IV.1 The thesis consists of 156 photoplates, 43 figures, 33 tables and 21 annexures.

സംഗ്രഹം

സഹ്യപർവ്വത മലനിരകളിൽ പാലക്കാട് ചുരത്തോട് ചേർന്ന് 125.65 ചതുരശ്ര കിലോമീറ്ററിൽ വ്യാപിച്ചു കിടക്കുന്ന വാളയാർ വനമേഖലയുടെ സപുഷ്പികളെ കുറിച്ചുള്ള ഈ വിവരശേഖരണ പഠനത്തിൽ 133 സസ്യകുടുംബങ്ങളിലായി 1077 വിവിധ സ്പീഷിസുകൾ കണ്ടെത്തി.

ഉഷ്ണമേഖലാ ഇലപൊഴിയും കാടുകൾ കൂടുതലായി കണ്ടുവരുന്ന ഈ വനമേഖലയിൽ മിതശീതോഷ്ണ വനവും പുൽമേടുകളും ഉൾപ്പെട്ടിട്ടുണ്ട്. പാലക്കാട് ചുരത്തിലെ ശക്തമായ കാറ്റും, തീവ്രമായ ഉഷ്ണവും, ജലലഭ്യത കുറവും, ഈ പ്രദേശത്തെ സസ്യവിഭാഗങ്ങളെ ശക്തമായി സ്വാധീനിക്കുന്നതിനാൽ ഈ കാലാവസ്ഥയെ അതിജീവിക്കുന്ന പ്രത്യേകതരം സപുഷ്പികൾ ഈ മേഖലയിൽ വളരുന്നുണ്ട്. ഇത്തരം സസ്യവിഭാഗങ്ങളെ സാമൂഹ്യ വനവത്കരണത്തിൽ കൂടുതൽ പ്രയോജനപ്പെടുത്തിയാൽ പാലക്കാട് ചുരത്തിലെ നിലവിലെ സ്ഥിതിക്ക് മാറ്റമുണ്ടാക്കാൻ കഴിയുമെന്ന് പഠനം തെളിയിക്കുന്നു.

സ്പീഷീസുകളുടെ ബാഹുല്യംകൊണ്ട് ഫാബേസിയേ, പോയേസിയേ, സൈപറേസിയേ എന്നീ കുടുംബങ്ങളിലെ അംഗങ്ങളാണ് ഈ മേഖലയിൽ കൂടുതലായി കണ്ടുവരുന്നത്. സൈപറസ് ജെനറയിലാണ് ഏറ്റവും കൂടുതൽ സ്പീഷീസുകൾ കണ്ടെത്തിയത്.

പാലക്കാട് ജില്ലയിലെ കുടിവെള്ള സ്രോതസ്സുകളായ മലമ്പുഴ, വാളയാർ ഡാമുകൾ ഈ വനമേഖലയോട് ചേർന്ന് കിടക്കുന്നതിനാൽ, വാളയാർ വനമേഖലയുടെ നാശം, ജലസ്രോതസ്സുകളെ നേരിട്ട് ബാധിക്കുമെന്നതിനാൽ ഈ വനമേഖലയുടെ കാലോചിതമായ സംരക്ഷണം ഉറപ്പാക്കേണ്ടത് അത്യാവശ്യമാണ്. വാളയാർ വനമേഖലയിൽ, സഹ്യപർവ്വത നിരകളോടൊപ്പം ചെറു കുന്നുകളിലും സസ്യവൈവിധ്യം വ്യാപിച്ചു കിടക്കുന്നു. ഈ പഠനത്തിൽ 86 സസ്യ കുടുംബങ്ങളിലായി 411 വിവിധ സപുഷ്പികളാണ് കണ്ടെത്തിയിട്ടുള്ളത്. മഴയെ ആശ്രയിച്ച് ഈ മേഖലയിൽ ജൂൺ മുതൽ നവംബർ വരെ സസ്യ വൈവിധ്യ കൂടുതലും ഡിസംബർ മുതൽ മെയ് വരെ വരണ്ട കാലാവസ്ഥയിൽ മാത്രം കാണുന്ന സസ്യജാലങ്ങളും കാണപ്പെടുന്നു. പാലക്കാട് ചുരത്തിലെ കാലാവസ്ഥയ്ക്ക് ഉതകും വിധം ഈ മേഖലയിലെ സസ്യങ്ങൾ വിവിധ തരത്തിലുള്ള സ്വഭാവ സവിശേഷതകൾ പ്രകടിപ്പിക്കുന്നതായും ഈ പഠനത്തിൽ കണ്ടെത്തിയിട്ടുണ്ട്. ഈ മേഖലയിൽ നിന്ന് രേഖപ്പെടുത്തിയ 1077 സ്പീഷിസുകളിൽ 14% സസ്യങ്ങൾ സ്ഥാനീയ

സസ്യവിഭാഗത്തിൽ ഉൾപ്പെടുന്നതായും, 27 സ്പീഷിസുകൾ IUCN വർഗ്ഗീകരണ വിഭാഗത്തിൽ ഉൾപ്പെടുന്നവയാണെന്നും കണ്ടെത്തിയിട്ടുണ്ട്.

ഈ പഠനത്തിന്റെ ഭാഗമായി 50 വർങ്ങൾക്ക് മുമ്പ് കണ്ടെത്തിയിരുന്ന ഓൾഡൻലാൻഡിയ ഹൈഗ്രോഫില്ല എന്ന സസ്യത്തെ ഒരു നീണ്ട ഇടവേളയ്ക്ക് ശേഷം കണ്ടെത്താൻ കഴിഞ്ഞു. കൂടാതെ പഠനത്തിന്റെ ഭാഗമായി അമോർഫോഫാലസ്, ഔറ്റ്, ഇംപേഷ്യൻസ് എന്നീ മൂന്ന് ജെനറകളിലായി ഓരോ പുതിയ സസ്യത്തെ തിരിച്ചറിഞ്ഞിട്ടുണ്ട്. പാലക്കാട് ജില്ലയിലെ സപുഷ്പികളുടെ 1990 ൽ പ്രസിദ്ധീകരിച്ച പഠനത്തിൽ കണ്ടെത്താതിരുന്ന 387 സ്പീഷീസുകൾ ഈ വനമേഖലയിൽ നിന്ന് കണ്ടെത്തിയിട്ടുണ്ട്. കൂടാതെ ഇതുവരെ പാലക്കാട് ജില്ലയിൽ ഉണ്ടെന്ന് രേഖപ്പെടുത്താത്ത 98 സ്പീഷീസുകളും ഈ പഠനത്തിന്റെ ഭാഗമായി രേഖപ്പെടുത്തിയിട്ടുണ്ട്.

പാലക്കാട് ചുരത്തിലെ ശക്തമായ പാലക്കാടൻ കാറ്റിന്റെ സാദ്ധ്യത, വിത്തുവിതരണത്തിനും, പ്രത്യുത്പാദനത്തിനും ഉപയോഗപ്പെടുത്തുന്ന സസ്യങ്ങളുടെ ബാഹുല്യം ഈ വനമേഖലയുടെ പ്രത്യേകതയാണ്. ഈ പഠനത്തിന്റെ ഭാഗമായി 124 വിവിധ സസ്യങ്ങൾ ഗോത്രവിഭാഗങ്ങൾ വിവിധ ആവശ്യങ്ങൾക്കായി ഉപയോഗപ്പെടുത്തുന്നതായി കണ്ടെത്തിയിട്ടുണ്ട്. കൂടാതെ 389 ഔഷധ സസ്യങ്ങളുടേയും, 116 ജനിതക ഉപയോഗമുള്ള സസ്യങ്ങളുടേയും, 139 വന്യ ആഹാര സസ്യങ്ങളുടേയും സാന്നിദ്ധ്യവും ഈ പഠനത്തിന്റെ ഭാഗമായി തിരിച്ചറിഞ്ഞിട്ടുണ്ട്.

GIS സാങ്കേതികവിദ്യ ഉപയോഗപ്പെടുത്തി ഈ വനമേഖലയിൽ നടത്തിയ മാപ്പിംഗ് പഠനത്തിൽ നിന്ന് കഴിഞ്ഞ 20 വർഷങ്ങൾക്കിടയിൽ വിവിധ വനമേഖലകളുടെ പരിധി കുറഞ്ഞു വരുന്നതായും കണ്ടെത്തിയിട്ടുണ്ട്. ഇത് ജില്ലയുടെ കാലാവസ്ഥയിൽ ദൂരവ്യാപകമായ ദോഷഫലങ്ങൾ ഉണ്ടാകാൻ ഉതകുന്നതായി തീരുമെന്നത് ആശങ്കപ്പെടുത്തുന്നതാണ്.

കൂടാതെ, ഈ പഠനത്തിന്റെ ഭാഗമായി നടത്തിയ വിവര ശേഖരണത്തിൽ നിന്ന് കേരളത്തിൽ ഏറ്റവും കൂടുതൽ വന്യമുഗങ്ങളുടേയും മനുഷ്യരുടേയും ഏറ്റുമുട്ടൽ സംഭവിക്കുന്ന വനമേഖലകളിൽ ഒന്നു കൂടിയാണ് വാളയാർ വനമേഖല എന്ന് തിരിച്ചറിഞ്ഞിട്ടുണ്ട്. മാത്രവുമല്ല ക്വാറികളുടേയും, മൈനുകളുടേയും പ്രവർത്തനവും പരദേശി സസ്യങ്ങളുടെ ബാഹുല്യം, കാട്ടുതീ, ടൂറിസം പോലുള്ള മനുഷ്യ ഇടപെടലുകൾ എന്നിവയും ഈ വനമേഖലയുടെ നിലനിൽപ്പിനെ ദോഷകരമായി ബാധിക്കുന്നതായും ഈ മേഖലയുടെ സംരക്ഷണം ഉറപ്പാക്കേണ്ടത് കാലത്തിന്റെ ആവശ്യമാണെന്ന് തിരിച്ചറിയുകയും ചെയ്തിട്ടുണ്ട്.

ABSTRACT

The present investigation focuses on the angiosperm diversity and bio-monitoring of Walayar Forest range which lies on the north-western side of the Palghat Gap. The hill tracts flanks an area of 125.65 sq.km. As the forest range is having human - animal conflicts, the floristic explorations were meager and a comprehensive study of angiosperm diversity in this range is lacking. In this context, an attempt was hereby made to account the diversity of angiosperms, their habitat diversity, biomonitoring and resource mapping in Walayar hill ranges including the discrete hillocks scattered in the range.

The extensive exploration resulted in the documentation of 1077 taxa which includes 1056 species, 11 subspecies and 10 varieties under 610 genera in 133 families. Fabaceae is the largest family followed by Poaceae and Cyperaceae. *Cyperus* is the most speciose genus followed by *Ipomoea* and *Ficus.* Herbaceous taxa predominates the vegetation followed by tree members. Among the forest types, deciduous forests form the prominent vegetation, with characteristic drier elements specific to this range in the district, followed by semi - evergreen forests and Grasslands.

The vegetation profile under this range showed reserve forests, vested forests, EFL sites and discrete low altitude hillocks. The range has two reservoirs and two major rivers along with small rivulets. The study area shows a range of altitudinal gradients from below 60m asl to 1700m asl and maximum species diversity was observed in medium altitudes. Raunkiaer lifeform spectrum analysis revealed 39.36% of the taxa as therophytes followed by Phanerophytes (30.45%) and lianas (13.74%).

The floristic diversity of hillocks documented 411 taxa belonging to 296 genera among 86 families. Nine different microhabitats were found to occur with special plant associations and a shift in vegetation with gradual disappearance of microhabitats with increasing temperature regimes during post monsoon period could be observed in the range. Adaptive traits like pubescence, succulence, semi - parasitism, carnivory, subterranean organs etc. were found among the plants in Walayar hills to thrive harsh edaphic and climatic conditions operating in the Palghat Gap zone. About 14% of the collected taxa were found to be endemic to various geographical regions of the country and could document 27 threatened taxa under various IUCN categories. Phenological studies revealed peak flowering between the months of September to December and from January to March. About 46.70% of the vegetation is confined to Indo - Pacific zone. Apart from the Indo - Pacific zone, the taxa showed more affinity to South American, African and Holarctic zones and least affinity towards Australian zone.

Three new plant novelties *Amorphophallus sp. nov*., *Ouret sp. nov*. and *Impatiens sp. nov*. along with recollection of *Oldenlandia hygrophila* Bremek. from its type location could be documented from Walayar hills. In addition to this, several taxa showed morphological variations in tune with the adverse environmental stresses of extremities in temperature, acute water shortage, higher wind velocity through the Gap etc. Further, taxonomic notes on the status of new taxa described *viz*., *Polycarpaea palakkadensis* V. S. A. Kumar, Sindhu Arya & V. Suresh and *Allmania multiflora* V. S. A. Kumar, V. Suresh, Sindhu Arya & Iamonico from Palghat Gap is also included. Out of the taxa collected, 87 were found to be an addition to Flora of Palghat (Vajravelu, 1990) and 98 taxa were found to have extended distribution to Palakkad district. Analysis of vegetation across Palghat Gap using PAST software revealed a demarcating difference in the vegetation on the northern and southern sides of the Gap.

Out of the 610 genera recorded, 401 were found to have single species and of the 133 families, 63 families contain a single genus. The taxonomic singularity of vegetation at Walayar hills at genus level is 0.83 and at family level is 0.61. In addition to this, a total of 33 monotypic genera could be recorded from Walayar hills. The ethnobotanical survey revealed that a total of 124 taxa were found to be collected and used by three tribal groups Irulars, Paniyars and Mudugars of the forest range.

The geographical peculiarities of the study area revealed the incidence of more anemophilous and anemochorous taxa. A total of 389 medicinal plants, 139 wild edibles and 115 taxa as wild relatives of cultivated plants could also be documented. Since the study area is one of the most disturbed hill tracts in Palakkad district, about 93 alien invasive taxa along with 87 degraded forest elements were found to occur in the range.

GIS mapping of Walayar hills for understanding the forest cover change over decades using Land Use Land Cover analysis could classify 11 land cover classes. Deciduous forests formed the major forest type followed by semi - evergreen and grasslands. There is a slight difference in the deciduous, semi - evergreen and grassland elements over decades. Analysis of vegetation in different altitudinal gradients revealed the occurrence of more deciduous elements below 1000m asl. The evergreen elements are found to be more above 400m asl and grassland elements in higher altitudes above 1300 m asl. Slope wise analysis revealed that the majority of the study area falls under gentle and medium slope areas. NDVI analysis of the health of vegetation over decades and mapping of landslide affected areas in the range could also be done.

Several threat factors adversely affect the health of the vegetation in Walayar hills. These include natural causes such as landslides, flood, forest fire and alien invasive taxa, and anthropogenic factors like mines and quarries, construction of highways, tourism, unscientific agricultural practices, pollution, waste disposal, grazing, man - animal conflicts etc. As the range lies in the vicinity of Palghat Gap, which plays a major role in regulating climate of the state, the conservation of existing vegetation and protection initiatives along with greening the Gap is essential to sustain the life support systems in this hill range.

LIST OF ABBREVIATIONS

AHP - Analytical Hierarchy Process

AICRPE - All India Coordinated Research Project on Ethnobotany

APFISN - Asia-Pacific Forest Invasive Species Network

APG - Angiosperm Phylogeny Group

AR4 - Fourth Assessment Report

ASTER - Advanced Spaceborne Thermal Emission and Reflection Radiometer

BHL - Biodiversity Heritage Library

BSI - Botanical Survey of India

CABI - Centre for Agriculture and Bioscience International (CABI)

CAL- Central National Herbarium, India

CALI - Calicut University Herbarium

CBD - Convention on Biological Diversity

CMPR - Central Medicinal Plant Research

DDF - Dry Deciduous Forest

ENVIS - Environmental Information System

ERDAS - Earth Resources Data Analysis System

ESA - Ecologically Sensitive Area

ESZ1 - Ecologically Sensitive Zone 1

ESZ2 - Ecologically Sensitive Zone 2

ESZ3 - Ecologically Sensitive Zone 3

ETM - Enhanced Thematic Mapper

FBI - Flora of British India

FCC - False Colour Composite

Fl. Madras - Flora of the Presidency of Madras

Fl. Palghat Dist. - Flora of Palghat District

FSI - Forest Survey of India

GIS - Geographic Information System

GPS - Global Positioning System

GRASS GIS - Geographic Resources Analysis Support System Geographic Information System

GVCH - Govt. Victoria College Herbarium

IPCC - Intergovernmental Panel on Climate Change

IPNI- International Plant Names Index

IUCN - International Union for Conservation of Nature and Natural Resources

K - Kew Herbarium

KFRI - Kerala Forest Research Institute

KSBB - Kerala State Biodiversity Board

LULC - Land use - Land Cover

LWG- Herbarium, National Botanical Research Institute, Rana Pratap Marg, Lucknow

MDF - Moist Deciduous Forest

MH - Madras Herbarium

MSL - Mean Sea Level

NDVI - Normalized Difference Vegetation Index

NIR - Near Infrared Radiation

OLI - Optical Line Interface

PAST - Paleontological Statistics

PDNA - Post-Disaster Needs Assessments

POWO - Plants of the World Online

Q- GIS - Quantum Geographic Information System

RET - Rare, Endangered and Threatened

RF - Reserve Forest

SNMH - SNM Herbarium

UNEP - United Nations Environment Programme

UNESCO -United Nations Educational, Scientific and Cultural Organization

USGS - United States Geological Survey

VF - Vested Forest

WCMC - The World Conservation Monitoring Centre

WGEA - Western Ghats Ecology Authority

WHC - World Heritage Centre

WTEF - Western Tropical Evergreen Forest

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I. INTRODUCTION

Humans are considered as the most intelligent species ever since life originated on earth and has invented sophisticated technologies to understand what is happening in and around their by just tapping his fingertip on a computer screen. They have even gained knowledge about the stars and planets that are located thousands of light years far from earth. But, with regard to the questions, like, how far do we know about our home earth? Do we have clarity on the number of living things on our earth? How many plants? How many animals? How many bacteria, viruses, our knowledge base is still incomplete.

Human life is always dependent on other living organisms in one way or the other. Among them, plants became an integral part of human life and when man started agriculture, which marked the beginning of human civilization. With the progress in civilization, human knowledge on the flora and fauna gathered remarkable momentum that in turn enhanced the quest for resources all around the world.

Biological diversity, first coined by Harris (1916) describes it as flora and fauna rich in genera and species. They may be of different geographical origin, but dependent on each other directly or indirectly. Biological diversity or biodiversity is the variety and variability of organisms at the genetic, species and ecosystem level (Savage, 1995; Ghimire & Pimbert 1997; Schwartz 2007; Kohli, 2019). It is not uniformly distributed on earth. It is usually greater in the tropics than temperate zones. Warm climate with adequate light and other favorable environments may be the reason for the rich diversity in tropical regions.

Changes in the biological diversity of natural ecosystems due to intensive anthropogenic interventions in the middle of the 20th century have become a global issue. Biodiversity is a complex issue and is frequently equated with the level of species richness. It is addressed at the level of number of species in a geographical area. Three different levels of biodiversity occurs viz., genetic diversity which is the diversity within a species, species diversity defining the diversity of different species and ecosystem diversity defined by diversity within a region (Merganič *et al.*, 2012; Soloviev, 2019).

1.1. Floristic diversity - the Indian perspective

The World Conservation Monitoring Centre (WCMC) of the United Nations Environment Program has identified a total of 17 megadiverse countries (https://www.iberdrola.com). India is one of the 17 mega biodiversity nations with angiosperms comprising ca. 18,532 species, representing around 10% of all known

flowering plants of the world (Singh, 2020). The country is both rich and diverse due to a wide range of variations in climate, altitude and ecological habitats.

Latest India State of forest report (2021) summarizes that the total forest and tree cover of the country is 80.9 million hectares which is 24.62 percent of the geographical area of India. There is an increase of 2261 sq km in the total forest and tree cover of the country when compared with the assessment of 2019.

Nayar (1996) conducted endemism studies on the floristic diversity of India and found that about 5725 species of flowering plants can be considered as endemics and represent 33.5% of the Indian flora, of which, 3471 species are found in the Himalayas, 2051 in the Peninsular India and 239 in Andaman & Nicobar Islands. Besides that, 147 genera are endemic to India, out of these 71 genera are endemic to the Himalaya, 60 to Peninsular India and one genus, i.e., *Pubistylus* Thoth. is endemic to Andaman & Nicobar Islands. He further identified 3 megacentres and 25 micro centres of endemic plants in the Indian subcontinent based on the diversity and distribution of endemic species.

Later assessments state that the floral wealth of India comprises 47,513 species representing as much as 11.4% of world flora, of which about 28% are endemic. The angiosperm flora comprises 20,141 species, including 4036 endemic as well as 1700 threatened taxa (Arisdason & Lakshminarasimhan, 2016).

According to Botanical Survey of India (BSI, 2021), 4045 taxa belonging to 975 genera under 155 families are considered as strict endemics to the present Indian political boundary. Further, dicotyledones dominate the endemic flora with 2984 taxa under 720 genera in 128 families whereas monocotyledons are represented by 1061 taxa belonging to 255 genera under 27 families. According to BSI - ENVIS (2022), in present India, about 20,000 flowering plants were recorded so far including cultivated or naturalized ones with approximately 15% endemic taxa.

Singh (2020) also commented that the largest number of species is found in family Leguminosae (with 1421 spp.), followed by Poaceae (1291spp.), Orchidaceae (1251 spp.), Asteraceae (1120 spp.) and Rubiaceae (679 spp.). The largest represented genus is *Impatiens* (with 279 spp.), followed by *Carex* (160 spp.), *Pedicularis* (145 spp.), *Bulbophyllum* and *Primula* (135 spp. each). Of late, the number of taxa under the genus *Impatiens* has been accounted as 326 taxa includes 302 species and 24 subspecies or varieties (Prabhukumar *et al*., 2022).

The Indian flora is concentrated in three major centers of floristic diversity viz., the Himalayas, the Western Ghats and Andaman and Nicobar Islands, which are part of the

thirty-six identified 'global biodiversity hotspots', viz., Himalayas, Western Ghats and Sri Lanka, Indo Burma (NE India and Andaman Islands), and Sundaland (Nicobar Islands). It is also one of the vast geographic areas where deep associations between biodiversity and culture present unique traditions and religious rituals. Further, India is also recognized as one of the eight Vavilovian centers of origin of crop plants and consists of more than 300 wild relatives of cultivated plants. Biogeographically India forms a large part of the Indo-Malayan ecozone. India has vast diversity of forest areas and the forest cover of India is 24.39 percent of the total geographical area of the country. With only 2.4 per cent of the land area, India accounts for 7 to 8 percent of the recorded species of the world. Further, India is also one of the twelve primary centers of origin of cultivated plants and is rich in agricultural biodiversity (Roy & Roy, 2015).

India contributes to the seven percent of global faunal diversity even though India occupies nearly 2 percent of global space (Mathur *et al.*, 2014). Also, the country has a wide range of climate and vegetation types ranging from tropical to temperate and alpine ecosystems with high level of endemism (Ahmedullah & Nayar, 1987; Pascal & Ramesh, 1997). Champion & Seth (1968) categorized the main Forest types in India as coniferous forests, tropical evergreen forests, semi evergreen, tropical dry deciduous, evergreen forests, semi desert forests, mangrove forests, wetlands, littoral and swamp forests, montane vegetation and grasslands.

Many old Indian historical and mythological literature have quoted various rare plants that were used to cure diseases, as food, as miracle plant etc. Many such plants were conserved since it is mentioned as sacred in the religious writings. As the foreign traders landed in India, they got interested in the diverse habitats and plant wealth. Since then, floristic assessment of Indian biodiversity has been a very significant target of all the foreign rulers during pre - independent period. *The flora of British India* (Hooker, 1872 - 1897) published in 7 volumes and *The Flora of Presidency of Madras* (Gamble & Fischer, 1915-1936) published in 3 volumes are some of the authentic literature published with the detailed floristic documentation of plants in entire India and South India respectively. In recent times, several online databases are available to document the floral diversity in India viz., eflora of India, Indian Biodiversity Portal etc. This geared the floristic explorations of the earlier unexplored regions and re-explorations to verify the presence of those taxa already recorded in the Indian forest ecosystems. Several national agencies such as Botanical Survey of India (BSI) with substations in various parts of the country are

promoting the angiosperm taxonomy studies by conducting various research works, maintenance of herbaria and by offering other library facilities along with online resources.

Nowadays, remote sensing technology and Geographic Information systems are being utilized to categorize and spatially map, stratify the vegetation types based on ecological gradients and environmental drivers (Roy & Roy 2010).

1.2. Floristic diversity in Western Ghats

The Western Ghats, also known as 'Sahyadris' form a long chain of mountains running parallel to India's Western coast, approximately 30-50 km in land, traversing through the states of Kerala, Tamil Nadu, Karnataka, Goa, Maharashtra and Gujarat covering a total area of about 160,000 sq km (UNESCO, 2021). There is a high degree of diversity of medicinal plants in Western Ghats, which shows varying degrees of endemism (Rao, 2012). Rao (2012) observed seven major forest types in Western Ghats viz., (i) the dry scrub vegetation (ii) the dry deciduous forests (iii) moist deciduous forests (iv) the semi-evergreen forests (v) the evergreen forests (vi) the shoals and (vii) the high altitude grasslands.

The mountain chains of Western Ghats have remarkable geographical features and scenic beauty. These hill ranges may be classified under four division on the basis of floristic composition viz., 1) from river Tapti to Goa, (2) from Kalinadi to Coorg, (3) the Nilgiris and (4) the Anamalai, Palni and Cardamom hills (Rao, 1994). The mountainous ecosystem has a great impact on the Indian monsoon weather pattern, and it is one of the best examples for the monsoon system on the planet. The Western Ghats have a high percentage of endemic species and an earlier assessment account for about 48% of 4000 species occur in this region (Gopalan & Henry, 2000). It is also observed that a treasure of diverse religions, socio - cultural and tribal groups. Western Ghats create a natural geographical barrier forming western coast of Malabar and Deccan along windward and leeward sides respectively (Chatterjee, 1939). This resulted in the diverse climatic conditions in Western Ghats. The rainfall ranges from about 5000 mm per annum in windward areas to less than 600 mm in the leeward or rain shadow areas with prolonged dry seasons .

The floristic diversity of the Western Ghats hotspot was earlier documented by Gamble and Fischer (1915 - 1936), Fyson (1932), Nair and Daniel (1986), Rao (1994), Nayar (1996) and several others. These studies are the base information for today's explorers to identify the floristic elements present in these diverse forests.

Of late, assessments on diversity of angiosperms in Western Ghats, (Nayar *et al.*, 2014) estimates about 7995 taxa with 7402 species and 593 infraspecific categories, including 5,588 species which are native and 376 as exotics. Of the native ones, 2,253 species are endemic to India and 1,273 are exclusively confined to the Western Ghats. This assessment accounts 1,438 species as cultivated or grown as ornamentals.

The discovery of many new taxa from these tropical forests in recent explorations indicates the need for further investigations and studies in Sahyadri hills. Even though, Western Ghats is one of the hottest hotspots of the world with high degree of endemism, the serenity of this forest is being lost due to habitat destruction, increased fragmentation, urbanization, pollution, wildlife poaching, alien - invasive elements, establishment of plantations and human wildlife conflict.

1.3. Floristic diversity in Kerala

The state of Kerala is located on the Malabar coast of South West India sharing its boundary with states of Tamil Nadu and Karnataka. It lies between 8°18'–12°48' N and 74°52'–77°22' E longitudes and covers a total area of 38,863 Sq Km representing 1.l8% of the total area of India (http://www.forest.kerala.gov.in). The state of Kerala experiences south - west and north - east monsoon with highest annual rainfall of about 5883mm and lowest with 651mm from Chinnar in Idukki. Occurrence of tropical rain forests along the windward region of southern Western Ghats and dry deciduous forests and scrub jungles on the rain shadow regions (Sasidharan, 2011) are peculiar for southern Western Ghats. The diverse topological conditions along with high rainfall and moderate tropical temperature have resulted in the occurrence of diverse ecosystems in the state. Champion and Seth (1968) observed twenty- six forest types and some of the important ones include west coast tropical evergreen, west coast semi-evergreen, southern moist mixed deciduous, southern dry mixed deciduous, southern montane wet temperate forests, southern subtropical hill forests, southern montane wet temperate grasslands and littoral forests (mangroves). Other special habitats include Myristica swamps, thorn forests, Scrub jungles of Euphorbiaceae, Reed, bamboo and cane brakes etc. The state harbours 5094 taxa under 1537 genera and 221 families of flowering plants (Sasidharan, 2014). The flora of Kerala has some resemblance with that of Sri Lankan, northeastern and lower Himalayan elements. It also documents 880 exotic species that have been introduced for agriculture and forestry. The database on flowering plants of Kerala (Sasidharan, 2014) adds 1418 taxa to the flora of Kerala after the Flora of the Presidency of Madras, of which 355 taxa form new species and

rest 1,063 are new records of occurrence. New plant discoveries and new plant records are reported from various parts of Kerala after this database. Continuous explorations in different seasons may result in the documentation of new taxa which will add to the floral wealth of Kerala.

1.4. Floristic diversity in Palakkad district

Palakkad, one of the major gateways to Kerala lies between 10°47'4.93"N and 76°39'11.32"E and 10°51'44.02"N and 76°48'27.55"E due to the presence of the Palghat Gap in the Western Ghats. The presence of this gap separates Kovai district of Tamil Nadu and Palakkad district of Kerala. The climate of the district is tropical. The district has both midlands and highlands and the midland region comprises valleys and plains, while highlands includes all higher hilly mountain tracks. The eastern region of the district has high mountains, extensive ravines and dense forests. The altitude ranges between 15m in the west and 2500m in the North-East which contain high mountain peaks, long spurs, extensive dense forests and tangled jungles. Anginda and Karimala (above 1900m) are the largest peaks in the district (District Census handbook Palakkad, 2014).

Vegetation of Palakkad district is unique due to the Palghat Gap features and the first attempt to study the angiosperm vegetation of Palakkad district (Subramanian *et al.,* 1987) enumerated 757 angiosperm species followed by the detailed documentation of its flora by Vajravelu (1990), enlisting 1355 species belonging to 732 genera spread over 146 families of flowering plants. In terms of conservation, Palakkad harbors two major protected areas, Silent valley National Park and Parambikulam Tiger Reserve . The Flora of Silent valley was done by Manilal (1988) and that of Parambikulam by Sasidharan (2002). Vajravelu (1990) published the district flora covering almost all parts of the district boundary. After the publication of flora of Parambikulam Wildlife sanctuary (Sasidharan, 2002), studies have been undertaken in Attappady hills (Anilkumar, 2015), Kollengode range forests (Soumya, 2018), low altitude hillocks in Palghat Gap region (Arabhi, 2019), Dhoni hills (Rekha, 2019), the riparian vegetation of Thuthapuzha sub-basin (Jisha, 2019) and Nelliyampathy Hills (Jabeena, 2021). Apart from these, other forest ranges have not been submitted to comprehensive explorations and it is in this background, the present documentation on Walayar Forest range is being attempted in this investigation.

1.5. Palghat Gap

One of the noteworthy features of Western Ghats is the occurrence of three major breaks along its stretch, viz. Goa Gap, Palghat Gap and Aryankavu Gap and significant among them is the widest one, the Palghat Gap which is the major break in the continuity of

the high hill tracts of Western Ghats (Jacob & Narayanaswami, 1953). Palghat Gap is one of the main gaps in the Southwestern India's Western Ghats mountain range. This gap is about 32 Km wide and is located between the states of Kerala and Tamil Nadu and forms one of the noteworthy. This gap is creating the Western Ghats as one of the globally recognized ecologically sensitive zones with diverse forest types ranging from the dry scrub types to the semi-evergreen and evergreen forests. The state of Kerala has been divided into two rainfall regions with respect to the 10^{o} latitude which incidentally is the position of Palghat Gap (Simon & Mohankumar, 2004). Consequently, the surrounding regions of the Gap possess unique species composition compared to any other region in the state.

Nilgiris and Anamalai stretches are the mountainous regions situated on either side of the Palghat Gap. The climate of the district is found to be greatly influenced by this Gap which enables the North – East winds to blow right up to the coast throughout the breadth of the gap. This Gap region forms the river basins for the largest river the Bharathapuzha and its tributaries viz. the Kalpathipuzha, the Walayar river, the Korayar river, etc. The region has a number of isolated low altitude hill systems which is a special feature in Palghat gap region. (District Census handbook Palakkad, 2014).

Molecular studies reveal that the Gap forms a major biogeographic barrier for several species suggesting that, gap forms one of the drivers for diversification of various taxa such as the Asian elephant, the lion-tailed macaque, bush frogs and some birds (Vidya *et al.*, 2005, Robin *et al*., 2010, Vijayakumar *et al*., 2016). Studies also suggest that changes in Palaeo-climatic conditions and gradual formation of the Gap might have resulted in population diversification during the Pleistocene. Further, genetic studies on the Nilgiri Tahr in north and southern side of Palghat Gap do highlight that Gap act as a significant barrier in population diversification (Joshi *et al*., 2018).

Due to low elevation at the Gap region, the South west monsoon winds do not ascend as it does in other parts of the Western Ghats, and get channeled through the gap. This is the reason for the extremely strong winds in the eastern side of the district in general and explains the slightly less amount of rainfall received in the district of Palakkad (Maya *et al*., 2022). Due to this unique feature, the vegetation pattern in and around the Gap is also different from other parts of the district. Reserve Forests of the district under different forest divisions are less explored for bioresources and these regions harbor undocumented floristic wealth which will form the asset to the state’s floral wealth.

1.6. Floristic diversity in Walayar forest range

Walayar hill ranges come under the Nilgiri Biosphere Reserve and is a continuous mountain tract located north to the Palghat gap region (Prithiviraj *et al*., 2011). It comes under the jurisdiction of Palakkad Forest division. Earlier studies by Balaji and Hariharan (2013) reported, dry deciduous forest (DDF), moist deciduous forest (MDF), and western tropical evergreen forest (WTEF) as the predominant vegetation types in the valleys and nearby hills of Walayar. Malampuzha and Walayar dams are the two major reservoirs in the range which forms the major water source for irrigation and drinking water. Except for few ethnobotanical studies that have been carried out in the tribal settlements bordering the Tamil Nadu state (Thomas *et al.*, 2011; Venkatachalapathi *et al*., 2016), no thorough explorations have been attempted in this forest range . As the area is within the Palghat Gap zone, the environmental extremities are so severe and hence the vegetation composition makes a series of adaptations by way of metabolic pathways and morphological readjustments by way of adaptive mechanisms (Smrithy *et al*., 2023). Hence a critical analysis in this dimension will provide data required for effective conservation strategies to be implemented in this fragile harsh ecosystem.

1.7. Modern Trends in Vegetation analysis

A series of technologies have emerged in the past few decades for collecting and analyzing spatial and geographic data (Goodchild, 1994). Global Positioning System (GPS) based on the information and signals received from specific orbitary satellites have resulted in the advancements in remote sensing and Geographic Information System (GIS). With the advancements in these technologies, it's now possible to monitor environmental changes, vegetation analysis, movement of animals, forest fire prediction, assessment of intensity of natural calamities, changes happening to forests and other natural resources over a period of time and many more.

Different application software such as Arc. GIS, Q- GIS, MapInfo Professional, GRASS GIS etc. uses the data available from Geostationary satellites to study, analyze and finally create various maps of high accuracy. These GPS based data collection and analysis is more precise and faster than the conventional mapping and surveying techniques.

These technologies have also enabled the study of inaccessible interior forests, peaks and trenches, which was thought to be impossible (http://www.GPS.Gov/applications/survey). These technologies have applications in military, intelligence, commercial, economic and planning fields (https://www.usgs.gov/).

Future climate prediction of earth, survival possibilities of different threatened animals and plants, invasive tendencies of different organisms, pest control and spreading rate of a pandemic are some other applications of this technology. For this, special application software such as Maxent, Garp, Biomod2 etc. are used. The geographical information received from various databases of satellites can further be used to map the forest areas of Western Ghats, one of the hottest hotspots of the world.

Only a few forest tracts remain protected due to the establishment of biosphere reserves, national parks, sanctuaries etc. It is also noted that forest tracts which are difficult to access also remain protected in its natural form. One such region is the Walayar forest range. This forest range is least explored by the botanists due to its inaccessible difficult terrain characterized by steep mountain slopes and valleys, attack of wild animals etc. In this background, the present study focuses on the angiosperm diversity in the Walayar forest range.

1.8. Aim of the study

The present research focuses on exploring the angiosperm flora of Walayar hill ranges under Palakkad Forest division. The study also documents the threat category taxa along with the degree of endemism in the study area. Since tribal settlements are part of Walayar forest range, the study also aims at the documentation of ethnobotanical knowhow of the community inhabiting the forest range. Phytogeographical affinities of the vegetation, along with resource mapping is also being attempted in the present study. In order to attain these, short term objectives have been set as follows:

1.9. Objectives of the study

- Exploration and collection of angiosperms in different seasons with an objective of bio-monitoring
- Taxonomic characterization and identification of angiosperm diversity with reference to diverse ecosystems in the study area
- Preparation of taxonomic account
- Documentation of low altitude hillock vegetation along with the main Ghat system
- Preparation of a document on the degree of endemism and threat category taxa as influenced by Palghat Gap features
- Photo-documentation of the taxa of the area and their habitats
- Identification of species in consultation with floras, types and protologues
- Preparation of herbarium

- Ethnobotanical survey with special emphasis on the tribal communities inhabiting the study area
- Vegetation mapping using GIS
- Elucidation of the Phytogeographical affinity of the vegetation in the area

1.10. Relevance of the study

The present study aims to explore the flowering plant diversity of the Walayar forest range. The area has not yet been explored thoroughly by any previous documentation of angiosperms conducted in Palakkad district and this forms the first comprehensive attempt to document the angiosperm diversity of this unexplored hill tract.

Explorations in the low altitude hillocks located in the forest range highlights the biodiversity richness in such abandoned wastelands. Such areas may be home for numerous floral and faunal forms and will be having only a narrow distribution status. Several microclimatic species may be present in these systems which may get lost with any minor habitat modifications either by eco-climatic factors or by human intervention . This documentation in hillocks may help the authorities to limit the exploitations in these small rocky systems.

Floristic studies along with the geo – spatial characterization of Walayar hills will result in the better understanding of the floristic elements in the hill tracts very close to the Palghat Gap region. These results may also be used to compare the changes happening to the forest cover with the available past data. Resource mapping of Walayar hills will reveal the forest types, altitudinal distribution of taxa and nature of forest cover. This will also help in analyzing the changes happening in the forest cover in the study area during the last two decades.

Further, the present study may help in understanding the influence of Palghat gap on the species composition in Walayar hills and the adaptive traits exhibited by the plants to overcome the strong desiccating hot winds blowing through the Gap. The investigation also may help to document the invasive taxa in the Walayar hills and the potentiality of these taxa to get invaded in the nearby forest tracts. Moreover, the study may reveal the presence of lesser-known taxa along with presence of economically and medicinally significant species. Identification of floristic diversity and its taxonomic characterization giving emphasis to the biomonitoring planned in the investigation expects to unravel the angiosperm diversity at local level, which could be extrapolated into macro level diversity as a product of direct influence of Palghat Gap features.

II. REVIEW OF LITERATURE

Floristic explorations followed by its documentation provides us with the information regarding the species diversity and richness in a specific biogeographic area. Such documentations date back to many centuries. Initially, in India, these studies were carried out by foreigners who ruled our nation. They aimed at finding out the bioresources for their country's infrastructure development. Later in the post independent period, exploratory studies were focused in various habitats with an intention to document the floristic diversity with conservation of certain geographical locations. Here an attempt is made to get an insight on the past floristic studies in various ecosystems giving more emphasis to southern Western Ghats, Kerala and the district of Palakkad.

II. 1. Floristic studies in Peninsular India – An overview

In Western scientific taxonomy, the Greek philosopher Aristotle (384-322 BC) was the first to classify all living things and some of his groups are still used today. Swedish Botanist Carolus Linnaeus marked the beginning of present day binomial nomenclature of plants by publishing a two-volume book '*Species Plantarum*' in 1753. He came up with a precise workable binomial system for naming plants. This formed the basis of modern taxonomy. The book described 6000 species of plants with each species having a generic name followed by a specific name.

Arrival of Europeans for trade, marked the beginning of the new era of taxonomic explorations in India as the Europeans were astonished to see the floristic wealth. Many foreign botanists took the initiative to explore the biodiversity rich sites. Portuguese physician and naturalist, Garcia de Orta published a check list of medicinal plants used in India '*Colóquios dos simples e drogas da India*' in 1563 and became the pioneer of tropical medicine. This is followed by another book on the medicinal plants used in Pharmacology '*Tractado de las drogas y medicinas de las Indias orientales'* by Acosta (1578), a Portuguese doctor and naturalist and the book describes on the simple drugs and medicinal substances of India. Later after a century, an epic work named *'Hortus Indicus Malabaricus'* was published in 12 volumes by Van Rheede (1678 - 1703) and provided a detailed documentation of plants in Malabar coast (present Goa to Kanyakumari) with about 742 species supported by 794 illustrations. Since Van Rheede was not a professional botanist, he was assisted by a native Physician, Itti Achuthan and is believed to be the earliest comprehensive printed work on the flora of Asia and the tropics (Manilal, 1980).

Later, the British in the pre - Independent India made major contributions in documenting the floristic wealth of India. The books '*Flora Indica'* by William Roxburgh

(1832) and '*Prodromus Florae Peninsular Indiae Orientalis'* by Wight and Arnott (1834) gave information about plants in India and Peninsular India respectively. Later, Wight (1840 -1853) published a six volume '*Icones Plantarum Indiae Orientalis'* containing plant illustrations. His other major work includes 'Illustrations of Indian Botany' with colored plant illustrations (Wight, 1840 -1850).

The other important contributions to floristic wealth of South India was done by Beddome by his three renowned books namely *Trees of the Madras Presidency* (1863), *Icones Plantarum Indiae Orientalis* (1868-1874) and *the Flora Sylvatica of South India* (1869-1874).

The botanical studies in India reached its heights when Hooker, J. D. (1872 - 1897) published his seven-volume work '*Flora of British India*' dealing with the Phanerogams of British India along with their geographical information. Following this, several regional floras like the *Flora of the Presidency of Bombay* (Cooke, 1901-1908) and the *Flora of the Presidency of Madras* (Gamble & Fischer, 1915-1936) were published and these literature were found to be classical reference material till date.

During 1908, the British-Indian botanist, Bourdillon, the then Conservator of Forests in the Princely state of Travancore published a book on the forest trees in Travancore which covered 582 indigenous species present in the state. Later, another important documentation of flowering plants of Travancore was authored by Rama Rao in 1914. Furthermore, many floristic studies were carried out to record the plant wealth in high altitude hill tracts of South India. '*The flora of the Niligiri and Pulney hill tops'* (Fyson, 1915-1920), '*Flora of South Indian Hill Stations'* (Fyson, 1932) and '*Vegetation of Nilgiris*' (Bor, 1938) are significant among them.

Later, several local floras were published by the Botanical survey of India, including Flora *of Tamil Nadu* published in three volumes (Nair & Henry, 1983; Henry *et. al*., 1987 and 1989), '*Flora of Karnataka: analysis*' by Sharma (1984), '*Materials for the flora of Arunachal Pradesh* Vol. 1 and 2' by Hajra (1996) and Giri *et al.,* 2008 and '*Flora of Madhya Pradesh* published in three volumes (Verma *et al*., 1993, Mudgal *et al.,* 1997 and Singh *et al.*, 2001). Another important work of Botanical Survey of India was 'Red Data Book on Indian Plants' by Nayar and Sastry (1987; 1988; 1990) that revealed the threat status of 614 taxa of vascular plants for whole of India, of which, 185 taxa of flowering plants find its distribution in southern Western Ghats.

Another important work includes the floristic record on the vegetation of Khedbrahma region of North Gujarat listing 554 taxa, of which 448 are dicotyledons and

102 are monocotyledons (Bhatt *et al*., 1969). Further, Blasco (1970) published a book on the flora and ecology of Savannas in south Indian hill stations and described 356 species, specific to that habitat. Later, floristic diversity of Bangalore district revealed the presence of 979 species (Ramaswamy & Razi, 1973). Further, the documentation of rare and threatened plants in south India was carried out (Henry *et al.,* 1979) and Flora of Courtallam (Nair & Nayar, 1986 - 1987) enumerated 745 flowering plants. '*The book of Indian Trees*' and '*Flowering trees*' by Sahni (1998) and Randhawa (1965) respectively formed truly some of the major contributions to the tree flora of India.

Chandrabose (1981) conducted floristic studies in Coimbatore city and the nearby areas. The flora of Tamil Nadu – Carnatic was explored by Matthew (1983) and resulted in the record of 2260 angiosperms under 983 genera. In the same year, 600 vascular plants were recorded from Agasthyamalai and surrounding regions in Tirunelveli District, Tamil Nadu by Henry and Subramanyam (1981). Detailed floristic studies on the epiphyte diversity in forest ecosystems in Nilgiri biosphere reserve (Kumar, 1988) yielded 225 species of vascular epiphytes with Orchidaceae forming the dominant family represented by 129 species under 39 genera.

Sreekumar and Nair (1991) described the occurrence of 296 grass species under 103 genera from Kerala. The study introduced two new genera, *Chandrasekharania* V. J. Nair, V. S. Ramach. & Sreek. and *Silentvalleya* V. J. Nair, Sreek., Vajr. & Bhargavan to the Kerala flora along with 26 new novelties. In the same year, Sabu (1991) carried out extensive taxonomic study on the south Indian Zingiberaceae members and documented 65 species and 2 varieties under 10 genera. The leaf morphology of 14 south Indian *Dioscorea* species was examined and made useful for the easy identification at specific level in the same year (Amalraj *et al*., 1991). The first revisionary study on the bladderworts by Janarthanan and Henry (1992) documented 35 species in India. During the same period, Sivarajan *et al*., (1992) came up with the report of seven species of *Psilanthes* in India.

In the same year, Kumar and Manilal (1992) documented 630 species of epiphytic orchids under 85 genera from all over India except the alpine region of Himalaya. Later, field studies to Shevoroy and Kolli hills lead to the documentation of 15 parasitic angiosperms (Ansari *et al*., 1994). The flora of the Gulf of Mannar was analyzed by Daniel and Umamaheswari (2001) and recorded 784 angiosperms belonging to 433 genera under 113 families. The exploratory studies on the orchid diversity of Shevoroy and Kolli hills of Tamil Nadu revealed the occurrence of 66 species (Ansari and Dwarakan, 2002). The flora of Darjeeling hills (Das, 2004) recorded 2137 species belonging to 898 genera and 193

families, of which ca 1900 species in 772 genera and 159 families belong to Dicots and the rest to the Monocots.

Sampling studies for woody plants in shola forest in Palani hills (Davidar *et al.*, 2007) identified 83 species under 68 genera and 40 families including trees and lianas, among which 30 percent of species were endemic to Western Ghats. Followed by this, floristic studies in Nallamala in Andhra Pradesh (Reddy *et al*., 2008) revealed 1541 species under 778 genera and 144 families with Poaceae as the dominant family followed by Papilionaceae and Euphorbiaceae. In the same period, quantitative studies of 156 trees in tropical forests in Mudumalai Wildlife sanctuary in Tamil Nadu was carried out by Reddy *et al*., (2008). The book '*Flora of Tamil Nadu: Grasses*' by Kabeer and Nair (2009) is one of the major contributions to the taxonomy of Tamil Nadu state which recorded about 466 taxa in 136 genera under 19 tribes. Floristic studies in protected ecosystems of Pathankot, Hoshiarpur (Manhas *et al.*, 2010) and Garhshanker areas of Kandi region in Punjab (Rawat *et al*., 2013) were also done as floristic knowledge additions to Indian vegetation.

Saini *et al.*, (2012) highlighted the immediate need for the conservation of Pichavaram reserve forest, Tamil Nadu by reporting 14 species of mangroves, of which ten are endangered, three vulnerable and one taxa under near threatened. The taxonomy and distribution of family Pontederiaceae in South India was studied by Anoop *et al*., (2012) and the distribution status of *Eichhornia crassipes* (Mart.) Solms, *Monochoria hastata* (L.), *Monochoria vaginalis* (Burm. f.) Presl and *Pontederia cordata* L. were presented.

Harisha and Hosetti (2013) have assessed the Floristic diversity of Daroji Sloth Bear Sanctuary, Hospet, in Bellary district located in North Karnataka. A total of 98 species of plants belonging to 85 genera and 37 families were recorded. Floristic study at Shirur region in Maharashtra (Ganorkar & Kshirsagar, 2013) revealed the vegetation as arid to semi - arid, dry deciduous and thorny scrub type, and recorded 161 plants belonging to 49 families. In 2014, Nayar and his team gave a detailed record of 7995 flowering plants in Western Ghats and also reported 5588 species as indigenous or native to Western Ghats. The plant diversity of Muniandavar Sacred Groves of Thiruvaiyaru in Thanjavur district (Jayapal *et al*., 2014) revealed the presence of 180 species belonging to 158 genera and 75 families with herbs forming the dominant habit followed by trees. In the following year, Sarvalingam and Rajendran (2016) documented 285 climbers belonging to 125 genera and 41 families from different forest regions in Tamil Nadu with 33 threatened taxa.

Shaik and Parveen (2017) conducted floristic and medicinal plant survey at Ahobilam forest of Kurnool district in Andhra Pradesh and recorded 102 plant species belonging to 40

dicot families, 7 monocot families and 6 pteridophyte families with trees forming the major composition followed by herbs, shrubs and climbers. Gulia *et al*., (2017) recorded 181 species belonging to 142 genera and 52 families from village ponds of southern Haryana with Poaceae as the dominant family followed by Fabaceae and Asteraceae. Floristic Studies of Sasihithlu Estuary of Dakshina Kannada in Karnataka (Bharadwaj & Prasad, 2021) showed the occurrence of 88 species under 81 genera belonging to 46 families. Rao and Krishnamurthy (2021) evaluated the floristic diversity in Agumbe in south India and accounted 570 species belonging to 370 genera and 105 families with Leguminosae contributing the maximum number of species (47 species) followed by Rubiaceae (32 species) and Asteraceae (27 species).

II.2. Revisionary studies in Angiosperms

Several revisionary and monographic studies are being carried out for the better understanding of floral diversity in family and at generic levels. These studies further provide us with the minute details of the respected family or genera and take the taxonomic studies to a different level by seeking modern techniques for the better classification and grouping of each taxon.

Saldanha (1963) conducted revisionary studies on the genus *Striga* Lour. in western India and reported five species along with a dichotomous key for the easy identification. Later, taxonomic revision of family Caryophyllaceae in India (Majumdar, 1965) resulted in the documentation of 134 species under 23 genera of which 27 species were added to the number of species recorded in the flora of British India. In the following year, Saldanha (1966) published his work on the genus *Torennia* L. in western peninsular India and reported seven species with two new distributional records and Rao (1966) came up with the preliminary survey of family Orchidaceae in South India and recorded 84 species. Following this, the genus *Scolopia* Schreb. of family Flacourtiaceae was examined by Sleumer (1972) and described thirty seven species and two varieties. Later, revisionary studies on the genus *Antistrophe* A. DC. enumerated five species (Nayar & Giri, 1976). Mukerjee (1980) carried out a detailed revisionary study on the family Sapindaceae in Peninsular India and came up with 22 species under 15 genera and Nair (1980) studied the genus *Microchloa* R.Br. in India. Next year, revisionary work by Subramanyam (1981) gave a detailed distribution of twenty-four species of genus *Utricularia* L. in Peninsular India, Chandrabose and Nair (1981) revised the genus *Polygala* L. in the south Indian states of Andhra Pradesh, Tamil Nadu and Kerala and Dixit and Panigrahi (1981) reported 12

species under the genus *Sibbaldia* (Rosaceae) in India of which 4 species were found to be endemic to Himalayas.

Detailed phenological, ecological and distributional patterns of two species of *Vatica* in India was studied by Tewari and Sarkar (1986) and in the next year Sivarajan *et al*., (1987) came up with the study of genus *Spermacoce* L. in India. In 1988, Paul and Nair in collaboration with Botanical Survey of India conducted taxonomic study on family Malvaceae in India and reported 104 species under 24 genera and Basu (1988) provided a detailed account on the distribution of four *Corypha* species in India. Later, the revision of genus *Rotala* Linn. in Peninsular India (Joseph & Sivarajan, 1989) documented 19 species and among them 16 species are having their distribution in Kerala. The study also revealed two new novelties namely *Rotala cookie* Joseph & Sivar. and *Rotala vasudevanii* Joseph & Sivar.

Other revisionary investigations include the genus *Curcuma* in south India with seventeen species (Mangaly & Sabu, 1993), genus *Aporusa* BI. in Indian sub – continent (Chakrabarty & Gangopadhyay, 1993) and genus *Julostylis* Thwaites in India (Pradeep & Sivarajan, 1993). The family Eriocaulaceae in India was studied by Ansari and Balakrishnan (1994) and recorded 65 species. Following this, eight species of *Ochlandra* Thw. (Poaceae: Bambusoideae). could be collected and investigated by Kumar in 1995. Taxonomic Monograph on Malvaceae (Sivarajan & Pradeep, 1996) reported 78 species in Peninsular India and was one of the major contributions to the taxonomy of Malvaceae. Earlier and primary studies on the diversity of family Balsaminaceae (Rajalal *et al*., 1996) recorded about 200 species in India. The family Podostemaceae was investigated by Mathew and Satheesh (1997) and described thirteen species from Kerala. In the same year, the family Amaranthaceae in south India was first studied by Reddy and Raju (1997) and came up with 51 taxa belonging to 17 genera and Kumar *et al*., (1997) provided a detailed account on 15 species of *Vanda* in India. Then, the family Caesalpiniaceae and mimosaceae in Eastern Ghats was examined by Pullaiah (1997) and recorded 42 species.

Other some important revisionary studies carried out in the following years include the taxonomic account of genus *Indigofera* L. in Eastern Ghats (Ramamurthy & Pullaiah, 1998), genus *Dalbergia* in Eastern Ghats (Murthy *et al*., 2000a) and genus *Rhyncosia* Lour. in eastern Ghats (Murthy *et al.*, 2000b). The record of sedges and grasses in Dakshina Kannada and Udupi districts were carried out by Bhat and Nagendran (2001) and documented 75 species of sedges belonging to 16 genera and 158 species of grasses belonging to 72 genera. Following this, the taxonomic revision of the family Verbenaceae

in India revealed 105 species and 11 varieties, of which 77 of them are illustrated (Rajendran & Daniel, 2002) and the study on members of family Solanaceae in Eastern Ghats (Venkittappa & Pullaiah, 2002) reported 34 species under 12 genera.

Systematics and phylogeny of the genus *Calamus* Linn. (Araceae) in the Western Ghats by Sreekumar (2004) revealed the presence of 21 species, among which 16 are endemic to different regions of Western Ghats. Also, the study highlighted the need for emergency conservation of three rattan species (*C. dransfieldii, C. neelagiricus and C. huegelianus*) which are at the verge of extinction. Another important contribution to the Indian taxonomy was the revisionary studies by Dutta and Deb (2004) who intensively studied the genus *Hedyotis* L. in Indian sub – continent and classified 74 species under seven sections namely, *Hedyotis, Oldenlandia, Kohautia, Scleromitrion, Involucrella, Diplophragma* and *Anotidopsis*.

Following this, Sasidharan and Sujanapal (2005) presented their paper on the genus *Medinilla* Gaudich. ex DC. in peninsular India. Gangopadhyay and Chakrabarthy (2005) reported 15 species of the genus *Cryptocarya* R. Br. from the Indian sub-continent and Singh (2005) with his monographic studies on Indian *Diospyros* L. documented 66 taxa. Further, taxonomic studies of the genus *Leucas* in southern peninsular India was conducted by Sunojkumar (2005) and documented 33 species and 8 varieties under 6 sections. Following this, Tsai (2006), in his monograph on genus *Clematis* sect. *Naraveliopsis* mentions about twenty-one species with one subspecies and one variety which are widespread in tropical Asia and *C. vietnamensis* W. T. Wang & N. T. Do is described as new from Vietnam.

Later in 2007, Balakrishnan and Chakrabarty surveyed on the family Euphorbiaceae in India and gave a detailed taxonomic account on the ecology, pollination and seed dispersal methods and Puy and Cribb (2007) carried out monograph studies on the genus *Cymbidium*, one of the most popular orchids in horticulture and recorded 52 species distributed throughout Malay Archipelago, South and East Asia and North and East Australia. They have also used molecular evidence for the identification and classification of the species. The study also focuses on the detailed study on the wild habitats, ecology, natural variation of wild populations and conservation assessments for this taxon. In the next year, 2008, Ansari listed 93 species, 1 subspecies, 17 varieties and 2 formae of *Crotalaria* in India. Bhattacharryya and Sanjappa (2008) enumerated 80 *Rhododendron* species in India along with their detailed habitat, distribution and ecological preferences.

Ansari and Balakrishnan (2009) conducted a long-term study on the species - *Eriocaulon* in India and described 65 species along with illustrations. The floristic documentation and revision of the family Acanthaceae in Kerala revealed 147 species and 4 varieties under 33 genera (Remadevi & Binojkumar, 2009). In 2010, Sekar and Srivastava studied genus *Rhododendron* in Himalayan region and accounted for 87 species, 12 subspecies and 8 varieties.

Revision of *Amorphophallus* Blume ex Decne. Sect. *Rhaphiophallus, Amorphophallus* Blume ex Decne. Sect. *Conophallus* (Schott) Engl. and *Amorphophallus* Blume ex Decne. Sect. *Amorphophallus* in India (Jaleel *et al*., 2011; 2012; 2014) resulted in the documentation of eight, six and five species respectively in each section. Out of the total nineteen species of *Amorphophallus* Blume ex Decne. in India, thirteen species are exclusively endemic to India. Sanoj (2011) carried out revisionary studies on the genus *Hedychium* J. Koenig. (Zingiberaceae) in India and reported the presence of 44 taxa including 13 varieties, of which 19 taxa are endemic to India. At the same period, Sasidharan and Sujanapal (2011) examined the genus *Atuna* in southern Western Ghats and rediscovered *Atuna indica* (Bedd.) Kosterm. after 150 years.

Documentation of genus *Ficus* L. in India (Chaudhary *et al*., 2012) reported 115 taxa with maximum species diversity in Northeast region and 10 endemics to India. An elaborate monograph of *Impatiens* L. (Bhaskar, 2012) in Western Ghats recorded 106 species, 13 infra – specific taxa including 12 new species and 6 new varieties. His monograph gives us detailed information of 103 species endemic to Peninsular India as well as the threat status of each *Impatiens* species recorded. Nandikar (2013) reported 92 species under 15 genera while he conducted taxonomic revision of family Commelinaceae in India.

The genus *Murdannia* Royle in India was studied by Ancy (2014) and estimated twenty-six species including two new species *M. assamica* Nampy & Ancy and *M. Sahyadrica* Ancy & Nampy. At the same time, thirteen taxa of *Cyanotis* was reported from India by Nandikar and Gurav (2014) and *Cyanotis glabrescens* (*C. fasciculata* var. *glabrescens*) and *C. axillaris* var. *cucullata* (*Cyanotis cucullata*) were the new combinations, while some taxa have been lectotypified. A taxonomic revision of the genus *Canscora* in South India (Shahina & Nampy, 2014) recorded 6 taxa along with the description of a new genus *Canscorinella* (Canscorinae, Gentianaceae) with two new combinations.

The family Linderniaceae in south Indian states of Andhra Pradesh, Telengana, Karnataka, Kerala, Tamil Nadu and union territory of Pondicherry was extensively studied by Prasad (2015) and recorded 39 taxa under 6 genera. Revisionary study of the family Musaceae was carried out by Joe (2015) and mentioned the occurrence of 41 taxa under two genera. Jameera *et al*. (2016) recorded 6 species of *Pollia* in India belonging to family Commelinaceae along with lectotypification of 6 taxa namely *Aclisia indica, Pollia pentasperma, P. secundiflora, P. subumbellata, P. thyrsiflora* and *P. aclisia* var. *robusta.* Similarly, Shahina and Nampy (2016) carried out revisionary study on family Gentianaceae in south India and documented 35 taxa under 9 genera.

In the next year, Pokle (2017) conducted revisionary investigation of genus *Alysicarpus* in India and reported 17 species, 9 varieties and 65 formae and revisionary studies on family Gesneriaceae in south India along with molecular studies was carried out by Janeesha (2017) and reported 24 species and two varieties. Further, Moller *et al*., (2017) provided a new classification model for the family Gesneriaceae in India based on molecular phylogeny of the reported species. Similarly, Balan and Pradeep (2017) published their taxonomic revision of the genus *Smithia* Ait. in South India revealing twelve species and two varieties from the states of Andhra Pradesh, Goa, Karnataka, Kerala, Tamil Nadu and Telangana.

Taxonomic revision and molecular studies of the genus *Plectranthus* L. in India revealed 22 species (Smitha, 2018). In the same year, a regional revision on the *Impatiens* commonly called as 'balsams' was carried out by Gogoi and his team in Eastern Himalaya in 2018 and recorded 84 taxa with highest record of taxa (43) from Arunachal Pradesh and 24 species from Sikkim. Meanwhile, Augustine (2018) published a detailed account on the genus *Strobilanthes* in Western Ghats along with easy identification methods of the genus using vegetative characters such as leaf, stem etc. The distribution of 55 species in Western Ghats is enumerated in this book. Taxonomic revision of genus *Arisaema* sect. *Sinarisaema* in India (Manudev *et al*., 2019) documented twenty-three species based on the morphological data. Chandani (2019) carried out extensive studies on the genus *Rubus* L. (Rosaceae) in India and reported 73 species and 6 varieties. The study could further introduce one new novelty *Rubus ramachandrae* S.S. Dash & Chand. Gupta from Arunachal Pradesh and two new combinations viz., *Rubus franchetianus* H. Lev. var. *fragarioides* (Focke) Chand. Gupta & S.S. Dash and *Rubus franchetianus* H. Lev. var. *pubescens* (Franch.) Chand. Gupta & S.S. Dash. Next year, the Genus *Henckelia* Spreng. (Gesneriaceae) in South India had been intensively studied by Janeesha and Nampy (2020)

and came up with 15 species including *Henckelia wayanadensis* Janeesha & Nampy as a novelty to science. Followed by this, Thoiba and Pradeep (2020) conducted intensive studies on the genus *Tripogon* Roem. & Schult. in India and recognized 24 species and two varieties and Nawale and Bhuktar (2021) revised genus *Desmodium* Desv. in Maharasthra and recognized thirteen taxa. Another study by Balan and Pradeep (2021) recorded 448 legumes from Kerala of which majority of the taxa are herbs and shrubs. Further, *Crotalaria*, *Indigofera* and *Desmodium* are the predominant genera reported from the study.

Vivek *et al*., (2021) conducted taxonomic revision of the genus *Eragrostis* Wolf, in India and recognized 42 species and 5 varieties. Resmi and Nampy (2022) carried out revisionary studies on the caulescent tuberous *Sonerila* (Melastomataceae) in India and described 49 species and one variety in India. Revisionary studies on many families and genera are continuing and the results of these studies are expected to bring more additions to the floral diversity of the state in particular and the country in general.

II.3. Hillocks – Islands for biodiversity

Hillocks are habitat islands which vary in size and are isolated under specific edaphic, climatic and floristic compositions. Even though numerous geological studies have been carried out in these isolated land masses, especially coastal inselbergs, less focus has been given on its ecological or floristic perspectives especially in granitic and lateritic outcrops.

German geographer, Bornhardt (1900) was the one who introduced the term 'inselberg'. Earlier studies by Burbanck and Platt (1964) identified forty island communities in Piedmont plateau in Georgia and noticed the dominance of lichen – herb communities which gradually lead to the succession in these outcrops. Later, Poremski *et al*., (1993) have investigated the ecological conditions and floristic diversity of Mt. Niangbo, an inselberg which is more than 70 million years old in the Savanna zone of Ivory coast. They have observed varying microclimatic conditions that took place in accordance with differences in precipitation, evapotranspiration and high degree of radiation. Following this, Seine *et al,* (1995) conducted an extensive study on the carnivorous plants present in inselbergs and reported 45 species coming under 3 families such as Droseraceae, Lentibulariaceae and Nepenthaceae.

Fleischmann *et al*., (1996) provided an account on the vegetation of large rocky outcrops in the oceanic islands of Mahe, Praslin and Seychelles. They proposed that vegetation in these islands might have arisen due to natural immigration and further plant

colonization. The floristic composition in these inselbergs is different from the surroundings due to selective pressure and extreme climatic and edaphic conditions, and identified five different microhabitats. In the same year, biogeography and diversity of the inselberg of Southern Venezuela was carried out by Groger and Barthlott (1996) and documented 614 species belonging to 344 genera and 107 families. It was also concluded that intermediate isolation promotes the diversification of an autochthonous and species rich flora. Similarly, Frahm (1996) came up with the bryophyte diversity, its origin and distribution in inselbergs in Ivory Coast and Zimbabwe, and recorded thirty-one and twenty-five taxa respectively. A survey of floristic diversity of West African inselberg (Barthlott and Porembski, 1996) revealed that extreme climatic conditions and geographical isolation affect the vegetation in these islands, and Poaceae, Cyperaceae and Fabaceae dominated the system. It was also noticed that ephemeral flush vegetation recorded high species richness compared to the least diverse monocot mats.

Porembski *et al*., (1997) opined that the plant diversity of inselbergs (island mountains) is related to stochastic environmental disturbances which promote higher species richness due to prevention of competitive exclusion. Following this, Seine *et al*., (1998) conducted floristic studies in 53 inselbergs in Zimbabwe and recorded 549 vascular plants. Out of the recorded taxa, 100 plant species were found to show strong habitat preference to inselbergs.

A zonal vegetation mapping on tropical inselbergs in Africa, Australia and America has been studied by several researchers such as Wyatt (1997) and Burke (2003). Porembski and Barthlott (2000) emphasized upon the 'naturally formed' or 'primary outcrops' which are exposed due to geological causes such as volcanism, weathering etc. Porembski *et al*., (2000) described inselbergs as 'terrestrial habitat islands' and microhabitats as 'islands upon island'. Another study by Withers (2000) gave an overview on the distribution of granitic rocks, their origin, different forms of granite rock forms and an account of life forms in granitic outcrops in Western Australia. Studies by Sarthou *et al*., (2003, 2009, 2017) analyzed the scrub vegetation, floristic patterns and successional patterns on tropical granitic inselbergs in French Guiana. Porembski and Watve (2005) noticed the occurrence of families Eriocaulaceae, Xyridaceae, Lentibulariaceae, Droseraceae along with frequent occurrence of Commelinaceae, Poaceae and Cyperaceae in the seasonal ephemeral flush vegetation. Muller (2007) presented herbaceous vegetation in wet habitats such as on rocks, mountain ridges and lateritic crusts in inselbergs of Tropical West Africa and Atlantic Central Africa. Porembski (2007) identified three global hotspots of inselberg floral

diversity such as Southeastern Brazil, Madagascar and Southwestern Australia based on the species richness and endemism. In the following year, a brief study on the geochemistry and origin of Kirana volcanics, isolated hillocks in Pakistan was carried out by Ahmad and Chaudhry (2008). In 2010, El-Sheikh *et al*. had done vegetational and ecological studies of forty-two 'nabkhas' (hillocks) in the coastal regions of Jal Az-Zor National Park, Kuwait and recorded sixty-two taxa under 20 families.

Numerous discontinuous hill systems occur in India also and they are classified into different types based on the rock type, nature of vegetation, appearance etc. They are classified either as cliffs and plateaus, lateritic and granitic hillocks. Like the studies across the world, these hillocks became a study area for numerous researchers. Ecological, floristic and faunal studies were conducted on the basalt and laterite outcrops in Northern Western Ghats by Watve (2003, 2007 and 2008) and Watve and Thakur (2006). Ranjitkar and Chaulagain (2004) enumerated the plant diversity, vegetation analysis as well as the conservation practices adopted to protect Swyambhu hillock in Nepal. Watve (2013) critically analyzed the microhabitat diversity of rocky plateaus in Konkan region of Maharashtra and put forward the recommendations for the conservation of the inselbergs.

Lekhak and Yadhav (2012) discovered nine different microhabitats in the high-altitude laterite plateau ecosystems in southwestern Maharashtra. It also lists certain taxa which shows adaptive traits developed to overcome the major environmental stress such as high temperature, drought, nutrient deficiency and high light intensities. Rao *et al*., (2012) reported 140 species of flowering plants under 44 families with the dominance of Poaceae (19 taxa) followed by Fabaceae (15 taxa) from laterite plateaus of coastal Uttara Kannada. Bhattarai *et al*., (2012) identified 103 plants from Kas plateau and it was noticed that two – third of the plants occur on the plateau top. They also identified eleven microhabitats with specific plant associations. Following this, floristic exploration of Daroji sloth bear sanctuary, Hospet in Bellary district of Karnataka (Harisha and Hosetti, 2013) revealed ninety-eight species belonging to eighty five genera and thirty seven families. The area is characterized by rock – strewn hillocks and long stretches of plains with parallel chains of hills in between. The study also highlights the need for protection of the sanctuary owing to poaching of wildlife, grazing by domestic cattle, deforestation and water scarcity problems.

Floristic composition of Gunadala hill of Krishna district in Andhra Pradesh, India was studied by Reddy *et al*. (2016) and reported 197 taxa belonging to 150 genera and 55 families. Datar and Watve (2018) documented 102 vascular plants belonging to 35 families

and 69 genera from various cliff habitats of northern Western Ghats. It was also observed that angiosperm flowering was at its peak between August and October.

Recently, Kulkarni and his research team (2022) came forward with a review on the flowering plant diversity, adaptations, endemism and floristic composition of Indian rocky outcrops and summarizes the special features of these biodiversity rich sites. The authors cited desiccation tolerance, succulence, carnivory and geophytism as a common trend of the tropical outcrops. Further, study also highlights the physiological features of the plant such as plant metabolism to further connect the adaptability of plants to adverse conditions and the occurrence of higher number of endemic grasses and monocotyledonous members along with the succulent plant diversity unique to the system.

Numerous small and medium sized hillocks occur in Kerala which can be classified into two types viz; lateritic hillocks widely distributed from Kasargod to Malappuram and granitic hillocks distributed from Palakkad to South. Jayarajan (2004) prepared a report on the socio – cultural and ecological studies on the lateritic hillocks along Kavvayi river basin, Kannur district. He located and mapped out 75 hillocks along the river basin. Balakrishnan *et al*., (2010) presented the flora of Madayipara, a biodiversity rich midland laterite hill in Kannur district for the first time and recorded 512 plant species. He also gave detailed observations on the changes in plant composition during wet and dry season in the hillock. Later in 2014, Pramod *et al* had done intensive floristic survey on the seasonal pools in Madayipara hillock and identified twenty-two endemic taxa. The changes that happen in the floristic composition in different seasons is well monitored and recorded.

In recent times, floristic studies in these outcrops resulted in the discovery of many new taxa such as *Canscora bhatiana* K. S. Prasad & Raveendran (Prasad and Raveendran, 2012), *Eriocaulon madayiparense* Swapna, K. P. Rajesh, Manju & Prakash K. (Swapna *et al*., 2012), *Eriocaulon kannurense* Sunil, Ratheesh & Nandakumar (Sunil *et al.*, 2013), *Fimbristylis pokkudaniana* Sunil, Ratheesh & Sivadasan (Sunil *et al*., 2016), *Isachne bhattii* Biju, Josekutty & Augustine J. (Biju *et al*., 2016), *Lobelia lammersiana* Biju, Josekutty & Augustine J. (Biju et al., 2016), *Chrysopogon narayanii* Sunil, Ratheesh & Sivadasan (Sunil *et al*., 2017), *Strobilanthes jomyi* P. Biju, Josekutty, Rekha & J. R. I Wood (Biju *et al*., 2017), *Sonerila lateritica* Resmi, Manudev & Nampy (Resmi *et al*., 2018) and *Dimeria kalerii* P. Biju, E.J. Josekutty & Augustine Jomy (Biju *et al*., 2018). Sreejith *et al.*, (2016) identified 9 microhabitats in the lateritic hillocks in northern parts of Kerala. Pramod *et al.*, (2017) prepared a check list of 670 angiosperms from Madayipara in Kannur district.

Though numerous granitic outcrops occur in the Palghat gap region, these outcrops gained less attention in terms of biodiversity till recent years. *Dipcadi montanum* (Dalz.) Baker formed a new addition to the flora of Kerala (Jose *et al.*, 2013) and further, *Oldenlandia dineshii* (Jose *et al*., 2015) was discovered from Gangothri hills, a small rocky outcrop in Nemmara forest division. Soumya *et al*., (2015) presented an article on the morpho – anatomical and ecological studies of endemic taxa *Heliotropium rottleri* Lehm. from these habitats. Following this, Arabhi *et al*., (2018) brought out angiosperm diversity in nine selected granitic outcrops occurring in the Palghat gap region of southern Western Ghats. Later, Arabhi and Nair (2019) reported the seasonal Vegetational shift in the lower altitude granitic rocky outcrops in the Palghat gap region and observed a distinct wet phase and dry phase and unique plant composition in relation to the precipitation rates. Arabhi (2019) provided a comprehensive account on the microhabitat diversity and associated floristic composition in low altitude hillocks in the Gap region. Hence, occurrence of unique plants, plant associations and discovery of new taxa from these outcrops shows the need of thorough floristic studies on these terrestrial island systems giving emphasis to its conservation and protection. Critical observations on the recent publications of new taxa from the rocky outcrops in the Palghat Gap region such as *Polycarpaea palakkadensis* V.S.A. Kumar, Sindhu Arya & V. Suresh and *Casearia seethalakshmiae* V. Suresh & Ambika (Arya *et al*., 2021; Ambika *et al*., 2022**)** demands more intense studies on the impact of acute environmental stress operating in these rocky outcrops.

II.4. Ethnobotanical studies- an overview

Since the origin of human beings, there has been an inseparable relationship between plants and human beings and this in turn resulted in gaining huge wealth of knowledge. He learnt to use different plants for food, treating diseases, developed different products such as tools for hunting, housing materials, utensils, ornaments, furniture, transportation etc. This knowledge about plants and its uses got transferred as oral tradition among the tribal communities. Tribal communities have close connections with the forest plants and know the medicinal properties of different forest plants around them.

In tune with the ethnobotanical surveys and knowledge accumulation across the world, several ethnobotanical studies have been carried out in post-independent India. Among them, All India Coordinated Research Project on Ethnobiology (AICRPE), a DST project coming under the jurisdiction of Man and Biosphere Programme was one of the important projects undertaken by the Botanical Survey of India. This project was completed in two phases (1982 – 88 and 1989 – 1994) in different regional centres of BSI

like Howrah, Shillong, Gangtok, Allahabad, Coimbatore and Port Blair. A total of 7500 medicinal plants, 3900 edible plants, 525 fiber and cordage yielding plants and 400 fodder plants were reported from all over India. (https://bsi.gov.in/.).

Kerala forms the home for different tribal communities and some communities stay close to the forests while some have their settlements deep in the forests. Earlier studies by Nazarudeen (1999) identified 348 taxa of useful fruits from Kerala of which 43 plants were found to be endemic to the Western Ghats. He opined that increased need and reduced habitats due to anthropogenic activities is creating a threat for the survival of such medicinally important wild fruits. Later, Khan (2002) who conducted ethnobotanical and taxonomic studies on the angiosperm epiphytes and parasites of Kerala recorded 209 taxa belonging to 64 genera and 16 families. In 2005, Udayan and his research team reported 41 plants belonging to 27 families that was used by the Kaadar tribes of Sholayar forest in Thrissur district. Later, Yesodharan and Sujana (2006, 2007a, 2007b, 2007c, 2009a, 2009b) have done various ethnobotanical surveys and studies on the tribal communities such as Kadars, Malasars and Malamalasars and their traditionally significant plants in Parambikulam Wildlife sanctuary, Palakkad.

Detailed ethnobotanical investigations on the tribal groups of Palakkad district by Remesh (2007) recorded eight different tribal groups from various parts of the district namely Eravallans, Irulars, Kadars, Kurumbars, Malamalasars, Mudugars, Malasars and Muthuvans. Further, the survey resulted in the identification of 560 plants belonging to 423 genera under 148 families. He also highlighted the 13 threatened plants among them and added the need for the conservation of 161 plants which were found to be rare in the forest premises.

During the same time, systematic and ethnobotanical studies on the family Rubiaceae by Pramod (2008) revealed 263 species in 61 genera distributed in the Kerala state and out of which 37 taxa were found to have medicinal properties. Following this, Yesodharan *et al.*, 2011 conducted ethnobotanical study to document 83 species of wild food that is traditionally used by the tribal people in Parambikulam wildlife sanctuary in Palakkad district. In 2012, Shyma and Deviprasad conducted ethnobotanical studies to find out the tribal groups in Mananthavady of Wayanad district and identified five tribal communities viz., Kurichia, Kuruma, Kattunaika, Adiyan and Paniya along with 295 medicinal plants used by them in folk medicines. Several ethnobotanical studies were carried out in Idukki district also during this period (Sajeev & Sasidharan, 1997; Simon *et al.*, 2011; Sudeesh, 2012).

Jose (2015) based on his questionnaires and field observations of Malampandaram tribes residing in the Achankovil valley, documented 1040 species of flowering plants belonging to 642 genera and 130 families which forms 20.2% of the total flora of Kerala. In the same year Pius *et al.,* (2015), conducted intensive field studies on the plant diversity of Malappuram district with special emphasis to folk and Indian systems of medicines and recorded 484 taxa used in Ayurveda and 393 taxa in Siddha systems. Further, ethnobotanical studies on the six tribal groups residing in the forest areas of Nilambur Valley in Malappuram listed 334 taxa in 82 families (Chithra, 2016).

One of the important ethnobotanical surveys by Yabesh *et al.,* (2014) to understand the folk medicinal plants used by the traditional healers in Silent Valley in Palakkad district documented 102 species belonging to 53 families which they used to cure 19 human ailments. Also, in almost all the treatments, leaves of the medicinal plant was used and are either made paste and taken orally. Jenny and Suganthi (2017) documented 51 medicinal plants used by the tribal people in Attappady of Palakkad district. An enquiry into the IUCN threat status of different medicinal plants used in the various Siddha formulations and as single drugs resulted in the documentation of 23 threatened plants out of which eight were critically endangered, five endangered and ten were vulnerable plants which needs immediate conservation (Gopi *et al.,* 2018).

Ethnomedicinal survey on the herbal medicines used by mannan, velan and malayan tribes in Madayipara hillock identified 58 plant species included in 46 families. (Divakar *et al*., 2013). At the same time, Prasad and Shyma (2013) documented 67 medicinal preparations used by the Kurichia, Kuruma, Adiyan, Kattunaika and Paniya tribes using 67 species belonging to 44 families to treat 33 human and 7 veterinary ailments. In the following year, Xavier *et al.,* (2014) attempted to reveal the folk knowledge by traditional inhabitants in Thodu Hills and recorded 35 medicinal plant species belonging to 28 families and also found out that these plants were used to treat various diseases and ailments with the highest number of species (7) being used for liver problems, circulatory system and dermatological disorders, followed by skeleton – muscular system disorders (6), and fever (5). At the same period, Vijayakumar *et al.,* (2014) carried out a detailed quantitative ethnomedicinal study of plants used by the remote tribal people in the Nelliyampathy hills of Palakkad and found a total of 85 medicinal plants belonging to 49 families were reported to be used against 19 different ailments in the hills. Cucurbitaceae plants (6 species) formed the major components in their traditional medicines followed by Acanthaceae, Malvaceae and Fabaceae 5 species each. The study also gives insights to the need for the further

phytochemical analysis and development of pharmacological techniques which leads to natural drug discovery in the near future.

Least focus was always given to the tribal settlements in the Palghat gap region, especially the indigenous people in Walayar forests. Venkatachalapathi *et al*., (2016) conducted ethnomedicinal assessment of Irula tribes of Walayar valley and a total of 146 plant species belonging to 58 families was found to have ailment properties. The study reports medicinal properties for 26 species like *Alstonia venenata* R.Br.*, Artocarpus heterophyllus* Lam.*, Carissa spinarum* L.*, Curculigo orchioides* Gaertn.*, Hybanthus enneaspermus* F.Muell. etc. This reveals the need for unraveling the traditional knowledge of these tribal groups present further in Walayar forest range.

II. 5. Riparian studies

The rivers and streams originate from various mountainous regions and form the home for varied, diverse and rare aquatic and wetland plants. These aquatic and wetland systems can occur even in estuaries, back waters, ponds, lakes, canals, wetlands, kolelands and even paddy fields. The Kerala state is blessed with the presence of 44 rivers and its tributaries, streams and its long network of river systems (Ansari *et al.,* 2016).

Wetlands in Kerala is one of the important biodiversity rich sites which the scientists are really enthusiastic to explore. Very little studies have been carried out in the riparian flora of various parts of our country. Varghese and Kumar (1997) conducted ecological studies on the freshwater swamp forests with special focus to Kulathupuzha, Anchal and Shendurney of southern Kerala. Two years later, Varghese and Menon (1999) carried out floristic studies on the diversity and dynamics of Myristica swamp forests of southern Western Ghats in Kerala.

Bachan (2003) documented 329 angiosperms belonging to 260 genera under 97 families from Vazhachal region of the Chalakudy river basin. Later, Ambat *et al*., (2007) prepared a comprehensive report on the wetlands of Kerala, an overview on the various wetland systems, its diversity, threat factors and restoration plans for the conservation and protection of these fragile environments. In the following year, Sujana and Sivaperuman (2008) documented 140 taxa belonging to 23 families of Dicotyledons, 11 families of monocotyledons and 5 water fern families from the Kole wetlands in Thrissur district and highlighted the ecological importance for the protection of this fast diminishing biodiversity rich places.

Followed by it, riparian flora of the Chalakudy river basin along with its ecological perspectives (Bachan, 2010) enumerated 696 taxa of flowering plants belonging to 450 genera under 129 families with Poaceae as the dominant family followed by Euphorbiaceae and Orchidaceae. The riparian studies in the Pamba river was carried out by Joby (2012) and reported 545 angiosperms belonging to 119 families, 3 gymnosperms under 3 families and 31 pteridophytes in 14 families. He further conducted detailed studies to check the nativity of riparian plants and found that only 20.72 percent floristic elements are native, and among them 114 taxa showed endemism in different zones.

A checklist of 221 species of Myristica swamp forests in southern Kerala was prepared by Roby *et al*. (2014) and reported the dominance of family Myristicaceae followed by Celastraceae, Dipterocarpaceae, Anacardiaceae, Zanthophyllaceae and Myrtaceae with 49 endemic and 18 IUCN red listed taxa. In the following year, Vincy *et al*., (2015) carried out comparative study on the species diversity of riparian elements in the main river channel and sub watersheds of Meenachil river in Kerala and documented 441 species belonging to 106 families and Leguminosae represented the highest no of species followed by Poaceae. The herbaceous riparian elements in the lower stretch of Bharathapuzha river was studied by Cherullipadi and Paul (2016) and recorded 181 plant species with Poaceae as the dominant family followed by Asteraceae.

Jisha and Nair (2018) summarized the diversity of angiosperms in Thuppanad river along with Phytogeographical affinities, endemism, adaptive characters as well as the biological invasion and concludes with the record of 270 species belonging to 70 families. Jisha *et al*., (2018) investigated the riparian vegetation along Kanjirapuzha basin and recorded 196 angiosperms under 62 families with significant reduction in the number of native and strict riparian elements and a massive inhabitation of invasive elements.

Sunil *et al*., (2019) found that *Terminalia arjuna* has potential positive effects on riparian landscapes and influences the biological diversity and can be considered as a key stone species in riparian ecosystems of South India. At the same time, Jisha (2019) investigated the vascular plant diversity along the riparian system of Thuthapuzha sub-basin in Kerala and recorded 648 taxa distributed in 130 families including 34 Pteridophytes and two gymnosperms. The study further emphasized on the habitat modifications along river basins during the Kerala floods using GIS technology and the occurrence of the alien invasive species was further examined. In the following year, the exploratory studies in low elevation riparian forests in Vazhachal in Thrissur district (Pooja *et al.*, 2020) documented high species diversity with 696 angiosperms out of which 254 were endemic and 33 were

threatened taxa and the Shannon diversity value is comparable to other evergreen forest type.

II.6. Endemism in Indian vegetation

The term 'endemism' was coined by A.P. de Candolle for the distribution of a taxa in a restricted geographical or habitat which is isolated through temporal or ecological barriers (Morrone, 2008; Singh *et al*., 2015). Werff and Consiglio (2004) said it as the measurement of uniqueness of vegetation and can be expressed as the degree of endemism for an area. This can be used for assigning an area for conservation.

Notable research on the occurrence of endemic plants and their significance in providing evidence for explaining the formation of the Indian sub – continent has not been yet carried out till date. Chatterjee (1939) included 2045 species of dicotyledons as endemic to India. This was one of th pioneer studies carried out in India on endemic plants. Cain (1944) opined that the high degree of endemism is correlated with isolation, age of the geographical zones along with diversification of habitats which further influence evolution and survival of a taxa. But there are few general studies carried out which provide us with the basic idea of endemism in India.

Subramanyam and Nayar (1974) accounted 20 genera and 84 species as endemic to Western Ghats. Nayar (1980) had conducted a study on the endemic angiosperms of peninsular India and recorded 56 genera in 25 families revealing that Gramineae with 10 genera constitutes the large family with endemic taxa followed by Asteraceae with 9 genera. Further in 1987, Ahmedullah and Nayar prepared a checklist of endemic plants of Peninsular India of which they reported 57 genera endemic to Western Ghat region of Peninsular India.

Nayar (1996) estimated 60 endemic genera and 2015 endemic flowering plants in peninsular India. Later, Rao (1997) documented 10 biogeographical zones of India in which he inferred that out of the 15000 species, 5000 were endemic. Studies by Gopalan and Henry (2000) on the endemic plants of India specially focusing on the Agasthyamalai hills of southern Western Ghats found out 150 taxa strictly endemic to the area. In the following year, Kumar *et al*., (2001) studied on the threat status of endemic orchid plants of Western Ghats and reported 80 taxa under threatened category.

Krishnan and Ramesh (2005) conducted a very important study on the endemism and sexual systems in the wet evergreen tree flora of the Western Ghats and recorded 656 species including all gymnosperms and angiosperms. It was found that no family is endemic to Western Ghats but 53 percent of the recorded taxa belonging to 43 families and

5 genera were endemic. Dipterocarpaceae formed the largest endemic family followed by Anacardiaceae, Lauraceae, Fabaceae, Rubiaceae and Myrtaceae. Gunawardene *et al.*, (2007) prepared an elaborate account on the level of endemism in Western Ghats and Sri Lanka and proposed that Trees, bryophytes, odonates, land snails, reptiles and amphibians show higher levels of endemicity when compared with butterflies, birds and mammals. This might be due to the dispersal ability and habitat specialization of these taxa that make the colonization to far range. At the same period, Reddy *et al*., (2007) conducted a survey on the endemic flowering plants of Kerala and reported 344 endemic taxa from Kerala which belongs to 175 genera of 65 families. They could also record 7 endemic genera from Kerala viz., *Kanjaram, Haplothismia, Chandrasekharania, Limnopoa, Silentvalleya, Seidenfedeniella* and *Janakia.*

A detailed checklist of endemic species of Kerala was prepared by Shaju (2010) along with its importance in ethnobotany. The study ended with listing of 267 taxa which are exclusively endemic to Kerala of which 21 taxa is closely associated with the tribal groups and are used as medicine (9 taxa), wild edibles (6 taxa) and artisanal creations (6 taxa) and insect repellants (2 taxa). A special issue of ENVIS on the endemic angiosperms in Agasthyamalai Biosphere Reserve, Nilgiris Biosphere Reserve and Anamalai Tiger Reserve reported 365 species as endemic to these regions.

Irwin and Narasimham (2011) carried out a review on the endemic genera of angiosperms in India. This study identified 62 genera, which were thought to be endemic to India, but consequently lost their endemic status since they had distribution on other regions too. According to their studies, there are only 49 endemic genera in India which belong to 22 families with 80 different taxa. Among them, 40 genera is confined to Peninsular India, 4 in Himalayas, 3 in Andaman and Nicobar Islands. Two genera, *Bentinckia* had a disjunct distribution and *Hardwickia* had a distribution throughout the dry deciduous forests of Peninsular India except Northeast India.

In the same year, Sasidharan (2011) accounted 1687 angiosperms endemic to Kerala. He further classified these taxa in 7 geographical categories according to its distributional range viz., 814 taxa strictly restricted to southern Western Ghats, 272 taxa endemic to Western Ghats; 234 taxa endemic to Peninsular India; 192 taxa endemic to Kerala part of Southern Western Ghats; 70 taxa endemic to India; 63 taxa endemic to South India and 42 taxa endemic to Kerala part of South India. He further accounted 2930 taxa from Palakkad out of which 785 taxa are found to have endemic distribution. Among these 785 taxa, Rubiaceae represents the highest no of endemic taxa with 134 taxa followed by

Poaceae (128 taxa), Orchidaceae (106 taxa), Fabaceae (102 taxa) and Acanthaceae (101 taxa).

Singh and his team (2015) reported 4303 angiosperms endemic to India. They further reveals that southern Western Ghats contributes to the 62% of the total endemic plants in Western Ghats. Their other findings include, out of the total endemic taxa, 72% belongs to dicotyledons and Poaceae is the most speciose endemic family (355 taxa) followed by Orchidaceae (274 taxa), Fabaceae (274 taxa) and Rubiaceae (235 taxa). *Impatiens* forms the most speciose genera with 169 taxa followed by *Fimbristylis* (75 taxa*), Eriocaulon* and *Strobilanthes* with 69 and 68 taxa each.

According to the floristic database prepared by Arisdason and Lakshminarasimhan (2016), there are 4045 taxa belonging to 975 genera in 155 families endemic to the political boundary of India. Jagadeeshan (2018) presented 816 angiosperms as endemic plants of Kerala state in southern Western Ghats. Among them, 300 taxa is found to be narrow endemics with Palakkad district as its endemic site. As per the recent floristic statistics by ENVIS (2019), there are 4303 endemic taxa in India.

II. 7. Floristic studies in Kerala

One of the pioneering floristic studies in Kerala was by Bourdillon (1908) who published The forest trees of Travancore. After this, flowering plants of Travancore was an important work by Rao (1914). Several district floras were published starting from *Flora of Calicut* (Manilal & Sivarajan, 1982), in which 983 species belonging to 566 genera under 132 families have been treated. Other major documentations include: *Flora of Silent Valley* (Manilal, 1988), in which he reported 966 species of angiosperms belonging to 559 genera under 134 families; *Flora of Cannanore* (Ramachandran & Nair, 1988), documented 1132 species belonging to 658 genera under 157 families of angiosperms; *Flora of Palghat* (Vajravelu, 1990), treated 1355 species of flowering plants belonging to 732 genera under 146 families; and *Flora of Kerala grasses* (Sreekumar & Nair,1991), *Flora of Thiruvananthapuram district* (Mohanan & Henry, 1994), *Flora of Thenmala division* (Subramanyan, 1995), *Flowering plants of Thrissur forests* (Sasidharan and Sivarajan, 1996), *Flora of Nilambur* (Sivarajan & Mathew, 1997), *flora of Periyar Tiger Reserve* (Sasidharan, 1998), *Floristic diversity of Shenduruny Wildlife Sanctuary* (Sasidharan, 1999a), *Flora of Chinnar wildlife Sanctuary* (Sasidharan, 1999b), *Flora of Agasthyamalai* (Mohanan & Sivadasan, 2002), *Flora of Pathanamthitta district* (Anilkumar & Sivadasan, 2005) and *Flora of Alappuzha district* (Sunil & Sivadasan, 2009), Flowering plants of

Kerala CD ROM (Sasidharan, 2014) are the other regional documentations on the floristic diversity in the state of Kerala.

'Flowering Plants of Kerala: A Handbook' published by Nayar and his team (2006) provides a detailed account of the angiosperms recorded from Kerala till then. Detailed studies by Nayar *et al*., 2008 gives a comprehensive analysis of the flowering plants of Kerala based on the information received from various publications until 2008. The report says that the state is diverse with 4694 species under 188 families. Among them, 4078 are indigenous, 199 exotic naturalized and 417 species are either cultivated or planted. Further, 1568 species are endemic to India, 865 species endemic to Western Ghats and 237 species endemic to Kerala.

Divakar *et al.,* (2013), studied the medicinal plant diversity of Madayipara located near Payangadi in Kannur district. About 49 species of medicinal plants were recorded. Mathew *et al*., (2014) studied the grass diversity in Vagamon hills in Kerala and the study recorded 77 species of grasses out of which 18 are endemic to Peninsular India. Vijayan *et al*., (2015) documented a study on the floristic study and richness of the Mangroves in Ayiramthengu, Kollam district. Botanical Survey of India along with Sreekumar and Nair (1991) conducted floristic documentation of Grasses in Kerala and recorded 296 taxa distributed in 103 genera.

II. 8. Floristic studies in Palakkad

Flora of Palghat was the first documentation on the floristic elements of the district (Subramanyan *et al*.,1987). Followed by this, detailed floristic analysis of Palakkad district was done by Vajravelu (1990) in which he reported 1355 species. Vegetation study of protected areas in the district started with Flora of Silent Valley was done by (Manilal,1988) followed by Sasidharan (2002) who documented the vegetation of Parambikulam Wildlife sanctuary and recorded 1434 species belonging to 755 genera under 142 families including 2 gymnosperms.

The Attappady hills in the Western Ghats are home to 1661 species of angiosperms belonging to 818 genera of 160 families (Anilkumar, 2015). The floristic diversity of the forests and hillocks of Kollengode range in the district has been explored recently and 955 species of angiosperms belonging to 135 families have been recorded (Soumya, 2018). Later, low altitude hillocks in Palghat Gap region (Arabhi, 2019), angiosperm diversity of Dhoni hills (Rekha, 2019), the riparian vegetation of Thuthapuzha sub-basin (Jisha, 2019)

and floristic diversity along with biomonitoring and resource mapping of Nelliyampathy hills (Jabeena, 2021) have also been undertaken in Palakkad district.

As far as the new species reports are concerned, many taxa are getting reported from various parts of the district. Recently, more new species were added to Palakkad district which includes *Clematis udayanii* (Anilkumar, 2013), *Chlorophytum palghatensis* (Kumar *et al*., 2014), *Oldenlandia dineshii* (Jose *et al*., 2015), *Solanum exarmatum* (Anilkumar *et al*., 2015), *Ophiorrhiza sahyadriensis* (Hareesh *et al*., 2015), *Sonerila nairii* (Murugan & Nair, 2016), *Oldenlandia vasudevanii* (Soumya *et al*., 2017), *Pilea victoriae* (Jose, *et al*., 2017), *Sonerila victoriae* (Murugan, *et al*., 2017), *Leucas dhonimalayensis* (Vimal *et al*., 2018), *Themeda palakkadensis* (Chorge *et al*., 2019), *Glycosmis nelliyampathiensis* (Jabeena *et al*., 2021), *Elaeocarpus gadgilii* (Manoharan *et al*., 2021), *Eugenia pokudanii* (Manoharan *et al*., 2021), *Ischaemum sunilii* (Jabeena *et al*., 2022), *Tripogon sugathakumariae* (Jabeena *et al*., 2022). Aswani *et al*., (2020) relocated *Oldenlandia hygrophila* Bremek. a lesser-known taxon in the Palghat (Palakkad) gap region of southern Western Ghats from Malampuzha region. *Meistera aculeata* (Roxb.) Škorničk. & M.F. Newman is reported as a new record to Kerala (Aswani *et al*., 2021). *Polycarpaea palakkadensis* (Arya *et al*., 2021), is a recently discovered member of the family Caryophyllaceae from hillocks of Palakkad.

II.9. GIS Mapping

The population explosion and over exploitation of resources are one of the main causes for the depletion of natural resources on earth. The need for the proper conservation and sustainable utilization is required to retain these resources for the future generation. For this, we need to understand the overall health of vegetation remaining on the earth, its periodic change over time, restoration chances of a lost vegetation and calculation of the reduction rate of resources. Geographical Information system (GIS) and remote sensing have emerged recently as interpreting spatial data handling technologies with their own methods of data representation and analysis. Combining them as tools to support vegetation analysis and modeling presents a number of challenges (Goodchild, 1994; Ahmad, 1998).

Recently, many mapping studies have been initiated in Western Ghats region in Kerala to study the nature of forests and other natural resources. Most of these studies focus on assessing the strength of vegetation and to study the percentage of deterioration happening in a span of period using satellite imagery method. Preeja *et al*., (2011) worked

in identifying the groundwater potential zones in Ithikkara river basin in the western slopes of Southern Western Ghats in Kollam and Thiruvananthapuram districts in Kerala.

The forest and wildfire risk zones in Nemmara forest division in Southern Western Ghats was demarcated by Ajin *et al*., (2015) and classified the study area into five risk zones: very high, high, moderate, low and very low. The study concluded with inference that forest fire outbreaks were more due to natural causes.

Remote sensing and GIS techniques were effectively used for studying the occurrence of forest fires in different parts of Wayanad wildlife sanctuary and different thematic maps were prepared using ArcGIS 9.3 and ERDAS Imagine 9.2 software tools (Vinod *et al*., 2016).

Ramachandran and Reddy (2016) analyzed the forest cover change in Idukki district using multi- temporal remote sensing data and topographical maps and found that the rate of deforestation was reduced and the area of water covered regions increased. This may be due to the implementation of policies and new hydroelectric projects in the district. Further, agricultural area has been decreasing and commercial plantations have been increasing in the district. Ajin *et al*., (2017) used geospatial techniques to map the forest fire risk zones in Peechi-Vazhani wildlife sanctuary in Thrissur district of Kerala and found out that 86.7% of the forest fires happened in the high and very high-risk zones and is located near to the roads and human settlements which further confirms the core reason for the forest fire to be anthropogenic.

Ajin *et al*., (2018) attempted to delineate and map the forest fire risk zones in Mannarkkad forest division in Palakkad district and inferred that most of the fire occurrences are due to natural reasons. Joy *et al.*, (2019) could map the flood affected areas in Meloor Panchayath in Thrissur district and could be used to facilitate future uses and reference for flood preparedness. The study also finds that improper landfilling in paddy fields, construction work and further lack of proper drainage channels and canals triggered the flood event. Nikhil *et al*., (2021) used Analytical Hierarchy Process (AHP) method and GIS in mapping of forest fire risk zones in Parambikulam tiger reserve.

The available mapping studies are mainly focussing on preparing forest fire risk areas of a highly diverse forest track. Such mapping can help the forest managers and disaster management agencies to easily identify the high and very high fire risk zones and take preventive measures to reduce damage of natural resources and loss of life and property.

II. 10. Alien – Invasive Flora

Convention for Biological Diversity (1992) envisioned biological invasion of alien species as the second worst threat after habitat destruction and it can be considered as a form of biological pollution. According to CABI (2023), alien - invasive plant species are those plants which are not native to an ecosystem and whose introduction has created a threat to the biodiversity in the region, food security, health or economic development. Many ecosystems are badly affected by these invasive plants and they became one of the biggest threats to biodiversity worldwide.

Reddy (2008) prepared a catalog of invasive alien flora of India and a total of 173 species in 117 genera and under 44 families were documented as invasive alien plant species which represented 1% of the Indian flora. Globalization of the world through increased trade, transport, travel and tourism have resulted in the accidental or intentional introduction of such species to new environments which later convert them to invasive members (Khuroo *et al*., 2012). Based on the systematic reviews and published data over 120 years and other field studies, they proposed that 599 species, belonging to 842 genera in 161 families are found to be invasive and it forms 8.5% of the total Indian Vascular flora.

Many ecological studies have been conducted on various alien invasive species predominant in India and few of them include *Lantana camara* L. and *Chromolaena odorata* (L.) R. M. King & H. Rob. (Murali & Setty, 2001; Mahajan & Azeez, 2001, Sankaran *et al*., 2013 & Naithani and Pande, 2009), *Parthenium hysterophorus* L. (Aneja, 1991; Gunaseelan,1998; Singh & Kaur, 1997; Sankaran *et al*., 2013), *Mikania micrantha* Kunth (Gogoi 2001; Sankaran & Srinivasan, 2001; Lahkar *et al*., 2011), *Prosopis juliflora* (Sw.) DC. (Dayal, 2007; Anoop, 2010; Kaur *et al*., 2012), *Chromolaena odorata* L.) R. M. King & H. Rob. and so on.

Joshi *et al*., (2015) investigated on the impact of invasive alien species on native ecosystems in the rainforest fragments of Anamalai hills in Western Ghats with special emphasis on the occurrence and abundance of three invasive alien species *Chromolaena odorata* (L.) R. M. King & H. Rob*., Lantana camara* L. and *Maesopsis eminii* Engl. Lowii *et al*., (2000) published 100 of the World's Worst Invasive Alien Species.

II.11. Phytogeographical studies

History of phytogeographical studies dates back to many decades. The world travelers roamed around the various land masses and crossed different seas in order to find new landmasses and new resources. Many such explorers were also interested in finding

out the connection between these land masses and the living organisms (Plants and animals). It was de Candolle (1820) who primarily proposed the world-wide system of biogeographic regions on the basis of the distribution of plants and proposed 20 'areas of endemism'. Later, in 1838, he revised the area of endemism as 40. Engler (1879, 1882) recognized four phytogeographical kingdoms viz., Holarctic, South American, Paleotropical and Old Oceanic Kingdoms. Later, Takhtajan (1978; 1986) defined six kingdoms or 'realms' characterized by occurrence of endemic families, subfamilies and tribes with very high generic and species endemism further stating that each region contain a definite set of dominant families, in a relatively stable quantitative relationship.

Cox (2001) provided a new global system of five defined phytogeographical kingdoms namely Indo-Pacific, African, Holarctic, South American and Australian. His system fully avoided the Antarctic region as a kingdom. Following this, Morronne (2015) defined nine regions within three phyto-geographic kingdoms and additional five transition zones.

Many studies in the Indian subcontinent also detailed the relationship of the vegetation elements with other continents in the light of continental drift and land bridge hypotheses. Subramanyam and Nayar (1974) provided a brief outline on the characteristic vegetation and Phytogeographical features of the Western Ghats. According to them, Vegetational peculiarities are influenced by the abundance of seasonal rainfall rather than temperature, and the flora of Nilgiri shows distinct floristic elements of Khasi and Naga Hills, and Eastern Himalaya. Phytogeographic analysis of the flora of Kalakad reserve forest of Western Ghats accounted for 550 species and 250 species are reported to have Indo – Pacific phytogeographical affinity (Parthasarathy, 1988). In recent years, phytogeographic affinity analysis of regional floras have been attempted for Kollengode flora (Soumya, 2018), Dhoni hills (Rekha, 2019), low altitude hillocks (Arabhi, 2019) and Nelliyampathy hills (Jabeena, 2021).

II. 12. Threats to biodiversity

Western Ghats, being one of the hottest hotspots of biodiversity, is facing enormous threats. Several studies have already been carried out to examine these threat factors. Mining, livestock grazing, human wildlife conflict, extraction of forest resources, plantations, unscientific agricultural practices, human encroachments, forest fire, pollution, hydropower projects and large dams, tourism and pilgrimage, alien invasive taxa, deforestation, climate change and pollution (Mahanti & Kumar 2018,

https://forest.kerala.gov.in/., Eco Restoration Policy 2021) constitute the factors affecting the biodiversity.

Certain committees have proposed certain recommendations to protect and conserve these ecologically fragile lands. Gadgil (2011) designated the entire Western Ghats as an Ecologically Sensitive Area (ESA) and assigned three levels of Ecological Sensitivity to different regions viz., Ecologically Sensitive Zone1 (ESZ1), Ecologically Sensitive Zone 2 (ESZ2) and Ecologically Sensitive Zone 3 (ESZ3). He further recommended the constitution of a Western Ghats Ecology Authority (WGEA), as a statutory authority under the Ministry of Environment and Forests to take necessary actions and decision making for the protection of Western Ghats region. Several criticisms arose after the report was in action.

Later, Kasturirangan *et al*., (2013) came up with a news report on this with new recommendations which include the complete ban on mining, quarrying and sand mining in ESA (Ecologically Sensitive Area), bans the construction of buildings or townships in ESA, prohibiting the new thermal power projects and suggested that the expansion of existing forests as well as afforestation of the badly affected regions through scientific ways may be allowed in the ESA and legal control over highly polluting industries shall be implemented. Even though many reports came to highlight the necessity to protect our environment and forests, not much progress occurred in these ecologically fragile zones. Exploitations and other anthropogenic activities are continuously operating in these zones and that need to be monitored and regulated.

II.13. Kerala Floods 2018 and 2019

Climate change and disasters are fast emerging as the most defining challenges of the 21st century. The Fourth Assessment Report (AR4) of the Intergovernmental Panel on Climate Change (IPCC) has provided compelling evidence that climate change is advancing rapidly as a global risk with impacts far beyond just the environment. However, with the climate change manifesting at an unprecedented rate with increased variability and frequency of extreme events, fueled largely through anthropogenic causes, can cause mega disasters unless, urgent, radical and resolute mitigation actions are not implemented (Chauhan, 2009).

Extreme precipitation events, landslides, and floods are the most common natural disasters that affect human society and economy (Hirabayashi *et al*., 2008; Crozier, 2010; Coumou & Rahmstorf, 2012; Roxy *et al*., 2017). Frequent extreme precipitation events cause flooding (Fowler *et al*., 2010), which have become common in India. India has witnessed some of the most unprecedented extreme precipitation events that caused

flooding and loss of lives in the recent past. The extreme rainfall and widespread flooding in Kerala during 2018 and 2019 exemplify the enormity of extreme rainfall and large-scale floods in India. These natural calamities have caused serious damages to the biodiversity of most of the natural habitats in Kerala. Many studies have brought out the impacts of these floods and landslides in support of loss of biodiversity in Kerala (Joshi, *et al*., 2020; Joshi and Balakrishnan, 2020). In the present study also, the field observations made immediately after the floods and landslides of Walayar forest has been included and compiled.

II.13.1. The Kerala Flood 2018

Kerala is one of the most densely populated Indian states (860 persons per square kilometres) making it more vulnerable to damages and losses on account of disasters. Floods are the most common natural hazard in the state. Nearly 14.5% of the state's land area is prone to floods, and the proportion is as high as 50% for certain districts. Landslides are a major hazard along the Western Ghats in Wayanad, Kozhikode, Idukki, Palakkad and Kottayam districts.

The flood in August 2018 was the worst flood in Kerala in nearly a century. The torrential rains triggered several landslides and forced the release of excess water from 37 dams across the state, aggravating the flood impact. Nearly 341 landslides were reported from 10 districts. Idukki, the worst hit district, was ravaged by 143 landslides.

II.13.2. Effects of flood on environment

The devastating floods and landslides caused extensive damage to houses, roads, railways, bridges, power supplies, communications networks, and other infrastructure; washed away crops and livestock and affected the lives and livelihoods of millions of people in the state.

In many natural systems, floods play an important role in maintaining key ecosystem functions and biodiversity. They link the river with the land surrounding it, recharge groundwater systems, fill wetlands, increase the connectivity between aquatic habitats, and move both sediment and nutrients around the landscape, and into the marine environment. For many species, floods trigger breeding events, migration, and dispersal. These natural systems are resilient to the effects of all but the largest floods.

The post-disaster study report, prepared by a team consisting of geologists and soil scientists, coordinated by Kerala Forest Research Institute (KFRI), after visiting the landslide areas in Thrissur district, listed the causative factors for each site. According to the report, the landslides were in slopes above 22° and most common between 22°–28°

slopes. Majority of the landslide sites were in the fringes of forests, indicating that disruption of slope continuity due to forest fragmentation was a major contributing factor to landslides in the district. Quarrying in vulnerable areas has also contributed to these degradations and is reported as a factor that can accelerate landslides at least in a few locations. Soil erosion has been reported from most of the forest areas leading to loss of humus and soil nutrients. The problem is largely visible in areas where heavy rainfall has occurred (PDNA report, 2018).

All 44 rivers in the state crossed their banks during the week of 12–19 August 2018. Flooded riparian areas acted as buffers taking the full fury of the fast-flowing rivers, especially as a result of the surge that happened when the dams were opened. Damage and erosion to river banks occurred, irrigation canals and drains silted up, canal banks collapsed and many structures such as cross drains and gates were damaged. Inspection and approach roads to these irrigation structures were also damaged, in addition to severe damage occurred to coastal protection structures that led to saltwater intrusion into the Vembanad Lake area (PDNA Report, 2018). Protected areas in the state were comparatively the least affected (PDNA report 2018).

However, landslides have occurred in Kottiyoor Wildlife Sanctuary and at Karikombu in the Eravikulam National Park and some private areas in the border of the buffer areas of the Silent Valley National Park. There is a huge risk of increase in biological invasions in the post-disaster period that is being predicted by many reports. The newly exposed land substratum in landslide areas will be favorable for invasive plants such as *Lantana camara* L. , *Chromolaena odorata* (L.) R. M. King & H.Rob., *Mikania micrantha* Kunth etc.

II. 14. New Plant pursuit - Novelties in recent years from Kerala

In recent years, the interest for floristic studies and expeditions to unexplored forest areas have resulted in discovering new taxa as additions to the knowledge base on plants. Moreover, certain taxa collected from an area formed new distributional records and rediscovery of certain taxa that was thought to be extinct after many years added to the floristic richness and diversity of our state. Furthermore, these discoveries and other relevant findings unravel the hidden wealth of biodiversity in our hottest hotspot, the Western Ghats. Table 1 below provides a brief summary of the taxa that was recorded during the last few years (2015 – 23) and table 2. shows the new distributional records of taxa in Kerala state and table 3 records the rediscovery of taxa in recent years which were thought to be extinct.

Table. 1. New plant discoveries from the state of Kerala (2015 – 2023)

Sl. No	Botanical name with citation	Location
1	*Anisochilus shoolamudianus* Sunil & Naveen Kumar (Sunil, *et al.,* 2015)	Ernakulam - Edamalayar Forest Range, Shoolamudi
2	*Christisonia mira* J. Mathew (Mathew & George, 2015)	Kollam – Vellakkaltheri
3	*Christisonia tomentosa* J. Mathew & Kad. V. George (Mathew and George, 2015)	Vellakkaltheri, Kollam
4	*Dimeria raviana* Kiran Raj & Sivad. (Raj, *et al.,* 2015)	Idukki - Periyar Tiger Reserve
5	*Eriocaulon manoharanii* Sunil & Naveen Kumar (Sunil and Kumar, 2015)	Ernakulam - Neriamangalam Forest Range, Pattimudi
6	*Erioucaulon biappendiculatum* Manudev, Robi & Nampy (Manudev, *et al.,* 2015)	Idukki - Kurinji valley, way to Pachakkad from KFDC base camp, Silent Valley, Munnar
7	*Diospyros udaiyanii* Udayan (Udayan *et al*., 2015)	Malabar Wildlife Sanctuary, Kozhikode
8	*Tripogon idukkianus* Sunil & Pradeep (Sunil, *et al*., 2015)	Idukki - Ramakkalmedu
9	*Gentiana kurumbae* Anilkumar & Udayan (Anilkumar, *et al.*, 2015)	Palakkad - Attappady hills, Cherukolmala
10	*Gymnostachyum warrierianum* K. M. P. Kumar, Balach. & V.B.Sreek.(Kumar *et al*., 2015)	Kannur - Aralam Wildlife Sanctuary, Kannadivechakunnu
11	*Impatiens matthewiana* Ramasubbu & Pandurangan (Ramasubbu *et al*., 2015)	Idukki - Lochart Gap (way to Munnar)
12	*Impatiens neo-modesta* Hareesh, K. M. P. Kumar & Sreekumar (Prabhukumar, *et al.,* 2015)	Palakkad - Hill top, Nelliyampathy hills
13	*Impatiens sasidharanii var. hirsuta* K.M.P.Kumar, Omalsree, Hareesh & V.B.Sreek.(Prabhukumar, *et al.*, 2015)	Palakkad - Hill top, Nelliyampathy hills
14	*Impatiens sasidharanii* K. M. P. Kumar, Omalsree, Hareesh & V.B.Sreek. (Prabhukumar, *et al*., 2015)	Palakkad - Hill top, Nelliyampathy hills
15	*Justicia sivadasanii* Sunil, K. M. P. Kumar & Naveen Kum. (Sunil, *et al*., 2015)	Ernakulam-Kuttampuzha Forest Range, Knacherry
16	*Impatiens sahyadrica* V.B.Sreek., Hareesh, Dantas & Sujanapal	Silent Valley national Park, Palakkad
17	*Litsea udayanii* Robi (Robi, *et al.,* 2015)	Idukki - Pambadumshola National Park
18	*Oldenlandia dineshii* (Jose *et al.,2015*)	Palakkad - Gangothri, Nemmara
19	*Ophiorrhiza sahyadriensis* Hareesh, V.B. Sreek. & K.M.P. Kumar (Hareesh, *et al.,* 2015)	Palakkad - Silent Valley, Walakkad

20	*Henckelia bracteata* Janeesha & Nampy (Janeesha and Nampy, 2015)	Kurisumala, Kottayam
21	*Rotala anamika* Lemiya (Lemiya and Pradeep, 2015)	Malappuram - Parappanangadi, Koottumoochi
22	*Hedychium matthewii* Sinj.Thomas, B.Mani & Britto (Thomas *et al*., 2015)	Idukki district
23	*Solanum exarmatum* Anil, Maya, Soumya & Murugan (Anilkumar, *et al.,* 2015)	Thiruvananthapuram - Jersey farm, way to Bonaccord-via-Vithura
24	*Sonerila gadgiliana* Ratheesh & Sivadasan (Narayanan *et al.,* 2015)	Banasuramala, Wayanad
25	*Sonerila balasubramaniamii* Murugesan (Murugesan *et al*., 2015)	Nelliyampathy hills, Palakkad
26	*Memecylon kurichiarense* Sivu, Aswathi & N. S. Pradeep (Sivu *et al*., 2015)	Kurichiarmala shola forest, Wayanad
27	*Tripogon bimucronatus* Thoiba & Sunil (Thoiba *et al*., 2015)	Nelliyampathy hills, Palakkad
28	*Salacia wayanadica* Sujana, Nagaraju, Ratheesh & Anil Kumar (Sujana *et al*., 2015)	Periya – Chandanathode forests, Wayanad
29	*Ariopsis peltata* var. *brevifolia* J. Mathew & Kad. V. George (Mathew and George, 2015)	Kottavasal, Kollam
30	*Cuscuta krishnae* Udayan & Robi (Udayan *et al*., 2016)	Idukki - Munnar, Silent Valley, way to KFDC
31	*Acmella uliginosa* Sw. var. *pentamera* Reshmi & Rajalakshmi (Reshmi and Rajalashmi, 2016)	Bhudhanur, Alappuzha
32	*Blyxa kasaragodensis* Biju, Josekutty & Augustine J (Biju *et al*., 2016)	Kasaragod
33	*Ceropegia nampyana* Manudev, Kambale & Pramod (Manudev *et al*., 2016)	Nanmanda, Pokkunnu, Kozhikode
34	*Dendrobium anilii* P.M. Salim, J. Mathew & Szlach. (Salim *et al*., 2016)	Wayanad - Vellarimala tract, Chembra Hills
35	*Exacum idukkianum* Geethakum., Pandur., Ravich. & Deepu (Geethakumary *et al*., 2016)	Idukki - Anamudi Shola forest
36	*Beilschmiedia jacobii* Robi, Udayan & S. George (Robi *et al*., 2016)	Pongalapara, Agasthyamala, Thiruvananthapuram
37	*Fimbristylis pokkudaniana* Sunil, Ratheesh & Sivadasan (Sunil *et al*., 2016)	Madayipara, Kannur
38	*Exacum keralense* Geethakum., K. M. P. Kumar, Pandur. & Deepu (Geethaumari *et al*., 2016)	Elival hills, Muthikulam, Palakkad
39	*Cinnamomum mathewianum* Remya, K. R., E. S. S. Kumar, Radhamany, Valsaladevi *et* R. Jagad. *var. ponmudianum* Remya, K. R., E. S. S. Kumar, Radhamany, *et* Valsaladevi (Remyakrishnan *et al*., 2016)	Ponmudi hills, Thiruvananthapuram
40	*Habenaria sahyadrica* K.M.P. Kumar, T.K. Nirmesh, V.B. Sreek. & Kumar (Prabhukumar *et al*., 2016)	Muthikulam, way to Elival hills, Palakkad

41	*Impatiens glabrata* K. M. P. Kumar, Hareesh et Bhaskar (Prabhukumar *et al*., 2016)	Palakkad - Singappara, way to Muthikulam
42	*Isachne bhattii* Biju, Josekutty & Augustine J. (Biju *et al*., 2016)	Kannur - Kalliad lateritic plateau
43	*Isachne edamalayarensis* Sunil, Naveen Kumar & Sivadasan (Sunil *et al*., 2016)	Ernakulam - Edamalayar Forest Range, Variyam
44	*Isodon purpurescence* Sunil, Naveen Kumar & Ratheesh (Kumar *et al*., 2016)	Ernakulam - Edamalayar Forest Range, Variyam
45	*Lobelia lammersiana* Biju, Josekutty & Augustine J. (Biju *et al*., 2016)	Kanayi lateritic plateau, Kannur
46	*Ixora predeepii* Anoop et Harikrishnan (Balan and Shanmugham, 2016)	Udumbanchola, Myladumpara, Idukki
47	*Justicia gambleana* K. M. P. Kumar, Robi & Hareesh (Prabhukumar *et al*., 2016)	Dhoni hills, Palakkad
48	*Nymphoides balakrishnanii* Biju, Josekutty, Haneef & Augustine J. (Biju *et al*., 2016)	Kasaragod - Koovapara
49	*Phyllagathis indica* J. Mathew, Yohannan & Kad.V.George (Mathew *et al*., 2016)	Idukki - Kuttikkanam Hills, Pullupara
50	*Phyllanthus balakrishnanii* Sunil, K.M.P. Kumar & Naveen Kum (Sunil *et al*., 2016)	Ernakulam - Shoolamudi hills
51	*Piper rukshagandhum* J.Mathew (Mathew *et al*., 2016)	Kottavasal Valley, Kollam
52	*Nymphoides palyi* P.Biju, Josekutty, Haneef & Augustine (Biju *et al*., 2016)	Perla, Kasargode
53	*Murdannia nampyana* Joby, Rogimon & Nisha (Joby *et al*., 2016)	Near Bhramapuram Diesel Power Project, Kadambrayar River, Kakkanad, Ernakulam
54	*Miliusa paithalmalayana* Josekutty (Josekutty *et al*., 2016)	Paithalmala, Kannur
55	*Memecylon lawsonii* Gamble var. *pedicellata* M. Das Das, Sujana, A. Pramanik & D. Maity (Das *et al*., 2016)	Kurichyarmala, Wayanad
56	*Seidenfadeniella salimii* J.Mathew, T.K.Hride, V.B.Sreek.& K.Madhus. (Mathew *et al*., 2016)	Aranamala, Wayanad
57	*Miliusa sahyadrica* G.Rajkumar, Alister, Nazarudeen & Pandur (Rajkumar *et al*., 2016)	Palaruvi Forests, Aryankavu, Kollam
58	*Sida pradeepiana* Tambde and Sardesai (Tambde *et al*., 2016)	Marayur, Idukki
59	*Plectranthus anamudianus* Smitha & Sunojk. (Smitha and Sunojkumar, 2016)	Rajamala, Idukki
60	*Sonerila malabarica* Robi, Dantas & Sujanapal (Sujanapal *et al*., 2016)	Kozhikode - Malabar Wildlife Sanctuary, way to Kakkayam Damsite
61	*Sonerila nairii* Soumya & Maya (Murugan and Maya 2016)	Pothumala hills, Kollengode range forests, Palakkad
62	*Sonerila ponmudiana* Deepthi Kum. and Pandur (Deepthikumary and Pandurangan, 2016)	Ponmudi hills, Thiruvananthapuram

63	*Strobilanthes malabarica* Josekutty, P.Biju & Augustine (Josekutty *et al*., 2016)	Paithalmala, Kannur
64	*Strobilanthes agasthyamalana* Sasidh., Dantas & Robi (Sasidharan *et al*., 2016)	Agasthyamala, Pongalapara, Thiruvananthapuram
65	*Symplocos nicolsonii* R. Jagadeesan, A. Gangaprasad, S. P. Mathew, E. S. S. Kumar et J. Stephan (Jagadeesan *et al*., 2016)	Mathikettan Shola National Park, Idukki
66	*Tripogon munnarensis* Thoiba & Manudev (Kottekkattu *et al*., 2016)	Munnar, Udumbanchola, near Mundiyaruma, Idukki
67	*Zingiber sabuanum* K.M.P.Kumar & A.Joe ((Prabhukumar *et al*., 2016)	Dhoni forest, near Dhoni waterfall, Palakkad
68	*Alseodaphne semecarpifolia* Nees var. malabarica Robi & Udayan (Robi and Udayan 2017)	Kozhikode - Malabar Wildlife Sanctuary, Kakkayam
69	*Anisochilus petraeus* J. Mathew & Yohannan (Mathew *et al*., 2017)	Achankovil, Kollam
70	*Arisaema peerumedense* J. Mathew (Mathew and George, 2017)	Idukki - Peerumedu, tract to Parunthumpara
71	*Artabotrys sahyadricus* Robi, KMP Kumar & Hareesh (Prabhukumar *et al*., 2017)	Ernakulam - Kuttampuzha, Pooyyamkutty forest, Kunjippara
72	*Arundinella muthikulamensis* Sunil, K.M.P. Kumar & V.P. Thomas (Sunil *et al*., 2017)	Palakkad - Muthikulam, Elivalmala
73	*Chiloschista confusa* M. J. Mathew, J. Mathew, P. M. Salim & Szlach. (Mathew *et al*., 2017)	Kakkadumpoyil, Kozhikode
74	*Chrysopogon narayanii* Sunil, Ratheesh & Sivadasan (Sunil *et al*., 2017)	Kannur - Madayipara
75	*Clematis pettimudiensis* K.M.P. Kumar, Jagadeesan & G. Prasad (Prabhukumar *et al*., 2017)	Kannur - Munnar - Eravikulam National Park
76	*Desmodium helicocarpa* Abdul Kader (Kader, 2017)	Pattikkad, Thrissur
77	*Dimeria kalliyadense* Biju, Josekutty & Augustine (Biju *et al*., 2017)	Kalliyad, Kannur
78	*Eriocaulon govindiana* Sunil & Ratheesh (Sunil *et al*., 2017)	Wayanad - Wayanad wildlife Sanctuary, Valluvadi
79	*Eriocaulon idukkianum* Manudev, Robi & Nampy (Manudev *et al*., 2017)	Idukki - Munnar, Palakkad - Silent Valley
80	*Eriocaulon periyarense* Sunil, Naveen & Remya (Kumar *et al*., 2017)	Ernakulam - Thundam Forest Range, Vadaattupara
81	*Eriocaulon pradeepii* Anto & Reshma (Anto and Reshma 2017)	Kayampoovum, Thrissur
82	*Garcinia gamblei* Shameer, T. Sabu & N. Mohanan (Shameer *et al*., 2017)	Ponmudi hills, Thiruvananthapuram
83	*Impatiens brittoi* B. Mani & S. Thomas (Mani and Thomas 2017)	Adimali, Idukki
84	*Hymenachne pandurangani J.Remya & Geethakum* (Remya and Geethakumary, 2017)	Thirunelli, Wayanad

85	*Impatiens agastyamalayensis* (Bhaskar) A.Joe, Bhaskar & M. Sabu (Joe *et al*., 2017)	Agastyamala, Thiruvananthapuram
86	*Impatiens mankulamensis* K.M.P.Kumar, R. Jagad. & Nagaraj (Prabhukumar *etal*., 2017)	Mankulam forest, Idukki
87	*Impatiens pandurangani*i K.M.P.Kumar, R. Jagad. & G. Prasad (Prabhukumar *et al*., 2017)	Idukki - way to Edamalakudy, Pettimudi
88	*Impatiens stolonifera* Robi & Manudev (Manudev *et al*., 2017)	Kottayam - Vagamon hills
89	*Isachne manilaliana* Sunil, K.M.P. Kumar & Thomas (Prabhukumar *et al*., 2017)	Muthikulam, Elivalmala, Palakkad
90	*Ischaemum sreenarayanii* Sunil, Nithya and Remya (Sunil *et al*., 2017)	Thrissur - Kombazha
91	*Kleinia subrahmanianii* Sunil & Naveen Kumar (Sunil *et al*., 2017)	Ernakulam - Edamalayar Forest Range, Variyam
92	*Lepidagathis benojiana* Jithin & Jose (Jithin and Jose 2017)	Idukki - Kulamavu
93	*Liparis sanamalabarica* P. M. Salim (Salim, 2017)	Wayanad - Kattimattom Hills
94	*Litsea gorayana* Udayan & Robi (Udayan & Robi 2017)	Agasthyamala, Thiruvananthapuram
95	*Litsea indoverticillata* Robi & Udayan (Robi *et al*., 2017)	Kakkayam dam, Kozhikode
96	*Millettia pulchra* var. *munnarensis* Balan & Predeep, (Balan *et al*., 2017)	Munnar, Idukki
97	*Oldenlandia vasudevanii* Soumya & Maya (Soumya *et al*., 2017)	Nelliyampathy hills, Palakkad
98	*Nanooravia kayyurense* Shaju, Rajendraprasad, Rijuraj and Ratheesh Narayanan (Shaju *et al*., 2017)	Kayyur, Kasaragod
99	*Nymphoides krishnakesara* var. *bispinosa* P. Biju, Josekutty, Haneef & Augustine (*Biju et al*., 2017)	Kakkad, Kasaragod
100	*Pilea victoriae* V. Suresh & Sojan (Jose *et al*., 2017)	Palakkad - Govt. Victoria College, Palakkad
101	*Piper canescens* J. Mathew (Mathew *et al*., 2017)	Idukki -Vagamon, Valley of Suicide point
102	*Piper megacarpum* J.Mathew (Mathew *et al*., 2017)	Idukki - Periyar Tiger Reserve, walkway to boating point
103	*Piper karpuragandhum* J. Mathew & Yohannan (Mathew *et al*., 2017)	Kozhikode - Vellarimala tract, Kanjippara
104	*Plectranthus petricola* J.Mathew & B.J.Conn (Mathew *et al*., 2017)	Idukki - Udumbanchola, Chemmannar Hills
105	*Plectranthus idukkianus* J.Mathew, Yohannan & B.J.Conn (Mathew *et al*., 2017)	Idukki - Kuttikkanam, Panchalimedu Hills
106	*Plectranthus saxorum* J.Mathew, Yohannan & B.J.Conn (Mathew *et al*., 2017)	Kozhikode-Vellarimala,10 km away from Muthappanpuzha
107	*Rotala kanayensis* Rijuraj, Rajendraprasad, Shaju and Pandurangan (Rijuraj *et al*., 2017)	Kannayi, Kannur
108	*Sonerila janakiana* Ratheesh, Sunil & Sivadasan (Narayanan *et al*., 2017)	Idukki - Eravikulam National Park

109	*Sonerila victoriae* Soumya & Maya (Murugan *et al*., 2017)	Palakkad - Pothumala hills, Kollengode range forests, Palakkad
110	*Thismia sahyadrica* Sujanapal, Robi & Dantas (Sujanapal *et al*., 2017)	Idukki - Neryamangalam
111	*Strobilanthes jomyi* P. Biju, Josekutty, Rekha & J. R. I Wood (Biju *et al*., 2017)	Kasaragod - Pandy lateritic plateau
112	*Tylophora balakrishnanii* P.M.Salim & J. Mathew (Salim *et al*., 2017)	Arunamala, Wayanad
113	*Tylophora neglecta* J.Mathew (Salim *et al*., 2017)	Thoovalmala, Kollam
114	*Symplocos abrahami*i R. Jagadeesan, A.Gangaprasad et S.P. Mathew (Jagadeeshan *et al.,* 2017)	Idukki - Eravikulam National Park
115	*Fimbristylis agasthyamalaensis* Viji & Preetha (Viji and Preetha 2018)	Thiruvananthapuram - Ponmudi
116	*Impatiens josephia* S. Thomas, B. Mani & S. J. Britto (Mani *et al*., 2018)	Idukki - Idukki
117	*Impatiens saulierea* B. Mani, S. Thomas & S. J. Britto (Mani *et al*., 2018)	Kozhikode - Kakkayam
118	*Lasianthus agasthyamalayanus* R. Jagad., S.P. Mathew, Gangapr. & E.S.S. Kumar (Raveendran *et al*., 2018)	Thiruvananthapuram - Agasthyamala Biosphere Reserve, Pongalappa
119	*Parthenocissus renukae* Anto & Pradeep (Anto *et al*., 2018)	Thrissur - Mangad
120	*Sonerila lateritica* Resmi, Manudev & Nampy (Resmi *et al*., 2018)	Kozhikode - Kakkoor, Ponkunnu hills, lateritic rock crevices
121	*Ardisia agasthyamalayana* A. Nazarudeen, G. Rajkumar & M. Alister (Ahammed *et al*., 2018)	Thiruvananthapuram - Chemunji hills, Agasthyamala
122	*Memecylon travancorense* Sivu, N. S. Pradeep, Pandur. & Ratheesh (Sivu *et al*., 2018)	Way to Kowdiyar Mottai, Ponmudi,Thiruvananthapuram
123	*Oberonia muthikulamensis* K. Prasad, K. M. P. Kumar & P. Sudheshna (Prasad *et al*., 2018)	Muthikulam, way to Elival hills, Palakkad
124	*Dimeria kalerii* P. Biju, E.J. Josekutty & Augustine Jomy (Biju *et al*., 2018)	Karakkode lateritic plateau, Kasaragod
125	*Lagenandra cherupuzhica* P. Biju, Josekutty & Augustine (Biju *et al*. 2018)	Cherupuzha, Kasaragod
126	*Utricularia sunilii* Naveen Kum. & K. M. P. Kumar (Kumar *et al*., 2018)	Palakkad-Hilltop, Nelliyampathy
127	*Peperomia emarginatifolia* J. Mathew (Mathew *et al.,* 2018)	Thrissur - Peechi- Vazhani Wildlife Sanctuary, Way to Ponmudi
128	*Peperomia vellarimalica* J. Mathew & P. M. Salim (Mathew *et al*., 2018)	Kozhikode - Vellarimala, walkway to REC para
129	*Leucas dhonimalayensis* Sunojk. & Vimal (Vimal *et al*., 2018)	Dhoni hills, Palakkad

130	*Eugenia kalamii* Shareef, E.S.S.Kumar, Shaju & Prakashkumar (Shareef *et al.,* 2018)	Wayanad - Periya
131	*Peperomia ekakesara* Syam & S. Nampy (Radh and Namby 2018)	Idukki - Santhanpara, Mathikettan shola National Park
132	*Plectranthus sahyadricus* Smitha & Sunojk. (Smitha and Sunojkumar, 2018)	Lockhart Gap viewpoint, Munnar, Idukki
133	*Rhynchostylis cymifera* Yohannan, J.Mathew and Szlach. (Yohannan *et a*l., 2018)	Malappuram - Nilambur, Vaniyampuzha Estate
134	*Memecylon idukkianum* Nampy & Syam Radh (*Radh and Nampy* 2018)	Idukki - Mathikettan Shola National Park, Vattappara
135	*Strobilanthes kannanii* Josekutty, P.Biju, J.R.I.Wood & Augustine (Josekutty *et al*., 2018)	Paithalmala, Kannur
136	*Arisaema fischeri* Manudev & Nampy (Manudev *et al*., 2019)	Agasthyamalai biosphere reserve, Thiruvananthapuram
137	*Arisaema subulatum* Manudev & Nampy (Manudev *et al*., 2019)	Agasthyamalai, Thiruvananthapuram
138	*Themeda palakkadensis* Chorghe, K. Prasad & Lakshmin *(Chorghe* et al., 2019)	Palakkad - Elivai Malai
139	*Hedyotis indirae* K. M. P. Kumar & Aiswarya, (Prabhukumar *et al*., 2019)	Ellival mala, Palakkad
140	*Asystasia gangetica* var. *krishnae* Tandyekk. (Tandyekkal *et al*., 2019)	Kulathupuzha, Kollam
141	*Amaranthus saradhiana* S. Arya, V.S.A. Kumar, W.K. Vishnu & Rajesh Kumar (Arya *et al*., 2019)	Thiruvananthapuram - Palode, way to Kulathupuzha
142	*Begonia bachulkarii* Aitawade, Joseph John & S. R. Yadav (Aitawade *et al.*, 2019)	Nelliyampathy hills, Palakkad
143	*Begonia bracteolata* N.Krishna, Pradeep & B. Mani (Krishna *et al*., 2019)	Karimanal, Idukki
144	*Habenaria agasthyamalaiana* Jalal, Jayanthi & P.Suresh Kumar (Jalal *et al*., 2019)	Shendurney Wildlife sanctuary, Kollam
145	*Habenaria keralensis* K.Prasad (Prasad, 2019)	Agasthyakoodam, Thiruvananthapuram
146	*Impatiens eravikulamensis* Hareesh & Salish (Salish *et al.,* 2019)	Ernakulam - Eravikulam National Park, near Eravikulam Lake
147	*Phanera murthyi* Vadhyar & J.H.F. Benj. (Vadhyar and Benjamin., 2019)	Kozhikode - Malabar Wildlife Sanctuary, near to Ambalapara Waterfalls
148	*Leucas sahyadriensis* Sunojk. (Sunojkumar, 2019)	Peninsular India including Kerala
149	*Liparis tortilis* P.M. Salim & J.Mathew (Salim *et al*., 2019)	Wayanad - Aranamala
150	*Oberonia saintberchmansii* Kad.V.George & J.Mathew (George, *et al*., 2019)	Nedumkandam, Idukki

151	*Rotala baileyana* Rogi, Joby, Rameshan, Nisha & I. Antony (Thomas *et al*., 2019)	Kasaragod - Kayyur, Verikken Para Kulam
152	*Sonerila epeduncula* J.Mathew (Mathew *et al*., 2019)	Idukki - Parunthumpara Hills, Way to Kuttikanam
153	*Polycarpaea rangaiahiana* Geethakum., Deepu et Viji (Geethakumary *et al*., 2019)	Thaliparambu, Kannur
154	*Strobilanthes carmelensis* Sinj.Thomas, B.Mani, Britto & Pradeep (Thomas *et al*., 2019)	Vaduvanchal, Wayanad
155	*Zeylanidium manasiae* R.Krishnan, P.Khanduri & R.Tandon (Krishnan *et al*., 2019)	Thommankuthu, Idukki
156	*Syzygium ponmudianum* A. K. Sreekala, Ramas., D. S. Pillai & Surendr.(Sreekala *et al*., 2019)	Ponmudi hills, Thiruvananthapuram
157	*Eriocaulon vamanae* Dani & Nampy (Francis *et al*., 2020)	Idukki - Munnar, Meesapulimala
158	*Bulbostylis maritima* Sunil, V.P. Prasad & Naveen (Sunil *et al*., 2020)	Ernakulam - Munambam
159	*Pothos boyceanus* G. Rajkumar, Shaju, Nazarudeen & Prakashk. (Rajkumar *et al*., 2020)	Idukki – Valara
160	*Amaranthus rajasekharii* S. Arya, V. S. A. Kumar, W. K. Vishnu & Iamonico (Arya *et al*., 2020)	Thiruvananthapuram - Palode, way to Kulathupuzha
161	*Hedyotis shoolamudianus* Sunil, Naveen Kum. & K. M. P. Kumar (Kumar *et al*., 2020)	Ernakulam-Variyam Forest, Shoolamudi
162	*Myristica trobogarii* Govind & M. Dan (Govind *et al.,* 2020)	Kollam - Agasthyamala Biosphere Reserve
163	*Impatiens nidholapathra* Vishnu & Nampy (Vishnu *etal*., 2020)	Idukki - 50th mile- Mankulam
164	*Impatiens grandispora* Nampy & Vishnu (Vishnu *et al*., 2020)	Idukki - Edathattu- Mankulam
165	*Henckelia wayanadensis* Janeesha & Nampy (Janeesha & Nampy 2020)	Wayanad - Kaduvakuzhi hill top
166	*Gentiana sasidharanii* K.M.P. Kumar & Sunil (Prabhukumar *et al*., 2020)	Idukki - Meesappulimala hills, Chinnakanal area
167	*Peucedanum pradeepianum K.M.P.Kumar, Hareesh & Indu* (Prabhukumar *et al*., 2020)	Palakkad – Palamala hills in Dhoni
168	*Utricularia kamarudeenii* V.S.A.Kumar & S.Arya (Arya *et al*., 2020)	Kottayam – Manarcaud paddy fields
169	*Eugenia sphaerocarpa* Rakesh, Sujana, Franklin Benjamin & Murthy. (Vadhyar *et al*., 2020)	Malabar Wildlife Sanctuary, Kozhikode
170	*Utricularia sainthomia* P. Biju, Josekutty, Janarth. & Augustine. (Biju *et al*., 2020)	Koyithatta lateritic plateau, Kasaragod
171	*Myristica trobogarii* M. G. Govind & Dan (Govind *et al*., 2020)	Thiruvananthapuram - Agasthyamalai Biosphere Reserve
172	*Elatostema agasthyanum* Jeomol & Sunojkumar (Jeomol & Sunojkumar, 2020)	Thiruvananthapuram - Agasthyamalai Biosphere Reserve

173	*Ludwigia venugopalanii* Arya & Anilkumar (Arya *et al.,* 2020)	Valayamchal – Kannur
174	*Ophiorrhiza meenachilarensis* Robi & Balan (Balan *et al*., 2020)	Vagamon Hills, Kottayam
175	*Gymnanthemum sahyadricum* Balan & Robi (Balan & Robi, 2020)	Thangalpara, Vagamon Hills, Kottayam
176	*Sonerila sulpheyi* Salim &Hritheek (Salim *et al*., 2020)	way to Thollayiram Hill region, Wayanad
177	*Lepidagathis ananthapuramensis* Anilkumar & Augustine (Anilkumar *et al.,* 2020)	Ananthapuram, Kasaragode
178	*Biophytum agasthyamalayanum* Jisha, E.S.S.Kumar, Decruse & Rajendraprasad (Daniel *et al*., 2020)	Agasthyamala Biosphere Reserve, Pongalappara, Thiruvananthapuram
179	*Cryptocarya sheikelmudiyana* A. K. H. Bachan & P. K. Fasila (Fasila *et al*., 2020)	Pooppara, Thrissur
180	*Ceropegia ariyittaparensis P. Biju, Josekutty & Augustine* (Biju *et al*., 2020)	Ariyittapara, Kasaragod
181	*Coleus anthonyi* Jebin Joseph & J. Mathew (Joseph *et al.*, 2020)	Neyyar Dam, Thiruvananthapuram
182	*Hopea sasidharanii* Robi & Sujanapal (Robi *et al.*, 2020)	Shenduruny Wildlife Sanctuary, Kollam
183	*Impatiens periyarensis* B. Mani, Sinj. Thomas & Britto (Mani *et al*., 2020)	Alady, Idukki
184	*Knema flavostamina* M.G.Govind & Dan (Govind & Dan, 2020)	Kallar Forest, Thiruvananthapuram
185	*Strobilanthes scopulicola* A.K. Pradeep, Sinj. Thomas, B. Mani & Britto (Thomas *et al*., 2020)	Meppadi, Nilgiri Biosphere Reserve, Wayanad
186	*Cleistanthus travancorensis* var. *jaleelianus* E.Girish & Sunojk. (Girish & Sunoj, 2020)	Kuppam river riparian vegetation, Rayarome,Kannur
187	*Buchanania lanzan* var. *palodensis* E.S.S.Kumar, Shareef & Raj Vikr. (Kumar *et al*., 2020)	Palode, Thiruvananthapuram
188	*Alternanthera ebracteolata* Sindhu Arya & V.S.A.Kumar (Arya and Anilkumar, 2021)	Udayagiri, Kasaragod
189	*Alternanthera indica* Sindhu Arya, V.S.A.Kumar, Sánch.Pino & Iamonico (Arya *et al*., 2021)	Palode, way to Kulathupuzha, Thiruvananthapuram
190	*Argostemma quarantena* Balan & Robi (Balan *et al*., 2021)	Vagamon hills, Idukki
191	*Burmannia munnarensis* Dani & Nampy (Francis *et al*., 2021)	Munnar, Idukki
192	*Cryptocarya muthuvariana* R.Jagad., P.Suresh Kumar, Gangapr. & S.P.Mathew (Raveendran *et al*., 2021)	Edamalakkudy, Idukki
193	*Dendrobium gopalanii* M.Sulaiman & Murugan (Sulaiman and Murugan, 2021)	Agasthyamala Biosphere Reserve, Thiruvananthapuram.
194	*Glycosmis nelliyampathiensis Jabeena & Maya (Jabeena et al., 2021)*	Kurissumala, Nelliyampathy, Palakkad
195	*Sonerila longipedunculata* Resmi & Nampy (Resmi and Nampy, 2021)	Banasura hills, Kattukunnu – Wayanad
196	*Litsea manilaliana* Robi & Udayan (Robi and Udayan, 2021)	Wagamon hills – Idukki

197	*Asyneuma cupulare* Divya & Nampy (Venugopal *et al*., 2021)	Meesapulimala, Idukki District
198	*Sonerila stolonifera* (Sekarathil and Nampy 2021).	Silent Valley National Park – Palakkad
199	*Syzygium caryophyllatum* var. *abrahamianum* Shareef & E. S. S. Kumar (Shareef. and Kumar, 2021)	Bhagavathi kavu, Thiruvananthapuram
200	*Eriocaulon meenachilense* Anoop & Robi (Anoop and Robi, 2021)	Meenachil, Illikkal Hills - Kottayam District
201	*Phyllanthus sanadhanadarma* Mathew and Yohannan (Mathew and Yohannan, 2021)	Vellarimala, Kozhikode
202	*Strobilanthes pushpagiriensis* Patil (Patil, 2021)	Pushpagiri Wildlife Sanctuary, Karnataka
203	*Eugenia pokkudanii* Maya & Suresh (Manoharan *et al*., 2021)	Nelliyampathy, Palakkad
204	*Sida keralensis* E.S.S.Kumar, Shailaj., A.K.Sreekala, B. Parthipan & Prakashk. (Kumar *et al*., 2021)	Maruthur, Thiruvananthapuram
205	*Symplocos mohananii* J.Stephan, R.Akhil & P.W.Fritsch (Stephan *et al*., 2021)	Ponmudi, Thiruvananthapuram
206	*Impatiens achudanandanii* V. S. A. Kumar, M. G. Govind & Sindhu Arya (Arya *et al*., 2021)	Kallar, Thiruvananthapuram
207.	*Impatiens danii* Sindhu Arya, V. Suresh & V. S. A. Kumar (Arya *et al*., 2021)	Munnar, Idukki
208	*Impatiens shailajae* Sindhu Arya & V. S. A. Kumar (Arya *et al*., 2021)	Sangili, Thiruvananthapuram
209.	*Cryptocarya muthuvariana* R. Jagad, Suresh Kumar, Ganagpr & S. P. Mathew (Raveendran *et al*., 2021)	Pettimudi, Idukki
210	*Elaeocarpus gadgilii* A.M.Maya, V.Suresh & K.M.P.Kumar (Manoharan *et al*., 2021)	Nelliyampathy hills, Palakkad
211	*Polycarpaea palakkadensis* V. S. A. Kumar, S. Arya & Suresh (Arya *et al*., 2021)	Malampuzha, Palakkad
212	*Sonerila kanjilasseriensis* Arunraj, R. Reshma & Vishnupr (Arunraj and Raju, 2021)	Kanjilasseri, Kozhikode
213	*Strobilanthes pradeepiana* B. Mani, Sinj. Thomas & Britto (Thomas *et al*., 2021)	Munnar, Idukkis
214	*Neanotis prabhuii* Sunil, Salim & Ratheesh (Sunil *et al*., 2021)	Elimbilery, Wayanad
215	*Impatiens raktakesara* Vishnu & Nampy (Mohan *et al*., 2021)	Umiyamala, Anamudi, Idukki District
216	*Burmannia munnarensis* Dani & Nampy (Francis *et al*., 2021)	Munnar, Idukki District
217	*Parasopubia raghavendrae* K.V. Divya & Nampy (Venugopal *et al*., 2021)	Mathikettan Shola National Park, Idukki district
218	*Seidenfia manikathila* J.Mathew, P.M. Salim & Szlach (Mathew *et al.,* 2021)	Rajamala hills, Idukki district

219	*Fimbristylis sunilii* Sanilkum. & Nithya (2021)	Ponmudi hills, Thiruvananthapuram
220	*Madhuca balakrishnanii* E.S.S.Kumar, Shailaj. & Shareef (Kumar *et al*., 2021)	Thodiyoor, Kollam
221	*Eriocaulon sanjappae* M.K.Akhil & Nampy (Nampy and Akhil, 2021)	Periya-Chandanathode road,Wayanad
222	*Callitriche idukkiana* Vishnu & Nampy (Mohan and Nampy, 2021)	Idukki District
223	*Litsea anamalayana* Robi & Udayan (Robi and Udayan, 2021)	Nelliyampathy hills, Palakkad
224	*Allmania multiflora* V.S.A. Kumar, V. Suresh, Sindhu Arya and Lamonico (Sindhu *et al*., 2022)	Kollengode, Palakkad
225	*Buchanania abrahamiana* E.S.S.Kumar & Shareef (Kumar and Shareef, 2022)	Palode, Thiruvananthapuram
226	*Impatiens thulunadensis* Sindhu Arya, Biju &V. S. A. Kumar (Biju *et al*., 2022)	Hosangadi, Kasaragod
227	*Miliusa agasthyamalana Sindhu Arya &V.N. S.A. Kumar* (Arya & Kumar, 2022)	Athirumala, Agasthyamala biosphere Research, Thiruvananthapuram
228	*Ophiorrhiza sasidharaniana* A.S.V.Nair, Gangapr., Rameshk. & E.S.S.Kumar (Nair *et al*., 2022)	Adichilthotty tribal colony to Malakkappara, Thrissur
229	*Tripogon sugathakumariae* Jabeena, Sunil & Maya (Jabeena *et al*., 2022)	Nelliyampathy hills, Palakkad
230	*Casearia seethalakshmiae* V. Suresh & Ambika (Ambika *et al*., 2022)	Uppumpadam Road, Kannadi II, Palakkad
231	*Impatiens keralensis* Sarav. & Kaliam (Saravanan and Kaliamoorthy, 2022)	Kurichiyaarmala, Wayanad
232	*Ischaemum sunilii* Jabeena, Nithya, K.M.P.Kumar & Maya (Jabeena *et al.*, 2022)	Govindamala, Nelliyampathy hills, Palakkad
233	*Henckelia viridiflora* J.Mathew & P.M.Salim (Mathew *et al*., 2022)	Brandippara Hills, Periyar Tiger Reserve, Idukki
234	*Impatiens kurichiarmalayana* Sarav. & Kaliam (Saravanan and Kaliamoorthy, 2022)	Kurichiyaarmala, Wayanad
235	*Polycarpaea ebracteata* S. Arya, V.S.A. Kumar, V. Suresh & Alen Alex (Arya *et al*., 2022)	Vengappara, Nenmeni, Kollengode, Palakkad
236	*Polycarpaea psammophila* V. Suresh, V.S.A. Kumar, S. Arya, & Alen Alex (Arya *et al*., 2022)	Ayinampadam, Nenmara, Palakkad
237	*Polycarpaea barbellata* V.S.A. Kumar, S. Arya, V. Suresh & Alen Alex (Arya *et al*., 2022)	Chedukamala, Kuthanur, Palakkad
238	*Emilia lateritica* P.Biju, Josekutty, K.S.Prasad, V.S.A.Kumar & Augustine (Biju *et al.,* 2022)	Pandy, Kasaragode, Kerala
239	*Kalanchoe dineshii* Syam Radh & Nampy (Sasi & Nampy, 2022)	Near Aduvizhunthankudi, Mathikettan Shola National Park, Idukki

240	*Humboldtia ponmudiana* E.S.S.Kumar, Shareef & Raj Vikr. (Kumar *et al*., 2022)	Ponmudi, Thiruvananthapuram
241	*Ixora lavanya* J. Mathew & P. M. Salim (Mathew and Pichan, 2022)	Way to Agasthyarkoodam, Peppara Wildlife Sanctuary, Thiruvananthapuram
242	*Sonerila lundinii* Resmi & Nampy (Resmi *et al*., 2022)	Chemunji, way to hill top, Agasthyamala Biosphere Reserve, Thiruvananthapuram
243	*Polygala idukkiana* M.Vishnu & Nampy (Vishnu and Nampy, 2022)	Kottppara-Mullaringad, Idukki
244	*Piper kurichyarmalanum* J.Mathew & P.M.Salim (Mathew *et al*., 2022)	Kurichyarmala hills, Wayanad
245	*Piper ovalifructum* J.Mathew & P.M.Salim(Mathew *et al*., 2022)	Nellickampetty, tract to Mangaladevi, Idukki
246	*Eriocaulon pandeyana* Nampy, Harishma & M.Vishnu (Harishma *et al*., 2022)	Koymanchola, Idukki
247	*Christisonia flavirubens* J. Mathew & P.M.Salim (Mathew and Salim, 2023)	Paithalmala, Kannur
248	*Impatiens salimii* K. M. P. Kumar & Reshma (Prabhukumar *et al*., 2023)	Thollayiram forest, Kalladi, Meppadi,Wayanad
249	*Canthium vembanadensis* S. Soja & T. Sunil (Soja and Sunil, 2023)	Muhamma, Vembanad Lake, Alappuzha
250	*Parthenocissus wallichianus* Anto, Nimmi & Pradeep (Dominigose *et al*., 2023)	Kayambuvum, Thrissur

Table 2. New distributional records to Kerala

Sl. No	Botanical Name	Year	District	Authors
1	*Ophiorrhiza rugosa* var. *angustifolia* (Thwaites) Ridsdale	2015	Thiruvananthapuram	Hareesh *et al*., 2015
2	*Impatiens pseudo-acaulis* Bhaskar	2015	Silent Valley, Palakkad	Hareesh *et al*., 2015
3	*Commelina africana* subsp. *zanzibarica* Faden	2015	Malappuram	Joesph *et al*., 2015
4	*Friesodielsia sahyadrica* N.V.	2015	Parappa, Kasaragode	Robi *et al*., 2015
5	*Macroptilium lathyroides* (L.) Urb.	2016	Palakkad, Kollam	Prabhukumar *et al*., 2016
6	*Peristylus tentaculatus* J.J.Sm.	2016	Ernakulam	Prabhukumar *et al*., 2016
7	*Elytraria acaulis* (L.f.) Lindau	2016	Palakkad	Ramachandran & Remesh, 2016
8	*Eriocaulon tuberiferum* A.R.Kulk. & Desai	2018	Elival hills, Muthikulam, Palakkad	Sunil *et al*., 2018
9	*Fimbristylis griffithii* Boeckeler	2018	Koomul forest and Kalady, Ernakulam	Kumar *et al*., 2018
10	*Alocasia longiloba* Miq.	2019	Kerala	Mathew *et al*., 2019
11	*Arisaema madhuanum* Nampy & Manudev	2019	Kerala	Mathew *et al*., 2019
12	*Eriocaulon nepalense* var. *luzulifolium* (Mart.) Praj. & J.Parn.	2019	Palakkad	Soumya and M.C. Nair, 2019
13	*Pilea hyalina* Fenzl	2020	Idukki, Wayanad, Kozhikode	Jeomol & Sunojkumar, 2020
14	*Hanguana anthelminthica (Blume ex Schult. & Schult.f.) Masam.*	2020	Vembanad-Kol Wetland, Alappuzha	Balan *et al*., 2020
15	*Heterocentron subtriplinervium* (Link et Otto) A. Braun et Bouche	2020	Munnar Hills, Idukki	Balan *et al*., 2020
16	*Ficus virens* Aiton *var. matthewii* Chantaras	2021	Thirunelly, Wayanad	Nair *et al*., 2021
17	*Rorippa dubia* (Pers.) H. Hara	2021	Pallivasal, Idukki	Madhav *et al*., 2021
18	*Tectaria polymorpha* (Wall. ex Hook.) Copel. (Pteridophyte)	2022	Shendurney Wild Life Sanctuary, Kollam	Raju *et al*., 2022
19	*Corynandra felina* (L.f.) Cochrane and Iltis	2023	Chinnar Wildlife sanctuary, Idukki	Suran and Pillai, 2023

Table 3. Recollections in Kerala

Sl. No	Botanical Name	Location	Author
1	*Dalbergia travancorica* Thoth.	Thiruvananthapuram	Jagadeeshan *et al*., 2015
2	*Thottea dalzellii* (Hook.F.) Karthik. & Moorthy	Wayanad	Kumar *et al*., 2015
3	*Impatiens concinna* Hook.f.	Palakkad	Prabhukumar *et al*., 2015
4	*Phyllanthus macrocalyx* Mull. Arg.	Ernakulam	Naveen *et al*., 2015
5	*Hedyotis beddomei* Hook.f.	Palakkad	Prabhukumar *et al*., 2018
6	*Madhuca diplostemon* (C.B.Clarke) P.Royen	Kollam	Shailajakumari *et al*., 2020
7	*Burmannia indica* Jonker	Meenuliyanpara, Idukki	Francis *et al*., 2021

After thorough survey on the earlier floristic studies and the new taxonomic research publications, it is getting proved that even though the *Flora of Palghat* is the official publication on the flora of Palakkad district, the data needs to be updated due to the addition of many new taxa to the district floristic diversity. Detailed floristic studies on the Nelliyampathy hills, Dhoni hills, Kollengode hills, Attappady hills and Silent Valley hills have added insight to the floristic richness of the district. Walayar hill ranges is the area which is not yet been explored and needs special attention due to its geographical peculiarities and attempt is here made to explore Walayar hills and document its floral wealth along with emphasis to the detailed systematic study, mapping, biomonitoring, threat assessment, ethnobotanical study and endemism of taxa recorded. Foregoing review reveals that the floristic elements of Walayar hills are least explored, less represented in earlier literature and there exist a gap in the comprehensive knowledge base of angiosperm diversity which is the focus of present study.

III. MATERIALS AND METHODS

Angiosperm diversity along with resource mapping of Walayar forest range under Palakkad Forest division is critically evaluated in the present investigation. The present study has been undertaken during the period between 2017 – 2023.

III. 1. Study Area

Walayar range is the largest forest range under Palakkad division. This forest range lies between 10°45' - 10°55'N latitude and 76°37' - 76°49'E longitude and covers a total area of 125.65 Sq Km. The mountain tracts of this range is on the northward side of Palghat gap region and shares its boundary with Tamil Nadu in the north and Olavakkode and Nemmara forest division in the south. Majority of the forest areas are situated as a contiguous block on two sides of Malampuzha reservoir. This is seen extended from the water level of the reservoir to the ridges and peaks of the Western Ghats on the Northern side of the Palakkad Gap (Fig. 1).

Walayar forest division is divided into six sections, viz., Akamalavaram, Kottekkad, Akathethara, Pudussery North, Pudussery South and Walayar. Malampuzha and Kottekkad are the two beats of Akamalavaram and Kottekkad sections respectively. Pudussery North and Pudussery South form the beats of Pudussery North and South sections. Poolampara and Varali are the two beats under the Walayar section in this range. Of the total 125.65 sq kms area in the range, 11.11sq km forms the reserve forest and the rest forms the vested type (114.54 sq km). Further, important forest tracts in this range includes Chenat Nair reserve forest, Emoor Bhagavathy vested forest, Vadassery vested forests and Akathethara vested forest. Nellissery and Kottekkad are small bits of vested forests found contiguous with the large block.

Attumala with an altitude of about 1525m and Aduppukootimala (823m) are the important peaks recorded from the Walayar forest range. Other important hills in this range include Chinnaatumala, Parapetti, Jamanthimala, Ayyappan Mala, Kottamutti waterfalls, Edamala and Chaatappara waterfalls. In addition to the main forest around the Malampuzha reservoir, many detached small to medium sized hillocks are found scattered throughout the range which vary in their size just above the ground level to hill tops ranging upto 300m. The presence of these hill terrains are more towards the eastern side of the range where the Palghat gap is in near vicinity. These hillock systems are biodiversity rich areas with high species richness with different microhabitats facilitating unique plant associations and adaptations to thrive in the adverse edaphic and climatic conditions experienced throughout the year (Plate 1 to 4).

Palghat Gap is having great significance in influencing the climatic conditions and vegetation of Walayar forest range. Since the altitude of hill tracts is not sufficient for the arrival of the moist south west monsoon air, the wind flowing through the west gets channeled through the Gap and gets accelerated due to the funnel effect. Thus, the wind to the east side of the gap becomes very strong, often reaching 30 – 40 km in Coimbatore district and nearby borders of Palakkad district. These dry winds influence the vegetation of the Walayar hill tracts making it similar to dry deciduous forests in the state of Tamil Nadu with the presence of succulents and other cactoid species. Dry deciduous, moist deciduous and semi evergreen forests along with small patches of grassland and scrub jungles are the vegetation types seen in the study area (Working plan of Palakkad forest division, 2009 - 10 to 2018 - 19).

III. 1.1. Topography

Walayar forest range lies north-west of the Palghat gap and is characterized by main ghats varying greatly in altitude. They are also characterized by barren rocky hill tops, hill tops with small stretches of grasslands, steep valleys and slopes. The vegetation in these steep slopes are very low and that may be due to the unfavourable dry winds and consequent high temperature regimes on these hills. Another important feature is the presence of undulating hills in different stretches other than in a single hill tract. These hills also vary in their altitude ranging from 300m asl to 1525m asl (Highest recorded). The detached rocky outcrops are seen scattered throughout the range (Working plan of Palakkad Forest division, 2009 - 10 to 2018 - 19).

III. 1.2. Geology

Geologically, the Western Ghats region of Palakkad district is considered as a part of the Archean system. Formation of the Palghat Gap is considered as a tectonic feature of faulting during the lower Miocene period. The important rock type is the biotite granite gneiss. Other rock types include Khondalite with pegmatite, granites (hornblende and biotite types) and limestone. Another important feature of Walayar forest range is the presence of Pandarathu limestone deposit in the Vadassery malavaram and the area is being mined now by Malabar cements Pvt. Ltd. Presence of limestone deposits also occurs in the nearby zone. The limestone is found to be interlaced with garnet-sillimanite-graphite gneiss (Working plan of Palakkad Forest division, 2009 - 10 to 2018 - 19).

III. 1.3. Soil

Sub humid conditions and tropical climate causes weathering of the parent crystalline and metamorphic rocks yielding the major soil type in the area. The major type

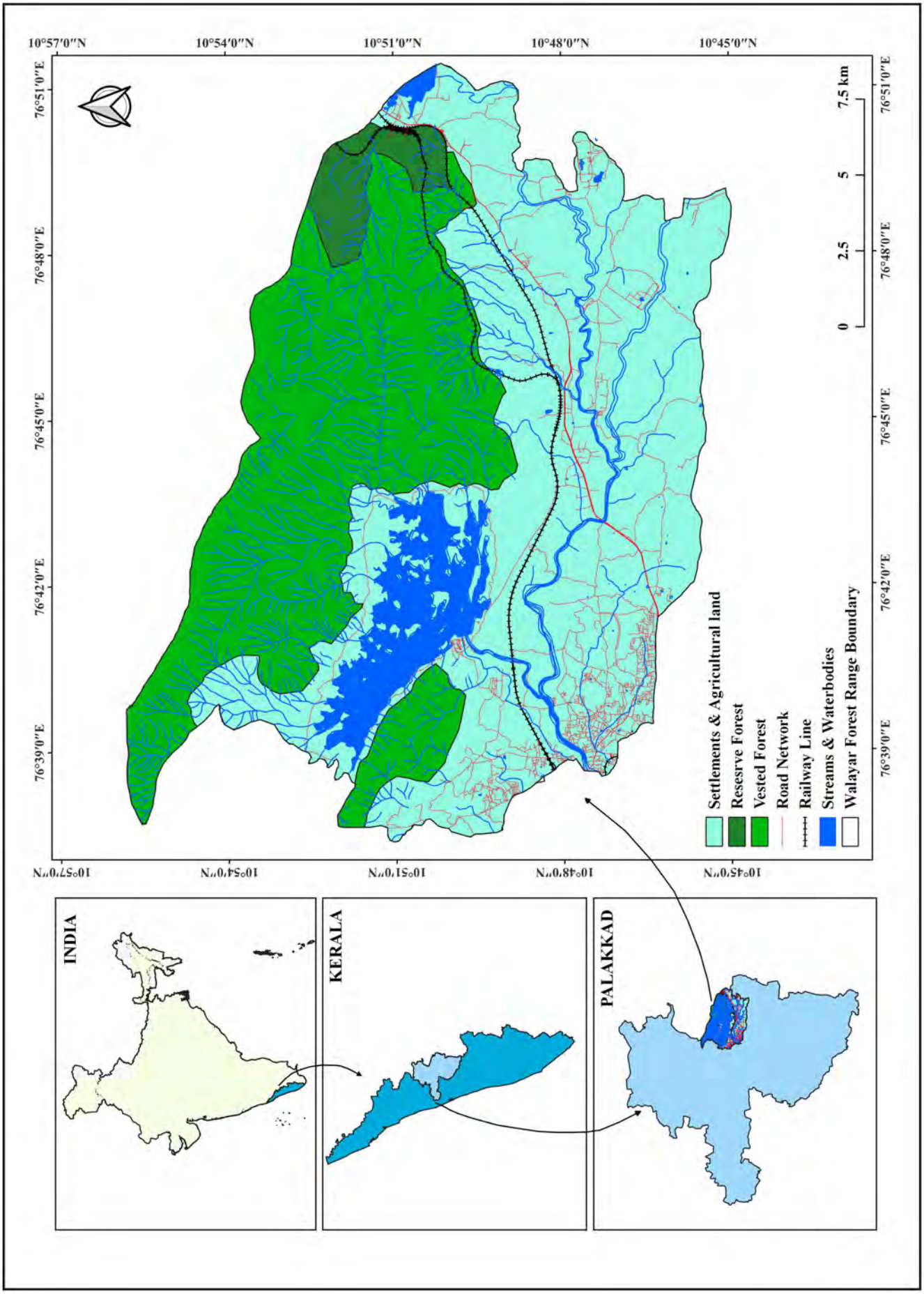


Figure 1. Study area – Walayar Forest Range

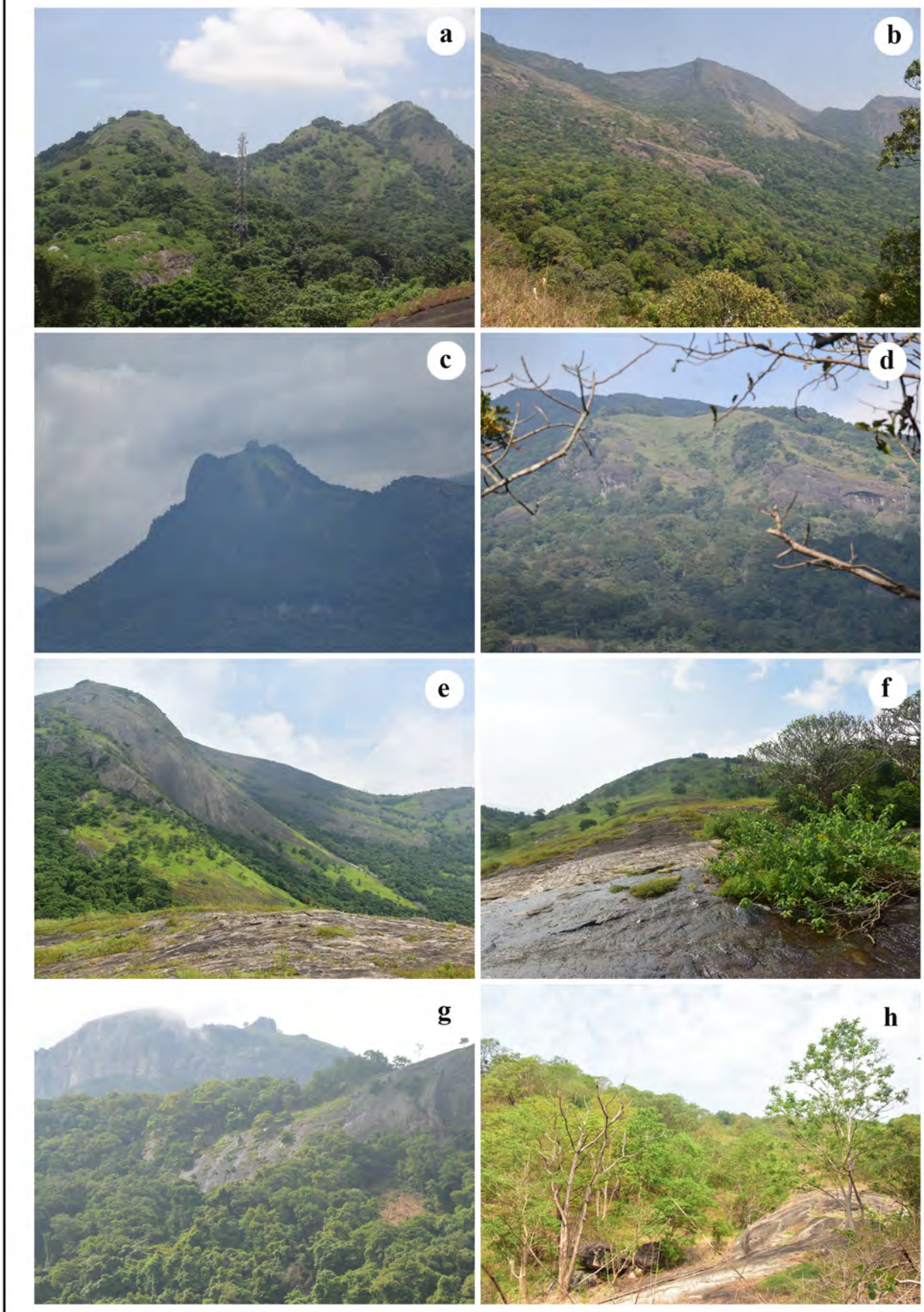


Plate 1: Study locations under Walayar forest range Fig. a. Thekke Malampuzha **b.** Aatumala **c.** Aduppukootimala **d.** Akamalavaram **e.** Kaataadikunnu **f.** Azhakumppara **g.** Chacolas estate h. Chottuppara

Plate 2: Study locations under Walayar forest range Fig. a. Jamanthimala **b.** Kavarakundu **c.** Kottamutti waterfalls **d.** Poolakunnu **e.** Velanchery hills **f.** Top of Parapetti hill **g.** Uchimala **h.** Mathaappumala

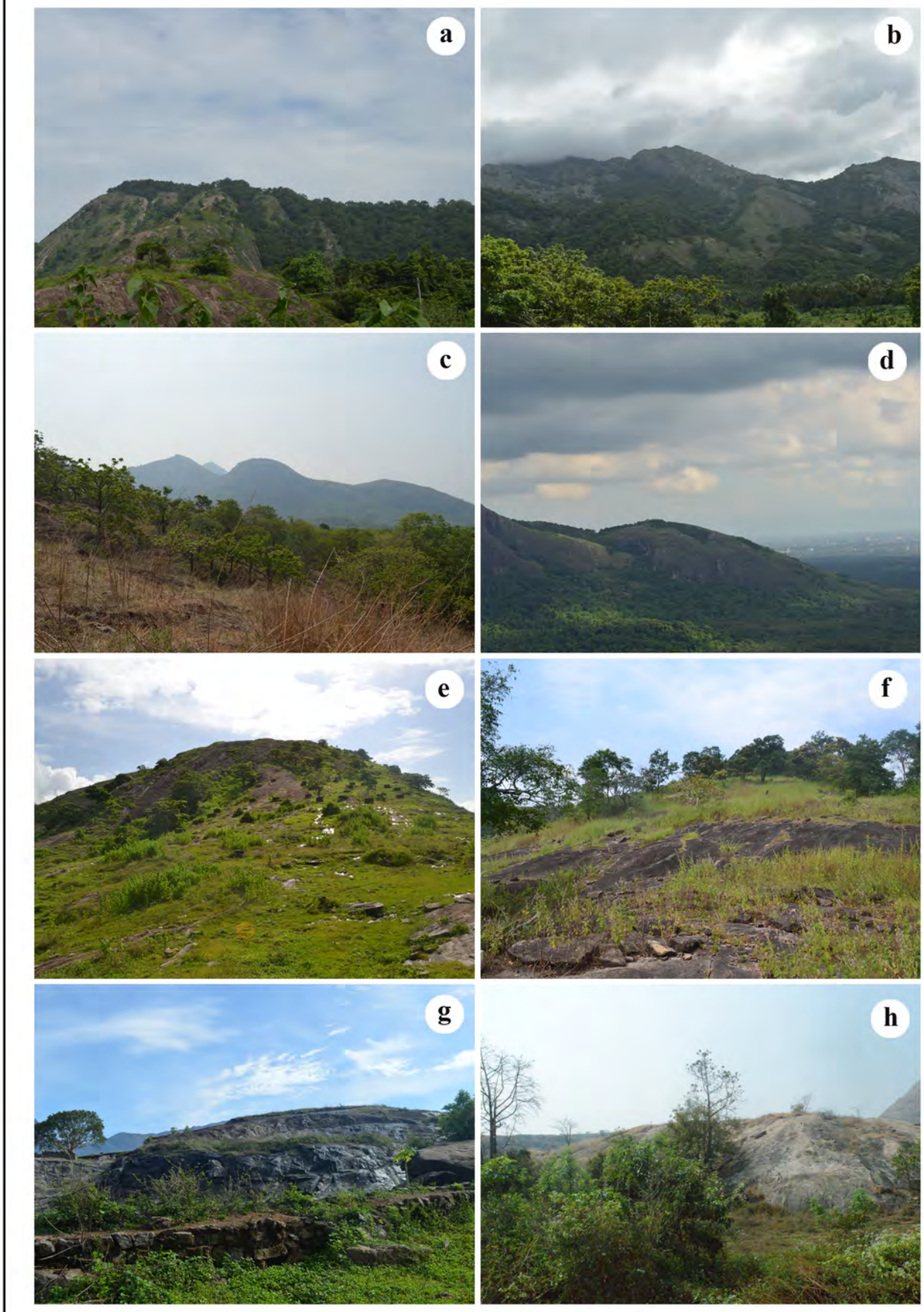


Plate 3: a. – d. Study locations under Walayar forest Range Fig. a. Ayyappanmala **b.** Walayar hills **c.** Parakkallu **d.** Neelikunnu **e. – h. Rocky outcrops in Walayar forest range Fig. e.** Koomachimala **f.** Kozhimala **g.** Mayyappalam **h.** Chemanamkaadu

Plate 4: Rocky outcrops in Walayar forest range Fig. a. Kozhimala **b.** Anayappanchalla c. Karadikunnu **d.** Pallippara **e.** Ollappalam **f.** Thekke Malampuzha hillock **Fig. g. – h.** Rocky outcrops in Malampuzha dam reservoir

is red soil, and mixed red and yellow soil. Alluvial soil is also present in the stream beds. They may vary from grayish brown to yellowish white sandy to coarse loamy soil.

The forest floor is characterized by heavy accumulation of organic matter in the surface soil due to the large quantity of organic debris that falls on the surface due to the presence of deciduous vegetation. They are rich in Nitrogen and contain moderate quantities of potassium and phosphorus. But, the quantity of organic matter decreases with depth and leaching of minerals is also observed. Soil is found to be acidic due to loss of calcium and other bases brought out by leaching. Soils of evergreen forests are comparatively richer in magnesium than that of deciduous forest floors (Working plan of Palakkad Forest division, 2009 - 10 to 2018 - 19).

III. 1.4. Temperature

The months from March to May are found to be the hottest months and the months December and January are observed to be the coldest ones. Dry and hot winds flowing through the Palghat gap region affects the vegetation and temperature regimes of the locality. The minimum temperature recorded is 22ºC to 23ºC. The maximum temperature recorded during the summer season is between 35ºC and 40ºC and occasionally, this temperature rises upto 43ºC in the last two years (Working plan of Palakkad Forest division, 2009 - 10 to 2018 - 19).

III. 1.5. Rainfall

The hill range is benefited by both Southwest and Northeast monsoons. This range receives lowest rainfall in the Walayar area and highest in Chenat Nair reserve forest areas. January to April are the driest months for the Walayar forest range with lowest rainfall. The annual average rainfall recorded in the range is above 2000mm. The South – West monsoon is received from June to September and North – Eastern monsoon by the end of October and last till December (Working plan of Palakkad Forest division, 2009 - 10 to 2018 - 19).

III. 1.6. Wind

Strong and dry winds desiccates from the eastward side of the district and as a tunnel effect, it is passed through the Palghat gap region from Coimbatore district of Tamil Nadu. These winds cause the faster drying of vegetation in the Walayar region and usually happen from October to March (Working plan of Palakkad Forest division, 2009 - 10 to 2018 - 19).

III. 1.7. Reservoirs in Walayar forest range

Malampuzha dam, one of the largest dams in Kerala is the water reservoir surrounding almost half the region of the forest areas in this range. The catchment area of

Malampuzha dam comes around 147.63 Sq. Km. Numerous small and medium sized rocky patches and islands are present in the Malampuzha dam region. During the monsoon season, some of the rocky patches get fully immersed in water as the water level rises. The maximum flood level of Malampuzha dam is 115 mts above Mean Sea Level (MSL).

Another reservoir present is Walayar dam. The maximum flood level of the dam is 666ft above Mean Sea Level. The catchment area of this dam is in Tamil Nadu with about 106.35 sq km. The shutters of the dam is on the Kerala side and is beneficial in the supply of water for irrigation purposes. Even though Walayar dam is not located near the forest areas in the Walayar range, the water for the reservoir drains from the rivers originating from Walayar forests (Working plan of Palakkad forest division, 2009 - 10 to 2018 - 19).

III. 1.8. Rivers and streams

Walayar forest range is one of the major sources for numerous streams and tributaries for the largest river in Kerala, The Bharathapuzha. Majority of the streams originating from the forest tract reaches Malampuzha reservoir. Also, the streams from the Dhoni Forest section joins the Akathethara forest in Walayar forest range and discharges to Malampuzha dam. Onnaampuzha, Mylaadumpuzha, Kallanpuzha, Sappal Thodu, Dhoni waterfalls and the stream flowing down are the main rivers that drain to Malampuzha Dam and further to Bharathapuzha. Korayar and Walayar river are the main sources of water for Walayar dam. Both Malampuzha and Walayar dams are irrigation dams and form the major sources of water in Palakkad and Chittur taluk respectively.

III. 1.9. Plantations

The presence of Malampuzha dam and the fertile forest soil are one of the major reasons for the establishment of plantations in and around the hill tracts of Walayar forest range. The catchment area around the Malampuzha dam is inhabited by human settlements. This made the conversion of forest land in the earlier period to agricultural lands. Some of the major agricultural practices include paddy, banana, cashew, coconut, arecanut, and pepper. With the arrival of new agricultural practices, rubber (*Hevea braziliensis* (Willd. ex A. Juss.) Muell.-Arg.) Cocco (*Theobroma cacao* L.) and pineapple (*Ananas comosus* (L.) Merr.) took over the forest margins and valleys of Walayar forests. Adequate temperature, rainfall and fertile soil, favoured the establishment of these agricultural crops in this zone.

Slowly, other than the crop plantations, practice of growing trees (silviculture) began in the forest margins which later got extended to the forest floor. Numerous teak, mango, mahagony plantations occur in private lands in Walayar forest range. The Kerala Forest department in collaboration with various research centres conducted several studies

on the possibilities of planting timber woods in the forest areas of Palakkad forest division and Walayar forest range was found suitable for the planting of several tree species. Initially, teak (*Tectona grandis* L. f.) was the major planted tree from 1939 to 1979. These plantations were established in Poolampara, Varalipadi, Pullimanpathy, Vattappara, Vadhyarchalla, Kallanakode, Panampully and Nadupathy. Later, cashew (*Anacardium occidentale* L.) and *Eucalyptus* (*Eucalyptus globulus* Labill.) were planted on an experimental basis in Panampully and the results were encouraging. Matti (*Ailanthus excelsa* Roxb.) Acacia (*Acacia auriculiformis* A.Cunn. ex Benth.), *Casuarina* (*Casuarina equisetifolia* L.) and other miscellaneous wood trees were planted in various plots in Walayar (Verli, Elichiram, Arangottukulambu, Malampuzha, Palamara, Nellisseri, Chozhamkod, Edamala and Edupukulam) from 1980 and this practice extended to 2003. From 2004 onwards the forest department started various plots of cane (reeds) and bamboo along with medicinal plants including sandalwood (*Santalum album* L.) in Velanchery, Poolamppara, Nadupathy, Moochikadavu, Vadhyarchalla, Chempana, Anakkal and Kottekkad vested forest regions. A total of 2166.54 ha of forest land was converted to various plantations till 2008 (Working plan of Palakkad forest division, 2009 - 10 to 2018 - 19).

III. 1.10. Captivity sites

Walayar forest has two important captivity sites in this range viz., the deer park and the snake park, for protection of deers and snakes.

III. 1.10.1. Deer Park

Deer park or Loknayak Jayaprakash Narayan Smaraka Maan Park is located at Walayar about 24 km from Palakkad along Palakkad – Coimbatore Road. Forty hectares of teak plantations in Walayar were converted into deer park in 1997 with the aim of rehabilitation of rescued deers like spotted deer, sambar deer etc. There were about 14 sambar deers, 65 spotted deers and three barking deer in the park (Working plan of Palakkad Forest division, 2009 - 10 to 2018 - 19). The animals were fed by supplying green leaves and other food since there arose food scarcity in the fenced park of teak plantation. Further, the attack and intrusion of wild animals like elephants, wild pigs etc. caused severe damage to the fencing of the park which led to the release of deers from the park and moreover, diseases affected the health of the inhabitants in the park. The park was permanently closed to the public considering the health of the deers in the park in 2006. Also, as the park is located close to Malabar Cements Limited, it is found that the

surrounding areas are severely polluted. This is really unhealthy for the animals in the enclosure. Hence, of late, it has been decided to release the animals into the wild and only the diseased animals that are now left behind are taken care of by park authority.

III. 1.10.2. The snake park, Malampuzha

The snake park was established on 18.08.1984 by the forest department for the rehabilitation of captured or injured snakes from various parts of the district. Now it has two King Cobras and an assortment of Cobras, Kraits, Vipers, Pythons, Rat snakes and other non-venomous snakes and reptiles including a monitor lizard. The snake park is a good tourist spot and it serves as an excellent center for disseminating nature education with respect to the role of one of the most misunderstood living creatures especially in rural India. It gives an opportunity for the people, especially children, to see poisonous as well as non-poisonous snakes at close quarters and also to identify them and understand their role in the ecosystem.

III. 1.11. Tribal Settlements

There are twenty two tribal settlements in the Walayar forest range. They belong to three tribal groups namely Irulars, Paniyans and Mudugas. Most of the tribal colonies are located adjacent to the forest land and few on the forest margins. None of the colony is located deep inside the forest except for Parapetti colony which is no longer inhabited by tribal people. More tribal settlements are present in the Akamalavarm section (11), followed by six and four tribal settlements in Kottekkad and Pudussery north sections respectively. Only one tribal colony is present in the Walayar section. No tribal settlements are present in Pudussery south and Akathethara sections. Details of tribal settlements in forest areas at Walayar forest range are mentioned below in table 4.

III. 2. Materials Analyzed

III. 2. 1. Exploration and identification of sampling sites

Explorations were conducted in different seasons and a total of one hundred and three field trips were conducted between the months from June 2017 - March 2023 focusing the main hill systems and hillocks. Before the field trips were planned, regular reference visits were made to the Walayar forest range office and section offices under this range. Base map of the Walayar forest range along with detailed section maps were granted by the forest department and were procured from the Walayar range office. The maps were useful

in understanding the boundary of the area of study. As the range has wildlife conflicts, all the field visits were assisted by forest officials. A detailed list of the hillocks in the range was prepared and field trips were planned accordingly. The field trips were planned in such a way that three prominent seasons of the year are covered for the visited forest tracts. Accordingly, vegetation in the summer (March – May), monsoon (June – October) and post monsoon (November – February) seasons were recorded by visiting the forest tracts in regular intervals. The duration of field trips ranged from 1 – 3 days. Some of the important forest tracts visited in Walayar forest range are given below in table no. 5.

Table 4. List of tribal settlements in Walayar forest range

Sl. No.	Settlement	Section	Tribe
1	Ayyappanpotta	Akamalavaram	Irular
2	Madanpara	Akamalavaram	Paniyan
3	Muthiramkunnu	Akamalavaram	Paniyan
4	Kochithodu	Akamalavaram	Paniyan
5	Mettupathy	Akamalavaram	Paniyan
6	Kadalikkad	Akamalavaram	Mudugas
7	Aanakkallu	Akamalavaram	Paniyan
8	Kollenkunnu	Akamalavaram	Paniyan
9	Elakuthanpara	Akamalavaram	Mudugas
10	Pookundu	Akamalavaram	Mudugas
11	Mooppanchalla	Akamalavaram	Mudugas
12	Adappu	Kottekkad	Irular
13	Adappu Colony Bit 2	Kottekkad	Irular
14	Chembana	Kottekkad	Irular
15	Kurithikadavu	Kottekkad	Irular
16	Melethottam	Kottekkad	Irular
17	Parachathy	Kottekkad	Irular
18	Mangalathanchalla	Pudussery North	Irular
19	Nadupathy	Pudussery North	Irular
20	Parappetty	Pudussery North	Irular
21	Vadhyarchalla	Pudussery North	Irular
22	Varalippadi	Walayar	Irular

Table 5. Targeted locations in Walayar forest range

Sl. No	Location name	Forest section	Latitude	Longitude
1	Thekke Malampuzha	Akamalavaram	10°50'07.08"N	76°40'26.15"E
2	Thonnikadavu - Vedivachappara	Akamalavaram	10°50'12.34"N	76°40'41.15"E
3	Koomachimala	Akamalavaram	10°49'48.14"N	76°40'20.90"E
4	Cheranpara, Malampuzha	Kottekkad	10°49'29.62"N	76°40'38.63"E
5	Kosavanidukku, Kaduvaachaal	Akamalavaram	10°50'26.38"N	76°40'30.88"E
6	Malampuzha Guest house hillock	Akamalavaram	10°50'04.20"N	76°40'52.68"E
7	Kezhakootimala	Akathethara	10°51'53.30"N	76°37'36.39"E
8	Neelippara	Akathethara	10°51'52.92"N	76°37'41.52"E
9	Edamala – Malampuzha	Akamalavaram	10°51'18.32"N	76°39'26.47"E
10	Pallippara	Kottekkad	10°49'48.36"N	76°43'44.04"E
11	Olappalam	Kottekkad	10°49'52.20"N	76°43'44.19"E
12	Kozhimala	Kottekkad	10°50'06.45"N	76°43'38.99"E
13	Poozhikunnu	Kottekkad	10°51'13.41"N	76°43'47.54"E
14	Karadikunnu hills	Walayar	10°50'19.96"N	76°49'39.56"E
15	Chemanamkadu	Pudussery South	10°48'44.68"N	76°44'51.94"E
16	Cheriya Eri	Pudussery South	10°48'19.84"N	76°45'3.21"E
17	Mucurnii	Pudussery South	10°48'37.19"N	76°44'56.27"E
18	Ayyankulam,	Pudussery South	10°48'10.29"N	76°44'39.61"E
19	Kallan Puzha	Akamalavaram	10°51'34.02"N	76°42'40.16"E
20	Poolakunnu	Akamalavaram	10°51'33.12"N	76°42'29.52"E
21	Moochikadavu	Akamalavaram	10°52'7.32"N	76°42'28.44"E
22	Kavarakundu	Akamalavaram	10°52'34.26"N	76°42'40.48"E
23	Kalliyara	Akamalavaram	10°53'14.64"N	76°39'39.96"E
24	GP Nair estate	Akamalavaram	10°53'29.76"N	76°39'50.76"E
25	Kava	Kottekkad	10°49'25.18"N	76°43'29.96"E
26	Walayar Dam	Walayar	10°50'24.58"N	76°51'01.52"E
27	Mayappalam	Pudussery South	10°48'01.78"N	76°45'58.91"E
28	Kongampaadam	Kanjikode	10°48'39.80"N	76°47'2.67"E
29	Ayyappanmala	Pudussery South	10°49'11.44"N	76°44'24.46"E
30	Koyamarakaadu	Pudussery South	10°47'44.88"N	76°45'38.52"E
31	Korayar river (Walayar river)	Pudussery South	10°47'48.42"N	76°45'35.67"E
32	Mangalathumchalla	Walayar	10°49'03.67"N	76°48'18.70"E
33	Vattappara	Walayar	10°49'29.47"N	76°49'05.26"E
34	Kottamutti Waterfalls	Pudussery South	10°49'42.40"N	76°46'51.44"E
35	Attippara	Akamalavaram	10°52'18.68"N	76°41'54.12"E
36	Onaampuzha	Kottekkad	10°50'37.29"N	76°43'40.79"E
37	Parachaathy	Kottekkad	10°50'54.24"N	76°43'55.92"E
38	Adupukootimala	Kottekkad	10°50'03.12"N	76°44'33.36"E
39	Anakundu	Pudussery South	10°49'42.90"N	76°46'13.00"E
40	Chottuppara waterfalls	Akamalavaram	10°52'37.92"N	76°41'39.84"E
41	S – Medu	Pudussery North	10°50'26.52"N	76°50'04.56"E

42	Nadupathy colony	Pudussery North	10°51'22.24"N	76°49'39.27"E
43	Jamanthimala	Pudussery North	10°52'21.00"N	76°47'00.24"E
44	Walayar toll plaza hillock	Walayar	10°48'45.00"N	76°47'49.56"E
45	Chacolas	Akamalavaram	10°51'23.03"N	76°44'29.39"E
46	Mayyappalam	Pudussery South	10°48'06.93"N	76°46'25.09"E
47	Anayappanchalla	Walayar	10°48'25.92"N	76°48'35.19"E
48	Chaavadippara	Pudussery North	10°52'42.204"N	76°48'43.56"E
49	Vettumadavu	Pudussery North	10°52'44.724"N	76°48'08.64"E
50	Parapetti	Pudusserry North	10°52' 42.6" N	76°46'53.32"E
51	Aatumala – Kundanmala	Akamalavaram	10° 53' 24" N	76° 42' 36" E
52	Kaatadikunnu	Akathethara	10°50'21.84"N	76°39'14.76"E
53	Ahalya campus	Walayar	10°47'28.54"N	76°49'50.13"E

III. 2.2. Collection of samples

Repeated collection of plant materials was done from the same locality covering all the respective seasons for further biomonitoring of the study area. A total of 6573 samples were recorded in the field book. Usually four to five specimens of each taxon were collected to study its morphological features which aid in plant identification and herbarium preparation. Details such as date of collection, field no, locality, habit, habitat, nature of bark, presence of latex or any other exudates, nature of inflorescence, odour of flower and leaf, colour of the young leaves, details of host plant (tree) if the collected specimen is a parasite or epiphyte, nature of fruits, local name of the plant, if identified and used by tribal people there, medicinal properties if any were recorded systematically. Photographs of the collected specimen were taken using NIKON D3200, NIKON D3100 and NIKON D810 DSLR cameras. Doubtful or interesting specimens were further preserved in 10% formaldehyde solution in labeled bottles and kept aside for further studies.

III. 2.3. Characterization and identification

Identification and characterization was made from either fresh or dried or processed specimens. This is done with the aid of different regional floras such as Gamble and Fischer (1915-1936), Hooker (1872-1897), Manilal and Sivarajan (1982), Manilal (1988), Vajravelu (1990), Sasidharan (2002; 2011; 2014), Daniel *et al.*, 2005, Murthy and Nair (2016) and other revisionary works available online and offline. Morphological characters of each specimen were recorded for the preparation of morphological description. Morphological characters of each taxon was observed with the aid of Leica S8APO and Labomed stereo microscopes and microphotographs were captured for the essential parts for the further identification and confirmation. The current code i.e. *Shenzhen Code* (Turland *et al*., 2018) was used for the nomenclatural clarifications. Acronyms of the

herbaria were used according to Index Herbariorum (Thiers, 2021). Expert advice was taken for the identification and confirmation of plants belonging to Poaceae and Cyperaceae.

Microhabitat studies were carried out in the hillock systems of the study area. Several seasonal microhabitats were detected in those rocky outcrops and were classified based on the previous studies (Porembski *et al.*, 1993; Porembski and Barthlott, 2000; Watve, 2003; Sreejith *et al.*, 2016). Also, the nature of vegetation of each hillock, presence or absence of perennating bodies, adaptive features to thrive the adverse conditions were also recorded and were utilized for the preparation of life form spectrum of plants (Ellenberg & Dombois, 1967) in these rocky outcrops. Further, certain taxa showing morphotypic variations were recorded along with their macro photographs captured using DSLR camera or microscope if needed. Biomonitoring analysis was conducted through the comparison of the detailed list of plant species present during a particular season. The plant associations in the forest floor were recorded along with data on phenology of each taxa. Further, phytogeographical affinity of the taxa was studied using Cox phytogeographical classification (Cox, 2001). The threat status of the recorded taxa is being evaluated by IUCN red list 2022.2 (http:// www.iucnredlist.org.). Endemic status of the floral elements were recorded based on checklists (Sasidharan, 2014; Ahmedullah and Nayar, 1987; ENVIS 2021).

III. 2.4. Nomenclature of taxa

Nomenclature of the identified taxa was made up to date with reference to the International Plant Name Index (IPNI) (http://www.ipni.org), TROPICOS (www.tropicos.org) and the Plants of World Online (POWO). Literature was collected or retrieved from library sources of research institutions such as University of Calicut, Kerala Forest Research Institute, Botanical Survey of India (Southern Circle – Coimbatore). Online libraries and information retrieval system such as SHODHGANGA, Biodiversity Heritage Library (BHL) maintained by New York Botanical Garden (http:// www.biodiversityheritagelibrary.org) and of Missouri Botanical Garden library (http://botanicus.org) were also used as reference sources. Kew digital herbarium and JSTOR digital herbarium were also utilized for the reference of doubtful herbarium specimens. Further, doubtful specimens difficult to identify was confirmed by matching the herbarium specimens available at Madras Herbarium (MH!), Calicut University Herbarium (CALI!), Kerala Forest Research Institute Herbarium (KFRI!), Central Medicinal Plant Research (CMPR!) and SNM Herbarium (SNMH!) and also by expert opinion.

III. 2.5. Systematic treatment of the taxa

Systematic treatment of the taxa was based on the Angiosperm Phylogeny Group IV classification (Chase *et al*., 2016). For each taxa, details such as Clade, family, sub – family (if present), botanical name, habit, habitat, Phytogeography, endemism, IUCN Red List category, Ecology, Raunkiaer's Life form, distribution frequency, Phenology, altitudinal preference and specimen examined were included in the systematic treatment. The floral elements which have endemic distribution and have threatened status were treated separately with details on morphological characterization of each of them along with photo plates.

III. 2.6. Herbarium preparation

Plant specimens with flowering or fruiting parts were collected from the field in sealed bags after treating with formaldehyde. Herbaria were prepared following the wet method (De Vogel, 1987; Bridson & Forman, 1998). Fleshy or succulent plant parts such as rhizome or bulbils are soaked in 20% formaldehyde for 1 – 2 days. The soaked specimens were then pressed in blotting papers and the regular changing of blotting papers is required until the specimen is dried properly. Similarly, plant parts were dried directly by keeping them between the blotting papers and regular changing of sheets. Processed specimens are then mounted on handmade herbarium sheets of standard size (42 x 28cm) along with a proper label of standard size (14.5 x 11 cm) on the lower right-hand corner of the sheets to provide relevant information gathered from the field.

The prepared herbaria are then treated with mercuric chloride and are deposited in Madras Herbarium (MH!) and another copy is kept in Govt. Victoria College, Palakkad (GVCH) for future reference.

III. 2.7. Preparation of Illustrations and microphotography

The interesting specimens collected from the field are brought to the laboratory and its detailed morphological characters were prepared. Leica S8APO and Labomed stereo microscopes were used to study the micromorphological characters and microphotographs of essential parts were captured for these specimens.

III. 3. Resource mapping

GIS resource mapping is used to prepare a more detailed study area map to analyze the different vegetation (forest types), difference in diversity with respect to altitude, change in the forest cover over a period of two decades of time, to study the nature of slopes and valleys in the study area and to locate the scattering of hillocks in the area. Different maps were prepared using GIS and remote sensing technology, and for the

present study, QGIS 3.16 was used along with the satellite data retrieved from USGS website.

III. 3. 1. Data used

Landsat Imagery was used for both Land Use-Land Cover change detection and NDVI, while dates are selected according to the data quality and data availability. Two Landsat imageries such as Landsat 7 ETM+ and Landsat 8 OLI were accessed for the years 2000 and 2020 respectively, from USGS Earth Explorer. ASTER Digital Elevation Model was used for the terrain analysis like elevation and slope. The whole process was done entirely in an open-source platform. The software package, QGIS 3.16 and Google Earth Pro were used at various stages of analysis. Both imageries have the same spatial resolution of 30m and require radiometric and atmospheric correction for a better output.

III. 3. 2. Land use - Land Cover Change detection within two decades

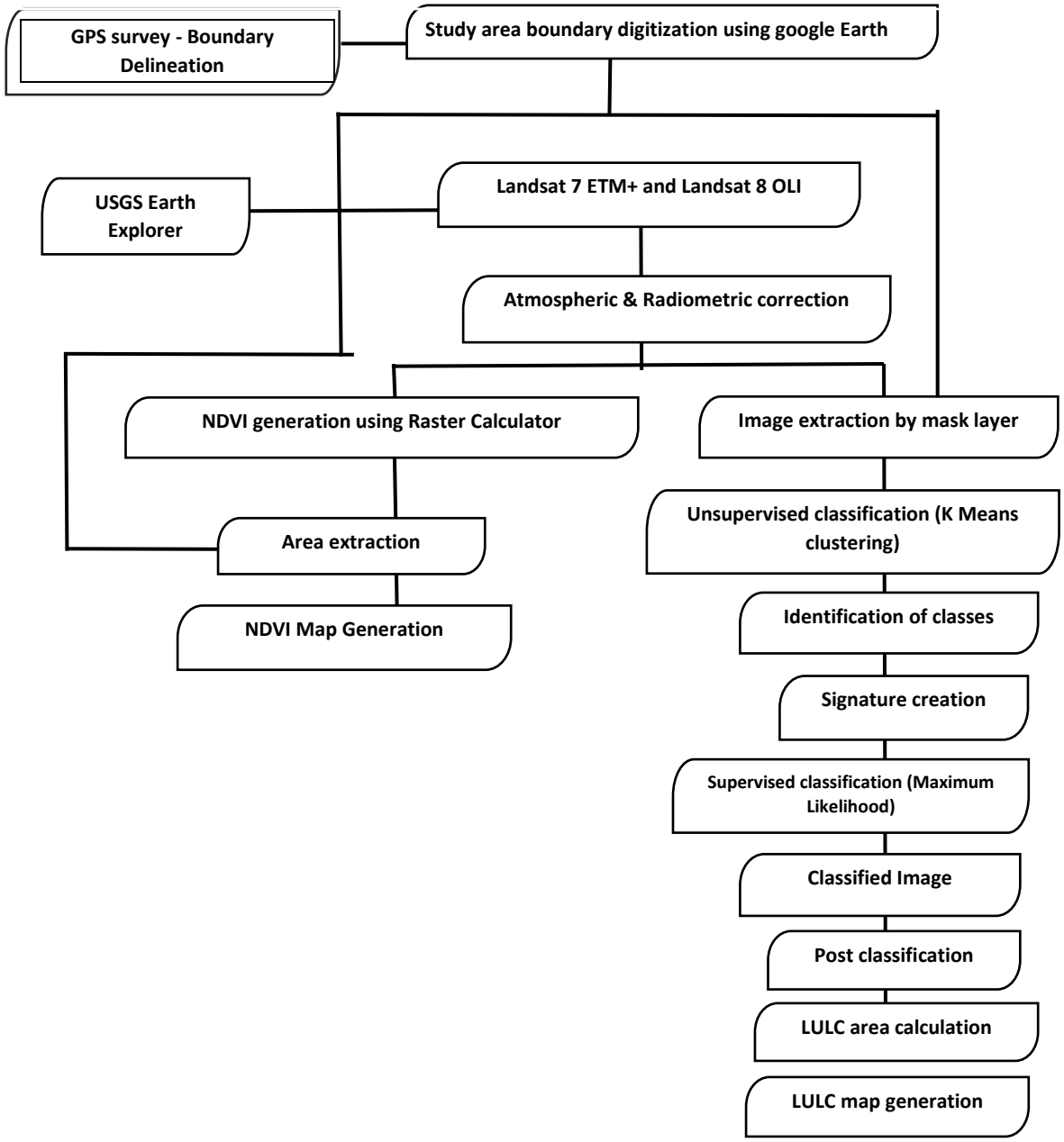
The radiometric and atmospheric correction of Landsat imageries were used for the Land Use – Land Cover classification. First, Unsupervised classification was done using the "K-Means Clustering for Grids" tool. The Unsupervised classification is a system generated classification and it was used only for the basic information for the distribution of classes. After Unsupervised classification, Supervised classification was done using the 'Semi-automatic Classification plugin' in QGIS 3.16. In the supervised classification, the spectral signatures of each class in the study area were taken on the basis of field data and transformed into a classification process. The result was then carried out for the post-classification analysis and calculated area of the classes. The resulting images of two decades were then used for the change detection process.

III. 3. 3. Normalized Difference Vegetation Index (NDVI)

The NDVI is one of the important indicators of vegetation health. The Near-infrared (NIR) and Red bands of Landsat imageries were used to calculate the NDVI of the study area. The high reflectance near NIR indicates the healthy and dense vegetation and the reflectance near the Red band indicates the sparse vegetation. The NDVI range lies in between -1 to 1. Ranges near to 1 indicate dense vegetation and near to -1 denotes sparse vegetation. The maps were prepared using QGIS 3.16 software.

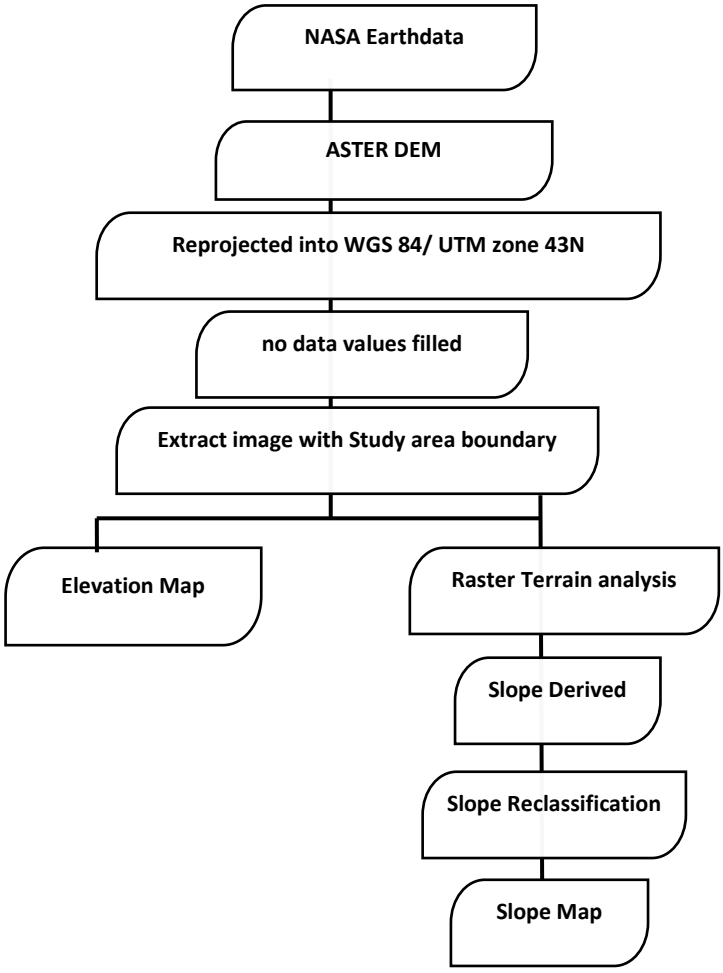
$$NDVI = (NIR - RED) / (NIR + RED)$$

The methodology used for NDVI is represented as a schematic diagram.



III. 3. 4. Terrain Analysis

ASTER Digital Elevation Model was downloaded from NASA Earthdata website and it was processed and analyzed in QGIS 3.16 software to generate Elevation and Slope map. The result was classified into five class ranges according to the lower and higher elevation. Slope was derived in degrees and then reclassified into three classes; gentle, moderate and steep.



III. 3. 5. Survey and resource mapping of landslide hit forest tracts

Floristic explorations were conducted systematically in the main Ghat regions and isolated low altitude hillock systems hit by heavy landslides and floods within three months of flood to monitor the species loss, species survival and habitat modifications.

III. 3.5.1. Photo documentation

Photographs of wide view of forest patches hit by landslides, damages to flora, uprooting of trees, habitat modifications viz. mud slides, silt deposition, sand filling etc. were documented.

III. 3.5. 2. Data collection on species loss and resilient taxa

All the taxa hit by landslides and heavy downpour were documented and identification of taxa was done by authentic literature after laboratory examination. Observations were also made on those taxa which survived in the flood hit areas. Further, biomonitoring of the landslide struck sites were carried out in the succeeding years, in order to check the restoration of the natural vegetation, the status of the alien invasive taxa in the canopy open regions and the documentation of the health of the survived taxa during the landslides. In addition to this, the precautionary measures taken up by the forest department to check and control landslides were also recorded.

IV. RESULTS

IV.1. Evolutionary disposition of angiosperm diversity in Walayar forest range

The exploration and documentation of angiosperm diversity in Walayar hill ranges resulted in the documentation of 1077 taxa which belongs to 133 families. This 1077 taxa includes 1056 species, 11 subspecies and 10 varieties. Further, 48 families are represented by a single species. The collected taxa belong to 11 clades, 42 orders and 610 genera. Table 6 summarizes the distribution of taxa according to APG IV.

Table 6. Distribution of taxa according to APG IV (Chase *et al*., 2016)

Sl. No	Clade	Order	Family	Genera	Species	Subspecies	Varieties
1	Basal Angiosperms	1	1	1	2	0	0
2	Magnoliids	3	5	18	25	0	0
3	Monocots	5	10	31	51	0	1
4	Commelinids	4	13	89	199	3	1
5	Eudicots	2	3	9	10	0	0
6	Core Eudicots	1	1	1	1	0	0
7	Superrosids	1	1	1	1	0	0
8	Rosids	14	50	220	389	6	3
9	Superasterids	2	15	33	49	0	1
10	Asterids	7	30	170	282	2	4
11	Campanulids	2	4	37	47	0	0
	Total	42	133	610	1056	11	10

IV.1.1. Artificial key to the families

1. Leaves usually with reticulate venation; seeds with two cotyledons……....….2

- Leaves usually with parallel venation; seeds with one cotyledon…….…..…....111

2. Flowers with one whorl of perianth lobes or perianth lobes sometimes lacking…….…..…3

- Flowers with both calyx and corolla; very rarely one of the whorl absent…….21

3. Flowers bisexual……..……...4

- Flowers unisexual; if bisexual then perianth lobes lacking…….....…...12

4. Ovary superior……..…….……..5

- Ovary inferior……..…….…...10

5. Habit of the plants climbing stragglers…….……....…..Elaeagnaceae

- Habit of plants herbs, shrubs or trees…….……..…….…6

6. Leaves with stipules either persistent or deciduous……....Polygonaceae

- Leaves without stipules……..……..……7

7. Stamens in 2 – 4 series……...……..…….....Lauraceae

- Stamens 1 – 5 or upto 30, but never in multiple series……..…...……8

8. Perianth lobes tubular……....Nyctaginaceae

- Perianth lobes free, united only at the base……...…...…….9

9. Leaves fleshy; perianth lobes fleshy……..……....Basellaceae

- Leaves membraneous; perianth lobes scarious and dry……...……..... Amaranthaceae

10. Ovary 1 – loculed……..……..……11

- Ovary 4 – 6 loculed……...……..……Aristolochiaceae

11. Climbers; ovules solitary; basal placentation…….....……..Loranthaceae

- Trees; ovules 2 – 4; pendulous, free central placentation……..…..... Santalaceae

12. Plants leafless; branchlets green with small scales in whorls at the node…Casuarinaceae

- Plants with leaves……...….13

13. Stipules lacking……..... Myristicaceae

- Stipules present, sometimes minute and early deciduous……..…….14

14. Ovary 2 or more loculed…….……...…..…..15

- Ovary 1 – loculed……...……....17

15. Ovary with one ovule per locule……...…..…Euphorbiaceae

- Ovary with two ovules per locule……..…….16

16. Stigma broad, flat; stamens free usually inserted around broad or folded disc……...……..Putranjivaceae

- Stigma slender, linear; stamens free to united……...….Phyllanthaceae

17. Plants with milky sap; flowers enclosed on inner walls of closed receptacle….Moraceae

- Plants with or without watery sap; flowers not enclosed on inner walls of a closed receptacle……...……18

18. Fruits a globose berry……...…..……Piperaceae

- Fruits a drupe, samara or achene……...……...…..19

19. Filaments of anther inflexed in bud……..……...…..…Urticaceae

- Filaments of anther not inflexed in bud……..……20

20. Fruits a samara……..……..…....Ulmaceae

- Fruits a drupe……..……..….Cannabaceae

21. Petals usually free (rarely united to a tube as in Cucurbitaceae and in Caricaceae)…...22

- Petals fused…….……84

22. Stamens directly arising from the receptacle; calyx lobes usually free ……..…23

- Stamens arising from the calyx or disc lining the calyx tube; calyx lobes usually united.63

23. Sepals valvate in bud……...……24

- Sepals imbricate in bud……...……...…….38

24. Flowers 3 – merous……Annonaceae

- Flowers 4 – 6 merous……..……..25

25. Anther filaments usually free……..……26

- Anther filaments united into a column or very shortly connate at the base and inserted on a flat torus……..……..……..Malvaceae

26. Sepals united at the base……...……...27

- Sepals free……...…...……...……..41

27. Leaves gland dotted…….…….…..…..Rutaceae

- Leaves without glands…….28

28. Fruits winged by the enclosement of 2 or more elongated sepals……..……. Dipterocarpaceae

- Fruits winged or wingless, but sepals never elongated in fruit……...……29

29. Leaves opposite; stamens 10……..…….……Malpighiaceae

- Leaves alternate; stamens 5……..……..30

30. Ovules numerous……...…...……..Moringaceae

- Ovules few……...……...31

31. Branchlets hooked; plants climbers…….…..Ancistrocladaceae

- Branchlets never hooed; plants herbs, shrubs, trees or climbers…….……...32

32. Stamens opposite to the petals……..……..33

- Stamens alternate to the petals ……..…..…34

33. Leaves with stipules……...……Vitaceae

- Leaves without stipules……..……Olacaceae

34. Ovules erect or ascending……..….35

- Ovules pendulous……...…….…36

35. Ovary 3 – 5 loculed; leaves always simple……...……...…….....Celastraceae

- Ovary usually 1 – loculed, rarely 2-5 loculed, if so then leaves compound…Anacardiaceae

36. Leaves simple; ovary 1 – loculed…….....……...….Icacinaceae

- Leaves compound; ovary 2 – 5 loculed……..…....…37

37. Anther filaments free; leaflets opposite……...……...……..…. Simaroubaceae

- Anther filaments fused to a tube; leaflets alternate……..……..Meliaceae

38. Leaves compound – imparipinnate……..……Burseraceae

- Leaves simple…….…...39

39. Stamens few usually 4 – 5…….….Rhamnaceae

- Stamens numerous……..……...40

40. Branchlets glandular pubescent; leaves glandular hairy above…….....Muntingiaceae

- Branchlets e – glandular, leaves e – glandular glabrous……..…....……Elaeocarpaceae

41. Sepals 2…….……..…..……Portulacaceae

- Sepals 4 or more……...…...42

42. Aquatic herbs……...…43

- Terrestrial plants…….……....44

43. Carpels sunk in a torus……..……..…..Nelumbonaceae

- Carpels fused into many celled ovary……..…...…….. Nymphaeaceae

44. Stamens usually numerous (very rarely definite in Achariaceae and Cleomaceae)…....45

- Stamens 10 or less……...……54

45. Sepals deciduous…….……..…….46

- Sepals persistent…….……51

46. Petals absent…….……..Salicaceae

- Petals present……..47

47. Stamens definite…….…….48

- Stamens indefinite or numerous……..……49

48. Habit Herbaceous…….……...…….....Cleomaceae

- Habit Trees……...……..……..…...Achariaceae

49. Leaves usually trifoliate, terminal leaflet transform to a tendril; staminodes petaloid; Fruits achene which is spirally twisted……...…..Ranunculaceae

- Leaves simple; terminal leaflet never modify to tendril; staminodes usually absent; fruits capsular……..……..……..50

50. Disc present, glandular; fruits never raised on a gynophore……Bixaceae

- Disc absent; fruits raised on a long gynophore……...……..….Capparaceae

51. Flowers pentamerous……..……52

- Flowers tetramerous……...…….53

52. Stamens free from the petals……....……. Dilleniaceae

Stamens attached to the base of petals…….....Theaceae

53. Ovary 2 – loculed; 2 ovuled per locule……..…….Calophyllaceae

- Ovary 2 – 12 loculed; ovules solitary in each locule……..……...…....Clusiaceae

54. Flowers 3 - merous……..……...…..Menispermaceae

- Flowers 4 – 5 merous……...……...……....55

55. Petals 4; stamens 6……..Brassicaceae

- Petals 4 – 5, rarely fewer; stamens never 6……...……..……56

56. Ovary 1 – loculed……..……..……....57

- Ovary 2 – many loculed……..……58

57. Ovary with free central placentation……...…Caryophyllaceae

- Ovary with parietal placentation……...……..Violaceae

58. Leaves exstipulate……...59

- Leaves stipulate……..60

59. Filaments of anther united to a tube; seeds carunculate…….....Polygalaceae

- Filaments of anther free; seeds without arils……..……..……..Sapindaceae

60. Stamens 10……...……..Zygophyllaceae

- Stamens usually 5……..…….61

61. Aquatic or semi – aquatic herbs……...…...…..Elatinaceae

- Terrestrial plants……...…..62

62. Flowers regular; leaves digitate or pinnately compound…….Oxalidaceae

- Flowers irregular; leaves simple……..……...Balsaminaceae

63. Stem fleshy; leaves minute, early deciduous……...…..Cactaceae

- Stem herbaceous or woody; leaves distinct……..……..…64

64. Plants with epigynous or perigynous flowers……....…....65

- Plants with hypogynous flowers……..……...81

65. Ovary with one carpel……..…..…..Fabaceae

- Ovary with one or more carpel……..…….66

66. Ovules pendulous attached to the base or inner sides of carpel; ovary usually inferior.67

- Ovules not pendulous; ovary inferior or superior……..…….71

67. Flowers in simple or compound umbels……..……...……....68

- Flowers in axillary or terminal fascicles, cymes, racemes or panicles……....…..69

68. Fruits dry; carpels usually two……..……...Apiaceae

- Fruits fleshy; carpels usually more than two……...……..Araliaceae

69. Ovules one per locule…….……Cornaceae

- Ovules two or more per locule……..…..70

70. Fruits winged; ovary 1 – loculed……..…Combretaceae

- Fruits wingless (leathery); ovary 2 – 6 loculed…….…....Rhizophoraceae

71. Flowers unisexual……..….72

- Flowers bisexual……...……..73

72. Habit are herbs or shrubs; stamens numerous; fruits winged; flowers asymmetrical……...……..Begoniaceae

- Habit are climbers; stamens usually 3; fruits wingless; flowers symmetrical……Cucurbitaceae

73. Stamens indefinite; stipules present……..…...Rosaceae

- Stamens limited (usually 5 – 10); stipules absent…….……..74

74. Ovary with free carpels; fleshy herbs……...…...……...Crassulaceae

- Ovary with fused carpels; plants usually not fleshy…….……..75

75. Ovary superior……...……..76

- Ovary half inferior or inferior……..……...77

76. Calyx lobes fused to form an elongate tube; plants succulent…...……..…….. Aizoaceae

- Calyx lobes deeply 5 – partite; plants not succulent…….....Molluginaceae

77. Calyx lobes imbricate in bud……...……...…….78

- Calyx lobes valvate in bud……..……80

78. Stamens as many as or twice as the petals; leaves 3 – 5 ribbed…….....Melastomataceae

- Stamens numerous; leaves not ribbed……...……...……...79

79. Leaves gland dotted, opposite……..…..Myrtaceae

- Leaves e – glandular, alternate……..…..Lecythidaceae

80. Ovary adnate to the calyx tube……Onagraceae

- Ovary free from the calyx tube…….....Lythraceae

81. Petals absent……...……..Tetramelaceae

- Petals present……..……82

82. Habit are small herbs; leaves with glandular hairs; insectivorous plants……Droseraceae

- Habit are climbers or trees; leaves never glandular……...……..……...83

83. Flowers dioecious; leaves palmately lobed; trees with milky sap……Caricaceae

- Flowers bisexual; leaves simple; climbers with tendrils…….....…Passifloraceae

84. Ovary inferior……...……...85

- Ovary superior……..……..88

85. Stipules present, usually interpetiolar……...…..Rubiaceae

- Stipules absent……..…..86

86. Stamens inserted on the corolla……..…...Asteraceae

- Stamens free from the corolla……..……..……87

87. Capsule circumscissile; flowers in dense cylindrical spikes…….....….Sphenocleaceae

- Capsule loculicidally 2 – valved; flowers axillary solitary or in sub-racemose peduncles…
…….....……...…..Campanulaceae

88. Ovary one loculed……..……..…...89

- Ovary 2 to many loculed……..……..….91
89. Stamens 2……...…..Lentibulariaceae
- Stamens as many as to the number of corolla lobes…….…..90
90. Calyx with stalked glands; ovules solitary…….....Plumbaginaceae
- Calyx without stalked glands; ovules 2 to many……..…...Primulaceae
91. Stamens free from the corolla……..…..Ebenaceae
- Stamens inserted on the corolla……..……....92
92. Ovary with 3 or more carpels……...……...93
- Ovary with two carpels……..…….94
93. Flowers superior with ovary 2 – 8 loculed; plants with milky sap……...Sapotaceae
- Flowers inferior with ovary usually 3 – loculed; plants with watery sap……Symplocaceae
94. Corolla regular…….…95
- Corolla irregular……..…..103
95. Leaves alternate……...96
- Leaves opposite……..…....99
96. Ovary with 2 – 4 ovules……..…97
- Ovary with many ovules……...…....98
97. Climbers……..…….....Convolvulaceae
- Herbs, shrubs or trees……...……..…...Boraginaceae
98. Styles 2; marshy herbs……...……...….Hydroleaceae
- Styles single; herbs or shrubs……...……...….....Solanaceae
99. Stamens 2……..……..…….Oleaceae
- Stamens 4 or more……..…..100
100. Carpels free; plants with milky sap…….....…Apocynaceae
- Carpels fused; plants without milky sap……..…….....101
101. Stigma bifid or lamellate……...……...Plantaginaceae
- Stigma terminal……...……..102
102. Stipules absent; ovary 1 – loculed…….…..Gentianaceae
- Stipules present; ovary 2 – loculed……..……..……Loganiaceae
103. Ovary with few ovules……..……..……104
- Ovary many ovuled……...……....105
104. Flowers in cymose inflorescence; stigma usually bifid……...……Lamiaceae
- Flowers in racemes; stigma more or less capitate…….…….Verbenaceae
105. Ovary 1 – loculed……..……...Gesneriaceae

- Ovary usually 2 – loculed or rarely imperfectly 2 – loculed by intrusion of placenta.....106

106. Plants are leafless obligate parasites; when leaves present then plants are semi-parasitic; seeds minute……..……..……..Orobanchaceae

- Plants leafy, never parasitic; seeds small to large…….....…...……107

107. Leaves compound……...…….Bignoniaceae

- Leaves simple……...….108

108. Fruits opening elastically from the apex of 2 – loculicidal valves (Hygroscopic in nature)…….……..……Acanthaceae

- Fruits not opening elastically……..……..109

109. Ovary with ovules in axile placentation…….Linderniaceae

- Ovary with ovules in parietal placentation……..…….110

110. Flowers in racemes; stamens 2……..…..Martyniaceae

- Flowers axillary solitary or in fascicles; stamens 4…….....…Pedaliaceae

111. Aquatic usually submerged plants……..……..Hydrocharitaceae

- Terrestrial plants……...112

112. Ovary superior……...…..113

- Ovary inferior……...…125

113. Both perianth lobes coralline or very rarely (in Commelinaceae) outer lobes calycine……..…....114

- Both perianth lobes calycine……...……..…….……...119

114. Flowers in heads enclosed by rigid dark brown bracts…….…..Xyridaceae

- Flowers not enclosed in bracteate heads……..……115

115. Outer perianth calycine; inner perianth coralline……....Commelinaceae

- Outer and inner perianth lobes both coralline……...…...……116

116. Aquatic herbs……...…….Pontederiaceae

- Terrestrial plants…….……..……117

117. Leaves minute; branchlets modified to form needle like flattened cladodes……...…….....Asparagaceae

- Leaves well developed……...……...118

118. Fruits dehiscent; flowers large; leaves ending in tendril…….Colchicaceae

- Fruits indehiscent; flowers small sized; leaves apex not modified to tendrils……...……....Smilacaceae

119. Leaves flabellate or pinnatisect; perianth lobes rigid…….…….Arecaceae

- Leaves simple; perianth lobes either lacing or reduced to scales or bristles……...…120

120. Flowers in heads or spikes enclosed in glumaceous bracts……...……121

- Flowers not as above……...……..123

121. Inflorescence in depressed or sub-globose heads; ovary 2 to 3 loculed….Eriocaulaceae

- Inflorescence in spikes; ovary one loculed……..……..…...122

122. Stem solid; triangular atleast at the tip; anther basifixed……..…..Cyperaceae

- Stem hollow except on nodes; terete; anthers versatile……..……..….Poaceae

123. Flowers in a spadix enclosed by spathe; spadix often branched; leaves spinulose……..…….……....Pandanaceae

- Flowers in a spadix either enclosed or not enclosed in spathe…….124

124. Robust perennial marshy rhizomatous herbs; flowers in long pedicelled cylindric or globose superposed spadices……...……..…….……Typhaceae

- Plants herbs, shrubs or climbers with either with tuberous, rhizomatous or aerial roots with spadix enclosed in spathe or plants are reduced to form thalloid rootless, stemless structures with microscopic flowers not enclosed in spathe……..…..Araceae

125. Ovary one loculed; seeds very small……....……Orchidaceae

- Ovary usually 3- loculed; seeds distinct…….....……126

126. Flowers regular……...…….127

- Flowers irregular……...……130

127. Climbers; fruits are winged……...….....Dioscoreaceae

- Herbs or shrubs……...……...…128

128. Leaves clustered; outer perianth calycine……..…….Bromeliaceae

- Leaves linear; both perianth series coralline……...…...……...129

129. Stamens united by a membraneous corona; leaves flat usually succulent or fleshy…….……...…Amaryllidaceae

- Stamens often free, not united by a membraneous corona; leaves rigid, plicate……..……...Hypoxidaceae

130. Anther 1 – celled; outer series of perianth free, inner one united to form a tube…….....Marantaceae

- Anther 2 – celled; Both perianth series united to form a tubular or spathaceous structure……...……131

131. Perianth spathaceous, stamens usually 5, free……...……Musaceae

- Perianth tubular or funnel shaped……..……...132

132. Leafy stem spirally twisted……..…….Costaceae

- Leafy stem not spirally twisted……..……..Zingiberaceae

IV.1.2. Systematic Enumeration

IV.1.2.1. Basal Angiosperms

Nymphaeales

Nymphaeaceae

Nymphaea L., *Sp. Pl.* 1: 510 (1753)

Key to species

Flowers mauve or creamy...…..*N. nouchalii*
Flowers crimson red …..……...…*N. rubra*

Nymphaea nouchali Burm.f., *Fl. Ind. (N. L. Burman)* 120 (1768); Vajr. *Fl. Palghat Dist* 53 (1990); *Nymphaea stellata* Willd.; Gamble, *Fl. Madras* 33 (1915).

Habit : Herb
Ecosystem preference : Aquatic herb in plains and deciduous forests
Distribution : Indo – Pacific and African
IUCN Category : Least Concern (LC)
Habitat : Occurring in deep rock pools in hillocks and ponds
Raunkiaer's Life form : Hydrophyte
Distribution Frequency : Common in rock pools
Phenology : Throughout the year
Altitude preference : Muddy pools with adequate sunlight in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Mayappalam, 10°48'7.57"N, 76°46'3.67"E, 114m, 10 May 2018, Aswani & Arabhi, 2098 (GVCH); Anayappanchalla, 10°48'20.41"N, 76°48'24.99"E, 164m, 30 November 2019, Aswani & Maya, 5230 (GVCH); Mayappalam, 10°48'1.52"N, 76°45'58.37"E, 114m, 10 December 2019, Aswani 5384 (GVCH) **(Plate 5: Fig. a).**

Nymphaea rubra Roxb. ex Salisb., *Parad. Lond. i. sub t.* 14. 1805; R. Ansari *et al*., *Aquatic and Wetland Fl. Kerala: Flow. Pl.* 617 (2016).
Habit : Herb
Ecosystem preference : Aquatic herb in ponds in plains
Distribution : Holarctic
IUCN Category : Least Concern (LC)
Habitat : Ponds
Raunkiaer's Life form: Hydrophyte
Distribution Frequency : Rare
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Akathethara, 10°49'34.77"N, 76°38'8.58"E, 45m, 21 June 2021, Aswani 6564 (GVCH) **(Plate 5: Fig. b)**.

IV.1.2.2. Magnoliids

Piperales

Piperaceae

Key to genera

Plants slender erect herbs with thin spikes and hermaphrodite flowers ……*Peperomia*
Plants woody erect or climbing shrubs with thick spikes and unisexual flowers……..…...*Piper*

Peperomia Ruiz & Pav., *Fl. Peruv. Prodr.* 8 (1794)

Peperomia pellucida (L.) Kunth, *Nov. Gen. Sp. [H.B.K.]* 1: 64 (1816); Gamble, *Fl. Madras* 1210 (1925); Vajr., *Fl. Palghat Dist* 396 (1990); Sasidh., *Fl. Parambikulam WLS* 262 (2002); *Peperomia exigua* (Blume) Miq.; Hook. f., *FBI* 5: 97 (1886).

Basionym: *Piper pellucidum* L., *Sp. Pl.* 1: 30 (1753).

Habit : Herb

Ecosystem preference : Moist deciduous forests and in wastelands
Distribution : Indo Pacific, African and South American
IUCN Category : Not evaluated (NE)
Habitat : Occurring in moist forest floors, surface of fallen tree trunks, top of rocks, near water sources and open places
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : September - December
Altitude preference : Grows well in moist soils in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kezhakootimala, 10°51'53.30"N, 76°37'36.39"E, 361.79m, 15 September 2017, Aswani & Rekha, 498 (GVCH); Poozhikunnu, 10°51'20.44"N, 76°43'38.28" E, 118m, 09 November 2017, Aswani & Maya, 845 (GVCH); Pallakkaadu, 10°51'32.04"N, 76°37'25.68"E, 139m, 09 October 2018, Aswani and Arabhi 3007 (GVCH); Kattadikkunnu, 10°50'20.10"N, 76°39'5.83"E, 163m, 16 October 2019, Aswani 4829 (GVCH); Ahalya campus, 10°47'28.54"N, 76°49'50.13"E, 170m, 24 September 2020, Aswani 6327 (GVCH) **(Plate 5: Fig. c)**.

Piper L., *Sp. Pl.* 1: 28 (1753)

Key to species

1.Plants erect shrubs with spikes in umbels……..…....*P. umbellatum*
- Plants climbing shrubs with spikes not in umbels……..……...…….. 2
2. Spikes erect……...…..*P. longum*
- Spikes pendulous……...…… 3
3. Leaves coriaceous, glabrous with spikes less than 13cm…….…….. 4
- Leaves membraneous with silvery scales on the under surface. Spikes more than 15 cm……..…….. *P. argyrophyllum*
4.Female spikes slender, upto 15cm long……...…*P. nigrum*
- Female and male spikes rather thick, upto 10cm long……..…...*P. wightii*

Piper argyrophyllum Miq., *Syst. Piperac. (F.A.W. Miquel*) 330 (1844); Hook. f., *FBI* 5:93 (1886); Gamble, *Fl. Madras* 1207 (1925); Sasidh., *Fl. Parambikulam WLS* 263. (2002).

Habit : Climber
Ecosystem preference : Found in moist deciduous and semi evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found as a common climber on *Terminalia* sp, *Xylia* sp. etc.in shady places in lower and medium altitudes
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Common
Phenology : July - February
Altitude preference : Tree trunks in rich canopy regions of moist deciduous forests
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kavarakundu,10°52'34.26"N, 76°42'40.48"E, 373m, 10 March 2018, Aswani & Maya, 1479 (GVCH); G. P. Nair estate, 10°53'29.76"N, 76°39'50.76"E, 288m, 30 November 2019, Aswani & Maya, 5230 (GVCH); Mayappalam, 10°48'1.52"N, 76°45'58.37"E, 114m, 10 December 2019, Aswani 5384 (GVCH) **(Plate 5: Fig. d)**.

Piper longum L., *Sp. Pl.* 1: 29 (1753); Hook. f., *FBI* 5: 83 (1886); Gamble, *Fl. Madras* 1205 (1925); Sasidharan *Fl. Parambikulam WLS* 264 (2002).

Habit : Shrub
Ecosystem preference : Found in the moist deciduous and semi evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not evaluated (NE)
Habitat : Understorey in canopy covered forest
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Occasional

Phenology : August - January
Altitude preference : Shaded forest floor in moist deciduous forests
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kezhakootimala, 10°51'53.30"N, 76°37'36.39"E, 362m, 15 August 2017, Aswani & Maya, 500 (GVCH); Parakkallu- Neelikunnu, 10°51'47.52"N, 76°37'37.38"E, 313m, 27 April 2018, Aswani & Maya, 1971 (GVCH); INDIA, Pallakaadu, 10°51'30.96"N, 76°37'39.00"E, 151m, 09 October 2018, Aswani 2988 (GVCH); Poolakunnu,10°51'33.12"N, 76°42'29.52"E, 142m, 02 August 2019, Aswani & Maya, 4435 (GVCH) **(Plate 5: Fig. e)**.

Piper nigrum L., *Sp. Pl.* 1: 28 (1753); Hook. f., *FBI* 5: 90. (1886); Gamble, *Fl. Madras* 1206 (1925); Vajr., *Fl. Palghat Dist.* 398. (1990); Sasidh., *Fl. Parambikulam WLS* 265 (2002).

Habit : Climber
Ecosystem preference : Found in the moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not evaluated (NE)
Habitat : Cultivated in the forest margins
Raunkiaer's Life form: Liana (Euliana)
Distribution Frequency : Common
Phenology : July - March
Altitude preference : Found as climber on different trees in all altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, G. P. Nair estate, 10°53'38.36"N, 76°39'44.27"E, 219m, 24 March 2018, Aswani & Maya, 1751 (GVCH); Kochuthodu, 10°51'58.32"N, 76°42'22.32"E, 177m, 18 December 2018, Aswani & Maya, 3302 (GVCH); Poolakkunnu, 10°51'30.60"N, 76°43'53.76"E, 164m, 02 August 2019, Aswani 4434 (GVCH); Chacolas, 10°51'23.03"N, 76°44'29.39"E, 220m, 02 August 2019, Aswani & Maya, 4563 (GVCH) **(Plate 5: Fig. f)**.

Piper umbellatum L., *Sp. Pl.* 1: 30 (1753); *Hackeria subpeltata* (Willd.) Kunth; Gamble, *Fl. Madras* 1208 (1925); *Lepianthes umbellata* (L.) Raf. ex Ramamoorthy; Vajr., *Fl. Palghat Dist.* 395 (1990); Sasidharan., *Fl. Parambikulam* WLS 262 (2002).

Basionym: *Lepianthes umbellata* (L.) Raf. ex Ramamoorthy, *Fl. Hassan Dist.* [Saldanha & Nicolson] 52 (1976).

Habit : Shrub
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific, Holarctic, African and Australian
IUCN Category : Not evaluated (NE)
Habitat : Understorey in canopy rich forest and margins of forests
Raunkiaer's Life form: Phanerophyte
Distribution Frequency : Rare
Phenology : June - February
Altitude preference : Margins of hill tracts in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala valley, 10°51'53.64"N, 76°47'16.80" E, 584m, 29 January 2020, Aswani & Maya, 6047 (GVCH) **(Plate 5: Fig. g)**.

Piper wightii Miq., *London J. Bot.* 5: 552 (1846); Hook. f., *FBI* 5: 94 (1886); Gamble, *Fl. Madras* 1207 (1925); Sasidh., *Fl. Parambikulam WLS* 265 (2002).

Habit : Climber
Ecosystem preference : Semi evergreen forests
Distribution : Indo - Pacific
Endemism : Southern Western Ghats
IUCN Category : Not evaluated (NE)
Habitat : Climber in shady trees
Raunkiaer's Life form: Liana (Euliana)

Distribution Frequency : Rare
Phenology : July - February
Altitude preference : Found in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Chatappara waterfalls, 10°53'11.76"N, 76°42'15.84"E, 599m, 10 December 2019, Aswani & Maya, 5496 (GVCH).

Aristolochiaceae

Key to genera

Woody erect shrubs; Flowers actinomorphic……...……..……*Thottea*
Woody or slender climbers; Flowers zygomorphic……..…….*Aristolochia*

Aristolochia L., *Sp. Pl.* [Linnaeus] 2: 960 (1753)

Aristolochia indica L., *Sp. Pl.* 2: 960 (1753); Hook. f., *FBI* 5: 75 (1886); Gamble, *Fl. Madras* 1202 (1925); Vajr., *Fl. Palghat Dist* 394 (1990); Sasidh., *Fl. Parambikulam WLS* 261 (2002).

Habit : Climber
Ecosystem preference : Moist deciduous forests and wastelands
Distribution : Indo - Pacific
IUCN Category : Not evaluated (NE)
Habitat : Climber in biofences and margins of forest lands
Raunkiaer's Life form: Liana (Euliana)
Distribution Frequency : Occasional
Phenology : July - March
Altitude preference : Found in biofences and as climber in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range,Valiya Eri, 10°49'04.44"N, 76°45'05.04"E, 129m, 06 January 2018, Aswani & Maya, 1299 (GVCH); Thekke Malampuzha Hillock, 10°50'04.20"N, 76°40'52.68"E, 120m, 18 May 2018, Aswani & Maya, 2239 (GVCH); Adupukootimala, 10°49'50.52"N, 76°44'24.72"E, 223m, 12 January 2019, Aswani & Maya, 3685 (GVCH); Chacolas, 10°51'22.68"N, 76°44'41.28"E, 227m, 02 August 2019, Aswani & Maya, 4503 (GVCH) **(Plate 5: Fig. h)**.

Thottea Rottb., *Nye Saml. Kongel. Danske Vidensk. Selsk. Skr.* 2: 529, t. 2 (1783)

Key to species

Branchlets angular; Capsules cylindrical……...…..…*T. siliquosa*
Branchlets terete with swollen nodes; Capsules 4 - angled ..…..……*T. sivarajanii*

Thottea siliquosa (Lam.) Ding Hou, *Blumea* 27(2): 327 (1981); Vajr., *Fl. Palghat Dist* 395 (1990); Sasidh., *Fl. Parambikulam WLS* 261 (2002); *Bragantia wallichii* R. Br. ex Wight & Arn., Hook. f., *FBI* 5: 73 (1886); *Apama siliquosa* Lam., Gamble, *Fl. Madras* 1200 (1925).

Basionym: *Apama siliquosa* Lam., *Encycl. [J. Lamarck & al.]* 1(1): 91 (1783).

Habit : Shrub
Ecosystem preference : Moist deciduous and Semi - Evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not evaluated (NE)
Habitat : Occur in forest valleys
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : Throughout the year
Altitude preference : Found in medium and higher altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kavarakundu, 10°52'20.16``N, 76°42'39.96"E, 305m, 10 March 2018, Aswani & Maya, 1478 (GVCH);

Chaatapara waterfalls, 10°52'47.28"N, 76°42'18.36"E**,** 451m, 10 December 2019, Aswani & Maya, 5469 (GVCH); Jamanthimala, 10°52'21.00"N, 76°47'00.24"E, 849m, 09 January 2020, Aswani & Maya, 5706 (GVCH); Aatumala, 10°53'24" N, 76°42'36" E, 674m, 28 February 2020, Aswani & Maya, 6181 (GVCH) **(Plate 6: Fig. a)**.

Thottea sivarajanii E.S.S.Kumar, A.E.S.Khan & Binu, *Rheedea* 10(2): 117 (2000); Ratheesh, *Fl. Stud. Wayanad Dist* 683 (2009); Sunil, *Fl. Pl. Diver. Ernakulam Dist* 331 (2016).

Habit : Shrub
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
Endemism : Southern Western Ghats (Kerala)
IUCN Category : Not evaluated (NE)
Habitat : Occur in forest valleys
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : Throughout the year
Altitude preference : Shady forest floors in lower and medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Pettikkallu, 10°52'7.32"N, 76°42'28.44" E, 245m, 19 July 2019, Aswani & Maya, 4378 (GVCH) **(Plate 6: Fig. b)**.

Magnoliales

Myristicaceae

Myristica fragrans Houtt., Handl. Pl.-Kruidk. 3: 333; Hook. f., *FBI* 5: 102 (1886); Gamble, *Fl. Madras* 1214 (1925); Manilal & Sivar., *Fl. Calicut* 249 (1982); C.N. Mohanan, *Fl. Quilon Dist* 342 (1984); V.T. Antony, *Syst. Stud. Fl. Kottayam Dist* 345 (1989); M. Mohanan & A.N. Henry, *Fl. Thiruvananthapuram* 388 (1994); Sivar. & P. Mathew, *Fl. Nilambur* 582 (1997); Anil Kumar *et al*., *Fl. Pathanamthitta* 421 (2005); Sunil & Sivad., *Fl. Alappuzha Dist* 608 (2009); Ratheesh, *Fl. Stud. Wayanad Dist* 693 (2009).

Habit : Tree
Ecosystem preference : In plains
Distribution : Indo - Pacific
IUCN Category : Data Deficient (DD)
Habitat : Cultivated in estates
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : December - August
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Poozhikunnu, 10°51'20.44"N, 76°43'38.28"E, 118m, 09 November 2017, Aswani & Maya, 889 (GVCH).

Annonaceae

Key to genera

1. Outer petals smaller than inner petals……....…...2
   - Outer petals larger than inner petals……...…..…..…3
2. Anther cells not connected by overlapping connectives.....*Miliusa*
   - Anther cells connected by connectives……...…..…*Orophea*
3. Petals flat…….…...……..4
   - Petals thick…...…….……..5
4. Ovules in row on ventral surface……..…..…*Meiogyne*
   - Ovules basal.....…..*Monoon*
5. Flowers smaller in size, about 1 cm across……..……..… *Polyalthia*
   - Flowers larger in size, above 1 cm across……....….6
6. Outer and inner petals both present…….... *Huberantha*
   - Outer petals present; inner petals either rudimentary or absent…..... *Annona*

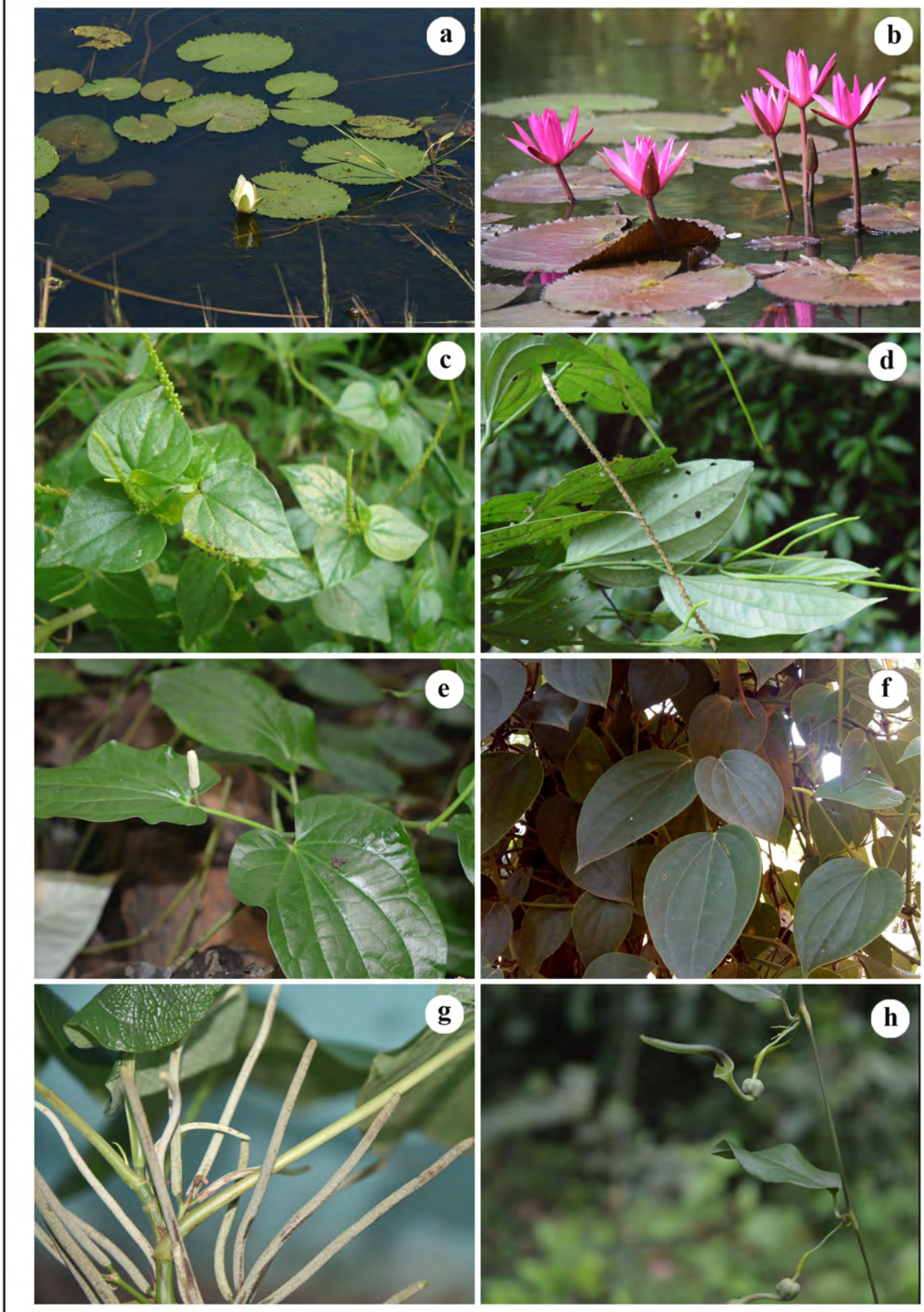


Plate 5: Fig. a. *Nymphaea nouchali* Burm.f. **b.** *Nymphaea rubra* Roxb. ex Salisb. **c.** *Peperomia pellucida* (L.) Kunth **d.** *Piper argyrophyllum* Miq. **e.** *Piper longum* L. **f.** *Piper nigrum* L. **g.** *Piper umbellatum* L. **h.** *Aristolochia indica* L.

***Annona* L.,** *Sp. Pl*. 1: 536 (1753)

Annona squamosa L., *Sp. Pl.* 1: 537 (1753); Hook. f., *FBI* 1: 78 (1872); Gamble, *Fl. Madras* 20 (1915); Vajr., *Fl. Palghat Dist* 49 (1990).

Habit : Tree
Ecosystem preference : Moist deciduous forests and plains
Distribution : South American
IUCN Category : Least Concern (LC)
Habitat : Forest margins and outskirts of hillock systems
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : June - October
Altitude preference : Cultivated in forest margins, also runs wild in the hillocks and low altitude forest tracts
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Olappalam, 10°49'53.78"N, 76°43'34.38"E, 132m, 25 November 2017, Aswani & Maya, 985 (GVCH); Mayappalam, 10°48'01.78"N, 76°45'58.91"E, 116m, 10 May 2018, Aswani & Maya, 2122 (GVCH); Kottamutti waterfall, 10°49'46.20"N, 76°46'47.28"E, 203m, 23 September 2018, Aswani & Maya, 2959 (GVCH) **(Plate 6: Fig. c)**.

Huberantha Chaowasku, *Kew Bull.* 70(2)-23: 1 (2015)

Huberantha cerasoides (Roxb.) Chaowasku, *Kew Bull*. 70(2)-23: 2 (2015); Hook. f., *FBI* 1:64 (1855); *Polyalthia cerasoides* (Roxb.) Bedd., Hook. f., *FBI* 1:64. (1855); Gamble, *Fl. Madras* 17 (1915); Vajr., *Fl. Palghat Dist* 48 (1990); Sasidh., *Fl. Parambikulam WLS* 5 (2002).

Basionym : *Uvaria cerasoides* Roxb., *Pl. Coromandel* 1(2): 30, t. 33 (1795).

Habit : Tree
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Forest floors
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : January - March
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kavarakundu, 10°52'07.34"N, 76°42'43.33"E, 215m, 10 March 2018, Aswani & Maya, 1505 (GVCH); Parachaathy, 10°50'54.24"N, 76°43'55.92"E, 159m, 02 January 2019, Aswani & Maya, 3593 (GVCH); Chaatappara waterfalls, 10°53'11.76"N, 76°42'15.84"E, 600m, 10 December 2019, Aswani & Maya, 5508 (GVCH) **(Plate 6: Fig. d)**.

Meiogyne Miq., *Ann. Mus. Bot. Lugduno-Batavi* 2: 12 (1865), nom. cons.

Meiogyne pannosa (Dalzell) J. Sinclair, *in Sarawak Mus. Journ. v.* 604 (1951).; Sasidh., *Fl. Parambikulam WLS* 3 (2002); *Unona pannosa* Dalz., Hook. f., *FBI* 1: 58 (1872); Gamble, *Fl. Madras* 14 (1915).

Habit : Tree
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
Endemism : Western Ghats
IUCN Category : Near Threatened (NT)
Habitat : Found in canopy rich forests
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : Throughout the year
Altitude preference : Found in lower altitudes

Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, G. P. Nair estate, 10° 53 '20.38"N, 76° 39' 41.73"E, 176m, 24 March 2018, Aswani & Maya, 1604. (GVCH).

Miliusa Lesch. ex A.DC., *Mém. Soc. Phys. Genève* 5: 213 (1832)

Miliusa tomentosa (Roxb.) Finet & Gagnep., *Bull. Soc. Bot. France* 53 (Mem. 4(2): 153 (1906). Vajr., *Fl. Palghat Dist* 47 (1990); Sasidh., *Fl. Parambikulam WLS* 3 (2002); *Saccopetalum tomentosum* (Roxb.) Hook. f. & Thoms., Hook. f., *FBI* 1: 88 (1872); Gamble, *Fl. Madras* 22 (1915).

Habit : Tree
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Open forest areas in hill tracks
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : October - May
Altitude preference : Found in open forests in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range,Kava, 10°50'2.04"N, 76°42'58.68"E, 109m, 06 April 2018, Aswani & Maya, 1872 (GVCH); Ayyappan Mala, 10°49'7.19"N, 76°44'50.28"E, 135m, 07 March 2019, Aswani & Maya, 3751 (GVCH) **(Plate 6: Fig. e)**.

Monoon Miq., *Ann. Mus. Bot. Lugduno-Batavi* 2: 15 (1865)

Key to Species

Leaves broad, oblong - lanceolate; Flowers fragrant…….....*M. fragrans*
Leaves narrow, Linear - lanceolate; Flowers non fragrant…….....*M. longifolium*

Monoon fragrans (Dalzell) B.Xue & R.M.K.Saunders, *Taxon* 61(5): 1031 (2012); *Polyalthia fragrans* (Dalz.) Bedd., Hook. f., *FBI* 1: 63 (1872); Gamble, *Fl. Madras* 16 (1915); Vajr., *Fl. Palghat Dist* 48 (1990); Sasidh., *Fl. Parambikulam WLS* 5 (2002).

Basionym: *Guatteria fragrans* Dalzell, *Hooker's J. Bot. Kew Gard. Misc.* 3: 206 (1851).

Habit : Tree
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
Endemism : Southern Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Canopy covered hill tracts
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : September - January
Altitude preference : Found in lower and medium altitudes of moist and semi-evergreen forests
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Moochi Kadavu - Pettikallu, 10°52'28.20"N, 76°42'38.52"E, 346m, 19 July 2019, Aswani & Maya, 4402 (GVCH); Chacolas, 10°51'15.48"N, 76°45'09.00"E, 265m, 02 August 2019, Aswani & Maya, 4556 (GVCH) **(Plate 6: Fig. f)**.

Monoon longifolium (Sonn.)B. Xue & R. M. K. Saunders, *Taxon* 61(5): 1032 (2012); *Polyalthia longifolia* (Sonn.) Thwaites, Hook. f., *FBI*, 1: 62 (1872); Gamble, *Fl. Madras* 16 (1915); Vajr., *Fl. Palghat Dist* 49 (1990); Sasidh., *Fl. Parambikulam WLS* 5 (2002).

Basionym: *Uvaria longifolia* Sonn., *Voy. Indes Orient. (Sonnerat)* iii. 260 (1782).

Habit : Tree
Ecosystem preference : Moist deciduous forests and plains

Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found in forest margins and in the human settlements
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : March - August
Altitue preference: Found in lower altitudes of moist deciduous forests
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala, 10°49'44.76"N, 76°40'36.16"E, 100m, 20 June 2017, Aswani & Maya, 149 (GVCH); Koyyamarakaadu, 10°47'41.24"N, 76°45'35.17"E, 140m, 30 November 2019, Aswani & Maya, 5325 (GVCH).

Orophea Blume, *Bijdr. Fl. Ned. Ind.* 1: 18 (1825)

Orophea zeylanica Hook.f. & Thomson, *Fl. Ind. [Hooker f. & Thomson]* i. 111. (1855); Hook. f., *FBI* 1: 90 (1872); Gamble, *Fl. Madras* 24 (1915).

Habit : Shrub
Ecosystem preference : Evergreen forests and margins of grasslands
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found in hill slopes below grasslands
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : May - September
Altitude preference : Found in the hill slopes and in valleys of grasslands in higher altitudes
Specimen examined :INDIA, Kerala: Palakkad District, Walayar range, Aduppukootimala, 10°50'15.72"N, 76°44'28.68"E, 446m, 16 February 2021, Aswani & Maya, 6483 (GVCH) **(Plate 6: Fig. g)**.

Polyalthia **Blume**

Polyalthia malabarica (Bedd.) I. M. Turner, *Nordic J. Bot.* 33(3): 284 (2015); *Phaeanthus malabaricus* Bedd. Hook. f., *FBI*, 1: 72 (1872); Gamble, *Fl. Madras* 17 (1915).

Basionym: *Phaeanthus malabaricus* Bedd., *Icon. Pl. Ind. Or. [Beddome]* 16. (1874).

Habit : Shrub
Ecosystem preference : Evergreen forests
Distribution : Indo - Pacific
Endemism : Southern Western Ghats (Kerala)
IUCN Category : Near Threatened (NT)
Habitat : Canopy rich hill slopes and margins of grasslands
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : Throughout the year
Altitude preference : Found in forest tracts in medium and higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Thanniplace, 10°52'36.48"N, 76°45'53.53"E, 924m, 28 January 2020, Aswani & Maya, 6031 (GVCH).

Laurales

Lauraceae

Key to genera

1. Leaves 3 or more ribbed from base, opposite or sub - opposite…..….....…*Cinnamomum*
- Leaves penninerved, usually alternate……..……...….2
2. Phyllotaxy in whorls or pseudo whorls……..…...…....3
- Phyllotaxy in alternate or crowded at tip…….....…..4

3. Flowers with deciduous involucral bracts…..……..... *Actinodaphne*
- Flowers with persistent involucral bracts……..…..…..…….. *Litsea*

4. Anthers 2 - celled…...*Beilschmiedia*
- Anthers 4 - celled ……..……5

5. Panicles few flowered; fruiting perianth lobes enlarged and erect……..….. *Phoebe*
- Panicles many flowered; fruiting perianth lobes scarcely enlarged and reflexed….…….……*Machilus*

Actinodaphne Nees, *Pl. Asiat. Rar. (Wallich).* ii. 68 (1831)

Actinodaphne salicina Meisn in A.DC. Prodr. 15(1): 212 (1864); Hook. f., *FBI* 5: 148 (1886); Gamble, *Fl. Madras* 1230 (1925).

Habit : Tree
Ecosystem preference : Evergreen forests
Distribution : Indo - Pacific
Endemism : Southern Western Ghats
IUCN Category : Endangered (EN)
Habitat : Found in hill slopes and valleys
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : September - March
Altitude preference : Found in high altitude forest floors
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Moochikadavu, 10°52'27.55"N, 76°42'44.32"E, 283m, 19 July 2019, Aswani & Maya, 4365 (GVCH); Pothukunnu, 10°53'21.84"N, 76°46'33.24"E, 972m, 28 January 2020, Aswani & Maya, 5986 (GVCH) **(Plate 6: Fig. h)**.

Beilschmiedia Nees in Wall., *Pl. Asiat. Rar. (Wallich).* 2: 61, 69 (1831)

Beilschmiedia gemmiflora (Blume) Kosterm., *J. Sci. Res., Indonesia* i. 115 (1952), in adnot; *Beilschmiedia bourdillonii* Brandis, Gamble, *Fl. Madras* 1221 (1925); Sasidh., *Fl. Parambikulam WLS* 267 (2002).

Habit : Tree
Ecosystem preference : Margins of grasslands
Distribution : Indo - Pacific
Endemism : Peninsular India
IUCN Category : Least Concern (LC)
Habitat : Forest margins and in valleys
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : January - February
Altitude preference : Found in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala, 10°52'10.20"N, 76°47'15.00"E, 764m, 23 June 2019, Aswani & Maya, 4125 (GVCH).

Cinnamomum Schaeff., *Bot. Exped.* 74 (1760), nom. cons

Key to species

Leaves large, lateral ribs almost reach upto apex, nervules transverse and parallel……..….. *C. malabatrum*
Leaves moderately sized, lateral ribs end three fourth the length, nervules transverse, irregular and reticulate……..... *C. verum*

Cinnamomum malabatrum (Burm.f.) J.Presl, *Prir. Rostlin* 2: 46 (1825).; *Cinnamomum malabatrum* (Burm. f.) Blume, Vajr., *Fl. Palghat Dist* 403 (1990); Sasidh., *Fl. Parambikulam WLS* 268 (2002); *Cinnamomum iners* sensu Gamble, *Fl. Madras* 1224 (1925).

Basionym: *Laurus malabatrum* Burm.f., *Fl. Ind. (N. L. Burman)* 92 (1768).

Habit : Tree
Ecosystem preference : Moist deciduous forests and margins of grasslands

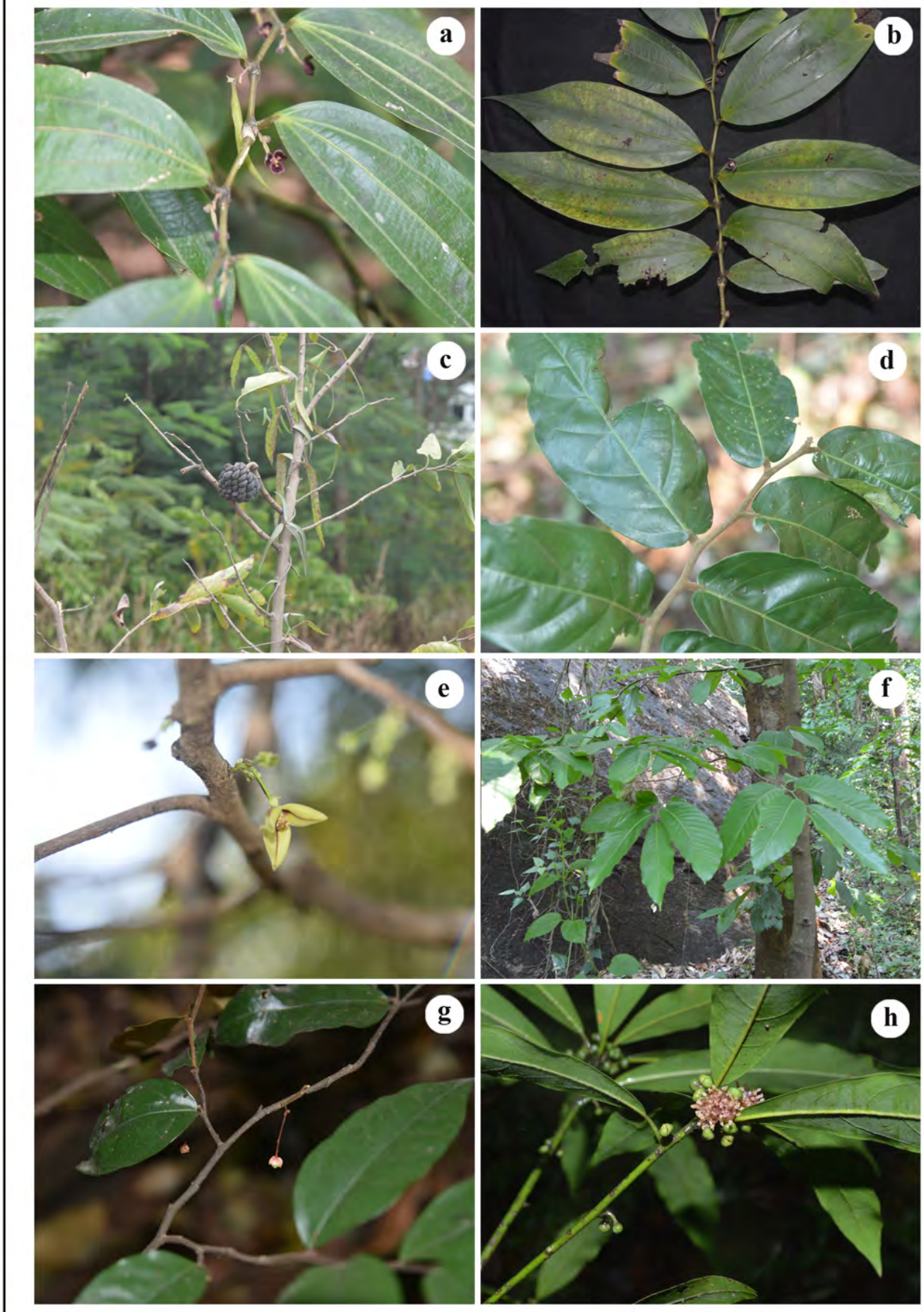


Plate 6: **Fig. a**. *Thottea siliquosa* (Lam.) Ding Hou **b.** *Thottea sivarajanii* E. S. S. Kumar, A. E. S. Khan & Binu **c.** *Annona squamosa* L. **d.** *Huberantha cerasoides* (Roxb.) Chowasku **e.** *Miliusa tomentosa* (Roxb.) Finet & Gagnep. **f.** *Monoon fragrans* (Dalzell) B. Xue & R. M. K. Saunders **g.** *Orophea zeylanica* Hook. f. *& Thomson* **h.** *Actinodaphne salicina* Meisn.

Distribution : Indo - Pacific
Endemism : Southern Western Ghats
IUCN Category : Not Evaluated ((NE)
Habitat : Found in all forest tracts
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : March - April
Altitude preference : Found in all altitudes in all forest types
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala, 10°52'18.19"N, 76°46'47.14"E, 921m, 09 January 2020, Aswani & Maya, 5672 (GVCH); Kundanmala - Akamalavaram, 10° 53' 33.4824" N, 76° 41' 52.7676" E, 943m, 27 February 2020, Aswani & Maya, 6119 (GVCH).

Cinnamomum verum J.Presl, *Prir. Rostlin* 2: 37 (1825); *Cinnamomum zeylanicum* Blume, Hook. f., *FBI* 5: 131 (1886); Gamble, *Fl. Madras* 1224 (1925).

Habit : Tree
Ecosystem preference : Moist deciduous forest and plains
Distribution : Indo -Pacific
IUCN Category : Not Evaluated (NE)
t: Found in forest margins as cultivated
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : March - April
Altitude preference : Found in low altitudes in all forests
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, G. P. Nair estate, 10°53'40.83"N, 76°39'43.16"E, 230m, 24 March 2018, Aswani & Maya, 1741 (GVCH); Chacolas Estate, 10°51'15.48"N, 76°45'09.00"E, 265.17m, 02 August 2019, Aswani & Maya, 4502 (GVCH) **(Plate 7: Fig. a)**.

Litsea Lam., *Encycl. [J. Lamarck & al.]* 3(2): 574 (1792)

Litsea coriacea (B.Heyne ex Nees) Hook.f., *FBI* 5: 166 (1886); Gamble, *Fl. Madras* 1236 (1925); Vajr., *Fl. Palghat Dist.* 404. 1990; Sasidh., *Fl. Parambikulam WLS* 270 (2002).

Habit : Tree
Ecosystem preference : Seen in semi - evergreen and evergreen forests
Distribution : Indo - Pacific
Endemism : Peninsular India
IUCN Category : Near threatened (NT)
Habitat : Hilly slopes in evergreen forests
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : December - January
Altitude preference : Found in higher altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala, 10°51'53.64"N, 76°47'16.80"E, 586m, 09 January 2020, Aswani & Maya, 5626 (GVCH); Aatumala, 10° 53' 31.2" N, 76° 41' 52.8" E, 934m, 28 February 2019, Aswani & Maya, 6179 (GVCH).

Machilus Nees, *Pl. Asiat. Rar. (Wallich).* 2(8): 70 (1831)

Machilus glaucescens (Nees) Wight, *Icon. Pl. Ind. Orient.* [Wight] 5(2): 12, t. 1825 (1852); *Machilus macrantha* Nees in Wall., Hook. f., *FBI* 5: 140. 1886; Gamble, F*l. Madras* 1227 (1925); *Persea macrantha* (Nees) Kosterm.,Vajr., *Fl. Palghat Dist.* 407 (1990); Sasidh., *Fl. Parambikulam WLS* 272 (2002).

Habit : Tree
Haitat : Evergreen forests
Phytogeogaphy : Indo - Pacific
IUCN Category : Not evaluated (NE)
Habitat : High canopy regions near water sources
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare

Phenology : December - May
Altitude preference : Found in high altitude hill tracts
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kundanmala, 10° 53' 31.2" N, 76° 41' 52.8" E, 934m, 27 February 2020, Aswani & Maya, 6113 (GVCH) **(Plate 7: Fig. b)**.

Phoebe Nees, *Syst. Laur.* 98 (1836)

Phoebe lanceolata (Nees) Nees, *Syst. Laur.* 109 (1836); Hook. f., *FBI* 5: 141. 1886; Gamble, *Fl. Madras* 1228 (1925); Vajr., *Fl. Palghat Dist.* 407 (1990); Sasidh., *Fl. Parambikulam WLS* 272 (2002).

Habit : Tree
Ecosystem preference : Semi evergreen forests
Distribution : Indo - Pacific
IUCN Category : Least Concern
Habitat : Understorey tree in canopy rich forest
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : January - March
Altitude preference : Found in medium altitudes in semi evergreen forests
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Ponthamcheeni, 10°50'03.12"N, 76°44'33.36"E, 330m, 12 January 2019, Aswani & Maya, 3722 (GVCH) **(Plate 7: Fig. c)**.

IV.1.2.3. Monocots

Alismatales

Araceae

Key to genera

1. Plants aquatic……..……...2
- Plants terrestrial, sometimes marshy..…4
2. Plant body well developed with distinct root, stem and leaves……..……...*Pistia*
- Plant body highly reduced to thalloid frond lacking distinct stem , roots and leaves…...……..…….……3
3. Rootlet solitary in each frond……..……..……*Lemna*
- Rootlet 2 - many in each frond……..……..….*Spirodela*
4. Scandent plants; adventitious aerial roots at nodes……..……..... *Pothos*
- Erect plants; aerial adventitious roots absent……..……..…….5
5. Leaves simple…….…..…..……6
- Leaves compound……..……9
6. Herbs epiphytic having leafless bulbiferous shoots……..…… *Remusatia*
- Herbs without any leafless bulbiferous shoots……..……..…..……..7
7. Large robust plants……..... *Colocasia*
-Small sized plants ...…..……..……..8
8. Leaves peltate; suborbicular…... *Ariopsis*
- Leaves not peltate; ovate-hastate……..... *Theriophonum*
9. Leaves 3 – partite; leaves appearing after flowering…...……..... *Amorphophallus*
- Leaves radially arranged; leaves present during flowering……..……...…. *Arisaema*

Amorphophallus Blume ex Decne., *Nouv. Ann. Mus. Hist. Nat.* 3: 366 (1834)

Key to species

1. Peduncle very short and present just above the soil…….. *A. paeoniifolius*
- Peduncle long raised much above the soil ……..…….2
2. Spathe with a constriction between the tube and the limb..... *A. commutatus*
- Spathe without a constriction between the tube and the limb ..... A. *sp. nov.*

Amorphophallus commutatus (Schott) Engl. in A.DC.& C.DC, *Monogr. Phan.* 2: 319 (1879); Hook. f., *FBI* 6: 515 (1893).

Basionym: *Conophallus commutatus* Schott, *Bonplandia* 7: 28 (1859).

Habit : Herb
Ecosystem preference : Moist deciduous forest and often semi - evergreen forests
Distribution : Indo - Pacific
Endemism : Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Shady forest floors with moisture and humus
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Occasional
Phenology : May - September
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Pudussery North, Jamanthimala, 10°51'59.76"N, 76°47'15.36"E, 643m, 23 June 2019, Aswani & Maya, 4112 (GVCH); Komattichalla, 10°48'36.72"N, 76°46'51.96"E, 144m, 06 August 2019, Aswani & Maya, 4636 (GVCH).

Amorphophallus paeoniifolius (Dennst.) Nicolson, *Taxon* 26: 338 (1977); Sasidh., *Fl. Parambikulam WLS* 365 (2002); *Amorphophallus dubius* Blume, *Rumphia* 1: 142 (1837); Hook. f., *FBI* 6: 514 (1893); Gamble, *Fl. Madras* 1587 (1931).

Basionym: *Dracontium paeoniifolium* Dennst., *Schlüssel Hortus Malab.* 13 (21, 38) (1818).

Habit : Herb
Ecosystem preference : Moist Deciduous forests and in plains
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Found in all forest floors and plains
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Common
Phenology : May - June
Altitude preference : Found in lower altitudes and plains
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kongampadam - Chullimada, 10°48'36.72"N, 76°46'51.96"E, 151m, 15 June 2018, Aswani & Maya, 2350 (GVCH); Ayyappan Mala, 10°49'06.91"N,76°44'44.91"E, 151m, 26 June 2018, Aswani & Maya, 2393 (GVCH); Akathethara - Pallakaadu, 10°51'30.96"N, 76°37'39.00"E, 151m, 09 October 2018, Aswani & Maya, 3014 (GVCH); Akamalavaram, Moochikadavu, Pettikallu, 10°52'01.20"N, 76°41'57.48"E, 174m, 19 July 2019, Aswani & Maya, 4290 (GVCH); Akamalavaram - Thakaramada,10°52'27.55"N,76°42'44.32" E, 280m, 19 July 2019, Aswani & Maya, 4359 (GVCH) **(Plate 7: Fig. d)**.

Amorphophallus sp. nov. *Aswani, Maya & Prabhukumar.*

Habit : Herb
Ecosystem preference : Moist Deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Open hill slopes
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Rare
Phenology : May - June
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Ayyappan Mala, Walayar hills, 10°49'10.38"N, 76°44'28.29"E, 310m, 26 June 2018, Aswani V. J. & Maya C. Nair 2566 (GVCH) **(Plate 7: Fig. e)**.

Ariopsis J. Graham*, Cat. Bomb. Pl*. 252 (1839)

Ariopsis peltata Nimmo, *Cat. Pl. Bombay [Graham]* 252 (1839); Hook. f., *FBI* 6: 519. 1893; Gamble, *Fl. Madras* 1580 (1931); Sasidh, *Fl. Parambikulam WLS* 366 (2002).

Habit : Herb
Ecosystem preference : Evergreen and moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Wet rock surfaces and mud cliffs
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Rare
Phenology : June - August
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Akamalavaram – Chacolas, 10°51'21.60"N, 76°44'52.08"E, 265m, 02 August 2019, Aswani & Maya, 4513 (GVCH) **(Plate 7: Fig. f)**.

Arisaema Mart.*, Flora* 14: 459 (1831)

Key to species

1. Spadix appendix fusiform, tapering to a short tail with a small minutely warted apical knob……..…... *A. barnesii*
- Spadix appendix sigmoid, tapering to a long tail without any knob ……...…2
2. Leaves usually two, pedatisect; corms proliferating..... *A. tortuosum*
- Leaves usually single, radiatisect or rarely sub-pedatisect; corms not proliferating ……... *A. tortuosum* var. *neglectum*

Arisaema barnesii C. E. C. Fisch., *Bull. Misc. Inform. Kew* 1933(7): 342 (1933); Gamble, *Fl. Madras Fl. Madras* 1891 (1936); Vajr., *Fl. Palghat Dist.* 532 (1990); Sasidh., *Fl. Parambikulam WLS* 367 (2002).

Habit : Herb
Ecosystem preference : Evergreen forests
Distribution : Indo - Pacific
Endemism : Southern Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Canopy rich forest floors
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Rare
Phenology : April - May
Altitude preference : Found in higher altitudes in evergreen forests
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala,10°52'04.24"N, 76°47'13.29"E,723m,23 June 2019, Aswani & Maya, 4119 (GVCH).

Arisaema tortuosum (Wall.) Schott, *Melet. Bot.* 1: 17. (1832); Hook. f., *FBI* 6: 502. (1893); Gamble, *Fl. Madras* 1584 (1931); Sasidh., *Fl. Parambikulam WLS* 367 (2002).
Basionym: *Arum tortuosum* Wall., *Pl. Asiat. Rar. (Wallich).* 2: 10 (1830).

Habit : Herb
Ecosystem preference : Evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found in open forest areas
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Rare
Phenology : May - June
Altitude preference : Found in medium and higher altitude evergreen forests
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Ayyappan Mala, 10°49'11.44"N , 76°44'24.46"E, 346m, 26 June 2018, Aswani & Maya, 2592 (GVCH) **(Plate 7: Fig. g)**.

Arisaema tortuosum* var. *neglectum (Schott) Fisch., *Fl. Madras* 3: 1585 (1931); *Arisaema neglectum* Schott, Hook.f., *FBI* 6: 504. 1894.

Habit : Herb
Ecosystem preference : Evergreen forests
Distribution : Indo - Pacific
Endemism : Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Soil rich region between tree trunks
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Rare
Phenology : April - July
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Mannukunnu, 10°52'5.50"N, 76°38'30.27"E, 181m, 09 July 2019, Aswani & Maya, 4193 (GVCH).

Colocasia *Schott,* Melet. Bot. 18 (1832)

Colocasia esculenta (L.) Schott, *Melet. Bot.* 18 (1832); *Colocasia antiquorum* Schott in Schott & Endl.; Hook. f., *FBI* 6: 523 (1893); Gamble, *Fl. Madras* 1580 (1931); Vajr., *Fl. Palghat Dist* 533 (1990); Sasidh., *Fl. Parambikulam WLS* 368 (2002).

Habit : Herb
Ecosystem preference : In Rock pools and river banks
Distribution : Indo - Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Waterlogged places and polluted water
Raunkiaer's Life form : Hydrophyte
Distribution Frequency : Common
Phenology : May - October
Altitude preference : Found commonly in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Akathethara – Mannukunnu, 10°52'5.50"N, 76°38'30.27"E, 181m, 09 July 2019, Aswani & Maya, 4212 (GVCH); Koyyamarakadu, 10°47'44.88"N, 76° 45 '38.52"E, 108m, 30 November 2019, Aswani & Maya, 5331 (GVCH) **(Plate 7: Fig. h)**.

Lemna L., *Sp. Pl.* 2: 970 (1753)

Key to species

Frond sub orbicular or broadly obovate……..……..*L. gibba*
Frond ovate to obovate or oblong……..…….L. *perpusill*a

Lemna gibba L., *Sp. Pl.* 2: 970 (1753); Hook. f., FBI 6: 556 (1893); C.E.C. Fisch. in Gamble, *Fl. Madras* 1593 (1931).

Habit : Herb
Ecosystem preference : Wetlands
Distribution : Indo - Pacific, Holarctic, African, South American and Australian
IUCN Category : Least Concern (LC)
Habitat : Stagnant waters in rock pools, paddy fields and ponds
Raunkiaer's Life form : Hydrophyte
Distribution Frequency : Occasional
Phenology : August - December
Altitude preference : Found in Ponds, rivers in lower altitudes when water flow stops
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Koyyamarakadu, 10°47'44.88"N, 76°45'38.52"E, 108m, 30 November 2019,Aswani & Maya, 5367 (GVCH).

***Lemna perpusill*a** Torr., *Fl. New York* 1: 245 (1843); R. Ansari, *Fl. Kasaragod Div* 405 (1985); E. Vajr., *Fl. Palghat Dist* 537 (1990); Sasidh. & Sivar., *Fl. Pl. Thrissur For*. 489 (1996); Anil Kumar *et al.*, *Fl. Pathanamthitta* 528 (2005); Sunil & Sivad.,

Fl. Alappuzha Dist 728 (2009); Ratheesh, *Fl. Stud. Wayanad Dist* 911 (2009); Sunil, *Fl. Pl. Diver. Ernakulam Dist* 425 (2016); R. Ansari *et al*., *Aquatic and Wetland Fl. Kerala: Flow. Pl.* 499 (2016); *Lemna paucicostata* Hegelm., Hook. f., *FBI* 6: 556 (1893); C.E.C. Fisch. in Gamble, *Fl. Madras* 1593 (1931); *Lemna minor* sensu Hook.f., *FBI* 6: 556 (1893).

Habit : Herb
Ecosystem preference : Wetlands
Distribution : Indo - Pacific, Holarctic, African, South American and Australian
IUCN Category : Least Concern (LC)
Habitat : Stagnant waters
Raunkiaer's Life form : Hydrophyte
Distribution Frequency : Occasional
Phenology : September - January
Altitude preference : Found in stagnant waters in Ponds, rivers, rock pools in hillocks in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Mayappallam, 10°48'08.64"N, 76°46'34.68"E, 127m, 30 November 2019, Aswani & Maya, 5408 (GVCH); Korayar river, 10°47'49.42"N, 76°45'32.94"E, 129m, 22 February 2021, Aswani & Maya, 6535 (GVCH) **(Plate 8: Fig. a)**.

Pistia L.*, Sp. Pl*. 2: 963 (1753)

Pistia stratiotes L., *Sp. Pl.* 2: 963 (1753); Hook. f., *FBI* 6: 497 (1893); Gamble, *Fl. Madras* 1573 (1931); Vajr., *Fl. Palghat Dist.* 535 (1990).

Habit : Herb
Ecosystem preference : In river banks
Distribution : Indo - Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Flowing and Waterlogged places, polluted water
Raunkiaer's Life form : Hydrophyte
Distribution Frequency : Common
Phenology : October - March
Altitude preference : Found in Ponds, rivers and Lakes in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koyyamarakadu, 10°47'44.88"N, 76°45'38.52"E, 109m, 06 September 2018, Aswani & Maya, 2678 (GVCH); Ayyappanchalla, 10°48'20.42"N, 76°48'05.00"E, 146m, 30 November 2019, Aswani & Maya, 5219 (GVCH) **(Plate 8: Fig. b)**.

Pothos L.*, Sp. Pl. [Linnaeus]* 2: 968 (1753)

Pothos scandens L., *Sp. Pl.* 2: 968 (1753); Hook. f., *FBI* 6: 551 (1893); Gamble, *Fl. Madras* 1592 (1931); Vajr., *Fl. Palghat Dist 5*35 (1990); Sasidh., *Fl. Parambikulam WLS* 369 (2002).

Habit : Climber
Ecosystem preference : Moist deciduous and semi evergreen forests
Distribution: Indo – Pacific and African
IUCN Red list Category: Not Evaluated (NE)
Habitat: Climber in trees
Raunkiaer's Life form: Liana (Euliana)
Distribution Frequency: Occasional
Phenology: October - November
Altitude preference: Found as a common climber in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kavarakundu, 10°52'28.20"N, 76°42'38.52"E, 346m, 10 March 2018, Aswani & Maya, 1502 (GVCH); Aduppukootimala, 10°50'08.16"N, 76°44'33.36"E, 361m, 12 January 2019, Aswani & Maya, 3733 (GVCH), Chaatapara waterfalls, 10°53'11.76"N, 76°42'15.84"E, 600m, 10 December 2019, Aswani & Maya, 5573(GVCH) **(Plate 8: Fig. c)**.

Plate 7 : Fig. a. *Cinnamomum verum* J.Presl **b.** *Machilus glaucescens* (Nees) Wight **c.** *Phoebe lanceolata* (Nees) Nees **d.** *Amorphophallus paeoniifolius* (Dennst.) Nicolson **e.** *Amorphophallus sp. nov.* **f.** *Ariopsis peltata* Nimmo **g.** *Arisaema tortuosum* (Wall.) Schott **h.** *Colocasia esculenta* (L.) Schott.

Remusatia Schott, *Melet. i.* 18 (1832)

Remusatia vivipara (Roxb.) Schott, *Melet. Bot.* 18 (1832); Hook. f., *FBI* 6:521 (1893); Gamble, *Fl. Madras* 1583 (1931); Vajr., *Fl. Palghat Dist* 535 (1990); Sasidh., F*l. Parambikulam WLS* 369 (2002).

Habit : Herb
Ecosystem preference : Evergreen forests
Distribution : Indo – Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Epiphytic in canopy rich forests
Raunkiaer's Life form : Epiphyte
Distribution Frequency : Rare
Phenology : February - April
Altitude preference : Found a epiphyte in canopy rich lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Akathethara – Mannukunnu, 10°52'5.50"N, 76°38'30.27"E, 181m, 09 July 2019, Aswani & Maya, 4196 (GVCH) **(Plate 8: Fig. d)**.

Spirodela Schleid., *Linnaea* 13: 391 (1839)

Spirodela polyrhiza (L.) Schleid., *Linnaea* 13: 392 (1839); Vajr., *Fl. Palghat Dist* 538 (1990); Sunil & Sivad., *Fl. Alappuzha Dist* 729 (2009); Ratheesh, *Fl. Stud. Wayanad Dist* 912 (2009); Sunil, *Fl. Pl. Diver. Ernakulam Dist* 425 (2016); Ansari *et al*., *Aquatic and Wetland Fl. Kerala: Flow. Pl*. 500 (2016); *Lemna polyrrhiza* L., Hook. f., *FBI* 6: 557 (1893); C.E.C. Fisch. in Gamble, *Fl. Madras* 1593 (1931).

Habit : Herb
Ecosystem preference : Wetlands
Distribution : Indo - Pacific, Holarctic, African, South American and Australian
IUCN Category : Least Concern (LC)
Habitat : Stagnant waters in rock pools, rivers, ponds and water canals
Raunkiaer's Life form : Hydrophyte
Distribution Frequency : Occasional
Phenology : October - November
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Ollappallam, 10°49'52.20"N, 76°43'44.19"E, 121m, 25 November 2017, Aswani & Maya, 1016 (GVCH); Korayar river, 10°47'49.42"N, 76°45'32.94"E, 129m, 22 February 2021, Aswani & Maya, 6534 (GVCH) **(Plate 8: Fig. e)**.

Theriophonum Blume, *Rumphia* 1: 127 (1837)

Key to species

Spathe limb broadly ovate; purplish in colour ……..…..... *T. fischeri*
Spathe limb elliptic; greenish yellow in colour…….…..……*T. infaustum*

Theriophonum fischeri Sivad., *Aroideana* 4(2): 64 (1981); Vajr., *Fl. Palghat Dist*. 536 (1990).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
Endemism : Southern Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Rock gaps hillock systems
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Occasional
Phenology : October - June
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Mayappalam, 10°48'09.35"N, 76°46'28.60"E, 137m, 10 May 2018, Aswani & Maya, 2152 (GVCH), Kongampadam, 10°48'36.72"N, 76°46'51.96"E, 151m, 15 June 2018, Aswani & Maya, 2353 (GVCH), Kongampadam, 10°48'36.72"N,

76°46'51.96"E,151m, 30 November 2019, Aswani & Maya, 5298 (GVCH).

Theriophonum infaustum N.E.Br., J. Linn. Soc., Bot. 18: 260 (1880); Hook. f., *FBI* 6: 513. (1893); Gamble, *Fl. Madras* 1579 (1931); Vajr., *Fl. Palghat Dist.* 537 (1990).
Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
Endemism : Southern Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Canopy rich forests
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Rare
Phenology : July - September
Altitude preference : Found in low and medium altitudes in wet areas
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Chacolas, 10°51'22.68"N, 76°44'41.28"E, 226.76m, 02 August 2018, Aswani & Maya, 4478 (GVCH).

Hydrocharitaceae

Key to genera

Stem bearing plants, leaves mostly whorled, lower leaves sometimes opposite……..…..... *Hydrilla*
Stemless plants, leaves radical..…. *Ottelia*

Hydrilla Rich., *Mem. Just. Par.* xii. (1811) II. 9, 61

Hydrilla verticillata (L.f.) Royle, *Illustrations of the Botany of the Himalayan Mountains* 1 (1839); Hook. f., *FBI* 5: 659 (1888); Gamble, *Fl. Madras* 1396 (1928); Vajr., *Fl. Palghat Dist* 460 (1990).

Basionym: *Serpicula verticillata* L.f., *Suppl. Pl.* 416 (1782).

Habit : Herb
Ecosystem preference : Waterbodies
Distribution : Indo - Pacific, Holarctic and African
IUCN Category : Least Concern (LC)
Habitat : Stagnant waters in ponds
Raunkiaer's Life form : Hydrophyte
Distribution Frequency : Rare
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Mayappalam, 10°48'0.36"N, 76°45'58.68"E, 114m, 10 May 2018, Aswani & Maya, 2100 (GVCH) **(Plate 8: Fig. f)**.

Ottelia Pers., *Syn. Pl. [Persoon]* 1: 400 (1805)

Ottelia alismoides (L.) Pers., *Syn. Pl. [Persoon]* 1: 400 (1805); Hook. f., *FBI* 5: 662 (1888); Gamble, *Fl. Madras* 1398 (1928); Vajr., *Fl. Palghat Dist* 461 (1990).

Habit : Herb
Ecosystem preference : Ponds and canals
Distribution : Indo – Pacific and Holarctic
IUCN Category : Least Concern (LC)
Habitat : Stagnant waters in rock pools, rivers and ponds
Raunkiaer's Life form : Vascular Hydrophyte
Distribution Frequency : Rare
Phenology : July - January
Altitude preference : Found in lower altitude pools in plains
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Panampully, 10°49'08.43"N, 76°48'56.51"E, 1541m, 18 September 2019, Aswani & Maya, 2850 (GVCH), Ahalya Campus, 10°47'43.08"N, 76°50'5.43", 150m, 24 September 2020,

Aswani & Maya, 6277 (GVCH) **(Plate 8: Fig. g)**.

Dioscoreales

Dioscoreaceae

Dioscorea L., *Sp. Pl.* 2: 1032 (1753)

Key to species

1.Leaves compound (3 – 5 foliolate)……..…...*D. pentaphylla*
- Leaves simple…….……..2
2.Stems twining to the left...….*D. bulbifera*
- Stem twining to the right……..……3
3. Stem winged or angled; male spikes appears zig – zag……..……...……..4
- Stem neither winged nor angled; male spikes not zig – zag…….…….…….5
4. capsule reniform or kidney shaped; stem unarmed; plants turn reddish when dry……..……..….*D. hamiltonii*
- capsule broadly obcordate; stem usually armed; plants do not turn reddish when dry……..……..…...….*D. alata*
5. Leaves coriaceous…….……..…*D. spicata*
- Leaves not coriaceous…….....……6
6.Venation of leaf prominent ……...*D. belophylla*
- Venation of leaf not prominent……7
7. Stem slender; unarmed; leaf base acute or rounded; 3 – 5 nerved.…*D. oppositifolia*
- Stem stout and woody; armed below; leaves widely cordate at base; 12 -nerved from base…...……..……*D. wallichii*

Dioscorea alata L., *Sp. Pl.* 2: 1033 (1753); Hook. f., *FBI* 6: 296 (1892); Gamble, *Fl. Madras* 1512 (1928); *Dioscorea globosa* Roxb., Hook. f., *FBI* 6: 296 (1892).

Habit : Climber
Ecosystem preference : Mostly cultivatedin plains, sometimes runs wild
Distribution : Indo - Pacific
Endemism : India
IUCN Category : Not Evaluated (NE)
Habitat : Climber in trees and fences
Raunkiaer's Life form : Liana (Euliana
Distribution Frequency : Occasional
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Malampuzha Guest House Hillock, 10°50'03.76"N, 76°40'56.19"E, 120m, 08 September 2017, Aswani & Maya, 443 (GVCH), Elichil - Edamala, 10°50'28.32"N, 76°38'45.96"E, 184m, 16 October 2019, Aswani & Maya, 4840 (GVCH), Edamala - Thekke Malampuzha, 10°51'15.84"N, 76°39'40.32"E, 129m, 23 November 2019, Aswani & Maya, 4988 (GVCH) .

Dioscorea belophylla **(**Prain) Voigt ex Haines, *Forest Fl. Chota Nagpur* 530 (1910); Gamble, *Fl. Madras* 1512 (1928).

Habit : Climber
Ecosystem preference : Moist deciduous forest
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Canopy rich forest floors
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : October - March
Altitude preference : Found in medium altitudes between tree groups
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Ayyappan Mala, 10°49'11.44"N, 76° 44 '24.46"E, 346m, 26 June 2018, Aswani & Maya, 2565 (GVCH).

Dioscorea bulbifera L., *Sp. Pl.* 2: 1033 (1753); Hook. f., *FBI* 6: 296. (1892); Gamble, *Fl. Madras* 1511(1928); Vajr., *Fl. Palghat Dist* 507 (1990); Sasidh., *Fl. Parambikulam WLS* 350 (2002); *Dioscorea*

bulbifera L. var. vera Prain & Burkill, Gamble, *Fl. Madras* 1511(1928).

Habit : Climber
Ecosystem preference : Moist deciduous forests
Distribution : Indo – Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Rocky forest areas
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Occasional
Phenology : September - October
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Pallippara, 10°49'48.36"N, 76°43'44.04"E, 119.78m, 29 October 2017, Aswani & Maya, 737 (GVCH), Pallippara, 10°49'48.36"N, 76°43'44.04"E, 119.78m, 23 November 2019, Aswani & Maya, 5042 (GVCH) **(Plate 8: Fig. h)**.

Dioscorea hamiltonii Hook.f., *FBI* [J. D. Hooker] 6(18): 295 (1892); Gamble, *Fl. Madras* 1512 (1928).

Habit : Climber
Ecosystem preference : Semi evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found in lower altitudes
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : October - December
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Mannukunnu, 10°52'5.50"N, 76°38'30.27"E, 181m, 09 July 2019, Aswani & Maya, 4226 (GVCH).

Dioscorea oppositifolia L., *Sp. Pl*. 2: 1033 (1753); Gamble, *Fl. Madras* 1512 (1928); Vajr., *Fl. Palghat Dist.* 508 (1990); Sasidh., *Fl. Parambikulam WLS* 350 (2002); *Dioscorea oppositifolia* L. var. *linnaei* Prain & Burkill,; Gamble, *Fl. Madras* 1512 (1928). *Dioscorea oppositifolia* L. var. *dukhunensis* Prain & Burkill, Gamble, *Fl. Madras* 1512 (1928); Hook. f., *FBI* 6: 292 (1892); Sasidh., *Fl. Parambikulam WLS* 350 (2002)

Habit : Climber
Ecosystem preference : Moist deciduous and semi – evergreen forests
Distribution : Indo – Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : Found in open forest lands and in waste places
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Common
Phenology : August - November
Altitude preference : Found common in all altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thekke Malampuzha, 10°50'07.08"N, 76°40'26.15"E, 224.94m, 08 September 2017, Aswani & Maya, 448 (GVCH), Kottamutti waterfalls, 10°49'42.94"N, 76°46'47.87"E, 206.04m, 23 September 2018, Aswani & Maya, 2893(GVCH), Jamanthimala, 10°51'59.76"N, 76°47'15.36"E, 641.29m, 23 March 2019, Aswani & Maya, 4077(GVCH), Aduppukootimala, 10°49'59.16"N, 76°44'31.56"E, 297.78m, 16 February 2021, Aswani & Maya, 6453(GVCH). **(Plate 9: Fig. a)**.

Dioscorea pentaphylla L., *Sp. Pl.* 2: 1032 (1753); Hook. f., *FBI* 6: 281. (1892); Gamble, *Fl. Madras* 1511 (1928); Vajr., Fl. Palghat Dist 508 (1990); *Dioscorea pentaphylla* L. var. *communis* Prain & Burkill., Gamble, *Fl. Madras* 1512 (1928); *Dioscorea pentaphylla* L. var. *linnaei* Prain & Burkill; Gamble, *Fl. Madras* 1511 (1928).

Habit : Climber

Plate 8: Fig. a. *Lemna perpusilla* Torr. **b.** *Pistia stratiotes* L. **c**. *Pothos scandens* L. **d.** *Remusatia vivipara* (Roxb.) Schott **e.** *Spirodela polyrhiza* (L.) Schleid. **f.** *Hydrilla verticillata* (L.f.) Royle **g.** *Ottelia alismoides* (L.) Pers. **h.** *Dioscorea bulbifera* L.

Ecosystem preference : Moist deciduous forests
Distribution : Indo – Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : Found in open forest areas and forest margins
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Common
Phenology : September - December
Altitude preference : Found common in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Neelikunnu, 10°51'30.14"N, 76°37'30.67"E, 155.44m, 27 April 2018, Aswani & Maya, 1914 (GVCH); Ayyappan Mala, 10°49'06.91"N, 76°44'44.91"E, 150.87m, 26 June 2018, Aswani & Maya, 2413 (GVCH); Pazhampullikaadu, 10°50'09.55"N, 76°38'28.33"E, 89.30m, 16 October 2018, Aswani & Maya, 3149 (GVCH); On the way to Jamanthimala, 10°50'26.52"N, 76°50'04.56"E , 213.96m, 23 March 2020, Aswani & Maya, 4030 (GVCH); Muchikadavu, 10°52'7.32"N, 76°42'28.44"E, 245.36m, 19 July 2020, Aswani & Maya, 4322 (GVCH) **(Plate 9: Fig. b)**.

Dioscorea spicata Roth, *Nov. Pl. Sp.* 371 (1821); Hook. f., *FBI* 6: 291. 1892; Gamble*, Fl. Madras* 1512 (1928).

Habit : Climber
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found in shady regions
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : August - December
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Poolakunnu, 10°51'33.12"N , 76° 42 '29.52"E, 141m, 15 May 2019, Aswani & Maya, 3948 (GVCH) **(Plate 9: Fig. c)**.

Dioscorea wallichii Hook.f., *FBI* [J. D. Hooker] 6(18): 295, in syn. (1892); Gamble, *Fl. Madras* 1512 (1928); Vajr., *Fl. Palghat Dist* 509 (1990); Sasidh., *Fl. Parambikulam WLS* 351 (2002).

Habit : Climber
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Found in shady forest areas
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : October - November
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kaatadikunnu, 10°50'21.84"N , 76°39'14.76 "E, 267m, 16 October 2019, Aswani & Maya, 4811 (GVCH) **(Plate 9: Fig. d)**.

Pandanales

Pandanaceae

Pandanus Parkinson, *J. Voy. South Seas* 46 (1773)

Pandanus canaranus Warb*., Pflanzenr. (Engler) Pandan*. 75 (1900); Gamble, *Fl. Madras* 1570 (1931); Vajr., *Fl. Palghat Dist* 529 (1990).

Habit : Shrub
Ecosystem preference : Moist deciduous forest
Distribution : Indo - Pacific
Endemism : Peninsular India
IUCN Category : Not Evaluated (NE)
Habitat : Along banks of rivers
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional

Phenology : July - August
Altitude preference : Low altitude water sources like river banks, canals etc.
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Cheranpara, 10°49'29.62"N, 76°40'38.63"E, 86m, 27 June 2017, Aswani & Maya, 202 (GVCH); Pazhampullikaadu, 10°50'09.55"N, 76°38'28.33"E, 16 October 2018, Aswani & Maya, 3162 (GVCH); Aduppukootimala, 10°49'38.80"N, 76°44'16.08"E, 16.02.2021, Aswani & Maya, 6505 (GVCH) **(Plate 9: Fig. e)**.

Liliales

Colchicaceae

***Gloriosa L.**, Sp. Pl.* 1: 305 (1753)

Gloriosa superba L., *Sp. Pl.* 1: 305 (1753); Hook. f., *FBI* 6: 358. 1892; Gamble, *Fl. Madras* 1519 (1928); Vajr., *Fl. Palghat Dist* 510 (1990); Sasidh., *Fl. Parambikulam WLS* 354 (2002).

Habit : Climber
Ecosystem preference : Moist deciduous and semi evergreen forests and plains
Distribution : Indo – Pacific and African
IUCN Category : Least Concern (LC)
Habitat : Outskirts of hillocks and road sides
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Common
Phenology : July - December
Altitude preference : Commonly found in all altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Cheranpara, 10°48'59.96"N , 76°45'22.61"E, 131m, 26 June 2018, Aswani & Maya, 2377 (GVCH); Jamanthimala, 10°52'10.20"N, 76°47'15.00"E, 765m, 23 June 2019, Aswani & Maya, 4127 (GVCH); Pettikallu, 10° 52' 7.896" N, 76° 42' 19.8" E, 244m, 19 July 2019, Aswani & Maya, 4271 (GVCH); Mayappalam, 10°48'07.06"N, 76°46'14.88"E, 157m, 06 September 2019, Aswani & Maya, 4652 (GVCH); Edamala, 10°50'8.57"N, 76°38'57.48"E, 104m, 16 October 2019, Aswani & Maya, 4705 (GVCH); Koyyamarakadu, 10°47'40.58"N, 76°45'27.05"E, 139m, 30 November 2019, Aswani & Maya, 5304 (GVCH) **(Plate 9: Fig. f)**.

Smilacaceae

Smilax L., *Sp. Pl.* 2: 1028 (1753)

Key to species

Fruits a globose berry ……..….*S. wightii*
Fruits an ovoid berry ……..….*S. zeylanica*

Smilax wightii A.DC., *Monogr. Phan. [A.DC. & C.DC.]* 1: 174 (1878); Hook. f., *FBI* 6: 310 (1892); Gamble, *Fl. Madras* 1519 (1928); Sasidh., *Fl. Parambikulam WLS* 351 (2002).

Habit : Climber
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
Endemism : Southern Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Found in shady places
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Occasional
Phenology : November - May
Altitude preference : Found in medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Ponthancheeni, 10°50'03.12"N , 76°44'33.36"E, 330m, 12 January 2019, Aswani & Maya, 3725 (GVCH); Jamanthimala, 10°51'53.64"N, 76°47'16.80"E, 586m, 23 June 2019,

Aswani & Maya, 4091 (GVCH) **(Plate 9: Fig. g)**.

Smilax zeylanica L., *Sp. Pl.* 2: 1029 (1753); Hook. f., *FBI* 6: 309 (1892); Gamble, *Fl. Madras* 1518 (1928); Vajr., *Fl. Palghat Dist* 511 (1990); Sasidh., *Fl. Parambikulam WLS* 351 (2002); *Smilax macrophylla* Roxb., Hook. f., *FBI* 6: 310 (1892).

Habit : Climber
Ecosystem preference : Moist deciduous and semi – evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Shady moist places in forest tracts
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Common
Phenology : July - January
Altitude preference : Found common in medium and higher altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kavarakundu, 10°51'59.76"N , 76°42'26.64"E, 212m, 10 March 2018, Aswani & Maya, 1504 (GVCH); G. P. Nair estate, 10°53'29.76"N, 76°39'50.76"E, 284m, 24 March 2018, Aswani & Maya, 1770 (GVCH), Jamanthimala, 10°52'04.24"N, 76°47'13.29"E, 722m, 09 January 2020, Aswani & Maya, 5666 (GVCH) **(Plate 9: Fig. h)**.

Asparagales

Orchidaceae

Key to Genera

1. Plants that are epiphytic..……..…2
- Plants that are terrestrial…...…..…6
2. Leaves usually ensiform…*Oberonia*
- Leaves usually long linear……..…3
3. Lip without a spur…...*Dendrobium*
- Lip spurred…….……..……..4
4. Spur at base of lip, spur not curved……..……..…….5
- Spur not at the base of lip, spur curved…….…..……*Aerides*
5. Sepals and petals narrowed to the base……..…. *Vanda*
- Sepals and petals broad to the base…….…..…...……*Acampe*
6. Plants with single leaf……...……..7
- Plants with more than one leaf……..……8
7. Leaves appear after flowering……....…*Nervilia*
- Leaves appear along with the flowers……....*Disperis*
8. Flowers purplish…….....*Crepidium*
- Flowers green, white or cream coloured…….……...….9
9. Lateral sepals larger, deflexed; petals and sepals sub equal…….…..... *Habenaria*
- Lateral sepals not much larger, erect; petals and sepals unequal……...… *Peristylus*

Acampe Lindl., *Fol. Orchid. 4(Acampe)*: 1 (1853)

Acampe praemorsa (Roxb.) Blatt. & Mc Cann, *J. Bombay Nat. Hist. Soc.* 35: 495 (1932); Vajr., *Fl. Palghat Dist* 465 (1990); Sasidh., *Fl. Parambikulam WLS* 321 (2002); *Saccolabium praemorsum* (Roxb.) Hook.f., *FBI* 6: 62 (1890).; *Acampe wightiana* Lindl., Gamble, *Fl. Madras* 1447 (1928).

Habit : Herb
Ecosystem preference : Moist deciduous forests and plains
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Common epiphyte in the forest tracts
Raunkiaer's Life form : Epiphyte
Distribution Frequency : Common
Phenology : March - April

Altitude preference : Found common in lower and middle altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kochithodu, 10° 52' 7.896" N, 76° 42' 19.8" E, 244m, 14 May 2019, Aswani & Maya, 3949 (GVCH); Jamanthimala, 10°52'10.20"N, 76°47'15.00"E, 765.96m, 23 March 2019, Aswani & Maya, 4123 (GVCH); Moochikadavu, 10°52'28.20"N, 76°42'38.52"E, 346.25m, 19 July 2019, Aswani & Maya, 4398 (GVCH); Chacolas estate, 10°51'23.03"N, 76°44'29.39"E, 219.45m, 02 August 2019, Aswani & Maya, 4477 (GVCH) **(Plate 10: Fig. a)**.

Aerides Lour., *Fl. Cochinch.* 2: 525 (1790)

Aerides maculosa Lindl., *Edwards's Bot. Reg.* 31: 58 (1845); Hook. f., *FBI* 6: 45 (1890); Gamble, *Fl. Madras* 1442 (1928); Vajr., *Fl. Palghat Dist* 466 (1990).

Habit : Herb
Ecosystem preference : Evergreen forests and grasslands
Distribution : Indo - Pacific
Endemism : Peninsular India
IUCN Category : Not Evaluated (NE)
Habitat : Found as an epiphyte in large trees in grasslands
Raunkiaer's Life form : Epiphyte
Distribution Frequency : Occasional
Phenology : June - August
Altitude preference : Found in medium and higher altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Ayyappan Mala, 10°49'11.44"N , 76°44'24.46"E, 346.45m, 26 June 2018, Aswani & Maya, 2584 (GVCH); Mannukunnu, 10°52'5.50"N, 76°38'30.27"E, 181m, 09 July 2019, Aswani & Maya, 4213 (GVCH) **(Plate 10: Fig. b)**.

Crepidium Blume, *Bijdr. Fl. Ned. Ind.* 8: 387 (1825)

Crepidium purpureum (Lindl.) Szlach., *Fragm. Florist. Geobot. Supp.* 3: 131 (1995); *Microstylis wallichii* sensu Hook. f., *FBI* 5:686 (1888); Gamble, *Fl. Madras* 1407 (1928); *Malaxis acuminata* auct. non D. Don, Vajr., *Fl. Palghat Dist* 484 (1990).

Basionym: *Microstylis purpurea* Lindl. in *Gen. Sp. Orchid. Pl.*: 20 (1830)

Habit : Herb
Ecosystem preference : Evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found in canopy rich forest floors
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Rare
Phenology : April- May
Altitude preference : Found in medium and higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala, 10°51'59.76"N, 76°47'15.36"E, 641.29m, 23 June 2019, Aswani & Maya, 4118 (GVCH) **(Plate 10: Fig. c)**.

Dendrobium Sw., *Nova Acta Regiae Soc. Sci. Upsal.* ser. 2, 6: 82 (1799), nom. cons.

Key to species

Mid lobe of lip rhomboid, bearded with yellow hairs at base……*D. barbatulum*
Mid lobe of lip subquadrate, disc pubescent..……..…..…..…*D. ovatum*

Dendrobium barbatulum Lindl., *Gen. Sp. Orchid. Pl.* 84 (1830); Hook. f., *FBI* 5: 719

Plate 9 Fig. a. *Dioscorea oppositifolia* L. **b.** *Dioscorea pentaphylla* L. **c.** *Dioscorea spicata* Roth **d.** *Dioscorea wallichii* Hook. f. **e.** *Pandanus canaranus* Warb. **f.** *Gloriosa superba* L. **g.** *Smilax wightii* A. DC. **h.** *Smilax zeylanica* L.

(1890); Gamble, *Fl. Madras* 1416 (1928); Vajr., *Fl. Palghat Dist* 473 (1990).

Habit : Herb
Ecosystem preference : Evergreen forests and grasslands
Distribution : Indo - Pacific
Endemism : Peninsular India
IUCN Category : Not Evaluated (NE)
Habitat : Found attached to tree trunks
Raunkiaer's Life form : Epiphyte
Distribution Frequency : Rare
Phenology : December - January
Altitude preference : Found in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kundanmala, 10° 53' 39.12" N, 76° 41' 47.2056" E, 1011m, 27 February 2019, Aswani & Maya, 6126 (GVCH) **(Plate 10: Fig. d)**.

Dendrobium ovatum Kraenzl., *Pflanzenr. (Engler) Orch.-Dendrob. pars* 1, 71 (1910); Gamble, *Fl. Madras* 1416 (1928); Vajr., *Fl. Palghat Dist.* 474 (1990); Sasidh., *Fl. Parambikulam WLS* 326 (2002); *Dendrobium chlorops* Lindl, Hook. f., *FBI* 5: 719 (1890).

Habit : Herb
Ecosystem preference : Evergreen forests and grasslands
Distribution : Indo - Pacific
Endemism : Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Found attached to tree trunks
Raunkiaer's Life form : Epiphyte
Distribution Frequency : Rare
Phenology : December - January
Altitude preference : Found in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala, 10°52'18.21"N, 76°46'37.80"E, 876m, 09 January 2020, Aswani & Maya, 5756 (GVCH) **(Plate 10: Fig. e)**.

Disperis Sw., *Kongl. Vetensk. Acad. Nya Handl.* Ser. 2, 21: 218 (1800)

Disperis monophylla Blatt. ex C.E.C.Fisch., *Fl. Madras* 3(8): 1477 (1928).

Habit : Herb
Ecosystem preference : Evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found at the foot of large trees
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Rare
Phenology : May - June
Altitude preference : Found in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala, 10°52'10.20"N , 76°47'15.00"E, 765m, 23 March 2020, Aswani & Maya, 4115 (GVCH) **(Plate 10: Fig. f)**.

Habenaria Willd., *Sp. Pl.*, ed. 4 [Willdenow] 4(1): 5 (44) (1805)

Key to species

1. Petals entire…...……..…..*H. furcifera*
- Petals 2 - partite……..……2
2. Stem leafy upwards; leaves often many, ovate - lanceolate; Inflorescence many flowered……...…..*H. digitata*
2. Stem leafy only near at the base; leaves 3 or more linear - oblong; Inflorescence 1 to 4 flowered……..……..….*H. rariflora*

Habenaria digitata Lindl., *Gen. Sp. Orchid. Pl.* 307 (1835); Hook. f., *FBI* 6: 134 (1890); Gamble, *Fl. Madras* 1469 (1928); Vajr., *Fl. Palghat Dist* 481 (1990); *Habenaria travancorica* Hook. f., *FBI* 6: 135 (1890); *Habenaria digitata* Lindl. var.

travancorica (Hook. f.) C.E.C. Fisch. in Gamble, *Fl. Madras* 1469 (1928).

Habit : Herb
Ecosystem preference : Moist deciduous and semi - evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found in canopy rich forest tracts
Raunkiaer's Life form: Geophyte (Cryptophyte)
Distribution Frequency : Rare
Phenology : August - November
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Mannukunnu, 10°52'5.50"N, 76°38'30.27"E, 181m, 09 July 2019, Aswani & Maya, 4198 (GVCH) **(Plate 10: Fig. g)**.

Habenaria furcifera Lindl., *Gen. Sp. Orchid. Pl.* 319 (1835); Hook. f., *FBI* 6: 149 (1890); Vajr., *Fl. Palghat Dist* 481 (1990); *Habenaria ovalifolia* Wight, Hook. f., *FBI* 6: 149 (1890); C.E.C. Fisch. in Gamble, *Fl. Madras* 1471 (1928); Sasidh., *Fl. Parambikulam WLS* 329 (2002).

Habit : Herb
Ecosystem preference : Moist deciduous and semi - evergreen forests
Distribution : Indo - Pacific
Endemism : Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Found in ground storey in forest floors
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Rare
Phenology : August - September
Altitude preference : Found in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, S Medu, 10°51'20.17"N, 76°47'4.18"E, 645m, 25 November 2020, Aswani & Maya, 6360 (GVCH) **(Plate 10: Fig. h)**.

Habenaria rariflora A.Rich., *Ann. Sci. Nat., Bot.* sér. 2, 15: 70 (1841); Hook. f., *FBI* 6: 136 (1890); Gamble, *Fl. Madras* 1469 (1928); Sasidh., *Fl. Parambikulam WLS* 330 (2002).

Habit : Herb
Ecosystem preference : Grasslands
Distribution : Indo - Pacific
Endemism : Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Found in open grasslands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : July - September
Altitude preference : Found in lower and medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Ayyappan Mala, 10°49'06.39"N, 76°44'39.99"E, 217.6m, 26 June 2018, Aswani & Maya, 2555 (GVCH) **(Plate 11: Fig. a)**.

Nervilia Comm. ex Gaudich., *Voy. Uranie, Bot.* 422, t. 35 (1829)

Key to species

1. Leaf raised above the ground; petiole long…..……..……2
- Leaf appressed to the ground; petiole short……..……..3
2. Leaf margins maroonish - brown……..... *N. infundibulifolia*
- Leaf margins green…...*N. concolor*
3. Leaves green, but mottled with purplish brown patches.....*N. plicata*
- Leaves green without any mottling….……*N. crociformis*

Nervilia concolor Schltr., Bot. Jahrb. Syst. 45(3): 404 (1911); *Pogonia carinata* Lindl.,

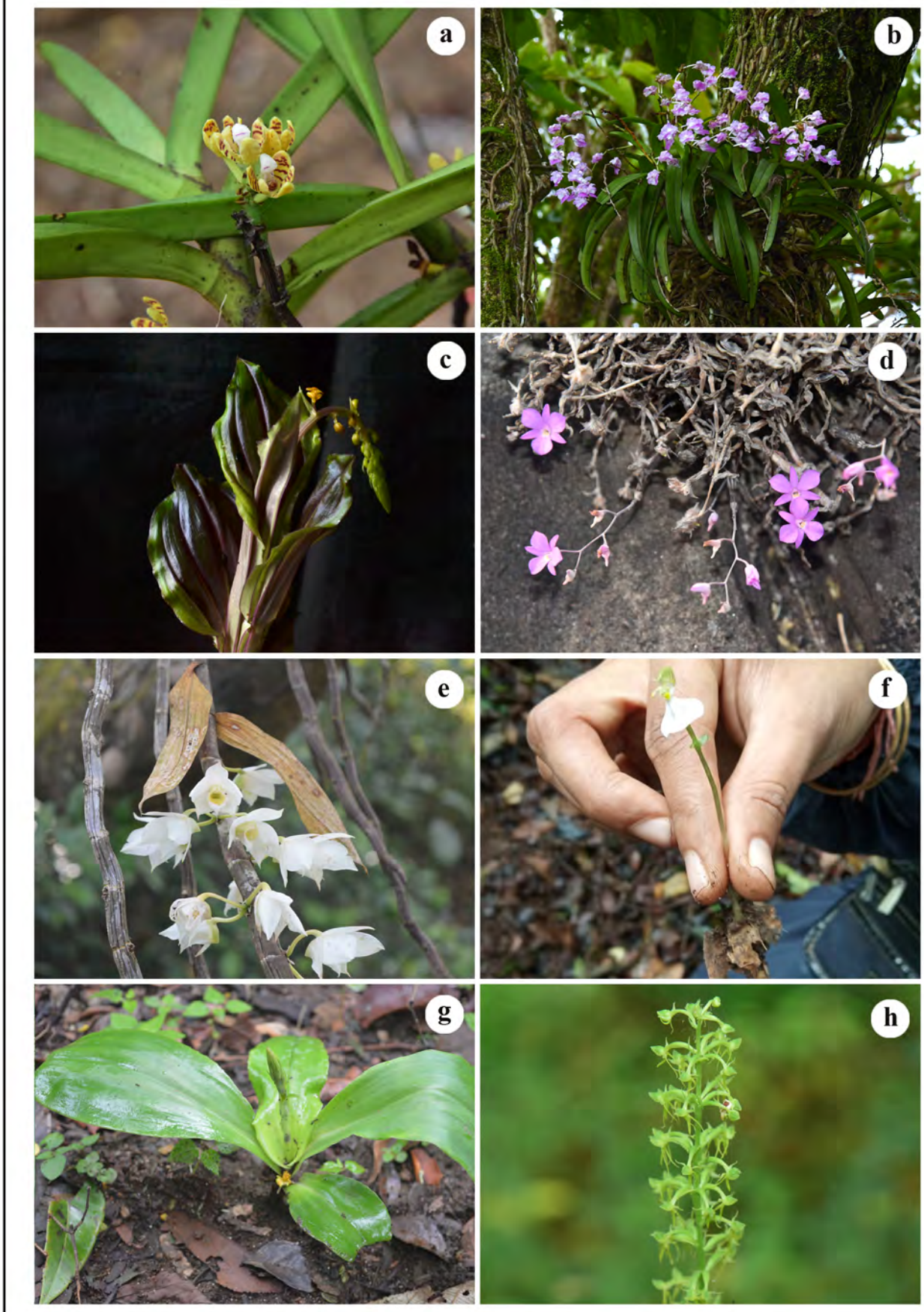


Plate 10: Fig. a. *Acampe praemorsa* (Roxb.) Blatt. & McCann **b.** *Aerides maculosa* Lindl. **c.** *Crepidium purpureum* (Lindl.) Szlach. **d.** *Dendrobium barbatulum* Lindl. **e.** *Dendrobium ovatum* Kraenzl. **f.** *Disperis monophylla* Blatt. ex C.E.C.Fisch . **g.** *Habenaria digitata* Lindl. **h.** *Habenaria furcifera* Lindl.

Hook. f., *FBI* 6: 120 (1890).; *Pogonia flabelliformis* Lindl, Hook. f., *FBI* 6: 121 (1890).; *Pogonia scottii* Rchb.f., Hook. f., *FBI* 6: 120 (1890).; *Nervilia carinata* (Lindl.) Schltr. in Engl., Gamble, *Fl. Madras* 1459 (1928).; *Nervilia aragoana* Gaud. in Freyc., Gamble, *Fl. Madras* 1459 (1928); Sasidh., *Fl. Parambikulam WLS* 332 (2002).

Habit : Herb
Ecosystem preference : Semi – evergreen and evergreen forests
Distribution : Indo - Pacific, Holarctic and Australian
IUCN Category : Not Evaluated (NE)
Habitat : Canopy rich forest tracts with rich humus
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Rare
Phenology : April - May
Altitude preference : Found in lower and medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Pettikallu, 10°52'34.26"N , 76° 42 '40.48"E, 36m, 19 July 2019, Aswani & Maya, 4394 (GVCH).

Nervilia infundibulifolia Blatt. & McCann, *J. Bombay Nat. Hist. Soc.* 35: 725 (1932).

Habit : Herb
Ecosystem preference : Moist deciduous and semi – evergreen forest
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Canopy rich forest tracts with rich humus
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Rare
Phenology : June - July
Altitude preference : Found in lower and medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Pettikallu, 10°52'34.26"N, 76° 42 '40.48 "E, 367m, 19 July 2019, Aswani & Maya, 4395 (GVCH) **(Plate 11: Fig. b)**.

Nervilia plicata Schltr., *Bot. Jahrb. Syst.* 45(3): 403 (1911); Gamble, *Fl. Madras* 1458 (1928); Vajr., *Fl. Palghat Dist* 485 (1990); Sasidh., *Fl. Parambikulam WLS* 332 (2002); *Pogonia biflora* Wight, Hook. f., *FBI* 6: 119 (1890); *Pogonia plicata* (Roxb.) Lindl., Hook. f., *FBI* 6: 119 (1890).; *Nervilia biflora* (Wight) Schltr. in Engl., Gamble, *Fl. Madras* 1459 (1928).

Habit : Herb
Ecosystem preference : Moist deciduous forest
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Canopy rich forest tracts with rich humus
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Rare
Phenology : February - March
Altitude preference : Found in lower and medium altitudes in hill slopes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Moochikadavu, 10°52'28.20"N, 76°42'38.52"E, 346m, 19 July 2019, Aswani & Maya, 4347(GVCH) **(Plate 11: Fig. c)**.

Nervilia simplex (Spreng.) Schltr., *Bot. Jahrb. Syst.* 45(3): 401 (1911); *Nervilia monantha* Blatt. & McCann, Gamble, *Fl. Madras* 1886 (1928); *Nervilia crociformis* (Zoll. & Mor.) Seidenf. Sasidh., *Fl. Parambikulam WLS* 332 (2002).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo – Pacific, Holarctic and Australian
IUCN Category : Not Evaluated (NE)

Habitat : Canopy rich forest tracts with rich humus
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Rare
Phenology : May - June
Altitude preference : Found in lower altitudes in hill slopes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Mannukunnu, 10°52'5.50"N, 76°38'30.27" E, 181m, 09 July 2019, Aswani & Maya, 4191(GVCH) **(Plate 11: Fig. d)**.

Oberonia Lindl., *Gen. Sp. Orchid. Pl.* 15 (1830), nom. cons.

Oberonia bicornis Lindl., *Gen. Sp. Orchid. Pl. Sig.* 1: 16 (1830); Hook. f., *FBI* 5: 682 (1888).

Habit : Herb
Ecosystem preference : Evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found as epiphyte in trees in grassland valleys
Raunkiaer's Life form : Epiphyte
Distribution Frequency : Rare
Phenology : October - November
Altitude preference : Found in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Aduppukootimala, 10°50'15.72"N, 76°44'28.68"E, 443m, 16 February 2021, Aswani & Maya, 6497(GVCH) **(Plate 11: Fig. e)**.

Peristylus Blume, *Bijdr. Fl. Ned. Ind.* 8: 404 (-405) (1825), nom. cons.

Peristylus spiralis A.Rich., *Ann. Sci. Nat., Bot. sér.* 2, 15: 69, t. 2 B (1841); Gamble, *Fl. Madras* 1474 (1928); *Habenaria torta* Hook.f., *FBI* 6: 159 (1890).

Habit : Herb
Ecosystem preference : Semi – evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Open forest areas
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Rare
Phenology : November - March
Altitude preference : Found in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, S - Medu, 10°50'26.52"N , 76°50'04.56"E, 214m, 25 November 2020, Aswani & Maya, 6362(GVCH) **(Plate 11: Fig. f)**.

Vanda Jones ex R.Br., Bot. Reg. 6: t. 506 (1820)

Vanda testacea Rchb.f., *Gard. Chron. n.s.,* 8: 166 (1877); Vajr., *Fl. Palghat Dist* 495 (1990); Sasidh., *Fl. Parambikulam WLS* 339 (2002); *Aerides wightiana* Lindl.; Hook. f., *FBI* 6: 50 (1890); *Vanda parviflora* Lindl., Hook. f., *FBI* 6: 50 (1890); Gamble, *Fl. Madras* 1444 (1928).

Habit : Herb
Ecosystem preference : Moist deciduous forests and in plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found in open forest areas and residential areas
Raunkiaer's Life form : Epiphyte
Distribution Frequency : Common
Phenology : April - May
Altitude preference : Found in lower altitudes as epiphyte in trees
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Poozhikunnu, 10°51'20.44"N,

76°43'38.28"E, 118m, 09 November 2017, Aswani & Maya, 870(GVCH); Olappallam, 10°49'53.04"N, 76°43'41.52"E, 127m, 25 November 2017, Aswani & Maya, 1003 (GVCH) **(Plate 11: Fig. g)**.

Hypoxidaceae

Key to genera

Anthers basifixed…….. *Curculigo*
Anthers dorsifixed ……..... *Hypoxis*

Curculigo Gaertn., *Fruct. Sem. Pl. i.* 63. t. 16 (1788)

Curculigo orchioides Gaertn., *Fruct. Sem. Pl. i.* 63. t. 16. (1788); Hook. f., *FBI* 6: 279 (1892); Gamble, *Fl. Madras* 1502 (1928); Vajr., *Fl. Palghat Dist* 505 (1990); Sasidh., *Fl. Parambikulam WLS* 352 (2002).

Habit : Herb
Ecosystem preference : Moist deciduous and evergreen forests and grasslands
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found in shady forest tracts
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Common
Phenology : June - December
Altitude preference : Found commonly growing in all altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kezhakootimala, 10°51'53.30"N, 76°37'36.39"E, 361m, 15 September 2017, Aswani & Maya, 490(GVCH); Olappalam, 10°49'53.78"N, 76°43'34.38"E, 131.67m, 25 November 2017, Aswani & Maya, 989(GVCH); Ayyappan Mala, 10°48'59.96"N, 76°45'22.61"E, 131m, 26 June 2018, Aswani & Maya, 2414(GVCH); Kottamutti waterfalls, 10°49'42.94"N, 76°46'47.87"E, 206m, 23 September 2018, Aswani & Maya, 2910(GVCH); Kanyarmuttu – Aduppukootimala, 10°49'50.52"N, 76°44'24.72"E, 222m, 12 January 2019, Aswani & Maya, 3695 (GVCH); Pettikkallu, 10° 52' 7.89" N,76°42'19.8" E, 244m, 19 July 2019, Aswani & Maya, 4295(GVCH); Jamanthimala, 10°51'53.64"N, 76°47'16.80"E, 586m, 09 January 2020, Aswani & Maya, 5640 (GVCH) **(Plate 11: Fig. h)**.

Hypoxis L., *Syst. ed. X* 986 (1759)

Hypoxis aurea Lour., *Fl. Cochinch.* 1: 200 (1790); Hook. f., *FBI* 6: 277 (1892); Gamble, *Fl. Madras* 1501 (1928); Sasidh., *Fl. Parambikulam WLS* 352 (2002).

Habit : Herb
Ecosystem preference : Grasslands
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found in open grasslands
Raunkiaer's Life form : Geophyte
Distribution Frequency : Rare
Phenology : May - August
Altitude preference : Found in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala, 10°52'21.00"N, 76°47 '00.24"E, 848m, 23 June 2019, Aswani & Maya, 4134(GVCH) **(Plate 12: Fig. a)**.

Amaryllidaceae

Pancratium L., *Sp. Pl.* 1: 290 (1753)

Pancratium triflorum Roxb., in Fl. Ind., ed. 1832. 2: 126 (1832); Hook. f., *FBI* 6: 285 (1892); Gamble, *Fl. Madras* 1505 (1928); Vajr., *Fl. Palghat Dist* 505 (1990); Sasidh., *Fl. Parambikulam WLS* 353 (2002); *Pancratium verecundum* Wight, Hook. f., *FBI* 6: 286 (1892).

Habit : Herb
Ecosystem preference : Moist deciduous forest
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found in open forest tracts
Raunkiaer's Life form: Geophyte (Cryptophyte)
Distribution Frequency : Rare
Phenology : March - May
Altitude preference: Found in lower altitudes
Specimen examined: INDIA, Kerala: Palakkad District, Walayar range, G. P. Nair estate, 10° 53 '20.76"N, 76° 39' 41.04"E, 179m, 24 March 2018, Aswani & Maya, 1642(GVCH) **(Plate 12: Fig. b)**.

Asparagaceae

Key to genera

Leaves reduced to cladodes; scandent shrubs……. *Asparagus*
Leaves normal and well developed; erect herbs……..…..… *Chlorophytum*

Asparagus L., *Sp. Pl.* 1: 313 (1753)

Key to species

Cladodes triquetrous; lower spines long……..……..*A. racemosus*
Cladodes flat, spines all short…….. *A. gonocladus*

Asparagus gonocladus Baker, *J. Linn. Soc., Bot.* 14: 627 (1875); Hook. f., *FBI* 6:318 (1892); Gamble, *Fl. Madras* 1517 (1928); Vajr., *Fl. Palghat Dist* 510 (1990).

Habit : Climber
Ecosystem preference : Moist deciduous forests
Distribution: Indo - Pacific
Endemism : Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Found as a common climber in open forests
Raunkiaer's Life form: Geophyte (Cryptophyte)
Distribution Frequency : Common
Phenology : July -August
Altitude preference : Found in lower and middle altitudes
Specimens examined: INDIA, Kerala: Palakkad District, Walayar range, Ayyappan Mala, 10°49'11.44"N, 76°44'24.46"E, 346.25m, 26 June 2018, Aswani & Maya, 2596(GVCH); Kochithodu, 10°52'20.16"N, 76°42'39.96"E, 304m, 14 May 2019, Aswani & Maya, 3965(GVCH); Jamanthimala, 10°52'04.24"N, 76°47'13.29"E, 722m, 23 June 2019, Aswani & Maya, 4116(GVCH); Chacolas, 10°51'23.03"N, 76°44'29.39"E, 219m, 02 August 2019, Aswani & Maya, 4495(GVCH).

Asparagus racemosus Willd., *Sp. Pl.,* ed. 4 [Willdenow] 2(1): 152 (1799); Hook. f., *FBI* 6: 316 (1892); Gamble, *Fl. Madras* 1517 (1928).

Basionym: *Protasparagus racemosus* (Willd.) Oberm., *S. African J. Bot.* 2(3): 244 (1983).

Habit : Climber
Ecosystem preference : Moist deciduous forests and plains
Distribution : Indo – Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Found in open forest floors
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Occasional
Phenology : July - August
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range,

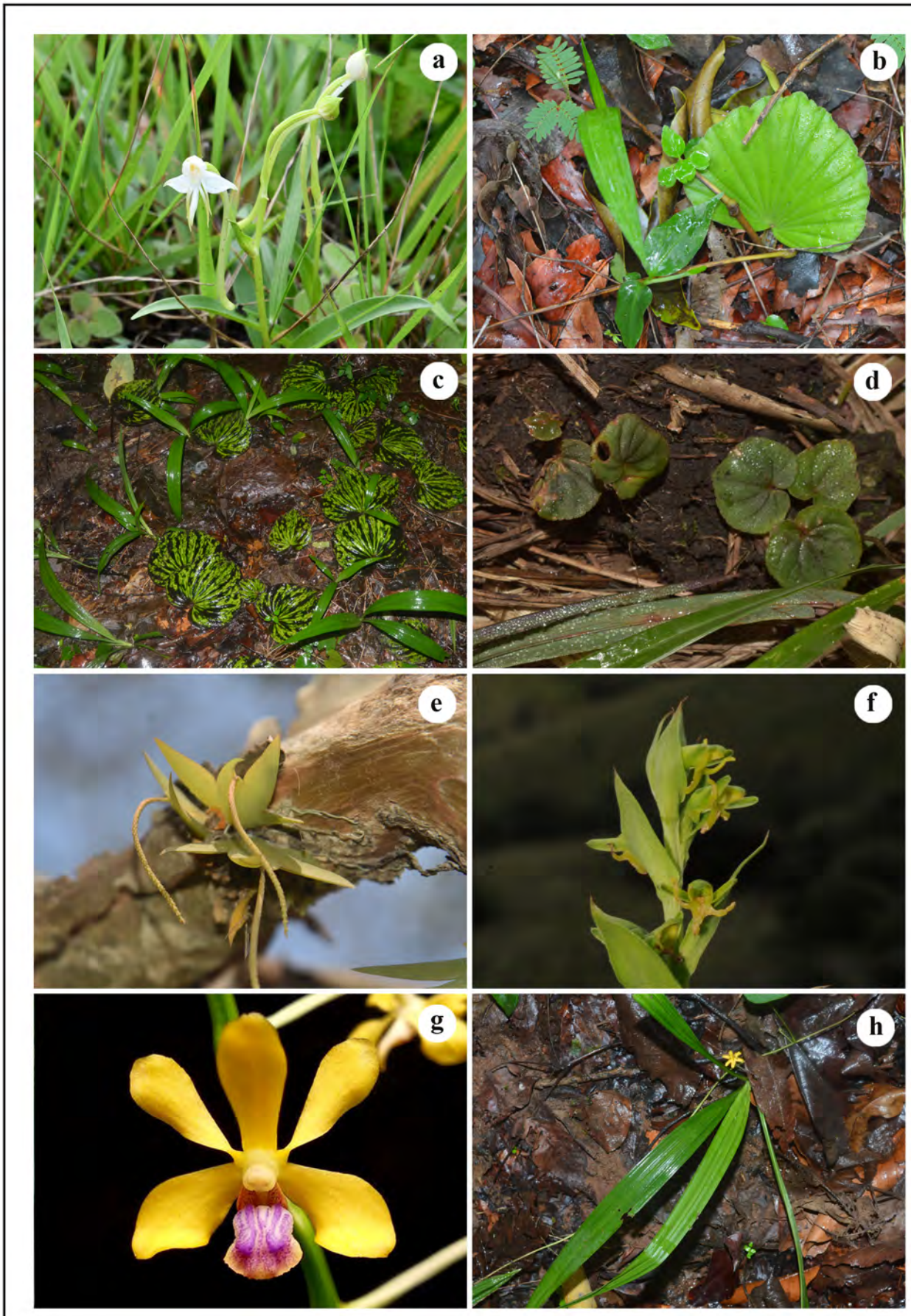


Plate 11: Fig. a. *Habenaria rariflora* A.Rich. **b.** *Nervilia infundibulifolia* Blatt. & McCann. **c.** *Nervilia plicata* Schltr. **d.** *Nervilia simplex* (Spreng.) Schltr. **e.** *Oberonia bicornis* Lindl. **f.** *Peristylus spiralis* A.Rich. **g.** *Vanda testacea* Rchb. **h.** *Curculigo orchioides* Gaertn.

Kavarakundu, 10°52'23.35"N , 76°42'39.58"E, 312.42m, 10 March 2018, Aswani & Maya, 1481(GVCH); Edamala, 10°50'11.04"N, 76°38'57.48"E, 114m, 16 October 2019, Aswani & Maya, 4784(GVCH) **(Plate 12: Fig. c)**.

Chlorophytum Ker Gawl., *Bot. Mag.* 27: t. 1071 (1807)

Chlorophytum nimmonii Dalzell, *Hooker's J. Bot. Kew Gard. Misc.* 2: 142 (1850); Sasidh., *Fl. Parambikulam WLS* 354 (2002); *Chlorophytum orchidastrum* sensu Hook.f., *FBI* 6: 336 (1892)p.p., non Lindl. (1824).

Habit : Herb
Ecosystem preference : Moist deciduous and semi – evergreen forests
Distribution : Indo – Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Canopy rich forest tracts
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Occasional
Phenology : August - November
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Ayyappan Mala, 10°48'59.96"N, 76°45'22.61"E, 131m, 26 June 2018, Aswani & Maya, 2419(GVCH); Chacolas, 10°51'16.20"N, 76°45'05.76"E, 285m, 02 August 2019, Aswani & Maya, 4532(GVCH) **(Plate 12: Fig. d)**.

IV.1.2.4. Commelinids

Arecales

Arecaceae

Key to genera

1. Stems climbing; leaves scattered throughout the plant; fruits scaly…..…… *Calamus*
   - Stems erect; leaves present as terminal crowns; fruits not scaly……2
2. Leaves simple……..……. *Borassus*
   - Leaves compound…...……..3
3. Lowermost pair of leaflets converted to long spines…..*Phoenix*
   - Lowermost pair of leaflets not modified to spines…….……...4
4. Leaflets fan shaped; spadix very long, drooping…….…….…. *Caryota*
   - Leaflets linear - lanceolate; spadix not much long ……..……..…...5
5. Apex of leaflets premorse; ovary one - celled……..…….. *Areca*
   - Apex of leaflets acuminate not premorse; ovary 3 - celled…. *Cocos*

Areca L., *Sp. Pl.* 2: 1189 (1753)

Areca catechu L., *Sp. Pl.* [Linnaeus] 2: 1189 (1753); Hook. f., *FBI* 6: 405 (1893); Gamble, *Fl. Madras* 1555 (1931); Vajr., *Fl. Palghat Dist* 525 (1990).
Habit : Tree
Ecosystem preference : Cultivated in plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Open areas near to forests
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : Throughout the year
Altitude preference : Found grown in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kallanpuzha, 10°51'34.02"N, 76°42'40.16"E, 140m, 26 January 2018, Aswani & Maya, 1335(GVCH); Poolakunnu, 10°51'33.12"N, 76°42'29.52" E, 141m, 10 March 2018, Aswani & Maya, 1416(GVCH); Kalliyara, 10°53'8.52"N,

76°39'38.88"E, 169m, 24 March 2018, Aswani & Maya, 1549(GVCH); Parachaathy, 10°50'38.76"N, 76°43'51.96" E, 147m, 02 January 2019, Aswani & Maya, 3628(GVCH); Moochikadavu, 10°52'13.80"N, 76°42'30.96"E, 258m, 10 December 2019, Aswani & Maya, 5419(GVCH).

Borassus L., *Sp. Pl.* 2: 1187 (1753)

Borassus flabellifer L., *Sp. Pl.* 2: 1187 (1753); Hook. f., *FBI* 6: 482 (1893); Gamble, *Fl. Madras* 1562 (1931); Vajr., *Fl. Palghat Dist* 526 (1990).

Habit : Tree
Ecosystem preference : In forest areas and in plains
Distribution : Indo – Pacific, African and Australian
IUCN Category : Not Evaluated (NE)
Habitat : Wastelands, margins of paddy fields and home steads
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : March - September
Altitude preference : Found in dam sites, hillocks and forest outskirts
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kava, 10°49'25.18"N, 76°43'29.96"E, 115m, 06 April 2018, Aswani & Maya, 1817(GVCH); Mayappallam, 10°48'01.78" N, 76°45'58.91"E, 115m, 10 May 2018, Aswani & Maya, 2149(GVCH); Ayyappan Mala, 10°49'07.40"N, 76°45'32.38"E, 170m, Aswani & Maya, 2598(GVCH); Kottamutti waterfalls, 10°49'46.20"N, 76°46'47.28"E, 202m, Aswani & Maya, 2857(GVCH); Kongampaadam, 10°48'36.72"N, 76°46'51.96"E, 151m, Aswani & Maya, 4605(GVCH); Anayappanchalla, 10°48'25.92"N, 76°48'35.19"E, 156.97m, Aswani & Maya, 5131(GVCH).

Calamus L., *Sp. Pl.* 1: 325 (1753)

Key to species

Stems upto 10m long; leaf sheaths small upto 1.3cm in diameter; fruit ovoid with scales in 21 rows……. *C. rotang*

Stems upto 20m or more longer; leaf sheaths upto 6 cm in diameter; fruit ovoid with scales in 12 rows…..…. *C. thwaitesii*

Calamus rotang L., *Sp. Pl.* 1: 325 (1753); Hook. f., *FBI* 6: 447 (1892); Gamble, *Fl. Madras* 1568 (1931).

Habit : Climber
Ecosystem preference : Moist deciduous forests and semi - evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Canopy rich forest tracts, Near forest streams and rivers
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : October - May
Altitude preference : Found in medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Parachaathy, 10°50'54.24"N, 76°43'55.92"E, 158m, 02 January 2019, Aswani & Maya, 3599 (GVCH); S- Medu, 10°51'20.17"N, 76°47'4.18"E, 645m, 23 June 2019, Aswani & Maya, 4063(GVCH); Chakolas , 10°51'21.60"N, 76°44'52.08"E, 264m, 02 August 2019, Aswani & Maya, 4506(GVCH); Chaatappara waterfalls, 10°53'11.76"N, 76°42'15.84"E, 599m, 10 December 2019, Aswani & Maya, 5474(GVCH); Jamanthimala, 10°51'53.64"N, 76°47'16.80"E, 586m, 09 January 2020, Aswani & Maya, 5625(GVCH) **(Plate 12: Fig. e)**.

Calamus thwaitesii Becc., *FBI* [J. D. Hooker] 6(18): 441 (1892); Sasidh., *Fl.*

Parambikulam WLS 363 (2002); *Calamus thwaitesii* Becc. var. *canaranus* Becc., Gamble, *Fl. Madras* 1567 (1931); Vajr., *Fl. Palghat Dist* 528 (1990).

Habit : Climber
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Canopy rich forest tracts, Near forest streams and rivers
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : March - January
Altitude preference : Found in higher altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thanni Place, 10°52'43.32"N, 76°45'54.07" E, 938m, 28 January 2020, Aswani & Maya, 3599 (GVCH); Aatumala, 10°53'52.08"N, 76°41'24"E, 1010m, 28 February 2020, Aswani & Maya, 6457 (GVCH) **(Plate 12: Fig. f)**.

Caryota L., *Sp. Pl.* 2: 1189 (1753)

Caryota urens L., *Sp. Pl.* 2: 1189 (1753); Hook. f., *FBI* 6: 422 (1892); Gamble, *Fl. Madras* 1560 (1931); Vajr., *Fl. Palghat Dist* 529 (1990); Sasidh., *Fl. Parambikulam WLS* 364 (2002).

Habit : Tree
Ecosystem preference : Moist deciduous forests and plains
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Margins of forests
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : January - April
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, G. P. Nair estate, 10°53'44.88"N , 76°39'46.08"E, 248.41m, 24 March 2018, Aswani & Maya, 1758(GVCH); Neelikunnu, 10°51'30.14"N, 76°37'30.67"E, 155m, 27 April 2018, Aswani & Maya, 1940(GVCH); Pettikallu, 10° 53' 2.04" N, 76° 42' 13.9248" E, 539m, 19 July 2019,
Aswani & Maya, 4382 (GVCH) **(Plate 12: Fig. g)**.

Cocos L., *Sp. Pl.* 2: 1188 (1753)

Cocos nucifera L., *Sp. Pl.* 2: 1188 (1753); Hook. f., *FBI* 6: 482 (1893); Gamble, *Fl. Madras* 1557 (1931); Vajr., *Fl. Palghat Dist* 529 (1990).

Habit : Tree
Ecosystem preference : In plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Not evaluated (NE)
Habitat : Cultivated in margins of forests and in plains
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : Throughout the year
Altitude preference : Found in Lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kallanpuzha, 10°51'34.02"N , 76°42'40.16"E, 140m, 26 January 2018, Aswani & Maya, 1333(GVCH); Kalliyara, 10°52'51.24"N, 76°39'24.84"E,127m, 24 March 2018, Aswani & Maya, 1535(GVCH); Ayyappan Mala, 10°48'59.96"N, 76°45'22.61"E, 131m, 26 June 2018, Aswani & Maya, 2504 (GVCH); Kochuthodu, 10°51'58.32"N, 76°42'22.32"E, 176m, 18 December 2018, Aswani & Maya, 3301(GVCH); Pothukunnu, 10° 53' 21.84" N, 76° 46' 33.24" E, 969m, 28 January 2020, Aswani & Maya, 5980 (GVCH).

Phoenix L., *Sp. Pl.* 2: 1188 (1753)

Phoenix loureiroi Kunth, *Enum. Pl.* [Kunth] 3: 257 (1841); *Phoenix loureiroi* Kunth, var. loureiroi; Vajr., *Fl. Palghat Dist* 528 (1990); Sasidh., *Fl. Parambikulam WLS* 364 (2002).

Habit : Shrub
Ecosystem preference : Grasslands
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Open forest areas
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : Throughout the year
Altitude preference : Found in higher altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kundanmala, 10° 53' 33.4824" N, 76° 41' 52.7676" E, 943m, 27 February 2020, Aswani & Maya, 6118(GVCH); Aatumala Thodu, 10° 53' 52.08" N, 76° 41' 24" E, 1010m, 27 February 2020, Aswani & Maya, 6143(GVCH) **(Plate 12: Fig. h)**.

Commelinales

Commelinaceae

1. Flowers arising from a spathaceous bracts or bracteoles…..…..…….2
- Flowers not arising from a spathaceous bracts or bracteoles….3
2. Fertile stamens 3; staminodes 1 -3; bracteoles absent…….. *Commelina*
- Fertile stamens 6; staminodes zero; biseriate, biseriate foliaceous bracteoles present…..... *Cyanotis*
3. Inflorescence dense…..… *Floscopa*
- Inflorescence lax……..……..4
4. Panicle short peduncled; flowers irregular; ovules 2 - many ovuled in each cell……..….... *Murdannia*
- Panicle long peduncled; flowers regular; one ovuled in each cell……..…..… *Rhopalephora*

Commelina L., *Sp. Pl.* 1: 40 (1753)

Key to species

1. Flowers yellow……..…C. wightii
- Flowers blue…...……..……..2
2. Capsule 2 loculed…….... *C. clavata*
- Capsule 3 loculed…..……..……..3
3. Plants rooting at nodes…..……. *C. benghalensis*
- Plants without roots at nodes…..…4
4. Mouth of leaf sheath ciliate; capsule oblong, apex beaked…….*C. diffusa*
- Mouth of leaf sheath with rufous hair; capsule trigonous, apex not beaked…….……. *C. paludosa*

Commelina benghalensis L., *Sp. Pl.* 1: 41 (1753); Hook. f., *FBI* 6: 370 (1892); Gamble, *Fl. Madras* 1539 (1931); Vajr., *Fl. Palghat Dist* 516 (1990); Sasidh., *Fl. Parambikulam WLS* 357 (2002).

Habit : Herb
Ecosystem preference : Moist deciduous forests and plains
Distribution : Indo - Pacific, Holarctic and African
IUCN Category : Least Concern (LC)
Habitat : Moisture rich shady regions
Raunkiaer's Life form : Hemicryptophyte
Distribution Frequency : Common
Phenology : July - November
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Cheranpara, 10°49'29.62"N, 76°40'38.63"E, 86m, 27 June 2017, Aswani & Maya, 181(GVCH); Ollapallam, 10°49'52.20"N, 76°43'44.19"E, 121m, 25 November 2017, Aswani & Maya, 929(GVCH); Walayar dam, 10°50'15.57"N,

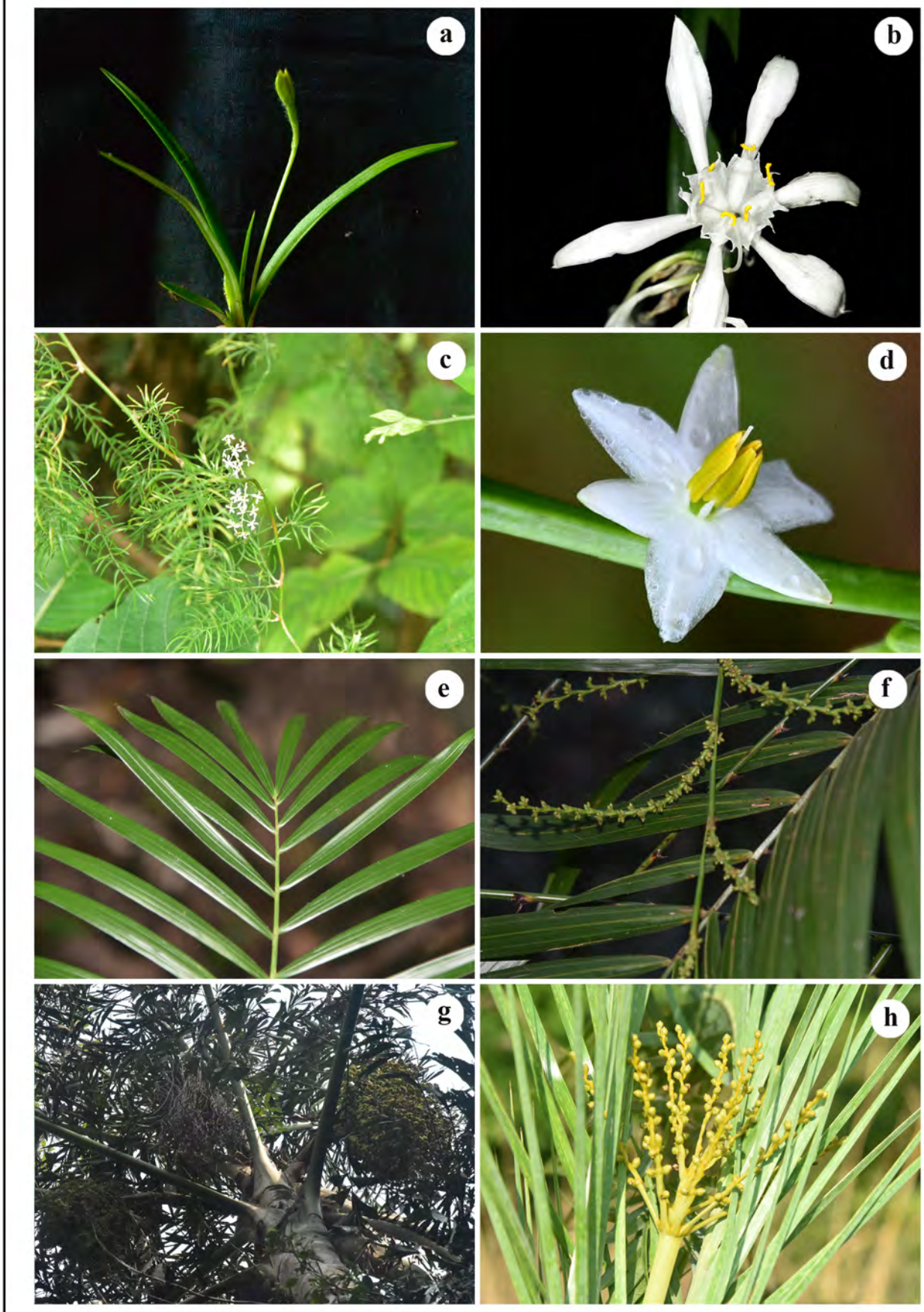


Plate 12: Fig. a. *Hypoxis aurea* Lour. **b.** *Pancratium triflorum* Roxb. **c.** *Asparagus racemosus* Willd. **d.** *Chlorophytum nimmonii* Dalzell **e.** *Calamus rotang* L. **f.** *Calamus thwaitesii* Becc. **g.** *Caryota urens* L. **h.** *Phoenix loureiroi* Kunth.

76°51'5.13"E, 189m, 09 May 2018, Aswani & Maya, 2002(GVCH); Kongampadam, 10°48'36.72"N, 76°46'51.96"E, 151m, 15 June 2018, Aswani & Maya, 2313(GVCH); Koomachimala,10°49'44.76"N, 76°40'30.72"E, 107m, 08 July 2019, Aswani & Maya, 4187(GVCH); Pallippara, 10°49'48.36"N, 76°43'44.04"E, 119m, 23 November 2019, Aswani & Maya, 5004 (GVCH) **(Plate 13: Fig. a).**

Commelina clavata C.B.Clarke, *Commelyn. Cyrtandr. Bengal* t. 5 (1874); Hook. f., *FBI* 6: 371 (1892); Gamble, *Fl. Madras* 1539 (1931).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Shady forest floors with enough moisture
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : September - July
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kaduvaachaal,10°50'26.38"N,76°40'30.88" E, 105m, 16 July2017, Aswani & Maya, 240(GVCH); Koomachimala, 10°49'44.76"N, 76°40'30.72"E, 107m, 05 October 2017, Aswani & Maya, 647(GVCH); Pallippara, 10°49'49.08"N, 76°43'47.28"E, 119m, 29 October 2017, Aswani & Maya, 708(GVCH); Ayyappan Mala, 10°49'07.40"N, 76°45'32.38"E, 170m, 06 January 2018, Aswani & Maya, 1218(GVCH); Pallakaadu, 10°51'30.96"N, 76°37'39.00"E, 151m, 09 October 2018, Aswani & Maya, 3045(GVCH); Chaavadippara, 10° 52' 42.204" N, 76° 48' 43.56" E, 242m, 28 January 2020, Aswani & Maya, 5834(GVCH) **(Plate 13: Fig. b).**

Commelina diffusa Burm.f., *Fl. Ind. (N. L. Burman)* 18, t. 7, f. 2 (1768); Vajr., *Fl. Palghat Dist* 516 (1990); Sasidh., *Fl. Parambikulam WLS* 357(2002).
Habit : Herb
Ecosystem preference : Moist deciduous forests and plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Wet regions in the forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : July - September
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Walayar dam, 10°50'24.58"N , 76°51'01.52"E, 199m, 09 May 2017, Aswani & Maya, 2005(GVCH);Mayappallam, 10°48'0.36"N, 76°45'58.68"E, 113m, 10 May 2018, Aswani & Maya, 2112(GVCH); Kongampadam, 10°48'40.59"N, 76°46'51.94"E, 128m, 15 June 2018, Aswani & Maya, 2292 (GVCH); Pallippara, 10°49'49.08"N, 76°43'47.28"E, 119m, 23 November 2019, Aswani & Maya, 2292 (GVCH); Anayappanchalla, 10°48'24.82"N, 76°48'30.73"E, 146m, 30 November 2019, Aswani & Maya, 5147 (GVCH) **(Plate 13: Fig. c)**.

Commelina paludosa Blume, *Enum. Pl. Javae* 1: 2 (1827); Vajr., *Fl. Palghat Dist.* 517 (1990); Sasidh., *Fl. Parambikulam WLS* 358 (2002); *Commelina obliqua* Buch.-Ham. ex D. Don, Hook. f., *FBI* 6: 372 (1892); Gamble, *Fl. Madras* 1539 (1931).

Habit : Herb
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Shady forest floor with enough moisture

Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : November - December
Altitude preference : Found frequently in higher altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Karakunnu, 10°50'25.10"N, 76°49'43.70"E, 211m, 30 December 2017, Aswani & Maya, 1067 (GVCH); Jamanthimala, 10°52'14.73"N, 76°46'46.15"E, 894m, 09 January 2020, Aswani & Maya, 5688 (GVCH) **(Plate 13: Fig. d)**.

Commelina wightii Raizada, *Indian Forester* 84(8): 479 (1958); Vajr., *Fl. Palghat Dist* 517 (1990); Sasidh., *Fl. Parambikulam WLS* 358 (2002); *Commelina glabra* (Wight) Clarke in A. & C. DC., Hook. f., *FBI* 6: 371 (1892); Gamble, *Fl. Madras* 1539 (1931).

Habit : Herb
Ecosystem preference : Moist deciduous forests, plains and wetlands
Distribution : Indo - Pacific
Endemism : Southern Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Exposed rocky regions and soil rich regions in hillock
Raunkiaer's Life form : Hemicryptophyte
Distribution Frequency : Occasional
Phenology : July - October
Altitude preference : Found in all altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thekke Malampuzha, 10°50'01.23"N, 76°40'58.49"E, 127m, 08 September 2017, Aswani & Maya, 416 (GVCH); Koomachimala, 10°49'45.32"N, 76°40'22.02"E, 228m, 05 October 2017, Aswani & Maya, 633(GVCH); Olappalam, 10°49'53.78"N, 76°43'34.38"E, 131m, 25 November 2017, Aswani & Maya, 1005(GVCH); Ayyappa Mala, 10°49'07.19"N, 76°44'50.28"E, 130m, 26 June 2018, Aswani & Maya, 2535(GVCH); Mayappalam, 10°48'0.36"N, 76°45'58.68"E, 113m, 06 September 2019, Aswani & Maya, 4672 (GVCH), Cheekuzhi, 10°50'8.57"N, 76°38'57.48"E, 104m, 16 October 2019, Aswani & Maya, 4733(GVCH); Jamanthimala, 10°52'17.83"N, 76°46'42.12"E, 909m, 09 January 2020, Aswani & Maya, 5780 (GVCH) **(Plate 13: Fig. e)**.

Cyanotis D.Don, *Prodr. Fl. Nepal.* 45 (1825)

Key to species

1. Inflorescence sessile, enclosed within leaf sheath…..... *C. axillaris*
- Inflorescence peduncled, not enclosed in leaf sheath……..…….2
2. Plants with basal rosette leaves……..……3
- Plants without basal rosette leaves……..……..……..4
3. Root fibres tuberous….. *C. tuberosa*
- Root fibres without any tubers……..…..……. *C. pilosa*
4. Style with hairs (bearded).....*C. burmanniana*
- Style without hairs (not bearded)..... *C. cristata*

Cyanotis axillaris (L.) D.Don ex Sweet, *Hort. Brit. [Sweet]* 430 (1826); Hook. f., *FBI* 6:388 (1892); Gamble, *Fl. Madras* 1550 (1931); Sasidh., *Fl. Parambikulam WLS* 359 (2002); *Tonningia axillaris* (L.) O. Ktze., Vajr., *Fl. Palghat Dist* 524 (1990).

Habit : Herb
Ecosystem preference : Moist deciduous forests, wetlands and plains
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Moist regions in hillocks, plains and agricultural lands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : August - December

Altitude preference : Found in lower altitudes in wet regions
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Cheranpara, 10°49'29.62"N, 76°40'38.63"E, 86m, 27 June 2017, Aswani & Maya, 182(GVCH); Koomachimala, 10°49'44.76"N, 76°40'34.59"E, 102m, 05 October 2017, Aswani & Maya, 646(GVCH); Mayappalam, 10°48'0.36"N, 76°45'58.68"E, 113m, 10 May 2018, Aswani & Maya, 2105(GVCH); Kongampaadam, 10°48'40.59"N, 76°46'51.94"E, 128m, 15 June 2018, Aswani & Maya, 2304 (GVCH); Ayyappan Mala, 10°49'06.91"N, 76°44'44.91"E, 150.80m, 26 June 2018, Aswani & Maya, 2505(GVCH); Mayappalam, 10°48'01.78"N, 76°45'58.91"E, 115m, 06 September 2019, Aswani & Maya, 4700(GVCH); Anayappanchalla, 10°48'24.82"N, 76°48'30.73"E, 146.60m, 30 November 2019, Aswani & Maya, 5145(GVCH) **(Plate 13: Fig. f)**.

Cyanotis burmanniana Wight, *Icon. Pl. Ind. Orient.* [Wight] t. 2089. f. 2 (1853); Sasidh., *Fl. Parambikulam WLS* 359 (2002).; *Cyanotis papilionacea* (L.) Schult. f. var. *burmanniana* (Wight) Clarke in A. & C. DC., Hook. f., *FBI* 6: 385 (1892).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
Endemism : Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Commonly seen exposed rock surfaces in hillocks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : August - December
Altitude preference : Found common in lower altitudes in hillocks
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala, 10°49'44.76"N, 76°40'34.59"E, 102m, 31 July 2017, Aswani & Maya, 377 (GVCH); Thekke Malampuzha hillock, 10°50'03.76"N, 76°40'56.19"E, 120m, 08 September 2017, Aswani & Maya, 417(GVCH); Kezhakootimala, 10°51'53.30"N, 76°37'36.39"E, 361m, 15 September 2017, Aswani & Maya, 514 (GVCH); Karadikunnu, 10°50'20.20"N, 76°49'48.92"E, 202m, 30 December 2017, Aswani & Maya, 1094(GVCH); Pallakaadu, 10°51'30.96"N, 76°37'39.00"E, 151m, 09 October 2018, Aswani & Maya, 3031(GVCH); Kongampaadam, 10°48'39.80"N, 76°47'2.67"E, 130m, 06 September 2019, Aswani & Maya, 4567(GVCH); Pallippara, 10°49'49.08"N, 76°43'47.28"E, 120m, 23 November 2019, Aswani & Maya, 5038(GVCH) **(Plate 13: Fig. g)**.

Cyanotis cristata (L.) D.Don, *Prodr. Fl. Nepal.* 46, adnot. (1825); Hook. f., *FBI* 6: 385 (1892); Gamble, *Fl. Madras* 1549 (1931); Vajr., *Fl. Palghat Dist* 519 (1990); Sasidh., *Fl. Parambikulam WLS* 359 (2002).

Basionym: *Commelina cristata* L., *Sp. Pl.* 1: 42 (1753).

Habit : Herb
Ecosystem preference : Moist deciduous forests and plains
Distribution : Indo - Pacific and African
IUCN Category : Least Concern (LC)
Habitat : Moisture rich forest floors and waterlogged regions in hillocks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : July - October
Altitude preference : Found in low altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thonikadavu, 10°50'04.96"N, 76°40'48.72"

E, 115m, 17 September 2017, Aswani & Maya, 604(GVCH); Kozhimala, 10°50'06.45"N, 76°43'38.99"E, 188m, 09 November 2017, Aswani & Maya, 832 (GVCH); Ayyappan Mala, 10°49'11.44"N, 76°44'24.46"E, 346m, 26 June 2018, Aswani & Maya, 2602 (GVCH); Kongampaadam, 10°48'36.72"N, 76°46'51.96"E, 151m, 06 September 2019, Aswani & Maya, 4630 (GVCH) **(Plate 13: Fig. h)**.

Cyanotis pilosa Schult. & Schult.f., *Syst. Veg.,* ed. 15 bis [Roemer & Schultes] 7(2): 1155 (1830); Hook. f., *FBI* 6: 387 (1892); Gamble, *Fl. Madras* 1549 (1931); Vajr., *Fl. Palghat Dist* 520 (1990); Sasidh., *Fl. Parambikulam WLS* 360 (2002); *Cyanotis wightii* Clarke in A. & C. DC., Hook. f., *FBI* 6: 386 (1892).

Basionym: *Tonningia pilosa* (Schult. & Schult.f.) Kuntze, *Revis. Gen. Pl.* 2: 722 (1891).

Habit : Herb
Ecosystem preference : Semi evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Open forest tracts with good moisture
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : November - December
Altitude preference : Found in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kaatadikunnu, 10°50'21.84"N , 76° 39 '14.76"E, 267m, 16 October 2019, Aswani & Maya, 4808(GVCH).

Cyanotis tuberosa (Roxb.) Schult. & Schult.f., *Syst. Veg.,* ed. 15 bis [Roemer & Schultes] 7(2): 1153 (1830); Hook. f., *FBI* 7:386 (1892); Gamble, *Fl. Madras* 1549 (1931); *Cyanotis concanensis* Hassk., Vajr., *Fl. Palghat Dist* 519 (1990).

Basionym: *Tradescantia tuberosa* Roxb., *Pl. Coromandel* 2(1): 5, t. 108 (1799).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
Endemism : Peninsular India
IUCN Category : Not Evaluated (NE)
Habitat : Open forest tracks near grasslands
Raunkiaer's Life form :Geophyte (Cryptophyte)
Distribution Frequency : Rare
Phenology : October - December
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Azakumpara waterfalls, 10°50'28.32"N, 76°38'45.96"E, 184m, 16 October 2019, Aswani & Maya, 4837(GVCH) **(Plate 14: Fig. a)**.

Floscopa Lour., *Fl. Cochinch.* 1: 192 (1790)

Floscopa scandens Lour., *Fl. Cochinch.* 1: 193 (1790); Hook. f., *FBI* 6: 390 (1892); Gamble, *Fl. Madras* 1552 (1931); Vajr., *Fl. Palghat Dist* 521 (1990); Sasidh., *Fl. Parambikulam WLS* 360 (2002).

Habit : Herb
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Water logged forest areas
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : January - April
Altitude preference : Found in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range,

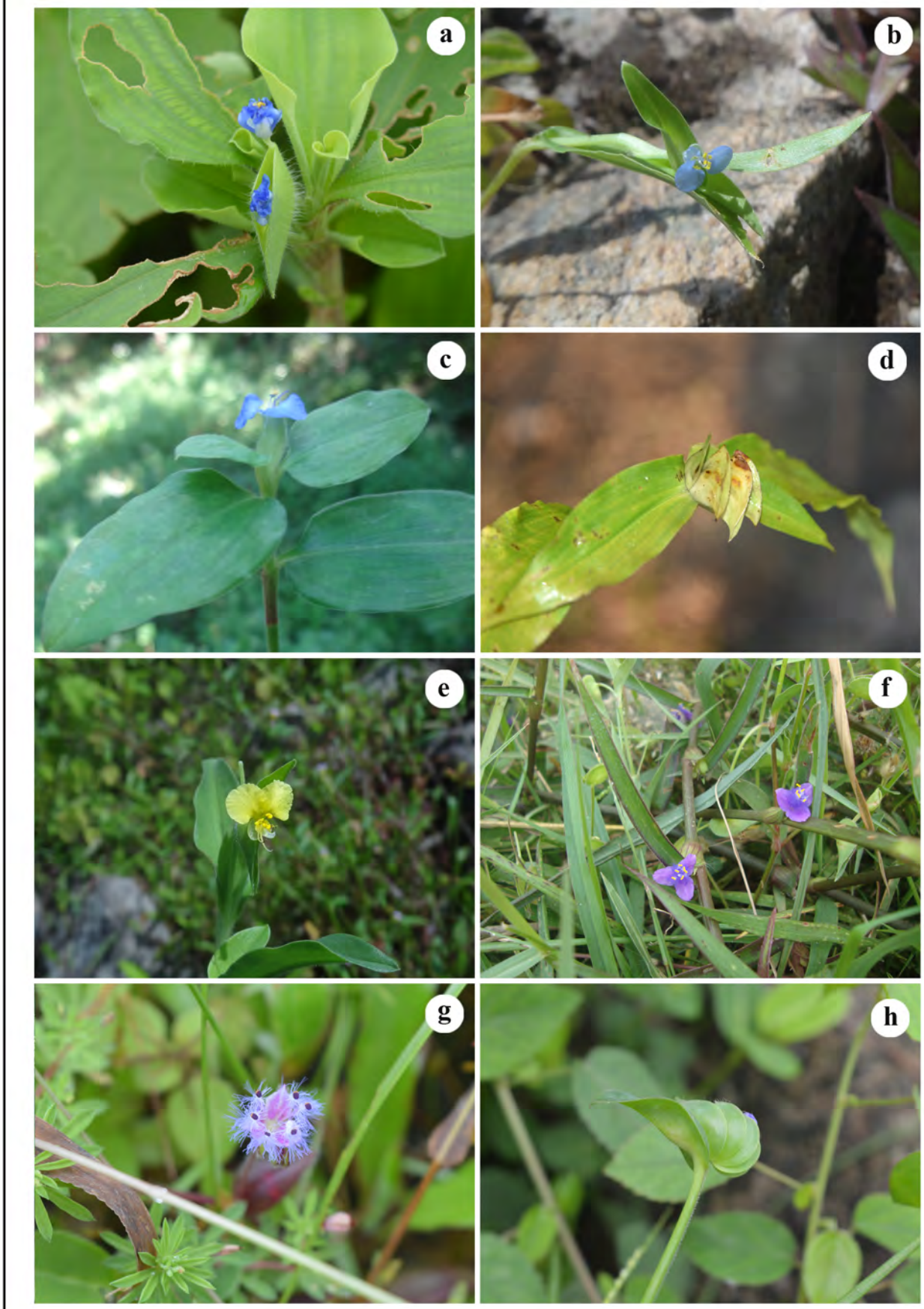


Plate 13: Fig. a. *Commelina benghalensis* L. **b.** *Commelina clavata* C. B.Clarke **c.** *Commelina diffusa* Burm.f. **d.** *Commelina paludosa* Blume **e.** *Commelina wightii* Raizada **f.** *Cyanotis axillaris* (L.) D.Don ex Sweet **g.** *Cyanotis burmanniana* Wight **h.** *Cyanotis cristata* (L.) D.Don.

Neelippara, 10°51'47.52"N, 76°37 '37.38"E, 312m, 15 September 2017, Aswani & Maya, 557(GVCH).

Murdannia Royle, *Ill. Bot. Himal. Mts. [Royle]* [11]: 403 (1840), nom. cons.

1.Seeds uniseriate in each cell……..…….2
- Seeds biseriate in each cell……..…6
2. Locules of ovary 2 - ovuled; capsule mostly 2 -seeded…… *M. nudiflora*
- Locules of ovary 3 - many ovuled; capsule 1 - many seeded…….……....3
3. Stem decumbent…..…..……. *M. spirata*
- Stem erect……..……..4
4. Root fibrous……..……..….*M. dimorpha*
- Root tuberous….……..……5
5. Leaves broad; elliptic - oblong; panicles stout and dichotomously branched……..…..…*M. japonica*
- Leaves narrow; linear; panicles spreading……..…..……. *M. esculenta*
6. Leaves filiform, semiterete; flowers terminal…...…….…….. *M. semiteres*
- Leaves linear, flowers usually axillary solitary or 2 - 6 enclosed in persistent bracts……..….. *M. vaginata*

Murdannia dimorpha G.Brückn., *Nat. Pflanzenfam.*, ed. 2 [Engler & Prantl] 15a: 173 (1930); *Aneilema dimorpha* Dalz., Hook. f., *FBI* 6: 377. 1892; Gamble, *Fl. Madras* 1545 (1931).

Habit : Herb
Ecosystem preference : Moist deciduous forest and forest margins
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Open forest tracts and low altitude grassy patches
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : July - September
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koshavanidukku, 10°50'26.38"N, 76°40'30.88"E, 105m, 16 July 2017, Aswani & Maya, 236 (GVCH); Neelippara, 10°51'47.52"N, 76°37'37.38"E, 312m, 15 September 2017, Aswani & Maya, 565 (GVCH); Mayappalam, 10°48'0.36"N, 76°45'58.68"E, 114m, 10 May 2018, Aswani & Maya, 2113 (GVCH); Kottampatti waterfalls, 10°49'46.20"N, 76°46'47.28"E, 203m, 23 September 2018, Aswani & Maya, 2958 (GVCH); Pallippara, 10°49'49.08"N, 76°43'47.28"E, 119m, 23 November 2019, Aswani & Maya, 5045 (GVCH); Kongampaadam, 10°48'40.59"N, 76°46'51.94"E, 128m, 30 November 2019, Aswani & Maya, 5278 (GVCH); Vanadurga temple hillock, 10°49'48.81"N, 76°39'58.80"E, 99m, 03 September 2020, Aswani & Maya, 6227 (GVCH) **(Plate 14: Fig. b)**.

Murdannia esculenta (Wall. ex C.B.Clarke) Abeyw., *Ceylon J. Sci., Biol. Sci.* 2(1): 82 (1959); Vajr., *Fl. Palghat Dist* 521 (1990).; *Aneilema esculentum* Wall. ex Clarke in A. & C. DC., Hook. f., *FBI* 6: 377 (1892); Gamble, *Fl. Madras.* 1545 (1931).

Basionym: *Aneilema esculentum* Wall. ex C.B.Clarke, *Monogr. Phan. [A.DC. & C.DC.]* 3: 206 (1881).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific, Holarctic and Australian
IUCN Category : Least Concern (LC)
Habitat : Open wet forest areas
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : August - December
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range,

Kongampaadam, 10°48'36.72"N, 76°46'51.96"E, 151m, 15 June 2018, Aswani & Maya, 2316 (GVCH) **(Plate 14: Fig. c)**.

Murdannia japonica (Thunb.) Faden, *Taxon* 26(1): 142 (1977); Vajr., *Fl. Palghat Dist.* 522 (1990); Sasidh., *Fl. Parambikulam WLS* 361 (2002); *Aneilema lineolatum* Kunth, Hook. f., *FBI* 6: 370 (1892); Gamble, *Fl. Madras* 1544 (1931).

Habit : Herb
Ecosystem preference : Moist and semi - evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Shady forest regions with high moisture (wet areas)
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : July - September
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kavarakundu, 10°52'14.88"N , 76°42'38.88"E, 263m, 19 July 2019, Aswani & Maya, 4372(GVCH); Chacolas, 10°51'22.68"N, 76°44'41.28"E, 226m, 02 August 2019, Aswani & Maya, 4488(GVCH) **(Plate 14: Fig. d)**.

Murdannia nudiflora (L.) Brenan, Kew Bull. 7(2): 189 (1952); Vajr., *Fl. Palghat Dist* 522 (1990); *Aneilema nudiflorum* (L.) R. Br., Hook. f., FBI 6: 378 (1892); C.E.C. Fisch. in Gamble, *Fl. Madras* 1545 (1931).
Habit : Herb
Ecosystem preference: Degraded deciduous forests and plains
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated
Habitat : Wet soils in plains and near river banks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : September - November
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koyyamarakaadu, 10°47'44.88"N, 76°45'38.52"E, 108m, 30 November 2019, Aswani & Maya, 5330 (GVCH); Kadukkamkunnam, 10°48'48.76"N, 76°39'48.98"E, 107m, 23 March 2023, Aswani & Maya, 6570 (GVCH) **(Plate 14: Fig. e)**.

Murdannia semiteres (Dalzell) Santapau, *Poona Agr. Coll. Mag.* 41(4): 15 (1951); Vajr., *Fl. Palghat Dist* 523 (1990); Sasidh., *Fl. Parambikulam WLS* 361 (2002); *Dichaespermum paniculatum* (Wall. ex Clarke) Hook. f. & Thoms. in Hook.f., *FBI* 6: 381 (1892); *Aneilema paniculatum* Wall. ex Clarke in A. & C. DC., Gamble, *Fl. Madras* 1546 (1931).

Basionym: *Aneilema semiteres* Dalzell in *Hooker's J. Bot. Kew Gard. Misc.* 3: 138 (1851).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
Endemism : Peninsular India
IUCN Category : Least Concern (LC)
Habitat : Exposed rocky patches in hillock systems with little soil
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : October - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thekke Malampuzha, 10°50'02.52"N, 76°40'58.49" E, 120m, 08 September 2017, Aswani & Maya, 423 (GVCH); Pallippara, 10°49'48.36"N, 76°43'44.04"E, 119m, 29 October 2017, Aswani & Maya, 702(GVCH); Kozhimala, 10°50'04.17"N,

76°43'23.82"E, 206m, 09 November 2017, Aswani & Maya, 801 (GVCH); Ollappallam, 10°49'52.20"N, 76°43'44.19"E, 121m, 25 November 2017, Aswani & Maya, 926 (GVCH); Kongampaadam, 10°48'40.59"N, 76°46'51.94"E, 128m, 06 September 2019, Aswani & Maya, 2796(GVCH); Cheekuzhi, 10°50'8.57"N, 76°38'57.48"E, 104m, 16 October 2019, Aswani & Maya, 2740(GVCH); Koomachimala, 10°49'44.76"N, 76°40'34.59"E, 102m, 23 November 2019, Aswani & Maya, 4898(GVCH); Pallippara, 10°49'48.36"N, 76°43'44.04"E, 119m, 23 November 2019, Aswani & Maya, 5008 (GVCH) **(Plate 14: Fig. f)**.

***Murdannia spirata* G. Brückn**., *Nat. Pflanzenfam*., ed. 2 [Engler & Prantl] 15a: 173 (1930); Vajr., *Fl. Palghat Dist.* 524 (1990); Sasidh., *Fl. Parambikulam WLS* 362 (2002); *Aneilema spiratum* (L.) Sweet, Hook. f., *FBI* 6: 377 (1892); Gamble, *Fl. Madras* 1546 (1931).

Habit : Herb
Ecosystem preference : Moist deciduous forests and in plains
Distribution : Indo - Pacific
Endemism : August - November
IUCN Category : Least Concern (LC)
Habitat : Wet regions in the outskirts of hillocks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : August - November
Altitude preference : Found in wet regions in hillock and its outskirts
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Pallippara, 10°49'48.36"N, 76°43'44.04"E, 119.78m, 29 October 2017, Aswani & Maya, 706 (GVCH); Koyyamarakaadu, 10°47'44.88" N, 76°45'38.52"E, 110m, 06 September 2018, Aswani & Maya, 2683(GVCH); Kongampaadam, 10°48'40.59"N, 76°46'51.94"E, 128m, 06 September 2019, Aswani & Maya, 4579(GVCH); Mayappalam, 10°48'0.36"N, 76°45'58.68"E, 113.99m, 06 September 2019, Aswani & Maya, 4664(GVCH); Ahalya campus, 10°47'33.27"N, 76°49'53.34"E, 167m, 24 September 2020, Aswani & Maya, 6281(GVCH) **(Plate 14: Fig. g)**.

Murdannia vaginata (L.) G.Brückn., *Nat. Pflanzenfam.*, ed. 2 [Engler & Prantl] 15a: 173 (1930); *Aneilema vaginatum* (L.) R. Br., Hook. f., *FBI* 6: 381 (1892); Gamble, *Fl. Madras* 1546 (1931).

Basionym: *Commelina vaginata* L., *Mant. Pl. Altera* 177 (1771).

Habit : Herb
Ecosystem preference : Moist deciduous forests and in plains
Distribution : Indo - Pacific and Holarctic
IUCN Category : Least Concern (LC)
Habitat : Open wet forest floors and similar wet areas in plains
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : July - February
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Koyyamarakaadu, 10°47'44.88"N, 76°45'38.52"E, 108m, 06 September 2018, Aswani & Maya, 2684 (GVCH).

Rhopalephora Hassk., *Bot. Zeitung (Berlin)* 22: 58 (1864)

Rhopalephora scaberrima (Blume) Faden, *Phytologia* 37(5): 480 (1977); *Aneilema scaberrimum* var. *fruticosum* C.B.Clarke in J.D.Hooker, *FBI* 6: 383 (1892); *Aneilema scaberrimum* (Blume) Kunth, Hook. f., *FBI* 6:382 (1892); Gamble, *Fl. Madras* 1546 (1931); Vajr., *Fl. Palghat Dist.* 514 (1990);

Sasidh., *Fl. Parambikulam WLS* 356 (2002).

Habit : Herb
Ecosystem preference : Moist deciduous forests near forest streams
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Shady forest tracks with high moisture
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : July - September
Altitude preference : Found in medium altitudes near water sources
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kezhakootimala, 10°51'53.30"N, 76°37'36.39"E, 361.79m, 15 September 2017, Aswani & Maya, 522(GVCH) **(Plate 14: Fig. h)**.

Pontederiaceae

Pontederia L., *Sp. Pl. [Linnaeus]* 1: 288 (1753)

Key to species

Leaf petiole and peduncle spongy above middle way; perianth lobe blue with a yellow spot surrounded by deep blue……..……..…...*P. crassipes*
Leaf petiole and peduncle never spongy; Perianth lobes deep blue……..…….....…*P. vaginalis*

Pontederia crassipes Mart., *Nov. Gen. Sp. Pl. (Martius)* 1(1): 9, t. 4 (1823); *Eichhornia crassipes* (Mart.) Solms., C.E.C. Fisch. in Gamble, *Fl. Madras* 1530 (1928); Vajr., *Fl. Palghat Dist* 512 (1990).

Habit : Herb
Ecosystem preference : Wetlands
Distribution : South American
IUCN Category : Not Evaluated (NE)
Habitat : Rivers and rocky pools
Raunkiaer's Life form : Hydrophyte
Distribution Frequency : Common
Phenology : November - February
Altitude preference : Found in water sources in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Anayappanchalla, 10°48'20.42"N, 76°48'05.00"E, 146m, 30 November 2019, Aswani & Maya, 5233(GVCH); Koyyamarakaadu,10°47'44.88"N, 76°45'38.52"E, 110m, 30 November 2019, Aswani & Maya, 5369(GVCH).

Pontederia vaginalis Burm.f., Fl. Ind. (N. L. Burman) 80 (1768); C.E.C. Fisch. in Gamble, *Fl. Madras* 1529 (1931); Vajr., *Fl. Palghat Dist* 512 (1990); Sasidh., *Fl. Parambikulam WLS* 354 (2002).

Habit : Herb
Ecosystem preference : Wetlands
Distribution : Indo - Pacific and Holarctic
IUCN Category : Least Concern (LC)
Habitat : In marshy paddy fields, other marshy river beds and in stagnant waters
Raunkiaer's Life form : Hydrophyte
Distribution Frequency : Common
Phenology : July - November
Altitude preference : Found in water sources in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Anayappanchalla, 10°48'20.42"N, 76°48'05.00"E, 146m, 30 November 2019, Aswani & Maya, 5229(GVCH).

Zingiberales

Musaceae

Musa L., *Sp. Pl.* 2: 1043 (1753)

Musa* × *paradisiaca L., *Sp. Pl.* 2: 1043 (1753); Gamble, *Fl. Madras* 1495 (1928); *Musa rosacea* Jacq., Hook. f., *FBI* 6: 263

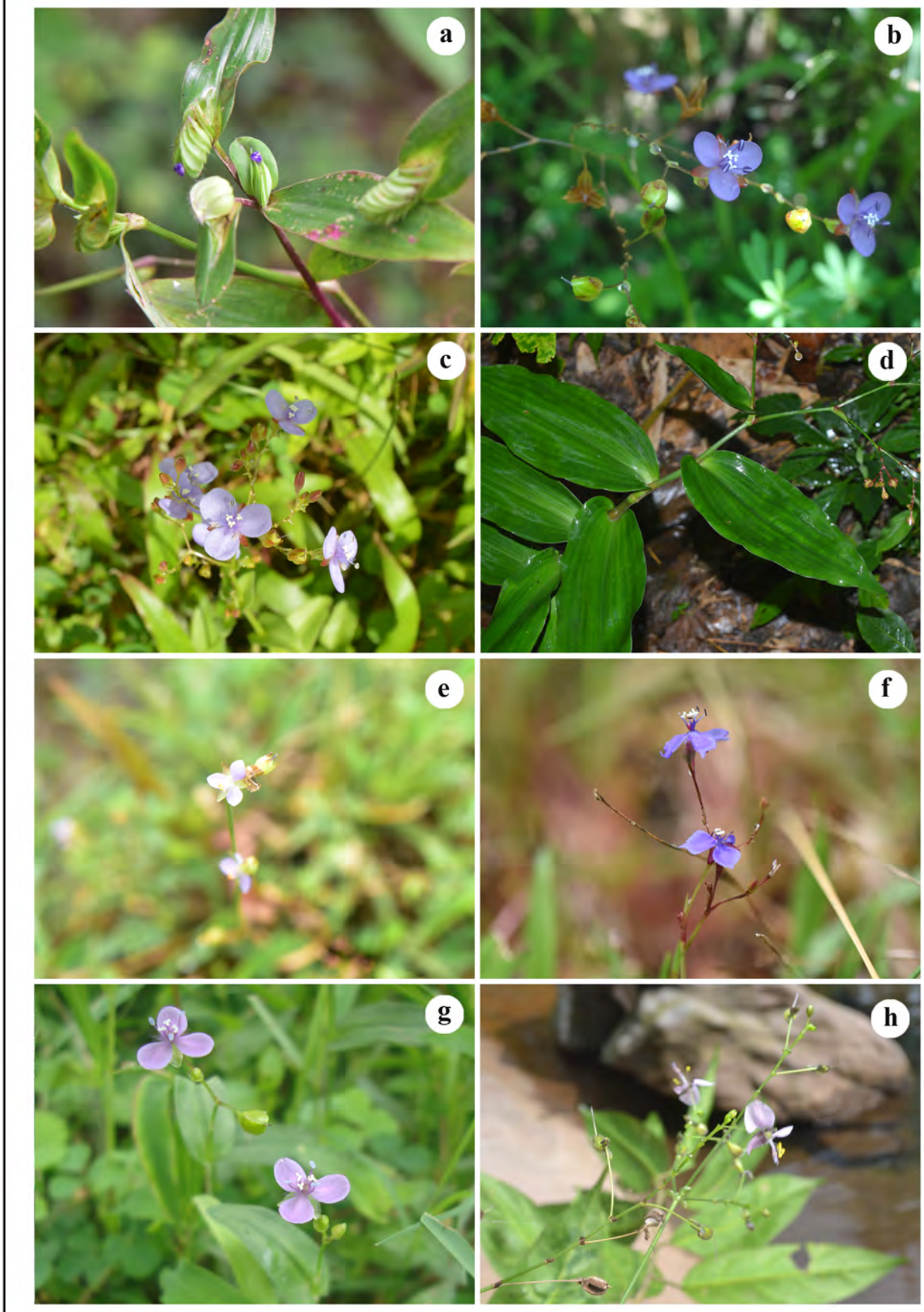


Plate 14: Fig. a. *Cyanotis tuberosa* (Roxb.) Schult. & Schult.f. **b.** *Murdannia dimorpha* G.Brückn. **c.** *Murdannia esculenta* (Wall. ex C. B.Clarke) Abeyw. **d.** *Murdannia japonica* (Thunb.) Faden **e.** *Murdannia nudiflora* (L.) Brenan **f.** *Murdannia semiteres* (Dalzell) Santapau **g.** *Murdannia spirata* G.Brückn. **h.** *Rhopalephora scaberrima* (Blume) Faden

(1892); Gamble, *Fl. Madras* 1497 (1928); *Musa* x *sapientum* L., Hook. f., *FBI* 6: 262 (1892).

Habit : Herb
Ecosystem preference : Margins of forests and in plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Found in outskirts of hillocks and the forest margins where tribals are inhabiting (cultivated)
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Common
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kalliyara, 10°52'51.24"N , 76°39'24.84"E, 127m, 24 March 2018, Aswani & Maya, 1532 (GVCH); Anayappanchalla, 10°48'23.66"N, 76°48'23.91"E, 145m, 30 November 2019, Aswani & Maya, 5169(GVCH); Chaatappara waterfalls, 10°53'11.76"N, 76°42'15.84"E, 599m, 10 December 2019, Aswani & Maya, 5418(GVCH).

Marantaceae

Stachyphrynium K.Schum., *Pflanzenr. (Engler) Marant.* 45 (1902)

Stachyphrynium spicatum K.Schum., *Pflanzenr. (Engler) Marant.* 46 (1902); Gamble, *Fl. Madras* 1494 (1928); Vajr., *Fl. Palghat Dist* 502 (1990).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
Endemism : Southern Western Ghats
IUCN Category : Least Concern (LC)
Habitat : Canopy rich regions with rich humus
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Occasional
Phenology : March - May
Altitude preference : Found in all altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Parachaathy, 10°50'49.97"N, 76°43'56.67"E, 159m, 02 January 2019, Aswani & Maya, 3623(GVCH); Kochithodu – Thakaramada, 10°52'27.55"N, 76°42'44.32"E, 280m, 14 May 2019, Aswani & Maya, 3963(GVCH); Jamanthimala, 10°52'14.73"N, 76°46'46.15"E, 894m, 09 January 2020, Aswani & Maya, 5667(GVCH); Pettikallu, 10°53'6"N, 76°42'0"E, 812m, 27.02.2020, Aswani & Maya, 6109(GVCH).

Costaceae

Hellenia Retz., *Observ. Bot. (Retzius)* 6: 18 (1791)

Hellenia speciosa (J.Koenig) S.R.Dutta, *Pleione* 7(1): 228 (2013); *Costus speciosus* (Koenig) J.E. Smith, Hook. f., *FBI* 6: 249 (1892); Gamble, *Fl. Madras* 1490 (1928); Vajr., *Fl. Palghat Dist* 498 (1990); Sasidh., *Fl. Parambikulam WLS 343 (*2002).

Basionym: *Banksea speciosa* J.Koenig, i*n Retz. Obs. iii.* 75 (1783).

Habit : Herb
Ecosystem preference : Moist deciduous and semi - evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found near the water sources and wet areas in forests
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Occasional
Phenology : July - October

Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kosavanidukku-Kaduvachal , 10°50'26.38"N, 76°40'30.88"E, 105m, 16 July 2017, Aswani & Maya, 272 (GVCH); Kottamutti waterfalls, 10°49'42.94"N, 76°46'47.87"E, 206m, 23 September 2018, Aswani & Maya, 2879(GVCH); Pazhampullikaadu, 10°50'09.55"N, 76°38'28.33"E, 89m, 16 October 2018, Aswani & Maya, 3178 (GVCH); Thaanikunnu, 10°52'44.47"N, 76°47'3.91" E, 604m, 18 December 2018, Aswani & Maya, 3454 (GVCH); Vettumadavu, 10°52'45.01"N, 76°48'8.60"E, 363m, 28 January 2020, Aswani & Maya, 5912(GVCH) **(Plate 15: Fig. a)**.

Zingiberaceae

Key to genera

1. Ovary one loculed; parietal placentation ……..……. *Globba*
- Ovary three loculed; axile placentation…..……..……2
2. Style exerted beyond anther sac……..… *Zingiber*
- Style never exerted beyond anther sac…….……..……3
3. Lateral staminodes small or absent; never petaloid…..……..… *Meistera*
- Lateral staminodes distinct and petaloid…...……..…..…4
4. Flowers solitary in each bract; small herbs…….…….....*Boesenbergia*
- Flowers 2 - many flowered in each bracts; large herbs……..…….5
5. Corolla tube funnel shaped; connective of anther spurred at base; inflorescence lateral……..….. ……..….*Curcuma*
- Corolla tube long;; connective of anther without any spur; inflorescence terminal....*Hedychium*

Boesenbergia Kuntze, *Revis. Gen. Pl.* 2: 685 (1891)

Boesenbergia pulcherrima Kuntze, *Revis. Gen. Pl.* 2: 685 (1891); Vajr., *Fl. Palghat Dist* 498 (1990); Sasidh., *Fl. Parambikulam WLS* 342 (2002); *Gastrochilus pulcherrimus* Wall., Hook. f., *Fl. Brit. India* 6: 217 (1890).

Habit : Herb
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
Endemism : Southern Western Ghats
IUCN Category : Least concern (LC)
Habitat : Canopy rich forest floors with enough moisture and banks of forest streams
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Occasional
Phenology : July - October
Altitude preference : Found in medium elevations
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kezhakootimala, 10°51'53.30"N, 76°37'36.39"E, 361m, 15 September2017, Aswani & Maya, 534 (GVCH); Jamanthimala, 10°51'53.64"N, 76°47'16.80"E, 586m, 23 June 2019, Aswani & Maya, 4108(GVCH) **(Plate 15: Fig. b)**.

Curcuma L., *Sp. Pl.* 1: 2 (1753), nom. cons.

Key to species

1. Rhizome white or cream or pale yellow coloured……..……...2

- Rhizome orangish - yellow coloured……..…..…6
2. Rhizome aromatic…. *C. aromatica*
- Rhizome non - aromatic……..…...3
3. Anther without spur..*C. aurantiaca*
- Anther spurred….……..….4
4. Fertile bracts broad, rounded, minutely pubescent on the outer surface; anther spur small with purple spots……..….*C. decipiens*
5. Fertile bracts ovate - elliptic; glabrous on both sides; anther spur long and creamish yellow……..… *C. mutabilis*
6. Sessile tubers with distinct comma present; flowers long equaling to bracts...……. *C. longa*
- Sessile tubers absent; distinct comma absent; flowers shorter than bracts……...….. *C. vamana*

Curcuma aromatica Salisb., *Parad. Lond. t.* 96 (1807); Hook. f., *FBI* 6:216 (1890); Gamble, *Fl. Madras* 1483 (1928); Sasidh., *Fl. Parambikulam WLS* 343 (2002).

Habit : Herb
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not evaluated (NE)
Habitat : Humus rich forest floors
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Rare
Phenology : May - June
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Moochikadavu, 10°52'13.80"N, 76° 42 '30. 96"E, 258m, 19 July 2019, Aswani & Maya, 4391(GVCH).

Curcuma aurantiaca Zijp, *Recueil Trav. Bot. Néerl.* 12: 345 (1915); *Curcuma ecalcarata* Babu, *Fl. Malappuram Dist* 791 (1990); Sasidh. & Sivar., *Fl. Pl. Thrissur For* 459 (1996); Sasidh., *Fl. Shenduruny WLS* 336 (1997); Sivar. & P. Mathew, *Fl. Nilambur* 707 (1997); Sasidh., *Fl. Parambikulam WLS* 343 (2002); Anil Kumar *et al*., *Fl. Pathanamthitta* 498 (2005); M. Sabu, *Zingiberaceae and Costaceae South India* 150 (2006); Sunil, *Fl. Pl. Diver. Ernakulam Dist* 394 (2016).

Habit : Herb
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
IUCN Category : Data Deficient (DD)
Habitat : Canopy rich forest floor with high moisture content
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Occasional
Phenology : August - November
Altitude preference : Found in medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Neelippara, 10°51'47.52"N , 76°37'37.38"E, 312m, 15 September 2017, Aswani & Maya, 580 (GVCH); Ayyappan Mala, 10°49'11.44"N, 76°44'24.46"E, 346m, 26 June 2018, Aswani & Maya, 2601(GVCH); Moochikadavu, 10°52'23.35"N, 76°42'39.58"E, 312m, 19 July 2019, Aswani & Maya, 4361(GVCH); Chacolas, 10°51'22.68"N, 76°44'41.28"E, 226m, 02 August 2019, Aswani & Maya, 4486 (GVCH) **(Plate 15: Fig. c)**.

Curcuma decipiens Dalzell, *Hooker's J. Bot. Kew Gard. Misc.* 2: 144 (1850); Hook. f., *FBI* 6: 215 (1890); Gamble, *Fl. Madras* 1483 (1928).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
Endemism : Peninsular India
IUCN Category : Not Evaluated (NE)

Habitat : Open forest areas and hill slopes
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Rare
Phenology : April - October
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Moochikadavu, 10°52'23.35"N, 76°42'39.58"E, 312m, 19 July 2019, Aswani & Maya, 4292(GVCH); Chacolas, 10°51'22.68"N, 76°44'41.28"E, 226m, 02 August 2019, Aswani & Maya, 4484(GVCH); Edamala, 10°50'11.04"N, 76°38'57.48"E, 114m, 16 October 2019, Aswani & Maya, 4766 (GVCH) **(Plate 15: Fig. d)**.

Curcuma longa L., *Sp. Pl.* 1: 2 (1753); Hook. f., *FBI* 6: 214 (1890); Gamble, *Fl. Madras* 1483 (1928); Sasidh., *Fl. Parambikulam WLS* 344 (2002).

Habit : Herb
Ecosystem preference : Moist deciduous forests and in plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Data Deficient (DD)
Habitat : Cultivated in forest margins
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Rare
Phenology : September - October
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Mannukunnu, 10°52'5.50"N, 76°38'30.27"E, 181m, 09 July 2019, Aswani & Maya, 4211(GVCH) **(Plate 15: Fig. e)**.

Curcuma mutabilis Škorničk., M.Sabu & Prasanthk., *Gard. Bull. Singapore* 56(1-2): 44 (2004); M. Sabu, *Zingiberaceae and Costaceae South India* 164 (2006).

Habit : Herb
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
Endemism : Southern Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Open forest tracks as well as in open grasslands
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Rare
Phenology : May - October
Altitude preference : Found in lower and middle altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Ayyappan Mala, 10°49'11.44"N , 76°44'24.46"E, 346m, 26 June 2018, Aswani & Maya, 2563(GVCH); Koomachimala, 10°49'39.72"N, 76°40'28.20"E, 184m, 17 July 2018, Aswani & Maya, 2616(GVCH); Koyyamarakaadu, 10°47'44.88"N, 76°45'38.52"E, 110m, 06 September 2018, Aswani & Maya, 2694(GVCH) **(Plate 15: Fig. f)**.

Curcuma vamana M.Sabu & Mangaly, *J. Econ. Taxon. Bot.* 10(2): 307 (1988); Sasidh., *Fl. Parambikulam WLS* 345 (2002).

Habit : Herb
Ecosystem preference : Moist deciduous forests and semi - evergreen forests
Distribution : Indo - Pacific
Endemism : Southern Western Ghats
IUCN Category : Critically endangered (CR)
Habitat : Canopy rich forest floors with high moisture
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Rare
Phenology : July - October
Altitude preference : Found in medium altitudes

Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Moochikadavu, 10°51'33.12"N , 76°42'29.52"E, 141m, 19 July 2019, Aswani & Maya, 4291(GVCH); Chacolas, 10°51'22.68"N, 76°44'41.28"E, 226m, 02 August 2019, Aswani & Maya, 4485(GVCH).

Globba L., *Mant. Pl. Altera* 143, 170-171 (1771)

Key to species

Bracts persistent; anthers with bifid wings……..……..…..*G. marantina*
Bracts deciduous; anthers without any wings……..……..…….*G. sessiliflora*

Globba marantina L., *Mant. Pl. Altera* 170 (1771); Hook. f., *FBI* 6: 206 (1890); Sasidh., *Fl. Parambikulam WLS* 346 (2002); *Globba bulbifera* Roxb., Hook. f., *FBI* 6: 206 (1890); Gamble, *Fl. Madras* 1481 (1928); Vajr., *Fl. Palghat Dist* 500 (1990).

Habit : Herb
Ecosystem preference : Moist Deciduous forests and in forest margins
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Margins of forests
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Rare
Phenology : July - September
Altitude preference : Found in humus rich medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, S - Medu, 10°51'20.17"N , 76°47'4.18"E , 645m, 25 November 2020, Aswani & Maya, 6349(GVCH) **(Plate 15: Fig. g)**.

Globba sessiliflora Sims, *Bot. Mag.* 35: t. 1428 (1811); Hook. f., *FBI* 6: 202 (1890); Gamble, *Fl. Madras* 1480 (1928); Vajr., *Fl. Palghat Dist* 500 (1990); Sasidh., *Fl. Parambikulam WLS* 346 (2002).

Habit : Herb
Ecosystem preference : Moist deciduous forests and semi - evergreen forests
Distribution : Indo - Pacific
Endemism : India
IUCN Category : Least Concern (LC)
Habitat : Forest floor near forest streams
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Rare
Phenology : July - September
Altitude preference : Found in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kezhakootimala, 10°51'53.30"N, 76°37'36.39"E, 361m, 15 September 2017, Aswani & Maya, 533(GVCH) **(Plate 15: Fig. h)**.

Hedychium J.Koenig, *Observ. Bot. (Retzius)* 3: 73 (1783)

Key to species

Calyx shorter than bracts, glabrous; stamens shorter than the lip……..…..…...….. *H. coronarium*
Calyx as long as or longer than the bracts, apex hairy; stamens longer than the lip…….…….……. *H. flavescens*

Hedychium coronarium J.Koenig, *Observ. Bot. (Retzius)* 3: 73. (1783); Hook. f., *FBI* 6: 225 (1892); Gamble, *Fl. Madras* 1485 (1928); Sasidh., *Fl. Parambikulam WLS* 346 (2002).

Habit : Herb
Ecosystem preference : Valley of grasslands
Distribution : Indo - Pacific
IUCN Category : Data Deficient (DD)

Habitat : Near forest streams and water channels in hill slopes
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Rare
Phenology : October - December
Altitude preference : Found in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kallappara, 10° 52' 54.66" N, 76°45'52.09" E, 1058m, 28 January 2020, Aswani & Maya, 5997(GVCH) **(Plate 16: Fig. a)**.

Hedychium flavescens Carey ex Rosc., *Monandr. t. 5*0. 1825; C.E.C. Fisch. in Gamble, *Fl. Madras* 1485 (1928); Manilal & Sivar., *Fl. Calicut* 288 (1982); Manilal, *Fl. Silent Valley* 313 (1988); V.S. Ramach. & V.J. Nair, *Fl. Cannanore Dist* 469 (1988); E. Vajr., *Fl. Palghat Dist* 501 (1990); M. Mohanan & A.N. Henry, *Fl. Thiruvananthapuram* 474 (1994); Sasidh. & Sivar., F*l. Pl. Thrissur For*. 462 1996); Sasidh., *Fl. Periyar Tiger Reserve* 449 (1998); Sasidh., *Fl. Parambikulam WLS* 345 (2002); M. Sabu, *Zingiberaceae and Costaceae South India* 199 (2006); Ratheesh, *Fl. Stud. Wayanad Dist*. 865 (2009); Sunil, *Fl. Pl. Diver. Ernakulam Dist* 396. (2016).
.
Habit : Herb
Ecosystem preference : Moist deciduous forests grasslands
Distribution : Indo - Pacific
IUCN Category : Data Deficient (DD)
Habitat : Shady regions near water sources in the forests
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Rare
Phenology : August - September
Altitude preference : Found in higher altitudes near waterfalls and rivers
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Aatumala, 10°53'48.57"N, 76°41'25.18"E, 1170m, 28 January 2020, Aswani & Maya, 6170(GVCH) **(Plate 16: Fig. b)**.

Meistera Giseke, *Prael. Ord. Nat. Pl.* 199, 205 (1792)

Meistera aculeata **(**Roxb.) Škorničk. & M.F.Newman, *Taxon* 67(1): 25 (2018); *Amomum aculeatum* Roxb., Hook. f. *FBI* 6: 242 (1894); Sameer Patil & Lakshminarasimhan, *Journal of Threatened Taxa* 10(13): 12850-12853 (2018).

Habit : Herb
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Hill slopes with rich humus and moisture
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Occasional
Phenology : June - September
Altitude preference : Found in medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala, 10°51'53.64"N, 76°47'16.80"E, 586mm, 23 June 2019, Aswani & Maya, 177854 (MH); Jamanthimala, 10°51'53.64"N, 76°47'16.80"E, 586mm, 23 June 2019, Aswani & Maya, 7005 (CALI); Jamanthimala, 10°51'53.64"N, 76°47'16.80"E, 586mm, 23 June 2019, Aswani & Maya, 4078(GVCH); Jamanthimala, 10°51'53.64"N, 76°47'16.80"E, 586m, 01 July 2019, Aswani & Maya, 4153(GVCH); Moochikadavu,10°52'28.20"N, 76°42'38.52"E, 346m, 19 July 2019, Aswani & Maya, 4385(GVCH); Chacolas, 10°51'15.48"N, 76°45'09.00"E, 265m, 02 August 2019, Aswani & Maya, 4555(GVCH); Chaatapara waterfalls,

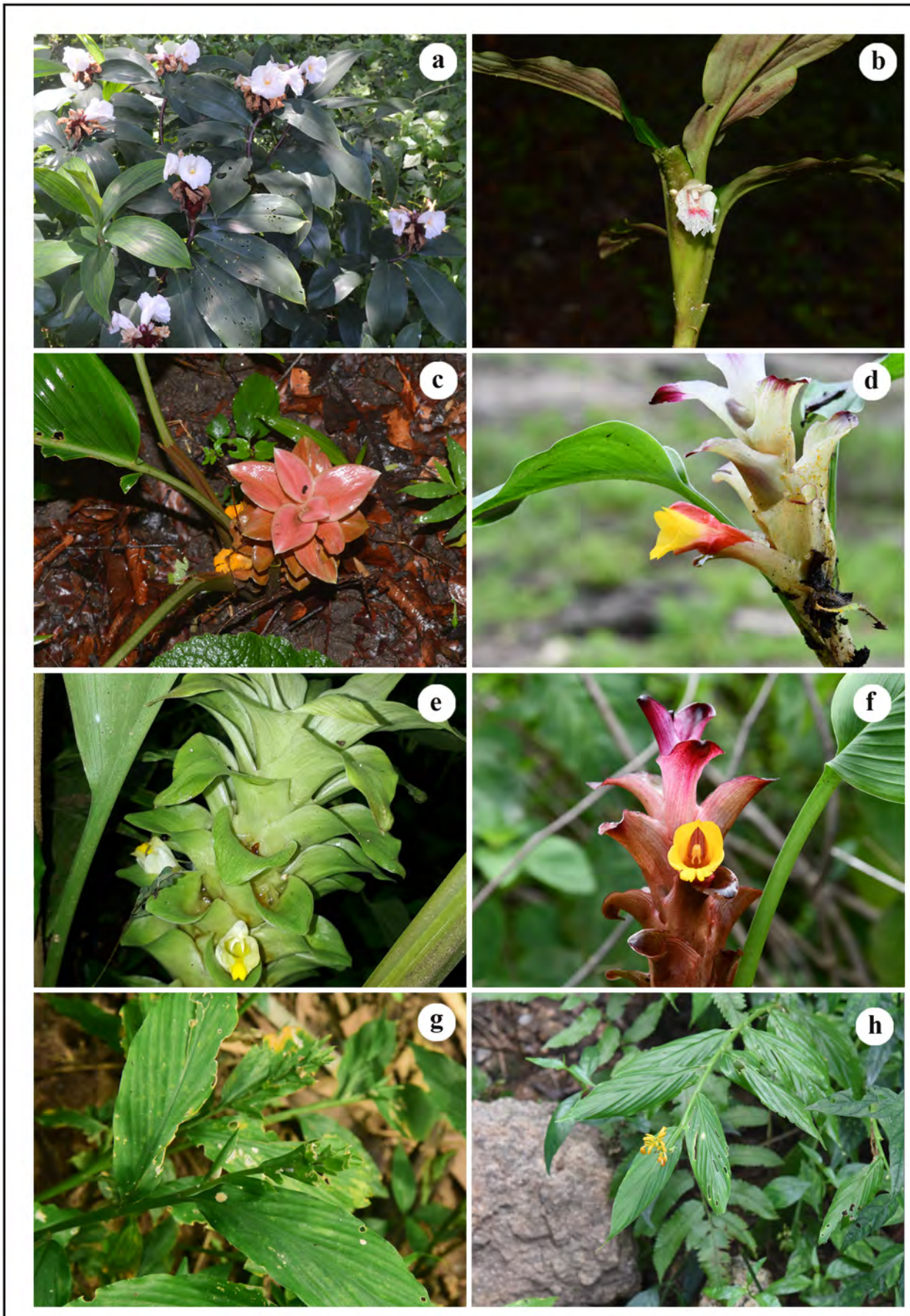


Plate 15: Fig. a. *Hellenia speciosa* (J.Koenig) S.R.Dutta **b.** *Boesenbergia pulcherrima* Kuntze **c.** *Curcuma aurantiaca* Zijp **d.** *Curcuma decipiens* Dalzell **e.** *Curcuma longa* L. **f.** *Curcuma mutabilis* Škorničk., M. Sabu & Prasanth K. **g.** *Globba marantina* L. **h.** *Globba sessiliflora* Sims.

10°52'22.77"N, 76°42'25.53"E, 599m, 10 December 2019, Aswani & Maya, 5567(GVCH); Aduppukootimala, 10°49'38.80"N, 76°44'16.08"E, 139m, 16 February 2021, Aswani & Maya, 6482(GVCH) **(Plate 16: Fig. c)**.

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Zingiber Mill., *Gard. Dict. Abr., ed.* 4. 3: [1545] (1754), nom. et orth. cons.

Key to species

1. Herbs stoloniferous..... *Z. sabuanum*
- Herbs upright without any stolons……..…...…2
2. Spikes directly arising from root stock with very short peduncles or peduncles absent…..….*Z. nimmonii*
- Spikes with long peduncles……..……..…3
3. Rhizome aromatic; floral bracts green……...…….. *Z. officinale*
- Rhizome nonaromatic; floral bracts reddish - green or blood red……...4
4. Spies elongate; capsule ellipsoid…….....……*Z. neesanum*
- Spikes ovoid or oblong; capsule oblong……*Z. zerumbet*

Zingiber neesanum (J.Graham) Ramamoorthy, *Fl. Hassan Dist. [Saldanha & Nicolson]* 769 (1976); Sasidh., *Fl. Parambikulam WLS* 347 (2002); *Zingiber macrostachyum* Dalz., Hook. f., *FBI* 6: 247 (1892); Gamble, *Fl. Madras* 1490 (1928).

Habit : Herb
Ecosystem preference : Moist deciduous forests and semi - evergreen forests
Distribution : Indo - Pacific
Endemism : Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Canopy rich forest floor with high moisture
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Rare
Phenology : July - September
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Moochikadavu, 10°52'7.32"N, 76°42'28.44"E, 245m, 19 July 2019, Aswani & Maya, 4306 (GVCH); Pettikallu, 10°52'51.24"N, 76°39'24.84"E, 127m, 19 July 2019, Aswani & Maya, 4381(GVCH); Chacolas, 10°51'22.68"N, 76°44'41.28"E, 226m, 02 August 2019, Aswani & Maya, 4497(GVCH).

Zingiber nimmonii Dalzell, *Hooker's J. Bot. Kew Gard. Misc.* 4: 341 (1852); Hook. f., *FBI* 6: 244 (1892); Gamble, *Fl. Madras* 1489 (1928); *Zingiber cernuum* Dalz., Hook. f., *FBI* 6: 245 (1892).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
Endemism : Western Ghats
IUCN Category : Least Concern (LC)
Habitat : Canopy rich and humus rich forest floor
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Occasional
Phenology : July - October
Altitude preference : Found in medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Parachaathy, 10°50'49.97"N , 76°43'56.67"E, 160m, 02 January 2019, Aswani & Maya, 3622 (GVCH); S – Medu, 10°51'20.17"N, 76°47'4.18"E, 645m, 23 June 2019, Aswani & Maya, 4059 (GVCH); Jamanthimala, 10°51'53.64"N, 76°47'16.80"E, 586m, 23 June 2019, Aswani & Maya, 4106(GVCH); Jamanthimala, 10°52'20.64" N, 76°46'57.00"E, 863.80m, 23 June 2019, Aswani & Maya, 4144(GVCH);

Moochikadavu, 10°52'7.32"N, 76°42'28.44"E, 245m, 19 July 2019, Aswani & Maya, 4307(GVCH); Chacolas, 10°51'21.60"N, 76°44'52.08"E, 265m, 02 August 2019, Aswani & Maya, 4511(GVCH) **(Plate 16: Fig. d)**.

Zingiber officinale Roscoe, *Trans. Linn. Soc. London* 8: 348 (1807); Hook. f., *FBI* 6: 246 (1892); Gamble, *Fl. Madras* 1489 (1928); Sasidh., *Fl. Parambikulam WLS* 347 (2002).

Habit : Herb
Ecosystem preference : Moist deciduous forests and plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Data Deficient (DD)
Habitat : Cultivated in forest margins, often found in wild conditions
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Common (In plains) and rare (in forest floor)
Phenology : September - December
Altitude preference : Found in lower and medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kavarakundu, 10°52'28.20"N , 76° 42 '38.52"E, 346.25m, 19 July 2019, Aswani & Maya, 4390 (GVCH) **(Plate 16: Fig. e)**.

Zingiber sabuanum K.M.P.Kumar & A.Joe, *Phytotaxa* 247(1): 92 (2016).

Habit : Herb
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
Endemism : Southern Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Canopy rich forest floors in hill slopes
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Rare
Phenology : July - September
Altitude preference : Found in medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Moochikadavu, 10°52'23.35"N , 76°42'39.58"E, 312m, 19 July 2019, Aswani & Maya, 4348 (GVCH); Chaatapara waterfalls, 10°53'11.76"N, 76°42'15.84"E, 599.84m, 10 December 2019, Aswani & Maya, 5448 (GVCH) **(Plate 16: Fig. f)**.

Zingiber zerumbet (L.) Sm., Exot. Bot. 2: 105 (t. 112) (1806); Hook. f., *FBI* 6:247 (1892); Gamble, *Fl. Madras* 1490 (1928); Sasidh., *Fl. Parambikulam WLS* 348 (2002).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Data Deficient (DD)
Habitat : Forest margins and plains
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Rare
Phenology : July - November
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Thaanikunnu, 10°52'01.20"N , 76°41'57.48"E, 174.34m, 18 December 2018, Aswani & Maya, 3463 (GVCH) **(Plate 16: Fig. g)**.

Poales

Typhaceae

Typha L., *Sp. Pl. [Linnaeus]* 2: 971 (1753)

Typha angustifolia L., *Sp. Pl.* 2: 971 (1753); *Typha angustata* Bory & Chaub.;

Hook. f., *FBI* 6: 489 (1893); Gamble, *Fl. Madras* 1571 (1931); Vajr., *Fl. Palghat Dist* 530 (1990).

Habit : Herb
Ecosystem preference : Marshy areas in plains
Distribution : Indo - Pacific, Holarctic, African, South American and Australian
IUCN Category : Least Concern (LC)
Habitat : In marshy places like banks of river
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Rare
Phenology : December - February
Altitude preference : Found in lower and medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Koyyamarakaadu – Korayar river, 10°47'44.46"N, 76°45'44.04"E, 105.76m, 30 November 2019, Aswani & Maya, 5324 (GVCH) **(Plate 16: Fig. h)**.

Bromeliaceae

Ananas Mill., *Gard. Dict. Abr., ed.* 4. [textus s.n.] (1754)

Ananas comosus (L.) Merr., *Interpr. Herb. Amboin.* 133 (1917); *Ananas sativus* Schult. f., Gamble, *Fl. Madras* 1497 (1928).

Basionym: *Bromelia comosa* L. in *Herb. Amb*.: 21 (1754).

Habit : Herb
Ecosystem preference : In forest margins and other plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Cultivated in hill slopes and in plains
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Thekke Malampuzha, 10°51'57.41"N, 76°38'43.79"E, 105.76m, 21 February 2019, Aswani & Maya, 6520 (GVCH).

Xyridaceae

Xyris L., *Sp. Pl.* 1: 42 (1753)

Xyris pauciflora Willd., *Phytogr.* i. 2. t. 1.f.1 (1794); Hook. f., *FBI* 6: 365 (1892); Gamble, *Fl. Madras* 1532 (1928).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and Australian
IUCN Category : Least Concern (LC)
Habitat : Found in marshy areas in hillocks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : August - October
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala, 10°49'39.72"N, 76°40'28.20"E, 184m, 17 September 2017, Aswani & Maya, 606 (GVCH); , Anayappanchalla, 10°48'24.82"N, 76°48'30.73"E, 146m, 18 September 2018, Aswani & Maya, 2849 (GVCH), Olappalam, 10°49'52.20"N, 76° 43 '44.19"E, 121m, 23 November 2019, Aswani & Maya, 5092 (GVCH) **(Plate 17: Fig. a)**.

Eriocaulaceae

Eriocaulon L., *Sp. Pl. [Linnaeus]* 1: 87 (1753)

Key to species

1. Appendages of seeds setiform……..……..……2
- Appendages of seeds ribbon like or rectangular structures…..……..3
2. Spathe of male flowers with truncate lobes, hoary at apex; seeds oblong – ellipsoid ……..…..*E. xeranthemum*
- Spathe of male flowers without any distinct lobes; straw coloured; seeds ovoid or globose……...…*E.sexangulare*
3. Floral bracts glabrous or sparsely hairy; leaves never turn purple……...… E. *palghatense*
- Floral bracts densely hairy at apex; leaves turn purple on drying……..…....*E. quinquangulare*

Eriocaulon palghatense R.Ansari & N.P.Balakr., *Fam. Eriocaulac. in India* 111 (1994); Sunil, *Fl. Pl. Diver. Ernakulam Dist* 431 (2016); R. Ansari *et al*., *Aquatic and Wetland Fl. Kerala*: *Flow. Pl.* 411 (2016).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
Endemism : Southern Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Found in hill slopes in hillocks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : July - September
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala, 10°49'39.72"N 76° 40 '28.20"E, 184m, 23 September 020, Aswani & Maya, 6249 (GVCH) **(Plate 17: Fig. b)**.

Eriocaulon quinquangulare L., *Sp. Pl.* 1: 87 (1753); Hook. f., *FBI* 5:582 (1893); Gamble, *Fl. Madras* 1620 (1931); Vajr., *Fl. Palghat Dist* 539 (1990).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Marshy areas in the outskirts of hillock
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : August - November
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala, 10°48'24.82"N, 76°48'30.73"E, 147m, 18 September 2018, Aswani & Maya, 2841 (GVCH) **(Plate 17: Fig. c)**.

Eriocaulon sexangulare L., *Sp. Pl.* 1: 87 (1753); Hook. f., *FBI* 6: 580 (1893); Gamble, *Fl. Madras* 1618 (1931).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Marshy areas in the outskirts of hillock
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : November - March
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala, 10°49'44.76"N, 76°40'30.72"E, 107m, 17 July 2018, Aswani & Maya, 2611 (GVCH); Koomachimala, 10°49'44.76"N, 76°40'34.59"E, 102m, 23 November 2019, Aswani & Maya, 4874 (GVCH) **(Plate 17: Fig. d)**.

Plate 16: Fig. a. *Hedychium coronarium* J.Koenig **b.** *Hedychium flavescens* Carey ex Rosc. **c.** *Meistera aculeata* (Roxb.) Škorničk. & M.F.Newman **d.** *Zingiber nimmonii* Dalzell **e.** *Zingiber officinale* Roscoe **f.** *Zingiber sabuanum* K.M.P.Kumar & A.Joe **g.** *Zingiber zerumbet* (L.) Sm. **h.** *Typha angustifolia* L.

Eriocaulon xeranthemum Mart., *Pl. Asiat. Rar. (Wallich).* 3(10): 29 (1832); Hook. f., *FBI* 6:584 (1893); Gamble, *Fl. Madras* 1620 (1931); Sasidh., *Fl. Parambikulam WLS* 372 (2002).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and African
IUCN Category : Least Concern (LC)
Habitat : Marshy areas in hillock and forest tracks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : July - September
Altitude preference : Found in lower and medium altitudes
Specimens examined: INDIA, Kerala: Palakkad District, Walayar range, Koomachimala, 10°49'44.76"N, 76°40'34.59"E, 102m, 24 July 2017, Aswani & Maya, 358 (GVCH); Ayyappan Mala, 10°49'10.38"N, 76°44'28.29"E, 310m, 26 June 2018, Aswani & Maya, 2558 (GVCH); Parachaathy, 10°50'42.54"N, 76°43'49.14" E, 121m, 02 January 2019, Aswani & Maya, 3573 (GVCH); Anayappanchalla, 10°48'24.61" N, 76°48'13.32"E, 158m, 30 November 2019, Aswani & Maya, 5157 (GVCH) **(Plate 17: Fig. e)**.

Cyperaceae

Key to genera

1. Flowers bisexual……..……..…..…2
- Flowers unisexual….……..……7
2. Hypogynous scales or bristles absent…….……...…..…3
- Hypogynous scales or bristles present…..……..……5
3. Glumes distichous in spikelets……..….*Cyperus*
- Glumes spirally arranged in spikelets…..……..……..4
4. Nut with a button like structure at style - base……..… *Bulbostylis*
- Nut without a button like structure at style - base…….....*Fimbristylis*
5. Leaves reduced to bladeless sheaths…..……..……6
- Leaves well developed….. *Fuirena*
6. Inflorescence always terminal…. ……..…...*Eleocharis*
- inflorescence terminal, axillary or pseudo - lateral……..…….. ……..*Schoenoplectiella*
7. Utricle present; male and female spikelets arranged in single spike……..…..……... *Carex*
- Utricle absent; male and female spikelets arranged separately ……..…… *Scleria*

Bulbostylis Kunth, *Enum. Pl. [Kunth]* 2: 205 (1837), nom. cons.

Key to species

1. Inflorescence anthelate……..….. ……..…….*B. thouarsii*
- Inflorescence capitate……...…2
2. Glumes with thick strongly recurved cusp……..…..…..…….. ……....*B. barbata* subsp. *barbata*
- Glumes apiculate or minutely mucronulate……..... *Bulbostylis barbata* subsp. *pulchella*

Bulbostylis barbata (Rottb.) C.B.Clarke, *FBI* [J. D. Hooker] 6(19): 651 (1893); Gamble, *Fl. Madras* 1662 (1931); Vajr., *Fl. Palghat Dist* 540 (1990); Sasidh., *Fl. Parambikulam WLS* 373 (2002).

Basionym: *Scirpus barbatus* Rottb., *Descr. Pl. Rar.* 27 (1772).

Habit : Herb
Ecosystem preference : Moist deciduous forests

Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Found in water refrained dam site, exposed areas in hillocks and often in plains
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : August - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Vedivachapara, 10°50'12.34"N, 76°40'41.15"E, 109m, 04 June 2017, Aswani & Maya, 90 (GVCH); Ayyappan Mala, 10°49'07.19"N, 76°44'50.28"E, 130m, 26 June 2018, Aswani & Maya, 2533 (GVCH); Mayappalam, 10°48'08.64"N, 76°46'34.68"E, 127m, 06 September 2018, Aswani & Maya, 4689 (GVCH) **(Plate 17: Fig. f)**.

Bulbostylis barbata* subsp. *pulchella (Thwaites) T.Koyama, *Bot. Mag. (Tokyo)* 93(1032): 341 (1980); *Bulbostylis barbata* Kunth ex C.B. Clarke var. *pulchella* (Thwaites) C.B. Clarke in Hook. f., *FBI* 6: 652 (1893).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : Found in the Ephemeral Flush Vegetation and other marshes Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : August - September
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kongampaadam, 10°48'40.59"N, 76°46'51.94"E, 128m, 15 June 2018, Aswani & Maya, 2287 (GVCH) **(Plate 17: Fig. g)**.

Bulbostylis thouarsii (Roem. & Schult.) Lye ex Veldkamp & Verloove, *Blumea* 59(1): 10 (2014); *Bulbostylis puberula* (Poir.) Clarke in Hook.f., *FBI* 6: 652 (1893).

Basionym: *Scirpus thouarsii* Roem. & Schult., *Syst. Veg., ed.* 15 bis [Roemer & Schultes] 2: 134 (1817).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Found in outskirts in hillocks and water refrained areas in dam
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : September - January
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thonikadavu, 10°50'04.96"N , 76°40'48.72"E, 116m, 04 June 2017, Aswani & Maya, 42 (GVCH); Koomachimala, 10°49'48.14"N, 76°40'20.90"E, 144m, 08 July 2019, Aswani & Maya, 4176 (GVCH) **(Plate 17: Fig. h)**.

Carex L., *Sp. Pl*. 2: 972 (1753)

Carex phacota Spreng., *Syst. Veg., ed.* 16 [Sprengel] 3: 826 (1826); Hook. f., *FBI* 6: 708 (1894); C.E.C. Fisch. in Gamble, *Fl. Madras* 1686 (1931); Vajr., *Fl. Palghat Dist* 542 (1990); Sasidh., Sasidh., *Fl. Parambikulam WLS* 372 (2002).

Habit : Herb
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific

Plate 17: Fig. a. *Xyris pauciflora* Willd. **b.** *Eriocaulon palghatense* R.Ansari & N.P.Balakr. **c.** *Eriocaulon quinquangulare* L. **d.** *Eriocaulon sexangulare* L. **e.** *Eriocaulon xeranthemum* Mart. **f.** *Bulbostylis barbata* (Rottb.) C.B.Clarke **g.** *Bulbostylis barbata* subsp. *pulchella* (Thwaites) T.Koyama **h.** *Bulbostylis thouarsii* (Roem. & Schult.) Lye ex Veldkamp & Verloove.

IUCN Category : Least Concern (LC)
Habitat : Found in marshy areas in evergreen forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : November - April
Altitude preference : Found in higher altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Pothukunnu, 10°53'21.84"N, 76°46'33.24"E, 970m, 28 January 2020, Aswani & Maya, 5979 (GVCH); Pothuunnu - Parapetti, 10°53'6.54"N, 76°45'59.72"E, 1045m, 28 January 2020, Aswani & Maya, 5962 (GVCH) **(Plate 18: Fig. a)**.

Cyperus L., *Sp. Pl.* 1: 44 (1753)

Key to species

1. Glumes spirally arranged in a spikelet…..…… *C. neochinensis*
- Glumes distichous……....…….2
2. Style 2 - fid; nut biconvex with one edge facing rachilla…...……....3
- Style 3 - fid; nut trigonous with one face facing rachilla…..……..…...11
3. Spikelet with several flowers and persistent rachilla…...…….....….4
- Spikelet with 1 - 4 flowered and articulated rachilla…..……..……...8
4. Nuts with longitudinally oblong epidermal cells, wrinkled, wavy……..……..... *C.substramineus*
- Nut with isodiametric epidermal cells, puncticulate…..……..…….5
5. Glumes prominently mucronate…. ……..…...*C. pumilus*
- Glumes muticous……..……..6
6. Stamens 3; Glumes 2.5 - 3mm long……..…...…*C. macrostachyos*
- Stamens 2; Glumes 1.5 - 2.5mm long…….……..…….……7
7. Rachilla straight; wingless…..…….. ……..…...*C. flavidus*
- Rachilla zigzag, narrowly but distinctly winged…….……. ……..……...*C. polystachyos*
8. Rhizome creeping or stoloniferous…...……..…….9
- Rhizome neither creeping nor stoloniferous…..……..……..10
9. Keel of glumes distinctly winged…...……..….*C. mindorensis*
- Keel of glumes wingless…….….. ……..……..*C. brevifolius*
10. Spike usually single, cylindrically elongate…… …*C. sesquiflorus* subsp. *cylindricus*
- Spikes 1 - 3, globose…….……..……*C. richardii*
11. Rachilla of the spikelet persistent; glumes and nuts only early deciduous……..……....17
- Rachilla of the spikelet deciduous as a whole together with glumes and nut…….……12
12. Keel of the glume broadly winged……..*C. pseudokyllingioides*
- Keel of the glume not winged……..……13
13. Inflorescence single, capitate….. ……..….*C. dubius*
- Inflorescence anthelate……....…14
14. Spikelet strongly compressed.....15
- Spikelet terete……...16
15. Spikes globose to oblong - ovoid, mucro strongly recurved; nuts oblong to obovoid, less than 1mm long…....……..*C. squarrosus*
- Spikes hemi - spherical; mucro slightly recurved; nuts cylindrically oblong nearly 1.5mm long…….... *C. maderaspatanus*
16. Inflorescence usually with well developed rays; rays 3 - 15, upto 7 - 8cm long…….*C. cyperoides*
- Inflorescence contracted and head like; rays absent…….. *C. cyperinus*
17. Spikelet digitately arranged…...……..……...18
- Spikelet spicately arranged…...…22

18. Spikelets 2.5 - 4.00mm broad…..……..…..*C. compressues*
- Spikelets 1.5 - 2.5mm broad……..…..……19
19. Involucral bracts many…….. *C. diffusus*
- Involucral bracts 3 - 55…….……20
20. Spikelets numerous, crowded in globose heads……..…. *C. difformis*
- Spikelets 3 - 9 digitately clustered……..……21
21. Glumes on maturity exposing nuts, nuts densely verruculose…..*C. tenuispica*
- Glumes on maturity not exposing nuts, nuts smooth……..… *C. haspan*
22. Spikes cylindrically oblong, several times longer than broad……....23
- Spikes ovate, as long as broad……..……...25
23. Spikelets closely arranged, rachis not visible…..……..……....24
- Spikelets distinctly arranged, rachis visible…..……..... *C. exaltatus*
24. Spikes pedicellate; spikelets not spreading…..……..…… *C. nutans*
- Spikes not pedicellate; spikelets spreading to almost right angle…….…….. *C. imbricatus*
25. Rachilla distinctly winged…..……..……..26
- Rachilla not winged…....…….28
26. Stem slender 1 - 2mm thick…..…….…….. *C. rotundus*
- Stem stout 3 - 10mm thick…..……..……27
27. Rhizome long creeping; leaves usually reduced to sheath……..... *C. pangorei*
- Rhizome short, not creeping; leaves well developed…… *C. distans*
28. Rachis of the spike scabrid pilose; glumes acute at apex ……...*C. pilosus*
- Rachis of spike smooth; glumes obtuse at apex…….*C. iria*

Cyperus brevifolius (Rottb.) Endl. ex Hassk., *Cat. Hort. Bot. Bogor. (Hasskarl)* 24 (1844); *Kyllinga brevifolia* Rottb. var. *brevifolia*; Hook. f., *FBI* 6: 588 (1893); Gamble, *Fl. Madras* 1624 (1931); Sasidh., *Fl. Parambikulam WLS* 378 (2002).
Basionym: *Kyllinga brevifolia* Rottb., *Descr. Icon. Rar. Pl.* 13 (t. 4, fig. 3) (1773).

Habit : Herb
Ecosystem preference : Moist deciduous forests and in plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Found in marshy areas in open forests
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Common
Phenology : July - November
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala, 10°49'44.76"N, 76°40'34.59"E, 35m, 20 June 2017, Aswani & Maya, 132 (GVCH); Chaatapara waterfalls, 10°53'11.76"N, 76°42'15.84"E, 594m, 10 December 2019, Aswani & Maya, 5572 (GVCH); Ahalya campus, 10°47'43.08"N, 76°50'5.43"E, 150m, 24 September 2020, Aswani & Maya, 6302 (GVCH); Walayar river, 10°47'43.99"N, 76°46 '54.71"E, 18m, 14 March 2021, Aswani & Maya, 6535 (GVCH) **(Plate 18: Fig. b)**.

Cyperus compressus L., *Sp. Pl. [Linnaeus]* 1: 46 (1753); Hook. f., *FBI* 6: 605 (1893); Gamble, *Fl. Madras* 1640 (1931); Vajr., *Fl. Palghat Dist* 543 (1990); Sasidh., *Fl. Parambikulam WLS* 374 (2002).

Habit : Herb
Ecosystem preference : Deciduous forests, wetlands and plains

Distribution : Indo - Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Moist regions
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kosavanidukku-Kaduvachal, 10°50'26.38"N, 76°40'30.88"E, 20m, 16 July 2017, Aswani & Maya, 335 (GVCH); Kava, 10°50'38.92"N, 76°43'34.63"E, 118m, 06 April 2018, Aswani & Maya, 1866 (GVCH); Kongampaadam, 10°48'39.80"N, 76°47'2.67"E, 136m, 15 June 2018, Aswani & Maya, 2291 (GVCH); Ayyappan Mala,10°49'06.91"N, 76°44'44.91"E, 153m, 26 June 2018, Aswani & Maya, 2528 (GVCH) **(Plate 18: Fig. c)**.

Cyperus cyperinus (Retz.) Valck.Sur., *Cyperus* 154, t. 6 (1898); *Mariscus cyperinus* (Retz.) Vahl, Hook. f., *FBI* 6: 621 (1893); Gamble, *Fl. Madras* 1644 (1931), Vajr., *Fl. Palghat Dist* 554 (1990) *Mariscus pictus* Nees in Wight, Hook. f., *FBI* 6:621 (1893); Gamble, *Fl. Madras* 1645 (1931).

Basionym: *Kyllinga cyperina* Retz., *Observ. Bot. (Retzius)* vi. 21 (1791).

Habit : Herb
Ecosystem preference : Moist deciduous forests and semi - evergreen forests
Distribution : Indo - Pacific, African, Holarctic and South American
IUCN Category : Not Evaluated (NE)
Habitat : Moist and marshy regions in forests
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Rare
Phenology : June - August
Altitude preference : Found in all altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Neelippara, 10°51'47.52"N, 76°37'37.38"E, 323m, 15 September 2017, Aswani & Maya, 560 (GVCH); Jamanthimala, 10°52'21.00"N, 76°47'00.24"E, 856m, 23 June 2019, Aswani & Maya, 4138 (GVCH) **(Plate 18: Fig. d)**.

Cyperus cyperoides (L.) Kuntze, Revis. *Gen. Pl.* 3[3]: 333 (1898); *Mariscus sieberianus* Nees ex C.B.Clarke in Hook. f., *FBI* 6:622 (1893); C.E.C. Fisch. in Gamble, *Fl. Madras* 1645 (1931); *Mariscus sumatrensis* (Retz.) Raynal, Vajr., *Fl. Palghat Dist* 556 (1990); Sasidh., *Fl. Parambikulam WLS* 378 (2002).
Basionym: *Scirpus cyperoides* L., *Mant. Pl. Altera* 181 (1771).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Moist and marshy regions in forests
Raunkiaer's Life form : Hemicryptophyte
Distribution Frequency : Rare
Phenology : July - August
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Parakkallu- Neelikunnu, 10°51'47.52"N, 76°37'37.38"E, 312m, 27 April 2018, Aswani & Maya, 1965 (GVCH) **(Plate 18: Fig. e).**

Cyperus difformis L., *Cent. Pl. II*. 6 (1756); Hook. f., *FBI* 6: 599. 1893; Gamble, *Fl. Madras* 1640 (1931); Vajr., *Fl. Palghat Dist* 544 (1990).

Habit : Herb
Ecosystem preference : Wetlands
Distribution : Indo - Pacific, African, Holarctic and South American
IUCN Category : Not Evaluated (NE)
Habitat : Moist and marshy regions in hillocks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Mayappalam, 10°48'06.93"N, 76°46'25.09"E, 95m, 10 May 2018, Aswani & Maya, 2097 (GVCH).

Cyperus diffusus Vahl, *Enum. Pl. [Vahl]* ii. 321. (1805); Hook. f., *FBI* 6: 603 (1894); Gamble, *Fl. Madras* 1639 (1931); *Cyperus pubisquama* Steud., Hook. f., *FBI* 6: 604 (1893); Gamble, *Fl. Madras* 1639 (1931); Vajr., *Fl. Palghat Dist* 547 (1990).; *Cyperus diffusus* Vahl ssp. *macrostachyus* (Boeck.) Koyama, Sasidh., *Fl. Parambikulam WLS* 374 (2002).

Habit : Herb
Ecosystem preference : Moist deciduous and semi evergreen forests
Distribution : Indo - Pacific and Holarctic
IUCN Category : Least Concern
Habitat : Marshy forest floors
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Rare
Phenology : December - August
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Neelippara, 10°51'53.30"N, 76°37'36.39"E, 423m, 15 September 2017, Aswani & Maya, 544 (GVCH); Way to Ayyappan Mala, 10°48'59.96"N, 76°45'22.61"E, 156m, 06 January 2018, Aswani & Maya, 1227 (GVCH); Chacolas, 10°51'22.68"N, 76°44'41.28"E, 232m, 02 August 2019, Aswani & Maya, 4466 (GVCH) **(Plate 18: Fig. f).**

Cyperus distans L.f., Suppl. Pl. 103 (1782); Hook. f., *FBI* 6: 607 (1894); Gamble, *Fl. Madras* 1640 (1931); Vajr., *Fl. Palghat Dist* 544 (1990); *Cyperus distans* L.f. var. *pseudonutans* Kukenth., Vajr., *Fl. Palghat Dist* 545 (1990).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Along banks of river and marshes
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Occasional
Phenology : October - November
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kochuthodu, 10°51'58.32"N, 76°42'22.32"E, 207m, 18 December 2018, Aswani & Maya, 3327 (GVCH); Koyyamarakaadu, 10°47'44.88"N, 76°45'38.52"E, 121m, 30 November 2019, Aswani & Maya, 5362 (GVCH); Walayar river, 10°47'43.99"N, 76°46'54.71"E, 18m, 14 March 2021, Aswani & Maya, 6536 (GVCH) **(Plate 18: Fig. g).**

Cyperus dubius Rottb., *Descr. Icon. Rar. Pl.* 20. t. 4. f. 5. (1773); *Mariscus dregeanus* Kunth, *FBI* 6: 620 (1894); *Mariscus dubius* (Rottb.) Kukenth. ex C.E.C. Fisch. in Gamble, *Fl. Madras* 1644 (1931); Vajr., *Fl. Palghat Dist* 554 (1990); Sasidh., *Fl. Parambikulam WLS* 379 (2002).

Basionym: *Mariscus dubius* (Rottb.) Kük. ex G.E.C.Fischer, *Fl. Madras* 1644 (1931).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific, African and Holarctic
IUCN Category : Least Concern (LC)
Habitat : Rocky crevices and boulders
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Occasional
Phenology : August - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Akamalavaram- Thakaramada, 10°52'11.03"N, 76°42'59.76"E, 263m, 30 November 2018, Aswani & Maya, 3268 (GVCH); Kongampadam, 10°48'36.72"N, 76°46'51.96"E, 187m, 06 September 2019, Aswani & Maya, 4637 (GVCH); Olappalam, 10°49'52.20"N, 76°43'44.19"E, 132m, 23 November 2019, Aswani & Maya, 5059 (GVCH) **(Plate 18: Fig. h)**.

Cyperus exaltatus Retz., *Observ. Bot. (Retzius) v*. 11. (1788); Hook. f., *FBI* 6: 617 (1893); Gamble, *Fl. Madras* 1642 (1931); Vajr., *Fl. Palghat Dist* 545 (1990).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Rocky crevices and boulders
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Rare
Phenology : August - December
Altitude preference : Found in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Aduppukootimala, 10°50'15.72"N, 76° 44 '28.68"E, 444m, 16 February 2021, Aswani & Maya, 6520 (GVCH) **(Plate 19: Fig. a).**

Cyperus flavidus Retz., *Observ. Bot. (Retzius) v.* 13. (1788); *Pycreus globosus* (All.) Rchb., Gamble, *Fl. Madras* 1627 (1931); *Pycreus capillaris* (Koenig ex Roxb.) Nees ex Clarke, FBI 6: 591 (1893); *Pycreus flavidus* (Retz.) Koyama,Vajr., *Fl. Palghat Dist* 556 (1990); Sasidh., *Fl. Parambikulam WLS* 379 (2002).

Habit : Herb
Ecosystem preference : Marshy regions in grasslands
Distribution : Indo - Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Banks of rocky pools
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : Throughout the year
Altitude preference : Found in wet regions in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Aatumala Thodu, 10°53'24"N, 76°41'24"E, 1080m, 28 February 2020, Aswani & Maya, 6147(GVCH)

Cyperus haspan L., *Sp. Pl.* 1: 45 (1753); Hook. f., *FBI* 6: 600 (1893); Gamble, *Fl. Madras* 1640 (1931); Sasidh., *Fl. Parambikulam WLS* 374 (2002).

Habit : Herb
Ecosystem preference : Wetlands and marshes
Distribution : Indo - Pacific, African, South American
IUCN Category : Least Concern (LC)
Habitat : Banks of rocky pools
Raunkiaer's Life form : Geophyte (Cryptophyte)

Distribution Frequency : Occasional
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala, 10°49'39.72"N, 76°40'28.20"E, 203m, 20 June 2017, Aswani & Maya, 110 (GVCH); Kosavanidukku-Kaduvachal, 10°50'26.38"N, 76°40'30.88"E, 116m, 16 July 2017, Aswani & Maya, 237 (GVCH); Ollappallam, 10°49'52.20"N, 76°43'44.19"E, 129m, 25 November 2017, Aswani & Maya, 903 (GVCH), Ayyankulam, 10°48'37.19"N, 76°44'56.27"E, 161m, 06 January 2018, Aswani & Maya, 1201 (GVCH) **(Plate 19: Fig. b)**.

Cyperus imbricatus Retz., *Observ. Bot. (Retzius)* v. 12 (1788); C.E.C. Fisch. in Gamble, *Fl. Madras* 1641 (1931); Manilal & Sivar., *Fl. Calicut* 317 (1982); Rejani, *Cyperac. Kerala* 173 (1991); R. Ansari *et al*., *Aquatic and Wetland Fl. Kerala: Flow. Pl.* 248 (2016).

Habit : Herb
Ecosystem preference : Wetlands
Distribution : Indo - Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : In marshy river banks
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Occasional
Phenology : March - July
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Koyyamarakaadu, 10°47'44.88"N, 76°45'38.52"E, 108m, 30 November 2019, Aswani & Maya, 2678 (GVCH) **(Plate 19: Fig. c)**.

Cyperus iria L., *Sp. Pl.* 1: 45 (1753); Hook. f., *FBI* 6: 606 (1893); Gamble, *Fl. Madras* 1640 (1931); Vajr., *Fl. Palghat Dist* 545 (1990); Sasidh., *Fl. Parambikulam WLS* 374 (2002); *Cyperus iria* L. var. *paniciformis* Clarke in Hook. f., *FBI* 6: 607 (1893).

Habit : Herb
Ecosystem preference : Moist deciduous forests and in plains
Distribution : Indo - Pacific, Holarctic, African and South American
IUCN Category : Least Concern (LC)
Habitat : In outskirts of hillocks and in wastelands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : November - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Ollappallam, 10°49'52.20"N, 76°43'44.19" E, 128m, 25 November 2017, Aswani & Maya, 902 (GVCH); Kongampaadam, 10°48'39.80"N, 76°47'2.67"E, 145m, 15 June 2018, Aswani & Maya, 2300 (GVCH); Ayyappan Mala, 10°49'07.19"N, 76°44'50.28"E, 182m, 26 June 2018, Aswani & Maya, 2510 (GVCH); Koyamarakaadu, 10°47'44.88"N, 76°45'38.52"E, 148m, 06 September 2018, Aswani & Maya, 2679(GVCH); Kongampadam, 10°48'39.80"N, 76°47'2.67"E, 156m, 06 September 2019, Aswani & Maya, 4593 (GVCH) **(Plate 19: Fig. d)**.

Cyperus macrostachyos Lam., *Tabl. Encycl.* i. 147 (1791); *Pycreus albomarginatus* Nees, C.E.C. Fisch. in Gamble, *Fl. Madras* 1628 (1931).

Habit : Herb
Ecosystem preference : Wetlands

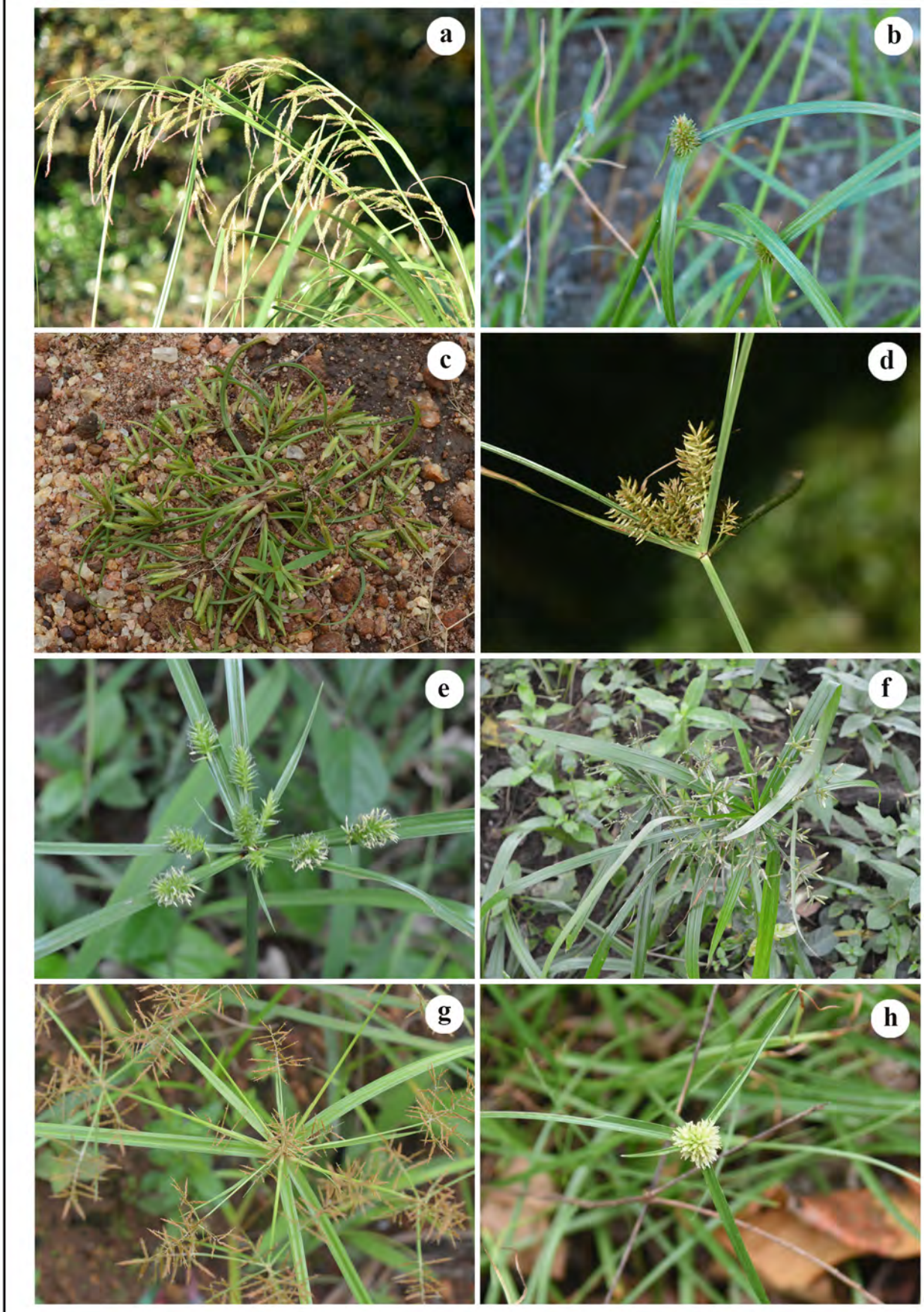

Plate 18 Fig. a. *Carex phacota* Spreng. **b.** *Cyperus brevifolius* (Rottb.) Endl. ex Hassk. **c.** *Cyperus compressus* L. **d.** *Cyperus cyperinus* (Retz.) Valck.Sur. **e.** *Cyperus cyperoides* (L.) Kuntze f. *Cyperus diffusus Vahl* **g.** *Cyperus distans* L.f. **h.** *Cyperus dubius* Rottb.

Distribution : Indo - Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : In sandy river beds
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : April - May
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kallanpuzha, 10°51'34.02"N, 76°42'40.16"E, 140m, 26 January 20178 Aswani & Maya, 1342 (GVCH).

Cyperus maderaspatanus Willd., *Sp. Pl., ed. 4 [Willdenow]* 1(1): 278 (1797); Sasidh., *Fl. Parambikulam WLS* 375 (2002); *Mariscus squarrosus* Clarke, Hook. f., *FBI* 6: 623 (1893); Gamble, *Fl. Madras* 1645 (1931); Vajr., *Fl. Palghat Dist* 555 (1990).

Habit : Herb
Ecosystem preference : Deciduous forests and in plains
Distribution : Indo - Pacific and African
IUCN Category : Least Concern (LC)
Habitat : Found in Outskirts of hillocks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : November - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Pallippara, 10°49'48.36"N, 76°43'44.04"E, 165m, 29 October 2017, Aswani & Maya, 731 (GVCH); Kongampaadam, 10°48'36.72"N, 76°46'51.96"E, 172m, 15 June 2018, Aswani & Maya, 2332 (GVCH); Anayappanchalla, 10°49'08.43"N, 76°48'56.51"E, 163m, 18 September 2018, Aswani & Maya, 2803 (GVCH); Pazhampullikaadu, 10°50'09.55"N, 76°38'28.33"E, 162m, 16 October 2018, Aswani & Maya, 3173 (GVCH) **(Plate 19: Fig. e)**.

Cyperus mindorensis (Steud.) Huygh, *Phytotaxa* 166(1): 39 (2014); *Kyllinga monocephala* Rottb., Hook. f., *FBI* 6: 588 (1893); Gamble, *Fl. Madras* 1624 (1931).; *Kyllinga nemoralis* (J. R & G. Forst.) Dandy ex Hutch. & Dalz., Vajr., *Fl. Palghat Dist* 552 (1990).

Basionym: *Kyllinga mindorensis* Steud., *Syn. Pl. Glumac. [Steudel]* 2(7): 67 (1854).

Habit : Herb
Ecosystem preference : Degraded forests and in plains
Distribution : Indo Pacific, African and South American
IUCN Category : Not evaluated (NE)
Habitat : Marshy areas in forest
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Occasional
Phenology : July - November
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Malampuzha irrigation dept. guest house hillock, 10°50'04.20"N, 76°40'52.68"E, 158m, 08 September 2017, Aswani & Maya, 449 (GVCH); Kallanpuzha, 10°51'34.02"N, 76°42'40.16"E, 196m, 26 January 2018, Aswani & Maya, 1386 (GVCH); Kongampaadam, 10°48'36.81"N, 76°46'43.06"E, 163m, 15 June 2018, Aswani & Maya, 2363 (GVCH).

Cyperus neochinensis (Tang & F.T.Wang) Bauters, *Phytotaxa* 166(1): 21 (2014); *Scirpus squarrosus* L., Hook. f., *FBI* 6: 663 (1893); Gamble, *Fl. Madras* 1666 (1931).
Basionym: *Scirpus neochinensis* Tang & F.T.Wang, *Fl. Reipubl. Popularis Sin.* xi. 28, 223 (1961).

Habit : Herb
Ecosystem preference : In grasslands

Distribution : Indo Pacific
IUCN Category : Not evaluated (NE)
Habitat : Marshy areas in forest areas near grasslands
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Occasional
Phenology : July - November
Altitude preference : Found in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kallappara - Pudussery North, 10° 53' 16.44" N, 76° 45' 50.4" E, 1016m, 28 January 2020, Aswani & Maya, 6000 (GVCH).

Cyperus nutans Vahl, *Enum. Pl. [Vahl]* ii. 363. (1805); C.N. Mohanan, *Fl. Quilon Dist* 444 (1984); Rejani, *Cyperac. Kerala* 163 (1991); Sasidh. & Sivar., *Fl. Pl. Thrissur For* 492 (1996); Sivar. & P. Mathew, *Fl. Nilambur* 775 (1997); Sasidh., *Fl. Periyar Tiger Reserve* 487 (1998); Sunil & Sivad., *Fl. Alappuzha Dist* 758 (2009); Sunil, *Fl. Pl. Diver. Ernakulam Dist* 438 (2016); R. Ansari *et al*., *Aquatic and Wetland Fl. Kerala: Flow. Pl.* 253 (2016).

Habit : Herb
Ecosystem preference : Marshy regions
Distribution : Indo Pacific, African and South American
IUCN Category : Not evaluated (NE)
Habitat : Near banks of river
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Occasional
Phenology : July - November
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Koyyamarakaadu, 10°47'44.88"N, 76°45'38.52"E, 108m, 06 September 2018, Aswani & Maya, 2678 (GVCH) **(Plate 19: Fig. f)**.

Cyperus pangorei Rottb., Descr. *Icon. Rar. Pl.* 31; *Prog.* 18 (1773); C.E.C. Fisch. in Gamble, *Fl. Madras* 1641 (1931); Vajr., *Fl. Palghat Dist* 546 (1990); *Cyperus tegetum* Roxb., C.B. Clarke in Hook. f., *FBI* 6: 613 (1893).

Habit : Herb
Ecosystem preference : Marshes and wetlands
Distribution : Indo Pacific
IUCN Category : Least Concern (LC)
Habitat : Marshy areas in the river banks and in other wetlands
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Rare
Phenology : September - January
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Mucuroni, 10°48'37.19"N , 76°44'56.27"E, 118m, 06 January 2018, Aswani & Maya, 1166 (GVCH) **(Plate 19: Fig. g)**.

Cyperus pilosus Vahl, *Enum. Pl. [Vahl]* ii. 354. (1805); Hook. f., *FBI* 6: 609 (1893); Gamble, *Fl. Madras* 1641 (1931); Vajr., Fl. Palghat Dist 547 (1990); *Cyperus pilosus* Vahl var. *obliquus* (Nees) Clarke, Hook. f., *FBI* 6: 610 (1893); *Cyperus pilosus* Vahl var. *polyanthus* Clarke, Hook. f., *FBI* 6: 610 (1893).

Habit : Herb
Ecosystem preference : Degraded forests and in plains
Distribution : Indo Pacific, African and South American
IUCN Category : Not evaluated (NE)
Habitat : Marshy areas in forest

Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Occasional
Phenology : July - November
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Mukkai river, 10°48'39.89"N, 76°40'2.05"E, 100m, 17 February 2023, Aswani & Maya, 6526 (GVCH) **(Plate 19: Fig. h)**.

Cyperus polystachyos Rottb., *Descr. Pl. Rar.* 21 (1772); *Pycreus polystachyos* (Rottb.) P. Beauv., var. *polystachyos*; Hook. f., *FBI* 6: 592 (1893); Vajr., *Fl. Palghat Dist* 557 (1990); *Pycreus odoratus* Urban, Gamble, *Fl. Madras* 1627 (1931).

Habit : Herb
Ecosystem preference : Degraded forests and plains
Distribution : Indo Pacific, African and South American
IUCN Category : Not evaluated (NE)
Habitat : Wet regions in hillocks, Near rock pools
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Occasional
Phenology : July - November
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Mayappallam, 10°48'07.06"N, 76°46'14.88"E, 157m, 06 September 2019, Aswani & Maya, 4656 (GVCH) **(Plate 20: Fig. a)**.

Cyperus pseudokyllingioides Kük., Pflanzenr. (Engler) *Cyperac.-Scirp.-Cyp.* 14 (1935); Courtoisia cyperoides (Roxb.) Nees, Hook. f., FBI 6: 625 (1893); Gamble, *Fl. Madras* 1645 (1931).

Habit : Herb
Ecosystem preference : Degraded forests and in plains
Distribution : Indo Pacific, African and South American
IUCN Category : Not evaluated (NE)
Habitat : Marshy areas in forest
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Occasional
Phenology : July - November
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Walayar river, 10°47'44.01"N , 76° 46 '56.82"E, 46m, 29 March 2023, Aswani & Maya, 6558(GVCH) **(Plate 20: Fig. b)**.

Cyperus pumilus L., *Cent. Pl.* II. 6 (1756); *Pycreus nitens* (Retz.) Nees, Hook. f., *FBI* 6: 591 (1893); *Pycreus pumilus* (L.) Nees, Hook. f., *FBI* 6: 591 (1893); Gamble, *Fl. Madras* 1627 (1931); Vajr., *Fl. Palghat Dist* 557 (1990); Sasidh., *Fl. Parambikulam WLS* 380 (2002).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Wet regions in hillocks and plains
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala, 10°49'39.72"N, 76°40'28.20"E, 215m, 20 June 2017, Aswani & Maya, 122 (GVCH); Kava, 10°50'38.92"N, 76°43'34.63"E, 119m, 06 April 2018, Aswani & Maya, 1867 (GVCH); Mayappalam, 10°48'0.36"N, 76°45'58.68"E, 121m, 30 November 2019, Aswani & Maya, 1867 (GVCH).

Cyperus richardii Steud., *Syn. Pl. Glumac.* 2(7): 8 (1854); *Kyllinga triceps* Rottb., Hook. f., *FBI* 6: 587 (1893); Gamble, *Fl. Madras* 1623 (1931); Vajr., *Fl. Palghat Dist* 553 (1990); *Kyllinga bulbosa* P. Beauv., Sasidh., *Fl. Parambikulam WLS* 378 (2002).

Habit : Herb
Ecosystem preference : Marshy areas and wet plains
Distribution : Indo - Pacific and African
IUCN Category : Least Concern
Habitat : Found in marshy regions in plains, water refrained regions in dam and other wastelands
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Occasional
Phenology : August - December
Altitude preference : Found marshes in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Cheranpara, 10°49'29.62"N , 76°40'38.63"E, 90m, 27 June 2017, Aswani & Maya, 162 (GVCH); Kosavanidukku-Kaduvachal, 10°50'26.38"N, 76°40'30.88"E, 137m, 16 July 2017, Aswani & Maya, 258 (GVCH); Walayar Dam, 10°50'24.58"N, 76°51'01.52"E, 252m, 09 May 2018, Aswani & Maya, 2025 (GVCH); Mayyappallam, 10°48'0.36"N, 76°45'58.68"E, 132m, 10 May 2018, Aswani & Maya, 2088 (GVCH); Kongampaadam, 10°48'39.80"N, 76°47'2.67"E, 131m, Aswani & Maya, 2286 (GVCH) **(Plate 20: Fig. c)**.

Cyperus rotundus L., *Sp. Pl.* 1: 45 (1753); Hook. f., *FBI* 6: 614 (1893); Gamble, *Fl. Madras* 1641 (1931); Vajr., *Fl. Palghat Dist* 548 (1990).

Habit : Herb
Ecosystem preference : Deciduous forests and in plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Plains and wastelands
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Common
Phenology : August - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Ayyappan Mala, 10°49'07.19"N, 76°44'50.28"E, 149m, 07 March 2019, Aswani & Maya, 3769 (GVCH); Chaavadippara, 10°52'42.20"N, 76°48'43.56"E, 285m, 28 January 2020, Aswani & Maya, 5842 (GVCH); Kallappara, 10°53'16.44"N, 76°45'50.4"E, 1019m, 28 January 2020, Aswani & Maya, 6000 (GVCH); Ahalya campus, 10°47'43.08"N, 76°50'5.43"E, 150m, 24 September 2020, Aswani & Maya, 6299 (GVCH).

Cyperus sesquiflorus **subsp.** ***cylindricus*** (Nees) T. Koyama, *Bot. Mag. (Tokyo)* 83: 187 (1970); *Kyllinga cylindrica* Nees ex Wight, Hook. f., *FBI* 6:588 (1893); Gamble, *Fl. Madras* 1624 (1931).

Habit : Herb
Ecosystem preference : Wet and moist regions
Distribution : Indo - Pacific and African
IUCN Category : Least Concern (LC)
Habitat : Marshy regions in semi evergreen forests
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Rare
Phenology : July - August
Altitude preference : Found in grasslands in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kadukkamkunnam, 10°48'48.76"N,

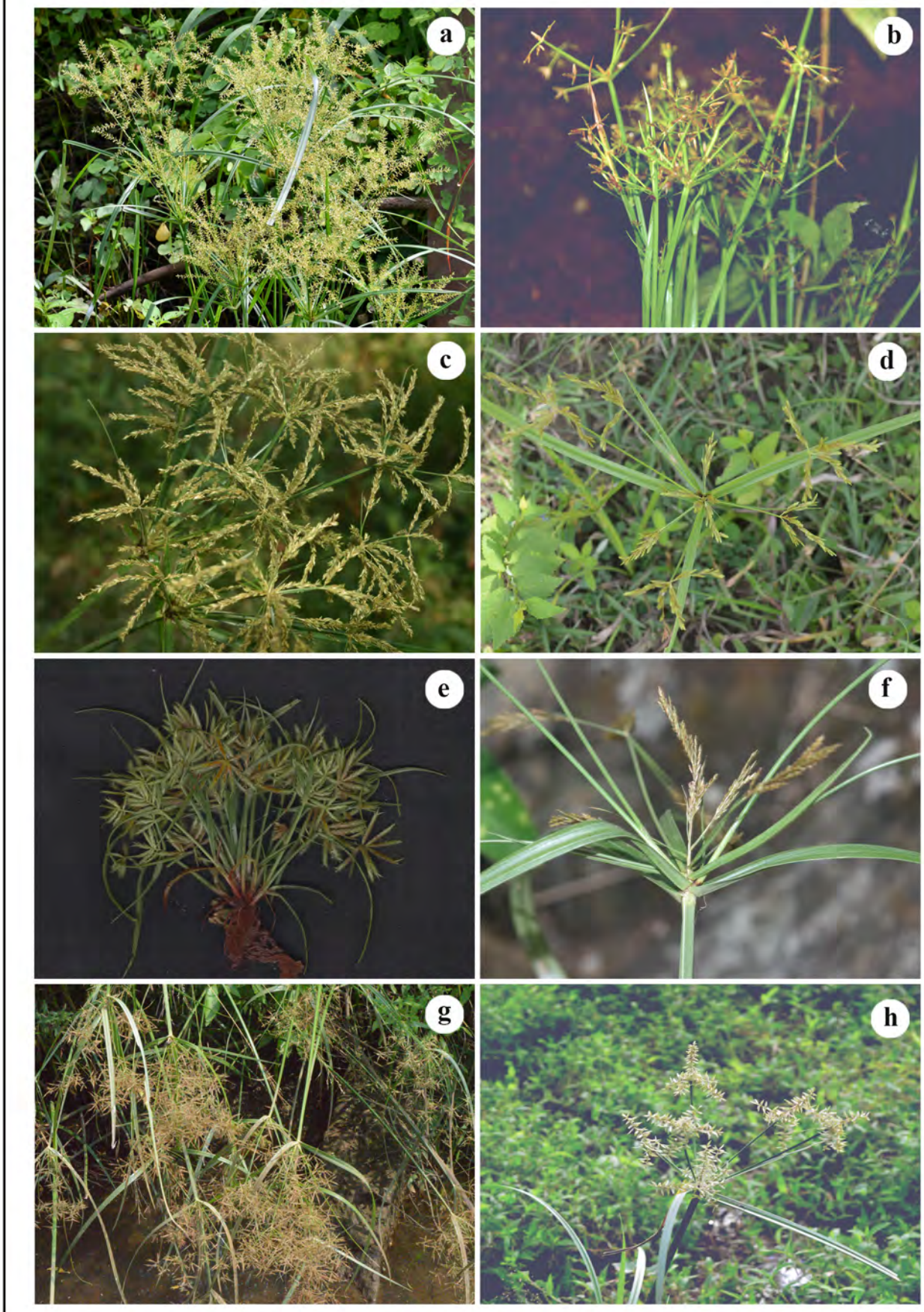

Plate 19: Fig. a. *Cyperus exaltatus* Retz **b.** *Cyperus haspan* L. **c.** *Cyperus imbricatus* Retz. **d.** *Cyperus iria* L. f. **e.** *Cyperus maderaspatanus* Willd. **f.** *Cyperus nutans* Vahl **g.** *Cyperus pangorei* Rottb. **h.** *Cyperus pilosus* Vahl

76°39'48.98"E, 107m, 23 March 2023, Aswani & Maya, 6569 (GVCH).

Cyperus squarrosus L., *Cent. Pl. II.* 6 (1756); *Mariscus squarrosus* (L.) C. B. Clarke in Hook. f., *FBI* 6: 623 (1893).

Habit : Herb
Ecosystem preference : Wetlands and marshes
Distribution : Indo - Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Found in river beds
Distribution Frequency : Common
Phenology : November - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kallanpuzha, 10°51'34.02"N, 76°42'40.16"E, 140m, 26 January 2018, Aswani & Maya, 1345 (GVCH); Pazhampullikadu, 10°50'20.14"N, 76°38'07.09"E, 91m, 16 October 2018, Aswani & Maya, 3208 (GVCH) **(Plate 20: Fig. d)**.

Cyperus substramineus Kük., *Pflanzenr. (Engler) Cyperac.-Scirp.-Cyp.* 10 (1935), **in obs.**; *Pycreus stramineus* Clarke in Hook. f., *FBI* 6: 589 (1893); Gamble, *Fl. Madras* 1627 (1931); Vajr., *Fl. Palghat Dist* 557 (1990); Sasidh., *Fl. Parambikulam WLS* 380 (2002).

Habit : Herb
Ecosystem preference : Wetland and Marshes
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found in marshy regions in forest tracts
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : August - December
Altitude preference : Found in medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Akamalavaram - Pettikallu, 10°52'28.20"N, 76°42'38.52"E, 401m, 19 July 2019, Aswani & Maya, 4326 (GVCH); Kongampadam, 10°48'39.80"N, 76°47'2.67``E, 134m, 06 September 2019, Aswani & Maya, 4571 (GVCH) **(Plate 20: Fig. e)**.

Cyperus tenuispica Steud., *Syn. Pl. Glumac.* 2 (7): 11 (1854); Gamble, *Fl. Madras* 1640 (1931); Vajr., *Fl. Palghat Dist* 548 (1990); *Cyperus flavidus* Clarke, Hook. f., *FBI* 6: 600 (1893).

Habit : Herb
Ecosystem preference : Marshy lands
Distribution : Indo - Pacific, Holarctic, African
IUCN Category : Least Concern (LC)
Habitat : Found in marshy areas in forests and in plains
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : Throughout the year
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Neelippara, 10°51'47.52"N, 76°37'37.38"E, 349m, 15 September 2017, Aswani & Maya, 586 (GVCH); Kava, 10°50'38.92"N, 76°43'34.63"E, 120m, 06 April 2018, Aswani & Maya, 1868 (GVCH) **(Plate 20: Fig. f)**.

Eleocharis R.Br., *Prodr. Fl. Nov. Holland.* 224 (1810)

Eleocharis dulcis (Burm.f.) Trin. ex Hensch., *Vita Rumphii* 186 (1833); *Eleocharis plantaginea* (Retz.) Roem. & Schult., Hook. f., *FBI* 6:625 (1893); Gamble, *Fl. Madras* 1647 (1931).

Habit : Herb
Ecosystem preference : Marshy areas
Distribution : Indo - Pacific and African
IUCN Category : Least Concern (LC)
Habitat : Found in marshy areas in rock pools in hillocks
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Rare
Phenology : September - October
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Mayyappallam, 10°48'0.36"N, 76°45'58.68"E, 125m, 10 May 2018, Aswani & Maya, 2081 (GVCH) **(Plate 20: Fig. g)**.

Fimbristylis Vahl, *Enum. Pl. [Vahl]* 2: 285 (1805)

Key to species

1. Style 2 - fid; nut biconvex…....….2
- Style 3 - fid; nut triquetrous…..….7
2. Inflorescence composed of single terminal spikelet……..…...…3
- Inflorescence composed of few to many spikelet……..……4
3. Nuts obovoid……....*F. schoenoides*
- Nuts oblong – cylindrical ……..……*F. tetragona*
4. Perennials with long or short rhizome…….....…...….*F. dichotoma*
- Annuals without rhizome…..….....5
5. Leaves ligulate…….....
……*F. aestivalis* var. *aestivalis*
- Leaves eligulate……..……...6
6. Spikelets squarrose; nut with a clavate appendage...…...*F. dipsacea*
- Spikelets cylindrically oblong; nut without clavate appendage…..……
……..….*F. argentea*
7. Glumes distichous…....*F. narayanii*
Glumes spiral……....*F. microcarya*

Fimbristylis aestivalis* var. *aestivalis (Retz.) Vahl, *Fl. Austral.* (1878); Hook. f., *FBI* 6: 637 (1893); Vajr., *Fl. Palghat Dist* 549 (1990); Sasidh., *Fl. Parambikulam WLS* 375 (2002).

Habit : Herb
Ecosystem preference : Moist deciduous forests and in plains
Distribution : Indo - Pacific, Holarctic, Australian
IUCN Category : Not Evaluated (NE)
Habitat : Found in open rocky areas in hillocks and its outskirts
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : January - April
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thonikadavu, 10°50'04.96"N, 76°40'48.72"E, 158m, 04 June 2017, Aswani & Maya, 44 (GVCH); Malampuzha irrigation dept guest house hillock, 10°50'03.76"N, 76°40'56.19"E, 131m, 08 September 2017, Aswani & Maya, 476 (GVCH); Koomachimala, 10°49'44.76"N, 76°40'34.59"E, 106m, 05 October 2017, Aswani & Maya, 626 (GVCH); Ollappallam, 10°49'52.20"N, 76°43'44.19"E, 182m, 25 November 2017, Aswani & Maya, 956 (GVCH) **(Plate 20: Fig. h)**.

Fimbristylis argentea Vahl, *Enum. Pl. [Vahl]* ii. 294. (1805); Hook. f., *FBI* 6: 640 (1893); Gamble, *Fl. Madras* 1659 (1931); Sasidh., *Fl. Parambikulam WLS* 376 (2002).

Habit : Herb
Ecosystem preference : Wetlands
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Found in water refrained regions in dam, wet regions in hillocks and other wet forest floors
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional

Plate 20: Fig. a. *Cyperus polystachyos* Rottb. **b.** *Cyperus pseudokyllingioides* Kük. **c.** *Cyperus richardii* Steud. **d.** *Cyperus squarrosus* L. **e.** *Cyperus substramineus* Kük. **f.** *Cyperus tenuispica* Steud. **g.** *Eleocharis dulcis* (Burm.f.) Trin. ex Hensch. **h.** *Fimbristylis aestivalis* var. *aestivalis* (Retz.) Vahl.

Phenology : November - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kosavanidukku-Kaduvachal, 10°50'26.38"N, 76°40'30.88"E, 223m, 16 July 2017, Aswani & Maya, 352 (GVCH); Koomachimala, 10°49'44.76"N, 76°40'30.72"E, 116m, 24 July 2017, Aswani & Maya, 363 (GVCH); Ayyappan Mala, 10°49'06.91"N, 76°44'44.91"E, 165m, 26 June 2018, Aswani & Maya, 2540 (GVCH) **(Plate 21: Fig. a)**.

Fimbristylis dichotoma* subsp. *dichotoma (L.) Vahl, *Flora Malesiana Series* I (1974); Gamble, *Fl. Madras* 1658 (1931); Vajr., *Fl. Palghat Dist* 550 (1990); Sasidh., *Fl. Parambikulam WLS* 376 (2002); *Fimbristylis diphylla* (Retz.) Vahl, Hook. f., *FBI* 6: 636 (1823).

Habit : Herb
Ecosystem preference : Deciduous forests and other degraded forest tracts
Distribution : Indo Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Found in open wet regions in main forests and wet regions in hillocks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : March - December
Altitude preference : Found in lower altitudes
Specimens examined :INDIA, Kerala: Palakkad District, Walayar range, Akamalavaram- Thakaramada, 10°52'11.03"N, 76°42'59.76"E, 269m, 30 November 2018, Aswani & Maya, 3274 (GVCH); Jamanthimala, 10°52'21.00"N, 76°47'00.24"E, 857m, 23 June 2019, Aswani & Maya, 4139 (GVCH); Kongampadam, 10°48'39.80"N, 76°47'2.67"E, 159m, 06 September 2019, Aswani & Maya, 4596 (GVCH) **(Plate 21: Fig. b)**.

Fimbristylis dipsacea (Rottb.) C.B.Clarke, *FBI* [J. D. Hooker] 6(19): 635 (1893); C.E.C. Fisch. in Gamble, *Fl. Madras* 1658 (1931); Vajr., *Fl. Palghat Dist* 550 (1990); Sasidh., *Fl. Parambikulam WLS* 375 (2002).

Habit : Herb
Ecosystem preference : Wetlands and marshes
Distribution : Indo - Pacific, Holarctic and African
IUCN Category : Least Concern (LC)
Habitat : Marshy areas in river beds
Raunkiaer's Life form :Therophyte
Distribution Frequency : Rare
Phenology : April - May
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Malampuzha Dam near Kava, 10°50'38.92"N, 76°43'34.63"E, 114m, 06 April 2018, Aswani & Maya, 1842 (GVCH) **(Plate 21: Fig. c)**.

Fimbristylis microcarya F. Muell., Fragm. (Mueller) 1(8): 200 (1859); *Fimbristylis complanata* var. *microcarya* (Muller) Clarke, Hook. f., *FBI* 6: 646 (1893).

Habit : Herb
Ecosystem preference : Marshy areas
Distribution : Indo - Pacific, Holarctic, Australian
IUCN Category : Least Concern (LC)
Habitat : Wet marshy regions in hillocks and water refrained regions in dam
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : July - September
Altitude preference : Found in lower altitudes
Specimens examined :INDIA, Kerala: Palakkad District, Walayar range, Kongampadam, 10°48'39.80"N, 76°47'2.67"E, 137m, 06 September 2019,

Aswani & Maya, 4574 (GVCH); Edamala, 10°50'28.32"N, 76°38'45.96"E, 198 m, 16 October 2019, Aswani & Maya, 4846 (GVCH);Olappalam, 10°49'52.20"N, 76°43'44.19"E, 164m, 23 November 2019, Aswani & Maya, 5091 (GVCH).

Fimbristylis narayanii **C.E.C.Fisch.,** *Bull. Misc. Inform. Kew* 1931(1): 46 (1931); Gamble, *Fl. Madras* 1660 (1931); Vajr., *Fl. Palghat Dist* 551(1990); Sasidh., *Fl. Parambikulam WLS* 376 (2002).

Habit : Herb
Ecosystem preference : Wet and marshy places
Distribution : Indo -Pacific
Endemism : South India (Kerala)
IUCN Category : Least Concern (LC)
Habitat : Marshy areas in hillocks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : October - December
Altitude preference : Found in lower altitudes
Specimen sexamined : INDIA, Kerala: Palakkad District, Walayar range, Kongampadam, 10°48'36.72"N, 76°46'51.96"E, 151m, 15 June 2018, Aswani & Maya, 2328 (GVCH); Ayyappan Mala,10°48'59.96"N, 76°45'22.61"E, 132m, 26 June 2018, Aswani & Maya, 2499 (GVCH).

Fimbristylis schoenoides (Retz.) Vahl, *Enum. Pl. [Vahl]* 2: 286 (1805); Hook. f., *FBI* 6: 634 (1893); Gamble, *Fl. Madras* 1658 (1931).

Habit : Herb
Ecosystem preference : Wet and marshy places
Distribution : Indo -Pacific, Holartic and Australian
IUCN Category : Least Concern (LC)
Habitat : Marshy areas in hillocks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : October - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Mayyappallam, 10°48'01.78"N, 76°45'58.91"E, 152m, 10 May 2018, Aswani & Maya, 2159 (GVCH); Kongampaadam, 10°48'36.72"N, 76°46'51.96"E, 168m, 15 June 2018, Aswani & Maya, 2328 (GVCH); Pallakaadu, 10°51'30.96"N, 76°37'39.00"E, 188m, 09 October 2018, Aswani & Maya, 3048 (GVCH);Anayappanchalla, 10°48'19.16"N, 76°48'15.25"E, 143m, 30 November 2019, Aswani & Maya, 5212 (GVCH) **(Plate 21: Fig. d)**.

Fimbristylis tetragona R.Br., *Prodr. Fl. Nov. Holland.* 226. (1810); Hook. f., *FBI* 6: 631. (1893); Gamble, *Fl. Madras* 1658 (1931).

Habit : Herb
Ecosystem preference : Marshy and wetlands
Distribution : Indo - Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Marshy exposed regions in hillocks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : October - December
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kava, 10°50'38.92"N, 76°43'34.63"E, 141m, 06 April 2018, Aswani & Maya, 1842 (GVCH); Pallakaadu, 10°51'30.96"N, 76°37'39.00"E, 225m, 09 October 2018, Aswani & Maya, 3084 (GVCH).

***Fuirena* Rottb.,** *Descr. Icon. Rar. Pl.* 70. t. 19 (1773).

Fuirena ciliaris (L.) Roxb., *Fl. Ind. (Carey & Wallich ed.)* 1: 184 (1820); *Fuirena glomerata* Lam., C.B. Clarke in Hook. f., *FBI* 6: 666 (1893); C.E.C. Fisch. in Gamble, *Fl. Madras* 1669 (1931).
Basionym: *Scirpus ciliaris* L., *Mant. Pl. Altera* 182 (1771).

Habit : Herb
Ecosystem preference : Wet and marshy places
Distribution : Indo - Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Marshy areas
Raunkiaer's Life form :Therophyte
Distribution Frequency : Rare
Phenology : January - March
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Walayar dam, 10°50'24.58"N , 76°51'01.52"E, 199m, 05 May 2018, Aswani & Maya, 2003 (GVCH) **(Plate 21: Fig. e)**.

Schoenoplectiella Lye, *Lidia* 6(1): 20 (2003)

Schoenoplectiella articulata (L.) Lye, *Lidia* 6(1): 20 (2003); *Scirpus articulatus* L., Hook. f., *FBI* 6: 655 (1893); Gamble, *Fl. Madras* 1666 (1931).

Habit : Herb
Ecosystem preference : Marshy and wetlands
Distribution : Indo - Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Marshy exposed regions in hillocks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : October - December
Altitude preference : Found in lower altitudes
Specimen examined :INDIA, Kerala: Palakkad District, Walayar range, Kongampaadam, 10°48'36.72"N, 76°46'51.96"E, 171m, 15 June 2018, Aswani & Maya, 2331 (GVCH) **(Plate 21: Fig. f)**.

Scleria P.J.Bergius, *Kongl. Vetensk. Acad. Handl.* 26: 142 (-144) (1765)

Key to species
Disc reduced to glandular ring……..……..……..*S. lithosperma*
Disc well developed with lanceolate lobes…….……. *S. oblata*

Scleria lithosperma (L.) Sw., *Prodr. [O. P. Swartz]* 18 (1788); Hook. f., *FBI* 6: 685 (1894); Gamble, *Fl. Madras* 1677 (1931); Vajr., *Fl. Palghat Dist* 558 (1990).

Habit : Herb
Ecosystem preference : Marshy regions in semi - evergreen forests
Distribution : Indo Pacific, African and South American
IUCN Category: Least Concern (LC)
Habitat : Marshy regions in forest tracts
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Rare
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Chacolas, 10°51'22.68"N, 76°44'41.28"E, 287m, 02 August 2019, Aswani & Maya, 4521 (GVCH) **(Plate 21: Fig. g)**.

Scleria oblata S.T.Blake ex J.Kern, *Reinwardtia* 6: 73; S. T. Blake in *Blumea,* xi. 169, 219 (1961); *Scleria laevis* Retz., Hook. f., *FBI* 6: 694 (1894); Gamble, *Fl.*

Madras 1678 (1931); *Scleria hebecarpa* Nees, Hook. f., *FBI* 6: 694 (1894); Gamble, *Fl. Madras* 1677 (1931).

Habit : Herb
Ecosystem preference : Marshy regions in semi evergreen forests
Distribution : Indo -Pacific
IUCN Category : Least Concern (LC)
Habitat : Found in marshy regions in forest tracts
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Rare
Phenology : October - December
Altitude preference : Found in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Chaatapara waterfalls, 10°53'11.76"N, 76°42'15.84"E, 650m, 10 December 2019, Aswani & Maya, 5509 (GVCH).

Poaceae

Key to genera

1. Plant woody; leaves dimorphic……..…….……2
- Plants herbaceous; leaves only single type……..…..……...3
2. Spikelet in globose congested heads; internodes in rachila indistinct.…….*Dendrocalamus*
- Spikelet 1 - many flowered in clusters; internodes in rachilla distinct……..…..... *Bambusa*
3. Stamens 6……..…. *Oryza*
- Stamens 3 or less……..……..4
4. Spikelets 2 - flowered……....…5
- Spikelets 1 to many flowered……..……..…38
5. Spikelets unisexual; male and female spikelets in different positions……...…..…...*Coix*
- Spikelets bisexual with female, male, bisexual and barren spikelets intermixed……..…….…6
6. Upper lemma awned; spikelets dissimilar……..……..7
- Upper lemma awnless ; spikelets similar……..…….....24
7. Sessile spikelets, usually solitary……...… *Dimeria*
- Sessile or pedicelled spikelets; spikelets paired or in triads…….……..…….....8
8. Inflorescence in racemes usually solitary, digitate or sub - digitate……....9
- Inflorescence in panicles……..…17
9. Racemes solitary……..….10
- Racemes more than 2……...12
10. Awns very long upto 10cm long, awns hairy……..…..*Heteropogon*
- Awns short upto 3cm long, awns never hairy……..……..11
11. Spikelets solitary; upper floret epaleate……..…...*Pogonatherum*
- Spikelets in triads; upper floret palette……..……...*Polytrias*
12. Lower glume of sessile spikelets truncate or emarginate at apex……..……. *Apocopis*
- Lower glume of sessile spikelets acute or acuminate at apex……..……13
13. Upper lemma reduced to a hyaline base of a awn…….……...14
- Upper lemma well developed……...…...……15
14. Pedicels and joints with translucent median line……....…*Bothriochloa*
- Pedicels and joints without translucent median line……..…...*Dicanthium*
15. Upper lemma of sessile spikelets with basal or sub - basal awns……..…...*Arthraxon*
- Upper lemma of sessile spikelets with awn arising from the sinus……..……....16

16. Upper lemma deeply cleft……..…. *Pseudoponatherum*
- Upper lemma never deeply cleft……..…...*Ischaemum*
17. Panicles interrupted by spathe……..……..18
- Panicles not interrupted by spathe……..……..20
18. Grasses aromatic...…. *Cymbopogon*
- Grasses non - aromatic…….....19
19. Racemes subtended by an involucre of 2 - opposite pair of one flowered homogamous spikelets; basal joints of racemes non - bulbous……...……*Themeda*
- Racemes not subtended an involucre of 2 - opposite pair of one flowered homogamous spikelets; basal joints of racemes bulbous……..…….*Apluda*
20. Spikelets similar with both pair bisexual……..……...21
- Spikelets dissimilar……..…….22
21. Spikelets awned…..... *Spodiopogon*
- Spikelets unawned…..... *Saccharum*
22. Joints and pedicel with median translucent line…..… *Capillipedium*
- Joints and pedicel without median translucent line…….……23
23. Spikelets all in threes - one sessile and two pedicelled…..*Chrysopogon*
- Spikelets all in pairs - one sessile and one pedicelled…....… *Sorghum*
24. Spikelets supported by bristles……..…...…25
- Spikelets not supported by bristles……..……26
25. Upper lemma wrinkled……...…… *Setaria*
- Upper lemma smooth….. *Cenchrus*
26. Flowers in digitate or sub - digitate racemes……...….*Allopteropsis*
- Flowers in panicles……..…….27
27. Lower glume awnless ; leaf lamina linear…….... *Echinochloa*
- Lower glume awned; leaf lamina ovate - elliptic or elliptic - lanceolate……..……....28
28. Upper lemma with crest like structure at apex…..… *Cyrtococcum*
- Upper lemma without crest like structure……..……..29
29. Glumes awned at apex…...……..... *Oplismenus*
- Glumes awnless ……..……....30
30. Panicles lax……..…….31
- Panicles spiciform……..……..33
31. Lower glume reduced to minute scale or either absent…..... *Digitaria*
- Lower glume much developed……..……...32
32. Spikelets in groups of 2 - 10; upper glume shorter than second lemma……..... *Ottochloa*
- Spikelets solitary; upper glume as long as or slightly longer than second lemma.. ……..…....*Panicum*
33. Upper florets closed at apex……..…. *Sacciolepis*
- Upper florets open……..…..……34
34. Lower glume reduced or scale like……...……35
- Lower glume well developed..…36
35. Culms stoloniferous; lower glume absent……..…..*Axonopus*
- Culms erect; lower glume absent or scale like……..….*Paspalum*
36. Spikelets with button like bulged callus at base…..……..... *Eriochloa*
- Spikelets without button like bulged callus at the base, but callus distinct in appearance……..…..37
37. Upper lemma dull, coarsely to finely rugose; spikelets often flattened...……..…... *Urochloa*
- Upper lemma and palea transversely rugose; spikelets never flattened……..... *Megathyrsus*
38. Spikelet with one floret…..……..……..…39
- Spikelets with 2 - many florets……..…...…..52

39. Spikelets awned……..…..40
- Spikelets awnless ……..…..….45
40. Awns trifid……..….*Aristida*
- Awns simple……..……...41
41. Awns capillary in nature, much longer than glumes……*Perotis*
- Awns not capillary,not much longer than glumes……..…..42
42. Flowers in panicles…..…. *Garnotia*
- Flowers in digitate spikes or racemes……..……...….43
43. Spikelets one flowered; awnless ……..…..... *Cynodon*
- Spikelets 2 - many flowered; awned……...……..….44
44. Grains trigonous……..…….*Chloris*
- Grains dorsally compressed……..... *Enteropogon*
45. Palea keeled, often 2 - keeled…...46
- Palea not keeled...…..….*Sporobolus*
46. Rachis of spikes ending in sharp point……..……..*Dactyloctenium*
- Rachis of spikes ending in a spikelet……...……..….47
47. Inflorescence either solitary or digitate or in racemes…….....48
- Inflorescence in panicles……..….50
48. Flowers in digitate or sub - digitate spikes……..……... *Eleucine*
- Flowers in solitary spikes or in racemes……....……49
49. Lemma 2 - 4 lobed at apex; lemma awned……..…...*Tripogon*
- Lemma entire at apex; lemma unawned……..... *Eragrostiella*
50. Lemma ciliate on nerves…..…….51
- Lemma never ciliate on nerves……..…… *Eragrostis*
51. Leaves flaccid; membraneous……..... *Trigonochloa*
- Leaves chartaceous…....*Leptochloa*
52. Tall reeds; lemma and joints silky hairy……..….... *Arundo*
- *S*hort or moderate sized grasses; lemma and joints glabrous……..…..53
53. Leaf blades broad; tessellately nerved……..….. *Centotheca*
- Leaf blades usually narrow, never tessellately nerved……..……..54
54. Spikelets sub - globose or obovoid; second lemma awnless; glumes almost equal in size…….….*Isachne*
- Spikelets never globose in nature; second lemma awned; glumes unequal in size…….. *Arundinella*

Alloteropsis J.Presl, *Reliq. Haenk.* 1(4-5): 343, t. 47 . Gen. dub. (1830)

Alloteropsis cimicina (L.) Stapf, *Fl. Trop. Afr. [Oliver et al.]* 9(3): 487 (1919); Gamble, *Fl. Madras* 1766 (1934); Sasidh., *Fl. Parambikulam WLS* 382 (2002); *Axonopus cimicinus* (L.) P. Beauv., Hook. f., *FBI* 7: 64 (1896).

Basionym: *Milium cimicinum* L., *Mant. Pl. Altera* 184 (1771).

Habit : Herb
Ecosystem preference : Moist deciduous forests, plains, roadsides and wastelands
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Weed in forest areas and in plains
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : July - November
Altitude preference : Found in lower altitudes
Specimen examined :INDIA, Kerala: Palakkad District, Walayar range, Akamalavaram- Thakaramada, 10°52'11.03"N, 76°42'59.76"E, 272m, 30 November 2018, Aswani & Maya, 3277 (GVCH) **(Plate 21: Fig. h)**.

Apluda L., *Sp. Pl*. 1: 82 (1753)

Apluda mutica L., *Sp. Pl.* 1: 82 (1753); Gamble, *Fl. Madras* 1750 (1934); Sasidh., *Fl. Parambikulam WLS* 384 (2002); *Apluda varia* Hack. ssp. *aristata* (L.) Hack. 6: 196

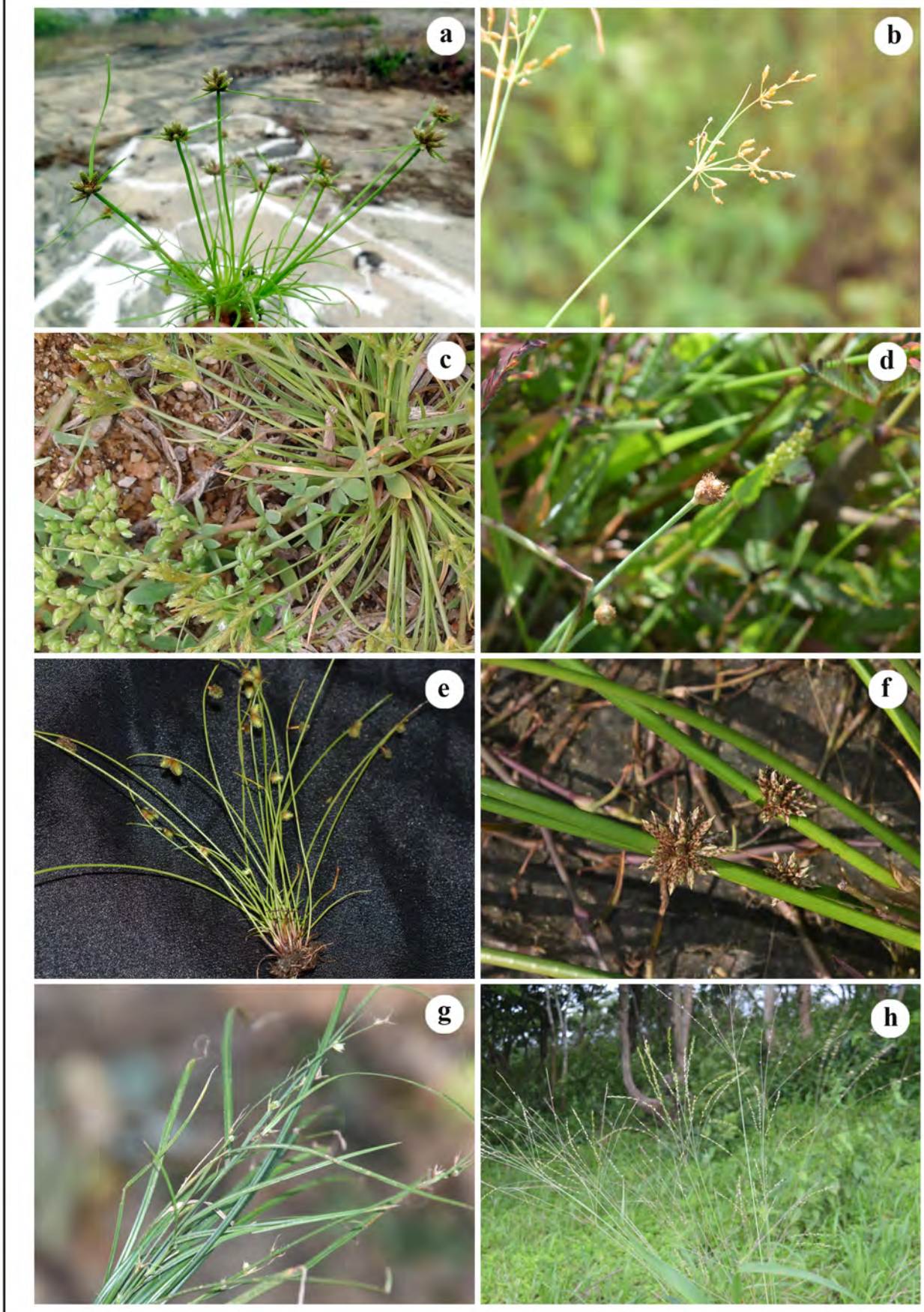

Plate 21:Fig. a. *Fimbristylis argentea* Vahl **b.** *Fimbristylis dichotoma* subsp. *dichotoma* (L.) Vahl **c.** *Fimbristylis dipsacea* (Rottb.) C.B.Clarke **d.** *Fimbristylis schoenoides* (Retz.) Vahl **e.** *Fuirena ciliaris* (L.) Roxb. **f.** *Schoenoplectiella articulata* (L.) Lye **g.** *Scleria lithosperma* (L.) Sw. **h.** *Alloteropsis cimicina* (L.) Stapf.

(1889); Hook. f., *FBI* 7: 151 (1896); Vajr., *Fl. Palghat Dist* 563 (1990); *Apluda aristata* L., Gamble, *Fl. Madras* 1750 (1934); *Apluda varia* Hack., Hook. f., *FBI* 7: 150 (1896).

Habit : Herb
Ecosystem preference : Moist deciduous forests and in plains
Distribution : Indo - Pacific, Holarctic and Australian
IUCN Category : Not Evaluated (NE)
Habitat : Found in grassy hillocks, hill slopes and the open regions near forests, sides of railway track
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : October - November
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Karadikunnu, 10°50'23.64"N, 76°49'47.64"E, 227m, 30 December 2017, Aswani & Maya, 1104 (GVCH); Valiya eri, 10°48'53.21"N, 76°44'52.53"E, 169m, 06 January 2018, Aswani & Maya, 1284 (GVCH); Ayyappan Mala, 10°49'06.39"N, 76°44'39.99"E, 227m, 26 June 2018, Aswani & Maya, 2552 (GVCH); Koomachimala, 10°49'44.76"N, 76°40'34.59"E, 156m, 23 November 2019, Aswani & Maya, 4905 (GVCH).

Apocopis Nees, *Proc. Linn. Soc. London* 1(11): 93 (1841)

Key to species

Decumbent herbs; leaves and sheaths covered with tubercled based hairs; anthers yellow; stigma cream coloured…..…….. *A. mangalorensis*
Erect herbs; leaves hairy on both surfaces; sheath glabrous towards base, hairy towards apex; anthers reddish; stigma reddish - brown…….. *A. cochinchinensis*

Apocopis cochinchinensis A.Camus, *Bull. Mus. Natl. Hist. Nat.* 1919, xxv. 286; Sabu & Jayasree, *J. Econ. Tax. Bot.* 25: 611 (2001); Sasidh., *Biodiv. Doc. Kerala-Fl. Pl.* 550 (2004).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Indo - Pacific
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : September - December
Altitude preference : Found in low and middle altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thonikadavu, 10°50'04.96"N, 76°40'48.72"E, 127m, 04 June 2017, Aswani & Maya, 12 (GVCH); Kezhakootimala, 10°51'53.30"N, 76°37'36.39"E, 407m, 15 September 2017, Aswani & Maya, 528 (GVCH); Kavarakundu, 10°52'14.88"N, 76°42'38.88"E, 267m, 10 March 2018, Aswani & Maya, 1474 (GVCH); Ayyappan Mala, 10°49'07.19"N, 76°44'50.28"E, 186m, 07 March 2019, Aswani & Maya, 3806 (GVCH).

Apocopis mangalorensis (Hochst. ex Steud.) Henrard, *Blumea* iv. 523 (1941); Sasidh., *Fl. Parambikulam WLS* 383 (2002).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found in open forest areas and rocky hillocks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare

Phenology : October - February
Altitude preference : Found in lower altitudes
Specimens examined :INDIA, Kerala: Palakkad District, Walayar range, Akamalavaram- Thakaramada, 10°52'11.03"N, 76°42'59.76"E, 255m, 30 November 2018, Aswani & Maya, 261 (GVCH); Koomachimala, 10°49'44.76"N, 76°40'34.59"E, 17m, 23 November 2019, Aswani & Maya, 4920 (GVCH).

Aristida L., *Sp. Pl.* 1: 82 (1753)

Key to species

Panicles upto 50cm long; glumes prominently awned; awns of lemma upto 4cm long…… *A. setacea*
Panicles upto 20cm long; glumes shortly aristate or not awned; awns of lemma upto 10cm long…..…..……..…. *A. adscensionis*

Aristida adscensionis L., *Sp. Pl.* 1: 82 (1753); Hook. F., *FBI* 7: 224 (1896); Vajr., *Fl. Palghat Dist* 564 (1990); *Aristida depressa* Retz., Gamble, *Fl. Madras* 1809 (1934).

Basionym: *Arthratherum adscensionis* (L.) Tzvelev, *Novosti Sist. Vyssh. Rast.* 8: 74 (1971).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Moist forest floors
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : March – August
Altitude preference : Found in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Chottuppara, 10°52'37.92"N, 76°41'39.84"E, 392m, 14 May 2019, Aswani & Maya, 3929 (GVCH).

Aristida setacea Retz., Observ. Bot. (Retzius) iv. 22. (1786); Hook. F., *FBI* 7: 225 (1896); Gamble, *Fl. Madras* 1809 (1934).

Habit : Herb
Ecosystem preference : Moist Deciduous forests
Distribution : Indo – Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Open forest floors
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimen examined :INDIA, Kerala: Palakkad District, Walayar range, Aduppukootimala, 10°49'50.52"N, 76°44'24.72"E, 252m, 12 January 2019, Aswani & Maya, 3700 (GVCH).

Arthraxon P.Beauv., *Ess. Agrostogr.* 111 (1812)

Arthraxon hispidus (Thunb.) Makino, *Bot. Mag. (Tokyo)* 26: 214 (1912); *Arthraxon ciliaris* P. Beauv., Hook. F., *FBI* 7: 146 (1896); *Arthraxon quartinianus* (A. Rich.) Nash, Gamble, *Fl. Madras* 1728 (1934).

Basionym: *Phalaris hispida* Thunb., *Syst. Veg., ed.* 14 (J. A. Murray). 104 (1784).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo – Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Grassy hillslopes
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Rare
Phenology : September – March
Altitude preference : Found in lower altitudes

Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Ayyappan Mala, 10°49’07.19”N, 76°44’50.28”E, 137m, 26 June 2018, Aswani & Maya, 2465 (GVCH).

Arundinella Raddi, *Agrostogr. Bras. [Raddi]* 37, t. 1 (1823)

Key to species

1. Nodes bearded; upper lemma without setae……..…..…. *A. ciliata*
- Nodes glabrous; upper lemma with setae on either side of awn…….……..……..2
2. Spikelets greenish – yellow; glabrous; panicles drooping……. ……..…..*A. setosa*
- Spikelets purplish to brown with tubercled based hairs; panicles spreading…….*A. mesophylla*

Arundinella ciliata Nees ex Miq., *in Verh. Nederl. Inst.* III. Iv. (1851) 30; Sasidh., *Fl. Parambikulam WLS* 385 (2002); *Arundinella holcoides* Trin, *Fl. Madras* 1801 (1934); *Arundinella agrostoides* Trin, *FBI* 7: 71 (1896).

Habit : Herb
Ecosystem preference : Grasslands
Distribution : Indo – Pacific
Endemism : Peninsular India
IUCN Category : Not Evaluated (NE)
Habitat : Exposed rocky areas in grasslands
Raunkiaer’s Life form : Therophyte
Distribution Frequency : Rare
Phenology : October – November
Altitude preference : Found in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Aduppukootimala, 10°50’43.08”N, 76° 44 ‘28.68”E, 824m, 16 February 2021, Aswani & Maya, 6513 (GVCH).

Arundinella mesophylla Nees ex Steud., *Syn. Pl. Glumac.* 1(2): 115 (1854); Hook. F., *FBI* 7: 69 (1896); Gamble, *Fl. Madras* 1801 (1934); Vajr., *Fl. Palghat Dist* 565 (1990); Sasidh., *Fl. Parambikulam WLS* 385 (2002).

Habit : Herb
Ecosystem preference : Moist deciduous forests, plains and in wastelands
Distribution : Indo – Pacific
Endemism : South India
IUCN Category : Not Evaluated (NE)
Habitat : Found in exposed rocks in hillocks, grasslands and open forest floors
Raunkiaer’s Life form : Therophyte
Distribution Frequency : Common
Phenology : July – December
Altitude preference : Found in all altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Aduppukootimala, 10°49’38.80”N, 76°44’16.08”E, 161m, 12 January 2019, Aswani & Maya, 3654 (GVCH); Cheekuzhi, 10°50’11.04”N, 76°38’57.48”E, 120m, 16 October 2019, Aswani & Maya, 4755 (GVCH); Anayappanchalla, 10°48’25.92”N, 76°48’35.19”E, 159m, 30 November 2019, Aswani & Maya, 5098 (GVCH); Mayappalam, 10°48’01.78”N, 76°45’58.91”E, 132m, 30 November 2019, Aswani & Maya, 5404 (GVCH).

Arundinella setosa Trin., *Gram. Panic. [Trinius]* 65 (1826); Hook. F., *FBI* 7: 70 (1896); Gamble, *Fl. Madras* 1801 (1934); *Arundinella capillaris* Hook.f., *FBI* 7: 74 (1896).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo – Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : Canopy rich forest floors
Raunkiaer’s Life form : Therophyte
Distribution Frequency : Rare

Phenology : May – December
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Akamalavaram - Thakaramada, 10°52'11.03"N, 76°42'59.76"E, 251m, 30 November 2018, Aswani & Maya, 3257 (GVCH).

Arundo L., *Sp. Pl.* 1: 81 (1753)

Arundo donax L., *Sp. Pl.* 1: 81 (1753); Hook. f., *FBI* 7: 302 (1896); Gamble, *Fl. Madras* 1805 (1934); Vajr., *Fl. Palghat Dist* 566 (1990).

Habit : Herb
Ecosystem preference : Wastelands
Distribution : Indo - Pacific and African
IUCN Category : Least Concern (LC)
Habitat : Found along railway tracks, bans of streams and canals
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : August - December
Altitude preference : Found in lower altitudes
Specimen examineds : INDIA, Kerala: Palakkad District, Walayar range, Kottamutti waterfalls, 10°49'42.94"N, 76°46'47.87"E, 212m, 23 September 2018, Aswani & Maya, 2858 (GVCH); Ayyappan Mala, 10°49'07.19"N, 76°44'50.28"E, 176m, 07 March 2019, Aswani & Maya, 3796 (GVCH).

Axonopus P. Beauv., *Ess. Agrostogr.* 12 (1812)

Axonopus compressus (Sw.) P.Beauv., *Ess. Agrostogr.* 12 (1812) ; Sasidh., *Fl. Parambikulam WLS* 386 (2002).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo- Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Found near water sources in forest tracts
Raunkiaer's Life form :Hemicryptophyte

Distribution Frequency : Rare
Phenology : Throughout the year
Altitude preference : Found in lower altitudes near water sources
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kallanpuzha, 10°51'34.02"N, 76°42'40.16" E, 198m, 26 January 2018, Aswani & Maya, 1388 (GVCH).

Bambusa Schreb., *Gen. Pl., ed.* 8[a]. 236 (1789)

Bambusa bambos (L.) Voss, *Vilm. Blumengärtn., ed.* 3. 1: 1189 (1895); Sasidh., *Fl. Parambikulam WLS* 386 (2002); *Bambusa arundinacea* (Retz.) Willd., Hook. f., *FBI* 7: 395 (1896); Gamble, *Fl. Madras* 1859 (1934); Vajr., *Fl. Palghat Dist* 566 (1990).

Habit : Shrub
Ecosystem preference : Moist deciduous forests, wastelands and in plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found in outskirts of hillocks, banks of rivers and streams, and in forest floors
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : July - February
Altitude preference : Found in all altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Karadikunnu, 10°50'25.97"N, 76°49'42.92"E, 209m, 30 December 2017, Aswani & Maya, 1024 (GVCH); Mangalathumchalla, 10°49'04.07"N, 76°48'16.50"E, 156m, 18 September 2018,

Aswani & Maya, 2737 (GVCH); Parachaathy, 10°50'42.54"N, 76°43'49.14" E, 147m, 02 January 2019, Aswani & Maya, 3539 (GVCH); On the way to Jamanthimala, 10°51'20.17"N, 76°47'4.18"E, 658m, 23 June 2019, Aswani & Maya, 4037 (GVCH).

Bothriochloa Kuntze, *Revis. Gen. Pl.* 2: 762 (1891)

Key to species

Lower glume of the sessile spikelets more or glabrous…..……..……. *B. insculpta*
Lower glume of the sessile spikelets hairy below the middle……..….. *B. pertusa*

Bothriochloa insculpta (Hochst. ex A.Rich.) A.Camus, *Ann. Soc. Linn. Lyon sér.* 2, 76: 165 (1931).; *Andropogon pertusus* (L.) Willd. var. *insculptus* (Hochst. ex A. Rich.) Hack., Hook. f., *FBI* 7: 174 (1896); *Amphilophis insculpta* (Hochst. ex A. Rich.) Stapf, Gamble, *Fl. Madras* 1732 (1934).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo Pacific, Holarctic, African and Australian
IUCN Category : Not Evaluated (NE)
Habitat : Rocky grass rich areas
Raunkiaer's Life form : Hemicryptophyte
Distribution Frequency : Rare
Phenology : September - January
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala, 10°49'39.72"N, 76° 40 '28.20"E, 198m, 17 September 2017, Aswani & Maya, 619 (GVCH).

Bothriochloa pertusa (L.) A.Camus, *Ann. Soc. Linn Lyon ser.* 2, 76 (1931); Sasidh., *Fl. Parambikulam WLS* 386 (2002); *Andropogon pertusus* (L.) Willd., Hook. f., *FBI* 7: 173 (1896); *Amphilophis pertusa* (L.) Nash ex Stapf, Gamble, *Fl. Madras* 1731 (1934).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Found near water sources in hillocks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : August - February
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kozhimala, 10°50'01.89"N, 76°42'58.61"E, 150m, 09 November 2017, Aswani & Maya, 800 (GVCH); Valiya eri, 10°48'53.21"N, 76°44'52.53"E, 156m, 06 January 2018, Aswani & Maya, 1271 (GVCH).

Capillipedium Stapf, *Fl. Trop. Afr. [Oliver et al.]* 9(1): 169 (1917)

Capillipedium assimile (Steud.) A.Camus, *Fl. Indo-Chine [P.H. Lecomte et al.]* 7: 314 (1922); Sasidh., *Fl. Parambikulam WLS* 387 (2002); Andropogon assimilis Steud., Hook. f., *FBI* 7: 179 (1896); *Capillipedium glaucopsis* Stapf, Gamble, *Fl. Madras* 1730 (1934).

Basionym: *Andropogon assimilis* Steud., *Syn. Pl. Glumac.* 1(4-5): 397 (1854).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific, Holarctic
IUCN Category : Not Evaluated (NE)

Habitat : Found commonly in hillocks and other open forest tracts
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : October - November
Altitude preference : Found commonly in lower and middle altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kezhakootimala, 10°51'53.30"N, 76°37'36.39"E, 410m, 15 September 2017, Aswani & Maya, 531 (GVCH); Pallippara, 10°49'48.36"N, 76°43'44.04"E, 130m, 29 October 2017, Aswani & Maya, 696 (GVCH); Karadikunnu, 10°50'25.10"N, 76°49'43.70"E, 215m, 30 December 2017, Aswani & Maya, 1057 (GVCH) **(Plate 22: Fig. a)**.

***Cenchrus* L.,** Sp. Pl. 2: 1049 (1753)

Key to species

Spikelets pedicelled; inner bristles densely woolly plumose……..*C. pedicellatus*
Spikelets sessile; inner bristles plumose but not wooly……..…….. *C. setosus*

Cenchrus pedicellatus (Trin.) Morrone, *Ann. Bot. (Oxford) n.s*., 106(1): 128 (2010); Hook. f., *FBI* 7: 86 (1896); Gamble, *Fl. Madras* 1792 (1934); Vajr., *Fl. Palghat Dist* 585 (1990).

Basionym: *Pennisetum pedicellatum* Trin., *Mém. Acad. Imp. Sci. Saint-Pétersbourg*, Sér. 6, *Sci. Math*., *Seconde Pt. Sci. Nat.* 3(2): 184. (1834).

Habit : Herb
Ecosystem preference : Margins of forests and in plains
Distribution : Indo - Pacific and African
IUCN Category : Least Concern
Habitat : Wastelands, roadsides and often found as invasive in forest floors
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : September - December
Altitude preference : Found commonly in all altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kozhimala, 10°50'01.89"N, 76°42'58.61"E, 163m, 09 November 2017, Aswani & Maya, 813 (GVCH); G. P. Nair Estate, 10°53'20.76"N, 76°39'41.04"E, 221m, 24 March 2018, Aswani & Maya, 1660 (GVCH); Anakundu, 10°49'42.90"N, 76°46'13.00"E, 139m, 07 March 2019, Aswani & Maya, 3860 (GVCH); Anayappanchalla, 10°48'25.92"N, 76°48'35.19"E, 170m, 30 November 2019, Aswani & Maya, 5109 (GVCH) **(Plate 22: Fig. b)**.

Cenchrus setosus Sw*., Prodr. [O. P. Swartz]* 26 (1788); *Pennisetum setosum* (Sw.) L.C. Rich, Hook. f., *FBI* 7: 87 (1896); *Pennisetum polystachyon* (L.) Schult, Gamble, *Fl. Madras* 1792 (1934); Vajr., *Fl. Palghat Dist* 585 (1990).
Basionym: *Cenchrus polystachios* subsp. *setosus* (Sw.) P.M.Peterson & Y.Herrera, *Smithsonian Contr. Bot.* 107: 95 (2018).

Habit : Herb
Ecosystem preference : Moist deciduous forests, plains and in wastelands
Distribution : Indo - Pacific and African
IUCN Category : Least Concern (LC)
Habitat : Found commonly in degraded forests, road sides and wastelands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : April - December
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Way to Ayyappan Mala, 10°48'59.96"N, 76°45'22.61"E, 136m, 06 January 2018, Aswani & Maya, 1207 (GVCH); Koomachimala, 10°49'44.76"N, 76°40'34.59"E, 103m, 23 November 2019, Aswani & Maya, 4852 (GVCH);

Aduppukootimala, 10°50'15.72"N, 76°44'28.68"E, 450m, 16 February 2021, Aswani & Maya, 6419 (GVCH) **(Plate 22: Fig. c)**.

Centotheca Desv., *Nouv. Bull. Sci. Soc. Philom. Paris* 2: 189 (1810)

Centotheca lappacea Desv., *in Nouv. Bull. Soc. Philom.* ii. (1810) 189; Hook. f., *FBI* 7: 332 (1896); Gamble, *Fl. Madras* 1848 (1934); Vajr., *Fl. Palghat Dist* 567 (1990); Sasidh., *Fl. Parambikulam WLS* 387 (2002).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific, Holarctic and African
IUCN Category : Not Evaluated (NE)
Habitat : Found in moisture rich forest floors
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : October - February
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Poozhikunnu, 10°51'20.44"N, 76°43'38.28"E, 169m, 09 November 2017, Aswani & Maya, 885 (GVCH) **(Plate 22: Fig. d)**.

Chloris Sw., *Prodr. [O. P. Swartz]* 25 (1788)

Chloris barbata Sw., Fl. Ind. Occid. 1: 200 (1797); Hook. f., *FBI* 7:292 (1896); Gamble, *Fl. Madras* 1838 (1934).

Habit : Herb
Ecosystem preference : Moist deciduous forests and in plains
Distribution : Indo - Pacific, African, South American
IUCN Category : Not Evaluated (NE)
Habitat : Found in open forest areas
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : March - December
Altitude preference : Found in lower altitudes
Specimens examined: INDIA, Kerala: Palakkad District, Walayar range, Thonikadavu, 10°50'04.96"N, 76°40'48.72" E, 155m, 04 June 2017, Aswani & Maya, 40 (GVCH); Malampuzha irrigation dept Guest house hillock, 10°50'04.20"N, 76°40'52.68"E, 171m, 08 September 2017, Aswani & Maya, 463 (GVCH); Ollappallam, 10°49'52.20"N, 76°43'44.19" E, 173m, 25 November 2017, Aswani & Maya, 947 (GVCH); Walayar river, 10°47'43.99"N, 76°46'54.71"E, 18m, 14 March 2021, Aswani & Maya, 6537 (GVCH) **(Plate 22: Fig. e)**.

Chrysopogon Trin., *Fund. Agrost. (Trinius)* 187 (1820)

Key to species

1. Lower glume of pedicelled spikelets awned.……...…. *C. asper*
- Lower glume of pedicelled spikelets not awned…….…..…2
2. Pedicels more or less glabrous; sessile spikelets aristate…..……. *C. aciculatus*
- Pedicels villous; sessile spikelets awned…..……..…. *C. hackelii*

Chrysopogon aciculatus Trin., *Fund. Agrost. (Trinius)* 188 (1820); Gamble, *Fl. Madras* 1738 (1934); Vajr., *Fl. Palghat Dist* 568 (1990); *Andropogon aciculatus* Retz., Hook. f., *FBI* 7: 188 (1896).

Habit : Herb
Ecosystem preference : Moist deciduous forests and grasslands

Distribution : Indo - Pacific, Holarctic and Australian
IUCN Category : Not Evaluated (NE)
Habitat : Rocky open grasslands
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Occasional
Phenology : June - October
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Akamalavaram- Thakaramada, 10°52'27.55"N, 76°42'44.32"E, 293m, 30 November 2018, Aswani & Maya, 3292 (GVCH); Anakundu, 10°49'53.76"N, 76°46'14.88"E, 161m, 07 March 2019, Aswani & Maya, 3874 (GVCH); Cheekuzhi, 10°50'8.57"N, 76°38'57.48"E, 147 m, 16 October 2019, Aswani & Maya, 4748 (GVCH); Aduppukootimala, 10°50'43.44"N, 76°44'33.36"E, 764m, 16 February 2021, Aswani & Maya, 6506 (GVCH).

Chrysopogon asper B. Heyne *ex* Blatt. & Mc Cann, *in Sci. Monogr. Imp. Counc. Agric. Research No. 5 (Bombay Grasses)* 68 (1935); Gamble, *Fl. Madras* 1738 (1934); *Andropogon asper* Heyne ex Hook. f., *FBI* 7: 189 (1896).

Habit : Herb
Ecosystem preference : Grasslands
Distribution : Indo - Pacific
Endemism : Peninsular India
IUCN Category : Not Evaluated (NE)
Habitat : Found in open grasslands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : September - December
Altitude preference : Found only in high altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala, 10°52'21.00"N, 76°47'00.24"E, 853m, 09 January 2020, Aswani & Maya, 5696 (GVCH); Thanniplace, 10°52'43.32"N, 76°45'54.07"E, 993m, 28 January 2020, Aswani & Maya, 6026 (GVCH).

Chrysopogon hackelii (Hook.f.) C. E. C. Fisch., in Gamble, *Fl. Madras* 1739 (1934); Vajr., *Fl. Palghat Dist* 568 (1990); Sasidh., *Fl. Parambikulam WLS* 388 (2002); *Andropogon hackelii* Hook. f., *FBI* 7: 194 (1896).
Habit : Herb
Ecosystem preference : Grasslands
Distribution : Indo - Pacific
Endemism : Peninsular India
IUCN Category : Not Evaluated (NE)
Habitat : Found in open grasslands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : October - January
Altitude preference : Found in all altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala, 10°49'44.76"N, 76°40'34.59"E, 129m, 20 June 2017, Aswani & Maya, 155 (GVCH); Aatumala - Kundanmala, 10°53'31.2"N, 76°41'52.8"E, 937m, 28 February 2020, Aswani & Maya, 6178 (GVCH); Aduppukootimala, 10°49'58.80"N, 76°44'31.92"E, 305m, 16 February 2021, Aswani & Maya, 6471 (GVCH).

Coix L., *Sp. Pl.* 2: 972 (1753)

Coix lacryma-jobi L., *Sp. Pl. [Linnaeus]* 2: 972 (1753); Hook. f., *FBI* 7: 100 (1896); Gamble, *Fl. Madras* 1705 (1934); Vajr., *Fl. Palghat Dist* 569 (1990); Sasidh., *Fl. Parambikulam WLS* 388 (2002).

Habit : Herb
Ecosystem preference : Marshy regions
Distribution : African
IUCN Category : Not Evaluated (NE)
Habitat : Found along drainage canals and other marshy wastelands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : July - March
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Korayar river, 10°47'49.42"N , 76° 45 '32.94"E, 129m, 22 February 2021, Aswani & Maya, 6537 (GVCH).

Cymbopogon Spreng., *Pl. Min. Cogn. Pug.* 2: 14 (1815)

Key to species

1. Sessile spikelets awnless..…… ……..*A. citratus*
- Sessile spikelets awned…...…..…2
2. Lower glume of fertile spikelets deeply channeled; lower pedicel of sessile racemes slightly swollen……..…. *C. martini*
- Lower glume of fertile spikelets not channeled; lower pedicel hardly stouter than rest…… *C. flexuosus*

Cymbopogon citratus (Hort. ex DC.) Stapf, *Bull. Misc. Inform. Kew* 1906 (8): 322, 357 (1906); Gamble, *Fl. Madras* 1756 (1934); Manilal & Sivar., *Fl. Calicut* 344 (1982); Sreek. & V.J. Nair, *Fl. Kerala Grasses* 70 (1991); Anil Kumar *et al*., *Fl. Pathanamthitta* 568 (2005).
Basionym: *Andropogon citratus* hort. ex DC., *Cat. Pl. Horti Monsp.* 78 (1813).

Habit : Herb
Ecosystem preference : Moist deciduous and Semi evergreen forests
Distribution : Indo Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Found in open hill slopes
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : July - September
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, G. P. Nair Estate, 10°53'20.76"N, 76°39'41.04"E, 220m, 24 March 2018, Aswani & Maya, 1659 (GVCH); Akamalavaram-Thakaramada, 10°52'11.03"N, 76°42'59.76"E, 249m, 30 November 2018, Aswani & Maya, 3255 (GVCH); Kundanmala, 10°53'33.48" N, 76°41'52.76"E, 952m, Aswani & Maya, 6122 (GVCH).

Cymbopogon flexuosus (Nees *ex* Steud.) Will.Watson, *Bot. Himalayan Distr. N. W. Prov.* 392 (1882); Gamble, *Fl. Madras* 1756 (1934); Vajr., *Fl. Palghat Dist* 569 (1990); Sasidh., *Fl. Parambikulam WLS* 389 (2002); *Andropogon nardus* L. var. *flexuosus* (Nees ex Steud.) Hack., Hook. f., *FBI* 7: 207 (1896).

Basionym: *Andropogon flexuosus* Nees ex Steud., *Syn. Pl. Glumac. [Steudel]* 1: 388 (1854).

Habit : Herb
Ecosystem preference : Grasslands
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found in grasslands and rocky hill slopes
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : November - January
Altitude preference : Found in higher altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala, 10°52'20.64"N,

76°46'57.00"E, 881m, 09 January 2020, Aswani & Maya, 5727 (GVCH); Pothukunnu, 10°53'6.54"N, 76°45' 59.72"E, 1046m, 28 January 2020, Aswani & Maya, 5992 (GVCH); Kundanmala, 10°53'33.48"N, 76°41'52.76"E, 947m, 28 February 2021, Aswani & Maya, 6117 (GVCH); Aduppukootimala, 10°50'15.72"N, 76°44'28.68"E, 446m, 16 February 2021,Aswani & Maya, 6480 (GVCH) **(Plate 22: Fig. f)**.

Cymbopogon martini (Roxb.) Will.Watson, *Gaz. N.-W. Prov. India* 10: 392 (1882); Gamble, *Fl. Madras* 1756 (1934); *Andropogon schoenanthus* L. var. *martinii* (Roxb.) Hook.f., *FBI* 7: 204 (1896).

Habit : Herb
Ecosystem preference : Grasslands
Distribution : Indo - Pacific
Endemism : Peninsular India
IUCN Category : Not Evaluated (NE)
Habitat : Found in open hill slopes
Raunkiaer's Life form : Hemicryptophyte
Distribution Frequency : Rare
Phenology : November - December
Altitude preference : Found in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Aduppukootimala, 10°50'15.72"N, 76°44'28.68"E, 450m, 16 February 2021, Aswani & Maya, 6484 (GVCH).

Cynodon Rich., *Syn. Pl. [Persoon]* 1: 85 (1805), nom. cons.

Cynodon dactylon (L.) Pers., *Syn. Pl. [Persoon]* 1: 85 (1805); Hook. f., FBI 7: 288 (1896); Gamble, *Fl. Madras* 1835 (1934); Vajr., *Fl. Palghat Dist* 570 (1990); Sasidh., *Fl. Parambikulam WLS* 389 (2002).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and Australian
IUCN Category : Not Evaluated (NE)
Habitat : Found along river banks, wastelands, roadsides and other plains
Raunkiaer's Life form : Hemicryptophyte
Distribution Frequency : Common
Phenology : March - October
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kava, 10°50'38.92"N76°43'34.63"E, 35m, 06 April 2018, Aswani & Maya, 1820 (GVCH); Ahalya campus, 10°47'43.08"N, 76°50'5.43"E, 150m, 24 September 2020, Aswani & Maya, 6328 (GVCH).

Cyrtococcum Stapf, *Fl. Trop. Afr. [Oliver et al.]* 9(1): 15, *in clavi* (1917)

Key to species

1. Pedicels shorter than spikelets……..…….. *C. oxyphyllum*
- Pedicels longer than spikelets……...…..…2
2. Panicle with few spikelets……..…
……..….*C. deccanense*
- Panicle with numerous spikelets…...……..……...….3
3. Lower lemma obtuse; glumes puberulous or hirpidulous…….
……..….*C. patens*
- Lower lemma acute or cuspidate; glumes glabrous…...…. *C. longipes*

Cyrtococcum deccanense Bor, *Kew Bull.* 11(2): 255 (1956); Sreek. & V.J. Nair, *Fl. Kerala Grasses* 227 (1991); Sivar. & P. Mathew, *Fl. Nilambur* 834 (1997); Sasidh., *Fl. Periyar Tiger Reserve* 518 (1998); Sasidh., *Fl. Chinnar WLS* 344 (1999); N. Mohanan & Sivad., *Fl. Agasthyamala* 811 (2002); *Panicum patens* Hook. f., *FBI* 7: 57 (1896).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found in understorey of forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : June - October
Altitude preference : Found in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, S - Medu, 10°51'20.17"N, 76°47'4.18"E, 645m, 23 June 2019, Aswani & Maya, 4062 (GVCH) **(Plate 22: Fig. g)**.

Cyrtococcum longipes A.Camus, *Bull. Mus. Natl. Hist. Nat.* 1921, xxvii. 118; Gamble, *Fl. Madras* 1786 (1934); *Panicum longipes* Wight & Arn. ex Hook. f., *FBI* 7: 58 (1896).

Habit : Herb
Ecosystem preference : Moist deciduous forests and semi - evergreen forests
Distribution : Indo - Pacific
Endemism : Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Found in shady understorey of forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : November - March
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Neelippara, 10°51'47.52"N, 76°37'37.38"E, 335m, 15 September 2017, Aswani & Maya, 572 (GVCH); Parachaathy, 10°50'42.54"N, 76°43'49.14"E, 128m, 02 January 2019, Aswani & Maya, 3520 (GVCH); Chacolas, 10°51'16.20"N, 76°45'05.76"E, 298m, 02 August 2019, Aswani & Maya, 4538 (GVCH).

Cyrtococcum oxyphyllum Stapf, *Hooker's Icon. Pl.* 31: sub t. 3096 (1922); Gamble, *Fl. Madras* 1786 (1934); Sasidh., *Fl. Parambikulam WLS* 390 (2002); *Panicum pilipes* Nees & Arn. ex Buese, Hook. f., *FBI* 7: 57 (1896).

Habit : Herb
Ecosystem preference : Moist deciduous and semi - evergreen forests
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : Found in open forest tracks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : August - March
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Neelippara, 10°51'47.52"N, 76°37'37.38"E, 350m, 15 September 2017, Aswani & Maya, 587 (GVCH); Akamalavaram-Thakaramada, 10°52'27.55"N, 76°42'44.32"E, 288m, 30 November 2018, Aswani & Maya, 3287 (GVCH); Thaanikunnu, 10°52'01.20"N, 76°41'57.48"E, 174m, 18 December 2018, Aswani & Maya, 3472 (GVCH); Kezhakootimala, 10°51'53.30"N, 76°37'36.39"E, 373m, 15 September 2017, Aswani & Maya, 3494 (GVCH) **(Plate 22: Fig. h)**.

Cyrtococcum patens (L.) A. Camus, *Bull. Mus. Natl. Hist. Nat.* 27: 118 (1921); C.E.C. Fisch. in Gamble, *Fl. Madras* 1786 (1934); Sasidh., *Fl. Parambikulam WLS* 390 (2002); *Panicum patens* L.,Hook. f., *FBI* 7: 57 (1896); *Cyrtococcum radicans* (Retz.) Stapf, C.E.C. Fisch. in Gamble, *Fl. Madras* 1786 (1934).

Basionym: *Panicum patens* L., *Sp. Pl.* 1: 58 (1753).

Habit : Herb

Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : Open forest tracts
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : May - June
Altitude preference : Found in lower altitudes
Specimen examined: INDIA, Kerala: Palakkad District, Walayar range, Akamalavaram-Thakaramada, 10°52'11.03" N, 76°42'59.76"E, 262m, 30 November 2018, Aswani & Maya, 3267 (GVCH).

Dactyloctenium Willd., *Enum. Pl. [Willdenow]* 2: 1029 (1809)

Dactyloctenium aegyptium (L.) Willd., *Enum. Pl. [Willdenow]* 1029 (1809); Gamble, *Fl. Madras* 1840 (1934); Sasidh., *Fl. Parambikulam WLS* 390 (2002).

Basionym: *Cynosurus aegyptius* L., *Sp. Pl. [Linnaeus]* 1: 72 (1753).

Habit : Herb
Ecosystem preference : Moist deciduous forests and in plains
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Found in plains, dam sites and along roadsides
Raunkiaer's Life form : Hemicryptophyte
Distribution Frequency : Common
Phenology : Throughout the year
Altitude preference : Found commonly in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Pallippara, 10°49'48.36"N, 76°43'44.04"E, 129m, 29 October 2017, 129m, Aswani & Maya, 695 (GVCH); Ollappallam, 10°49'52.20"N, 76°43'44.19"E, 25 November 2017, 140m, Aswani & Maya, 914 (GVCH); Kava, 10°50'38.92"N, 76°43'34.63"E, 120m, Aswani & Maya, 1821 (GVCH); Kottamutti waterfalls, 10°49'42.94"N, 76°46'47.87"E, 217m, 23 September 2018, Aswani & Maya, 2863 (GVCH).

Dendrocalamus Nees, *Linnaea* 9(4): 476 (1835)

Dendrocalamus strictus Nees, *Linnaea* 9(4): 476 (1835); Hook. f., *FBI* 7: 404. 1897; Gamble, *Fl. Madras* 1858 (1934); Sasidh., *Fl. Parambikulam WLS* 391 (2002).

Habit : Shrub
Ecosystem preference : Moist deciduous and semi evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found as a small forest in hill slopes
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : December - January
Altitude preference : Found in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, S Medu, 10°51'20.17"N, 76° 47 '4.18"E, 654m, 23 June 2019, Aswani & Maya, 4062 (GVCH).

Dichanthium P.Willemet, *Ann. Bot. (Usteri)* 18: 11 (-12) (1796)

Dichanthium annulatum (Forssk.) Stapf, *Fl. Trop. Afr. [Oliver et al.]* 9(1): 178 (1917); Gamble, *Fl. Madras* 1741(1934); Vajr., *Fl. Palghat Dist* 570 (1990); *Andropogon annulatus* Forssk., Hook. f., *FBI* 7: 196 (1896).

Basionym: *Andropogon annulatus* Forssk., *Fl. Aegypt.-Arab.* 173. (1775).

Habit : Herb

Plate 22: Fig. a. *Capillipedium assimile* (Steud.) A.Camus **b.** *Cenchrus pedicellatus* (Trin.)Morrone **c.** *Cenchrus setosus* Sw. **d.** *Centotheca lappacea* Desv. **e.** *Chloris barbata* Sw. **f.** *Cymbopogon flexuosus* (Nees ex Steud.) Will.Watson **g.** *Cyrtococcum deccanense* Bor **h.** *Cyrtococcum oxyphyllum* Stapf.

Ecosystem preference : Moist deciduous forests
Distribution : Indo Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Found in rocky forest tracks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : June - December
Altitude preference : Found in lower and middle altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Akamalavaram- Thakaramada, 10°52'27.55"N, 76°42'44.32"E, 294m, 30 November 2018, Aswani & Maya, 3293 (GVCH); Kochithodu, 10°52'7.89"N, 76°42'19.8"E, 265m, 14 May 2019, Aswani & Maya, 3952 (GVCH); Akamalavaram- Chaatapara waterfalls, 10°52'56.81"N, 76°42'11.22"E, 507m, 10 December 2019, Aswani & Maya, 5443 (GVCH).

Digitaria Haller, *Hist. Stirp. Helv.* 2: 244 (1768)

Key to species

1. Spikelets less than 2mm long……..…….…. *D. longiflora*
- Spikelets more than 2mm long……...……..……2
2. Spikelets of each pair similar…...… ……..*D. radicosa*
- Spikelets of each pair heteromorphic……..……...…3
3. Annual herbs; midrib of rachis narrow, winged; lower lemma with 7 slender veins…… *D. ciliaris*
- Stoloniferous perennial herbs; midrib of rachis thick; scarcely winged; lower lemma with 7 -11 thick prominent veins.…*D. bicornis*

Digitaria bicornis (Lam.) Roem. & Schult., *Syst. Veg., ed. 15 bis [Roemer & Schultes]* 2: 470 (1817); Sasidh., *Fl. Parambikulam WLS* 391 (2002); *Paspalum heteranthum* Hook. f., *FBI* 7: 16 (1896).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Found in open forest areas
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : March - September
Altitude preference : Found commonly in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Akamalavaram- Thakaramada, 10°52'11.03"N, 76°42'59.76"E, 265m, 30 November 2018, Aswani & Maya, 3270 (GVCH).

Digitaria ciliaris (Retz.) Koeler, *Descr. Gram. [Koeler]* 27 (1802); Vajr., *Fl. Palghat Dist* 571 (1990); Sasidh., *Fl. Parambikulam WLS* 392 (2002); *Paspalum sanguinale* (L.) Lam. var. *rottleri* Hook. f., *FBI* 7: 15 (1896); *Digitaria marginata* Link, Gamble, *Fl. Madras* 1764 (1934).

Habit : Herb
Ecosystem preference : Moist deciduous forests and in plains
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Found in open forest floors
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : July - November
Altitude preference : Found commonly in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Akamalavaram- Thakaramada, 10°52'11.03"N, 76°42'59.76"E, 267m, 30

November 2018, Aswani & Maya, 3272(GVCH); On the way to Jamanthimala, 10°50'26.52"N, 76°50'04.56"E, 218m, 23 March 2020, Aswani & Maya, 3996(GVCH); Kongampadam, 10°48'36.72"N, 76°46'51.96"E, 154m, 06 September 2019, Aswani & Maya, 4604 (GVCH);Cheekuzhi, 10°50'11.04"N, 76°38'57.48"E, 147m, 16 October 2019, Aswani & Maya, 4782 (GVCH).

Digitaria longiflora (Retz.) Pers., *Syn. Pl. [Persoon]* 1: 85 (1805); Gamble, *Fl. Madras* 1765 (1934); Sasidh., *Fl. Parambikulam WLS* 392 (2002); *Paspalum longiflorum* Retz., Hook. f., *FBI* 7: 17 (1896).
Basionym: *Paspalum longiflorum* Retz., *Observ. Bot. (Retzius)* iv. 15 (1786).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Sandy areas in open forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : July - November
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Parachaathy, 10°50'54.96"N, 76°43'59.16"E, 187m, 02 January 2019, Aswani & Maya, 3608 (GVCH).

Digitaria radicosa (J.Presl) Miq., *Fl. Ned. Ind.* iii. 437 (1857); *Paspalum sanguinale* (L.) Lam. var. *debile* Hook.f., *FBI* 7: 16 (1896).
Basionym: *Panicum radicosum* J.Presl, *Reliq. Haenk.* 1(4-5): 297 (1830).
Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and Australian
IUCN Category : Not Evaluated (NE)
Habitat : Found in wet soils near water sources
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : December - March
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Aamalavaram - Thakaramada, 10°52'27.55"N, 76°42'44.32"E, 291m, 30 November 2018, Aswani & Maya, 3290 (GVCH).

Dimeria R.Br., Prodr. *Fl. Nov. Holland.* 204 (1810)

Key to species

1. Rachis trigonous… *D. ornithopoda*
- Rachis flat……..……....2
2. Upper glume awned; upper glume not winged……...… *D. raizadae*
- Upper glume awnless; upper glume narrowly winged at the apex……..... *D. deccanensis*

Dimeria deccanensis Bor, *Kew Bull.* 7(4): 578 (1953); Manilal, *Fl. Silent Valley* 352 (1988); Sreek. & V.J. Nair, *Fl. Kerala Grasses* 89 (1991); Sasidh., *Fl. Periyar Tiger Reserve* 523 (1998); Ratheesh Narayanan, *Fl. Stud. Wayanad Dist* 972 (2009).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
Endemism : Southern Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Grassy patches in forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : October - December

Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kongampadam, 10°48'39.80"N, 76°47'2.67"E, 153m, 06 September 2019, Aswani & Maya, 4590 (GVCH).

Dimeria ornithopoda Trin., *Fund. Agrost. (Trinius)* 167 (1820); Hook. f., *FBI* 7: 104 (1896); Gamble, *Fl. Madras* 1713 (1934); Vajr., *Fl. Palghat Dist.* 571 (1990); Sasidh., *Fl. Parambikulam WLS* 392 (2002).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Least Concern
Habitat : Found near rocky areas near water sources
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : August - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Akamalavaram- Thakaramada, 10°52'11.03"N, 76°42'59.76"E, 256m, 30 November 2018, Aswani & Maya, 3262 (GVCH); Kochuthodu, 10°51'58.32"N, 76°42'22.32"E, 251m, 18 December 2018, Aswani & Maya, 3371 (GVCH).

Dimeria raizadae V.J.Nair, Sreek. & N.C.Nair, *Indian J. Forest.* 6(2): 163 (1983); Sreek. & V.J. Nair, *Fl. Kerala Grasses* 98 (1991).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
Endemism : South Kerala
IUCN Category : Not Evaluated (NE)
Habitat : Rocky grassy regions near water sources
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : October - December
Altitude preference : Found in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Chaatapara waterfalls, 10°53'11.76"N, 76°42'15.84"E, 594m, 10 December 2019, Aswani & Maya, 5556 (GVCH).

Echinochloa P.Beauv., *Ess. Agrostogr.* 53. I. 11 (1812)

Key to species

Racemes simple; spikelets awnless……..… *E. colonum*

Racemes usually more or less branched; spikelets awned……...…. *E. crus - galli*

Echinochloa colonum (L.) Link, *Hort. Berol. [Link]* 2: 209 (1833); Gamble, *Fl. Madras* 1776 (1934); Vajr., *Fl. Palghat Dist* 572 (1990); Sasidh., *Fl. Parambikulam WLS* 392 (2002); *Panicum colonum* L., Hook. f., *FBI* 7: 32 (1896).

Basionym: *Panicum colonum* L., *Syst. Nat., ed.* 10. 2: 870 (1759).

Habit : Herb
Ecosystem preference : Marshy wetlands
Distribution : Indo - Pacific, Holarctic and African
IUCN Category : Least Concern (LC)
Habitat : Found in marshy regions near hillocks and other wetlands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thonikadavu, 10°50'04.96"N, 76°40'48.72"E, 32m, 04 June 2017, Aswani

& Maya, 35 (GVCH); Ollappallam, 10°49'53.04"N, 76°43'41.52"E, 134m, 25 November 2017, Aswani & Maya, 964 (GVCH); Way to Ayyappan Mala, 10°48'59.96"N, 76°45'22.61"E, 20m, 06 January 2018, Aswani & Maya, 1236 (GVCH); Kongampadam, 10°48'39.80"N, 76°47'2.67"E, 151m, 06 September 2019, Aswani & Maya, 4588 (GVCH) **(Plate 23: Fig. a)**.

Echinochloa crus-galli (L.) P.Beauv., *Ess. Agrostogr.* 53 (1812); Gamble, *Fl. Madras* 1777 (1934); Vajr., *Fl. Palghat Dist* 572 (1990); *Panicum crus-galli* L., Hook. f., *FBI* 7: 30 (1896).
Basionym: *Panicum crus-galli* L., *Sp. Pl.* 1: 56 (1753).

Habit : Herb
Ecosystem preference : Wetlands
Distribution : Indo - Pacific and African
IUCN Category : Least Concern (LC)
Habitat : Marshy regions in the margins of hillocks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : March - September
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Valiya eri, 10°48'53.21"N 76°44'52.53"E, 35m, 06 January 2018, Aswani & Maya, 1317(GVCH); Kongampadam, 10°48'36.72"N, 76°46'51.96"E, 155m, 30 November 2019, Aswani & Maya, 5284 (GVCH).

Eleusine Gaertn., *Fruct. Sem. Pl.* 1: 7 (1788)

Eleusine indica **(**L.) Gaertn., *De fructibus et seminibus plantarum* 1 (1788); Hook. f., *FBI* 7: 293 (1896); Gamble, *Fl. Madras* 1839 (1934); Vajr., *Fl. Palghat Dist* 572 (1990); Sasidh., *Fl. Parambikulam WLS* 393 (2002).

Basionym: *Cynosurus indicus* L., *Sp. Pl. [Linnaeus]* 1: 72 (1753).

Habit : Herb
Ecosystem preference : Plains and wastelands
Distribution : Indo Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Forest margins and soil rich areas in hillocks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimens examined: INDIA, Kerala: Palakkad District, Walayar range, Anayappanchalla, 10°48'24.15"N, 76°48'32.06"E, 154m, 30 November 2019, Aswani & Maya, 5174 (GVCH); Kongampadam, 10°48'36.72"N, 76°46'51.96"E, 156m, 30 November 2019, Aswani & Maya, 5285(GVCH); Ahalya campus, 10°47'43.08"N, 76°50'5.43"E, 150m, 24 September 2020, Aswani & Maya, 6329 (GVCH).

Enteropogon Nees, *Nat. Syst. Bot. (Lindley), ed.* 2. 448 (1836)

Key to species

Inflorescence with 2 - 4 spikes; spikelets with one fertile and two rudimentary florets……..…….. *E. dolichostachyus*
Inflorescence with only one spike; spikelets with two fertile and one sessile floret.……..……. *E. monostachyus*

Enteropogon dolichostachyus (Lag.) Keng, *Clav. Gen. Sp. Gram. Prim. Sin.* 197 (1957); *Chloris incompleta* Roth, Hook. f.,

FBI 7:290 (1896); Gamble, *Fl. Madras* 1838 (1934); *Chloris dolichostachya* Lagasca, Sasidh., *Fl. Parambikulam WLS* 386 (2002).

Basionym: *Chloris dolichostachya* Lag., *Gen. Sp. Pl. [Lagasca]* 5 (1816).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific, Holarctic and Australian
IUCN Category : Not Evaluated (NE)
Habitat : Found in degraded forest lands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : November - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kozhimala, 10°50'01.89"N, 76°42'58.61"E, 165m, 09 November 2017, Aswani & Maya, 815 (GVCH); Poozhikunnu, 10°51'20.44"N, 76°43'38.28"E, 162m, 09 November 2017, Aswani & Maya, 878 (GVCH); Chemanamkadu, 10°48'44.68"N, 76°44'51.94"E, 124m, 06 January 2018, Aswani & Maya, 1131 (GVCH); Parachaathy, 10°50'42.54"N, 76°43'49.14"E, 184m, 02 January 2019, Aswani & Maya, 3576 (GVCH).

Enteropogon monostachyus Schum., *Abh. Königl. Akad. Wiss. Berlin* 1894: 17 (1894); Gamble, *Fl. Madras* 1834 (1934); *Enteropogon melicoides* (Koenig ex Rottl.) Nees, Hook. f., *FBI* 7: 284 (1896).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found in canopy rich forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : November - January
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, G. P. Nair Estate, 10°53'26.52"N, 76°39'41.04"E, 191m, 24 March 2018, Aswani & Maya, 1686 (GVCH); Pazhampullikaadu, 10°50'20.14"N, 76°38'07.09"E, 103m, 16 October 2018, Aswani & Maya, 3216 (GVCH).

Eragrostiella Bor, *Indian Forester* 66: 269; et in Fl. Assam, v. 105 (1940)

Eragrostiella bifaria (Vahl) Bor, *Indian Forester* 66: 270, *in obs.; et in Fl. Assam*, v. 107 (1940). In obs. (1940); Vajr., *Fl. Palghat Dist* 573 (1990); *Eragrostis bifaria* (Vahl) Wight ex Steud., Hook. f., *FBI* 7: 325 (1896); Gamble, *Fl. Madras* 1828 (1934).

Habit : Herb
Ecosystem preference : Plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Sandy soils in dam
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : September - December
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Walayar dam, 10°50'15.57"N, 76°51'5.13"E, 197m, 30 January 2021, Aswani & Maya, 6371 (GVCH) **(Plate 23: Fig. b)**.

Eragrostis Wolf, *Gen. Pl. [Wolf]* 23 (1776)

Key to species

1. Spikelets not breaking up at maturity……..… *E. tef*
- Spikelets breaking up at maturity…….……..……...2

2. Spikelets breaking up from the apex downloads ……..……....3
- Spikelets falling of from base upwards……..……6
3. Panicles spiciform…..…*E. riparia*
- Panicles effuse…..……..…….4
4. Stamens 2……..… *E. japonica*
- Stamens 3…….…….…….5
5. Culms just below the inflorescence viscous with sticky sand grains……..... *E. viscosa*
- Culms without any viscous and stickiness; pedicels scented when fresh……..…..... *E. tenella*
6. Lemma more than 1.5mm long……...……..……7
- Lemma upto 1.5mm long……..……..……8
7. Lateral nerves of lemma prominent; spikelets purplish……..*E. uniloides*
- Lateral nerves of lemma weak; spikelets black……..... *E. nigra*
8. Culms glandular below panicles; lemma with a purple spot at the tip……..….. *E. pilosa*
- Culms eglandular; lemma without purple spot……..… *E. gangetica*

Eragrostis gangetica Steud., *Syn. Pl. Glumac.* 1(3): 266 (1854); Gamble, *Fl. Madras* 1826 (1934); Vajr., *Fl. Palghat Dist* 574 (1990); *Eragrostis stenophylla* Hochst. ex Miq., Hook. f., *FBI* 7: 318 (1896).

Habit : Herb
Ecosystem preference : Wetlands
Distribution : Indo - Pacific and African
IUCN Category : Least Concern (LC)
Habitat : Water refrained region in dam
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : June - December
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Walayar Dam, 10°50'24.58"N, 76°51'01.52"E, 282m, 09 May 2018, Aswani & Maya, 2055 (GVCH).

Eragrostis japonica Trin., *Mém. Acad. Imp. Sci. St.-Pétersbourg, Sér.* 6, *Sci. Math. i.* (1831) 405; Gamble, *Fl. Madras* 1826 (1934); Sasidh., *Fl. Parambikulam WLS* 393 (2002); *Eragrostis interrupta* Lam, Hook. f., *FBI* 7: 316 (1896); *Eragrostis diarrhena* (Schult.) Steud., Gamble, *Fl. Madras* 1826 (1934); Vajr., *Fl. Palghat Dist* 574 (1990).

Habit : Herb
Ecosystem preference : Wetlands
Distribution : Indo Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Open forests and sandy soils
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : November - May
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Parachaathy, 10°50'42.54"N, 76°43'49.14"E, 175m, 02 January 2019, Aswani & Maya, 3567 (GVCH); Cheekuzhi, 10°50'8.57"N, 76°38'57.48"E, 137m, 16 October 2019, Aswani & Maya, 4738 (GVCH).

Eragrostis nigra Nees ex Steud., *Nomencl. Bot. [Steudel], ed.* 2. i. 563; *et Syn. Pl. Gram*. 267; Hook. f., *FBI* 7: 324 (1896); Gamble, *Fl. Madras* 1827 (1934).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : Wet soils in forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare

Phenology : July - September
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kaatadikunnu, 10°50'17.16"N, 76°38'59.64"E, 141m, 16 October 2019, Aswani & Maya, 4796 (GVCH); Mathappumala, 10°50'57.35"N, 76°49'44.27"E, 315m, 07 January 2020, Aswani & Maya, 5610 (GVCH).

Eragrostis pilosa (L.) P.Beauv., *Ess. Agrostogr.* 71 (162, 175) (1812); Hook. f., *FBI* 7: 323 (1896); Gamble, *Fl. Madras* 1827 (1934).

Habit : Herb
Ecosystem preference : Wetlands
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Waterlogged regions in dam
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : May - August
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kosavanidukku-Kaduvachal, 10°50'26.38" N, 76°40'30.88"E, 27m, 16 July 2017, Aswani & Maya, 253 (GVCH).

Eragrostis riparia Nees, *Fl. Bras. Enum. Pl.* 2(1): 512, adn. (1829); Gamble, *Fl. Madras* 1825 (1934); Sasidh., *Fl. Parambikulam WLS* 393 (2002); *Eragrostis tenella* (L.) P. Beauv. var. *riparia* (Willd.) Stapf in Hook.f., *FBI* 7: 315 (1896).

Habit : Herb
Ecosystem preference : Wetlands
Distribution : Indo - Pacific
Endemism : Peninsular India
IUCN Category : Not Evaluated (NE)
Habitat : Moist soils and banks of water sources
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : December - June
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, On the Way to Ayyappan Mala, 10°48'59.96"N, 76°45'22.61"E, 157m, 06 January 2018, Aswani & Maya, 1228 (GVCH); Anakundu, 10°49'53.76"N, 76°46'14.88"E, 162m, 07 March 2019, Aswani & Maya, 3875 (GVCH).

Eragrostis tef (Zuccagni) Trotter, *Bull. Soc. Bot. Ital.* 62 (1918); Sreek. & V.J. Nair, *Fl. Kerala Grasses* 388 (1991); Sasidh., *Fl. Periyar Tiger Reserve* 527 (1998); Sunil & Sivadasan, *Fl. Alappuzha Dist* 851 (2009). *Poa tef* Zucc., *Diss. Ist. Pianta Panizz. Abiss.* (1774).

Habit : Herb
Ecosystem preference : Degraded forests
Distribution : Indo - Pacific, African and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : Found in wet soils in forest floor
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : September - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Akamalavaram - Thakaramada, 10°52'11.03"N, 76°42'59.76"E, 254m, 28 January 2020, Aswani & Maya, 3260 (GVCH), Chaavadippara, 10°52'42.20"N, 76°48'43.56"E, 264m, 28 January 2020, Aswani & Maya, 5821 (GVCH).

Eragrostis tenella (L.) P. Beauv., *Syst. Veg., ed. 15 bis [Roemer & Schultes]* 2: 576 (1817); Sasidh., *Fl. Parambikulam WLS* 394 (2002); *Eragrostis plumosa* (Retz.) Link, Gamble, *Fl. Madras* 1826 (1934); *Eragrostis tenella* (L.) P. Beauv.

var. *plumosa* (Retz.) Stapf in Hook.f., *FBI* 7: 315 (1896).

Basionym: *Poa tenella* L., *Sp. Pl.* 1: 69 (1753).

Habit : Herb
Ecosystem preference : Moist deciduous forests and in plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Wet soils and other open forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : July - November
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Akamalavaram- Thakaramada, 10°52'11.03"N, 76°42'59.76"E, 266m, 30 November 2018, Aswani & Maya, 3271 (GVCH); Parchaathy, 10°50'42.54"N, 76°43'49.14"E, 131m, 02 January 2019, Aswani & Maya, 3523 (GVCH); Chottuppara waterfalls, 10°52'37.92"N, 76°41'39.84"E, 346m, 14 May 2019, Aswani & Maya, 3970 (GVCH).

Eragrostis unioloides (Retz.) Nees ex Steud., *Syn. Pl. Glumac. [Steudel]* 1(3): 264 (1854); Hook. f., *FBI* 7: 317 (1896); Gamble, *Fl. Madras* 1826 (1934); Vajr., *Fl. Palghat Dist* 575 (1990).
Basionym: *Poa unioloides* Retz., *Observ. Bot. (Retzius) v.* 19 (1788).

Habit : Herb
Ecosystem preference : Moist deciduous forests and other plains
Distribution : Indo - Pacific and African
IUCN Category : Least Concern (LC)
Habitat : Wet soils, River banks and other waste lands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Vedivachapara, 10°50'12.34"N, 76°40'41.15"E, 13m, 04 June 2017, Aswani & Maya, 59 (GVCH); Kozhimala, 10°50'01.89"N, 76°42'58.61"E, 164m, 09 November 2017, Aswani & Maya, 814 (GVCH); Kongampaadam, 10°48'39.80"N, 76°47'2.67"E, 143m, 15 June 2018, Aswani & Maya, 2298 (GVCH); Mayappalam, 10°48'0.36"N, 76°45'58.68"E, 121m, 06 September 2019, Aswani & Maya, 4678 (GVCH).

***Eragrostis viscosa*,** Mém., *Acad. Imp. Sci. St.-Pétersbourg, Sér. 6, Sci. Math.* 1: 397 (1830); Gamble, *Fl. Madras* 1826 (1934); Sasidh., *Fl. Parambikulam WLS* 394 (2002); *Eragrostis tenella* (L.) P. Beauv. ex Roem. & Schult. var. *viscosa* (Retz.) Stapf in Hook.f., *FBI* 7: 315 (1896).

Basionym: *Poa viscosa* Retz., *Observ. Bot. (Retzius)* iv. 20 (1786).

Habit : Herb
Ecosystem preference : Deciduous forests
Distribution : Indo Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Wet soils and in river banks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Akamalavaram- Thakaramada, 10°52'27.55"N, 76°42'44.32"E, 284m, 30 November 2018, Aswani & Maya, 3283 (GVCH); Pallippara, 10°49'48.36"N, 76°43'44.04"E, 126m, 23 November 2019, Aswani & Maya, 4995 (GVCH).

Eriochloa Kunth, *Nov. Gen. Sp. [H.B.K.]* 1: 94, t. 30, 31 (1816)

Eriochloa procera (Retz.) C.E.Hubb., Bull. Misc. Inform. Kew 1930(6): 256 (1930); Gamble, *Fl. Madras* 1767 (1934); *Eriochloa polystachya* Hook.f., *FBI* 7: 20 (1896).

Habit : Herb
Ecosystem preference : Wet soils and other swampy regions
Distribution : Indo - Pacific and African
IUCN Category : Least Concern (LC)
Habitat : Wetlands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : September - March
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Chacolas, 10°51'22.68"N, 76°44'41.28"E, 288m, 02 August 2019, Aswani & Maya, 4522 (GVCH).

Garnotia Brongn., *Voy. Monde, Phan.* 132, t. 21 (1832)

Key to species

Panicles constricted upto 5 - 30cm long; lower glume longer than the upper one…… *G.tenella*
Panicles lax upto 15 cm long; lower glume shorter than the upper one……..…. *G. courtallensis*

Garnotia courtallensis Thwaites, *Enum. Pl. Zeyl. [Thwaites]* 363 (1864); Hook. f., *FBI* 7: 244 (1896); Gamble, *Fl. Madras* 1812 (1934).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Open forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : November - December
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Mayyappallam, 10°48'01.78"N, 76°45'58.91"E, 154m, 10 May 2018, Aswani & Maya, 2161 (GVCH).

Garnotia tenella Janowski, *Repert. Spec. Nov. Regni Veg.* 17: 86 (1921); Vajr., *Fl. Palghat* Dist. 576 (1990); Sasidh., *Fl. Parambikulam WLS* 395 (2002); *Garnotia stricta* Brogn, *FBI* 7: 243 (1896); Gamble, *Fl. Madras* 1812 (1934).

Habit : Herb
Ecosystem preference : Moist deciduous forests and rocky grasslands
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Wet areas in the forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : May - December
Altitude preference : Found in lower altitudes
Specimens examined: INDIA, Kerala: Palakkad District, Walayar range, Koomachimala, 10°49'44.76"N, 76°40'34.59" E, 35m, 20 June 2017, Aswani & Maya, 157 (GVCH); Olappallam, 10°49'52.20"N, 76°43'44.19" E, 145m, 25 November 2017, Aswani & Maya, 919 (GVCH); Valiya eri, 10°48'53.21"N, 76°44'52.53"E, 165m, 06 January 2018, Aswani & Maya, 1281 (GVCH); Akamalavaram- Thakaramada, 10°52'27.55"N, 76°42'44.32"E, 287m, 30 November 2018, Aswani & Maya, 3286 (GVCH).

Heteropogon Pers., *Syn. Pl. [Persoon]* 2: 533 (1807)

Heteropogon contortus (L.) P.Beauv., *Syst. Veg., ed.* 15 *bis [Roemer & Schultes]* 2: 836 (1817); Gamble, *Fl. Madras* 1743 (1934); Vajr., *Fl. Palghat Dist* 577 (1990); Sasidh., *Fl. Parambikulam WLS* 396 (2002); *Andropogon contortus* L., Hook. f., *FBI* 7: 199 (1896).
Basionym: *Andropogon contortus* L., *Sp. Pl*. 2: 1045 (1753).

Habit : Herb
Ecosystem preference : Grasslands
Distribution : Indo - Pacific, Holarctic, African, South American and Australian
IUCN Category : Not Evaluated (NE)
Habitat : Open grasslands and open forest tracks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : October - December
Altitude preference : Found in lower altitudes
Specimens examined: INDIA, Kerala: Palakkad District, Walayar range, Koomachimala, 10°49'44.76"N, 76°40'34.59"E, 104m, 23 November 2019, Aswani & Maya, 4853 (GVCH); Anayappanchalla, 10°48'25.92"N, 76°48'35.19" E, 181m, 30 November 2019, Aswani & Maya, 5120 (GVCH); Koyyamarakaadu, 10°47'44.88"N, 76°45'38.52"E, 112m, 30 November 2019, Aswani & Maya, 5353 (GVCH); Jamanthimala, 10°52'20.64"N, 76°46'57.00"E, 894m, 09 January 2020, Aswani & Maya, 5740 (GVCH).

Isachne R.Br., ***Prodr. Fl. Nov. Holland.*** 196 (1810)

Key to species

Spikelets 3.5mm or more long; leaves upto 20cm long; pedicels with glandular bands……..….. *I. walkeri*

Spikelets 1.5 - 3.5mm long; leaves upto 5 cm long; pedicels without glandular bands……..…. *I. globosa*

Isachne *globosa* (Thunb.) Kuntze, *Revis. Gen. Pl.* 2: 778 (1891); Vajr., *Fl. Palghat Dist* 578 (1990); Sasidh., *Fl. Parambikulam WLS* 397 (2002); *Isachne australis* R. Br., Hook. f., *FBI* 7: 24 (1896); *Isachne dispar* Hook.f., *FBI* 7: 26 (1896); *Isachne miliacea* Roth, Hook. f., *FBI* 7: 25 (1896); Gamble, *Fl. Madras* 1797 (1934).

Basionym: *Milium globosum* Thunb., *Syst. Veg., ed.* 14 (J. A. Murray). 109 (1784).

Habit : Herb
Ecosystem preference : Wetlands
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : Marshes in forests and hillocks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Pallippara, 10°49'48.36"N, 76°43'44.04"E, 149m, 29 October 2017, Aswani & Maya, 715 (GVCH); Anayappanchalla, 10°48'24.82"N, 76°48'30.73"E, 168m, 18 September 2018, Aswani & Maya, 2836 (GVCH); Koomachimala, 10°49'44.76"N, 76°40'34.59"E, 106m, 23 November 2019, Aswani & Maya, 4855 (GVCH); Aduppukootimala, 10°50'30.12"N, 76°44'28.32"E, 642m, 16 February 2021, Aswani & Maya, 6382 (GVCH) **(Plate 23: Fig. c)**.

Isachne walkeri Arn. ex Steud., *Syn. Pl. Glumac.* 1(2): 97 (1854); Hook. f., *FBI* 7: 26 (1896); Gamble, *Fl. Madras* 1797 (1934).

Habit : Herb
Ecosystem preference : Wetlands

Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Marshy regions of forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : August - March
Altitude preference : Found in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Pothukunnu, 10°53'21.84"N, 76°46'33.24"E, 970m, 28 January 2020, Aswani & Maya, 5962 (GVCH).

Ischaemum L., *Sp. Pl. [Linnaeus]* 2: 1049 (1753)

Key to species

1. Margins of lower glume of sessile spikelets expanded below the middle…..... *I. timorense*
- Margins of lower glumes pedicelled; not expanded…...…....2
2. Base of lower leaves acute, leaves all sessile……...…..…3
- Base of lower leaves cordate at base; leaves usually petiolate……..... *I. rangacharianum*
3. Lower glumes densely villous with silky white hairs; glumes without furrows and ridges……..…. *I. molle*
- Lower glumes glabrous; glumes with furrows or ridges ; lower leaves tapered to an acute base; pedicels plano - convex……...… *I. rugosum*

Ischaemum molle Hook.f., *FBI* [J. D. Hooker] 7(21): 128 (1896); *FBI* 7: 128 (1896); Gamble, *Fl. Madras* 1722 (1934).

Habit : Herb
Ecosystem preference : Wetlands
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Found in marshy regions
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : October - January
Altitude preference : Found in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Chottuppara, 10°52'37.92"N , 76° 41 '39.84"E, 385m, 14 May 2019, Aswani & Maya, 3922 (GVCH).

Ischaemum rangacharianum C.E.C.Fisch., *Bull. Misc. Inform. Kew* 1933(7): 352 (1933); Gamble, *Fl. Madras* 1722 (1934); Vajr., *Fl. Palghat Dist* 579 (1990).

Habit : Herb
Ecosystem preference : Drier grasslands
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Open forest tracks and rocky grassy patch
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : September - December
Altitude preference : Found in all altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Akamalavaram- Thakaramada, 10°52'27.55"N, 76°42'44.32"E, 282m, 30 November 2018, Aswani & Maya, 3281 (GVCH); Kochuthodu, 10°51'58.32"N, 76°42'22.32"E, 247m, 18 December 2018, Aswani & Maya, 3367 (GVCH); Parachaathy, 10°50'42.54"N, 76°43'49.14"E, 182m, 02 January 2019, Aswani & Maya, 3574 (GVCH); S Medu, 10° 51 '20.17"N, 76° 47' 4.18"E, 648m, 25 November 2020, Aswani & Maya, 6360 (GVCH) **(Plate 23: Fig. d)**.

Ischaemum rugosum **Salisb., *Icon. Stirp. Rar.* 1, t. 1 (1791)**; Hook. f., *FBI* 7: 127 (1896); Gamble, *Fl. Madras* 1722 (1934).

Habit : Herb
Ecosystem preference : Wetlands

Distribution : Indo - Pacific, Holarctic and African
IUCN Category : Least Concern (LC)
Habitat : Marshy regions near waterfalls and other wet regions
Raunkiaer's Life form : Therophyte
Distribution Frequency: Common
Phenology : November - February
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kochuthodu, 10°51'55.44"N, 76°42'00.11"E, 207m, 18 December 2018, Aswani & Maya, 3417 (GVCH); Parachaathy, 10°50'42.54"N, 76°43'49.14"E, 174m, 02 January 2019, Aswani & Maya, 3566 (GVCH); Anayappanchalla, 10°48'24.15"N, 76°48'32.06"E, 148m, 30 November 2019, Aswani & Maya, 5168 (GVCH); Kongampadam, 10°48'42.95"N, 76°48'14.01"E, 156m, 30 November 2019, Aswani & Maya, 5263 (GVCH).

Ischaemum timorense Kunth, *Révis. Gramin. i.* 369. t. 98; Hook. f., *FBI* 7136 (1896); Gamble, *Fl. Madras* 1722 (1934); Vajr., *Fl. Palghat Dist* 580 (1990); *Ischaemum thomsonianum* Stapf., Gamble, *Fl. Madras* 1722 (1934); *Ischaemum muricatum* Hook.f., *FBI* 7: 135 (1896); *Ischaemum timorense* Kunth var. *villosum* Fischer in Gamble, *Fl. Madras* 1722 (1934); *Ischaemum timorense* Kunth var. *zeylanicolum* Hack., Hook. f., *FBI* 7: 136 (1896).

Habit : Herb
Ecosystem preference : Wetlands
Distribution : Indo - Pacific and South American
IUCN Category : Not Evaluated (NE)
Habitat : Near backwaters and marshes
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : September - December
Altitude preference : Found in all altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Akamalavaram- Thakaramada, 10°52'11.03"N, 76°42'59.76"E, 260m, 30 November 2018, Aswani & Maya, 3265 (GVCH); Cheekuzhi, 10°50'11.04"N, 76°38'57.48"E, 148m, 16 October 2019, Aswani & Maya, 4783 (GVCH); Jamanthimala, 10°52'20.64"N, 76°46'57.00"E, 898m, 09 January 2020, Aswani & Maya, 5744 (GVCH).

Leptochloa P.Beauv., *Ess. Agrostogr.* 71. t. 15. f. 1 (1812)

Leptochloa chinensis Nees, *Syll. Pl. Nov. i. (*1824) 4; *Agrost. Bras.* 432 (1824); Hook. f., *FBI* 7: 299 (1896); Gamble, *Fl. Madras* 1820 (1934); Vajr., *Fl. Palghat Dist* 581 (1990).

Habit : Herb
Ecosystem preference : Wetlands
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Marshy regions near water source
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : May - December
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kattadikunnu, 10°50'34.80"N, 76° 38 '54.60"E, 234m, 16 October 2019, Aswani & Maya, 4828 (GVCH).

Megathyrsus (Pilg.) B. K. Simon & S.W.L.Jacobs, *Austrobaileya* 6(3): 572 (2003)

Megathyrsus maximus (Jacq.) B.K.Simon & S.W.L.Jacobs, *Austrobaileya* 6(3): 572 (2003); *Panicum maximum* Jacq., Hook. f., *FBI* 7: 49 (1896); Gamble, *Fl. Madras* 1783 (1934).

Basionym: *Panicum maximum* Jacq., *Icon. Pl. Rar. [Jacquin]* 1: t. 13. 1781-1786; Coll. 1: 76.

Habit : Herb
Ecosystem preference : Moist deciduous forests and plains
Distribution : Indo Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : In forest floors and in plains
Raunkiaer's Life form : Hemicryptophyte
Distribution Frequency : Rare
Phenology : August - December
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kosavanidukku-Kaduvachal, 10°50'26.38"N, 76°40'30.88"E, 159m, 16 June 2017, Aswani & Maya, 280 (GVCH).

Oplismenus P.Beauv., *Fl. Oware* 2: 14 (1810)

Key to species

Perennial herbs; awn purplish; lower lemma acute not aristate…....*O. compositus*
Annual herbs; awns pale yellow; lower lemma aristate…… *O. burmanni*

Oplismenus burmanni (Retz.) P.Beauv., *Ess. Agrostogr.* 54, 168 (1812); Hook. f., FBI 7: 68 (1896); Gamble, *Fl. Madras* 1778 (1934).

Basionym: *Panicum burmanni* Retz., *Observ. Bot. (Retzius)* 3: 10 (1783).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Open forest tracks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : September - November
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Pallakaadu, 10°51'30.96"N, 76°37'39.00"E, 200m, 09 October 2018, Aswani & Maya, 3059 (GVCH); Akamalavaram-Thakaramada, 10°52'27.55"N, 76°42'44.32"E, 285m, 30 November 2018, Aswani & Maya, 3284 (GVCH); Ayyappan Mala, 10°48'59.96"N, 76°45'22.61"E, 184m, 26 June 2018, Aswani & Maya, 2426 (GVCH); Kottamutti waterfalls, 10°49'42.94"N, 76°46'47.87"E, 284m, 23 September 2018, Aswani & Maya, 2930 (GVCH).

Oplismenus compositus (L.) P. Beauv., *Ess. Agrostogr.* 54 (1812); Hook. f., *FBI* 7: 66 (1896); Gamble, *Fl. Madras* 1778 (1934); Vajr., *Fl. Palghat Dist* 581 (1990); Sasidh., *Fl. Parambikulam WLS* 399 (2002).
Basionym: *Panicum compositum* L., *Sp. Pl*. 1: 57 (1753).

Habit : Herb
Ecosystem preference : Deciduous forests and plains
Distribution : Indo Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Degraded forests, plains and other wastelands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : Throughout the year
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Aduppukootimala, 10°50'15.72"N, 76°44'28.68"E, 446m, 16 February 2021, Aswani & Maya, 6415 (GVCH); Chaatapara waterfalls, 10°52'56.81"N,

76°42'11.22"E, 507m, 10 December 2019, Aswani & Maya, 5457 (GVCH); Malampuzha irrigation dept. guest house hillock, 10°50'04.20"N, 76°40'52.68"E, 153m, 23 November 2019,Aswani & Maya, 4958 (GVCH) **(Plate 23: Fig. e)**.

Oryza L., *Sp. Pl.* 1: 333 (1753)

Key to species

1. Ligule of the lower leaves very long upto 5 cm long……..…...2
- Ligule of the lower leaves very short less than 0.6cm long…….…3
2. Spikelets persistent……..... *O. sativa*
- Spikelets deciduous….*O. rufipogon*
3. Panicles spiciform; spikelets glabrous…….…… *O. meyeriana*
- Panicles lax; spikelets hispid……....……. *O. officinalis*

Oryza meyeriana Baill., *Hist. Pl. (Baillon)* 12: 166 (1893); *Oryza granulata* Nees & Arn. ex Watt, Hook. f., *FBI* 7:93 (1896); *Oryza meyeriana* sensu C.E.C. Fisch. in Gamble, *Fl. Madras* 1845 (1934); *Oryza meyeriana* (Zoll. & Mor. ex Steud.) Baill. subsp. *granulata* (Nees & Arn. ex Watt) Tateoka, Sasidh., *Fl. Parambikulam WLS* 399 (2002).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Wet canopy rich forest floors
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Rare
Phenology : July - February
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Thaanikunnu, 10°51'55.44"N, 76°42'00.11"E, 209m, 18 December 2018, Aswani & Maya, 3467 (GVCH).

Oryza officinalis Wall., *Numer. List [Wallich] n.* 8685. 1848; *et Steud. Syn. Pl. Gram.* 3.; *Oryza officinalis* Wall. ex Watt ssp. *malampuzhensis* (Krishnasw. & Chandrasek.) Tateoka , Vajr., *Fl. Palghat Dist* 582 (1990).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
Endemism : Peninsular India
IUCN Category : Least Concern (LC)
Habitat : Shady and moist regions
Raunkiaer's Life form: Therophyte
Distribution Frequency : Rare
Phenology : May - November
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Akamalavaram- Thakaramada, 10°52'11.03"N, 76°42'59.76"E, 271m, 30 November 2018, Aswani & Maya, 3276 (GVCH).

Oryza rufipogon Griff., *Not. Pl. Asiat.* 3: 5 (1851); Icon. Pl. Asiat. t. 145, f. 2 (1851); Vajr., *Fl. Palghat Dist* 582 (1990).

Basionym: *Oryza sativa* subsp. *rufipogon* (Griff.) de Wet, Kulturpflanze 29: 188 (1981).

Habit : Herb
Ecosystem preference : Wetlands
Distribution : Indo - Pacific and Australian
IUCN Category : Least Concern (LC)
Habitat : Marshy grasslands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : September - March
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Mayappalam, 10°48'01.78"N,

76°45'58.91"E, 127m, 30 November 2019, Aswani & Maya, 5399 (GVCH); S Medu, 10°51'20.17"N, 76°47'4.18"E, 651m, 25 November 2020, Aswani & Maya, 6363 (GVCH) **(Plate 23: Fig. f)**.

Oryza sativa L., *Sp. Pl.* 1: 333 (1753); Hook. f., *FBI* 7: 92 (1896); Gamble, *Fl. Madras* 1844 (1934); Vajr., *Fl. Palghat Dist* 582 (1990).

Habit : Herb
Ecosystem preference : Cultivated
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Cultivated in plains near forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : September - June
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Akathethara - Malampuzha road, 10°49'34.77"N, 76°38'8.58"E, 100m, 21 June 2021, Aswani & Maya, 6561 (GVCH).

Ottochloa Dandy, *J. Bot.* 69: 54 (1931)

Ottochloa nodosa (Kunth) Dandy, *J. Bot.* 69: 55 (1931); Gamble, *Fl. Madras* 1778 (1934); *Panicum nodosum* Kunth, Hook. f., *FBI* 7: 43 (1896).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Near water sources
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : July - December
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Akamalavaram- Thakaramada, 10°52'11.03"N, 76°42'59.76"E, 250m, 30 November 2018, Aswani & Maya, 3256 (GVCH).

Panicum L., *Sp. Pl.* 1: 55 (1753)

Key to species

1. Leaves linear; spikelets symmetrical…..…… *P. paludosum*
- Leaves ovate to lanceolate; spikelets slightly gibbous……..…...2
2. Culms decumbent; rooting below; upper glume longer than the lower lemma……..…… *P. brevifolium*
- Culms erect; base woody; upper glume subequal to the lower lemma……...…. *P. notatum*

Panicum brevifolium L., *Sp. Pl.* 1: 59 (1753); Gamble, *Fl. Madras* 1783 (1934); *Panicum ovalifolium* Poir., Hook. f., *FBI* 7: 44 (1896).

Habit : Herb
Ecosystem preference : Moist deciduous forests and plains
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Margins of forests and other wastelands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : October - January
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Akathethara - Malampuzha road, 10°49'34.77"N, 76°38'8.58"E, 100m, 21 June 2021, Aswani & Maya, 6558 (GVCH).

Panicum notatum Retz., *Observ. Bot. (Retzius)* iv. 18 (1786); Sasidh., *Fl. Parambikulam WLS* 399 (2002); *Panicum montanum* Roxb., Hook. f., *FBI* 7: 53

(1896); Gamble, *Fl. Madras* 1783 (1934); Vajr., *Fl. Palghat Dist* 583 (1990).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Soil rich areas
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : September - October
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Akamalavaram- Thakaramada, 10°52'11.03"N, 76°42'59.76"E, 259m, 31 November 2018, Aswani & Maya, 3264 (GVCH) **(Plate 23: Fig. g)**.

Panicum paludosum Roxb., *Fl. Ind. (Carey & Wallich ed.)* 1: 310 (1820); Gamble, *Fl. Madras* 1783 (1934); *Panicum proliferum* Hook.f., *FBI* 7: 50 (1896).

Habit : Herb
Ecosystem preference : Wetlands and marshes
Distribution : Indo - Pacific and African
IUCN Category : Least Concern (LC)
Habitat : Found in marshes
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : March - December
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Akathethara - Malampuzha road, 10°49'34.77"N, 76°38'8.58"E, 100m, 21 June 2021, Aswani & Maya, 6560 (GVCH).

Paspalum L., *Syst. Nat., ed.* 10. 2: 855 (1359) (1759)

Key to species

Spikelets more than 2mm long and margins without ciliate fringes….. *P. scorbiculatum*
Spikelets below 2mm long and margins with ciliate fringes……..... *P. conjugatum*

Paspalum conjugatum P. J. Bergius, *Acta Helv. Phys.-Math.* 7: 129 (-130; t. 8) **(1772)**; Hook. f., *FBI* 7: 11 (1896); Gamble, *Fl. Madras* 1772 (1934); Vajr., *Fl. Palghat Dist* 584 (1990); Sasidh., *Fl. Parambikulam WLS* 400 (2002).

Habit : Herb
Ecosystem preference : Wetlands
Distribution : Indo Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Along banks of forest streams
Raunkiaer's Life form : Hemicryptophyte
Distribution Frequency : Rare
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Akamalavaram- Thakaramada, 10°52'27.55"N, 76°42'44.32"E, 292m, 30 November 2018, Aswani & Maya, 3291 (GVCH).

Paspalum scrobiculatum L., *Mant. Pl.* 29 (1767); Hook. f., *FBI* 7: 10 (1896); Gamble, Fl. Madras 1772 (1934); Vajr., *Fl. Palghat Dist* 584 (1990); Sasidh., *Fl. Parambikulam WLS* 400 (2002); *Paspalum orbiculare* Forst., Gamble, *Fl. Madras* 1772 (1934).

Habit : Herb
Ecosystem preference : Wetlands
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : River beds and ,margins of waterfalls
Raunkiaer's Life form : Hemicryptophyte
Distribution Frequency : Occasional
Phenology : Throughout the year

Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kallanpuzha, 10°51'34.02"N, 76°42'40.16"E, 154m, 26 January 2018, Aswani & Maya, 1343 (GVCH); Chaatapara waterfalls, 10°52'56.81"N, 76°42'11.22"E, 507m, 10 December 2019, Aswani & Maya, 5449 (GVCH); Chacolas, 10°51'15.48"N, 76°45'09.00"E, 275m, 02 August 2019, Aswani & Maya, 4554 (GVCH) **(Plate 23: Fig. h)**.

Perotis Aiton, *Hort. Kew. [W. Aiton]* 1: 85; 3: 506 (1789)

Perotis indica (L.) Kuntze, *Rev. Gen. Pl.* 2 (1891); Gamble, *Fl. Madras* 1814 (1934); Vajr., *Fl. Palghat Dist* 585 (1990); Sasidh., *Fl. Parambikulam WLS* 401 (2002); *Perotis latifolia* Ait., Hook. f., *FBI* 7: 98 (1796).

Basionym: *Anthoxanthum indicum* L., *Sp. Pl.* 1 (1753).

Habit : Herb
Ecosystem preference : Plains and wastelands
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found in water refrained areas in dam and nearby plains
Raunkiaer's Life form :Hemi - Cryptophyte
Distribution Frequency : Occasional
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kosavanidukku-Kaduvachal, 10°50'26.38"N, 76°40'30.88"E,117m, 16 July 2017, Aswani & Maya, 238 (GVCH); Kava, 10°49'34.95"N, 76°43'5.18"E, 128m, 06 April 2018, Aswani & Maya, 1897 (GVCH); Mayyappallam, 10°48'01.78"N, 76°45'58.91"E, 153m, 10 May 2018, Aswani & Maya, 2160 (GVCH) **(Plate 24: Fig. a)**.

Pogonatherum P.Beauv., *Ess. Agrostogr.* 56. t. 11. f. 7 (1812)

Pogonatherum crinitum Kunth, *Enum. Pl. [Kunth] 1*: 478 (1833); Hook. f., *FBI* 7: 141 (1896); Sasidh., *Fl. Parambikulam WLS* 401 (2002); *Pogonatherum saccharoideum, Beauv.,* Hook. f., *FBI* 7: 141 (1796); *Pogonatherum paniceum* sensu Gamble, *Fl. Madras* 1714 (1934).

Habit : Herb
Ecosystem preference : Semi evergreen forests and grasslands
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Open grasslands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : February - March
Altitude preference : Found in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala, 10°52'21.00"N, 76°47'00.24"E, 864m, 09 January 2020, Aswani & Maya, 5707 (GVCH).

Polytrias Hack., *Nat. Pflanzenfam. [Engler & Prantl]* ii. 2 (1887) 24

Polytrias indica (Houtt.) Veldkamp, *Blumea* 36(1): 180 (1991); *Ischaemum indicum* (Houtt.) Merr. subsp. *indicum* var. *indicum*., Sasidh., *Fl. Parambikulam WLS* 398 (2002); *Ischaemum ciliare* Retz., Hook. f., *FBI* 7: 133 (1896); *Ischaemum aristatum* C.E.C. Fisch. in Gamble, *Fl. Madras* 1721 (1934) non L.

Basionym: *Phleum indicum* Houtt., *Nat. Hist. (Houttuyn)* 2(13): 198, t. 90, fig. 2 (1782).

Habit : Herb

Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific, South American and Australian
IUCN Category : Least Concern (LC)
Habitat : Margins of forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : October - November
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Akamalavaram- Thakaramada, 10°52'27.55"N, 76°42'44.32"E, 295m, 30 November 2018, Aswani & Maya, 3294 (GVCH); Koomachimala, 10°49'44.76"N, 76°40'34.59"E, 105m, 23 November 2019, Aswani & Maya, 4854 (GVCH).

Pseudopogonatherum A.Camus, *Fl. Indo-Chine [P.H. Lecomte et al.]* 7: 254 (1922)

Pseudopogonatherum trispicatum (Schult.) Ohwi, *Bull. Tokyo Sci. Mus.* 18: 3 (1947); *Pollinia argentea* Trin., Hook. f., *FBI* 7: 11 (1896).; *Eulalia tristachya* (Roxb.) O. Ktze., Gamble, *Fl. Madras* 1715 (1934); *Eulalia trispicata* (Schult.) Henrard, Vajr., *Fl. Palghat Dist* 575 (1990); Sasidh., *Fl. Parambikulam WLS* 394 (2002).

Habit : Herb
Ecosystem preference : Grasslands
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : Open grasslands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : October - March
Altitude preference : Found in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Aatumala, 10°53'24"N, 76°41'24"E, 1054m, 28 February 2020, Aswani & Maya, 6170 (GVCH).

Saccharum L., *Sp. Pl.* 1: 54 (1753)

Saccharum spontaneum L., *Mant. Pl. Altera* 183 (1771); Hook. f., *FBI* 7: 118 (1896); Gamble, *Fl. Madras* 1709 (1934); Vajr., *Fl. Palghat Dist* 588 (1990); Sasidh., *Fl. Parambikulam WLS* 403 (2002).

Habit : Herb
Ecosystem preference : Wetlands
Distribution : Indo - Pacific and African
IUCN Category : Least Concern (LC)
Habitat : Rock pools and river banks
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Occasional
Phenology : November - February
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koyyamarakaadu, 10°47'40.58"N, 76°45'27.05"E, 154m, 30 November 2019, Aswani & Maya, 5329 (GVCH); Walayar river, 10°47'43.99"N, 76°46'54.71"E, 18m, 14 March 2021, Aswani & Maya, 6538 (GVCH).

Sacciolepis Nash, *Man. Fl. N. States [Britton]* 89 (1901)

Key to species

Culms spongy and floating below; lower glume less than ⅓ of the length of the spikelets…….…….…….. *S. interrupta*
Culms never spongy and floating; lower glume half the length of the spikelets……..…..... *S. indica*

Sacciolepis indica (L.) Chase, *Proc. Biol. Soc. Washington* 21: 8 (1908); Gamble, *Fl. Madras* 1787 (1934); Vajr., *Fl. Palghat Dist* 588 (1990); Sasidh., *Fl. Parambikulam WLS* 403 (2002); *Panicum indicum* L., Hook. f., *FBI* 7: 41 (1896).

Plate 23: Fig. a. *Echinochloa colonum* (L.) Link **b.** *Eragrostiella bifaria* (Vahl) Bor **c.** *Isachne globosa* (Thunb.) Kuntze **d.** *Ischaemum rangacharianum* C.E.C.Fisch. **e.** *Oplismenus compositus* (L.) P. Beauv. **f.** *Oryza rufipogon* Griff. **g.** *Panicum notatum* Retz. **h.** *Paspalum scrobiculatum* L.

Basionym: *Aira indica* L., *Sp. Pl.* 1: 63; 2: *Errata* (1753).

Habit : Herb
Ecosystem preference : Wetlands
Distribution : Indo - Pacific, Holarctic, African, South American and Australian
IUCN Category : Least Concern (LC)
Habitat : Rocky pools and other water logged regions in hillocks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : June - February
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kongampadam, 10°48'39.80"N, 76°47'2.67"E, 160m, 06 September 2019, Aswani & Maya, 4597 (GVCH) **(Plate 24: Fig. b)**.

Sacciolepis interrupta Stapf, *Fl. Trop. Afr. [Oliver et al.]* 9(4): 757 (1920); Gamble, *Fl. Madras* 1787 (1934); Vajr., *Fl. Palghat Dist* 589 (1990); *Panicum interruptum* Willd., Hook. f., *FBI* 7: 40 (1896).

Habit : Herb
Ecosystem preference : Wetlands near forests
Distribution : Indo - Pacific and African
IUCN Category : Not evaluated (NE)
Habitat : Along margins of paddy fields and wet areas near it
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Akathethara - Malampuzha road, 10°49'34.77"N, 76°38'8.58"E, 100m, 21 June 2021, Aswani & Maya, 6562 (GVCH).

Setaria P. Beauv., *Ess. Agrostogr.* 51, 178 (1812)

Key to species

Culms long, 30 - 105cm; panicles 4 - 10cm long; leaf apex acuminate……..… *S. pumila*
Culms short, 15 - 65cm long; panicles 10 - 25cm long; leaf apex blunt…...… *S. flavida*

Setaria flavida (Retz.) Veldkamp, *Blumea* 39(1–2): 376 (1994); *Panicum flavidum* Retz., Hook. f., *FBI* 7: 28 (1896); *Paspalidium flavidum* (Retz.) A.Camus in Lecomte, C.E.C. Fisch. in Gamble, *Fl. Madras* 1774 (1934); Vajr., *Fl. Palghat Dist* 583 (1990).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : Wet soils near water source
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : July - December
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kongampadam, 10°48'36.72"N, 76°46'51.96"E, 166m, 06 September 2019, Aswani & Maya, 4616 (GVCH).

Setaria pumila Roem. & Schult., *Syst. Veg., ed. 15 bis [Roemer & Schultes]* 2: 891 (1817); Vajr., *Fl. Palghat Dist* 590. 1990; Sasidh., *Fl. Parambikulam WLS* 404 (2002); *Setaria pallidifusca* (Schum.) Stapf & C.E.Hubb., Gamble, *Fl. Madras* 1789 (1934).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Margins of forests and plains

Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : July - October
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala, 10°49'44.76"N, 76°40'34.59"E, 130m, 20 June 2017, Aswani & Maya, 156 (GVCH); Neelippara, 10°51'47.52"N, 76°37'37.38"E, 337m, 15 September 2017, Aswani & Maya, 574 (GVCH); Ollappallam, 10°49'52.20"N, 76°43'44.19"E, 126m, 25 November 2017, Aswani & Maya, 900 (GVCH) **(Plate 24: Fig. c)**.

Sorghum Moench, *Methodus (Moench)* 207 (1794)

Sorghum bicolor (L.) Moench, *Methodus (Moench)* 207 (1794); Ansari, *Fl. Kasaragod Div* 480 (1985); Sreek. & V.J. Nair, *Fl. Kerala Grasses* 191 (1991).

Basionym: *Holcus bicolor* L., *Mant. Pl. Altera* 301 (1771).

Habit : Herb
Ecosystem preference : Moist deciduous forests and plains
Distribution : African
IUCN Category : Least Concern (LC)
Habitat : Cultivated in forest margins
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : December - March
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Anayappanchalla, 10°48'24.82"N, 76°48'30.73"E, 159m, 30 November 2019, Aswani & Maya, 5154 (GVCH).

Spodiopogon Trin., *Fund. Agrost. (Trinius)* 192, t. 17 (1820)

Spodiopogon rhizophorus (Steud.) Pilg., *Nat. Pflanzenfam*., ed. 2 *[Engler & Prantl]* 14e: 119 (1940); Vajr., *Fl. Palghat Dist* 591 (1990); Sasidh., *Fl. Parambikulam WLS* 404 (2002); *Spodiopogon albidus* Benth., Hook. f., *FBI* 7: 108 (1896); Gamble, *Fl. Madras* 1710 (1934).

Habit : Herb
Ecosystem preference : Semievergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Mud cliffs and forest cuttings
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : November - January
Altitude preference : Found in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Ayyappan Koil, 10°52'51.49"N, 76°47'39.48"E, 527m, 28 January 2020, Aswani & Maya, 5915 (GVCH).

Sporobolus R.Br., *Prodr. Fl. Nov. Holland.* 169 (-170) (1810)

Key to species

1. Lower glume as long as or longer than lemma; culms decumbent below……..... *S. virginicus*
- Lower glume shorter than lemma; culms erect……..……....2
2. Leaves pilose or bristilate……..... *S. pilifer*
- Leaves glabrous…….…..……...3
3. Panicles spiciform…….... *S. indicus*
- Panicles effuse…….. *S. tenuissimus*

Sporobolus indicus (L.) R.Br., *Prodr. Fl. Nov. Holland.* 170 (1810); Gamble, *Fl. Madras* 1817 (1934); *Sporobolus indicus* (L.) R. Br. var. *diander* (Retz.) Jovet & Guedes, Sasidh., *Fl. Parambikulam WLS* 405 (2002).

Habit : Herb
Ecosystem preference : Moist deciduous forest and plains
Distribution : Indo - Pacific and Australian
IUCN Category : Not Evaluated (NE)
Habitat : Found in open forest tracks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : March - September
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Ollappallam, 10°49'52.20"N, 76°43'44.19"E, 39m, 25 November 2017, Aswani & Maya, 917 (GVCH); Mayyappallam, 10°48'0.36"N, 76°45'58.68"E, 141m, 10 May 2018, Aswani & Maya, 2097 (GVCH); Poolakunnu, 10°51'30.60"N, 76°43'53.76"E, 165m, 02 August 2019, Aswani & Maya, 4420 (GVCH); Kongampadam, 10°48'39.80"N, 76°47'2.67"E, 147m, 06 September 2019, Aswani & Maya, 4584 (GVCH) **(Plate 24: Fig. d)**.

Sporobolus pilifer (Trin.) Kunth, *Enum. Pl. [Kunth]* 1: 211 (1833); *Sporobolus piliferus* (Trin.) Kunth, Hook. f., *FBI* 7: 251 (1896); Gamble, *Fl. Madras* 1817 (1934); Vajr., *Fl. Palghat Dist* 591 (1990); Sasidh., *Fl. Parambikulam WLS* 405 (2002).

Basionym: *Vilfa pilifera* Trin., *Gram. Unifl. Sesquifl.* 157 (1824).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Found in open grassy patches
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : September - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Mangalathumchalla, 10°49'04.07"N, 76°48'16.50"E, 152m, 18 September 2018, 152m, 18 September 2018, Aswani & Maya, 2733 (GVCH); Edamala, 10°50'28.32"N, 76°38'45.96"E, 199m, 16 October 2019, Aswani & Maya, 4847 (GVCH).

Sporobolus tenuissimus (Mart. ex Schrank) Kuntze, Revis. Gen. Pl. 3[3]: 369 (1898); *Sporobolus minutiflorus* (Trin.) Link., Hook. f., *FBI* 7: 248 (1896); Gamble, *Fl. Madras* 1817 (1934).

Basionym: *Panicum tenuissimum* Mart. ex Schrank, *Denkschr. Königl.-Baier. Bot. Ges. Regensburg* 2: 26 (1822).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Found in open forest tracks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : September - December
Altitude preference : Found commonly in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Poolakunnu, 10°51'30.60"N, 76°43'53.76"E, 165m, 02 August 2019, 165m, 02 August 2019, Aswani & Maya, 4420 (GVCH).

Sporobolus virginicus (L.) Kunth, *Révis. Gramin*. 1: 67 (1829); Hook. f., *FBI* 7: 249 (1896) Gamble, *Fl. Madras* 1818 (1934).

Basionym: *Agrostis virginica* L., *Sp. Pl*. 1: 63 (1753).

Habit : Herb
Ecosystem preference : Grasslands
Distribution : Indo Pacific, Holarctic, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Open grassy forest tracks
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Rare
Phenology : July - September
Altitude preference : Found in lower altitude grassy patches
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Mannukunnu, 10°52'5.50"N, 76°38'30.27"E, 181m, 09 July 2019, Aswani & Maya, 4266 (GVCH) **(Plate 24: Fig. e)**.

Themeda Forssk., *Fl. Aegypt.-Arab.* 178 (1775)

Themeda triandra Forssk., *Fl. Aegypt.-Arab.* 178 (1775); Gamble, *Fl. Madras* 1746 (1934); Vajr., *Fl. Palghat Dist* 591 (1990); Sasidh., *Fl. Parambikulam WLS* 405 (2002); *Anthistiria imberbis* Retz., Hook. f., *FBI* 7: 211 (1896).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Found commonly in rocky hillocks and plains
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : October - January
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Akamalavaram- Thakaramada, 10°52'11.03"N, 76°42'59.76"E, 252m, 30 November 2018, Aswani & Maya, 3258 (GVCH); Koomachimala, 10°49'44.76"N , 76°40'34.59"E, 169m, 23 November 2019, Aswani & Maya, 4918 (GVCH); Anayappanchalla, 10°48'25.92"N, 76°48'35.19"E, 183m, 30 November 2019, Aswani & Maya, 5123 (GVCH); Jamanthimala, 10°52'20.64"N, 76°46'57.00"E, 896m, 09 January 2020, Aswani & Maya, 5742 (GVCH) **(Plate 24: Fig. f)**.

Trigonochloa P. M. Peterson & N.Snow, *Ann. Bot. (Oxford) n.s.,* 109(7): 1327 (2012)

Trigonochloa uniflora (Hochst. ex A.Rich.) P. M. Peterson & N. Snow, *Ann. Bot. (Oxford) n.s.*, 109 (7): 1328 (2012); *Leptochloa uniflora* Hochst. ex A. Rich., Hook. f., *FBI* 7: 297 (1896); Gamble, *Fl. Madras* 1820 (1934).

Basionym: *Leptochloa uniflora* Hochst. ex A.Rich., *Tent. Fl. Abyss.* 2: 409 (1850).

Habit : Herb
Ecosystem preference : Moist deciduous forests and plains
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Open forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : October - December
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Akathethara - Malampuzha road, 10°49'34.77"N, 76°38'8.58"E, 100m, 21 June 2021, Aswani & Maya, 6563 (GVCH).

Tripogon Roem. & Schult., *Syst. Veg., ed. 15 bis [Roemer & Schultes]* 2: 34 (1817)

Tripogon bromoides Roem. & Schult., *Syst. Veg., ed. 15 bis [Roemer & Schultes]* **2: 600 (1817)**; Hook. f., *FBI* 7: 287 (1896);

Gamble, *Fl. Madras* 1834 (1934); Vajr., *Fl. Palghat Dist* 592 (1990); Sasidh., *Fl. Parambikulam WLS* 405 (2002).

Habit : Herb
Ecosystem preference : Moist deciduous forests and plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found in open rocky floors
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : August - March
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Anayappanchalla, 10°48'25.92"N, 76°48'35.19"E, 171m, 30 November 2019, Aswani & Maya, 5110 (GVCH); Walayar Toll Plaza, 10°48'45.00"N, 76°47'49.56"E, 154m, 30 November 2019, Aswani & Maya, 5243 (GVCH); Koyyamarakaadu, 10°47'44.88"N, 76°45'38.52"E, 126m, 30 November 2019, Aswani & Maya, 5367 (GVCH); Mayappalam, 10°48'01.78"N, 76°45'58.91"E, 136m, 30 November 2019, Aswani & Maya, 5408 (GVCH) **(Plate 24: Fig. g)**.

Urochloa P.Beauv., *Ess. Agrostogr.* 52 (1812)

Keyto species

1. Rachis triquetrous…….. *U. ramosa*
- Rachis flat, narrowly winged……..……..……...2
2. Pedicels with white glassy hairs; lower floret male….. *U. panicoides*
- Pedicels glabrous; lower floret empty…..……..…... *U. distachyos*

Urochloa distachyos (L.) T.Q.Nguyen, *Novosti Sist. Vyssh. Rast.* 1966, 13 (1966); *Brachiaria miliiformis* (J. Presl ex C. Presl) A. Chase., Gamble, *Fl. Madras* 1769 (1934); Vajr., *Fl. Palghat Dist* 567 (1990); *Panicum distachyum* L. , Hook. f., *FBI* 7: 37 (1896).

Habit : Herb
Ecosystem preference : Moist deciduous forests and plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Moist forest floors and river banks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : July - October
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Mayappalam, 10°48'01.78"N, 76°45'58.91" E, 131m, 30 November 2019, Aswani & Maya, 5403 (GVCH); Chaatapara waterfalls, 10°53'11.76"N, 76°42'15.84"E, 636m, 10 December 2019, Aswani & Maya, 5495 (GVCH); Akathethara - Malampuzha road, 10°49'34.77"N, 76°38'8.58"E, 100m, 21 June 2021, Aswani & Maya, 6559 (GVCH).

Urochloa panicoides P.Beauv., *Ess. Agrostogr.* 52. t. 11 (1812); Gamble, *Fl. Madras* 1775 (1934); Vajr., *Fl. Palghat Dist* 592 (1990); *Panicum javanicum* Poir., Hook. f., *FBI* 7: 35 (1896).

Habit : Herb
Ecosystem preference : Semi evergreen forests
Distribution : Indo - Pacific and African
IUCN Category : Least Concern (LC)
Habitat : Open forest floors
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : September - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, G. P. Nair Estate, 10°53'17.51"N, 76°39'42.72"E, 183m, 24 March 2018, Aswani & Maya, 1592 (GVCH); Parakkallu- Neelikunnu,

10°51'30.14"N, 76°37'30.67"E, 209m, 27 April 2018, Aswani & Maya, 1965 (GVCH).

Urochloa ramosa (L.) T.Q.Nguyen, *Novosti Sist. Vyssh. Rast.* 1966, 13 (1966); *Brachiaria ramosa* (L.) Stapf, Gamble, *Fl. Madras* 1770 (1934); Sasidh., *Fl. Parambikulam WLS* 387 (2002); *Panicum ramosum* L., Hook. f., *FBI* 7: 36 (1896).

Habit : Herb
Ecosystem preference : Moist deciduous forests and plains
Distribution : Indo - Pacific, Holarctic, African
IUCN Category : Least Concern (LC)
Habitat : Found commonly in margins of forests and wastelands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : March - September
Altitude preference: Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kottamutti waterfalls, 10°49'46.20"N, 76°46'47.28"E, 297m, 23 September 2018, Aswani & Maya, 2946 (GVCH) **(Plate 24: Fig. h)**.

IV.1.2.5. Eudicots

Ranunculales

Menispermaceae

Key to the Female plants

1. Petals absent……..….... *Anamirta*
- Petals present…….……..…...2
2. Flowers in simple racemes or cymes…….…..…...3
- Flowers in panicles or compound umbels……..……..…..…..4
3. Flowers are subtended by foliaceous cordate bracts……..…*Cissampelos*
- Flowers are not subtended by foliaceous bracts…..…..... *Tinospora*
4. Ovary one loculed……...…….…..5
- Ovary 2 or more loculed……....…6
5. Flowers in stalked solitary or umbellate heads.…….. *Stephania*
- Flowers in panicles...…..... *Cyclea*
6. Drupes sessile, drooping……..*Diploclisia*
- Drupes pedicelled, not drooping as above…..…….……..… *Tiliacora*

Key to the male plants

1. Petals absent…….....….... *Anamirta*
- Petals present…..……..…...2
2. Stamens connate…..……..…… 3
- Stamens free……..….5
3. Flowers in umbellate cymes or heads…..……..…. *Stephania*
- Flowers in corymbose cyme or pseudo raceme…...……...……..4
4. Sepals 4, free; Male flowers in axillary cymes..……*Cissampelos*
- Sepals 4 - 8, connate; Male flowers in panicles...……. *Cyclea*
5. Leaves cordate at base…….…. ……..*Tinospora*
- Leaves not as above…..……..….6
6. Inner 3 sepals valvate….. *Tiliacora*
- Inner 3 sepals imbricate…..…… ……..……..*Diploclisia*

Anamirta Colebr., *Trans. Linn. Soc. London* 13(1): 52 (1821)

Anamirta cocculus (L.) Wight & Arn., *Prodr. Fl. Ind. Orient.* 1: 446 (1834) ; Hook. f., *FBI* 1: 93. 1872; Gamble, *Fl. Madras* 27 (1915); Vajr., *Fl. Palghat Dist* 50 (1990); Sasidh., *Fl. Parambikulam WLS* 6 (2002).

Basionym: *Menispermum cocculus* L. in *Sp. Pl.*: 340 (1753)

Habit : Climber

Plate 24: Fig. a. *Perotis indica* (L.) Kuntze **b.** *Sacciolepis indica* (L.) Chase **c.** *Setaria pumila* Roem. & Schult. **d.** *Sporobolus indicus* (L.) R.Br. **e.** *Sporobolus virginicus* (L.) Kunth **f.** *Themeda triandra* Forssk. **g.** *Tripogon bromoides* Roem. & Schult. **h.** *Urochloa ramosa* (L.) T.Q.Nguyen.

Ecosystem preference : Moist deciduous and semi evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found commonly in forest floor forming good canopy
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Common
Phenology : August - December
Altitude preference : Found in lower and middle altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala, 10°51'59.76"N, 76°47'15.36"E, 641m, 01 July 2019, Aswani & Maya, 4159 (GVCH); Moochikadavu – Pettikallu, 10°52'28.20"N, 76°42'38.52"E, 346m, 19 July 2019, Aswani & Maya, 4369 (GVCH); Akamalavaram – Poolakunnu, 10°51'33.12"N, 76°42'29.52"E, 142m, 02 August 2019, Aswani & Maya, 4437 (GVCH); Akamalavaram – Chacolas, 10°51'22.68"N, 76° 44 '41.28"E, 227m, 02 August 2019, Aswani & Maya, 4498 (GVCH).

Cissampelos L., *Sp. Pl.* 2: 1031 (1753)

Cissampelos pareira L., *Sp. Pl.* 2: 1031 (1753); Hook. f., *FBI* 1: 103 (1872); Gamble, *Fl. Madras* 30 (1915); *Cissampelos pareira* L. var. *hirsuta* (Ham. ex DC.) Forman, Vajr., *Fl. Palghat Dist* 50 (1990); Sasidh., *Fl. Parambikulam WLS* 7 (2002).

Habit : Climber
Ecosystem preference : Moist deciduous forests and plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Commonly seen in open forests
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Common
Phenology : July - September
Altitude preference : Found commonly in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kozhimala, 10°50'06.45"N , 76°43'38.99"E, 188m, 09 November 2017, Aswani & Maya, 772 (GVCH); G. P. Nair estate, 10°53'44.88"N, 76°39'46.08"E, 248m, 24 March 2018, Aswani & Maya, 1763 (GVCH); Moochikadavu - Pettikallu, 10°52'10.56"N, 76°42'45.18"E, 226m, 19 July 2019, Aswani & Maya, 4296 (GVCH); Akamalavaram - Poolakunnu, 10°51'33.12"N, 76°42'29.52"E, 142m, 02 August 2019, Aswani & Maya, 4424 (GVCH); Akamalavaram – Chaatappara waterfalls, 10°53'11.76"N, 76°42'15.84"E, 560m, 10 December 2019, Aswani & Maya, 5476 (GVCH) **(Plate 25: Fig. a)**.

Cyclea Arn. *ex* Wight, *Ill. Ind. Bot. i.* 22 (1840)

Cyclea peltata (Lam.) Hook.f. & Thomson, *Fl. Ind. [Hooker f. & Thomson]* 201 (1855); Hook. f., *FBI* 1: 104 (1872); Gamble, *Fl. Madras* 31 (1915); Vajr., *Fl. Palghat Dist* 51 (1990); *Cyclea burmannii* (DC.) Hook. f. & Thoms., Hook. f., *FBI* 1: 104 (1872).
Basionym: *Menispermum peltatum* Lam., *Encycl. [J. Lamarck & al.]* 4(1): 96 (1797).

Habit : Climber
Ecosystem preference : Moist deciduous forests and semi evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found in forest margins
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Occasional
Phenology : April - May
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, G. P.

Nair estate, 10°53'20.38"N, 76°39'41.73"E, 115m, 24 March 2018, Aswani & Maya, 1609 (GVCH); Ayyappan Mala, 10°49'11.44"N, 76°44'24.46"E, 346m, 26 June 2018, Aswani & Maya, 2597 (GVCH); Akamalavaram – Attippara, 10°52'06.24"N, 76°41'53.16"E, 194m, 18 December 2018, Aswani & Maya, 3489 (GVCH); Akamalavaram – Pettikallu, 10°52'23.35"N, 76°42'39.58"E, 312m, 19 July 2019, Aswani & Maya, 4351 (GVCH); Akamalavaram – Chaatappara waterfalls, 10°53'11.76"N, 76°42'15.84"E, 600m, 10 December 2019, Aswani & Maya, 5460 (GVCH) **(Plate 25: Fig. b)**.

Diploclisia Miers, *Ann. Mag. Nat. Hist. ser.* 2, 7(37): 37, 42 (1851)

Diploclisia glaucescens (Blume) Diels, *Pflanzenr. (Engler)* IV. 94(Heft 46): 225 (1910); Gamble, *Fl. Madras* 28 (1915); Sasidh., *Fl. Parambikulam WLS* 9 (2002); *Cocculus macrocarpus* Wight & Arn., Hook. f., *FBI* 1: 101 (1872).
Basionym: *Cocculus glaucescens* Blume, *Bijdr. Fl. Ned. Ind.* 1: 25 (1825).

Habit : Climber
Ecosystem preference : Semi evergreen forests
Distribution : Indo - Pacific, Holarctic
IUCN Category : Not Evaluated (NE))
Habitat : Found in canopy rich forest floors
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : March - August
Altitude preference : Found in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, G. P. Nair estate, 10°54'1.40"N, 76°40'13.65"E, 549m, 24 March 2018, Aswani & Maya, 1603 (GVCH).

Stephania Lour., *Fl. Cochinch.* 2: 608 (1790)

Herbaceous climbers; inflorescence head in stalked umbels……..…….*S. japonica*
Woody climbers; male flowers in solitary axillary stalked heads……..…… *S. wightii*

Stephania japonica (Thunb.) Miers, *Ann. Mag. Nat. Hist. ser.* 3, 18(103): 14 (1866); Gamble, *Fl. Madras* 29 (1915); Sasidh., *Fl. Parambikulam WLS* 9 (2002); *Stephania hernandifolia* (Willd.) Walp., Hook. f., *FBI* 1: 103 (1872).

Basionym: *Menispermum japonicum* Thunb., *Syst. Veg., ed.* 14 (J. A. Murray). 892 (1784).

Habit : Climber
Ecosystem preference : Evergreen forests
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : Canopy rich forest floors
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : March - September
Altitude preference : Found in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Jamanthiamala, 10°51'53.64"N, 76°47'16.80"E, 586m, 23 June 2019, Aswani & Maya, 4100 (GVCH).

Stephania wightii (Arn. ex Wight) Dunn, *Fl. Madras* 1(1): 30 (1915); Vajr., *Fl. Palghat Dist* 51 (1990); *Stephania rotundus* Hook. f. & Thoms., Hook. f., *FBI* 1: 103 (1872).

Basionym: *Clypea wightii* Arn. ex Wight, *Ill. Ind. Bot.* 22 (1840).

Habit : Climber
Ecosystem preference : Semi evergreen forests
Distribution : Indo - Pacific

IUCN Category : Not Evaluated (NE))
Habitat : Found in thick canopy rich forest floors
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : April - June
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Chaavadippara, 10°52'42.20" N, 76°48'43.56" E, 242m, 28 January 2020, Aswani & Maya, 5815 (GVCH).

Tiliacora Colebr., *Trans. Linn. Soc. London* 13: 53, 67 (1821)

Tiliacora acuminata (Lam.) Miers, *Ann. Mag. Nat. Hist. ser*. 2, 7(37): 39 (1851); Gamble, *Fl. Madras* 28 (1915); Vajr., *Fl. Palghat Dist* 52 (1990); T*iliacora racemosa* Coleb., Hook. f., *FBI* 1: 99 (1872).
Basionym: *Menispermum acuminatum* Lam., *Encycl. [J. Lamarck & al.]* 4(1): 101 (1797).
Habit : Climber
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Canopy rich forest floors
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Occasional
Phenology : April - December
Altitude preference : Found in all altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Pallakaadu, 10°51'30.96"N, 76°37'39.00"E, 157m, 09 October 2018, Aswani & Maya, 3017 (GVCH); Parachaathy, 10°50'54.24"N, 76°43'55.92" E, 174m, 02 January 2019, Aswani & Maya, 3595 (GVCH); Mannukunnu, 10°52'5.50"N, 76°38'30.27" E, 181m, 09 July 2019, Aswani & Maya, 4263 (GVCH); Chacolas, 10°51'22.68"N, 76°44'41.28"E, 284m, 02 August 2019, Aswani & Maya, 4518 (GVCH) **(Plate 25: Fig. c)**.

Tinospora Miers, *Ann. Mag. Nat. Hist. ser.* 2, 7(37): 35, 38 (1851)

Tinospora cordifolia (Willd.) Miers ex Hook.f. & Thomson, *Fl. Ind. [Hooker f. & Thomson]* 1: 184 (1855); Hook. f., *FBI* 1: 97 (1872); Gamble, *Fl. Madras* 26 (1915); Vajr., *Fl. Palghat Dist* 52 (1990); Sasidh., *Fl. Parambikulam WLS* 9 (2002).
Basionym: *Menispermum cordifolium* Willd., *Sp. Pl., ed. 4 [Willdenow]* 4(2): 826 (1806).

Habit : Climber
Ecosystem preference : Moist Deciduous forests and plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found in degraded forests and plains
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Occasional
Phenology : January - June
Altitude preference : Found in fences as stragglers in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala, 10°49'39.72"N, 76°40'28.20"E, 184m, 20 June 2017, Aswani & Maya, 121 (GVCH); Valiya Eri, 10°48'51.04"N, 76°45'01.67"E, 136m, 06 January 2018, Aswani & Maya, 1300 (GVCH); Akamalavaram – Chaatappara waterfalls, 10°53'11.76"N, 76°42'15.84"E, 600m, 10 December 2019, Aswani & Maya, 5466 (GVCH); Pudussery – Vettumaadavu, 10° 52' 44.724" N, 76° 48' 8.64" E, 457m, 28 January 2020, Aswani & Maya, 5890 (GVCH).

Ranunculaceae

Clematis L., *Sp. Pl. [Linnaeus]* 1: 543 (1753)

Clematis zeylanica Poir., *Encycl. [J. Lamarck & al.] Suppl. 2*. 296 (1811); *Naravelia zeylanica* (L.) DC., Hook. f., *FBI* 1: 7 (1872); Gamble, *Fl. Madras* 3 (1915); Vajr., *Fl. Palghat Dist* 44 (1990); Sasidh., *Fl. Parambikulam WLS* 1 (2002).

Habit : Climber
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Open forest floor
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Occasional
Phenology : October - April
Altitude preference : Found in all altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kozhimala, 10°50'06.45"N, 76°43'38.99"E, 188m, 19 November 2017, Aswani & Maya, 833 (GVCH); G. P. Nair estate, 10°53'17.51"N, 76°39'42.72"E, 177m, 24 March 2018, Aswani & Maya, 1601(GVCH); Parachaathy, 10°50'54.24"N, 76°43'55.92"E, 159m, 02 January 2019, Aswani & Maya, 3580(GVCH); Jamanthimala, 10°52'20.64"N, 76°46'57.00"E, 864m, 23 June 2019, Aswani & Maya, 4148 (GVCH); Chacolas estate, 10°51'23.03"N, 76°44'29.39"E, 219m, 02 August 2019, Aswani & Maya, 4524 (GVCH) **(Plate 25: Fig. d)**.

Proteales

Nelumbonaceae

Nelumbo Adans., *Fam. Pl. (Adanson)* 2: 76 (1763)

Nelumbo nucifera Gaertn., *Fruct. Sem. Pl. i.* 73 (1788); Vajr., *Fl. Palghat Dist* 53 (1990); *Nelumbium speciosum* Willd., Hook. f., *FBI* 1: 116 (1872); Gamble, *Fl. Madras* 34 (1915).

Habit : Aquatic Herb
Ecosystem preference : Wetlands
Distribution : Indo - Pacific, Holarctic, African and Australian
IUCN Category : Data Deficient (DD)
Habitat : Found in freshwater ponds in plains
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Occasional
Phenology : August - January
Altitude preference : Found in water sources in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Akathethara – Malampuzha road, 10°49'34.77"N, 76°38'8.58"E, 100m, 28 February 2021, Aswani & Maya, 6521 (GVCH).

IV.1.2.6. Core eudicots

Dilleniales

Dilleniaceae

Dillenia L., *Sp. Pl.* 1: 535 (1753)

Dillenia pentagyna Roxb., *Pl. Coromandel* 1(1): 21, t. 20 (1795); Hook. f., *FBI* 1: 38 (1872); Gamble, *Fl. Madras* 8 (1915); Vajr., *Fl. Palghat Dist* 44 (1990); Sasidh., *Fl. Parambikulam WLS* 1 (2002).

Habit : Tree
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific

IUCN Category : Not Evaluated (NE)
Habitat : Open forest tracks in humus rich forest floors
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : February - June
Altitude preference : Mostly near water sources in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Akamalavaram – Kochuthodu, 10°51'55.44"N, 76°42'00.11"E, 165m, 18 December 2021, Aswani & Maya, 3380 (GVCH); Akamalavaram – Moochikadavu, 10°52'27.55"N, 76°42'44.32"E, 280m, 19 July 2019, Aswani & Maya, 4283 (GVCH); Chacolas estate, 10°51'22.68"N, 76°44'41.28"E, 227m, 02 August 2019, Aswani & Maya, 4464 (GVCH), Akamalavaram – Nakkamalakunnu, 10°52'14.484"N, 76°42'20.592"E, 321m, 27 February 2020, Aswani & Maya, 6062 (GVCH) **(Plate 25: Fig. e)**.

IV.1.2.7. Superrosids

Saxifragales

Crassulaceae

Kalanchoe Adans., *Fam. Pl. (Adanson)* 2: 248 (1763)

Kalanchoe olivacea Dalzell, *Dals. & Gibs. Bombay Fl.* 313; Gamble, *Fl. Madras* 450 (1919); Sasidh., *Fl. Parambikulam WLS* 114 (2002).

Habit : Herb
Ecosystem preference : Rocky grasslands
Distribution : Indo - Pacific
Endemism : Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Found in rocky boulders in grasslands
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Rare
Phenology : December - March
Altitude preference : Found in between rocky patches in higher altitudes
Specimens examined: INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala, 10°52'20.64"N, 76°46'57.00"E, 864m, 09 January 2020, Aswani & Maya, 5790 (GVCH); Way to Jamanthimala, 10°52'18.21"N, 76°46'37.80"E, 877m, 29 January 2020, Aswani & Maya, 6044 (GVCH).

IV.1.2.8. Rosids

Vitales

Vitaceae

Key to genera

1. Shrubs erect; tendrils absent; ovary 3 - 6 loculed; one ovule in each locule……..…….. *Leea*
- Shrubs scandent or climbing; tendrils present; ovary 2 - loculed; 2 ovuled in each locule…….…….2
2. Stem and branches flattened…… ……..……*Tetrastigma*
- Stem and branches terete or more or less angled……..……..……..3
3. Tendrils on peduncles; flowers polygamo - monoecious…… ……..…..*Ampelocissus*
- Tendrils leaf opposed; flowers hermaphrodite or bisexual…...…..4
4. Berry one seeded; seeds ellipsoid……..…..…. *Cissus*
- Berry 2 - 4 seeded; seeds hemispherical…..……..……5
5. Inflorescence in panicles; endosperm T - shaped lacking a membrane covering two cavities…….…...……*Causonis*
- Inflorescence in dichotomous cyme; endosperm U - shaped with a membrane covering the cavities…...…… *Cayratia*

Ampelocissus Planch., *Vigne Amer. Vitic. Eur.* 8(12): 371 (1884), nom. cons

Ampelocissus latifolia (Roxb.) Planch., *Vigne Amer. Vitic. Eur.* 8(12): 374 (1884); Gamble, *Fl. Madras* 230 (1918); Vajr., *Fl. Palghat Dist* 122 (1990); *Vitis latifolia* Roxb., Hook. f., *FBI* 1: 652 (1875).

Basionym: *Vitis latifolia* Roxb., *Fl. Ind. (Carey & Wallich ed.)* 2: 474 (1824).

Habit : Climber
Ecosystem preference : Moist deciduous forests and in plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found in the margins of forests and outskirts of hillocks
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Occasional
Phenology : May - June
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kosavanidukku- Kaduvaachaal, 10°50'26.38"N, 76°40'30.88"E, 105m, 16 July 2017, Aswani & Maya, 288 (GVCH); Mayappalam, 10°48'0.36"N, 76°45'58.68"E, 114m, 10 May 2018, Aswani & Maya, 2153 (GVCH) **(Plate 25: Fig. f)**.

Causonis Raf., *Med. Fl.* 2: 122 (1830)

Causonis trifolia (L.) Mabb. & J.Wen, *Mabberley's Pl.-Book* 1101 (2017); *Vitis carnosa* (Lam.) Wall. ex Wight & Arn., Hook. f., *FBI* 1: 654 (1875).; *Cayratia carnosa* (Lam.) Gagnep., Gamble, *Fl. Madras* 237 (1918); *Cayratia trifolia* (L.) Domin, Vajr., *Fl. Palghat Dist* 124 (1990).

Basionym: *Vitis trifolia* L., *Sp. Pl.* 1: 203 (1753).

Habit : Climber
Ecosystem preference : Moist deciduous forests and in plains
Distribution : Indo - Pacific, Holarctic and Australian
IUCN Category : Not Evaluated (NE)
Habitat : Found in wet regions in forests and near water bodies
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Occasional
Phenology : Throughout the year
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Way to Ayyappan Mala, 10°49'07.40"N, 76°45'32.38"E, 170m, 06 January 2018, Aswani & Maya, 1237 (GVCH); Mayappalam,10°48'0.36"N, 76°45'58.68"E, 114m, 10 May 2018, Aswani & Maya, 2154 (GVCH); Ayyappan Mala, 10°49'07.19"N, 76°44'50.28"E, 130m, 26 June 2018, Aswani & Maya, 2421 (GVCH); Akamalavaram – Moochikadavu, 10°52'56.81"N, 76°42'11.22"E , 507m, 10 December 2019, Aswani & Maya, 5536 (GVCH); Aduppukootimala, 10°50'30.12"N, 76°44'28.32"E, 609m, 16 February 2021, Aswani & Maya, 6501 (GVCH) **(Plate 25: Fig. g)**.

Cayratia Juss., *Dict. Sci. Nat., ed.* 2. *[F. Cuvier]* 10: 103 (1818), nom. cons

Cayratia pedata Gagnep., *Notul. Syst. (Paris)* 1: 346 (1911); *Vitis pedata* Vahl, Hook. f., *FBI* 1: 661 (1875).; *Cayratia pedata* (Lam.) A. Juss. ex Gagnep. var. *pedata*; Gamble, *Fl. Madras* 236 (1918); Vajr., *Fl. Palghat Dist* 123 (1990); Sasidh., *Fl. Parambikulam WLS* 70 (2002).

Basionym: *Cissus pedata* Lam., *Encycl. [J. Lamarck & al.]* 1(1): 31 (1783).

Habit : Climber
Ecosystem preference : Moist deciduous forests and in plains
Distribution : Indo - Pacific

IUCN Category : Vulnerable (VU)
Habitat : Found in outskirts of hillocks and forest margins
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Common
Phenology : June - July
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kozhimala, 10°50'06.45"N, 76°43'38.99"E, 188m, 09 November 2017, Aswani & Maya, 771 (GVCH); Akathethara – Pazhampullikaadu, 10°50'25.25"N, 76°38'05.83"E, 92m 16 October 2018, Aswani & Maya, 3209 (GVCH); Parachaathy, 10°50'54.24"N, 76°43'55.92"E, 159m, 02 January 2019, Aswani & Maya, 3581 (GVCH); Mayappallam, 10°48'0.36"N, 76°45'58.68"E, 114m, 06 September 2019, Aswani & Maya, 4659 (GVCH).

Cissus L., *Sp. Pl. [Linnaeus]* 1: 117 (1753)

Key to species

1. Stem 4 angled or 4 - winged……... *C. quadrangularis*
- Stem terete or obscurely angled……..……...2
2. Leaves blotched with pin and red on upper surface…...…... *C. discolour*
- Leaves green without any blotches…....……..……...3
3. Seeds smooth except for encircling raphe…..……..… *C. heyneana*
- Seeds with angular facets……..…….4
4. Leaves broadly ovate to sub - orbicular; glabrous above; pubescent on nerves beneath; petioles glabrous…...… *C. latifolia*
- Leaves rotund - ovate to deeply 3 - 5 lobed; puberulous above; grey pubescent beneath; petioles pubescent ……..… *C. vitiginea*

Cissus discolor Blume, *Cat. Gew. Buitenzorg (Blume)* 39 (1823); Gamble, *Fl. Madras* 235 (1918); Vajr., *Fl. Palghat Dist* 124 (1990); Sasidh., *Fl. Parambikulam WLS* 71 (2002); *Vitis discolor* (Blume) Dalz., Hook. f., *FBI* 1: 647 (1875).

Habit : Climber
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not evaluated (NE)
Habitat : Found in open forests
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : July - January
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Akathethara - Mannukunnu, 10°52'5.50"N, 76°38'30.27"E, 181m, 09 July 2019, Aswani & Maya, 4261 (GVCH) **(Plate 25: Fig. h)**.

Cissus heyneana Steud., *Nomencl. Bot. [Steudel], ed.* 2. i. 372; Gamble, *Fl. Madras* 234 (1918); Sasidh., *Fl. Parambikulam WLS* 71 (2002); *Vitis heyneana* Wall. ex Wight & Arn., Hook. f., *FBI* 1:647 (1875).

Habit : Climber
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Open forest areas
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : April - June
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range,

Akathethara - Mannukunnu, 10°52'34.26"N, 76°42'40.48"E, 366m, 10 March 2018, Aswani & Maya, 1495 (GVCH).

Cissus latifolia Lam., *Encycl. [J. Lamarck & al.]* 1(1): 30 (1783); *Vitis glauca* Wight & Arn., Hook. f., *FBI* 1:648 (1875); *Vitis gigantea* Bedd., Hook. f., *FBI* 1:648 (1875); Cissus glauca Gamble, *Fl. Madras* 234 (1918).

Habit : Climber
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found in rocky hill slopes
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : June - September
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Ayyappan Mala, 10°49'06.39"N , 76°44'39.99"E, 218m, 26 June 2018, Aswani & Maya, 2553 (GVCH).

Cissus quadrangularis L., *Mant. Pl.* 39 (1767); Gamble, *Fl. Madras* 233 (1915); *Vitis quadrangularis* (L.) Wall. ex Wight, Hook. f., *FBI* 1:645 (1875).

Habit : Climber
Ecosystem preference : In plains
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Found in margins of forests and homesteads
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Occasional
Phenology : June - January
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kadukkamkunnam, 10°48'48.76"N, 76°39'48.98"E, 107m, 23 March 2023, Aswani & Maya, 6566 (GVCH).

Cissus vitiginea L., *Sp. Pl.* 1: 117 (1753); Gamble, *Fl. Madras* 234 (1918); Vajr., *Fl. Palghat Dist* 126 (1990); *Vitis linnaei* Wall. ex Wight & Arn., Hook. f., *FBI* 1: 649 (1875).

Habit : Climber
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found in hill slopes in hillocks and often in main tracks
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Occasional
Phenology : May - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala, 10°49'44.76"N , 76°40'30.72"E, 108m, 20 June 2017, Aswani & Maya, 136 (GVCH); Chemanamkadu, 10°48'46.51"N, 76°44'41.47"E, 154m, 06 January 2018, Aswani & Maya, 1147 (GVCH); Mayappalam, 10°48'01.78"N, 76°45'58.91"E, 116m, 10 May 2018, Aswani & Maya, 2146 (GVCH); Kattaadikunnu, 10°50'17.16"N, 76°38'59.64"E, 139m, 16 October 2019, Aswani & Maya, 4800 (GVCH).

Leea D. Royen, *Mant. Pl.* 17, 124 (1767), nom. cons

Key to species

Leaves simple……..……*L. macrophylla*
Leaves compound…...…..…….2
2. Stem and rachis fluted or crispately winged……..……..… *L. asiatica*
- Stem and rachis neither fluted nor winged……..…….…….. *L. indica*

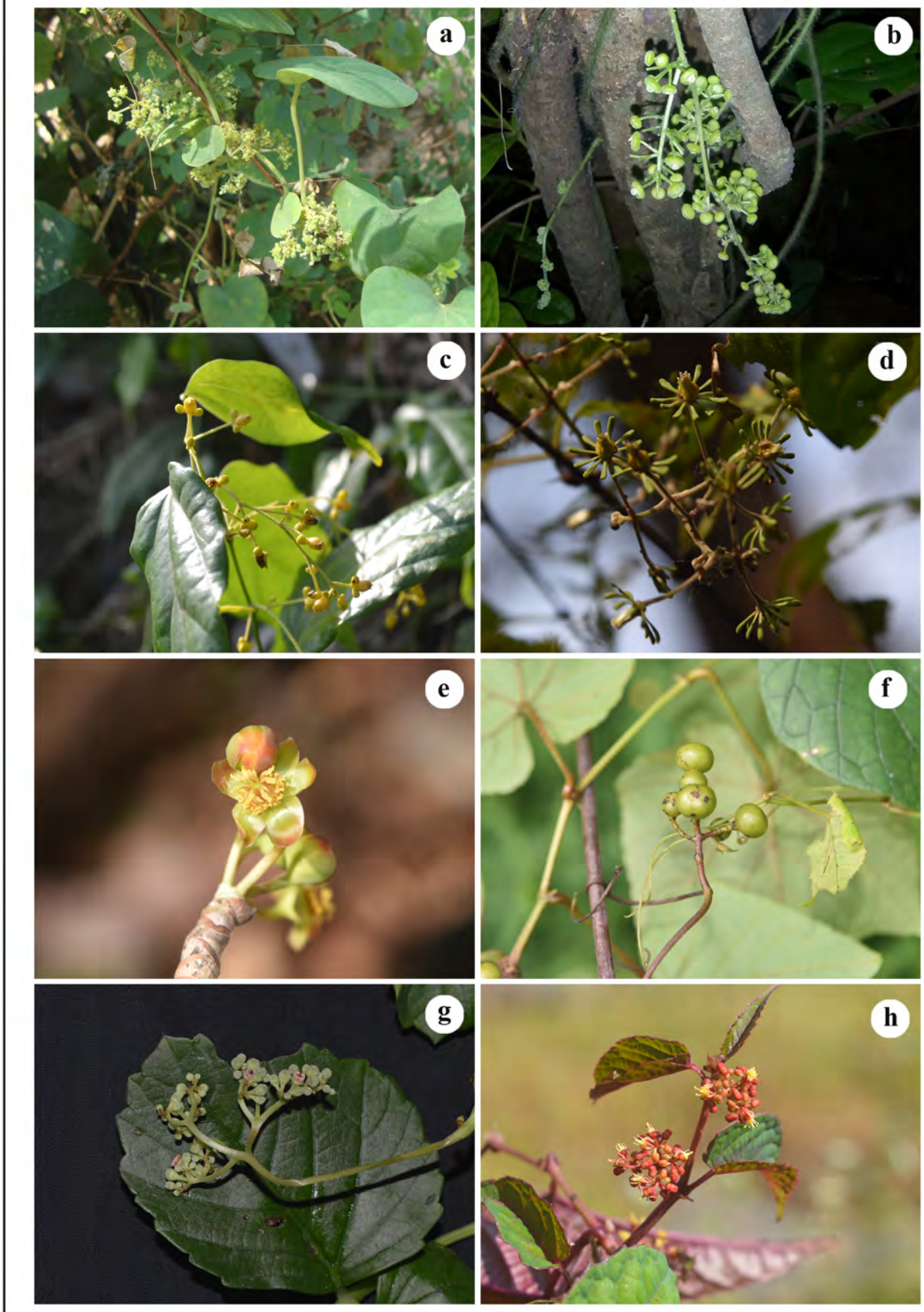

Plate 25:Fig. a. *Cissampelos pareira* L. **b.** *Cyclea peltata* (Lam.) Hook.f. & Thomson **c.** *Tiliacora acuminata* (Lam.) Miers **d.** *Clematis zeylanica* Poir. **e.** *Dillenia pentagyna* Roxb. **f.** *Ampelocissus latifolia* (Roxb.) Planch. **g.** *Causonis trifolia* (L.) Mabb. & J.Wen **h.** *Cissus discolor* Blume.

Leea asiatica (L.) Ridsdale, *Bot. Hist. Hort. Malabaricus* 189 (1980); *Leea pumila* Kurz, Hook. f., *FBI* 1: 666 (1875); *Leea crispa* Royen ex L., Hook. f., *FBI* 1: 665 (1875); Gamble, *Fl. Madras* 240 (1918); *Leea aspera* Edgw., Gamble, *Fl. Madras* 240 (1918); *Leea herbacea* Ham., Gamble, *Fl. Madras* 240 (1918).

Habit : Shrub
Ecosystem preference : Moist deciduous forests and in plains
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : Open forest tracks
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology: March - August
Altitude preference : Found in lower and middle altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Ayyappan Mala, 10°49'10.38"N, 76°44'28.29"E, 310m, 26 June 2018, Aswani & Maya, 2599 (GVCH); Aduppukootimala – Kanyarmuttu, 10°49'59.16"N, 76°44'31.56"E, 298m, 12 January 2019, Aswani & Maya, 3704 (GVCH); Akamalavaram – Chottuppara, 10°52'37.92"N, 76°41'39.84"E, 346m, 14 May 2019, Aswani & Maya, 3909 (GVCH); Jamanthimala, 10°51'48.95"N , 76°47'20.39"E, 504m, 16 February 2021, Aswani & Maya, 6450 (GVCH).

Leea indica (Burm.f.) Merr., *Philipp. J. Sci.* 14(2): 245 (1919); Vajr., *Fl. Palghat Dist* 127(1990); Sasidh., *Fl. Parambikulam WLS* 72 (2002); *Leea sambucina* (L.) Willd., Hook. f., FBI 1: 666 (1875); Gamble, *Fl. Madras* 240 (1918).

Basionym: *Staphylea indica* Burm.f., *Fl. Ind. (N. L. Burman)* 75, t. 24, f. 2 (1768).

Habit : Shrub
Ecosystem preference : Moist deciduous forests and in plains
Distribution : Indo - Pacific, Holarctic and Australian
IUCN Category : Least Concern (LC)
Habitat : Open forest areas near water sources
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : March - August
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kalliyara, 10°52'51.24"N, 76°39'24.84"E, 128m, 24 March 2018, Aswani & Maya, 1526 (GVCH); Malampuzha irrigation dept guest house, 10°50'03.76"N, 76°40'56.19"E, 120m, 18 May 2018, Aswani & Maya, 2197 (GVCH); Koomachimala, 10°49'44.76"N, 76°40'34.59"E, 102m, 17 July 2018, Aswani & Maya, 2620 (GVCH); Akamalavaram – Thannikunnu, 10°52'01.20"N, 76°41'57.48"E, 174m, 18 December 2018, Aswani & Maya, 3460 (GVCH); Chaatapara waterfalls, 10°52'56.81"N, 76°42'11.22"E, 507m, 10 December 2019, Aswani & Maya, 5454 (GVCH) **(Plate 26: Fig. a)**.

Leea macrophylla Roxb. ex Hornem., *Hort. Bot. Hafn.* 1: 251 (1813); Hook. f., FBI 1: 664 (1875); Gamble, *Fl. Madras* 239 (1918); Vajr., *Fl. Palghat Dist* 127 (1990); *Leea diffusa* Lawson in Hook.f., *FBI* 1: 664 (1875); Gamble, *Fl. Madras* 240 (1918).; *Leea latifolia* Wall. ex Kurz, Gamble, *Fl. Madras* 240 (1918); *Leea cinerea* Lawson in Hook.f., *FBI* 1: 665 (1875); *Leea coriacea* Lawson in Hook.f., *FBI* 1: 665 (1875); *Leea venkobarowii* Gamble, Gamble, *Fl. Madras* 240 (1918).

Habit : Shrub
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and Holarctic

IUCN Category : Not Evaluated (NE)
Habitat : Along margins of forests and both sides of railway track
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : November - December
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kottamutti waterfalls, 10°49'46.20"N, 76°46'47.28"E, 203m, 23 September 2018, Aswani & Maya, 2972 (GVCH) **(Plate 26: Fig. b)**.

Tetrastigma Planch., *Monogr. Phan. [A.DC. & C.DC.]* 5(2): 423 (1887)

Tetrastigma sulcatum Gamble, *Fl. Madras* 229 (1918); *Vitis sulcata* Lawson in Hook. f., *FBI* 1: 661 (1875).

Habit : Climber
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
Endemism : Peninsular India
IUCN Category : Not Evaluated (NE)
Habitat : Canopy rich forest slopes near grasslands
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : November - March
Altitude preference : Found in medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thanniplace, 10°53'18.36"N, 76°45'4.95"E, 1160m, 28 January 2020, Aswani & Maya, 6017 (GVCH); Akamalavaram – Pettikallu, 10°53'2.04"N, 76°42'13.92"E, 540m, 27 February 2020, Aswani & Maya, 6090 (GVCH).

Zygophyllales

Zygophyllaceae

Tribulus L., *Sp. Pl.* 1: 386 (1753)

Tribulus terrestris L., *Sp. Pl.* 1: 387 (1753); Hook. f., *FBI* 1: 423 (1874); Gamble, *Fl. Madras* 130 (1915); Sasidh., *Fl. Parambikulam WLS* 40 (2002).

Habit : Herb
Ecosystem preference : Moist deciduous forests, wastelands and plains
Distribution : Indo - Pacific, Holarctic and African
IUCN Category : Least Concern (LC)
Habitat : Found rarely in soil rich areas in much drier hillocks and water refrained regions in dam site
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : October - December
Altitude preference : Drier soils with direct exposure to sunlight
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Walayar dam, 10°50'24.58"N, 76°51'01.52"E, 199m, 09 May 2018, Aswani & Maya, 1972 (GVCH); Mayappallam, 10°48'0.36"N, 76°45'58.68"E, 114m, 10 May 2018, Aswani & Maya, 2148 (GVCH) **(Plate 26: Fig. c)**.

Fabales

Fabaceae

1. Flowers papilionate; staminal filaments usually connate into a tube or sheath; sepals united atleast at the base…..…….. Papilionoideae
- Flowers not papilionate; stamens and filaments only partly connate or free…….……...…2
2. Seeds with a pleurogram...……Caesalpinioideae
- Seeds without pleurogram or sometimes with pseudo – pleurogram……..3

3. Seed hilum crescent shaped……..….... Cercidoideae
- Seed hilum not crescent shaped…...……...…Detarioideae

Caesalpinioideae

Key to genera

1. Flowers actinomorphic…..…….……2
- Flowers zygomorphic……..…….13
2. Flowers tetramerous; stamens 4 - 8……...……..……. *Mimosa*
- Flowers pentamerous; stamens usually more than 8…...……...….3
3. Stamens indefinite……..…...….4
- Stamens definite upto 10 stamens…..……..……....9
4. Phyllodes present……....… *Acacia*
- Phyllodes absent……..……...5
5. Branches with stipular spines…….……..……...6
- Branches without stipular spines…..……..……7
6. Pods dehiscent……..….*Vachellia*
- Pods indehiscent..… *Pithecellobium*
7. Prickles present on branches….. ……..……*Senegalia*
- Prickles absent on branches…...….8
8. Fruits dehiscent.…….. *Albizia*
- Fruits indehiscent.……..... *Samanea*
9. Inflorescence in heads…….……....10
- Inflorescence in spikes…..……...11
10. Pods woody, falcate……..…. *Xylia*
- Pods never woody, linear and flat…….……...….. *Leucaena*
11. Habit - liana with tendrils, unarmed……..……. *Entada*
- Habit - armed shrubs or small trees……...…..….12
12. Pods turgid and straight; sterile flowers without staminodes...….. ……..…..*Prosopis*
- Pods thin and twisted; sterile flowers with staminodes……..……. ……..….*Dichrostachys*
13. Leaves bipinnate.……..……14
- Leaves simple pinnate…….……17
14. Sepals valvate or sub - valvate…..……..….. *Delonix*
- Sepals imbricate…….…….……15
15. Armed plants; leaves terminating in a pair of pinnae……...……..……16
- Unarmed plants ; leaves terminating in a pair of pinnae plus a single terminal pinnae……..….*Libidibia*
16. Plants glandular…....…... *Hultholia*
- Plants e - glandular…..... *Guilandina*
17. Glands absent on leaves…… Cassia
- Glands present on the leaves……..……..18
18. Bracteoles absent; pod valves not coiling…...……...…… *Senna*
- Bracteoles 2, pod valves coiling….……..… *Chamaecrista*

Acacia Mill., *Gard. Dict. Abr*., *ed.* 4. 1: [25] (1754)

Acacia auriculiformis A.Cunn. ex Benth., *London J. Bot.* 1: 377 (1842); Antony, *Syst. Stud. Fl. Kottayam Dist* 148 (1989); Sanjappa, *Legumes India* 45 (1992); Sasidh. & Sivar., *Fl. Pl. Thrissur For* 167 (1996); Sasidh., *Fl. Shenduruny WLS* 111 (1997); Anil Kumar *et al*., *Fl. Pathanamthitta* 206 (2005); Sunil & Sivad., *Fl. Alappuzha Dist* 263 (2009).

Habit : Tree
Ecosystem preference : Planted in plains, often found to be invasive in the forest areas
Distribution : Australian
IUCN Category : Least Concern (LC)
Habitat : Found as a avenue plant and in plantations
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : Throughout the year
Altitude preference : Found commonly in lower altitudes as invasive tree species
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range,

Malampuzha - Vedivachapara, 10°50'12.34"N, 76°40'41.15"E, 109m, 04 June 2017, Aswani & Maya, 57 (GVCH); Malampuzha Anakkal hillock, 10°51'38.48"N, 76°40'14.42"E, 105m, 26 January 2018, Aswani & Maya, 1395 (GVCH); Ayyappan Mala, 10°49'07.19"N, 76°44'50.28"E, 130m, 26 June 2018, Aswani & Maya, 2464 (GVCH).

Albizia Durazz., *Mag. Tosc.* 3(4): 13 (1772)

Key to species

1. Leaflets large……...…...2
- Leaflets small…..……...3
2. Flowers sessile…... *A. odoratissima*
- Flowers pedicelled……. *A. lebbeck*
3. Stipules obliquely cordate, auriculate and pink…... *A. chinensis*
- Stipules linear - subulate, greenish…...…..……..… *A.amara*

Albizia amara (Roxb.) Boivin, *Encycl. Dix-Neuvième Siécle* 2: 34 (1837); Hook. f., *FBI* 2: 301 (1878); Gamble, *Fl. Madras* 432 (1919).

Basionym: *Mimosa amara* Roxb., *Pl. Coromandel* 2(1): 13, t. 122 (1799).

Habit : Tree
Ecosystem preference : Moist deciduous forests
Distribution : Indo Pacific and African
IUCN Category : Least Concern (LC)
Habitat : Lower forest tracks
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : June to January
Altitude preference : Found in lower altitudes in deciduous forests
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Ayyappan Mala, 10°49'07.19"N, 76°44'50.28"E, 130m, 07 March 2019, Aswani & Maya, 3755 (GVCH).

Albizia chinensis (Osbeck.) Merr., *Amer. J. Bot.* 3: 575 (1916); Vajr., *Fl. Palghat Dist* 187 (1990); *Albizia stipulata* (Roxb.) Boivin, Hook. f., *FBI* 2: 300 (1878); *Albizia marginata* (Lam.) Merr., Gamble, *Fl. Madras* 433 (1919).

Basionym: *Mimosa chinensis* Osbeck, *Dagb. Ostind. Resa* 233 (1757).

Habit : Tree
Ecosystem preference : Moist deciduous forests and plains
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : Found in forest margins and roadsides
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : March - July
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, S- Medu-Walayar, 10°50'26.52"N, 76°50'04.56"E, 214m, 23 June 2019, Aswani & Maya, 4043 (GVCH).

Albizia lebbeck (L.) Benth Hooker's *London Journal of Botany* 3 (1844); Hook. f., *FBI* 2: 298 (1878); Gamble, *Fl. Madras* 432 (1919); Sasidh., *Fl. Parambikulam WLS* 111 (2002).

Habit : Tree
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and Holarctic
IUCN Category : Least Concern (LC)
Habitat : Found in degraded forests and plains
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : March - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Vettiyil sandal estate, 10°51'34.30"N,

76°42'28.02"E, 145m, 10 March 2018, Aswani & Maya, 1438 (GVCH); Kochuthodu – Akamalavaram, 10°51'58.32"N, 76°42'22.32"E, 177m, 18 December 2018, Aswani & Maya, 3345 (GVCH); Anakundu – Pudussery, 10°49'42.90"N, 76°46'13.00"E, 135m, 07 March 2018, Aswani & Maya, 3854 (GVCH).

Albizia odoratissima (L.f.) Benth., *London J. Bot.* 3: 88 (1844); Hook. f., *FBI* 2: 299. 1878; Gamble, *Fl. Madras* 431 (1919); Vajr., *Fl. Palghat Dist* 187 (1990); Sasidh., *Fl. Parambikulam WLS* 111 (2002).

Basionym: *Mimosa odoratissima* L.f., *Suppl. Pl.* 437 (1782).

Habit : Tree
Ecosystem preference : Moist deciduous forests and plains
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Degraded forest tracks
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : April - January
Altitude preference : Found in lower altitudes as degraded forest elements
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Akathethara - Mannukunnu, 10°52'5.50"N, 76°38'30.27"E, 181m, 09 July 2019, Aswani & Maya, 4188 (GVCH) **(Plate 26: Fig. d)**.

Cassia L., *Sp. Pl.* 1: 376 (1753)

Cassia fistula L., *Sp. Pl.* 1: 377 (1753).; Hook. f., *FBI* 2: 261 (1878); Gamble, *Fl. Madras* 400 (1919); Vajr., *Fl. Palghat Dist* 181 (1990); Sasidh., *Fl. Parambikulam WLS* 107 (2002).

Basionym: *Bactyrilobium fistula* (L.) Willd., *Enum. Pl. [Willdenow]* 1: 440 (1809).

Habit : Tree
Ecosystem preference : Deciduous forests and in plains
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Found in the margins of forests and often planted as ornamental tree in homesteads and as an avenue tree
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : February - September
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kozhimala, 10°50'01.89"N, 76°42'58.61"E, 105m, 09 November 2017, Aswani & Maya, 767 (GVCH); Poolakunnu, 10°51'33.12"N, 76°42'29.52"E, 142m, 10 March 2018, Aswani & Maya, 1409 (GVCH); Parakkallu – Neelippara, 10°51'34.19"N, 76°37'35.37"E, 193m, 27 April 2018, Aswani & Maya, 1927 (GVCH); Ayyappan Mala, 10°49'06.91"N, 76°44'44.91"E, 151m, 07 March 2019, Aswani & Maya, 3776 (GVCH); Kattadikunnu – Akathethara, 10°50'17.16"N, 76°38'59.64"E, 139m, 16 October 2019, Aswani & Maya, 4818 (GVCH); Jamanthimala, 10°52'20.64"N, 76°46'57.00"E, 864m, 09 January 2020, Aswani & Maya, 5722 (GVCH).

Chamaecrista (L.) Moench, *Methodus (Moench)* 272 (1794)

Key to species

1. Leaflets 2 pairs; glands present on rachis between leaflets….. *C. absus*
- Leaflets more than two pairs; glands on petiole below leaflets……..……..……..…2
2. Glands sessile; discoid; leaflets upto 80 pairs……..…. C. *mimosoides*
- Glands stalked; obconoid; leaflets 8 - 24 pairs ……..…….....*Chamaecrista nictitans* subsp. *patellaria*

Chamaecrista absus (L.) H.S.Irwin & Barneby, *Mem. New York Bot. Gard.* 35: 664 (1982); Sasidh., *Fl. Parambikulam WLS* 107 (2002); *Cassia absus* L., Hook. f., *FBI* 2: 265 (1878); Gamble, *Fl. Madras* 403 (1919).

Basionym: *Cassia absus* L. in Sp. Pl.: 376 (1753)

Habit : Herb
Ecosystem preference : Degraded and Deciduous forests
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Found in the outskirts of hillocks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : September - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kosavanidukku-Kaduvachal, 10°50'26.38"N, 76°40'30.88"E, 105m, 16 July 2017, Aswani & Maya, 242 (GVCH); Pallippara, 10°49'48.36"N, 76°43'44.04"E, 120m, 29 October 2017, Aswani & Maya, 717 (GVCH); Cheekuzhi – Edamala, 10°50'8.57"N, 76°38'57.48"E, 104m, 16 October 2019, Aswani & Maya, 4759 (GVCH); Anayappanchalla, 10°48'25.92" N, 76°48'35.19"E, 157m, 30 November 2019, Aswani & Maya, 5130 (GVCH); Koomachimala, 10°49'44.76"N, 76°40'34.59"E, 102m, 23 September 2020, Aswani & Maya, 6229 (GVCH).

Chamaecrista mimosoides (L.) Greene, *Pittonia* 4(20): 27 (1899); Sasidh., *Fl. Parambikulam WLS* 107 (2002); *Cassia mimosoides* L., Hook. f., *FBI* 2: 266 (1878); Gamble, *Fl. Madras* 403 (1919); Vajr., *Fl. Palghat Dist* 181 (1990).

Basionym: *Cassia mimosoides* L., *Sp. Pl.* 1: 379 (1753).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and African
IUCN Category : Least Concern (LC)
Habitat : Found in the temporary pools in hillocks and in marshy areas
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : July - December
Altitude preference : Found in the lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Valiya Eri, 10°48'53.76"N , 76°44'59.07"E, 124m, 06 January 2018, Aswani & Maya, 1256 (GVCH); Anayappanchalla, 10°48'24.82"N, 76°48'30.73"E, 147m, 18 September 2018, Aswani & Maya, 2817 (GVCH); Cheekuzhi – Akathethara, 10°50'8.57"N, 76°38'57.48"E, 104m, 16 October 2019, Aswani & Maya, 4750 (GVCH); Thekke Malampuzha, 10°50'01.23"N, 76°40'58.49"E, 127m, 23 November 2019, Aswani & Maya, 4971 (GVCH) **(Plate 26: Fig. e)**.

Chamaecrista nictitans **subsp.** ***patellaria*** (Collad.) H.S.Irwin & Barneby, *Mem. New York Bot. Gard.* 35(2): 814 (1982); *Cassia leschenaultiana* DC., Gamble, *Fl. Madras* 403 (1919); Vajr., *Fl. Palghat Dist* 181 (1990).

Basionym: *Cassia patellaria* Collad., *Hist. Nat. Méd. Casses* 125, t (1816).

Habit : Herb
Ecosystem preference : Moist deciduous forests and in plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Found in the wet regions in the hillocks and in open grassy areas
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : August - October

Altitude preference : Found in the lower altitudes in small ephemeral ponds
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Mayappalam, 10°48'01.78"N , 76°45'58.91"E, 116m, 10 May 2018, Aswani & Maya, 2093 (GVCH); Kongampaadam, 10°48'36.72"N, 76°46'51.96"E, 151m, 15 June 2018, Aswani & Maya, 2337 (GVCH); Ayyappan Mala, 10°49'07.40"N, 76°45'32.38"E, 170m, 26 June 2018, Aswani & Maya, 2445 (GVCH); Cheekuzhi – Edamala, 10°50'11.04"N, 76°38'57.48"E, 114m, 16 October 2019, Aswani & Maya, 4751 (GVCH); Ahalia Campus, 10°47'43.08"N, 76°50'5.43"E, 150m, 24 September 2020, Aswani & Maya, 6300 (GVCH) **(Plate 26: Fig. f)**.

Delonix Raf., *Fl. Tellur.* 2: 92 (1837)

Delonix regia (Bojer) Raf., *Fl. Tellur.* 2: 92 (1837); Gamble, *Fl. Madras* 396 (1919); P*oinciana regia* Boj. ex Hook., Hook. f., *FBI* 2: 260 (1878).

Basionym : *Poinciana regia Bojer*, *Bot. Mag.* 56: t. 2884 (1829).

Habit : Tree
Ecosystem preference : Planted as ornamental tree
Distribution : Indo - Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Found in road sides and wastelands
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : February - July
Altitude preference : Found grown in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range,Malampuzha - Anakkal road, 10°51'33.84"N, 76°41'41.94"E, 124m, 24 March 2018, Aswani & Maya, 1809 (GVCH); Mayappallam, 10°48'01.78"N, 76°45'58.91"E, 116m, 10 May 2018, Aswani & Maya, 2123 (GVCH); Kongampaadam, 10°48'31.45"N, 76°46'38.56"E, 138m, 15 June 2018, Aswani & Maya, 2372 (GVCH); Walayar Dam, 10°50'24.58"N, 76°51'01.52"E, 199m, 30 January 2021, Aswani & Maya, 6369 (GVCH).

Dichrostachys (DC.) Wight & Arn., *Prodr. Fl. Ind. Orient.* 1: 271 (1834)

Dichrostachys cinerea (L.) Wight & Arn., *Prodr. Fl. Ind. Orient.* 1: 271 (1834); Hook. f., *FBI* 2: 288 (1878); Gamble, *Fl. Madras* 419 (1919); Vajr., *Fl. Palghat Dist* 187 (1990).

Basionym : *Mimosa cinerea* L., *Sp. Pl.* 1: 520 [no. 25] (1753)

Habit : Tree
Ecosystem preference : Dry deciduous forests
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Along wastelands and scrub jungles
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : October - January
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Valiya Eri, 10°49'04.44"N , 76°45'05.04"E, 129m, 06 January 2018, Aswani & Maya, 1327 (GVCH); Walayar toll plaza hillock, 10°48'45.00"N, 76°47'49.56"E, 145m, 30 November 2019, Aswani & Maya, 5235 (GVCH) **(Plate 26: Fig. g)**.

Entada Adans., *Fam. Pl. (Adanson)* 2: 318, 554 (1763)

Entada phaseoloides (L.) Merr., *Philipp. J. Sci., C* 9: 86 (1914); *Entada scandens* Hook.f., *FBI* 2: 287 (1878); Gamble, *Fl. Madras* 417 (1919); *Entada rheedei* Spreng., Vajr., *Fl. Palghat Dist* 188 (1990); Sasidh., *Fl. Parambikulam WLS* 112 (2002).

Basionym : *Lens phaseoloides* L., *Herb. Amboin. (Linn.)* 18 (1754)

Habit : Liana
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Near water sources
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Occasional
Phenology : December - April
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Chottuppara waterfalls, 10°52'37.92"N, 76°41'39.84"E, 346m, 14 May 2019, Aswani & Maya, 3973 (GVCH); Akamalavaram - Chaatapara waterfalls, 10°53'11.76"N, 76°42'15.84"E, 600m, 10 December 2019, Aswani & Maya, 5452 (GVCH).

Guilandina L., *Sp. Pl.* 1: 381 (1753)

Guilandina bonduc L., *Sp. Pl.* 1: 381 (1753); *Caesalpinia bonducella* (L.) Flem., Hook. f., *FBI* 2: 254 (1878); *Caesalpinia crista* Linn., Gamble, *Fl. Madras* 393 (1919); *Caesalpinia bonduc* (L.) Roxb., Sasidh., *Fl. Parambikulam WLS* 106 (2002).

Basionym : *Guilandina bonduc* L., *Sp. Pl.* 1: 381 (1753).

Habit : Climber
Ecosystem preference : Moist deciduous forests and semi - evergreen forests
Distribution : Indo - Pacific and African
IUCN Category : Least Concern (LC)
Habitat : Canopy rich forest floor near forest floors
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Common
Phenology : March - May
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Parakkallu- Neelikunnu, 10°51'52.92"N, 76°37'41.52"E, 397m, 27 April 2018, Aswani & Maya, 1926 (GVCH); Pallakaadu, 10°51'30.96"N, 76°37'39.00"E, 151m, 09 October 2018, Aswani & Maya, 3013 (GVCH); Thaanikunnu, 10°52'01.20"N, 76°41'57.48"E, 174m, 18 December 2018, Aswani & Maya, 3453 (GVCH); Attippara, 10°52'06.24"N, 76°41'53.16"E, 194m, 18 December 2018, Aswani & Maya, 3509 (GVCH); Jamanthimala, 10°51'53.64"N, 76°47'16.80"E, 586m, 23 June 201, Aswani & Maya, 4090 (GVCH) **(Plate 26: Fig. h)**.

Hultholia Gagnon & G.P.Lewis, *PhytoKeys* 71: 58 (2016)

Hultholia mimosoides (Lam.) Gagnon & G.P.Lewis, *PhytoKeys* 71: 61 (2016); *Caesalpinia mimosoides* Lam., Hook. f., *FBI* 2:256 (1878); Gamble, *Fl. Madras* 394 (1919); Sasidh., *Fl. Parambikulam WLS* 106 (2002).

Basionym : *Caesalpinia mimosoides* Lam., *Encycl. [J. Lamarck & al.]* 1(2): 462 (1785).

Habit : Climber
Ecosystem preference : Moist deciduous forests and also in the plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In the outskirts of hills

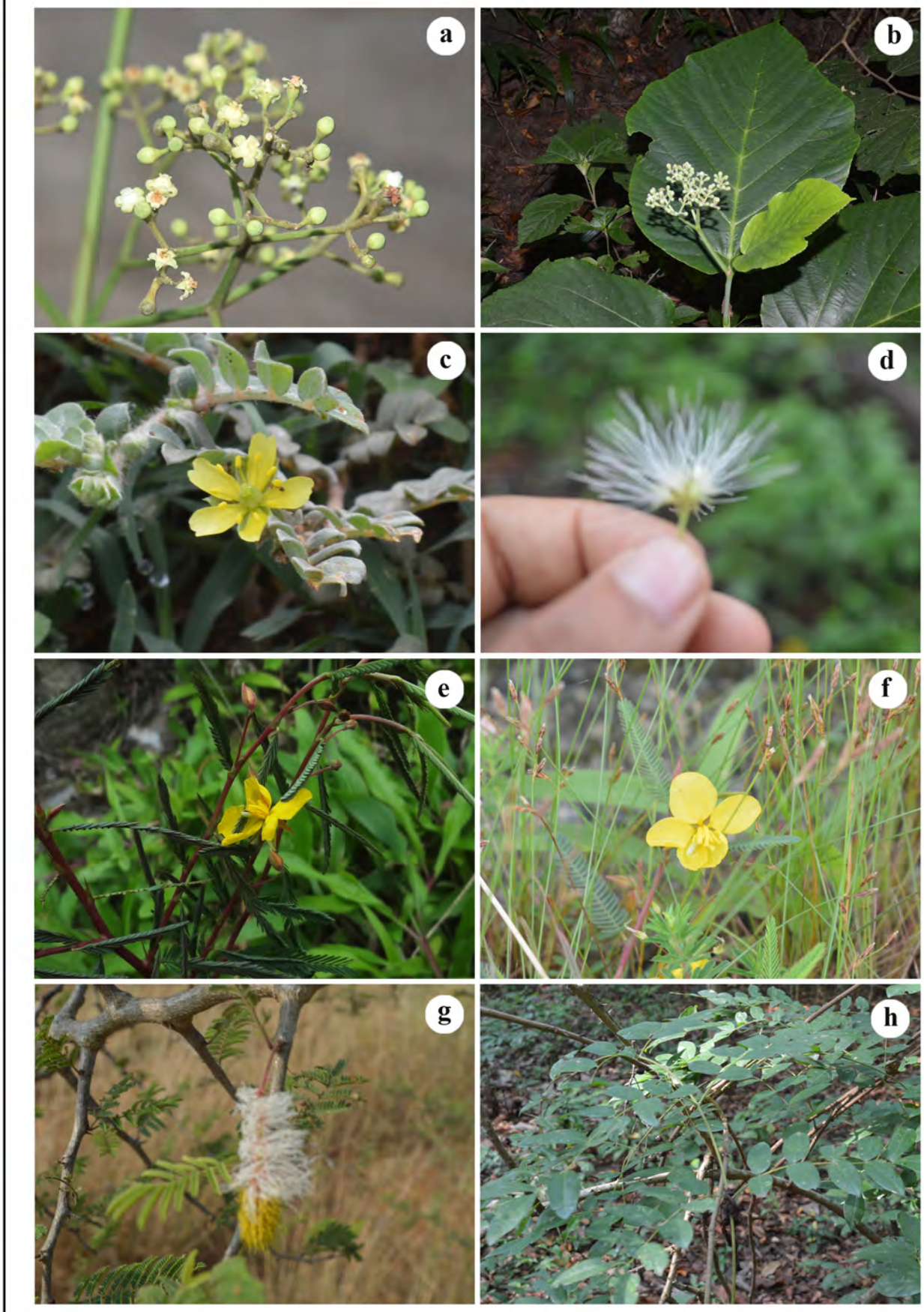

Plate 26: Fig. a. *Leea indica* (Burm.f.) Merr. **b.** *Leea macrophylla* Roxb. ex Hornem. **c.** *Tribulus terrestris* L. **d.** *Albizia odoratissima* (L.f.) Benth. **e.** *Chamaecrista mimosoides* (L.) Greene **f.** *Chamaecrista nictitans* subsp. *patellaria* (Collad.) H.S.Irwin & Barneby **g.** *Dichrostachys cinerea* (L.) Wight & Arn. **h.** *Guilandina bonduc* L.

Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Occasional
Phenology : January - March
Altitude preference : Found in lower altitudes
Specimens examined: INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala, 10°52'21.00"N, 76°47'00.24"E, 848m, 09 January 2020, Aswani & Maya, 5751 (GVCH); Chaavadippara, 10°52'42.20" N, 76°48'43.56"E, 243m, 28 January 2020, Aswani & Maya, 5811 (GVCH) **(Plate 27: Fig. a)**.

Leucaena Benth., *J. Bot. (Hooker)* 4: 416 (1842)

Leucaena leucocephala **(**Lam.) de Wit, *Taxon* 10: 54 (1961); *Leucaena glauca* Benth., Hook. f., *FBI* 2: 290 (1878); Gamble, *Fl. Madras* 419 (1919); *Leucaena latisiliqua* (L.) Gillis, Vajr., *Fl. Palghat Dist* 190 (1990).

Basionym: *Mimosa leucocephala* Lam. in *Encycl.* 1: 12 (1783)

Habit : Tree
Ecosystem preference : Cultivated for fuel wood and fodder
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Found as a biofence in homesteads and in forest margins
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : November - Aprils
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, G. P. Nair Estate, 10°53'47.40"N, 76°39'47.16"E, 267m, 24 March 2018, Aswani & Maya, 1787 (GVCH); Walayar Dam, 10°50'15.57"N, 76°51'5.13"E, 190m, 09 May 2018, Aswani & Maya, 2068 (GVCH); Malampuzha irrigation dept. guest house hillock, 10°50'04.20"N, 76°40'52.68"E, 120m, 18 May 2018, Aswani & Maya, 2206 (GVCH); Kongampaadam, 10°48'39.80"N, 76°47'2.67"E, 130m, 30 November 2019, Aswani & Maya, 5267 (GVCH).

Libidibia Schltdl., *Linnaea* 5(2): 192 (1830)

Libidibia coriaria (Jacq.) Schltdl., *Linnaea* 5(2): 193 (1830); *Caesalpinia coriaria* (Jacq.) Willd., Gamble, *Fl. Madras* 394 (1919).

Basionym: *Poinciana coriaria* Jacq. in *Select. Stirp. Amer. Hist*.: 123 (1763)

Habit : Tree
Ecosystem preference : Found in road sides
Distribution : Indo - Pacific, Holarctic, African and South American
IUCN Category : Least Concern (LC)
Habitat : Found as avenue tree
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : September to March
Altitude preference : Found grown in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Akathethara - Malampuzha road, 10°49'34.77"N, 76°38'8.58"E, 100m, 28 February 2021, Aswani & Maya, 6523(GVCH).

Mimosa L., *Sp. Pl.* 1: 516 (1753)

Key to species

Leaf pinnae arranged pinnately; leaflets upto 35 pairs…….…….. *M. diplotricha*

Leaf pinnae arranged palmately; leaflets upto 20 pairs…….…….. *M. pudica*

Mimosa diplotricha C.Wright, *Anales Acad. Ci. Med. Habana* 5: 405 (-406) (1868); Sasidh., *Fl. Parambikulam WLS* 112 (2002).

Habit : Climber
Ecosystem preference : Degraded forests and also in the plains
Distribution : Indo - Pacific and South American
IUCN Category : Not Evaluated (NE)
Habitat : Weed in forest floor
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Common
Phenology : November - March
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Vedivachapara, 10°50'12.34"N, 76°40'41.15"E, 109m, 04 June 2017, Aswani & Maya, 81 (GVCH); Valiya Eri, 10°48'53.76"N, 76°44'59.07"E, 124m, 06 January 2018, Aswani & Maya, 1267 (GVCH); Malampuzha irrigation dept. guest house hillock, 10°50'04.20"N, 76°40'52.68"E, 120m, 18 May 2018, Aswani & Maya, 2235 (GVCH); Pazhampullikaadu, 10°50'09.55"N, 76°38'28.33"E, 89m, 16 October 2018, Aswani & Maya, 3137 (GVCH); Koomachimala, 10°49'44.76"N, 76°40'34.59"E, 102m, 23 November 2019, Aswani & Maya, 4888 (GVCH).

Mimosa pudica L., *Sp. Pl.* 1: 518 (1753); Hook. f., *FBI* 2: 291 (1878); Gamble, *Fl. Madras* 421 (1919); Vajr., *Fl. Palghat Dist* 188 (1990); Sasidh., *Fl. Parambikulam WLS* 112 (2002).

Habit : Climber
Ecosystem preference : In plains and in wastelands
Distribution : Indo - Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : A common weed in plains
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Common
Phenology : July - January
Altitude preference : Found very commonly in lower altitudes in plains and wastelands
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thonikadavu, 10°50'04.96"N , 76°40'48.72"E, 116m, 04 June 2017, Aswani & Maya, 22 (GVCH); Chemanamkadu, 10°48'46.03"N, 76°44'47.99"E, 121m, 06 January 2018, Aswani & Maya, 1133 (GVCH); Akamalavaram – Moochikadavu, 10°52'13.80"N, 76°42'30.96"E, 258m, 10 March 2018, Aswani & Maya, 1469 (GVCH); Ahalya campus, 10°47'43.08"N, 76°50'5.43"E, 150m, 24 September 2020, Aswani & Maya, 6301 (GVCH); Aduppukootimala, 10°49'38.80"N, 76°44'16.08"E, 140m, 16 February 2021, Aswani & Maya, 6428 (GVCH).

Pithecellobium Mart., *Flora 20(2, Beibl.)*: 114 (1837), nom. et orth. cons.

Pithecellobium dulce (Roxb.) Benth., *London J. Bot.* 3: 199 (1844); Hook. f., *FBI* 2: 302 (1878); Gamble, *Fl. Madras* 434 (1919); Vajr., *Fl. Palghat Dist* 189 (1990); Sasidh., *Fl. Parambikulam WLS* 112 (2002).

Basionym : *Mimosa dulcis Roxb*., *Pl. Coromandel* 1(4): 67, t. 99 (1798).

Habit : Tree
Ecosystem preference : Scrub jungles and in plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Least Concern (LC)

Habitat : Grown as the fuel wood tree in plains
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : November - March
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Walayar Dam, 10°50'24.58"N, 76°51'01.52"E, 199m, 09 May 2018, Aswani & Maya, 2067 (GVCH); Mayappallam, 10°48'01.78"N, 76°45'58.91"E, 116m, 10 May 2018, Aswani & Maya, 2158 (GVCH); Malampuza irrigation dept guest house hillock, 10°50'03.76"N, 76°40'56.19"E, 120m, Aswani & Maya, 2213 (GVCH); Pallippara, 10° 49 '49.08"N, 76° 43' 47.28"E, 120m, 23 November 2019, Aswani & Maya, 4996 (GVCH) **(Plate 27: Fig. b)**.

Prosopis L., *Mant. Pl.* 10 (1767)

Prosopis juliflora (Sw.) DC., *Prodr. [A. P. de Candolle*] 2: 447 (1825); Sasidh., *Fl. Parambikulam WLS* 113 (2002).

Habit : Tree
Ecosystem preference : Deciduous forests and scrub jungles
Distribution : Indo - Pacific, Holarctic and South American
IUCN Category : Not Evaluated (NE)
Habitat : In the catchment areas in dams and in the hillock base
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : October - February
Altitude preference : Found in lower altitudes

Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Anayappanchalla, 10°48'25.92"N, 76°48'35.19"E, 157m, 18 September 2018, Aswani & Maya, 2812 (GVCH); Walayar Dam, 10°50'24.58"N, 76°51'01.52"E, 199m, 30 January 2021, Aswani & Maya, 6364 (GVCH) **(Plate 27: Fig. c)**.

Samanea (Benth.) Merr., *J. Wash. Acad. Sci.* 6(2): 46 (1916)

Samanea saman (Jacq.) Merr., *J. Wash. Acad. Sci.* 6(2): 47 (1916); Sanjappa, *Legumes Ind.* 72 (1992).

Basionym : *Mimosa saman Jacq*., *Fragm. Bot. pt.* 1: 15, t. 9 (1800).

Habit : Tree
Ecosystem preference : In plains
Distribution : South American
IUCN Category : Least Concern (LC)
Habitat : Often found as avenue tree in hillocks and forest margins
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : March - May
Altitude preference : Found commonly in the lower altitudes in plains
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Mangalathumchalla, 10°49'04.07"N , 76°48'16.50"E, 151m, 18 September 2018, Aswani & Maya, 2739 (GVCH); Vattappara, 10°49'29.47"N, 76°49'05.26"E, 162m, 18 September 2018, Aswani & Maya, 2785 (GVCH); Nadupathy colony, 10°51'27.72"N, 76°47'0.96"E, 546m, 23 June 2019, Aswani & Maya, 4042 (GVCH); Poolakunnu, 10°51'33.12"N, 76°42'29.52"E, 142m, 02 August 2019, Aswani & Maya, 4425 (GVCH); Walayar dam, 10°50'15.57"N, 76°51'5.13"E, 190m, 30 January 2021, Aswani & Maya, 6368 (GVCH).

Senegalia Raf., *Sylva Tellur.* 119 (1838)

Key to species

1. Trees……...…….……..2

- Climbers…..…..……...……3
2. Petals twice as long as calyx; ovate - oblong……..…..…….. *S. catechu*
- Petals more than twice as long as calyx; linear – lanceolate……....*S. chundra*
3. Pinnae 5 - 6 pairs; leaflets 10 - 15 pairs…….…..… *S. caesia*
- Pinnae 7 - 15 pairs; leaflets 15 - 35 pairs…….……..…….4
4. Bracts ovate; pods thick, obtuse at both ends, nearly 7cm long…….……...….. *S. rugata*
- Bracts linear - lanceolate, pods thin, acute at both ends, 15 - 18cm long……..…….. *S. pennata*

Senegalia caesia (L.) Maslin, *Seigler & Ebinger, Blumea* 58(1): 40 (2013); *Acacia caesia* (L.) Willd., Gamble, *Fl. Madras* 428 (1919); Sasidh., *Fl. Parambikulam WLS* 110 (2002); *Acacia intsia* Willd. var. *caesia* (L.) Baker, Hook. f., FBI 2: 297 (1878); *Acacia columnaris* Craib., Gamble, *Fl. Madras* 429 (1919).

Basionym : *Mimosa caesia* L., *Sp. Pl.* 1: 522 (1753).

Habit : Climber
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Hill slopes and found as climber in the trees
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Common
Phenology : October - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kozhimala, 10°50'04.17"N, 76°43'23.82"E, 207m, 09 November 2017, Aswani & Maya, 769 (GVCH); Ayyappan Mala, 10°48'59.96"N, 76°45'22.61"E, 132m, 26 June 2018, Aswani & Maya, 2382 (GVCH); Parachaathy, 10°50'54.24"N, 76°43'55.92"E, 159m, 02 January 2019, Aswani & Maya, 3604 (GVCH); Chaatappara waterfalls, 10°52'37.92"N, 76°41'39.84"E, 346m, 10 December 2019, Aswani & Maya, 5451 (GVCH); Mathappumala, 10°51'9.36"N, 76°49'55.56"E, 230m, 07 January 2020, Aswani & Maya, 5589 (GVCH); Thanniplace, 10°52'43.32"N, 76°45'54.07" E, 972m, 28 January 2020, Aswani & Maya, 6029 (GVCH) **(Plate 27: Fig. d)**.

Senegalia catechu (L.f.) P.J.H.Hurter & Mabb., *Mabberley's Pl.-Book* 1021 (2008); *Acacia catechu* (L.f.) Willd. Hook. f., *FBI* 2: 295 (1878); Gamble, *Fl. Madras* 427 (1919); Sasidh., *Fl. Parambikulam WLS* 110 (2002).

Basionym : *Mimosa catechu* L.f., *Suppl. Pl.* 439 (1782).

Habit : Tree
Ecosystem preference : Deciduous forests
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Margins of deciduous forests
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : March - September
Altitude preference : Found commonly in all altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Ayyappan Mala, 10°48'59.96"N, 76°45'22.61"E, 132m, 26 June 2016, Aswani & Maya, 2408 (GVCH); On the way to Jamanthimala, 10°51'20.17"N, 76°47'4.18"E, 645m, 23 June 2019, Aswani & Maya, 4020 (GVCH); Chacolas, 10°51'22.68"N, 76°44'41.28"E, 227m, 02 August 2019, Aswani & Maya, 4496 (GVCH); Jamanthimala, 10°52'18.19" N, 76°46'47.13"E, 922m, 09 January 2020, Aswani & Maya, 5708 (GVCH).

Senegalia chundra (Roxb. ex Rottler) Maslin, *Nuytsia* 22(6): 466 (2012); *Acacia sundra* (Roxb.) DC., Hook. f., *FBI* 2: 295 (1878); Gamble, *Fl. Madras* 428 (1919); *Acacia chundra* (Roxb. ex Rottl.) Willd., Vajr., *Fl. Palghat Dist* 185 (1990).

Basionym : *Mimosa chundra* Roxb. ex Rottler, *Neue Schriften Ges. Naturf. Freunde Berlin* 4: 207 (1803).

Habit : Tree
Ecosystem preference : Deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Margins of grasslands
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : July - August
Altitude preference : Found in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala, 10°51'20.17"N, 76°47'4.18"E, 645m, 01 July 2019, Aswani & Maya, 4157 (GVCH) **(Plate 27: Fig. e)**.

Senegalia pennata (L.) Maslin, *Nuytsia* 22(6): 466 (2012); *Acacia pennata* (L.) Willd., Hook. f., *FBI* 2: 297 (1878); Gamble, *Fl. Madras* 429 (1919); Vajr., *Fl. Palghat Dist* 186 (1990); Sasidh., *Fl. Parambikulam WLS* 110 (2002).

Basionym : *Mimosa pennata* L., *Sp. Pl.* 1: 522 (1753).

Habit : Climber
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and African
IUCN Category : Least Concern (LC)
Habitat : In margins of forests and in hillocks
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Occasional
Phenology : October- January
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kosavanidukku-Kaduvachal, 10°50'26.38"N, 76°40'30.88"E, 105m, 16 July 2017, Aswani & Maya, 248 (GVCH); Koyamarakaadu, 10°47'40.58"N, 76°45'27.05"E, 139m, 06 September 2018, Aswani & Maya, 2723 (GVCH) **(Plate 27: Fig. f)**.

Senegalia rugata (Lam.) Britton & Rose, *N. Amer. Fl.* 23(2): 120 (1928); *Acacia concinna* (Willd.) DC., Hook. f., *FBI* 2: 296 (1878); Gamble, *Fl. Madras* 429 (1919); *Acacia concinna* (Willd.) DC. var. *rugata* (Benth.) Baker, Hook. f., *FBI* 2: 297 (1878); *Acacia rugata* (Lam.) J. Voigt, Gamble, *Fl. Madras* 429 (1919); *Acacia sinuata* (Lour.) Merr., Vajr., *Fl. Palghat Dist* 186 (1990); Sasidh., *Fl. Parambikulam WLS* 110 (2002).

Basionym : *Mimosa rugata* Lam., *Encycl. [J. Lamarck & al.]* 1(1): 20 (1783).

Habit : Climber
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Margins of forests
Raunkiaer's Life form: Liana (Euliana)
Distribution Frequency : Common
Phenology : February - March
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thekke Malampuzha irrigation dept. guest house hillock, 10°50'03.76"N, 76°40'56.19"E, 120m, 08 September 2017, Aswani & Maya, 456 (GVCH); Vettiyil Sandal estate, 10°51'34.30"N, 76°42'28.02"E, 145m, 10 March 2018, Aswani & Maya, 1435 (GVCH); Aatumala – Kundanmala, 10°53'31.2"N, 76°41'52.8"E, 934m, 28

February 2020, Aswani & Maya, 6196 (GVCH); Aduppukootimala, 10°49'58.80"N, 76°44'31.92"E, 295m, 16 February 2021, Aswani & Maya, 6435 (GVCH).

Senna Mill., *Gard. Dict. Abr*., ed. 4. [1280] (1754)

Key to species

1. Leaves and pods densely hirsute……..……...… *S. hirsuta*
- Leaves and pods glabrous…..……2
2. Leaflets 8 - 12 pairs….*S. auriculata*
- Leaflets 3 - 5 pairs……...….3
3. Leaves with one gland on petiole; none between leaflets ……..…..……...…..*S. occidentalis*
- Leaves with glands between leaflets; none on the petiole……..…..… *S. tora*

Senna auriculata Roxb., *Fl. Ind.* ii. 349; *Cassia auriculata* L., Hook. f., *FBI* 2: 263 (1878); Gamble, *Fl. Madras* 402 (1919); Vajr., *Fl. Palghat Dist* 180 (1990).

Habit : Shrub
Ecosystem preference : Dry deciduous forests
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Found in the catchment area of dams and in plains
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Walayar Dam, 10°50'15.57"N , 76°51'5.13"E, 190m, 09 May 2018, Aswani & Maya, 2016 (GVCH); Mayappallam, 10°48'0.36"N, 76°45'58.68"E, 114m, 10 May 2018, Aswani & Maya, 2143 (GVCH) **(Plate 27: Fig. g)**.

Senna hirsuta (L.) H.S.Irwin & Barneby, *Phytologia* 44: 499 (1979); Sasidh., *Fl. Parambikulam WLS* 108 (2002); *Cassia hirsuta* L., Hook. f., *FBI* 2: 263 (1878); Gamble, *Fl. Madras* 401 (1919); Vajr., *Fl. Palghat Dist* 181 (1990).

Habit : Shrub
Ecosystem preference : Degraded forests also in the plains
Distribution : South American
IUCN Category : Not Evaluated (NE)
Habitat : In wastelands and road sides
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Rare
Phenology : September - December
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Pallippara, 10°49'49.08"N , 76° 43 '47.28"E, 119m, 29 October 2017, Aswani & Maya, 714 (GVCH) **(Plate 27: Fig. h)**.

Senna occidentalis (L.) Link, *Handbuch [Link]* 2: 140 (1831); Sasidh., *Fl. Parambikulam WLS* 108 (2002); *Cassia occidentalis* L., Hook. f., *FBI* 2: 262 (1878); Gamble, *Fl. Madras* 401 (1919); Vajr., *Fl. Palghat Dist* 182 (1990).

Basionym : *Cassia occidentalis* L., *Sp. Pl*. 1: 377 (1753).

Habit : Shrub
Ecosystem preference : In plains
Distribution : Indo - Pacific, Holarctic and South American
IUCN Category : Least Concern (LC)
Habitat : Soil rich areas in hillocks and wastelands
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Common
Phenology : July - December
Altitude preference : Found in lower altitudes

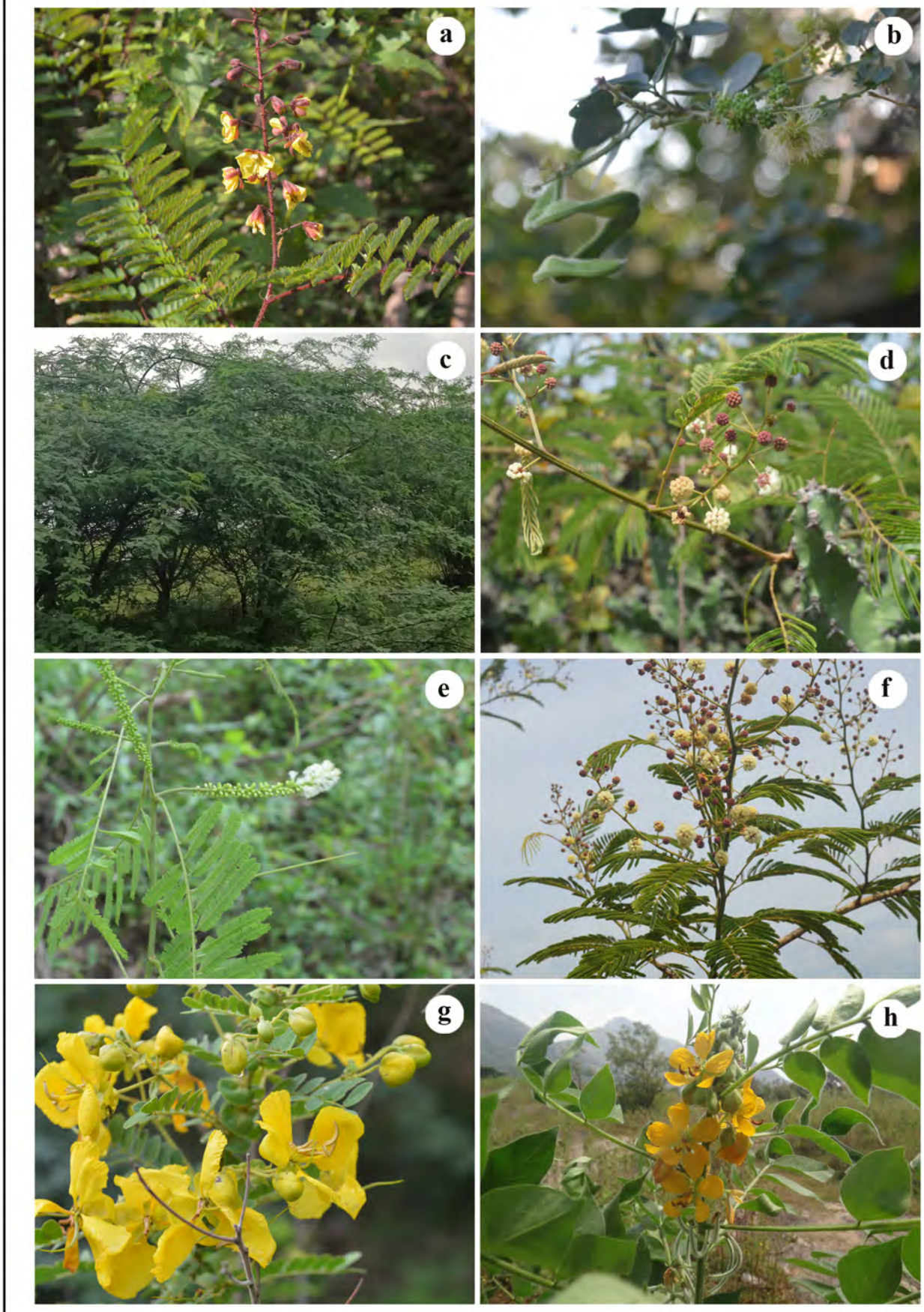

Plate 27: Fig. a. *Hultholia mimosoides* (Lam.) Gagnon & G.P.Lewis. **b.** *Pithecellobium dulce* (Roxb.) Benth. **c.** *Prosopis juliflora* (Sw.) DC. **d.** *Senegalia caesia* (L.) Maslin, Seigler & Ebinger **e.** *Senegalia chundra* (Roxb. ex Rottler) Maslin **f.** *Senegalia pennata* (L.) Maslin **g.** *Senna auriculata* Roxb. **h.** *Senna hirsuta* (L.) H.S.Irwin & Barneby.

Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Ollappallam, 10°49'52.20"N , 76°43'44.19"E, 121m, 25 November 2017, Aswani & Maya, 925 (GVCH); Way to Ayyappan Mala, 10°48'59.96"N, 76°45'22.61"E, 132m, 06 January 2018, Aswani & Maya, 1234 (GVCH); Kava, 10°49'25.18"N, 76°43'29.96"E, 115m, 06 April 2018, Aswani & Maya, 1834 (GVCH); Walayar Dam,10°50'15.57"N, 76°51'5.13"E, 190m, 09 May 2018, Aswani & Maya, 2041 (GVCH); Olappalam, 10°49'55.39"N, 76°43'39.76"E, 116m, 23 November 2019, Aswani & Maya, 5068 (GVCH) **(Plate 28: Fig. a)**.

Senna tora (L.) Roxb., *Fl. Ind. (Roxburgh)* 2: 340 (1832); Sasidh., *Fl. Parambikulam WLS* 109 (2002); *Cassia tora* L., Hook. f., *FBI* 2: 263 (1878); Gamble, *Fl. Madras* 401 (1919); Vajr., *Fl. Palghat Dist* 182 (1990).
Basionym : *Cassia tora* L., *Sp. Pl*. 1: 376 (1753).

Habit : Herb
Ecosystem preference : Moist deciduous forests, also in the plains
Distribution : South American
IUCN Category : Not Evaluated (NE)
Habitat : Soil rich areas in hillocks and wastelands
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Common
Phenology : August - December
Altitude preference : Found in lower altitudes in the plains
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Pallippara, 10°49'49.08"N, 76°43'47.28"E, 120m, 29 October 2017, Aswani & Maya, 736 (GVCH); Ayyappan Mala, 10°49'10.38"N, 76°44'28.29"E, 310m, 26 June 2018, Aswani & Maya, 2487 (GVCH); Mangalathumchalla, 10°49'04.76"N, 76°48'17.12"E, 148m, 18 September 2018, Aswani & Maya, 2735 (GVCH); Koyyamarakaadu, 10°47'41.24"N, 76°45'35.17"E, 145m, 30 November 2019, Aswani & Maya, 5314 (GVCH); Vettumadavu, 10°52'44.72"N, 76°48'8.64"E, 399m, 28 January 2020, Aswani & Maya, 5887 (GVCH) **(Plate 28: Fig. b)**. .

Vachellia Wight & Arn., *Prodr. Fl. Ind. Orient.* 1: 272 (1834)

***Vachellia nilotica* subsp. *indica* (Benth.)** Kyal. & Boatwr., *Bot. J. Linn. Soc.* 172(4): 515 (2013); *Acacia nilotica* (L.) Willd. ex Del. ssp. *indica* (Benth.) Brenan, Vajr., *Fl. Palghat Dist* 185 (1990); *Acacia arabica* Hook.f., *FBI* 2: 293 (1878); Gamble, *Fl. Madras* 425 (1919); *Vachellia nilotica* (L.) P. J. H. Hurter & Mabb., *Mabberley's Pl.-Book* 1021 (2008).

Basionym: *Acacia arabica* var. *indica* Benth., *London J. Bot.* 1: 500 (1842).

Habit : Tree
Ecosystem preference : Moist deciduous forests and in plains
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Often planted in plains
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : July - October
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Walayar Dam, 10°50'24.58"N , 76°51'01.52"E, 199m, 09 May 2018, Aswani & Maya, 2020 (GVCH); Ayyappan Mala, 10°49'07.40"N, 76°45'32.38"E, 170m, 26 June 2018, Aswani & Maya, 2453 (GVCH) **(Plate 28: Fig. c)**.

Xylia Benth., *J. Bot. (Hooker)* 4: 417 (1842)

Xylia xylocarpa (Roxb.) W.Theob., *Burmah [Mason], ed.* 3. 2: 541 (1883); Gamble, *Fl. Madras* 417 (1919); Vajr., *Fl. Palghat Dist* 190 (1990); Sasidh., *Fl. Parambikulam WLS* 113 (2002); *Xylia dolabriformis* Benth, Hook. f., *FBI* 2: 286 (1878).

Basionym: *Mimosa xylocarpa* Roxb., *Pl. Coron. i.* 68. t. 100
Habit : Tree
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Hill slopes
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : February - December
Altitude preference : Found in lower altitudes in forest outskirts
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kosavanidukku-Kaduvachal, 10°50'04.96" N, 76°40'48.72"E, 116m, 16 July 2017, Aswani & Maya, 267 (GVCH); Kozhimala, 10°50'01.89"N, 76°42'58.61"E, 105m, 09 November 2017, Aswani & Maya, 756 (GVCH); Kottamutti waterfalls, 10°49'42.94"N, 76°46'47.87"E, 206m, 23 September 2018, Aswani & Maya, 2896 (GVCH); Aduppukootimala, 10°49'38.80" N, 76°44'16.08"E, 140m, 12 January 2019, Aswani & Maya, 3648 (GVCH); Mathappumala, 10°51'9.36"N, 76°49'55.56"E, 230m, 07 January 2020, Aswani & Maya, 5578 (GVCH) **(Plate 28: Fig. d)**.

CERCIDOIDEAE

Key to genera

Plants are climbers with tendrils; calyx lobed……..……..……. *Phanera*
Plants are trees; calyx spathaceous……..……. *Bauhinia*

Bauhinia L., *Sp. Pl.* 1: 374 (1753)

Key to species

Fertile stamens 10; staminodes absent; pods falcate or twisted, tapering at base……....…. *B. racemosa*
Fertile stamens 3 - 4, staminodes present; pods flat, acute at both ends..... *B. purpurea*

Bauhinia purpurea L., *Sp. Pl.* 1: 375 (1753); Hook. f., *FBI* 2: 284 (1878); Gamble, *Fl. Madras* 407 (1919); Vajr., *Fl. Palghat Dist* 179 (1990).

Habit : Tree
Ecosystem preference : Forest margins and plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found along roadsides and other wastelands
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : September - December
Altitude preference : Found in lower altitudes in plains and other wastelands
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Ahalia Campus, 10°47'43.08"N, 76°50'5.43"E, 150m, 121m, 24 September 2020, Aswani & Maya, 6298 (GVCH); Akathethara – Malampuzha road, 10°49'34.77"N, 76°38'8.58"E, 100m, 28 February 2021, Aswani & Maya, 6522 (GVCH) **(Plate 28: Fig. e)**.

Bauhinia racemosa Lam., *Encycl. [J. Lamarck & al.]* 1(2): 390 (1785); Hook. F., *FBI* 2: 276 (1878); Gamble, *Fl. Madras* 406 (1919); Vajr., *Fl. Palghat Dist* 179 (1990).

Habit : Tree
Ecosystem preference : Moist deciduous forests
Distribution : Indo – Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Near open forests
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : March – December
Altitude preference : Found commonly at lower altitudes in forest tracks.
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Ayyappan Mala, 10°49'10.78"N , 76°44'14.15"E, 381m, 26 June 2018, Aswani & Maya, 2469 (GVCH); Attippara – Akamalavaram, 10°52'06.24"N, 76°41'53.16"E, 194m, 18 December 2018, Aswani & Maya, 3484 (GVCH); Parachaathy, 10°50'38.76"N, 76°43'51.96"E, 147m, 02 January 2019, Aswani & Maya, 3544 (GVCH); Mannukunnu – Akathethara, 10°52'5.50"N, 76°38'30.27"E, 181m, 09 July 2019, Aswani & Maya, 4208 (GVCH); Anayappanchalla, 10°48'25.92"N, 76°48'35.19"E, 157m, 30 November 2019, Aswani & Maya, 5133 (GVCH); Jamanthimala, 10°52'20.64"N, 76°46'57.00"E, 864m, 09 January 2020, Aswani & Maya, 5733 (GVCH) **(Plate 28: Fig. f)**.

Phanera Lour., *Fl. Cochinch.* 1: 37 (1790)

Phanera scandens (L.) Lour. Ex Raf., *Sylva Tellur.* 122 (1838); *Bauhinia anguina* Roxb., Hook. F., *FBI* 2: 284 (1878); Gamble, *Fl. Madras* 408 (1919).

Basionym : *Bauhinia scandens* L., *Sp. Pl.* 1: 374 (1753)

Habit : Climber
Ecosystem preference : Moist deciduous forests
Distribution : Indo – Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Climber in the forest tracks
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Occasional
Phenology : September – March
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kanyarmuttu – Aduppukootimala, 10°50'42.72"N, 76°44'36.24''E, 713m, 12 January 2019, Aswani & Maya, 3655 (GVCH); Chacolas, 10°51'22.68''N, 76°44'41.28"E, 227m, 02 August 2019, Aswani & Maya, 4519 (GVCH) **(Plate 28: Fig. g)**.

DETARIOIDEAE

Key to genera

Leaflets large; flowers yellow- orange in dense sessile paniculate corymbs..…. ……..…….*Saraca*
Leaflets smaller; flowers yellow with reddish pink dots in lax terminal racemes……..….. *Tamarindus*

Saraca L., *Mant. Pl.* 13 (1767)

Saraca asoca (Roxb.) W.J.de Wilde, *Blumea* 15(2): 393 (1968); Vajr., *Fl. Palghat Dist* 184 (1990); *Saraca indica* Bedd. Hook. f., *FBI* 2: 271 (1878); Gamble, *Fl. Madras* 409 (1919).

Basionym : *Jonesia asoca* Roxb., *Asiat. Res.* 4: 355 (1795).

Habit : Tree
Ecosystem preference : In the plains and forest margins
Distribution : Indo - Pacific
IUCN Category : Vulnerable (VU)
Habitat : Often planted in forest margins
Raunkiaer's Life form : Phanerophyte

Distribution Frequency : Rare
Phenology : February - August
Altitude preference : Found in lower altitudes in all soils
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Mannukunnu, 10°52'5.50"N, 76°38'30.27"E, 181m, 09 July 2019, Aswani & Maya, 4254 (GVCH) **(Plate 28: Fig. h)**.

Tamarindus Tourn. ex L., *Sp. Pl.* 1: 34 (1753)

Tamarindus indica L., *Sp. Pl.* 1: 34 (1753); Hook. f., *FBI* 2: 273 (1878); Gamble, *Fl. Madras* 409 (1919); Vajr., *Fl. Palghat Dist* 184 (1990); Sasidh., *Fl. Parambikulam WLS* 109 (2002).

Habit : Tree
Ecosystem preference : In plains
Distribution : African
IUCN Category : Least Concern (LC)
Habitat : Found in homesteads
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : September - April
Altitude preference : Found in lower altitudes in plains and rarely as escape to forests
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Poozhikunnu, 10°51'20.44"N, 76°43'38.28"E, 118m, 09 November 2017, Aswani & Maya, 890 (GVCH); Chemanamkadu, 10°48'46.51"N, 76°44'41.47"E, 154m, 06 January 2018, Aswani & Maya, 1152 (GVCH); Edamala, 10°50'11.04"N, 76°38'57.48"E, 114m, 16 October 2019, Aswani & Maya, 4714 (GVCH).

PAPILIONOIDEAE

Key to genera

1. Anthers dimorphic……..…...…2
- Anthers uniform……6
2. Climbing plants……..……....3
- Erect plants, rarely prostrate….....4
3. Slender twining herbs; flowers very small; stamens monadelphous; pods covered with fine needle-like irritant bristles…..…..…. *Teramnus*
- Large twining herbs or shrubs; flowers large; stamens diadelphous; pods glabrous except for few acicular hairs……..…*Mucuna*
4. Leaves 2 - 4 foliolate…… *Zornia*
- Leaves unifoliate or trifoliate or penta or multifoliate……..…….5
5. Fruits compressed; jointed…… ……..…….*Stylosanthes*
- Fruits turgid or inflated never compressed or jointed…….. ……..…...*Crotalaria*
6. Leaves paripinnate; stamens 9…...…….…… *Abrus*
- Leaves imparipinnate; stamens usually 10…….…….7
7. Anthers appendaged…. *Indigofera*
- Anthers without any appendages…….……..…….……8
8. Pods jointed……..……..9
- Pods not jointed…….....……..…..19
9. Calyx glumaceous….. ..*Alysicarpus*
- Calyx non - glumaceous…..……10
10. Pods jointed and folded within the calyx……..……..…. *Uraria*
- Pods not folded within the calyx…...…….……11
11. Pods inflated; dehiscent…..….. ……..….*Pycnospora*
- Pods compressed; indehiscent or very rarely dehiscent…..……..…12
12. Indehiscent fruits; distinctly jointed…….……...……...13
- Dehiscent fruits, not jointed……..…..…. *Pseudarthria*
13. Flowers in dense axillary umbels; pods curved……. *Dendrolobium*
- Flowers in elongate racemes; Pods curved or straight.……....…14

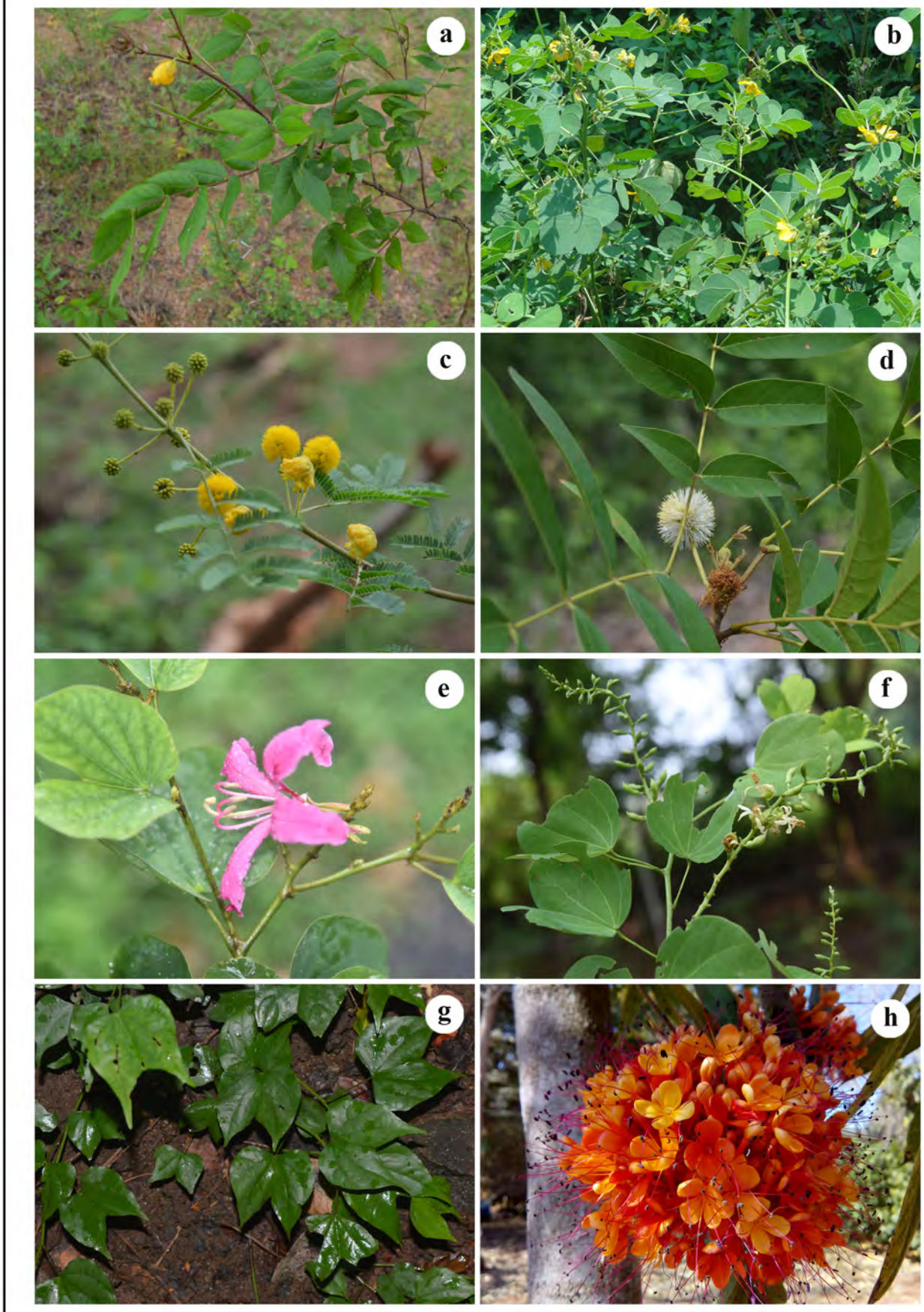

Plate 28: Fig. a. *Senna occidentalis* (L.) Link **b.** *Senna tora* (L.) Roxb. **c.** *Vachellia nilotica* subsp. *indica* (Benth.) Kyal. & Boatwr. **d.** *Xylia xylocarpa* (Roxb.) W.Theob. **e.** *Bauhinia purpurea* L. **f.** *Bauhinia racemosa* Lam. **g.** *Phanera scandens* (L.) Lour. ex Raf. **h.** *Saraca asoca* (Roxb.) W.J.de Wilde.

14. Flowers enclosed in conspicuous and persistent foliaceous bracts……..……..….*Phyllodium*
- Flowers not enclosed within bracts; bracts usually non - foliaceous and dehiscent……..…...…..15
15. Prostrate herbs or very rarely erect; root stock generally creeping…...16
- Erect herbs or shrubs……....17
16. Calyx lobes shorter than tube……..…. *Desmodium*
- Calyx lobes longer than tube……....…....*Grona*
17. Leaves unifoliate; pods crenate or constricted…..……..……18
- Leaves trifoliate; pods linear and flat……..……..……. *Ohwia*
18. Calyx lobes triangular; tomentose without; stem hairy when young, glabrous when old…... *Pleurolobus*
- Calyx lobes ovate; stem tomentose hairy…….……..…… *Polhillides*
19. Style straight.……...……..*Rothia*
- Style curved towards standard petal…..……..……..20
20. Leaves usually imparipinnate; leaflets generally opposite and stipulate; intrastaminal disk present……...…..…21
- Leaves paripinnate to imparipinnate; leaflets alternate to opposite with or without stipels; intrastaminal disc absent…..……36
21. Lateral leaflets usually symmetric or very slightly asymmetrical..…22
- Lateral leaflets usually asymmetrical…..……..……24
22. Leaflets parallel nerved…...…… ……*Tephrosia*
- Leaflets reticulate nerved…..…...23
23. Climbers; pods with wing……. ……*Brachypterum*
- Trees; pods without any wings……...…... *Pongamia*
24. Calyx and leaflets spotted with yellow coloured glands…...……25
- Calyx and leaflets e - glandular……..…26
25. Wing petal adherent to the keel; pods turgid……..…….. *Flemingia*
- Wing petals free without any adherence to the keel; pods compressed and depressed between seeds…..……..….. *Cajanus*
26. Style bearded below stigma; standard or eel petals usually appendaged……..……..……...27
- Style without hairs below stigma; Standard or keel petals without appendages……..…..……...29
27. Standard petals without appendages……..…. *Dysolobium*
- Standard petals appendaged…….28
28. Stigma oblique…….……..… *Vigna*
- Stigma terminal…….…… *Dolichos*
29. Woody lianas or trees……..…….30
- Climbers……...…36
30. Plants with prickles…….. *Erythrina*
- Plants without prickles……...…31
31. Flowers large, red in dense axillary or terminal racemes…...…….. *Butea*
- Flowers small, creamy brown in large panicles…...…... *Spatholobus*
32. Leaves odd pinnate to 3 - 7 foliolate…..……..…... *Clitoria*
- Leaves trifoliate……..…….33
33. Stamens diadelphous……..…..34
- Stamens monadelphous……....35
34. Standard petals appendaged; pods coarsely pubescent……...…….. ……..…*Calopogonium*
- Standard petals not appendaged; pods slightly pubescent ……...…..…. *Centrosema*
35. Branches rooting at nodes; style curved, filiform; seeds sub orbicular……..…. *Neustanthus*
- Branches without any roots arising from nodes; style incurved; seeds ovate compressed…….... *Canavalia*
36. Trailing herbs; flowers enclosed in conspicuous ciliate bracts……..…. ……..…..*Geissaspes*

- Erect herbs, shrubs or trees…..….37
37. Stamens arranged in two bundles of 5 stamens each…...…….…38
- Stamens monadelphous or diadelphous but never in bundles of 5 stamens each…….…..…..39
38. Pods twisted and enclosed in calyx; calyx 2 - lipped and bristly……. ……..…*Smithia*
- Pods straight, exerted from calyx; calyx without bristles…...…… ……..*Aeschynomene*
39. Leaves paripinnate; leaflets small, numerous……..... *Sesbania*
- Leaves imparipinnate……..….40
40. Ovules numerous……..... *Gliricidia*
- Ovules 1 - 4……..……41
41. Flowers small; whitish pink or pale blue; pods flat, oblong to linear…….…..… *Dalbergia*
- Flowers large, yellow; pods sub - orbicular…..…….. *Pterocarpus*

Abrus Adans., *Fam. Pl. (Adanson)* 2: 327 (1763)

Abrus precatorius L., *Syst. Nat.*, ed. 12. 2: 472 (1767); Hook. f., *FBI* 2:175 (1876); Gamble, *Fl. Madras* 349 (1918); Vajr., *Fl. Palghat Dist* 145 (1990); Sasidh., *Fl. Parambikulam WLS* 83 (2002).

Habit : Climber
Ecosystem preference : Moist deciduous forests and in plains
Distribution : Indo Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : A common climber in forest margins and in biofences
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Common
Phenology : October - May
Altitude preference : Found commonly in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kosavanidukku-Kaduvachal, 10°50'26.38"N, 76°40'30.88"E, 105m, 16 July 2017, Aswani & Maya, 310(GVCH); Way to Ayyappan Mala, 10°48'59.96"N, 76°45'22.61"E, 132m, 06 January 2018, Aswani & Maya, 1210(GVCH); Kottamutti waterfalls, 10°49'42.94"N, 76°46'47.87"E, 206m, 23 September 2018, Aswani & Maya, 2912 (GVCH); Kochuthodu – Akamalavaram, 10°51'55.44"N, 76°42'00.11"E, 165m, 14 May 2019, Aswani & Maya, 3955 (GVCH); Olappalam, 10°49'52.20"N, 76°43'44.19"E, 121m, 23 November 2019, Aswani & Maya, 5087 (GVCH); Malampuzha Vanadurga temple, 10°49'48.81"N, 76°39'58.80"E, 99m, 03 August 2020, Aswani & Maya, 6215 (GVCH) **(Plate 29: Fig. a)**.

Aeschynomene L., *Sp. Pl*. 2: 713 (1753)

Key to species

Stem glandular……..…. *A. americana*
Stem non - glandular or glabrous or hispid……..….. *A. indica*

Aeschynomene americana L., *Sp. Pl.* 2: 713 (1753); C.N. Mohanan, *Fl. Quilon Dist* 136 (1984); Sanjappa, *Legumes India* 75 (1992); Sasidh., *Fl. Shenduruny WLS* 87 (1997); Anil Kumar *et al*., *Fl. Pathanamthitta* 155 (2005); E.Vajr.& K.A.A. Kabeer in G.V.S. Murthy & V.J. Nair (eds.), *Fl. Kerala* 2: 7 (2016); Sunil, *Fl. Pl. Diver. Ernakulam Dist* 120 (2016); C. Pramod & A.K. Pradeep, *Fl. Madayippara* 270 (2020).

Habit : Herb
Ecosystem preference : Wet regions in plains
Distribution : Indo Pacific and South American
IUCN Category : Not Evaluated (NE)
Habitat : At banks of canals and near agricultural fields
Raunkiaer's Life form : Therophyte

Distribution Frequency : Occasional
Phenology : September - December
Altitude preference : Found commonly in lower altitudes near farms
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Anayappanchalla, 10°48'25.92"N, 76°48'35.19"E, 157m, 30 November 2019, Aswani & Maya, 5172 (GVCH); Ahalya campus, 10°47'37.00"N, 76°49'33.40"E, 156m, 24 September 2020, Aswani & Maya, 6303 (GVCH).

Aeschynomene indica L., *Sp. Pl.* 2: 713 (1753); Hook. f., *FBI* 2: 151 (1876); Gamble, *Fl. Madras* 331 (1918); Vajr., *Fl. Palghat Dist* 145 (1990).

Habit : Herb
Ecosystem preference : Moist deciduous forests and plains
Distribution : Indo Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Waterlogged regions in hillocks and near paddy fields
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : August - December
Altitude preference : Found in lower altitudes in wet regions
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Cheranpara, 10°49'29.62"N , 76°40'38.63"E, 87m, 27 June 2017, Aswani & Maya, 178 (GVCH); Kava – Malampuzha, 10°49'25.18"N, 76°43'29.96"E, 115m, 06 April 2018, Aswani & Maya, 1857 (GVCH); Ayyappan Mala, 10°49'07.19"N, 76°44'50.28"E, 130m, 26 June 2018, Aswani & Maya, 2484 (GVCH); Kongampadam, 10°48'40.59"N, 76°46'51.94"E, 128m, 06 September 2019, Aswani & Maya, 4583 (GVCH) **(Plate 29: Fig. b)**.

Alysicarpus Neck. ex Desv., *J. Bot. Agric.* 1(2): 120 (1813), nom. cons.

Key to species

1. Leaves dissimilar; upper trifoliate, lower unifoliate..…*A. heterophyllus*
- Leaves similar, all unifoliate..……2
2. Calyx much longer than first joint of the pod……..…….3
- Calyx shorter than first joint of the pod…..……..……...4
3. Pods transversely ribbed ……..…….. *A. glumaceus*
- Pods without any transverse ribs…..……...*A. bupleurifolius*
4. Joints of pod subglobose; stem with short bristly hairs…….. *A. monilifer*
- Joints of pod tetragonous; stem glabrescent……..…..….*A. vaginalis*

Alysicarpus bupleurifolius (L.) DC., *Prodr. [A. P. de Candolle]* 2: 352 (1825); Hook. f., *FBI* 2: 158 (1876); Gamble, *Fl. Madras* 338 (1918); Vajr., *Fl. Palghat Dist* 146 (1990); Sasidh., *Fl. Parambikulam WLS* 84 (2002).

Basionym: *Hedysarum bupleurifolium* L., *Sp. Pl*. 2: 745 (1753).

Habit : Herb
Ecosystem preference : Moist deciduous forests and open grasslands
Distribution : Indo - Pacific and Australian
IUCN Category : Least Concern (LC)
Habitat : Found in exposed rocks in forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : September - January
Altitude preference : Found in lower altitudes in dry places
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Walayar Dam, 10°50'15.57"N , 76°51'5.13"E, 190m, 07 August 2018, Aswani & Maya, 2640 (GVCH); Aashramam – Akamalavaram, 10°51'23.40"N,

76°43'34.72"E, 116m, 02 August 2019, Aswani & Maya, 4414 (GVCH) **(Plate 29: Fig. c)**.

Alysicarpus glumaceus (Vahl) DC., *Prodr. [A. P. de Candolle]* 2: 353 (1825); *Alysicarpus rugosus* (Willd.) DC., Hook. f., *FBI* 2:159 (18760; Gamble, *Fl. Madras* 338 (1918); Vajr., *Fl. Palghat Dist* 146 (1990).

Basionym: *Hedysarum glumaceum* Vahl, *Symb. Bot.* (Vahl) 2: 106 (1791).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Open grassy regions in forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : September - December
Altitude preference : Found in open forests in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Akamalavaram - Moochikadavu, 10°52'7.32"N, 76° 42 '28.44"E, 245m, 30 November 2018, Aswani & Maya, 3237 (GVCH) **(Plate 29: Fig. d)**.

Alysicarpus heterophyllus (Baker) Jafri & Ali, *Biologia (Lahore)* 12(2): 33 (1966); Sasidh., *Fl. Parambikulam WLS* 84 (2002); *Alysicarpus vaginalis* (L.) DC. var. *heterophyllus* Benth. ex Baker, Hook. f., *FBI* 2: 158 (1876).
Basionym: *Alysicarpus vaginalis* var. *heterophyllus* Baker, *FBI* [Hook.f.] 2(4): 158 (1876).

Habit : Herb
Ecosystem preference : Moist deciduous forests and plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Open grassy regions and other plains
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : October - January
Altitude preference : Found commonly in lower altitudes near planes and wastelands
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Pallippara, 10°49'49.08"N, 76°43'47.28"E, 120m, 29 October 2017, Aswani & Maya, 699 (GVCH);Kozhimala, 10°50'01.89"N, 76°42'58.61"E, 105m, 09 November 2017, Aswani & Maya, 831 (GVCH); Cheekuzhi – Edamala, 10°50'8.57"N, 76°38'57.48"E, 104m, 16 October 2019, Aswani & Maya, 4769 (GVCH); Koomachimala, 10°49'44.76"N, 76°40'34.59"E, 102m, 23 November 2019, Aswani & Maya, 4890 (GVCH) **(Plate 29: Fig. e)**.

Alysicarpus monilifer (L.) DC., *Prodr. [A. P. de Candolle]* 2: 353 (1825); Hook. f., *FBI* 2: 157 (1876); Gamble, *Fl. Madras* 338 (1918).

Basionym: *Hedysarum moniliferum* L., *Mant. Pl*. 102 (1767).

Habit : Herb
Ecosystem preference : Moist deciduous forests and plains
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Wet soils in hillocks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : November - January
Altitude preference : Found in lower altitudes in plains
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Chemanamkadu, 10°48'44.68"N, 76°44'51.94"E, 119m, 06 January 2018, Aswani & Maya, 1157 (GVCH); Cheekuzhi – Edamala, 10°50'8.57"N, 76°38'57.48"E, 104m, 16 October 2019, Aswani & Maya, 4752 (GVCH);

Anayappanchalla, 10°48'25.92"N, 76°48'35.19"E, 157m, 30 November 2019, Aswani & Maya, 5113 (GVCH) **(Plate 29: Fig. f)**.

Alysicarpus vaginalis (L.) DC., *Prodr. [A. P. de Candolle]* 2: 353 (1825); Hook. f., *FBI* 2: 158 (1876); Gamble, *Fl. Madras* 338 (1918); Vajr., *Fl. Palghat Dist* 146 (1990); Sasidh., *Fl. Parambikulam WLS* 84 (2002).

Basionym: *Hedysarum vaginale* L., *Sp. Pl.* 2: 746 (1753).

Habit : Herb
Ecosystem preference : Deciduous forests and in plains
Distribution : Indo Pacific and African
IUCN Category : Not Evaluated
Habitat : Road sides and outer regions of hillocks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : September - January
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Olappalam, 10°49'52.20"N, 76°43'44.19"E, 121m, 25 November 2017, Aswani & Maya, 922 (GVCH); Malampuzha Dam – Kava, 10°49'25.18"N, 76°43'29.96"E, 115m, 06 April 2018, Aswani & Maya, 1827 (GVCH); Walayar dam, 10°50'15.57"N, 76°51'5.13"E, 190m, Aswani & Maya, 1988 (GVCH); Kongampaadam, 10°48'36.72" N, 76°46'51.96"E, 151m,06 September 2019, Aswani & Maya, 4648 (GVCH); Ahalia Campus, 10°47'33.27"N, 76° 49 '53.34"E, 167m, 24 September 2020, Aswani & Maya, 6292 (GVCH) **(Plate 29: Fig. g)**.

Brachypterum (Wight & Arn.) Benth., *Commentat. Legum. Gen.* 37 (1837), nom. cons.

Brachypterum scandens (Roxb.) Wight & Arn. ex Miq., *Fl. Ned. Ind.* 1(1): 138 (1855).; *Derris scandens* (Roxb.) Benth., Hook. f., *FBI* 2: 240 (1878); Gamble, *Fl. Madras* 387 (1918);Vajr., *Fl. Palghat Dist* 155 (1990); Sasidh., *Fl. Parambikulam WLS* 90 (2002).
Basionym: *Dalbergia scandens* Roxb., *Pl. Coromandel* 2(4): 49, t. 192 (1805).

Habit : Climber
Ecosystem preference : Moist deciduous forests
Distribution: Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat: Margins of forests and in deciduous forests
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Common
Phenology : March - April
Altitude preference: Lower and medium altitudes in forest margins along roadsides
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Aduppukootimala, 10°49'59.16"N, 76°44'31.56"E, 297m, 12 January 2019, Aswani & Maya, 3657 (GVCH); Parachaathy, 10°50'03.12"N, 76°44'33.36"E, 330m, 12 January 2019, Aswani & Maya, 3748 (GVCH); Pettikallu, 10°52'34.26"N, 76°42'40.48"E, 365m, 27 February 2020, Aswani & Maya, 6107 (GVCH).

Butea Roxb. ex Willd., *Sp. Pl.,* ed. 4 [Willdenow] 3(2): 917 (1802), nom. cons.

Butea monosperma Kuntze, *Revis. Gen. Pl.* 1: 202 (1891); Vajr., *Fl. Palghat Dist* 147 (1990); Sasidh., *Fl. Parambikulam WLS* 84 (2002); *Butea frondosa* Koenig ex Roxb., Hook. f., *FBI* 2: 194 (1876); Gamble, *Fl. Madras* 357 (1918).

Habit : Tree

Ecosystem preference : Moist deciduous forests
Distribution: Indo - Pacific and Holarctic
IUCN Category : Least Concern (LC)
Habitat: Margins of forests and in deciduous forests
Raunkiaer's Life form: Phanerophyte
Distribution Frequency : Occasional
Phenology: March - April
Altitude preference: Lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kozhimala, 10°50'04.17"N, 76°43'23.82"E, 207m, 09 November 2017, Aswani & Maya, 758 (GVCH); Ayyakulam – Pudussery, 10°48'10.29"N, 76°44'39.61"E, 116m, 06 January 2018, Aswani & Maya, 1192 (GVCH); Kochuthodu – Akamalavaram, 10°51'58.32"N, 76°42'22.32"E, 177m, 18 December 2018, Aswani & Maya, 3355 (GVCH); Jamanthimala, 10°51'53.64"N, 76°47'16.80"E, 586m, 23 June 2019, Aswani & Maya, 3999 (GVCH); Koyyamarakaadu, 10°47'41.24"N, 76°45'35.17"E, 145m, 30 November 2019, Aswani & Maya, 5334 (GVCH); Pettikallu, 10°52'28.20"N, 76°42'38.52"E, 346m, 27 February 2020, Aswani & Maya, 6096 (GVCH) **(Plate 29: Fig. h)**.

Cajanus Adans., *Fam. Pl. (Adanson)* 2: 326, 529 (1763), nom. et orth. cons.

Key to species

1. Plants climbers……..…….2
- Plants - erect shrubs……..…..3
2. Leaves digitately trifoliate; style glabrous……..…… *C. rugosus*
- Leaves pinnately trifoliate; style filiform……. *C. scarabaeoides*
3. Stipels present; racemes many flowered; style glabrous…..*C. cajan*
- Stipels absent; racemes 1- 2 flowered; style pubescent at base……..…... *C. lineatus*

Cajanus cajan (L.) Huth, *Helios* 11: 133 (1893);Vajr., *Fl. Palghat Dist* 177 (1990); *Cajanus indicus* Spreng., Hook. f., *FBI* 2: 217 (1876); Gamble, *Fl. Madras* 369 (1918).

Basionym: *Cytisus cajan* L., *Sp. Pl*. 2: 739 (1753).

Habit : Shrub
Ecosystem preference : In plains
Distribution : Indo - Pacific, Holarctic, African, South American and Australian
IUCN Category : Not Evaluated (NE)
Habitat : Cultivated
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : December - March
Altitude preference : Cultivated common in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kadukkamkunnam, 10°48'48.76"N, 76°39'48.98"E, 107m, 23 March 2023, Aswani & Maya, 6567 (GVCH).

Cajanus lineatus (Wight & Arn.) Maesen, *Agric. Univ. Wageningen Pap.* 85(4): 143 (1986); Sasidh., *Fl. Parambikulam WLS* 85 (2002); *Atylosia lineata* Wight & Arn., Hook. f., *FBI* 2: 213 (1876); Gamble, *Fl. Madras* 368 (1918); Vajr., *Fl. Palghat Dist* 147 (1990).

Basionym: *Atylosia lineata* Wight & Arn., *Prodr. Fl. Ind. Orient. [Wight & Arnott]* 1: 258 (1834).

Habit : Shrub
Ecosystem preference : Grasslands
Distribution : Indo - Pacific
Endemism : Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Open grasslands
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Rare
Phenology : June - January

Plate 29: Fig. a. *Abrus precatorius* L. **b.** *Aeschynomene indica* L. **c.** *Alysicarpus bupleurifolius* (L.) DC. **d.** *Alysicarpus glumaceus* (Vahl) DC. **e.** *Alysicarpus heterophyllus* (Baker) Jafri & Ali **f.** *Alysicarpus monilifer* (L.) DC. **g.** *Alysicarpus vaginalis* (L.) DC **h.** *Butea monosperma* Kuntze.

Altitude preference : Found in open grasslands in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Aatumala, 10°53'57.53"N, 76°41'35.06"E, 1066m, 28 February 2021, Aswani & Maya, 6166 (GVCH) **(Plate 30: Fig. a)**.

Cajanus rugosus (Wight & Arn.) Maesen, *Agric. Univ. Wageningen Pap.* 85(4): 179 (1986); *Atylosia rugosa* Wight & Arn., Hook. f., *FBI* 2: 215 (1876); Gamble, *Fl. Madras* 369 (1918).

Basionym: *Atylosia rugosa* Wight & Arn., *Prodr. Fl. Ind. Orient.* [Wight & Arnott] 1: 257 (1834).

Habit : Climber
Ecosystem preference : Grasslands
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Open grasslands
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Occasional
Phenology : November - December
Altitude preference : Found in low altitude open grassy regions
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kozhimala, 10°50'04.17"N, 76°43'23.82"E, 207m, 09 November 2017, Aswani & Maya, 809 (GVCH); Thekke Malampuzha, 10°50'02.52"N, 76°40'58.49"E, 120m, 18 May 2018, Aswani & Maya, 2259 (GVCH); Ayyappan Mala, 10°49'07.40"N, 76°45'32.38"E, 170m, 26 June 2018, Aswani & Maya, 2534 (GVCH); Koomachimala, 10°49'45.32"N, 76°40'22.02"E, 228m, 23 November 2019, Aswani & Maya, 4894 (GVCH) **(Plate 30: Fig. b)**.

Cajanus scarabaeoides (L.) Thouars, *Dictionnaire des Sciences Naturelle* (1817); *Atylosia scarabaeoides* (L.) Benth., Hook. f., *FBI* 2: 215 (1876); Gamble, *Fl. Madras* 369 (1918).

Basionym: *Dolichos scarabaeoides* L., *Sp. Pl.* 2: 726 (1753).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Therophyte
IUCN Category : Least Concern (LC)
Habitat : Open rocky surfaces
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : September - January
Altitude preference : Found commonly in open rocky surfaces
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Walayar Dam, 10°50'24.58"N, 76°51'01.52"E, 199m, 09 May 2018, Aswani & Maya, 2009 (GVCH); Anayappanchalla, 10°48'25.92"N, 76°48'35.19"E, 157m, 18 September 2018, Aswani & Maya, 2811 (GVCH); Ayyappan Mala, 10°49'07.40"N , 76°45'32.38"E, 170m, 07 March 2019, Aswani & Maya, 3789 (GVCH); Kongampaadam, 10°48'36.72"N, 76°46'51.96"E, 151m, Aswani & Maya, 4610 (GVCH); Anayappanchalla, 10°48'25.92"N, 76°48'35.19"E, 157m, Aswani & Maya, 5116 (GVCH); Edasherikunnu, 10°52'42.6"N, 76°46'53.32" E, 645m, Aswani & Maya, 5952 (GVCH) **(Plate 30: Fig. c)**.

Calopogonium Desv., *Ann. Sci. Nat. (Paris)* 9: 423 (1826)

Calopogonium mucunoides Desv., *Ann. Sci. Nat. (Paris)* 9: 423 (1826); Vajr., *Fl. Palghat Dist* 178 (1990).

Habit : Climber
Ecosystem preference : Moist deciduous forests and in plains
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : Near agricultural estates
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Occasional

Phenology : August - December
Altitude preference : Found in rubber and other plantations in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Valiya Eri, 10°48'53.76"N, 76°44'59.07"E, 124m, 06 January 2018, Aswani & Maya, 1306 (GVCH); Pallakaadu – Akathethara, 10°51'30.96"N, 76°37'39.00"E, 151m, 09 October 2018, Aswani & Maya, 3069 (GVCH); Attippara – Akamalavaram, 10°52'07.75"N, 76°41'51.98"E, 203m, 18 December 2018, Aswani & Maya, 3479 (GVCH) **(Plate 30: Fig. d)**.

Canavalia DC., *Mém. Légum.* ix. 375; *Prod.* ii. 403 (1825)

Key to species

1. Apex of leaflets acute - acuminate…..……...… *C. gladiata*
- Apex of leaves blunt……..……2
2. Branches densely pubescent; pods glabrescent…..…….. *C. mollis*
- Branches glabrous or sparsely pubescent; pods pubescent …….. *C. africana*

Canavalia africana Dunn in *Bull. Misc. Inform. Kew* 1922: 135 (1922).; *Canavalia ferruginea* Piper in *Bull. Misc. Inform. Kew* 1922: 141 (1922).

Habit : Climber
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Near water sources
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Occasional
Phenology : November - December
Altitude preference : Found in lower altitudes near estates
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Pazhampullikaavu - Akathethara, 10°50'25.25"N, 76°38'05.83"E, 92m, 16 October 2018, Aswani & Maya, 3222 (GVCH); Mayappalam, 10°48'08.64"N, 76°46'34.68"E, 127m, 06 September 2019, Aswani & Maya, 4688 (GVCH) **(Plate 30: Fig. e)**.

Canavalia gladiata (Jacq.) DC., *Prodr. [A. P. de Candolle]* 2: 404 (1825); Vajr., *Fl. Palghat Dist* 148 (1990); *Canavalia ensiformis* Baker, Hook.f., FBI 2:195 (1876); Gamble, *Fl. Madras* 359 (1918).

Basionym: *Dolichos gladiatus* Jacq., *Icon. Pl. Rar. [Jacquin]* 3(1): t. 560 (1788).

Habit : Climber
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Found as escape to wild
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : July - December
Altitude preference : Found growing in lower altitudes as an escape to wild
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kochuthodu - Akamalavaram, 10°51'55.44"N, 76°42'00.11"E, 165m, 18 December 2018, Aswani & Maya, 3392 (GVCH) **(Plate 30: Fig. f)**.

Canavalia mollis Wall. ex Wight & Arn., *Prodr. Fl. Ind. Orient.* 1: 253 (1834); *Canavalia ensiformis* DC. var. *mollis* (Wight & Arn.) Baker, Hook. f., *FBI* 2: 196 (1876); *Canavalia virosa* (Roxb.) Wight & Arn. var. *mollis* (Wight & Arn.) Gamble, *Fl. Madras* 359 (1918).

Habit : Climber
Ecosystem preference : Deciduous forests and in plains
Distribution : Indo - Pacific

IUCN Category : Not Evaluated (NE)
Habitat : Found in hillocks and in the margins of deciduous forests
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Occasional
Phenology : February - April
Altitude preference : Found in lower altitudes in rocky hill tracks
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Karadikunnu, 10°50'20.20"N , 76°49'48.92"E, 202m, 30 December 2017, Aswani & Maya, 1102 (GVCH); Anayappanchalla, 10°48'25.92"N, 76°48'35.19"E, 157m, 30 November 2019, Aswani & Maya, 5135 (GVCH) **(Plate 30: Fig. g)**.

Centrosema (DC.) Benth., *Commentat. Legum. Gen.* 53 (1837), nom. cons.

Centrosema molle Mart. ex Benth., *Ann. Wiener Mus. Naturgesch.* ii. (1838) 119.; Centrosema pubescens Benth., Vajr., *Fl. Palghat Dist* 178 (1990); Sasidh., *Fl. Parambikulam WLS* 85 (2002).

Habit : Climber
Ecosystem preference : Deciduous forests and in plains
Distribution : Indo - Pacific and South American
IUCN Category : Not Evaluated (NE)
Habitat : Found in estates, hillocks, degraded forests and in plains
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Common
Phenology : September - January
Altitude preference : Found commonly in lower altitudes in all areas
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Olappalam, 10°49'52.20"N, 76°43'44.19"E, 121m, 25 November 2017, Aswani & Maya, 957 (GVCH); G. P. Nair estate, 10°53'26.52"N, 76°39'41.04"E, 181m, 24 March 2018, Aswani & Maya, 1691 (GVCH); Pazhampullikaadu, 10°50'09.55" N, 76°38'28.33"E, 89m, 16 October 2018, Aswani & Maya, 3139 (GVCH); Kochuthodu – Akamalavaram, 10°51'58.32"N, 76°42'22.32"E, 177m, 18 December 2018, Aswani & Maya, 3390 (GVCH); Koomachimala, 10°49'44.76"N, 76°40'34.59"E, 102m, 23 November 2019, Aswani & Maya, 4886 (GVCH) **(Plate 30: Fig. h)**.

Clitoria L., *Sp. Pl.* 2: 753 (1753)

Clitoria ternatea L., *Sp. Pl.* 2: 753 (1753); Hook. f., *FBI* 2: 208 (1876); Gamble, *Fl. Madras* 365 (1918); Vajr., *Fl. Palghat Dist* 148 (1990).

Basionym: *Nauchea ternatea* (L.) Descourt., *Mém. Soc. Linn. Paris* 4: 8 (1826).

Habit : Climber
Ecosystem preference : Plains and also found running wild
Distribution: Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Found growing in homesteads and in the outskirts of hillocks and in degraded forests
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Common
Phenology : July - October
Altitude preference : Found in the lower altitudes in biofences
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Valiya Eri, 10°48'53.76"N, 76°44'59.07"E, 124m, 06 January 2018, Aswani & Maya, 1311 (GVCH); Walayar Dam, 10°50'24.58"N,

76°51'01.52"E, 199m, 09 May 2018, Aswani & Maya, 2052 (GVCH); Ayyappan Mala, 10°49'07.40"N, 76°45'32.38"E, 170m, 26 June 2018, Aswani & Maya, 2450 (GVCH); Kottamutti waterfalls, 10°49'42.94"N, 76°46'47.87"E, 206m, 23 September 2018, Aswani & Maya, 2880 (GVCH); Anayappanchalla, 10°48'20.42"N, 76°48'05.00"E, 146m, 30 November 2019, Aswani & Maya, 5215 (GVCH) **(Plate 31: Fig. a)**.

Crotalaria L., *Sp. Pl.* 2: 714 (1753)

Key to species

1. Leaves compound……... C. pallida
- Leaves simple……...……2
2. Diffuse or prostrate or trailing herbs…..……..……...3
- Erect herbs or shrubs……..……4
3. Flowers and pods more than 1 cm long; pods hirsute… *C. evolvuloides*
- Flowers and pods less than 1cm long; pods glabrous……..... *C. nana*
4. Stipules usually absent or if present minute……..……..……7
- Stipules present ……..…….……...5
5. Stem angled in mature part of the plant; flowers blue…...*C. verrucosa*
- Stem usually terete……..……..….6
6. Stem densely hairy; leaves sub-sessile, membraneous, lateral nerves 3 - 5 pairs; bracts linear - lanceolate; racemes 5 - 10 flowered…..…… *C. mysorensis*
- Stem glabrescent; leaves shortly petioled, sub - coriaceous, lateral nerves 10 - 12 pairs; racemes 15 - 25 flowered; bracts foliaceous….. ……..….*C. spectabilis*
7. Flowers bluish…...… *C. heyneana*
- Flowers yellowish……..……...8
8. Erect shrubs, more than 1m tall; pods hairy…….…*C. leptostachya*
- Erect herbs, less than 1m tall; pods glabrous……..…….. *C. calycina*

Crotalaria calycina Schrank, *Plantae Rariores Horti Academici Monacensis* (1817); Hook. f., *FBI* 2: 72 (1876); Gamble, *Fl. Madras* 295 (1918).

Habit : Herb
Ecosystem preference : Grasslands
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Open hill tracks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : August - December
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Ayyappan Mala, 10°49'06.91"N, 76°44'44.91"E, 151m, 26 June 2018, Aswani & Maya, 2523 (GVCH).

Crotalaria evolvuloides Wight, *Prodr. Fl. Ind. Orient.* 1: 188 (-189) (1834); Hook. f., *FBI* 2: 68 (1876); Gamble, *Fl. Madras* 292 (1918); Vajr., *Fl. Palghat Dist* 150 (1990); Sasidh., *Fl. Parambikulam WLS* 87 (2002).

Habit : Herb
Ecosystem preference : Marshes
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Open grassy rocky places near water sources
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : October - February
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Akamalavaram- Muchikadavu, 10°52'27.55"N, 76°42'44.32"E, 280m, 30 November 2018, Aswani & Maya, 3235 (GVCH).

Crotalaria heyneana Graham ex Wight & Arn., *Prodr. Fl. Ind. Orient.* 1: 187 (-188)

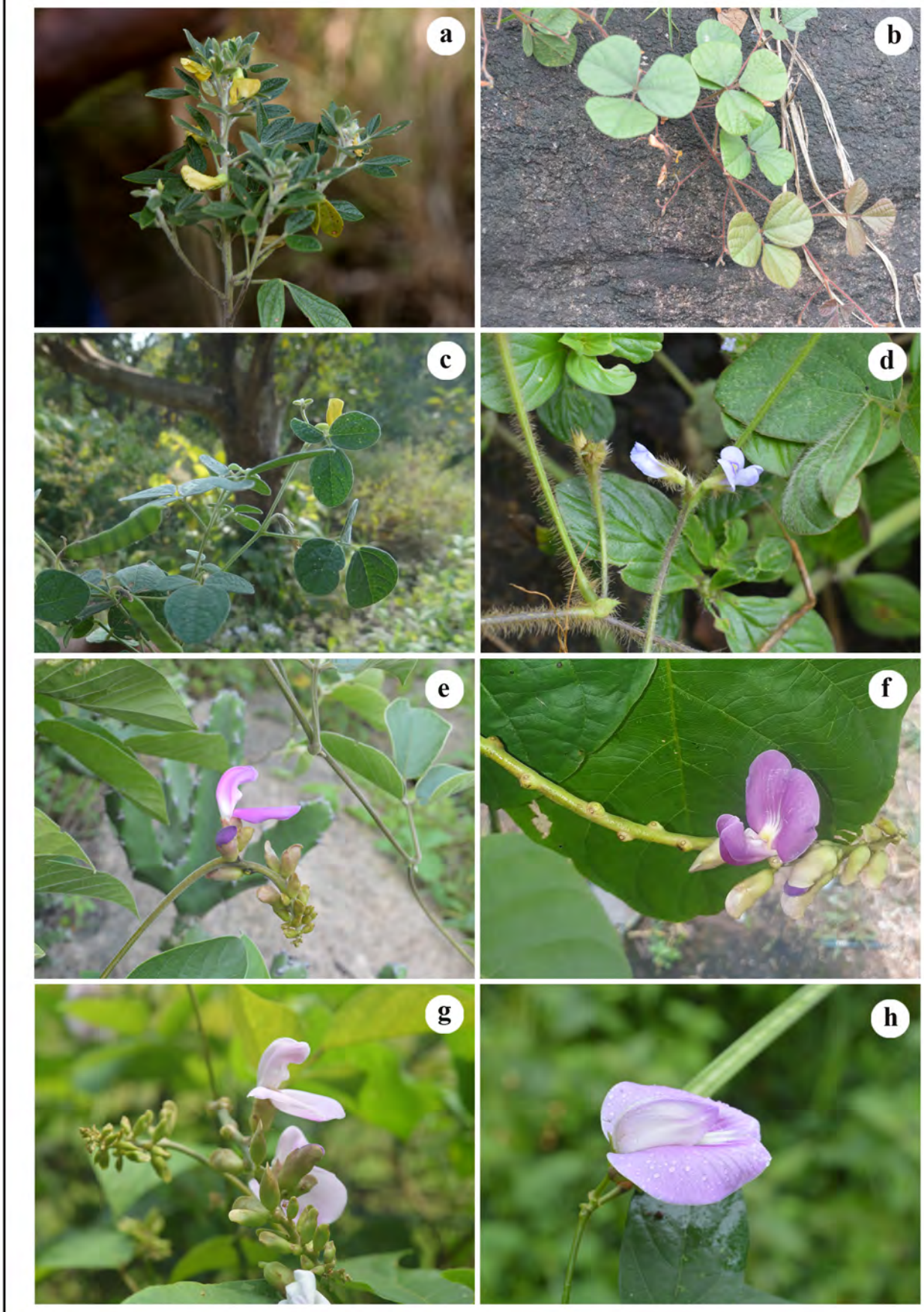

Plate 30: Fig. a. *Cajanus lineatus* (Wight & Arn.) Maesen **b.** *Cajanus rugosus* (Wight & Arn.) Maesen **c.** *Cajanus scarabaeoides* (L.) Thouars **d.** *Calopogonium mucunoides* Desv. **e.** *Canavalia africana* Dunn ex Hutch. **f.** *Canavalia gladiata* (Jacq.) DC. **g.** *Canavalia mollis* Wall. ex Wight & Arn. **h.** *Centrosema molle* Mart. ex Benth.

(1834); Hook. f., *FBI* 2: 78 (1876); Gamble, *Fl. Madras* 297 (1918); Vajr., *Fl. Palghat Dist* 150 (1990); Sasidh., *Fl. Parambikulam WLS* 87 (2002).

Habit : Shrub
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
Endemism : Southern Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Found in open forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : September - December
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Akamalavaram- Thannikunnu, 10°51'57.24"N, 76°42'0.00"E, 179m, 18 December 2018, Aswani & Maya, 3450 (GVCH); Akamalavaram - Chaatapara waterfalls, 10°53'11.76"N, 76°42'15.84"E, 600m, 10 December 2019, Aswani & Maya, 5478 (GVCH); Ayyappankoil, 10°52'51.492"N, 76°47'39.48" E, 525m, 28 January 2020, Aswani & Maya, 5926 (GVCH).

Crotalaria leptostachya Benth., *London J. Bot.* 2: 562 (1843); Hook. f., *FBI* 2: 78 (1876).

Habit : Shrub
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
Endemism : Peninsular India
IUCN Category : Not Evaluated (NE)
Habitat : Along forest margins and degraded regions
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : October - December
Altitude preference : Found in lower altitudes in disturbed areas
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Walayar toll plaza hillock, 10°48'44.11"N, 76°47'46.05"E, 14m, 30 November 2019, Aswani & Maya, 5251 (GVCH).

Crotalaria mysorensis Roth, *Nov. Pl. Sp.* 338 (1821); Hook. f., *FBI* 2: 70 (1876); Gamble, *Fl. Madras* 295 (1918); Vajr., *Fl. Palghat Dist* 151 (1990); Sasidh., *Fl. Parambikulam WLS* 88 (2002).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In open grassy hills and hillocks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : September - December
Altitude preference: Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Idamala – Thekke Malampuzha, 10°51'15.84"N, 76°39'40.32"E, 129m, 05 October 2017, Aswani & Maya, 672 (GVCH); Karadikunnu, 10°50'20.20"N, 76°49'48.92"E, 202m, 30 December 2017, Aswani & Maya, 1099 (GVCH); Way to Ayyappan Mala, 10°49'07.40"N, 76°45'32.38"E, 170m, 06 January 2018, Aswani & Maya, 1240 (GVCH); Anayappanchalla, 10°48'19.16"N, 76°48'15.25"E, 141m, 30 November 2019, Aswani & Maya, 5220 (GVCH); Ahalia Campus, 10°47'37.00"N, 76°49'33.40"E, 156m, 24 September 2020, Aswani & Maya, 6304 (GVCH) **(Plate 31: Fig. b)**.

Crotalaria nana Burm.f., *Fl. Ind. (N. L. Burman)* 156, t. 48 (1768); Hook. f., *FBI* 2: 71 (1876); Gamble, *Fl. Madras* 294 (1918); Vajr., *Fl. Palghat Dist* 151 (1990); Sasidh., *Fl. Parambikulam WLS* 88 (2002).

Habit : Herb
Ecosystem preference : Grasslands
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found common open grassy regions in hillocks and main ghats
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : September - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Way to Ayyappan Mala, 10°49'07.40"N, 76°45'32.38"E, 170m, 06 January 2018, Aswani & Maya, 1242 (GVCH); Koomachimala, 10°49'44.76"N, 76°40'30.72"E, 108m, 23 November 2019, Aswani & Maya, 4891 (GVCH) **(Plate 31: Fig. c)**.

Crotalaria pallida Aiton, *Hort. Kew. [W. Aiton]* 3: 20 (1789); Vajr., *Fl. Palghat Dist.* 152 (1990); *Crotalaria striata* DC., Hook. f., *FBI* 2: 84 (1876); Gamble, *Fl. Madras* 301 (1918).

Habit : Shrub
Ecosystem preference : Degraded forest areas in forests and also in the plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Found as a weed in open forests and along wastelands, roadsides
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : September - January
Altitude preference : Found in lower altitudes
Specimens examined: INDIA, Kerala: Palakkad District, Walayar range, Poozhikunnu, 10°51'20.44"N, 76°43'38.28" E, 118m, 09 November 2017, Aswani & Maya, 860 (GVCH); Karadikunnu, 10°50'20.20"N, 76°49'48.92"E, 202m, 30 December 2017, Aswani & Maya, 1099 (GVCH); Mayappalam, 10°48'0.36"N, 76°45'58.68"E, 114m, 10 May 2018, Aswani & Maya, 2085 (GVCH); Kattadikunnu – Akathethara, 10°50'21.84" N, 76°39'14.76"E, 267m, 16 October 2019, Aswani & Maya, 4810 (GVCH); Walayar toll plaza, 10°48'45.00"N, 76°47'49.56"E, 145m, 30 November 2019, Aswani & Maya, 5238 (GVCH).

Crotalaria spectabilis Roth, *Nov. Pl. Sp.* 341 (1821); *Crotalaria sericea* Retz., Hook. f., *FBI* 2: 75 (1876); Gamble, *Fl. Madras* 293 (1918); Vajr., *Fl. Palghat Dist* 153 (1990); *Crotalaria leschenaultii* DC., Hook. f., *FBI* 2: 76 (1876); Gamble, *Fl. Madras* 293 (1918).

Habit : Shrub
Ecosystem preference : Moist Deciduous forests
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Understorey of forest floors
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Occasional
Phenology : November - January
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Parachaathy, 10°50'49.97"N , 76°43'56.67``E, 160m, 02 January 2019, Aswani & Maya, 3618 (GVCH); Aduppukootimala – Kanyarmuttu, 10°49'50.52"N, 76°44'24.72"E, 222m, 12 January 2019, Aswani & Maya, 3688 (GVCH); Jamanthimala, 10°52'18.19"N, 76°46'47.14"E, 921m, 09 January 2020, Aswani & Maya, 5771 (GVCH); Aatumala Thodu, 10°53'52.08"N, 76°41'24"E, 327m, 28 February 2020, Aswani & Maya, 6148 (GVCH); Aduppukootimala, 10°50'01.68" N,76°44'33.00"E, 327m, 16 February 2021, Aswani & Maya, 6439 (GVCH) **(Plate 31: Fig. d)**.

Crotalaria verrucosa L., *Sp. Pl.* 2: 715 (1753); Gamble, *Fl. Madras* 297 (1918); Vajr., *Fl. Palghat Dist* 153 (1990).

Habit : Herb
Ecosystem preference : Deciduous forests, also in the plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Hill slopes and mud slips
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : August - November
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Koyyamarakaadu, 10°47'41.24"N, 76° 45 '35.17"E, 145m, 30 November 2019, Aswani & Maya, 5370 (GVCH) **(Plate 31: Fig. e)**.

Dalbergia L. f., *Suppl. Pl.* 52, 316 (1782)

Key to species

1. Standard petal erect; wing petals cuneate at base; style thick…….*D. sisso*
- Standard petal reflexed; wings hastate or sagittate at base; style thin……..……..…….2
2. Stamens 10…….…….. …*D. lanceolaria* subsp. *paniculata*
- Stamens 9……..…….…3
3. Young leaves green; flowers in congested corymbose panicles..… ……..…...*D. latifolia*
- Young leaves yellowish; flowers in lax panicles…..……..... *D. sissoides*

Dalbergia lanceolaria **subsp. *paniculata*** (Roxb.) Thoth., *Bull. Bot. Surv. India* 25(1-4): 171 (1985); Sasidh., *Fl. Parambikulam WLS* 89 (2002); *Dalbergia paniculata* Roxb., Hook. f., *FBI* 2: 236 (1876); Gamble, *Fl. Madras* 383 (1918).

Basionym: *Dalbergia paniculata* Roxb. in *Pl. Coromandel* 2: 8 (1799).

Habit : Tree
Ecosystem preference : Dry deciduous forests
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : In forest tracks
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : March - September
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Poolakunnu, 10°51'33.12"N, 76°42'29.52" E, 142m, 10 March 2018, Aswani & Maya, 1410 (GVCH); G. P. Nair estate, 10°53'20.76" N, 76°39'41.04"E, 179m, 24 March 2018, Aswani & Maya, 1644 (GVCH); Parakkallu- Neelikunnu, 10°51'30.14"N, 76°37'30.67``E, 155m, 27 April 2018, Aswani & Maya, 1939 (GVCH); Kochuthodu, 10°51'58.32"N, 76°42'22.32"E, 177m, 18 December 2018, Aswani & Maya, 3320 (GVCH); On the way to Jamanthimala, 10°51'20.17"N, 76°47'4.18"E, 645m, 23 June 2019, Aswani & Maya, 4028 (GVCH) **(Plate 31: Fig. f)**.

Dalbergia latifolia Roxb., *Pl. Coromandel* 2(1): 7, t. 113 (1799); Hook. f., *FBI* 2: 231 (1876); Gamble, *Fl. Madras* 383 (1918); Vajr., *Fl. Palghat Dist* 154 (1990); Sasidh., *Fl. Parambikulam WLS* 89 (2002).

Habit : Tree
Ecosystem preference : Dry and moist deciduous forests, also in the plains
Distribution : Indo - Pacific
IUCN Category : Vulnerable (VU)
Habitat : In forest floors
Raunkiaer's Life form : Phanerophyte

Distribution Frequency : Rare
Phenology : August - September
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kallanpuzha, 10°51'34.02"N, 76°42'40.16"E, 140m, 26 January 2018, Aswani & Maya, 1336 (GVCH); Kavarakundu, 10°51'59.76"N, 76°42'26.64" E, 213m, 10 March 2018, Aswani & Maya, 1516 (GVCH); G. P. Nair Estate, 10°53'26.52"N, 76°39'41.04"E, 181m, 24 March 2018, Aswani & Maya, 1684 (GVCH); Malampuzha irrigation dept guest house, 10°50'04.20"N, 76°40'52.68"E, 120m, 18 May 2018, Aswani & Maya, 2171 (GVCH); Aduppukootimala, 10°49'38.80"N, 76°44'16.08"E, 140m, 16 February 2021, Aswani & Maya, 6384 (GVCH).

Dalbergia sissoides Graham ex Wight & Arn., *Prodr. Fl. Ind. Orient.* 1: 265 (1834); Hook. f., *FBI* 2: 231 (1870); Gamble, *Fl. Madras* 383 (1918); Vajr., *Fl. Palghat Dist* 154 (1990); Sasidh., *Fl. Parambikulam WLS* 89 (2002).

Habit : Tree
Ecosystem preference : Moist and dry deciduous forests
Distribution : Indo - Pacific
IUCN Category : Vulnerable (VU)
Habitat : Found in forest floors
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : February - August
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Malampuzha irrigation dept guest house, 10°50'04.20"N, 76°40'52.68"E, 120m, 18 May 2018, Aswani & Maya, 2248 (GVCH); Kottamutti waterfalls, 10°49'42.94"N, 76°46'47.87"E, 206m, 23 September 2018, Aswani & Maya, 2918 (GVCH); Parachaathy, 10°50'42.54"N, 76°43'49.14"E, 121m, 02 January 2019, Aswani & Maya, 3548 (GVCH).

Dalbergia sissoo Roxb. ex DC., *Prodr. [A. P. de Candolle]* 2: 416 (1825); Hook. f., *FBI* 2: 237 (1876); Gamble, *Fl. Madras* 384 (1918); Sasidh., *Fl. Parambikulam WLS* 89 (2002).

Habit : Tree
Ecosystem preference : In plains
Distribution : Indo - Pacific and African
IUCN Category : Least Concern (LC)
Habitat : Found in forest floors and often planted as an avenue tree
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, G. P. Nair Estate, 10°53'40.83"N, 76°39'43.16"E, 230m, 24 March 2018, Aswani & Maya, 1747 (GVCH); Parakkallu- Neelikunnu, 10°51'30.14"N, 76°37'30.67"E, 155m, 27 March 2018, Aswani & Maya, 1935 (GVCH); Pallakaadu – Akathethara, 10°51'32.04"N, 76°37'25.68"E, 138m, 09 October 2018, Aswani & Maya, 2997 (GVCH); Pazhampullikaadu, 10°50'09.55"N, 76°38'28.33"E, 89m, 16 October 2018, Aswani & Maya, 3177 (GVCH); Akamalavaram - Chottuppara waterfalls, 10°52'37.92"N, 76°41'39.84"E, 346m, 14 May 2019, Aswani & Maya, 3978 (GVCH); Akamalavaram- Chaatapara waterfalls, 10°53'11.76"N, 76°42'15.84" E, 600m, 10 December 2019, Aswani & Maya, 5427 (GVCH); Jamanthimala, 10°52'14.73"N, 76°46'46.15"E, 895m, 09 January 2020, Aswani & Maya, 5680 (GVCH).

Dendrolobium (Wight & Arn.) Benth., *Pl. Jungh. [Miquel]* 2: 215 (1852)

Dendrolobium triangulare (Retz.) Schindl., *Repert. Spec. Nov. Regni Veg.* 20: 279 (1924); *Desmodium cephalotes* (Roxb.) Wall. ex Wight & Arn., Hook. f., *FBI* 2: 161 (1876); Gamble, *Fl. Madras* 344 (1918); *Desmodium triangulare* (Retz.) Merr., var. *congestum* (Prain) Sant., Vajr., *Fl. Palghat Dist* 159 (1990).

Basionym : *Hedysarum triangulare* Retz., *Observ. Bot. (Retzius)* iii. 40. (1783)

Habit : Shrub
Ecosystem preference : Moist deciduous forests, also in plantations
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : Hill slopes and open forests
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : September - January
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Malampuzha - Anakkal road, 10°51'33.84"N, 76°41'41.94"E, 124m, 24 March 2018, Aswani & Maya, 1809 (GVCH); Akamalavaram – Chaatapara waterfalls, 10°53'11.76"N, 76°42'15.84"E, 600m, 10 December 2019, , Aswani & Maya, 5514 (GVCH), Jamanthimala, 10°52'18.19"N, 76°46'47.14"E, 921m, 09 January 2020, Aswani & Maya, 5719 (GVCH) **(Plate 31: Fig. g)**.

Desmodium Desv., *J. Bot. Agric.* 1(2): 122, t. 5, fig. 15 (1813), nom. cons.

***Desmodium scorpiurus* (Sw.) Poir**. in G.-F.Cuvier, *Dict. Sci. Nat.,* ed. 2. 13: 110 (1819).
Basionym: Hedysarum scorpiurus Sw. in Prodr. *Veg. Ind. Occ*.: 107 (1788).
Habit : Herb
Ecosystem preference : Wastelands, also along the roadsides
Distribution : Indo - Pacific, Holarctic and Australian
IUCN Category : Not Evaluated (NE)
Habitat : Weed in degraded forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : December - July
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Walayar Dam, 10°50'24.58"N, 76°51'01.52"E, 199m, 09 May 2018, Aswani & Maya, 2038 (GVCH); Vattappara, 10°49'29.47"N, 76° 49 '05.26"E, 161m, 02 January 2019, Aswani & Maya, 2775 (GVCH) **(Plate 31: Fig. h)**.

Dolichos L., *Sp. Pl.* 2: 725 (1753), nom. cons.

Dolichos trilobus L., *Sp. Pl.* 2: 726 (1753); Vajr., *Fl. Palghat Dist* 160 (1990); *Dolichos falcatus* Klein ex Willd., Hook. f., *FBI* 2: 211 (1876); Gamble, *Fl. Madras* 366 (1918).

Habit : Climber
Ecosystem preference : Grasslands
Distribution : Indo - Pacific, Holarctic and African
IUCN Category : Not Evaluated (NE)
Habitat : Margins of grasslands
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : September - January
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kallanpuzha, 10°51'34.02"N , 76° 42 '40.16"E, 44m, 26 January 2018, Aswani & Maya, 1350 (GVCH).

Dysolobium Prain, *J. Asiat. Soc. Bengal*, Pt. 2, *Nat. Hist.* 66: 425 (1897)

Dysolobium pilosum (Willd.) Maréchal, *Bull. Jard. Bot. Natl. Belg.* 47(3-4): 483 (1977); *Vigna pilosa* (Roxb.) Baker in Hook.f., *FBI* 2: 207 (1876); Gamble, *Fl. Madras* 365 (1918).

Habit : Climber
Ecosystem preference : Semi-evergreen forests
Distribution : Indo - Pacific
Endemism : Peninsular India
IUCN Category : Not Evaluated (NE)
Habitat : Open forest floors
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Occasional
Phenology : October - December
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kattadikunnu, 10°50'19.32"N, 76°39'13.63"E, 261m, 16 October 2019, Aswani & Maya, 4804 (GVCH); Edasherikunnu, 10°52'42.6"N, 76°46'53.32" E, 644m, 28 January 2020, Aswani & Maya, 5958 (GVCH).

Erythrina L., *Sp. Pl.* 2: 706 (1753)

Key to species
1. Keel petals free…..…..…… *E. variegata*
- Keel petals connate….…….……2
2. Branchlets densely armed with white spines; calyx sub - spathaceous.... *E. stricta*
- Branchlets with black or yellowish spines; calyx campanulate…….... *E. suberosa*

Erythrina stricta Roxb., *Hort. Bengal.* 53; Fl. Ind. iii. 251; Hook. f., *FBI* 2: 189 (1876); Gamble, *Fl. Madras* 354 (1918); Sasidh., *Fl. Parambikulam WLS* 94 (2002).

Habit : Tree
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : Rocky patches and in plains
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : January - May
Altitude preference : Found in lower altitudes near water sources
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Ayyappan Mala, 10°49'16.35"N, 76°44'56.03"E, 144m, 07 March 2019, Aswani & Maya, 3838 (GVCH); Akamalavaram - Kochithodu, 10°52'7.32"N, 76°42'28.44"E, 245m, 14 May 2019, Aswani & Maya, 3946 (GVCH); Way to Jamanthimala, 10°50'26.52"N, 76°50'04.56"E, 214m, 23 June 2019, Aswani & Maya, 4017 (GVCH); Edamala – Azhakumpara waterfalls, 10°50'28.32"N, 76°38'45.96"E, 184m, 16 October 2019, Aswani & Maya, 4834 (GVCH) **(Plate 32: Fig. a)**.

Erythrina suberosa Roxb., *Hort. Bengal.* 53; *Fl. Ind*. iii. 253; Hook. f., *FBI* 2: 189 (1876); Gamble, *Fl. Madras* 354 (1918).

Habit : Tree
Ecosystem preference : Deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Near water sources and open rocky regions
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : February - April
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Edamala – Azakumpara waterfalls, 10°50'34.80"N, 76°38'54.60"E, 231m, 16 October 2019, Aswani & Maya, 4848 (GVCH); Vettumadavu, 10°52'44.72"N, 76°48'8.64"E, 457m, 28 January 2020,

Plate 31: Fig. a. *Clitoria ternatea* L. **b.** *Crotalaria mysorensis* Roth **c.** *Crotalaria nana* Burm.f. **d.** *Crotalaria spectabilis* Roth **e.** *Crotalaria verrucosa* L. **f.** *Dalbergia lanceolaria* subsp. *paniculata* (Roxb.) Thoth. **g.** *Dendrolobium triangulare* (Retz.) Schindl. **h.** *Desmodium scorpiurus* (Sw.) Desv. ex DC.

Aswani & Maya, 5895 (GVCH) **(Plate 32: Fig. b)**.

Erythrina variegata L.*, Herb. Amboin. (Linn.)* 10 (1754)*;* Vajr.*, Fl. Palghat Dist* 161 (1990); *Erythrina indica* Lam., Hook. f.,FBI 2: 188 (1876); Gamble, *Fl. Madras* 353 (1918); *Erythrina variegata* L. var. *orientalis* (L.) Merr., Sasidh., *Fl. Parambikulam WLS* 94 (2002).

Habit : Tree
Ecosystem preference : Deciduous forests
Distribution : Indo - Pacific, Holarctic and African
IUCN Category : Not Evaluated (NE)
Habitat : Grown as pepper stand in estates and in other plantations
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : March - April
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Pepper plantations in Malampuzha, 10°49'44.01"N, 76°43'50.64"E, 100m, 16 February 2021, Aswani & Maya, 6521 (GVCH) **(Plate 32: Fig. c)**.

Flemingia Roxb. ex W.T.Aiton, *Hort. Kew., ed.* 2 [*W.T. Aiton*] 4: 349 (1812), nom. cons.

Key to species

1. Leaves uni - foliolate; flowers hidden in large floral bracts……. *F. strobilifera*
- Leaves 3 - foliolate; Flowers not hidden in floral bracts…..……..…2
2. Leaflets thin, glabrous except on the nerves beneath; calyx lobes white silky; prominently dotted with black glands…….. *F. macrophylla*
- Leaflets thick, pubescent beneath; calyx lobes hairy arising from yellow glands……..... *F. wallichii*

Flemingia macrophylla (Willd.) Merr., *Philipp. J. Sci.,* C 5: 130 (1910); Sasidh., Fl. *Parambikulam WLS* 95 (2002); *Flemingia congesta* Roxb. ex Ait.f., Hook. f., *FBI* 2: 228 (1876); Gamble, *Fl. Madras* 378 (1918); *Flemingia semialata* Roxb., Gamble, *Fl. Madras* 378 (1918); Vajr., *Fl. Palghat Dist* 161 (1990); Sasidh., *Fl. Parambikulam WLS* 95 (2002); *Flemingia congesta* Roxb. ex Ait.f. var. *semialata* (Roxb.) Baker in Hook.f., *FBI* 2: 229 (1876).

Basionym : *Crotalaria macrophylla* Willd., *Sp. Pl., ed*. 4 *[Willdenow]* 3(2): 982 (1802).

Habit : Shrub
Ecosystem preference : Grasslands
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Open grassy hills
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : November - January
Altitude preference : Found in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala, 10°52'20.64"N, 76°46'27.12" E, 848m, 23 June 2019, Aswani & Maya, 4130 (GVCH) **(Plate 32: Fig. d)**.

Flemingia strobilifera (L.) W. T. Aiton, *Hort. Kew.*, ed. 2 [W.T. Aiton] 4: 350 (1812); Hook. f., *FBI* 2: 227 (1876); Gamble, *Fl. Madras* 377 (1918).

Basionym : *Hedysarum strobiliferum* L., *Sp. Pl.* 2: 746 (1753).

Habit : Shrub
Ecosystem preference : Moist deciduous and semi - evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)

Habitat : Understorey of deciduous and semi - evergreen forests
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : November - February
Altitude preference : Found in medium and higher altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Chaatapara waterfalls, 10°52'56.81"N, 76°42'11.22"E, 507m, 10 December 2019, Aswani & Maya, 5570 (GVCH); Jamanthimala, 10°52'20.64"N, 76°46'57.00"E, 864m, 09 January 2020, Aswani & Maya, 5723 (GVCH); Charalmudi, 10°52'41.26"N, 76°42'24.3"E, 435m, 28 February 2020, Aswani & Maya, 6082 (GVCH); Aduppukootimala, 10°50'20.07"N, 76°44'24.52"E, 504m, 16 February 2021, Aswani & Maya, 6477 (GVCH) **(Plate 32: Fig. e)**.

Flemingia wallichii Wight & Arn., *Prodr. Fl. Ind. Orient.* 1: 242 (1834); Hook. f., *FBI* 2:229 (1876); Gamble, *Fl. Madras* 379 (1918).

Habit : Shrub
Ecosystem preference : Grasslands
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : High canopy
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Occasional
Phenology : February - March
Altitude preference : Found in high altitude open grasslands
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala, 10°52'21.00"N, 76°47'00.24"E, 848m, 09 January 2020, Aswani & Maya, 5752 (GVCH); Pothukunnu, 10°53'21.84"N,76°46'33.24"E, 970m, 28 January 2020, Aswani & Maya, 5964 (GVCH) **(Plate 32: Fig. f)**.

Geissaspis Wight & Arn., *Prodr. Fl. Ind. Orient.* 1: 217 (1834)

Key to species

Flowers shorter than bracts; corolla yellow coloured……..…. *G. cristata*
Flowers as long as or longer than bracts; corolla reddish - purple.…….…..... …….*G. cristata* var. *tenella*

Geissaspis cristata Wight & Arn., *Prodr. Fl. Ind. Orient.* 1: 218 (1834); Hook. f., *FBI* 2: 141 (1876); Gamble, *Fl. Madras* 324 (1918); Vajr., *Fl. Palghat Dist* 162 (1990).

Habit : Herb
Ecosystem preference : Moist deciduous forests and open grassy patches
Distribution : Indo - Pacific and Holarctic
IUCN Category : Least Concern (LC)
Habitat : Exposed rock surfaces
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : July - September
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Edamala -Cheekuzhi, 10°50'11.04"N, 76°38'57.48" E, 114m, 16 October 2019, Aswani & Maya, 4768 (GVCH); Olappalam, 10°49'52.20"N, 76°43'44.19"E, 145m, 23 November 2019, Aswani & Maya, 5088 (GVCH); Anayappanchalla, 10°48'23.66" N, 76°48'23.91"E, 145m, 30 November 2019, Aswani & Maya, 5143 (GVCH); Koomachimala, 76°40'36.16"E, 76°40'34.59"E, 122m, 23 September 2020, Aswani & Maya, 6235 (GVCH) **(Plate 32: Fig. g)**.

Geissaspis cristata var. ***tenella*** (Benth.) M.R.Almeida, *Fl. Maharashtra* 2: 83 (1998); *Geissaspis tenella* Benth. var. *tenella*; Hook. f., *FBI* 2:141 (1876); Gamble, *Fl. Madras* 324 (1919);

Geissaspis tenella Benth. var. *malabarica* Sivar. & Babu, Sanjappa, *Legumes India* 181 (1992); Babu, *Fl. Malappuram Dist* 189 (1990); Sivar. & P. Mathew, Fl. *Nilambur* 175 (1997); E. Vajr. & K.A.A. Kabeer in G.V.S. Murthy & V.J. Nair (eds.), *Fl. Kerala* 2: 129 (2016).

Basionym: *Geissaspis tenella* Benth., *Flora* 32: 559 (1849).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
Endemism : Southern Western Ghats (Kerala)
IUCN Category : Not Evaluated (NE)
Habitat : Exposed rock surfaces and crevices of rocks in moist areas
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : July - September
Altitude preference : Found commonly in higher altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala, 10°49'44.76"N , 76°40'36.16"E, 100m, 20 July 2018, Aswani & Maya, 2624 (GVCH); Anayappanchalla, 10°48'24.82"N, 76°48'30.73"E, 147m, 18 September 2018, Aswani & Maya, 2842 (GVCH) **(Plate 32: Fig. h)**.

Gliricidia Kunth, *Repert. Bot. Syst. (Walpers)* 1(4): 679 (1842)

Gliricidia sepium (Jacq.) Kunth, *Repert. Bot. Syst. (Walpers)* 1(4): 679 (1842); Vajr., *Fl. Palghat Dist* 178 (1990).

Basionym : *Robinia sepium* Jacq., *Enum. Syst. Pl.* 28 (1760).

Habit : Tree
Ecosystem preference : In plains
Distribution : Indo - Pacific and South American
IUCN Category : Least Concern (LC)
Habitat : Found planted in margins of hillocks and homesteads
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : March - May
Altitude preference : Found as a biofencing plant in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kallanpuzha, 10°51'34.02"N, 76°42'40.16"E, 140m, 26 January 2018, Aswani & Maya, 1349 (GVCH); Ayyappan Mala, 10°48'59.96"N, 76°45'22.61"E, 132m, 26 June 2018, Aswani & Maya, 2397 (GVCH); Kochuthodu, 10°51'58.32"N, 76°42'22.32"E, 177m, 18 December 2018, Aswani & Maya, 3303 (GVCH); Anayappanchalla, 10°48'24.82"N, 76°48'30.73"E, 147m, 30 November 2019, Aswani & Maya, 5153 (GVCH) **(Plate 33: Fig. a)**.

Grona Lour., *Fl. Cochinch.* 2: 459 (1790)

Key to species

1. Plants erect under shrubs……..*G. heterocarpos*
- Plants prostrate herbs……..2
2. Leaflets obovate - cuneate, truncate or emarginate at apex…*G. triflorum*
- Leaflets elliptic or obovate, rounded at apex……...…*G. heterophylla*

Grona heterocarpos (L.) H.Ohashi & K.Ohashi, *J. Jap. Bot.* 93(2): 112 (2018); *Desmodium polycarpum* (Poir.) DC., Hook. f., *FBI* 2: 171 (1876); Gamble, *Fl. Madras* 346 (1918); *Desmodium heterocarpon* (L.) DC., Vajr., *Fl. Palghat Dist* 157 (1990); Sasidh., *Fl. Parambikulam WLS* 92 (2002).

Basionym : *Hedysarum heterocarpon* L., *Sp. Pl*. 2: 747 (1753).

Habit : Shrub
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : Near water sources in semi - evergreen forests
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : October - December
Altitude preference : Found in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Aatumala Thodu, 10°53'52.08"N, 76°41'24"E, 1084m, 28 February 2020, Aswani & Maya, 6158 (GVCH) **(Plate 33: Fig. b)**.

Grona heterophylla (Willd.) H.Ohashi & K.Ohashi, *J. Jap. Bot.* 93(2): 114 (2018); *Desmodium heterophyllum* (Willd.) DC., Hook. f., *FBI* 2: 173 (1876); Gamble, *Fl. Madras* 347 (1918); Vajr., *Fl. Palghat Dist* 157 (1990); Sasidh., *Fl. Parambikulam WLS* 92 (2002).

Basionym : *Hedysarum heterophyllum* Willd., *Sp. Pl., ed.* 4 *[Willdenow]* 3(2): 1201 (1802).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : Soil rich areas in plains
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : July - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Vattappara, 10°49'29.39"N, 76°49'06.40"E, 164m, 18 September 2018, Aswani & Maya, 2776 (GVCH); Akathethara - Malampuzha road, 10°49'34.77"N, 76°38'8.58"E, 100m, 28 February 2021, Aswani & Maya, 6524 (GVCH) **(Plate 33: Fig. c)**.

Grona triflora (L.) H.Ohashi & K.Ohashi, *J. Jap. Bot.* 93(2): 117 (2018); *Desmodium triflorum* (L.) DC., Hook. f., *FBI* 2: 173 (1876); Gamble, *Fl. Madras* 347 (1918); Vajr., *Fl. Palghat Dist* 159 (1990); Sasidh., *Fl. Parambikulam WLS* 93 (2002).

Basionym : *Hedysarum triflorum* L., *Sp. Pl.* 2: 749 (1753).

Habit : Herb
Ecosystem preference : Moist deciduous forests and in plains
Distribution : Indo - Pacific and Australian
IUCN Category : Not Evaluated (NE)
Habitat : Soil rich areas in hillocks and in plains
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : July - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kosavanidukku-Kaduvachal, 10°50'26.38"N, 76°40'30.88"E, 105m, 16 July 2017, Aswani & Maya, 232 (GVCH); Olappallam, 10°49'52.20"N, 76°43'44.19"E, 121m, 25 November 2017, Aswani & Maya, 924 (GVCH); Kochuthodu, 10°51'58.32"N, 76°42'22.32"E, 177m, 18 December 2018, Aswani & Maya, 3376 (GVCH); Malabar Cements Gateway, 10°50'53.49"N, 76°50'08.26"E, 221m, 23 June 2019, Aswani & Maya, 4073 (GVCH) **(Plate 33: Fig. d)**.

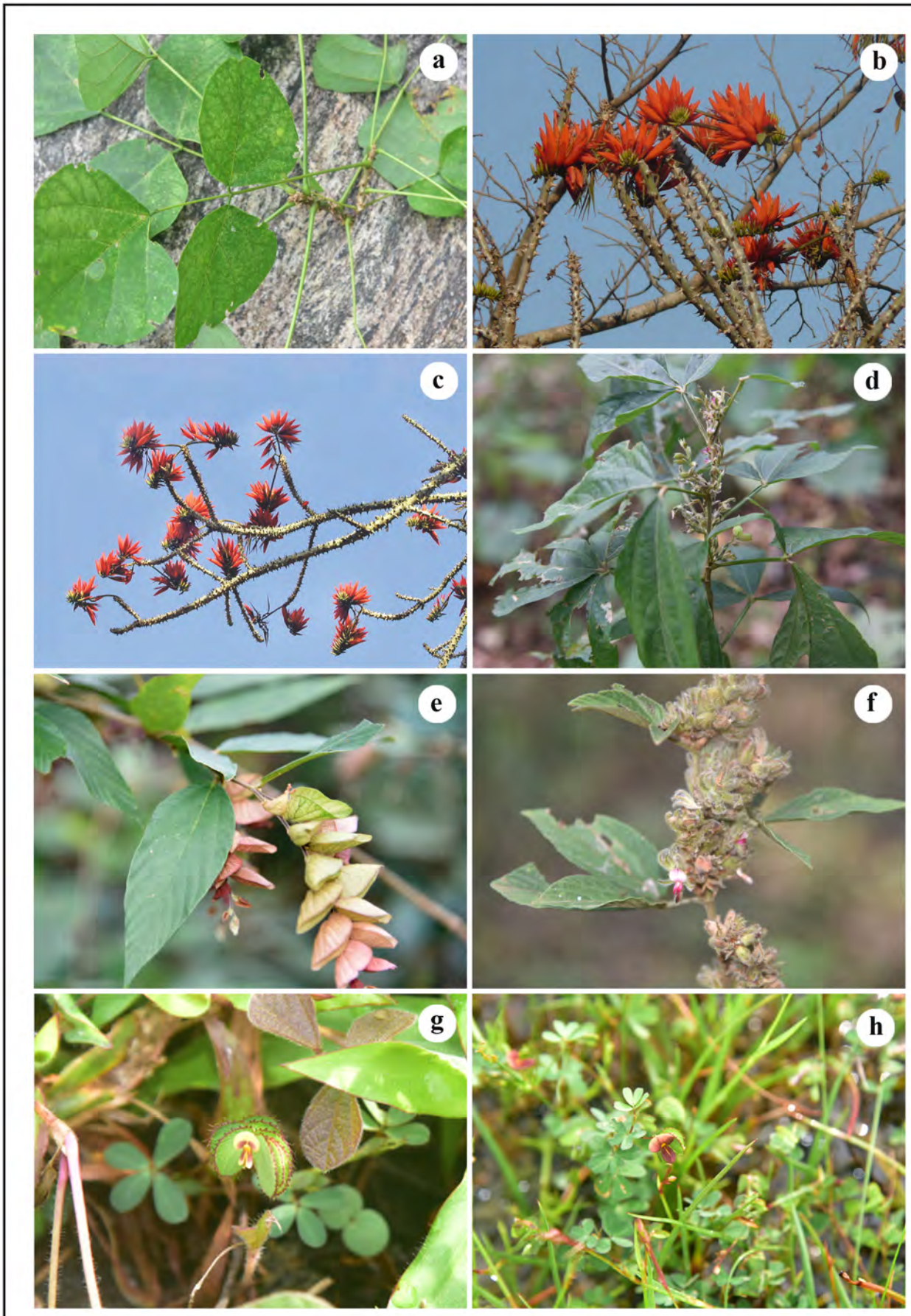

Plate 32: Fig. a. *Erythrina stricta* Roxb. **b.** *Erythrina suberosa* Roxb. **c.** *Erythrina variegata* L. **d.** *Flemingia macrophylla* (Willd.) Merr. **e.** *Flemingia strobilifera* (L.) W.T. Aiton **f.** *Flemingia wallichii* Wight & Arn. **g.** *Geissaspis cristata* Wight & Arn. **h.** *Geissaspis cristata* var. *tenella* (Benth.) M.R.Almeida.

Indigofera L., *Sp. Pl.* 2: 751 (1753)

Key to species

1. Flowers solitary……..…. *I. uniflora*
- Flowers in axillary racemes……...2
2. Calyx teeth with capitate stalked glands…..……..…..… *I. glabra*
- Calyx teeth without capitate stalked glands…..……..……..……..3
3. Inflorescence in very short sub - capitate racemes shorter than leaves; pods 2 - seeded…..……..... *I. tsiangiana*
- Inflorescence in much elongate racemes longer than leaves…....…4
4. Leaflets alternate…*I. hendecaphylla*
- Leaflets opposite or sub – opposite…….….5
5. Racemes 6 - 12 flowered; pods cylindric…..…….....…… *I. colutea*
- Racemes more than 12 flowered; pods tetragonous or angular……..6
6. Whole plant dessely brown hirsute; leaflets 5 - 11; petals brick red……..…..…..… *I. hirsuta*
- Whole plant densely hairy; leaflets 7 - 9 pairs; petals pink coloured……..….. *I. astragalina*

Indigofera astragalina DC., *Prodr. [A. P. de Candolle]* 2: 228 (1825); *Indigofera hirsuta* Linn., sensu Hook.f., *FBI* 2: 98 (1876); Gamble, *Fl. Madras* 312 (1918).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Soil Rich Areas and Soil Filled Depressions
Raunkiaer's life form : Therophyte
Distribution Frequency : Occasional
Phenology : October - January
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thekke Malampuzha Irrigation dept Guest house hillock, 10°50'03.76"N, 76°40'56.19"E, 120m, 08 September 2017, Aswani & Maya, 439 (GVCH); Thekke Malampuzha, 10°50'07.08"N, 76°40'26.15"E, 225m, 18 May 2018, Aswani & Maya, 2269 (GVCH); Ayyappan Mala, 10°48'59.96"N, 76°45'22.61"E, 132m, 26 June 2018, Aswani & Maya, 2495 (GVCH); Ahalya campus, 10°47'43.08"N, 76°50'5.43"E, 150m, 24 September 2020, Aswani & Maya, 6294 (GVCH) **(Plate 33: Fig. e)**.

Indigofera colutea (Burm.f.) Merr., *Philipp. J. Sci.* 19: 355 (1921); Vajr., *Fl. Palghat Dist* 163 (1990); *Indigofera viscosa* Lam., Hook. f., *FBI* 2: 95 (1876); Gamble, *Fl. Madras* 311 (1919).

Basionym : *Galega colutea* Burm.f., *Fl. Ind. (N. L. Burman)* 172 (1768).

Habit : Herb
Ecosystem preference : Moist deciduous forests and in scrub jungles
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Soil Filled Depressions and Soil Rich Areas
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : September - December
Altitude preference : Found in lower and medium altitudes
Specimenss examined : INDIA, Kerala: Palakkad District, Walayar range, Karadikunnu, 10°50'25.97"N, 76°49'42.92"E, 203m, 30 December 2017, Aswani & Maya, 1117 (GVCH); Way to Ayyappan Mala, 10°49'07.40"N, 76°45'32.38"E, 170m, 06 January 2018, Aswani & Maya, 1221 (GVCH); Jamanthimala, 10°51'53.64"N, 76°47'16.80"E, 586m, 01 July 2019, Aswani & Maya, 4161 (GVCH); Pothukunnu, 10°53'21.84"N,

76°46'33.24"E, 970m, 28 January 2020, Aswani & Maya, 5979 (GVCH) **(Plate 33: Fig. f)**.

Indigofera glabra L., *Sp. Pl.* 2: 751 (1753); Gamble, *Fl. Madras* 311 (1918); *Indigofera pentaphylla* Linn., Hook. f., *FBI* 2: 95 (1876).

Habit : Herb
Ecosystem preference : Moist Deciduous forests
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Plains and in wastelands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : November - December
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Pallakaadu, 10°51'30.96"N, 76°37'39.00"E, 151m, 09 October 2018, Aswani & Maya, 3039 (GVCH).

Indigofera hendecaphylla Jacq., Collectanea [Jacquin] 2: 358; *Indigofera endecaphylla* Jacq., Hook. f., FBI 2: 98 (1876); Gamble, *Fl. Madras* 311 (1918); *Indigofera spicata* auct. non Forssk., Vajr., *Fl. Palghat Dist* 164 (1990).

Habit : Herb
Ecosystem preference : Moist Deciduous forests
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : In hillocks and its outskirts
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : September - January
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Karadikunnu, 10°50'23.64"N , 76°49'47.64"E, 202m, 30 December 2017, Aswani & Maya, 1107 (GVCH); Way to Ayyappan Mala, 10°49'07.40"N, 76°45'32.38"E, 170m, 06 January 2018, Aswani & Maya, 1221 (GVCH).

Indigofera hirsuta L., *Sp. Pl.* 2: 751 (1753); Hook. f., *FBI* 2: 98 (1876); Gamble, *Fl. Madras* 312 (1918); Vajr., *Fl. Palghat Dist* 164 (1990).

Habit : Herb
Ecosystem preference : Moist deciduous forests and also in wastelands
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Open rocky patches
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : July - December
Altitude preference : Found in low altitude hillocks
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala, 10°49'44.76"N, 76°40'30.72"E, 108m, 23 November 2019, Aswani & Maya, 4902 (GVCH); Thekke Malampuzha irrigation dept. Guest house hillock, 10°50'04.20"N, 76°40'52.68"E, 120m, 23 November 2019, Aswani & Maya, 4938 (GVCH); Edamala, 10°51'14.32"N, 76°39'43.84"E, 105m, 23 November 2019, Aswani & Maya, 4982 (GVCH) **(Plate 33: Fig. g)**.

Indigofera tsiangiana F.P.Metcalf, *Sunyatsenia* 4: 156 (1940); *Indigofera enneaphylla* L., Hook. f., *FBI* 2: 94 (1876); Gamble, *Fl. Madras* 309 (1918).

Habit : Herb
Ecosystem preference : Plains and in wastelands
Distribution : Indo - Pacific, African and Australian
IUCN Category : Not Evaluated (NE)
Habitat : Soil rich areas

Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : September - December
Altitude preference : Found in lower altitudes
Specimen examineds : INDIA, Kerala: Palakkad District, Walayar range, Walayar Dam, 10°50'24.58"N, 76°51'01.52"E, 199m, 09 May 2018, Aswani & Maya, 2007 (GVCH); Ayyappan Mala, 10°49'07.40"N, 76°45'32.38"E, 170m, 26 June 2018, Aswani & Maya, 2496 (GVCH); Vattappara, 10°49'29.39"N, 76°49'06.40"E, 164m, 18 September 2018, Aswani & Maya, 2779 (GVCH); Ahalya campus, 10°47'37.00"N, 76°49'33.40"E, 156m, 24 September 2020, Aswani & Maya, 2779 (GVCH) **(Plate 33: Fig. h)**.

Indigofera uniflora Buch.-Ham. ex Roxb., *Hort. Bengal.* 57; *Fl. Ind.* iii. 374; Hook. f., *FBI* 2: 94 (1876); Gamble, *Fl. Madras* 309 (1918); Vajr., *Fl. Palghat Dist* 165 (1990); Sasidh., *Fl. Parambikulam WLS* 97 (2002).

Habit : Herb
Ecosystem preference : Deciduous forests
Distribution : Indo - Pacific
Endemism : Peninsular India
IUCN Category : Not Evaluated (NE)
Habitat : Exposed rock surfaces in hillocks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : September - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Mayappallam, 10°48'0.36"N, 76°45'58.68"E, 114m, 10 May 2018, Aswani & Maya, 2094 (GVCH); Ayyappan Mala, 10°49'06.39"N, 76°44'39.99"E, 218m, 26 June 2018, Aswani & Maya, 2494 (GVCH); Anayappanchalla, 10°48'25.92"N, 76°48'35.19"E, 157m, 18 September 2018, Aswani & Maya, 2800 (GVCH); Kongampaadam, 10°48'39.80"N, 76°47'2.67"E, 130m, 06 September 2019, Aswani & Maya, 4581 (GVCH) **(Plate 34: Fig. a)**.

Mucuna Adans., *Fam. Pl. (Adanson)* 2: 325, 579 (1763), nom. cons.

Key to species

1. Large woody climbers; pods large, compressed, winged along the margins……..….*M. monosperma*
- Herbaceous climbers; pods moderately sized……..…….2
2. Leaves pubescent; pods curved like S - shaped ……..... *M. pruriens*
- Leaves glabrous; pods without any S - shaped curve……. *M. bracteata*

Mucuna bracteata DC. ex Kurz, *J. Asiat. Soc. Bengal,* Pt. 2, *Nat. Hist.* 42: 231 (1873); Hook. f., *FBI* 2: 186 (1876).

Habit : Climber
Ecosystem preference : In plantations
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Planted in hill slopes
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Occasional
Phenology : January - April
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Ayyankulam, 10°48'10.29"N, 76°44'39.61" E, 116m, 06 January 2018, Aswani & Maya, 1176 (GVCH); Kallanpuzha, 10°51'34.02"N, 76°42'40.16"E, 140m, 26 January 2018, Aswani & Maya, 1375 (GVCH) **(Plate 34: Fig. b)**.

Mucuna monosperma DC. ex Wight, *Bot. Misc.* 2(6): 346, suppl. t. 12 (1831); Hook. f., *FBI* 2: 185 (1876); Gamble, *Fl. Madras* 355 (1918); Vajr., *Fl. Palghat Dist* 166 (1990).

Basionym : *Carpopogon monospermus* (DC. ex Wight) Roxb., *Fl. Ind*. (Roxburgh) 3: 283 (1832).

Habit : Climber
Ecosystem preference : Evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In hill tracks near water sources and in the hill slopes of semi - evergreen forests
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Occasional
Phenology : January - April
Altitude preference : Found in lower and medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Ponthancheeni - Adupukootimala, 10°49'59.16"N, 76°44'31.56"E, 298m, 12 January 2019, Aswani & Maya, 3715 (GVCH); Jamanthimala, 10°51'53.64"N, 76°47'16.80"E, 586m, 23 June 2019, Aswani & Maya, 4092 (GVCH) **(Plate 34: Fig. c)**.

Mucuna pruriens (L.) DC., *Prodr. [A. P. de Candolle]* 2: 405 (1825); Hook. f., *FBI* 2: 187 (1876); Vajr., *Fl. Palghat Dist* 167 (1990); Sasidh., *Fl. Parambikulam WLS* 97 (2002); *Mucuna prurita* Hook., Gamble, *Fl. Madras* 356 (1918).

Basionym : *Dolichos pruriens* L., *Herb. Amboin. (Linn.)* 23 (1754)

Habit : Climber
Ecosystem preference : Degraded forests and in plains
Distribution : Indo - Pacific
IUCN Category : Least Concern(LC)
Habitat : Soil rich areas in forest margins and wastelands
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Common
Phenology : October - February
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Karadikunnu, 10°50'23.64"N , 76°49'47.64"E, 203m, 30 December 2017, Aswani & Maya, 1091 (GVCH); Anayappanchalla, 10°48'25.92"N, 76°48'35.19"E, 157m, 30 November 2019, Aswani & Maya, 5136 (GVCH); Jamanthimala, 10°52'18.19"N, 76°46'47.14"E, 921m, 09 January 2020, Aswani & Maya, 5669 (GVCH) **(Plate 34: Fig. d)**.

Neustanthus Benth., *Pl. Jungh. [Miquel]* 2: 234 (1852)

Neustanthus phaseoloides Benth., *Pl. Jungh. [Miquel]* 2: 235 (1852); *Pueraria phaseoloides* (Roxb.) Benth., Hook. f., *FBI* 2: 199 (1876).

Habit : Climber
Ecosystem preference : Degraded forests and plains
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : In open forests often runs wild
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : October - March
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kallanpuzha, 10°51'34.02"N , 76° 42 '40.16"E, 140m, 26 January 2017, Aswani & Maya, 1352 (GVCH) **(Plate 34: Fig. e)**.

Ohwia H.Ohashi, *Sci. Rep. Tohoku Imp. Univ., Ser*. 4, *Biol*. 40(3): 243 (1999), nom. nov. (1999).

Ohwia caudata (Thunb.) H.Ohashi, *Sci. Rep. Tohoku Imp. Univ., Ser.* 4, *Biol.* 40(3): 243 (1999); Sanjappa, *Legumes Ind* 150 (1992).

Plate 33: Fig. a. *Gliricidia sepium* (Jacq.) Kunth **b.** *Grona heterocarpos* (L.) H.Ohashi & K.Ohashi **c.** *Grona heterophylla* (Willd.) H.Ohashi & K.Ohashid. **d.** *Grona triflora* (L.) H.Ohashi & K.Ohashi **e.** *Indigofera astragalina* DC. **f.** *Indigofera colutea* (Burm.f.) Merr. **g.** *Indigofera hirsuta* L. **h.** *Indigofera tsiangiana* F.P.Metcalf.

Basionym: *Hedysarum caudatum* Thunb., *Syst. Veg., ed.* 14 (J. A. Murray). 675 (1784).

Habit : Shrubs
Ecosystem preference : Semi evergreen forests
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : Near water sources in forest tracts
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : September - January
Altitude preference : Found in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range,Thanniplace, 10°52'20.64" N, 76°46'27.12"E, 848m, 28 January 2020, Aswani & Maya, 6026 (GVCH) **(Plate 34: Fig. f)**.

Phyllodium Desv., *J. Bot. Agric.* 1: 123, t. 5 (1813)

Phyllodium pulchellum Desv., *Mém. Soc. Linn. Paris* 4: 324 (1826); *Desmodium pulchellum* (L.) Benth., Hook. f., *FBI* 2: 162 (1876); Gamble, *Fl. Madras* 344 (1918); Vajr., *Fl. Palghat Dist* 158 (1990).

Habit : Shrub
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific, Holarctic and Australian
IUCN Category : Least Concern (LC)
Habitat : Ground storey in forest tracks
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : September - February
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Mucurnii -Pudussery, 10°48'37.19"N, 76°44'56.27"E, 118m, 06 January 2018, Aswani & Maya, 1163 (GVCH); Ayyappan Mala, 10°49'10.38"N, 76°44'28.29"E, 310m, 07 March 2019, Aswani & Maya, 3812 (GVCH); Akamalavaram- Kochitodu, 10°52'20.16"N, 76°42'39.96"E, 305m, 14 May 2019, Aswani & Maya, 3954 (GVCH) **(Plate 34: Fig. g)**.

Pleurolobus J.St.-Hil., in *Nouv. Bull. Soc. Philom.* iii. (1812) 192.

Pleurolobus gangeticus (L.) J.St.-Hil. ex H.Ohashi & K.Ohashi, *J. Jap. Bot.* 93(3): 184 (2018); *Desmodium gangeticum* (L.) DC., Hook. f., *FBI* 2:168 (1876); Gamble, *Fl. Madras* 345 (1918); Vajr., *Fl. Palghat Dist* 157 (1990); Sasidh., *Fl. Parambikulam WLS* 91 (2002).

Basionym : *Hedysarum gangeticum* L., *Sp. Pl.* 2: 746 (1753).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Understorey in forest floors
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : October - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Karadikunnu, 10°50'25.97"N, 76°49'42.92"E, 203m, 30 December 2017, Aswani & Maya, 1021 (GVCH); Mathappumala, 10°51'0.15"N, 76°49'53.62"E, 240m, 07 January 2020, Aswani & Maya, 5600 (GVCH); Chaavadippara, 10°52'42.20"N, 76°48'43.56"E, 243m, 28 January 2020, Aswani & Maya, 5836 (GVCH) **(Plate 34: Fig. h)**.

Polhillides H.Ohashi & K.Ohashi, *J. Jap. Bot*. 94(2): 71 (2019)

Polhillides velutina (Willd.) H.Ohashi & K.Ohashi, J. *Jap. Bot.* 94(2): 72 (2019); *Desmodium latifolium* (Roxb. ex Ker.) DC., Hook. f., FBI 2: 168 (1876); Gamble, *Fl. Madras* 346 (1918); *Desmodium velutinum* (Willd.) DC., Vajr., *Fl. Palghat Dist* 159 (1990); Sasidh., *Fl. Parambikulam WLS* 93 (2002).
Basionym : *Hedysarum velutinum* Willd., *Sp. Pl., ed. 4 [Willdenow]* 3(2): 1174 (1802).

Habit : Shrub
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific, Holarctic and African
IUCN Category : Not Evaluated (NE)
Habitat : In disturbed forest tracts and in other forest understorey
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : October - February
Altitude preference : Found in the lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Karadikunnu, 10°50'25.97"N, 76°49'42.92"E, 202m, 30 December 2017, Aswani & Maya, 1022 (GVCH); Way to Ayyappan Mala, 10°48'59.96"N, 76°45'22.61"E, 132m, 06 January 2018, Aswani & Maya, 1209 (GVCH) **(Plate 35: Fig. a)**.

Pongamia Adans., *Fam. Pl. (Adanson)* 2: 322, 593 (1763), nom. et orth. cons.

Pongamia pinnata (L.) Pierre, *Fl. Forest. Cochinch. sub t.* 385 (1899); Vajr., *Fl. Palghat Dist* 167 (1990); Sasidh., *Fl. Parambikulam WLS* 98 (2002); *Pongamia glabra* Vent., Hook. f., *FBI* 2:240 (1876); Gamble, *Fl. Madras* 385 (1918).
Basionym : *Cytisus pinnatus* L., *Sp. Pl.* 2: 741 (1753).

Habit : Tree
Ecosystem preference : In plains
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Planted as avenue tree in forest margins and plains
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : April - December
Altitude preference : Found in the lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Malampuzha irrigation dept. guest house hillock, 10°50'04.20"N, 76°40'52.68"E, 120m, 08 September 2017, Aswani & Maya, 475 (GVCH); Kottamutti waterfall, 10°49'46.20"N, 76°46'47.28"E, 203m, 23 September 2018, Aswani & Maya, 2976 (GVCH); Pallakaadu, 10°51'32.04"N, 76°37'25.68"E, 138m, 09 October 2018, Aswani & Maya, 2996 (GVCH); Chaavadippara, 10°52'42.20"N, 76°48'43.56"E, 243m, 28 January 2020, Aswani & Maya, 5800 (GVCH) **(Plate 35: Fig. b)**.

Pseudarthria Wight & Arn., *Prodr. Fl. Ind. Orient.* 1: 209 (1834)

Pseudarthria viscida (L.) Wight & Arn., *Prodr. Fl. Ind. Orient.* 1: 209 (1834); Hook. f., *FBI* 2: 154 (1876); Gamble, *Fl. Madras* 334 (1918); Vajr., *Fl. Palghat Dist* 168 (1990); Sasidh., Fl. Parambikulam WLS 98 (2002).

Basionym : *Hedysarum viscidum* L., *Sp. Pl. [Linnaeus*] 2: 747 (1753).

Habit : Shrub
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)

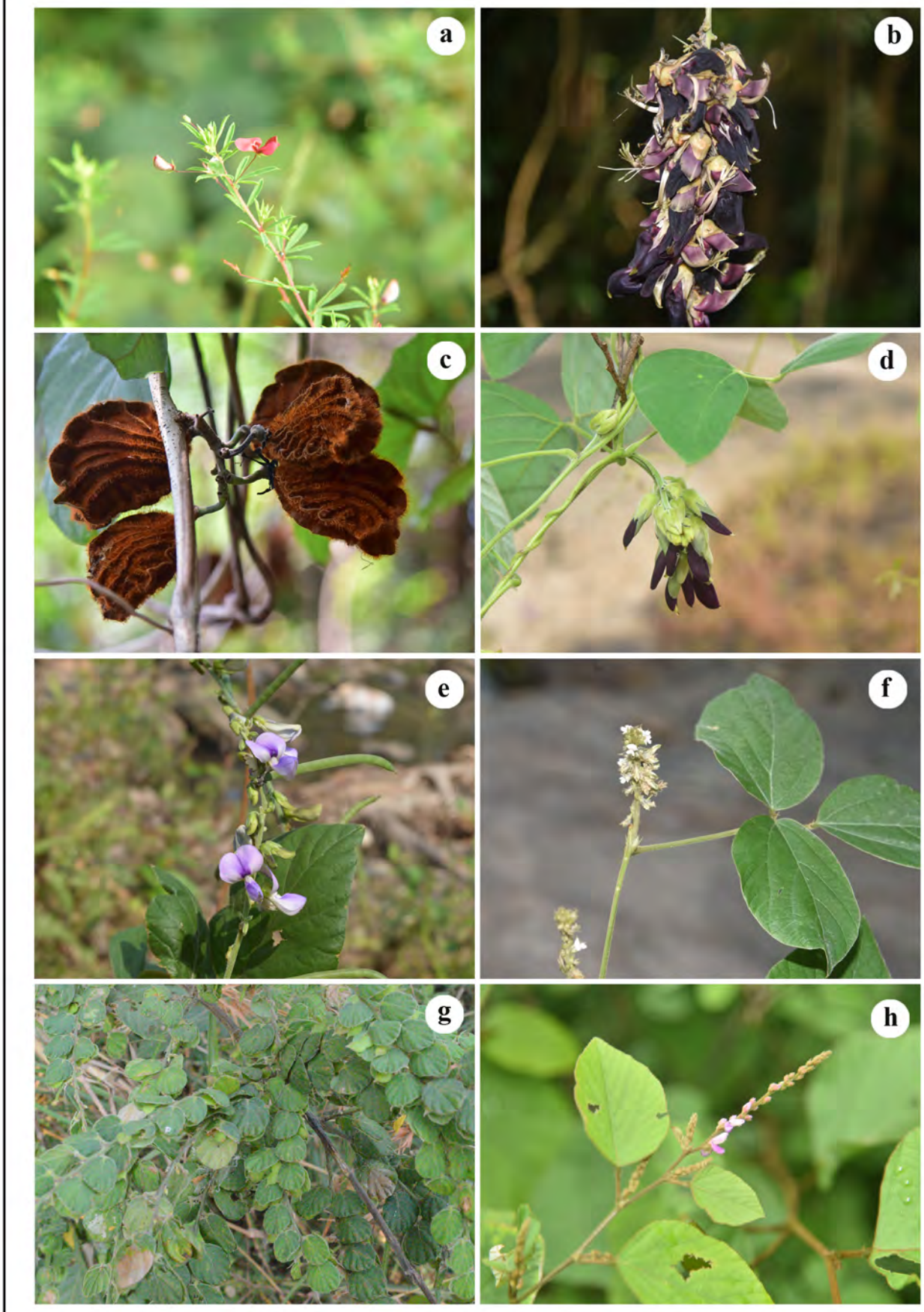

Plate 34: Fig. a. *Indigofera uniflora* Buch.-Ham. ex Roxb. **b.** *Mucuna bracteata* DC. ex Kurz. **c.** *Mucuna monosperma* DC. ex Wight **d.** *Mucuna pruriens* (L.) DC. **e.** *Neustanthus phaseoloides* Benth. **f.** *Ohwia caudata* (Thunb.) H.Ohashi **g.** *Phyllodium pulchellum* Desv. **h.** *Pleurolobus gangeticus* (L.) J.St.-Hil. ex H.Ohashi & K.Ohashi.

Habitat : Understorey of deciduous forests
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Common
Phenology : November - March
Altitude preference : Found in the lower altitudes and plains
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kottamutti waterfalls, 10°49'42.94"N, 76°46'47.87"E, 206m, 23 September 2018, Aswani & Maya, 2953 (GVCH); Pazhampullikaadu, 10°50'20.14"N, 76°38'07.09"E, 91m, 16 October 2018, Aswani & Maya, 3197 (GVCH); Ayyappan Mala, 10°49'19.20"N, 76°44'59.11"E, 177m, 07 March 2019, Aswani & Maya, 3845 (GVCH); Chottuppara, 10°52'37.92"N, 76°41'39.84"E, 346m, 14 May 2019, Aswani & Maya, 3914 (GVCH); Koyyamarakaadu, 10°47'41.24"N, 76°45'35.17"E, 145m, 30 November 2019, Aswani & Maya, 5361 (GVCH); Chaavadippara, 10°52'42.20" N, 76°48'43.56"E, 243m, 28 January 2020, Aswani & Maya, 5882 (GVCH); Ahalya campus, 10°47'37.00"N, 76°49'33.40"E, 156m, 24 September 2020, Aswani & Maya, 6305 (GVCH) **(Plate 35: Fig. c)**.

Pterocarpus Jacq., *Select. Stirp. Amer. Hist.* 283 (1763), nom. cons.

Pterocarpus marsupium Roxb., *Pl. Coromandel* 2(1): 9, t. 116 (1799); Hook. f., *FBI* 2: 239 (1876); Gamble, *Fl. Madras* 385 (1918); Vajr., *Fl. Palghat Dist* 168 (1990); Sasidh., *Fl. Parambikulam WLS* 98 (2002).

Habit : Tree
Ecosystem preference : Moist deciduous forests and in plains
Distribution : Indo - Pacific
IUCN Category : Near Threatened (NT)
Habitat : In hill slopes and the lower stretches of forests
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : September - October
Altitude preference : Found in all altitudes in the forest floors
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kozhimala, 10°50'04.17"N, 76°43'23.82"E, 207m, 09 November 2017, Aswani & Maya, 768 (GVCH); Ayyappan Mala, 10°49'10.38"N, 76°44'28.29"E, 310m, 26 June 2018, Aswani & Maya, 2560 (GVCH); Parachaathy, 10°50'54.24"N, 76°43'55.92"E, 159m, 02 January 2019, Aswani & Maya, 3611 (GVCH); Jamanthimala, 10°52'04.24"N,76°47'13.29"E, 723m, 23 June 2019, Aswani & Maya, 4019 (GVCH); Moochikadavu, 10°52'56.81"N, 76°42'11.22"E, 507m, 10 December 2019, Aswani & Maya, 5442 (GVCH).

Pycnospora R.Br. ex Wight & Arn., *Prodr. Fl. Ind. Orient.* 1: 197 (1834)

Pycnospora lutescens Schindl., *J. Bot.* 64: 145 (1926); Vajr., *Fl. Palghat Dist* 169 (1990); *Pycnospora hedysaroides* R. Br. ex Baker, Hook. f., *FBI* 2: 153 (1876); Gamble, *Fl. Madras* 333 (1918).

Habit : Climber
Ecosystem preference : Moist Deciduous forests and degraded forests
Distribution : Indo - Pacific, Holarctic, African and Australian
IUCN Category : Not Evaluated (NE)
Habitat : In the lower storey in deciduous forests
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Occasional
Phenology : September - December
Altitude preference : Found commonly in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kallanpuzha, 10°51'34.02"N , 76°42'40.16"E, 140m, 26 January 2018, Aswani & Maya, 1347 (GVCH);

Koyamarakaadu, 10°47'44.88"N, 76°45'38.52"E, 111m, 06 September 2018, Aswani & Maya, 2730 (GVCH).

Rothia Pers., *Syn. Pl. [Persoon]* 2: 638, [659] (1807)

Rothia indica Druce, *Bot. Exch. Club Brit. Isles Rep.* 3(5): 423 (1914); Vajr., *Fl. Palghat Dist* 170 (1990); Sasidh., *Fl. Parambikulam WLS* 100 (2002); *Rothia trifoliata* (Roth) Pers., Hook. f., *FBI* 2: 63 (1876); Gamble, *Fl. Madras* 279 (1918).

Habit : Herb
Ecosystem preference : Deciduous forests and in the plains
Distribution : Indo - Pacific and Australian
IUCN Category : Not Evaluated (NE)
Habitat : In catchment areas in the dams
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : August - December
Altitude preference : found in the lower altitudes in plains
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Thonikadavu, 10°50'04.96"N , 76° 40 '48.72"E, 116m, 04 June 2017, Aswani & Maya, 11 (GVCH) **(Plate 35: Fig. d)**.

Sesbania Scop., *Intr. Hist. Nat.* 308 (1777)

Sesbania bispinosa (Jacq.) W.Wight, *Bull. Bur. Pl. Industr.* U.S.D.A. No. 137, 15, No. 21797 (1909); Vajr., *Fl. Palghat Dist* 171 (1990); *Sesbania aculeata* (Willd.) Poir., Hook. f., *FBI* 2: 114 (1876); Gamble, *Fl. Madras* 323 (1918).

Basionym : *Aeschynomene bispinosa* Jacq. in *Icon. Pl. Rar.* 3: 13 (1794).

Habit : Shrub
Ecosystem preference : Marshy fields in the plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Margins of rock pools and marshes near plains
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : July - December
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Mayappallam, 10°48'09.35"N, 76°46'28.60"E, 137m, 10 May 2018, Aswani & Maya, 2141 (GVCH) **(Plate 35: Fig. e)**.

Smithia Aiton, *Hort. Kew. [W. Aiton]* 3: 496 (1789)

Key to species

1. Calyx membranous with anastomosing veins…..…..……2
- Calyx rigid with simple parallel veins……..…. *S. conferta*
2. Calyx lips equal; leaflets 3 pairs; lomentum joints reticulate with flat margins……...……. *S. gracilis*
- Calyx lip unequal; leaflets 4 - 5 pairs; lomentum joints reticulate and bordered…..…..…….*S. blanda*

Smithia blanda Wall. ex Wight & Arn. in *Prodr. Fl. Ind. Orient.* 1: 221 (1834); Hook. f., *FBI* 2: 151 (1876); Gamble, *Fl. Madras* 330 (1918); Vajr., *Fl. Palghat Dist* 172 (1990).

Habit : Herb
Ecosystem preference : Marshy areas in grasslands
Distribution : Indo - Pacific
Endemism : India
IUCN Category : Least Concern (LC)
Habitat : Exposed Rock Surfaces
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional

Phenology : October - January
Altitude preference : Found in lower altitudes in hillocks and forest floors
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Pallippara, 10°49'49.08"N , 76°43'47.28"E, 120m, 29 October 2017, Aswani & Maya, 753 (GVCH); Ollappallam, 10°49'53.78"N, 76°43'34.38"E, 132m, 25 November 2017, Aswani & Maya, 995 (GVCH) **(Plate 35: Fig. f)**.

Smithia conferta Sm., *Cycl. [A. Rees], (London ed.)* xxxiii. n. 2. (1816); Gamble, *Fl. Madras* 329 (1918); Vajr., *Fl. Palghat Dist* 172 (1990); Sasidh., *Fl. Parambikulam WLS* 101 (2002); *Smithia geminiflora* Roth, Hook. f., *FBI* 2:149 (1876); Gamble, *Fl. Madras* 329 (1918).

Habit : Herb
Ecosystem preference : Marshy areas in grasslands, also in the plains
Distribution : Indo - Pacific and Australian
IUCN Category : Not Evaluated (NE)
Habitat : Exposed Rock Surfaces near wet regions
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : November - February
Altitude preference : Found in lower altitudes in rocky outcrops
Specimens examined: INDIA, Kerala: Palakkad District, Walayar range, Kongampadam, 10°48'36.72"N, 76°46'51.96"E, 151m, 06 September 2019, Aswani & Maya, 4644 (GVCH); Anayappanchalla, 10°48'36.72"N, 76°46'51.96"E, 147m, 30 November 2019, Aswani & Maya, 5142 (GVCH); Mayappalam, 10°48'24.95"N, 76°48'32.77" E, 150m, 30 November 2019, Aswani & Maya, 5413 (GVCH) **(Plate 35: Fig. g)**.

Smithia gracilis Benth., *Linnaea* 24(6): 642 (1852); Hook. f., FBI 2: 150 (1876); Gamble, *Fl. Madras* 330 (1918).

Habit : Herb
Ecosystem preference : Grasslands
Distribution : Indo - Pacific
Endemism : Yes (Southern Western Ghats)
IUCN Category : Not Evaluated (NE)
Habitat : Exposed Rock Surfaces
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : December - March
Altitude preference : Found in lower altitudes in rocky outcrops
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Anayappanchalla, 10°48'24.82"N, 76°48'30.73"E, 147m,18 September 2018, Aswani & Maya, 2848 (GVCH).

Spatholobus Hassk., *Flora* 25(2, *Beibl.*): 52 (1842)

Spatholobus parviflorus Kuntze, *Revis. Gen. Pl.* 1: 205 (1891); Vajr., *Fl. Palghat Dist* 172 (1990); Sasidh., *Fl. Parambikulam WLS* 102 (2002); *Spatholobus roxburghii* Benth., Hook. f., *FBI* 2: 193 (1876); Gamble, *Fl. Madras* 358 (1918).

Habit : Climber
Ecosystem preference : Moist Deciduous forests
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Found in the outer forest tracks and in forest valleys
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Common
Phenology : September - April
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kottamutti waterfalls, 10°49'42.94"N, 76°46'47.87"E, 206m, 23 September 2018, Aswani & Maya, 2905 (GVCH);

Parachaathy, 10°50'38.76"N, 76°43'51.96"E, 147m, 02 January 2019, Aswani & Maya, 3549 (GVCH); Anakundu, 10°49'42.90"N, 76°46'13.00"E, 135m, 07 March 2019, Aswani & Maya, 3853 (GVCH); Parachaathy, 10°50'38.76"N, 76°43'51.96"E, 147m, 02 January 2019, Aswani & Maya, 3549 (GVCH); Anakundu, 10°49'42.90"N, 76°46'13.00"E, 135m, 07 March 2019, Aswani & Maya, 3853 (GVCH); Poolakunnu, 10°51'33.12"N, 76°42'29.52" E, 142m, 02 August 2019, Aswani & Maya, 4450 (GVCH); Ayyappan Koil, 10°49'07.40"N, 76°45'32.38"E, 170m, 28 January 2020, Aswani & Maya, 5930 (GVCH) **(Plate 35: Fig. h)**.

Stylosanthes Sw., *Prodr. [O. P. Swartz]* 7, 108 (1788)

Stylosanthes *fruticosa* (Retz.) Alston*, in Trimen, Hand-Book Fl. Ceylon vi. Suppl*., 77 (1931); Sasidh., *Fl. Parambikulam WLS* 102 (2002); *Stylosanthes mucronata* Willd., Hook. f., *FBI* 2:148 (1876); Gamble, *Fl. Madras* 326 (1918).

Habit : Herb
Ecosystem preference : moist deciduous forests and in plains
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Found in the outskirts of hillocks
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Occasional
Phenology : September - January
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Cheekuzhi, 10°50'8.57"N, 76°38'57.48"E, 104m, 16 October 2019, Aswani & Maya, 4788 (GVCH); Anayappanchalla, 10°48'22.74"N, 76°48'19.16"E, 147m, 30 November 2019, Aswani & Maya, 5224 (GVCH) **(Plate 36: Fig. a)**.

Tephrosia Pers., *Syn. Pl. [Persoon]* 2: 328 (1807)

Key to species

1. Style pubescent……..……2
- Style glabrous……..……...3
2. Leaflets upto 6.5cm long; corolla red……..……..…..*T. canarensis*
- Leaflets upto 3 cm long; corolla pinkish white……..… *T. maxima*
3. Procumbent herbs; inflorescence 1 - 3 flowered racemes…..…*T. pumila*
- Erect herbs or shrubs; inflorescence more than 3 - flowered racemes…….……..……4
4. Pods densely wooly tomentose….. ……..….*T. villosa*
- Pods glabrescent…….... *T. purpurea*

Tephrosia canarensis J. R. Drumm., in Gamble, *Fl. Madras* 319 (1918); Vajr., *Fl. Palghat Dist* 174 (1990); Sasidh., Fl. Parambikulam WLS 102 (2002).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found in the outskirts of forest tracks
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Occasional
Phenology : October - February
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Pallakaadu, 10°51'32.04"N , 76°37'25.68"E, 138m, 09 October 2018, Aswani & Maya, 3040 (GVCH); Cheekuzhi, 10°50'8.57"N, 76°38'57.48"E, 104m, 16 October 2019, Aswani & Maya, 4767 (GVCH) **(Plate 36: Fig. b)**.

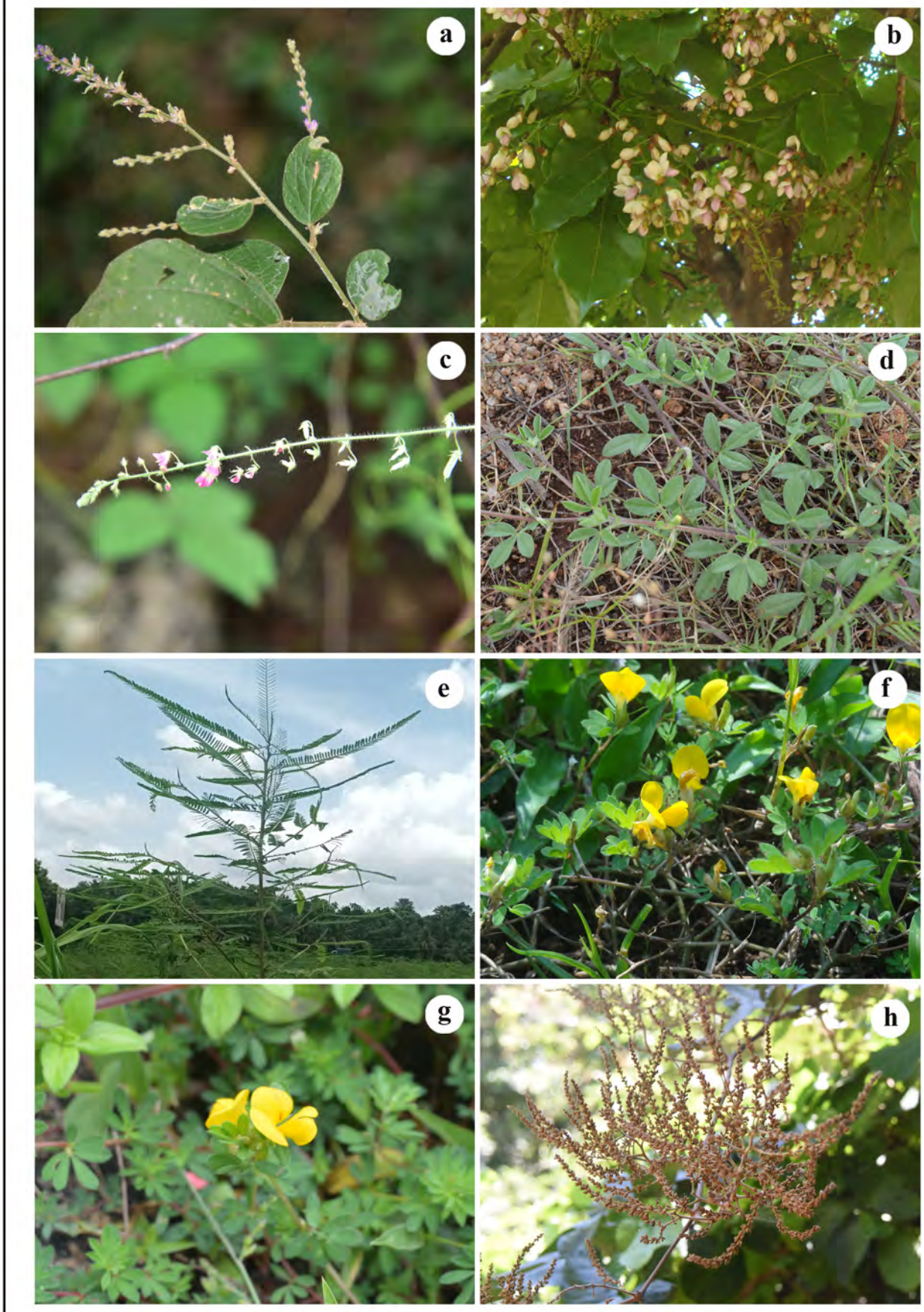

Plate 35: Fig. a. *Polhillides velutina* (Willd.) H.Ohashi & K.Ohashi **b.** *Pongamia pinnata* (L.) Pierre **c.** *Pseudarthria viscida* (L.) Wight & Arn. **d.** *Rothia indica* Druce **e.** *Sesbania bispinosa* (Jacq.) W.Wight **f.** *Smithia blanda* Wall. **g.** *Smithia conferta* Sm. **h.** *Spatholobus parviflorus* Kuntze.

Tephrosia maxima Pers., *Syn. Pl. [Persoon]* 2(2): 329 (1807); Gamble, *Fl. Madras* 319 (1918); *Tephrosia purpurea* (L.) Pers. var. *maxima* (L.) Baker, Hook.f., *FBI* 2: 113 (1876).

Habit : Shrub
Ecosystem preference : Moist deciduous forests and plains
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Found commonly in hillock systems
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Common
Phenology : June - September
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Pallippara, 10°49'48.36"N, 76°43'44.04"E, 120m, 29 October 2017, Aswani & Maya, 732 (GVCH); Ollappallam, 10°49'53.04"N, 76°43'41.52"E, 127m, 25 November 2017, Aswani & Maya, 921 (GVCH); Mayyappallam, 10°48'0.36"N, 76°45'58.68"E, 114m, 10 May 2018, Aswani & Maya, 2127 (GVCH); Chacolas, 10°51'23.03"N, 76°44'29.39"E, 219m, 02 August 2019, Aswani & Maya, 4515 (GVCH).

Tephrosia pumila Pers., *Syn. Pl. [Persoon]* 2(2): 330 (1807); Hook. f., *FBI* 2: 113 (1876); *Tephrosia purpurea* (L.) Pers. var. *pumila* (Lam.) Baker, Hook.f., *FBI* 2: 113 (1876); *Tephrosia procumbens* Buch.-Ham. ex Dunn in Gamble, *Fl. Madras* 320 (1918).

Habit : Herb
Ecosystem preference : Plains and wastelands
Distribution : Indo Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Found in outskirts of hillocks and in plains
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : July - September
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Ollappallam, 10°49'53.78"N , 76°43'34.38"E, 132m, 25 November 2017, Aswani & Maya, 908 (GVCH); Ayyappan Mala, 10°49'07.40"N, 76°45'32.38"E, 170m, 26 June 2018, Aswani & Maya, 2531 (GVCH) **(Plate 36: Fig. c)**.

Tephrosia purpurea (L.) Pers. in *Syn. Pl.* 2: 329 (1807); Hook. f., *FBI* 2: 112 (1876); Gamble, *Fl. Madras* 320 (1918); Vajr., *Fl. Palghat Dist* 174 (1990); Sasidh., *Fl. Parambikulam WLS* 103 (2002).

Basionym: *Cracca purpurea* L. in *Sp. Pl.*: 753 (1753).

Habit : Herb
Ecosystem preference : Deciduous forests and in plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Soil rich areas
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : October - December
Altitude preference : Found in lower altitudes in hillocks and in road sides
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Vedivachapara, 10°50'04.96"N, 76°40'48.72"E, 116m, 04 June 2017, Aswani & Maya, 72 (GVCH); Chemanamkadu, 10°48'46.51"N, 76°44'41.47"E, 154m, 06 January 2018, Aswani & Maya, 1128 (GVCH); Kava, 10°49'25.18"N, 76°43'29.96"E, 115m, 06 April 2018, Aswani & Maya, 1818 (GVCH); Mangalathumchalla, 10°49'04.07"N, 76°48'16.50"E, 151m, 18 September 2018, Aswani & Maya, 2750 (GVCH) **(Plate 36: Fig. d)**.

Tephrosia villosa (L.) Pers., *Syn. Pl. [Persoon]* 2: 329, no. 23 (1807); Hook. f., *FBI* 2: 113 (1876); Vajr., *Fl. Palghat Dist* 174 (1990); *Tephrosia hirta* (Buch.-Ham.) Gamble, *Fl. Madras* 318 (1918).

Basionym: *Cracca villosa* L., *Sp. Pl*. 2: 752 (1753)

Habit : Shrub
Ecosystem preference : Degraded forests and in plains
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Found commonly in hillocks and its margins
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Common
Phenology : December - April
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kongampaadam, 10°48'40.59"N, 76°46'51.94"E, 128m, 15 June 2018, Aswani & Maya, 2295 (GVCH); Anayappanchalla, 10°48'24.82"N, 76°48'30.73"E, 147m, 18 September 2018, Aswani & Maya, 2832 (GVCH); Thekke Malampuzha irrigation dept. guest house hillock, 10°50'03.76"N, 76°40'56.19"E, 120m, 23 November 2019, Aswani & Maya, 4936 (GVCH); Pallippara, 10°49'49.08"N, 76°43'47.28"E, 120m, 23 November 2019, Aswani & Maya, 5023 (GVCH); Ahalya campus, 10°47'43.08"N, 76°50'5.43"E, 150m, 24 September 2020, Aswani & Maya, 6293 (GVCH) **(Plate 36: Fig. e)**.

Teramnus P.Browne, *Civ. Nat. Hist. Jamaica* 290. 1756; *Sw. Prod. Veg. Ind. Occ.* 105. 1788

Teramnus labialis Spreng., *Syst. Veg., ed.* 16 [Sprengel] 3: 235 (1826); Hook. f., *FBI* 2:184 (1876); Gamble, *Fl. Madras* 352 (1918); Vajr., *Fl. Palghat Dist* 175 (1990); Sasidh., *Fl. Parambikulam WLS* 103 (2002).

Habit : Climber
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Often found as a climber in forest margins
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : October - December
Altitude preference : Found in lower altitudes in forest margins
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Moochikadavu, 10°52'7.32"N, 76°42'28.44" E, 245m, 30 November 2018, Aswani & Maya, 3241 (GVCH) **(Plate 36: Fig. f)**.

Uraria Desv., *J. Bot. Agric.* 1: 122, t. 5, f. 19 (1813)

Uraria rufescens Schindl., *Repert. Spec. Nov. Regni Veg.* 21: 14 (1925); Vajr., *Fl. Palghat Dist* 175 (1990); Sasidh., *Fl. Parambikulam WLS* 103 (2002); *Uraria hamosa* (Roxb.) Wall. ex Wight & Arn., Hook. f., *FBI* 2: 156 (1876); Gamble, *Fl. Madras* 336 (1918).

Habit : Shrub
Ecosystem preference : Moist deciduous forests and in plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found in wet regions in forests
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Rare
Phenology : November - January
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kochuthodu, 10°51'58.32"N, 76°42'22.32"

E, 177m, 18 December 2018, Aswani & Maya, 3353 (GVCH); Chaatapara waterfalls, 10°52'37.92"N, 76°41'39.84"E, 346m, 10 December 2019, Aswani & Maya, 5511 (GVCH) **(Plate 36: Fig. g)**.

Vigna Savi, *Nuovo Giorn. Lett. ser.* 3, 8: 113 (1824)

Key to species

1. Stigma terminal; style bearded only round the stigma…...…….2
- Stigma oblique; style bearded below the stigma…….……...……..3
2. Pods 50cm or more long…….. *V. unguiculata subsp. sesquipedalis*
- Pods upto 30cm long ...…… *..V. unguiculata* subsp. *unguiculata*
3. Plants climbers; pods glabrous……..……..… *V. umbellata*
- Plants erect herbs; pods hirsute……...……..……4
4. Seeds black……...… *V. mungo*
- Seeds green……...…..…. *V. radiata*

Vigna mungo (L.) Hepper, *Kew Bull.* 11(1): 128 (1956); Vajr., *Fl. Palghat Dist* 177 (1990); *Phaseolus mungo* L., Hook. f., *FBI* 2:313 (1878); Gamble, *Fl. Madras* 363 (1918).
Basionym: *Phaseolus mungo* L. in Mant. Pl.: 101 (1767).

Habit : Climber
Ecosystem preference : In plains and agricultural lands
Distribution : Indo - Pacific, Holarctic and African
IUCN Category : Not Evaluated (NE)
Habitat : Cultivated in agricultural lands
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Common
Phenology : August - December
Altitude preference : Cultivated in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Nadupathy colony, 10°51'27.72"N, 76°47'0.96"E, 546m, 17 February 2023, Aswani & Maya, 6534 (GVCH).

Vigna radiata (L.) R. Wilczek, *Fl. Congo Belge* 6: 386 (1954); *Phaseolus radiatus* L., Gamble, *Fl. Madras* 363 (1918); *Phaseolus mungo* L. var. *radiatus* (L.) Baker, Hook. f., *FBI* 2: 203 (1876).
Basionym: *Phaseolus radiatus* L., *Sp. Pl.* 2: 725 (1753).

Habit : Climber
Ecosystem preference : In plains
Distribution : Indo - Pacific and African
IUCN Category : Least Concern (LC)
Habitat : Cultivated in agricultural lands
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Common
Phenology : August - December
Altitude preference : Cultivated in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Akathethara, 10°49'3.06"N, 76°38'32.77"E, 116m, 10 April 2023, Aswani & Maya, 6590 (GVCH).

Vigna umbellata (Thunb.) Ohwi & H.Ohashi, *Journ. Jap. Bot.* xliv. 31 (1969); Vajr., *Fl. Palghat Dist* 177 (1990); Sasidh., *Fl. Parambikulam WLS* 104 (2002); *Phaseolus calcaratus* Roxb.; Hook. f., *FBI* 2: 203 (1876); Gamble, *Fl.Madras* 363 (1918).
Basionym: *Dolichos umbellatus* Thunb. in *Trans. Linn. Soc. London* 2: 339 (1794).

Habit : Climber
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In open forests
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare

Phenology : October - December
Altitude preference : Found in the hill slopes in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Neelippara, 10°51'47.52"N , 76° 37 '37.38"E, 312m, 15 September 2017, Aswani & Maya, 537 (GVCH) **(Plate 36: Fig. h)**.

Vigna unguiculata* subsp. *sesquipedalis (L.) Verdc., *Fl. Turkey* 3: 266 (1970).
Basionym: *Dolichos sesquipedalis* L., *Sp. Pl*., ed. 2. 2: 1019 (1763).

Habit : Climber
Ecosystem preference : In plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Cultivated in farms
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Common
Phenology : Throughout the year
Altitude preference : Found cultivated in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kadukkamkunnam, 10°48'48.76"N, 76°39'48.98"E, 107m, 23 March 2023, Aswani & Maya, 6568 (GVCH).

Vigna unguiculata subsp. unguiculata (L.) Walp., *Boissiera* (1978).; Vajr., *Fl. Palghat Dist* 177 (1990); *Dolichos biflorus* L., Hook. f., *FBI* 2: 210 (1876); Gamble, *Fl. Madras* 367 (1918).

Habit : Climber
Ecosystem preference : In plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Cultivated in farms
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Common
Phenology : Throughout the year
Altitude preference : Found cultivated in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Pampampallam, 10°48'45.85"N, 76° 47 '47.61"E, 166m, 27 March 2023, Aswani & Maya, 6580 (GVCH).

Zornia J.F.Gmel., *Syst. Nat., ed. 13[bis]*. 2: 1076, 1096 (1792)

Zornia gibbosa Span., *Linnaea* 15: 192 (1841); Vajr., *Fl. Palghat Dist* 177 (1990); Sasidh., *Fl. Parambikulam WLS* 104 (2002).

Basionym: *Zornia diphylla* subsp. *gibbosa* (Span.) Panigrahi & Murti, *Fl. Bilaspur District* 1: 223 (1989)

Habit : Herb
Ecosystem preference : Deciduous forests and plains
Distribution : Indo - Pacific, Holarctic and Australian
IUCN Category : Not Evaluated (NE)
Habitat : Degraded forests and in hillocks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : September - January
Altitude preference : Found in rocky regions in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Cheranpara, 10°49'29.62"N, 76°40'38.63"E, 87m, 27 June 2017, Aswani & Maya, 225 (GVCH); Ayyappan Mala, 10°49'07.19"N, 76°44'50.28"E, 130m, 26 June 2018, Aswani & Maya, 2529 (GVCH); Kongampaadam, 10°48'36.72"N, 76°46'51.96"E, 151m, 06 September 2019, Aswani & Maya, 4615 (GVCH); Koomachimala, 10°49'44.76"N, 76°40'34.59"E, 102m, 23 November 2019, Aswani & Maya, 4889 (GVCH); Ahalya campus, 10°47'43.08"N, 76°50'5.43"E,

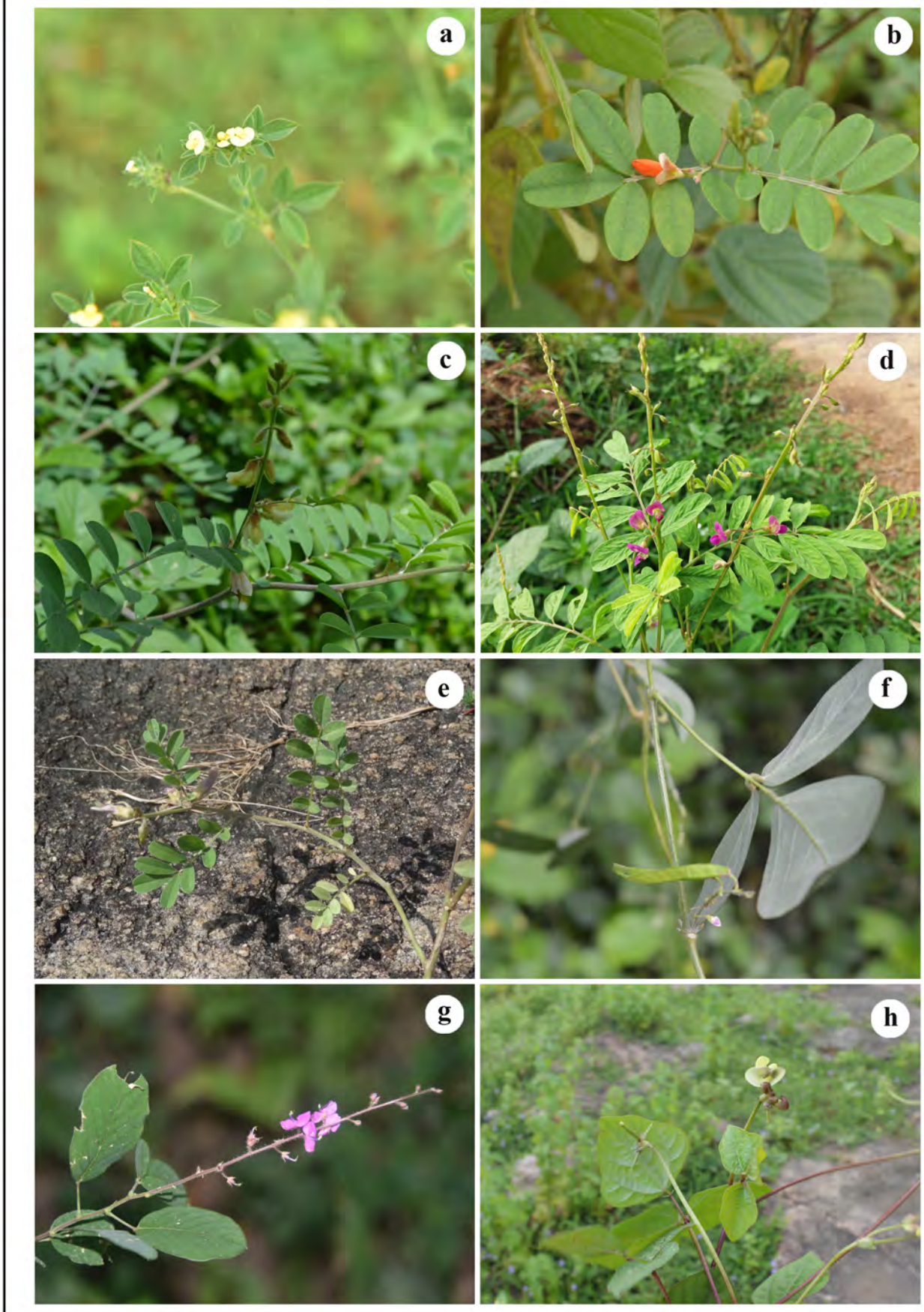

Plate 36: Fig. a. *Stylosanthes fruticosa* (Retz.) Alston **b.** *Tephrosia canarensis* J.R. Drumm. **c.** *Tephrosia pumila* Pers. **d.** *Tephrosia purpurea* Pers. **e.** *Tephrosia villosa* (L.) Pers. **f.** *Teramnus labialis* Spreng. **g.** *Uraria rufescens* Schindl. **h.** *Vigna umbellata* (Thunb.) Ohwi & H.Ohashi.

150m, Aswani & Maya, 6306 (GVCH) **(Plate 37: Fig. a)**.

Polygalaceae

Key to genera

1. Plants trees; fruits one seeded ……..……..…. *Xanthophyllum*
- Plants herbs; fruits two seeded…..……..……2
2. Flowers minute or small, sessile in terminal spikes…..…..….*Salomonia*
- Flowers fairly larger in stalked inflorescence…...…...…. *Polygala*

Polygala L., *Sp. Pl.* 2: 701 (1753)

Key to species

Caruncle cup shaped with three distinct teeth……..……..…….*P. bulbothrix*
Caruncle 3 - fid to the base ……..……..…..P. *persicariifolia*

Polygala bolbothrix Dunn, *in Gamble, Fl. Madras* i. 58 (1915); Vajr., *Fl. Palghat Dist* 64 (1990).

Habit : Herb
Ecosystem preference : Grasslands
Distribution : Indo - Pacific
Endemism : Southern Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Open grasslands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : January - May
Altitude preference : Found in all altitudes in rocky outcrops
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala, 10°52'20.64"N, 76°46'57.00"E, 863m, 09 January 2020, Aswani & Maya, 5759 (GVCH); Malampuzha Vanadurga temple, 10°49'48.81"N, 76°39'58.80"E, 99m, 03 September 2020, Aswani & Maya, 6218 (GVCH).

Polygala persicariifolia DC., *Prodr. [A. P. de Candolle]* 1: 326 (1824); Hook. f., *FBI* 1: 202 (1872); Gamble, *Fl. Madras* 58 (1915); Vajr., *Fl. Palghat Dist* 65 (1990).

Habit : Herb
Ecosystem preference : Grasslands
Distribution : Indo - Pacific, African and Australian
IUCN Category : Not Evaluated (NE)
Habitat : Open grassy regions in hillocks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : August - December
Altitude preference : Found in lower and medium altitudes in grassy regions
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kaduvachal, 10°50'26.38"N , 76°40'30.88"E, 105m, 16 July 2017, Aswani & Maya, 239 (GVCH); Neelippara, 10°51'47.52"N, 76°37'37.38"E, 312m, 15 September 2017, Aswani & Maya, 538 (GVCH); Pettikallu, 10°52'27.55"N, 76°42'44.32"E, 280m, 19 July 2019, Aswani & Maya, 4380 (GVCH); Cheekuzhi, 10°50'8.57"N, 76°38'57.48"E, 104m, 16 December 2019, Aswani & Maya, 4765 (GVCH) **(Plate 37: Fig. b)**.

Salomonia Lour., *Fl. Cochinch.* 1: 1, 14 (1790)

Salomonia ciliata DC., *Prodr. [A. P. de Candolle]* 1: 334 (1824); Hook. f., *FBI* 1: 206 (1872); *Salomonia oblongifolia* DC., Hook. f., *FBI* 1: 206 (1872); Gamble, *Fl. Madras* 56 (1915).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and Australian
IUCN Category : Not Evaluated (NE)

Habitat : Wet soils and in open forest lands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : October - December
Altitude preference : Found in open grassy forests in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Edamala, 10°50'28.32"N, 76° 38 '45.96"E, 184m, 16 October 2019, Aswani & Maya, 4839 (GVCH).

Xanthophyllum Roxb., *Pl. Coromandel* 3(4): 81 (1820)

Xanthophyllum flavescens Roxb., *Pl. Coromandel* 3(4): 82 (1820); Hook.f., *FBI* 1: 209 (1874); Gamble, *Fl. Madras* 59 (1915); Vajr., *Fl. Palghat Dist* 66 (1990); *Xanthophyllum arnottianum* Wight, Sasidh., *Fl. Parambikulam WLS* 19 (2002).

Habit : Tree
Ecosystem preference : Semi evergreen forests
Distribution : Indo - Pacific
Endemism : Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Found in canopy rich forest tracts
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : Throughout the year
Altitude preference : Found in medium and higher altitudes in semi evergreen forests
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, G. P. Nair Estate, 10°53'44.88"N, 76°39'46.08"E, 248m, 24 March 2018, Aswani & Maya, 1767 (GVCH); Jamanthimala, 10°51'53.64"N, 76°47'16.80"E, 586m, 09 January 2020, Aswani & Maya, 5662 (GVCH); Thanniplace, 10°52'43.32"N, 76°45'54.07"E, 972m, 28 January 2020, Aswani & Maya, 6023 (GVCH); Aduppukootimala, 10°50'03.12"N, 76°44'33.36"E, 330m, 16 February 2021, Aswani & Maya, 6476 (GVCH).

Rosales

Rosaceae

Prunus L., *Sp. Pl.* 1: 473 (1753)

Prunus ceylanica Miq., *Fl. Ned. Ind.* 1: 366; Vajr., *Fl. Palghat Dist* 190 (1990); Sasidh., *Fl. Parambikulam WLS* 113 (2002); *Pygeum acuminatum* Colebr., Hook. f., *FBI* 2: 318 (1878); Gamble, *Fl. Madras* 439 (1919); *Pygeum wightianum* Blume ex Muell., Hook. f., FBI 2: 319 (1878); Gamble, *Fl. Madras* 439 (1919).

Habit : Tree
Ecosystem preference : Semi-evergreen forests
Distribution : Indo - Pacific
IUCN Category : Endangered
Habitat : In hill slopes near grasslands
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : September - April
Altitude preference : Found in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Aatumala Adivaram, 10°53'24"N, 76°41'24"E, 1064m, 27 February 2020, Aswani & Maya, 6162 (GVCH) **(Plate 37: Fig. c)**.

Elaeagnaceae

Elaeagnus L., *Sp. Pl.* 1: 121 (1753)

Leaves silvery white below; perianth greenish - white……..……..… *E. indica*
Leaves with silvery and coppery scales mixed…….…..….. *E. conferta*

Elaeagnus conferta Roxb. *Fl. Ind*. 1: 460 (1820); Gamble, *Fl. Madras* 1246 (1925); Vajr., *Fl. Palghat Dist* 408 (1990); *Elaeagnus latifolia* L., Hook. f., *FBI* 5: 202 (1886).

Habit : Climber
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific and Holarctic
IUCN Category : Least Concern (LC)
Habitat : In open forests
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : January - May
Altitude preference : Found in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Charalmudi, 10°52' 41.26" N, 76°42'24.3"E, 435m, 27 February 2020, Aswani & Maya, 6080 (GVCH) **(Plate 37: Fig. d)**.

Elaeagnus indica Serv., *Bull. Herb. Boissier Ser.* II. viii. 393 (1908); Gamble, *Fl. Madras* 1246 (1925); Sasidh., *Fl. Parambikulam WLS* 273 (2002).

Habit : Climber
Ecosystem preference : Semi-evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In forest floors
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : December - April
Altitude preference : Found in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala, 10°52'14.73"N, 76°46'46.15"E, 894m, 09 January 2020, Aswani & Maya, 5682 (GVCH).

Rhamnaceae

Key to Genera

Climbing shrubs with tendrils; fruits 3 winged……...…*Gouania*

Erect shrubs or trees; fruits capsule without wings……...……*Ziziphus*

Gouania Jacq., *Select. Stirp. Amer. Hist.* 263 (1763)

Gouania microcarpa DC., *Prodr. [A. P. de Candolle]* 2: 40 (1825); Hook. f., *FBI* 1: 643 (1875); Gamble, *Fl. Madras* 225 (1918); Vajr., *Fl. Palghat Dist* 120 (1990).

Habit : Climber
Ecosystem preference : Semi-evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Near water sources
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : October - March
Altitude preference : Found in lower altitudes near rivers
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, G. P. Nair Estate, 10° 53 '40.83"N, 76° 39' 43.16"E, 230m, 24 March 2020, Aswani & Maya, 1731 (GVCH) **(Plate 37: Fig. e)**.

Ziziphus Mill., *Gard. Dict. Abr., ed.* 4. [1547] (1754)

Key to species

1. Flowers in long peduncled panicle; petals absent.....…… *Z. rugosa*
- Flowers in sessile or subsessile cymes or fascicles; petals present……...…….2
2. Styles 3……...……..*Z. xylopyrus*
- Styles 2……...…3
3. Leaves ovate; style united almost to the apex; drupes black when ripe……..…*Z. oenoplia*
- Leaves elliptic - ovate or elliptic - orbicular; style connate to the middle only; fruits yellow or orange when ripe……....*Z. mauritiana*

Ziziphus mauritiana Lam., *Encycl. [J. Lamarck & al.]* 3(1): 319 (1789); *Ziziphus jujuba* Lam., Hook. f., *FBI* 1: 632 (1875); Gamble, *Fl. Madras* 219 (1918).

Habit : Tree
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and African
IUCN Category : Least Concern (LC)
Habitat : In the degraded forest tracts and in the outskirts of forests
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : February - April
Altitude preference : Found commonly in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kava, 10°49'25.18"N, 76°43'29.96"E, 115m, 06 April 2018, Aswani & Maya, 1871 (GVCH); Vattappara, 10°49'29.47"N, 76°49'05.26"E, 162m, 18 September 2018, Aswani & Maya, 2788 (GVCH); Anayappanchalla, 10°48'25.92"N, 76°48'35.19"E, 157m, 18 September 2018, Aswani & Maya, 2807 (GVCH); Kongampadam, 10°48'24.38"N, 76°47'59.89"E, 138m, 30 November 2019, 10°48'24.38"N, 76°47'59.89"E, 138m, 30 November 2019, Aswani & Maya, 5254 (GVCH) **(Plate 37: Fig. f)**.

Ziziphus oenoplia (L.) Mill., *Gard. Dict., ed.* 8. [textus s.n.] *Ziziphus* no. 3 (1768); Hook. f., *FBI* 1:634 (1875); Gamble, *Fl. Madras* 220 (1918); Vajr., *Fl. Palghat Dist* 121 (1990); Sasidh., *Fl. Parambikulam WLS* 68 (2002).

Basionym : *Rhamnus oenoplia* L., *Sp. Pl*., ed. 2. 1: 282 (1762).

Habit : Climber
Ecosystem preference : Moist deciduous forests and also in the plains
Distribution : Indo - Pacific, Holarctic and Australian
IUCN Category : Not Evaluated (NE)
Habitat : Degraded forests and in the forest outskirts
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : November - March
Altitude preference : Found commonly in forest outskirts and in wastelands
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Vettiyil Sandal estate, 10°51'34.30"N, 76°42'28.02"E, 145m, 10 March 2018, Aswani & Maya, 1426 (GVCH); Walayar Dam, 10°50'15.57"N, 76°51'5.13"E, 190m, 09 May 2018, Aswani & Maya, 2064 (GVCH); Ayyappan Mala, 10°49'07.19"N, 76°44'50.28"E, 130m, 26 June 2018, Aswani & Maya, 2463 (GVCH); On the way to Jamanthimala, 10°51'53.64"N, 76°47'16.80"E, 586m, 23 June 2019, Aswani & Maya, 4016 (GVCH); Mathaapumala, 10°51'0.15"N, 76°49'53.62"E, 240m, 07 January 2020, Aswani & Maya, 5595 (GVCH) **(Plate 37: Fig. g)**.

Ziziphus rugosa Lam., *Encycl. [J. Lamarck & al.]* 3(1): 319 (1789); Hook. f., *FBI* 1: 636 (1875); Gamble, *Fl. Madras* 221 (1918); Vajr., *Fl. Palghat Dist* 121 (1990); Sasidh., *Fl. Parambikulam WLS* 68 (2002).

Habit : Shrub
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Understorey of forest floors
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : November - May
Altitude preference : Found commonly in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Pettikallu, 10°52'28.20"N, 76°42'38.52"E,

346m, 19 July 2019, Aswani & Maya, 4370 (GVCH); Chacolas, 10°51'15.48"N, 76°45'09.00"E, 265m, 02 August 2019, Aswani & Maya, 4565 (GVCH); Chaatapara waterfalls, 10°53'11.76"N, 76°42'15.84"E, 600m, 10 December 2019, Aswani & Maya, 5524 (GVCH); Jamanthimala, 10°52'18.19"N, 76°46'47.14"E, 921m, 09 January 2020, Aswani & Maya, 5700 (GVCH) **(Plate 37: Fig. h)**.

Ziziphus xylopyrus (Retz.) Willd., *Sp. Pl.*, ed. 4 [Willdenow] 1(2): 1104 (1798); Hook. f., *FBI* 1: 636 (1875); Gamble, *Fl. Madras* 220 (1918); Vajr., *Fl. Palghat Dist* 121 (1990); Sasidh., *Fl. Parambikulam WLS* 69 (2002).

Basionym : *Rhamnus xylopyrus* Retz., *Observ. Bot. (Retzius)* 2: 11 (1781).

Habit : Tree
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Understorey of forest floors
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : May - June
Altitude preference : Found rarely in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kalliyara, 10°53'8.52"N, 76° 39 '38.88"E, 170m, 24 March 2018, Aswani & Maya, 1563 (GVCH); G. P. Nair estate, 10° 53 '20.76 "N, 76° 39' 41.04"E, 179m, 24 March 2018, Aswani & Maya, 1723 (GVCH) **(Plate 38: Fig. a)**.

Ulmaceae

Holoptelea Planch., *Ann. Sci. Nat., Bot. sér.* 3, 10: 259 (1848)

Holoptelea integrifolia (Roxb.) Planch., *Ann. Sci. Nat., Bot. sér.* 3, 10: 259 (1848); Hook. f., *FBI* 5: 481 (1888); Gamble, *Fl. Madras* 1348 (1928); Vajr., *Fl. Palghat Dist* 441 (1990); Sasidh., *Fl. Parambikulam WLS* 307 (2002).

Basionym : *Ulmus integrifolia* Roxb., *Pl. Coromandel* 1(3): 56 (1796).

Habit : Tree
Ecosystem preference : Degraded forests and in plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In deciduous forests and in plains
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : December - March
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, G. P. Nair Estate, 10°53'20.38"N, 76°39'41.73"E, 176m, 24 March 2018, Aswani & Maya, 1614 (GVCH); Walayar Dam, 10°50'24.58"N, 76°51'01.52"E, 199m, 09 May 2018, Aswani & Maya, 2027 (GVCH); Malampuzha irrigation dept guest house hillock, 10°50'03.76"N, 76°40'56.19"E, 120m, 18 May 2018, Aswani & Maya, 2168 (GVCH); Ayyappan Mala, 10°48'59.96"N, 76°45'22.61"E, 132m, 26 June 2018, Aswani & Maya, 2415 (GVCH); Koyamarakaadu, 10°47'40.58"N, 76°45'27.05"E, 139m, 06 September 2018, Aswani & Maya, 2695 (GVCH) **(Plate 38: Fig. b)**.

Cannabaceae

Trema orientale Blume, *Mus. Bot.* 2(1-8): 62. (1856); Hook. f., *FBI* 5: 484 (1888); C.E.C. Fisch. in Gamble, *Fl. Madras* 1350 (1928); Vajr., *Fl. Palghat Dist* 442 (1990); Sasidh., *Fl. Parambikulam WLS* 307 (2002).

Habit : Tree
Ecosystem preference : Degraded forests, deciduous forests and in plains
Distribution : Indo - Pacific, Holarctic,
IUCN Category : Not Evaluated (NE)
Habitat : In deciduous forests and in plains
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : December - March
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Way to Ayyappan Mala, 10°49'07.19"N, 76°44'50.28"E, 130m, 07 March 2019, Aswani & Maya, 3787 (GVCH); Kattadikunnu, 10°50'26.52"N, 76°39'2.16"E, 151m, 16 October 2019, Aswani & Maya, 4823 (GVCH); Pallippara, 10°49'48.36"N, 76°43'44.04"E, 120m, 23 November 2019, Aswani & Maya, 4996 (GVCH) **(Plate 38: Fig. c).**

Moraceae

Key to genera

1. Plants with watery latex…..... Morus
   Plants with milky latex……..…2
2. Stamens influxed in bud; anthers reversed……..….. *Streblus*
- Stamens and anthers straight in bud…...……..……3
3. All flowers crowded in oblong or globose receptacles …... *Artocarpus*
- All flowers crowded in the inner surface of a fleshy receptacle with more or less completely closed bracts…..…….……..……. *Ficus*

Artocarpus J. R. Forst. & G.Forst., *Char. Gen. Pl., ed.* 2. 101 (1776), nom. cons.

Key to species

1. Leaves pinnatifid……..…. *A. altilis*
- Leaves simple, ovate or obovate - oblong……..……..……2
2. Branchlets glabrous; lateral nerves 6 - 8 pairs; intercostae scalariform and prominent; stipule spathaceaous; fruits tubercled…….....*A. heterophyllus*
- Branchlets hirsute; lateral nerves 6 - 12 pairs;intercostae scalariform, faint; stipule non - spathaceaous; fruits spinous……..….*A. hirsutus*

Artocarpus altilis (Parkinson) Fosberg, *J. Wash. Acad. Sci.* 31: 95 (1941); *Artocarpus communis* J.R. Forst. & G. Forst., Manilal & Sivar., *Fl. Calicut* 277 (1982); C.N. Mohanan, *Fl. Quilon Dist* 376 (1984); V.S. Ramach. & V.J. Nair, *Fl. Cannanore Dis*t 430 (1988); V.T. Antony, *Syst. Stud. Fl. Kottayam Dist* 374 (1989); *Artocarpus incisus* (Thunb.) L. f., Sunil & Sivad., *Fl. Alappuzha Dist* 659 (2009); Ratheesh, *Fl. Stud. Wayanad Dist* 777 (2009); Sunil, *Fl. Pl. Diver. Ernakulam Dist* 372 (2016).

Basionym: *Sitodium altile* Parkinson in *J. Voy. South Seas*: 45 (1773).

Habit : Tree
Ecosystem preference : In plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Cultivated in plains and in home steads
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : January - June
Altitude preference : Found commonly in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kadukamkunnam, 10°48'48.76"N, 76°39'48.98"E, 107m, 23 March 2023, Aswani & Maya, 6566 (GVCH).

Artocarpus heterophyllus Lam., *Encycl. [J. Lamarck & al.]* 3(1): 209 (1789); Vajr., *Fl.*

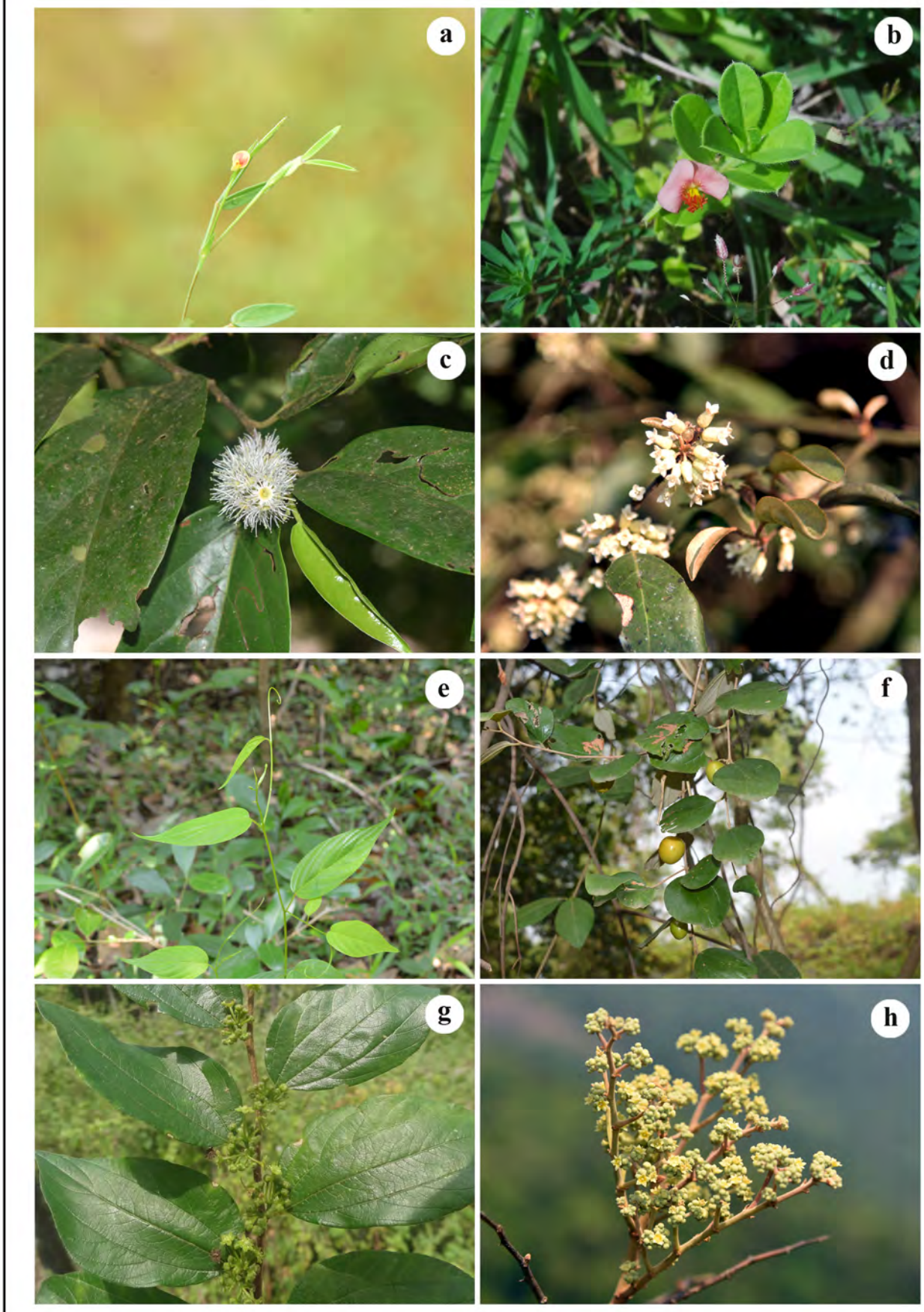

Plate 37: Fig. a. *Zornia gibbosa* Span. **b.** *Polygala persicariifolia* DC. **c.** *Prunus ceylanica* Miq. **d.** *Elaeagnus conferta* Roxb. **e.** *Gouania microcarpa* DC. **f.** *Ziziphus mauritiana* Lam. **g.** *Ziziphus oenoplia* (L.) Mill. **h.** *Ziziphus rugosa* Lam.

Palghat Dist 443 (1990); Sasidh., *Fl. Parambikulam WLS* 309 (2002); *Artocarpus integrifolius* Wight, Hook. f., *FBI* 5: 541 (1888); Gamble, *Fl. Madras* 1369 (1928).

Habit : Tree
Ecosystem preference : Degraded forests and in plains
Distribution : Indo – Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Often cultivated in plains and rarely runs wild
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : November - April
Altitude preference : Found commonly in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, G. P. Nair Estate, 10°53'29.76"N , 76°39'50.76"E, 284m, 24 March 2018, Aswani & Maya, 1773 (GVCH); Pallakaadu, 10°51'32.04"N, 76°37'25.68"E, 138m, 09 October 2018, Aswani & Maya, 3033 (GVCH); Pazhampullikaadu, 10°50'09.55"N, 76°38'28.33"E, 89m, 16 October 2018, Aswani & Maya, 3183 (GVCH); Charalmudi, 10°52'27.48" N, 76°42'28.72"E, 386m, 28 February 2020, Aswani & Maya, 6077 (GVCH).

Artocarpus hirsutus Lam., *Encycl. [J. Lamarck & al.]* 3(1): 211 (1789); Hook. f., *FBI* 5: 541 (1888); Gamble, *Fl. Madras* 1369 (1928); Vajr., *Fl. Palghat Dist* 443 (1990); Sasidh., Fl. Parambikulam WLS 309 (2002).

Habit : Tree
Ecosystem preference : Moist deciduous and semi - evergreen forests
Distribution : Indo - Pacific
Endemism : Southern Western Ghats
IUCN Category : Least Concern (LC)
Habitat : In high canopy forest tracks
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : December - March
Altitude preference : Found in all altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kalliyara, 10°53'8.52"N, 76°39'38.88"E, 170m, 24 March 2018, Aswani & Maya, 1556 (GVCH); Thanniplace, 10°52'43.32"N, 76°45'54.07"E, 972m, 28 January 2020, Aswani & Maya, 6022 (GVCH) **(Plate 38: Fig. d)**.

Ficus L., *Sp. Pl.* 2: 1059 (1753)

Key to species

1. Leaves all opposite; very rarely alternate……..…. *F. hispida*
- Leaves all alternate……...……..2
2. Figs cauliflorous…….. *F. racemosa*
- Figs non - cauliflorous…..……..3
3. Inflorescence receptacle solitary or sometimes paired in the axils of leaves……..…..…..……4
- Inflorescence receptacle two or more (2 - 6) in the axils of leaves……...…….. *F. tsjakela*
4. Receptacles sessile or subsessile……...…….5
- Receptacles with distinct peduncles…….……..…..……8
5. Leaves glandless…*F. benghalensis*
- Leaves with glands…….……6
6. Trees usually epiphytic, aerial roots numerous ……..... *F. microcarpa*
- Trees usually independent; aerial roots absent…...……...…..…….7
7. Leaf base truncate; primary nerves 8 pairs; apex narrowly caudate, acuminate, margins wavy; fruits depressed globose, dark purple when ripe…….…….*F. religiosa*
- Leaf base deeply cordate; primary nerves 5 - 7 paired; apex of leaves finely caudate, margins subundulate; fruits depressed globose, purple with green dots when ripe…...…..……*F. arnottiana*

8. Leaf base slightly asymmetrical or gibbose…….. *F. tinctoria*
- Leaf base equal…...……..….9
9. Leaves scabrid on both surfaces without coriaceous; margins serrate……..…….. *F. exasperata*
- Leaves glabrous or glabrescent; margins entire……..……10
10. Figs with persistent bracts at base……...……..……..11
- Figs with deciduous bracts at base……...……... *F. callosa*
11. Petiole upto 5 cm long; leaves upto 15 cm long……..…...…..12
- Petiole more than 10cm long; leaves more than 18 cm long……....…..…13
12. Basal bracts glabrous; figs red in colour…..……...…..… *F. beddomei*
- Basal bracts tomentose; figs yellow in colour……... *F. dalhousieae*
13. Lateral nerves 9 - 18 pairs, parallel, prominent, looped near the margin, intercostae reticulate, prominent …….…….... *F. costata*
- Lateral nerves 5 - 15 pairs, pinnate, prominent, faint towards margin, intercostae reticulate faint…… ……..……. *F. virens*

Ficus arnottiana (Miq.) Miq., *Ann. Mus. Bot. Lugduno-Batavi* 3: 287 (1867); Hook. f., *FBI* 5: 513 (1888); Gamble, *Fl. Madras* 1363 (1928); Sasidh., *Fl. Parambikulam WLS* 311 (2002).

Basionym : *Urostigma arnottianum* Miq., *London J. Bot*. 6: 564 (1847).

Habit : Tree
Ecosystem preference : Semi-evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In rocky open hill slopes
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : December - April
Altitude preference : Found in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kundanmala, 10°53'31.2"N, 76°41'52.8"E, 933m, 28 February 2020, Aswani & Maya, 6115 (GVCH) **(Plate 38: Fig. e)**.

Ficus beddomei King, *Ann. Roy. Bot. Gard. (Calcutta)* 1: 26, t. 24 (1888); Hook. f., *FBI* 5: 502 (1888); Gamble, *Fl. Madras* 1364 (1928); Vajr., *Fl. Palghat Dist* 446 (1990); Sasidh., *Fl. Parambikulam WLS* 311 (2002).

Habit : Tree
Ecosystem preference : Semi-evergreen forests
Distribution : Indo - Pacific
Endemism : Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Near water sources in canopy rich forests
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : July - February
Altitude preference : Found in medium and higher altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, G. P. Nair Estate, 10°53'23.22"N, 76°39'42.80"E, 190m, 24 March 2018, Aswani & Maya, 1666 (GVCH); Ayyappan Mala, 10°49'10.38"N, 76°44'28.29"E, 310m, 26 June 2018, Aswani & Maya, 2595 (GVCH); Chottupara waterfalls, 10°52'37.92"N, 76°41'39.84"E, 345m, 14 May 2019, Aswani & Maya, 3981 (GVCH); Aatumala Thodu, 10° 53' 52.08" N, 76° 41' 24" E, 1010m, 28 February 2022, Aswani & Maya, 6161 (GVCH).

Ficus benghalensis L., *Sp. Pl.* 2: 1059 (1753); Hook. f., *FBI* 5: 499 (1888); Gamble, *Fl. Madras* 1361 (1928); Vajr., *Fl. Palghat Dist* 450 (1990).

Habit : Tree

Ecosystem preference : Moist deciduous forests and in the plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In the outskirts of forests and in other residential areas
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : May - August
Altitude preference : Found commonly in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Walayar Dam, 10°50'15.57"N , 76°51'5.13"E, 190m, 09 May 2018, Aswani & Maya, 2026 (GVCH); Thekke Malampuzha, 10°50'07.08"N, 76°40'26.15"E, 225m, 18 May 2018, Aswani & Maya, 2276 (GVCH); Ahalia campus, 10°47'37.00"N, 76°49'33.40"E, 156m, 24 September 2020, Aswani & Maya, 6322 (GVCH) **(Plate 38: Fig. f)**.

Ficus callosa Willd., *Mem. Acad. Berl.* (1798) 102; Hook. f., *FBI* 5: 516 (1888); Gamble, *Fl. Madras* 1364 (1928); Vajr., *Fl. Palghat Dist* 446 (1990); Sasidh., *Fl. Parambikulam WLS* 311 (2002).

Habit : Tree
Ecosystem preference : Semi-evergreen
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Rocky regions near water sources
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : March - April
Altitude preference : Found in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Chaatapara waterfalls, 10°53'11.76"N, 76°42'15.84"E, 600m, 10 December 2019, Aswani & Maya, 5535 (GVCH) **(Plate 38: Fig. g)**.

Ficus costata Aiton, *Hort. Kew. [W. Aiton]* 3: 453 (1789); Sasidh., *Fl. Parambikulam WLS* 312 (2002); *Ficus caudiculata* Trimen, Hook. f., *FBI* 5: 510 (1888); *Ficus mooniana* King in Hook. f., *FBI* 5: 514 (1888).

Habit : Tree
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Near water sources in forests
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : November - December
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Akamalavaram - Thakaramada, 10°52'11.03"N, 76°42'59.76"E, 240m, 30 November 2019, Aswani & Maya, 3234 (GVCH).

Ficus dalhousieae Miq., *Ann. Mus. Bot. Lugduno-Batavi* 3: 285 (1867); Hook. f., *FBI* 5: 499 (1888); Gamble, *Fl. Madras* 1364 (1928); Vajr., *Fl. Palghat Dist* 446 (1990); Sasidh., *Fl. Parambikulam WLS* 312 (2002).

Habit : Tree
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
Endemism : Southern Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : In rocky regions near water sources
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : December - January
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Akamalavaram - Thakaramada, 10°52'11.03"N, 76°42'59.76"E, 240m, 30

November 2019, Aswani & Maya, 3224 (GVCH) **(Plate 38: Fig. h)**.

Ficus exasperata Vahl, *Enum. Pl. [Vahl]* ii. 197. (1805); Vajr., *Fl. Palghat Dist* 447 (1990); Sasidh., *Fl. Parambikulam WLS* 312 (2002); *Ficus asperrima* Roxb., Hook. f., *FBI* 5: 522 (1888); Gamble, *Fl. Madras* 1366 (1928).

Habit : Tree
Ecosystem preference : Moist deciduous forest and in the plains
Distribution : Indo - Pacific and African
IUCN Category : Least Concern (LC)
Habitat : In forest outskirts and in wastelands
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : February - April
Altitude preference : Found commonly in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kallanpuzha, 10°51'34.02"N, 76°42'40.16"E, 140m, 26 January 2018, Aswani & Maya, 1332 (GVCH); . Malampuzha irrigation dept guest house hillock, 10°50'03.76"N, 76°40'56.19"E, 120m, 18 May 2018, Aswani & Maya, 2215 (GVCH); Pazhampullikaadu, 10°50'09.55"N, 76°38'28.33"E, 89m, 16 October 2018, Aswani & Maya, 3142 (GVCH); Vanadurga temple, 10°49'48.81"N, 76°39'58.80"E, 99m, 03 September 2020, Aswani & Maya, 6200 (GVCH).

Ficus hispida L.f., *Suppl. Pl.* 442 (1782); Hook. f., *FBI* 5: 522 (1888); Gamble, *Fl. Madras* 1367 (1928); Vajr., *Fl. Palghat Dist* 447 (1990); Sasidh., *Fl. Parambikulam WLS* 313 (2002).

Habit : Tree
Ecosystem preference : Moist deciduous forests and in the plains
Distribution : Indo - Pacific and Australian
IUCN Category : Least Concern (LC)
Habitat : In forest outskirts and in disturbed forests
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : September - May
Altitude preference : Found commonly in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala, 10°49'44.76"N, 76°40'34.59"E, 102m, 20 June 2017, Aswani & Maya, 148 (GVCH); Kalliyara, 10°52'51.24"N, 76°39'24.84"E, 128m, 24 March 2018, Aswani & Maya, 1539 (GVCH); Parakkallu- Neelikunnu, 10°51'30.14"N, 76°37'30.67"E, 155m, 27 April 2018, Aswani & Maya, 1946 (GVCH); Chaatapara waterfalls, 10°52'56.81"N, 76°42'11.22"E, 507m, 10 December 2019, Aswani & Maya, 5532 (GVCH); Vanadurga temple, 10°49'48.81"N, 76°39'58.80"E, 99m, 09 September 2020, Aswani & Maya, 6203 (GVCH).

Ficus microcarpa L.f., *Suppl. Pl.* 442 (1782); Vajr., *Fl. Palghat Dist* 448 (1990); Sasidh., *Fl. Parambikulam WLS* 313 (2002); *Ficus retusa* King, Hook. f., *FBI* 5: 511 (1888); Gamble, *Fl. Madras* 1362 (1928); *Ficus retusa* var. *nitida* Hook. f., *FBI* 5: 511 (1888); Gamble, *Fl. Madras* 1362 (1928).

Habit : Tree
Ecosystem preference : Deciduous forests
Distribution : Indo - Pacific and Holarctic
IUCN Category : Least Concern (LC)
Habitat : In margins of forests
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : March - May
Altitude preference : Found commonly in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Moochikadavu, 10°52'13.80"N ,

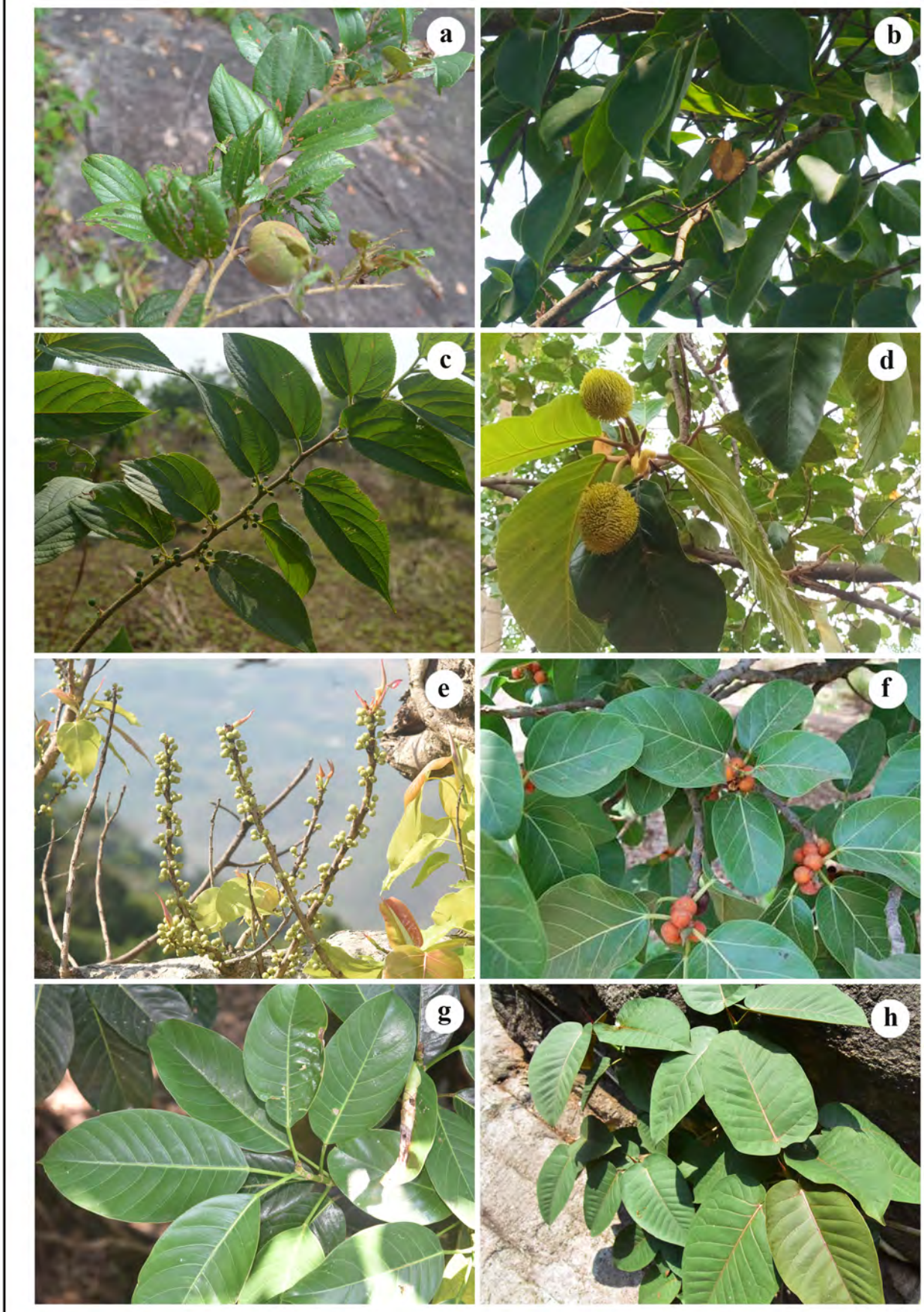

Plate 38: Fig. a. *Ziziphus xylopyrus* (Retz.) Willd. **b.** *Holoptelea integrifolia* (Roxb.) Planch. **c.** *Trema orientale* Blume **d.** *Artocarpus hirsutus* Lam. **e.** *Ficus arnottiana* (Miq.) Miq. **f.** *Ficus benghalensis* L. **g.** *Ficus callosa* Willd. **h.** *Ficus dalhousieae* Miq.

76°42'30.96"E, 258m, 10 March 2018, Aswani & Maya, 1459 (GVCH); G. P. Nair Estate, 10°53'40.83"N, 76°39'43.16"E, 230m, 24 March 2018, Aswani & Maya, 1745 (GVCH); Kochuthodu, 10°51'58.32"N, 76°42'22.32"E, 177m, 18 December 2018, Aswani & Maya, 3319 (GVCH); Anakundu, 10°49'42.90"N, 76°46'13.00"E, 135m, 07 March 2019, Aswani & Maya, 3865 (GVCH).

Ficus racemosa L., *Sp. Pl.* 2: 1060 (1753); Vajr., *Fl. Palghat Dist* 448 (1990); Sasidh., *Fl. Parambikulam WLS* 313 (2002); *Ficus glomerata* Roxb., Hook. f., *FBI* 5: 535 (1888); Gamble, *Fl. Madras* 1364 (1928).

Habit : Tree
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and Australian
IUCN Category : Least Concern (LC)
Habitat : In forest floors and sometimes near water sources
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : February - May
Altitude preference : Found commonly in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kezhakootimala, 10°51'53.30"N, 76°37'36.39"E, 362m, 15 September 2017, Aswani & Maya, 520 (GVCH); Kottamutti waterfalls, 10°49'46.20"N, 76°46'47.28"E, 203m, 23 September 2018, Aswani & Maya, 2934 (GVCH); Parachaathy, 10°50'38.76"N, 76°43'51.96"E, 146m, 02 January 2019, Aswani & Maya, 354 (GVCH); Aduppukootimala - Kanyarmuttu, 10°49'59.16"N, 76°44'31.56"E, 298m, 12 January 2019, Aswani & Maya, 3674 (GVCH); Chaavadippara, 10°52'32.16"N, 76°48'28.04"E, 303m, 28 January 2020, Aswani & Maya, 5880 (GVCH).

Ficus religiosa L., *Sp. Pl.* 2: 1059 (1753); Hook. f., *FBI* 5: 513 (1888); Gamble, *Fl. Madras* 1363 (1928); Vajr., *Fl. Palghat Dist* 450 (1990); Sasidh., *Fl. Parambikulam WLS* 314 (2002).

Habit : Tree
Ecosystem preference : Planted in the forest outskirts and in hillocks
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : In plains and seen planted in temple premises and in road sides
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : November - February
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala, 10°49'45.32"N, 76°40'22.02"E, 228m, 20 June 2017, Aswani & Maya, 133 (GVCH); Walayar Dam, 10°50'15.57"N, 76°51'5.13"E, 190m, 09 May 2018, Aswani & Maya, 2048 (GVCH); Ayyappan Mala, 10°49'11.44"N, 76°44'24.46"E, 346m, 26 June 2018, Aswani & Maya, 2569 (GVCH).

Ficus tinctoria G.Forst., *Fl. Ins. Austr.* 76 (1786); *Ficus tinctoria* G. Forst. ssp. *parasitica* (Koen. ex Willd.) Corner, Vajr., *Fl. Palghat Dist* 449 (1990); Sasidh., *Fl. Parambikulam WLS* 315 (2002); *Ficus gibbosa* Blume var. *parasitica* (Koenig ex Willd.) King, Hook. f., *FBI* 5: 497 (1888); Gamble, *Fl. Madras* 1365 (1928).

Habit : Tree
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Near water sources
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : March - April
Altitude preference : Found in lower altitudes

Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Cheranpara, 10°49'29.62"N , 76° 40 '38.63"E, 87m, 27 June 2017, Aswani & Maya, 210 (GVCH).

Ficus tsjakela Burm.f., *Fl. Ind. (N. L. Burman)* 227 (1768); Hook. f., *FBI* 5: 514 (1888); Gamble, *Fl. Madras* 1362 (1928); Vajr., *Fl. Palghat Dist* 450 (1990); Sasidh., *Fl. Parambikulam WLS* 315 (2002).

Habit : Tree
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Epiphyte in rocky forest floors near water sources but mature trees become independent
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : March - April
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kanyarmuttu, 10°49'59.16"N , 76°44'31.56"E, 298m, 12 January 2019, Aswani & Maya, 3684 (GVCH); Akamalavaram – Pettikallu, 10°53'2.04" N, 76°42'13.92" E, 539m, 19 July 2019, Aswani & Maya, 4387 (GVCH); Chacolas, 10°51'16.20"N, 76°45'05.76"E, 286m, 02 August 2019, Aswani & Maya, 4536 (GVCH) **(Plate 39: Fig. a)**.

Ficus virens Aiton, *Hort. Kew. [W. Aiton]* 3: 451 (1789); *Ficus infectoria* Roxb., Hook. f., *FBI* 5: 515 (1888); Gamble, *Fl. Madras* 1362 (1928).

Habit : Tree
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Near water sources
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : January - March
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kavarakundu, 10°52'14.88"N , 76°42'38.88"E, 263m, 10 March 2018, Aswani & Maya, 1515 (GVCH); G. P. Nair Estate, 10° 53 '26.52 "N, 76° 39' 41.04"E, 180m, 24 March 2018, Aswani & Maya, 1699 (GVCH); G. P. Nair Estate, 10° 53 '40.83 "N, 76° 39' 43.16"E, 230m, 24 March 2018, Aswani & Maya, 1718 (GVCH).

Morus L., *Sp. Pl.* 2: 986 (1753)

Morus alba L., *Sp. Pl.* 2: 986 (1753); Hook. f., *FBI* 5: 492 (1888); Gamble, *Fl. Madras* 1370 (1928).

Habit : Tree
Ecosystem preference : Cultivated
Distribution : Indo - Pacific and Holarctic
IUCN Category : Least Concern (LC)
Habitat : Found as a escape to wild
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Chaavadippara, 10° 52'42.20" N, 76°48'43.56"E, 242m, 28 January 2020, Aswani & Maya, 5812 (GVCH).

Streblus Lour., *Fl. Cochinch.* 2: 614 (1790)

Streblus asper Lour., *Fl. Cochinch.* 2: 615 (1790); Hook. f., *FBI* 5: 489 (1888); Gamble, *Fl. Madras* 1353 (1928); Vajr., *Fl. Palghat Dist* 450 (1990).

Habit : Tree

Ecosystem preference : Moist deciduous forests and in the plains
Distribution : Indo - Pacific and Holarctic
IUCN Category : Least Concern (LC)
Habitat : In degraded forests and in wastelands
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : January - October
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Vedivachapara, 10°50'04.96"N, 76°40'48.72"E, 116m, 04 June 2017, Aswani & Maya, 73 (GVCH); Way to Ayyappan Mala, 10°48'59.96"N, 76°45'22.61"E, 132m, 06 January 2018, Aswani & Maya, 1206 (GVCH); Walayar Dam, 10°50'24.58"N, 76°51'01.52"E, 199m, 09 May 2018, Aswani & Maya, 2024 (GVCH); Koyamarakaadu, 10°47'44.88"N, 76°45'38.52"E, 111m, 06 September 2018, Aswani & Maya, 2696 (GVCH); Parachaathy, 10°50'54.24"N, 76°43'55.92"E, 159m, 02 January 2019, Aswani & Maya, (GVCH); Parachaathy, 10°50'54.24"N,76° 43 '55.92"E, 159m, 02 January 2019, 159m, Aswani & Maya, 3582 (GVCH) **(Plate 39: Fig. b)**.

Urticaceae

Key to genera

1. Plants with stinging hairs……..2
- Plants without stinging hairs…....3
2. Stipules foliaceous; leaves 3 - 7 lobed……..…..*Girardinia*
- Stipules small, non foliaceous, leaves usually entire…….. *Laportea*
3. Leaves alternate; flowers clustered on fleshy receptacles or in axillary pedicelled cymes…..…. *Elatostema*
- Leaves opposite; flowers usually in axillary clusters……..……4
4. Stipules deciduous; bracts small or zero……..……..…. *Pilea*
- Stipules persistent; bracts prominent foliaceous in the upper region of the plant…...…….. *Pouzolzia*

Elatostema J. R. Forst. & G. Forst., *Char. Gen. Pl., ed.* 2. [105] (1776), nom. cons.

Key to species

1. Leaves without or very minute inconspicuous cystolith...*E. acuminata*
- Leaves with conspicuous cystolith……..……....2
2. Staminodes 5, scale like; stipules large….……..…*E. heyneanum*
- Staminodes zero; stipules small…...…….…. *E. lineolatum*

Elatostema acuminatum (Poir.) Brongn., *Bot. Voy. Coquille* 211 (1834); Hook. f., *FBI* 5: 566 (1888); Gamble, *Fl. Madras* 1377 (1928); Vajr., *Fl. Palghat Dist* 452 (1990); Sasidh., *Fl. Parambikulam WLS* 303 (2002).

Basionym : *Procris acuminata* Poir., *Encycl. [J. Lamarck & al.]* 5: 629 (1804).

Habit : Herb
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Wet rocky forest floors and in the mud cliffs
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : March - April
Altitude preference : Found in all altitudes in wet forest floors
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Chacolas, 10°51'23.03"N, 76°44'29.39"E, 219m, 02 August 2019, Aswani & Maya, 4475 (GVCH); Aatumala Thodu,

10°53'52.08"N,76°41'24"E, 1010m, 28.02.2023, Aswani & Maya, 6157 (GVCH) **(Plate 39: Fig. c)**.

Elatostema heyneanum (Wedd.) Hallier f., *Ann. Jard. Bot. Buitenzorg* 13: 316 (1896); *Pellionia heyneana* Wedd., Hook. f., *FBI* 5: 561 (1888); Gamble, *Fl. Madras* 1380 (1928); Vajr., *Fl. Palghat Dist* 455 (1990); Sasidh., *Fl. Parambikulam WLS* 304 (2002).

Basionym: *Pellionia heyneana* Wedd., *Arch. Mus. Hist. Nat*. 9: 287 (1856).

Habit : Herb
Ecosystem preference : Evergreen and semi-evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In mud cliffs
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : June - September
Altitude preference : Found in medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, G. P. Nair Estate, 10°53'40.83"N, 76°39'43.16"E, 230m, 24 March 2018, Aswani & Maya, 1752 (GVCH); Jamanthimala, 10°51'53.64"N, 76°47'16.80"E, 586m, 23 June 2019, Aswani & Maya, 4104 (GVCH); Pettikkallu, 10°52'48"N, 76°42'7.2"E, 594m, 19 July 2019, Aswani & Maya, 4366 (GVCH); Chacolas, 10°51'15.48"N, 76°45'09.00"E, 265m, 02 August 2019, Aswani & Maya, 4549 (GVCH); Aduppukootimala, 10°50'42.72" N, 76°44'36.24"E, 712m, 16 February 2021, Aswani & Maya, 6485 (GVCH) **(Plate 39: Fig. d)**.

Elatostema lineolatum Wight, *Icon. Pl. Ind. Orient.* [Wight] t. 1984; Hook. f., *FBI* 5: 565 (1888); Gamble, *Fl. Madras* 1376 (1928); Vajr., *Fl. Palghat Dist* 452 (1990); Sasidh., *Fl. Parambikulam WLS* 303 (2002).

Habit : Herb
Ecosystem preference : Semi-evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Mud cliffs
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : March - April
Altitude preference : Found in medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala, 10°51'53.64"N, 76°47'16.80"E, 586m, 23 June 2019, Aswani & Maya, 4104 (GVCH); Aduppukootimala, 10°50'20.07"N, 76°44'24.52"E, 504m, 16 February 2021, Aswani & Maya, 6485 (GVCH) **(Plate 39: Fig. e)**.

Girardinia Gaudich., *Voy. Uranie*, Bot. 498 (1830)

Girardinia diversifolia (Link) Friis, *Kew Bull.* 36(1): 145 (1981); Vajr., *Fl. Palghat Dist* 453 (1990); Sasidh., *Fl. Parambikulam WLS* 303 (2002); *Girardinia heterophylla* Decne., Hook. f., *FBI* 5: 551 (1888) incl. var. *palmata*.; *Girardinia heterophylla* Decne. var. *zeylanica* (Decne.) Hook. f., *FBI* 5: 551 (1888); *Girardinia leschenaultiana* Decne., Gamble, *Fl. Madras* 1372 (1928); *Girardinia zeylanica* Decne., Gamble, *Fl. Madras* 1373 (1928).

Basionym : *Urtica diversifolia* Link, *Enum. Hort. Berol. Alt.* 2: 385 (1822).

Habit : Shrub
Ecosystem preference : Semi-evergreen forests
Distribution : Indo - Pacific and Holarctic

IUCN Category : Not Evaluated (NE)
Habitat : In open wet forest floors
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : October - November
Altitude preference : Found in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, S - Medu, 10°51'20.17"N , 76° 47 '4.18"E, 645m, 25 November 2020, Aswani & Maya, 6345 (GVCH) **(Plate 39: Fig. f)**.

Laportea Gaudich., *Voy. Uranie [Freycinet]* 498 (1830), nom. cons.

Key to species

Leaves small, 4 - 10 x 3 - 5cm long; inflorescence spike upto 13 cm long..... ……*L. interrupta*
Leaves large, 10 - 16 x 5 - 8 cm long; inflorescence spikes upto 10 cm long… ……..*L. bulbifera*

Laportea bulbifera (Siebold & Zucc.) Wedd., *Arch. Mus. Hist. Nat.* 9: 139 (1856); Sasidh., *Fl. Parambikulam WLS* 304 (2002); *Laportea terminalis* Wight, Hook. f., *FBI* 5: 549 (1888); Gamble, *Fl. Madras* 1373 (1928).

Basionym : *Urtica bulbifera* Siebold & Zucc., *Abh. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss*. 4(3): 214 (1846).

Habit : Herb
Ecosystem preference : Evergreen and shola forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Understorey of muddy forest floors
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : November - February
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Chacolas, 10°51'23.03"N, 76°44'29.39"E, 219m, 02 August 2019, Aswani & Maya, 4489 (GVCH).

Laportea interrupta (L.) Chew, *Gard. Bull. Singapore* 21: 200 (1965); Vajr., *Fl. Palghat Dist* 453 (1990); Sasidh., *Fl. Parambikulam WLS* 304 (2002); *Fleurya interrupta* (L.) Gaud., Hook. f., *FBI* 5: 548 (1888); Gamble, *Fl. Madras* 1372 (1928).

Basionym: *Urtica interrupta* L. in *Sp. Pl.*: 985 (1753).

Habit : Herb
Ecosystem preference : Moist deciduous forests and other degraded forest tracts
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Wet forest floors
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : August - September
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Chacolas, 10°51'20.44"N, 76°43'38.28"E, 118m, 09 November 2017, Aswani & Maya, 854 (GVCH); Mangalathumchalla, 10°49'03.67"N, 76°48'18.70"E, 143m, 18 September 2018, Aswani & Maya, 2769 (GVCH); Kottamutti waterfall, 10°49'46.20"N, 76°46'47.28"E, 203m, 23 September 2018, Aswani & Maya, 2981 (GVCH); Pettikallu, 10°52'7.32"N, 76°42'28.44"E, 245m, 19 July 2019, Aswani & Maya, 2304 (GVCH); Aduppukootimala, 10°50'08.16"N, 76°44'33.36"E, 361m, 16 February 2021, Aswani & Maya, 6474 (GVCH) **(Plate 39: Fig. g)**.

Pilea Lindl., *Coll. Bot. (Lindley) ad t.* 4 (1821)

Key to species

Leaf petiole less than 1.5mm long; leaves elliptic - obovate or spathulate of unequal size at each node; stipules triangular…...……*P. microphylla*

Leaf petiole 2 - 3.5cm long, leaves orbicular, equal or subequal at each node; stipules ovate…..……..…..... *P. victoriae*

Pilea microphylla (L.) Liebm., *Kongel. Danske Vidensk. Selsk. Skr., Naturvidensk. Math. Afd. ser.* 5, 2: 296, 302 (1851); Gamble, *Fl. Madras* 1379 (1928); Sasidh., *Fl. Parambikulam WLS* 305 (2002); *Pilea muscosa* (L.) Lindl., Hook. f., *FBI* 5: 551 (1888).

Basionym: *Parietaria microphylla* L. in *Syst. Nat., ed.* 10. 2: 1308 (1759)

Habit : Herb
Ecosystem preference : Moist deciduous forests and plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : In wet walls and mud slips in forest margins
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : August - November
Altitude preference : Found commonly in monsoon season in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, G. P. Nair Estate, 10°53'20.38"N, 76°39'41.73"E, 176m, 24 March 2018, Aswani & Maya, 1617 (GVCH); Ahalia campus, 10°47'43.08"N, 76°50'5.43"E, 150m, 24 September 2020, Aswani & Maya, 6341 (GVCH) **(Plate 39: Fig. h)**.

Pilea victoriae V.Suresh & Sojan, *Int. J. Advanced Res*. 5(8): 1637 (2017).

Habit : Herb
Ecosystem preference : Moist deciduous forests and in plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In wet walls and mud slips in forest margins, wet walls and along canal walls in plains
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : Throughout the year
Altitude preference : Found commonly shady regions in monsoon season in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Ahalia campus, 10°47'33.27"N, 76°49'53.34"E, 167m, 24 September 2020, Aswani & Maya, 6277 (GVCH) **(Plate 40: Fig. a)**.

Pouzolzia Gaudich., *Voy. Uranie [Freycinet] pt.* 12: 503 (1830)

Pouzolzia zeylanica (L.) Benn., *Pl. Jav. Rar. (Bennett)* 67 (1838); Vajr., *Fl. Palghat Dist* 457 (1990); Sasidh., *Fl. Parambikulam WLS* 307 (2002); *Pouzolzia indica* (L.) Gaud., Hook. f., *FBI* 5: 581 (1888); Gamble, *Fl. Madras* 1382 (1928).

Basionym : *Parietaria zeylanica* L., *Sp. Pl.* 2: 1052 (1753).

Habit : Herb
Ecosystem preference : Moist deciduous forests, plains and other wastelands
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : Found in the wet regions often near canal bunds, Margins of hillocks and the disturbed forest tracks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : August - December
Altitude preference : Found commonly in wet regions in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range,

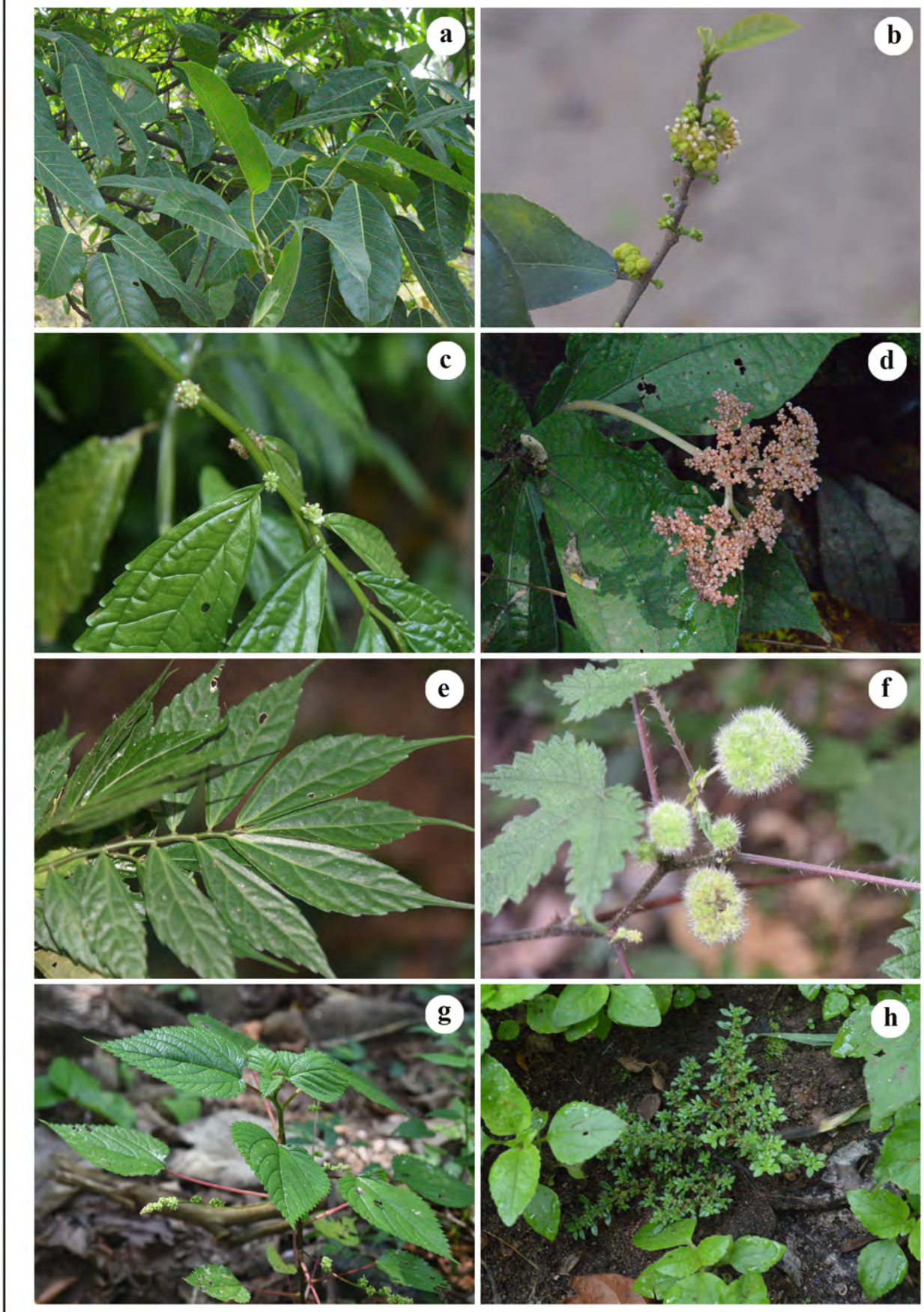

Plate 39: Fig. a. *Ficus tsjakela* Burm.f. **b.** *Streblus asper* Lour. **c.** *Elatostema acuminatum* (Poir.) Brongn. **d.** *Elatostema heyneanum* (Wedd.) Hallier f. **e.** *Elatostema lineolatum* Wight **f.** *Girardinia diversifolia* (Link) Friis **g.** *Laportea interrupta* (L.) Chew **h.** *Pilea microphylla* (L.) Liebm.

Cheranpara, 10°49'29.62"N, 76°40'38.63" E, 86m, 27 June 2017, Aswani & Maya, 203 (GVCH); Ayyappan Mala, 10°49'11.44"N, 76°44'24.46"E, 346m, 26 June 2018, Aswani & Maya, 2591 (GVCH); Pettikallu, 10°52'34.26"N, 76°42'40.48"E, 366m, 19 July 2019, Aswani & Maya, 4346 (GVCH); Olappalam, 10°49'52.20"N, 76°43'44.19"E, 121m, 23 November 2019, Aswani & Maya, 5060 (GVCH) **(Plate 40: Fig. b)**.

Fagales

Casuarinaceae

Casuarina L., *Amoen. Acad., Linnaeus ed.* 4: 123, 143 (1759)

Casuarina equisetifolia L., *Amoen. Acad., Linnaeus ed.* 4: 143 (1759); Hook. f., *FBI* 5: 598 (1888); Gamble, *Fl. Madras* 1389 (1928); Vajr., *Fl. Palghat Dist* 458 (1990).

Habit : Tree
Ecosystem preference : Cultivated
Distribution : Indo - Pacific and Australian
IUCN Category : Least Concern (LC)
Habitat : Grown as an avenue tree in homesteads and in the forest plantations
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : July
Altitude preference : Found usually in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Near Vanadurga temple, 10°49'48.81"N, 76°39'58.80"E, 99m, 03 September 2020, Aswani & Maya, 6211 (GVCH); Ahalia campus, 10°47'37.00"N, 76°49'33.40"E, 156m, 24 September 2020, Aswani & Maya, 6343 (GVCH) **(Plate 40: Fig. c)**.

Cucurbitales

Cucurbitaceae

Key to genera

1. Tendrils 2 - many fid or usually branched…..……...2
- Tendrils simple……..…….5
2. Margins of petals fimbriate (very rarely entire)...…..…..*Trichosanthes*
- Margins of petals entire…….....….3
3. Male flowers in racemes; fruits fibrous……..……....……..*Luffa*
- Male flowers either solitary or in fascicles; fruits usually non - fibrous……..……..…….4
4. Calyx lobes sub - foliaceous……..…….*Benincasa*
- Calyx lobes subulate..…*Diplocyclos*
5. Corolla lobes 5 - partite to the base…..……..…….…6
- Corolla lobes campanulate; 5 - partite to the middle or slightly lower…….……..……7
6. Male flowers usually subtended by a large bract; stamens inserted on the calyx lobes…....…...*Momordica*
- Male flowers subtended by small bract; stamens inserted on the corolla tube…..……....*Cucumis*
7. Anther cells straight...…....*Zehneria*
- Anther cells flexuose or conduplicate…...……..……..8
8. Filaments connate; stigma 3 - lobed……..…...…..*Coccinia*
- Filaments free; stigma 2 - lobed…...……..……....*Cucurbita*

Benincasa Savi, *Bibliot. Ital. (Milan)* ix. 158 (1818); *(Mem. sopra Piant. Cucurb. i.* (1818) 6)

Benincasa hispida (Thunb.) Cogn., Monogr. Phan. [A.DC. & C.DC.] 3: 513 (1881); *Benincasa cerifera* Savi., Hook. f.,

FBI 2: 616 (1879); Gamble, *Fl. Madras* 543 (1919).

Basionym : *Cucurbita hispida* Thunb., *Syst. Veg., ed. 14 (J. A. Murray).* 868 (1784).

Habit : Climber
Ecosystem preference : Cultivated
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : Cultivated in homesteads and in agricultural lands
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Common
Phenology : June - October
Altitude preference : Found commonly in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Nadupathy colony, 10°51'27.72"N, 76°47'0.96"E, 546m, 17 February 2023, Aswani & Maya, 6530 (GVCH).

Coccinia Wight & Arn., *Prodr. Fl. Ind. Orient.* 1: 347 (1834)

Coccinia grandis (L.) Voigt, *Hort. Suburb. Calcutt.* 59 (1845); Vajr., *Fl. Palghat Dist* 212 (1990); *Cephalandra indica* (Wight & Arn.) Naud., Hook. f., *FBI* 2: 621 (1879); *Coccinia indica* Wight & Arn., Gamble, *Fl. Madras* 537 (1919).

Basionym : *Bryonia grandis* L., *Mant. Pl.* 126 (1767).

Habit : Climber
Ecosystem preference : Dry deciduous forests and wastelands, also cultivated
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Cultivated in homesteads and in agricultural lands
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Common
Phenology : December - April
Altitude preference : Found commonly in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Cheranpara, 10°49'29.62"N, 76°40'38.63" E, 87m, 27 June 2017, Aswani & Maya, 169 (GVCH) **(Plate 40: Fig. d)**.

Cucumis L., *Sp. Pl.* 2: 1011 (1753)

Key to species

Anther cells straight; filaments distinct and free……..……..….*C.maderaspatanus*
Anther cells sigmoid; filaments very short or rarely absent…..……..……..*C. sativus*

Cucumis maderaspatanus L., *Sp. Pl.* 2: 1012 (1753); *Mukia scabrella* (L. f.) Arn., Hook. f., *FBI* 2: 623 (1879); *Melothria maderaspatana* (L.) Cogn., Gamble, *Fl. Madras* 539 (1919); Vajr., *Fl. Palghat Dist* 213 (1990); *Mukia maderaspatana* (L.) Roem., Sasidh., *Fl. Parambikulam WLS* 136 (2002).

Habit : Climber
Ecosystem preference : Moist Deciduous forests
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Found as common climber in hillocks
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Common
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koyamarakaadu, 10°47'44.88"N, 76°45'38.52"E, 111m, 06 September 2018, Aswani & Maya, 2666 (GVCH); Kottamutti waterfall, 10°49'46.20"N, 76°46'47.28"E, 203m, 23 September 2018, Aswani & Maya, 2961 (GVCH); Kattadikunnu, 10°50'20.54"N,

76°39'14.20"E, 266m, 16 October 2019, Aswani & Maya, 4826 (GVCH); Jamanthimala, 10°51'53.64"N, 76°47'16.80"E, 586m, 09 January 2020, Aswani & Maya, 5624 (GVCH) **(Plate 40: Fig. e)**.

Cucumis sativus L., *Sp. Pl*. 2: 1012 (1753); *Cucumis prophetarum* Hook. f., *FBI* 2: 619 (1879); Gamble, *Fl. Madras* 535 (1919); *Cucumis sativus* L. f. *hardwickii* (Royl) W.J.de Wilde & Duyfjes, *Sandakania* 17: 58 (2008).

Habit : Climber
Ecosystem preference : Semi-evergreen forests
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Found in the forest margins
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : September - March
Altitude preference : Found in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, S Medu, 10°51'20.17"N, 76°47'4.18"E , 645m, 25 November 2020, Aswani & Maya, 6358 (GVCH) **(Plate 40: Fig. f)**.

Cucurbita L., *Sp. P*l. 2: 1010 (1753)

Key of species

Hairs underneath petiole rigid and pungent……..……. *C. pepo*
Hairs underneath petiole neither rigid nor pungent…….. *C. maxima*

Cucurbita maxima Duchesne, *Essai Hist. Nat. Courges* 7 (1786); Hook. f., FBI 3: 622 (1879); Manilal & Sivar., *Fl. Calicut* 123 (1982); Babu, *Fl. Malappuram Dist* 289 (1990); Vajr., *Fl. Palghat Dist* 217 (1990); Sunil & Sivadasan, F*l. Alappuzha Dist* 319 2009).

Habit : Climber
Ecosystem preference : Cultivated
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Cultivated in homesteads, agricultural lands and wetlands
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Common
Phenology : September - May
Altitude preference : Found commonly in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kadukamkunnam, 10°48'48.76"N, 76°39'48.98"E, 107m, 23 March 2023, Aswani & Maya, 6563 (GVCH).

Cucurbita pepo L., *Sp. Pl*. 2: 1010 (1753); Hook. f., *FBI* 2: 622 (1879); Gamble, *Fl. Madras* 543 (1919); Vajr., *Fl. Palghat Dist* 217 (1990); Subram., *Fl. Thenmala Div* 151 (1995).

Habit : Climber
Ecosystem preference : Cultivated
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat: Cultivated in homesteads and farm lands
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Common
Phenology : September - May
Altitude preference : Found commonly in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Nadupathy colony, 10°51'22.24"N, 76°49'39.27"E, 527m, 17 February 2023, Aswani & Maya, 6529 (GVCH).

Diplocyclos (Endl.) T.Post & Kuntze, *Lex. Gen. Phan. [Post & Kuntze]* 178 (1903)

Diplocyclos palmatus (L.) C.Jeffrey, *Kew Bull.* 15(3): 352 (1962); Vajr., *Fl. Palghat*

Dist 212 (1990); Sasidh., *Fl. Parambikulam WLS* 134 (2002); *Bryonia laciniosa* L., Hook. *FBI* 2: 622 (1879); *Bryonopsis laciniosa* Naud., Gamble, *Fl. Madras* 534 (1919).

Basionym: *Bryonia palmata* L. in *Sp. Pl*.: 1012 (1753).

Habit : Climber
Ecosystem preference : Moist deciduous forests and in plains
Distribution : Indo - Pacific, Holarctic and African
IUCN Category : Not Evaluated (NE)
Habitat : In rocky out crops and in the wastelands
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Common
Phenology : November - January
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala, 10°49'44.76"N , 76°40'30.72"E, 108m, 05 October 2017, Aswani & Maya, 638 (GVCH); Valiya eri, 10°48'51.04"N, 76°45'01.67"E, 136m, 06 January 2018, Aswani & Maya, 1305 (GVCH); Koyamarakaadu, 10°47'44.88"N, 76°45'38.52"E, 06 September 2018, Aswani & Maya, 2659 (GVCH); Anayappanchalla, 10°48'25.92"N, 76°48'35.19"E, 30 November 2019, Aswani & Maya, 5137 (GVCH) **(Plate 40: Fig. g)**.

Luffa Mill., *Gard. Dict. Abr*., ed. 4. [806] (1754)

Luffa aegyptiaca Mill., *Gard. Dict*., *ed*. 8. (1768); Hook. f., *FBI* 2:614 (1879); Gamble, *Fl. Madras* 533 (1919); *Luffa cylindrica* (L.) Roem., Vajr., *Fl. Palghat Dist* 213 (1990).

Habit : Climber
Ecosystem preference : In plains
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Found in the outskirts of hillocks and wastelands
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Common
Phenology : February - December
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Anayappanchalla, 10°48'20.42" N,76°48'05.00"E, 146m, 30 November 2019, Aswani & Maya, 5200 (GVCH).

Momordica L., *Sp. Pl. [Linnaeus]* 2: 1009 (1753)

Key to species

1. Plant monoecious; bracts near or just below the middle of male pedicel……..…….. *M. charantia*
- Plant dioecious; bracts near the top of the pedicel…..……..……..2
2. Calyx lobes linear - lanceolate; acute at apex…..……..*M. dioica*
- Calyx lobes ovate - oblong; obtuse at apex…..……..…..*M. sahyadrica*

Momordica charantia L., *Sp. Pl. [Linnaeus]* 2: 1009 (1753); *Momordica charantia* L. var. *charantia*, Hook. f., *FBI* 2: 616 (1879); Gamble, *Fl. Madras* 532 (1919); Vajr., *Fl. Palghat Dist* 214 (1990); Sasidh., *Fl. Parambikulam WLS* 135 (2002).

Habit : Climber
Ecosystem preference : Cultivated often runs in wild
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : In forest margins, grown in homesteads and in agricultural lands
Raunkiaer's Life form : Liana (Euliana)

Distribution Frequency : Common
Phenology : June - September
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kozhimala, 10°50'04.17"N, 76° 43 '23. 82" E, 207m, 09 November 2017, Aswani & Maya, 792 (GVCH); G. P. Nair estate, 10°53'20.38"N, 76°39'41.73"E, 176m, 24 March 2018, Aswani & Maya, 1620 (GVCH); Koyamarakaadu, 10°47'44.88"N, 76°45'38.52"E, 111m, 06 September 2018, Aswani & Maya, 2663 (GVCH); Aduppukootimala – Kanyarmuttu, 10°49'59.16"N, 76°44'31.56"E, 298m, 12 January 2019, Aswani & Maya, 3686 (GVCH); Vettumadavu, 10°52'44.72"N, 76°48'8.64"E, 456m, 28 January 2020, Aswani & Maya, 5900 (GVCH) **(Plate 40: Fig. h)**.

Momordica dioica Roxb. ex Willd., *Sp. Pl.*, ed. 4 [Willdenow] 4(1): 605 (1805); Hook. f., *FBI* 2:617.1879; Gamble, *Fl. Madras* 531 (1919);Vajr., *Fl. Palghat Dist* 214 (1990); Sasidh., *Fl. Parambikulam WLS* 135 (2002).\

Habit : Climber
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : Found as a climber in forest floors
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : March - November
Altitude preference : Found in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Muchikadavu - Thakaramada, 10°52'07.34"N, 76°42'43.33"E, 215m, 30 November 2018, Aswani & Maya, 3242(GVCH).

Momordica sahyadrica Kattuk. & V.T.Antony, *Nordic J. Bot.* 24(5): 541 (2007); *Momordica subangulata* Gamble, *Fl. Madras* 532 (1919); Sasidh., *Fl. Parambikulam WLS* 135 (2002).

Habit : Climber
Ecosystem preference : Semi-evergreen forests
Distribution : Indo – Pacific
Endemism : Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Found as a climber in forest floors
Raunkiaer's Life form: Liana (Euliana)
Distribution Frequency : Rare
Phenology : June - October
Altitude preference : Found in medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thannikunnu, 10°52'44.47"N , 76°47'3.91" E, 605m, 18 December 2018, Aswani & Maya, 3442 (GVCH); Elichil, 10°50'34.80" N, 76°38'54.60"E, 231m,16 October 2019, Aswani & Maya, 4849 (GVCH) **(Plate 41: Fig. a)**.

Trichosanthes L., *Sp. Pl. [Linnaeus]* 2: 1008 (1753)

Key to species

Male flowers without bracts or if present very minute; petals with entire margins.....*T. cucumerina*
Male flowers with distinct bracts; petals fimbriate at margins…...…...*T. tricuspidata*

Trichosanthes cucumerina L., *Sp. Pl.* 2:1008 (1753). Hook. f., *FBI* 2: 609 (1879); Gamble, *Fl. Madras* 529 (1919); Vajr., *Fl. Palghat Dist* 215 (1990).*Trichosanthes anguina* L., Hook. f., FBI 2: 610 (1879); Gamble, *Fl. Madras* 530 (1919); Vajr., *Fl. Palghat Dist* 217 (1990);

Habit : Climber

Ecosystem preference : Moist deciduous forests and also in the plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found in the forest margins near water sources
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Occasional
Phenology : December - May
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kosavanidukku-Kaduvachal, 10°50'26.38"N, 76°40'30.88"E, 105m, 16 July 2017, Aswani & Maya, 269 (GVCH); Idamala, 10°50'07.08"N, 76°40'26.15"E, 225m, 05 October 2017, Aswani & Maya, 675 (GVCH) **(Plate 41: Fig. b)**

Trichosanthes tricuspidata Lour., *Fl. Cochinch.* 2: 589 (1790); Sasidh., *Fl. Parambikulam WLS* 137 (2002); *Trichosanthes bracteata* (Lam.) Voigt, Vajr., *Fl. Palghat Dist* 215 (1990); *Trichosanthes palmata* Roxb., Hook. f., *FBI* 2: 606 (1879); Gamble, *Fl. Madras* 529 (1919).

Habit : Climber
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and Australian
IUCN Category : Not Evaluated (NE)
Habitat : Found as a climber in deciduous forests
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : November - May
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kottamutti waterfalls, 10°49'42.94"N, 76°46'47.87"E, 206m, 23 September 2018, Aswani & Maya, 2948 (GVCH) **(Plate 41: Fig. c)**

Zehneria Endl., *Prod. Fl. Norfolk.* 69 (1833)

Zehneria maysurensis Arn., *J. Bot. (Hooker)* 3: 275 (1841); var. *maysorensis*, Vajr., *Fl. Palghat Dist* 216 (1990); Sasidh., *Fl. Parambikulam WLS* 137 (2002); *Zehneria hookeriana* Hook. f., *FBI* 2: 626 (1879); *Melothria perpusilla* Cogn, Gamble, *Fl. Madras* 538 (1919).

Habit : Climber
Ecosystem preference : Near valleys of semi - evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In canopy rich forest floors
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : October - December
Altitude preference : Found in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Edasherikunnu, 10°52'42.6"N, 76°46'53.32"E, 645m, 28 January 2020, Aswani & Maya, 5952 (GVCH) **(Plate 41: Fig. d)**.

Tetramelaceae

Tetrameles R.Br., *Denh. & Clapp. Trav.* II. 230 (App. 25). (1826)

Tetrameles nudiflora R.Br., *Plantae Javanicae Rariores* (1844); Hook. f., *FBI* 2: 627 (1879); Gamble, *Fl. Madras* 544 (1919); Vajr., *Fl. Palghat Dist* 217 (1990); Sasidh., *Fl. Parambikulam WLS* 139 (2002).

Habit : Tree
Ecosystem preference : Moist deciduous forests Distribution : Indo - Pacific and African
IUCN Category : Least Concern (LC)

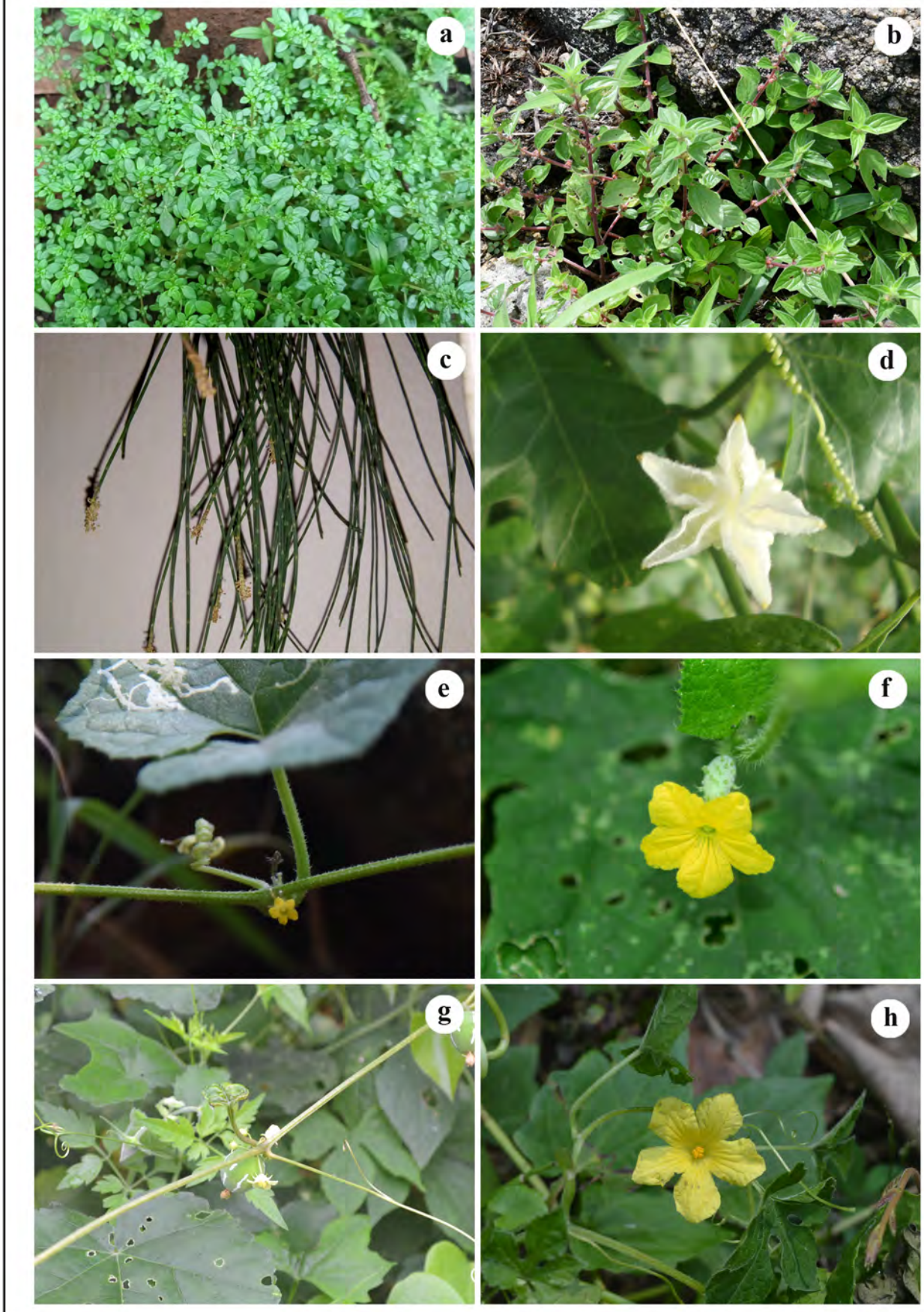

Plate 40: Fig. a. *Pilea victoriae* V.Suresh & Sojan **b.** *Pouzolzia zeylanica* (L.) Benn. **c**. *Casuarina equisetifolia* L. **d.** *Coccinia grandis* (L.) Voigt **e.** *Cucumis maderaspatanus* L. **f.** *Cucumis sativus* L. **g.** *Diplocyclos palmatus* (L.) C.Jeffrey **h.** *Momordica charantia* L.

Habitat : Found in hill slopes
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : March - May
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Chacolas, 10°51'15.48"N, 76°45'09.00"E, 265m, 02 August 2019, Aswani & Maya, 4558 (GVCH) **(Plate 41: Fig. e)**

Begoniaceae

Begonia L., *Sp. Pl.* 2: 1056 (1753)

Begonia dipetala Graham, *Bot. Mag.* 55: t. 2849 (1828); *Begonia malabarica* Lam., *Encycl. [J. Lamarck & al.]* 1(2): 393 (1785); Hook. f., *FBI* 2: 655 (1879); Gamble, *Fl. Madras* 546 (1919); Vajr., *Fl. Palghat Dist* 219 (1990); Sasidh., *Fl. Parambikulam WLS* 139 (2002).

Habit : Herb
Ecosystem preference : Semi-evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In wet regions in rocky regions
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : August - April
Altitude preference : Found in higher altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thanniplace, 10°52' 43.32"N, 76°45'54.07"E, 972m, 28 January 2020, Aswani & Maya, 6018 (GVCH); Aatumala Thodu, 10°53'24"N, 76°41'24"E, 1080m, 27 February 2020, Aswani & Maya, 6156 (GVCH) **(Plate 41: Fig. f).**

Celastrales

Celastraceae

Key to genera

1. Stamens 3……..…….....2
- Stamens 4 or 5…….……..…3
2. Fruits globose……..……*Salacia*
- Fruits samaroid…..…..…*Pristimera*
3. Leaves alternate; climbers .....*Celastrus*
- Leaves opposite; erect shrubs…..……..…..…..*Euonymus*

Celastrus L., *Sp. Pl.* 1: 196 (1753)

Celastrus paniculatus Willd., *Sp. Pl., ed. 4 [Willdenow]* 1(2): 1125 (1798); Hook. f., *FBI* 1: 617 (1875); Gamble, *Fl. Madras* 208 (1918); Vajr., *Fl. Palghat Dist* 117 (1990); Sasidh., *Fl. Parambikulam WLS* 64 (2002).

Habit : Climber
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and Australian
IUCN Category : Not Evaluated (NE)
Habitat : Climber in hill slopes
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : December - May
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Thekke Malampuzha guest house hillock, 10°50'04.20"N, 76°40'52.68"E, 120m, 23 November 2019, Aswani & Maya, 4925 (GVCH) **(Plate 41: Fig. g)**.

Euonymus L., *Sp. Pl.* 1: 197 (1753), nom. et orth. cons.

Euonymus angulatus Wight, *Icon. Pl. Ind. Orient. [*Wight] 3(4): 2, t. 1053 (1846); Hook. f., *FBI* 1: 610 (1875); Gamble, *Fl.*

Madras 203 (1918); Vajr., *Fl. Palghat Dist* 117 (1990).

Habit : Shrub
Ecosystem preference : Evergreen forests
Distribution : Indo - Pacific
Endemism : Southern Western Ghats
IUCN Category : Vulnerable (VU)
Habitat : In canopy rich forests
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : December - April
Altitude preference : Found rarely in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Aatumala Thodu, 10°53'24"N, 76°41'24"E, 1080m, 27 February 2020, Aswani & Maya, 6153 (GVCH).

Pristimera Miers, *Trans. Linn. Soc. London* 28(2): 360 (1872)

Pristimera arnottiana (Wight) R.H.Archer, *Molec. Phylogen. Evol.* 59(2): 328 (2011); *Hippocratea arnottiana* Wight, Hook. f., *FBI* 1: 624 (1875); Gamble, *Fl. Madras* 213 (1918); *Loeseneriella arnottiana* (Wight) A.C. Smith, Vajr., *Fl. Palghat Dist* 118 (1990); Sasidh., *Fl. Parambikulam WLS* 66 (2002).

Habit : Climber
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In margins of forest floors
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : February - March
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Nakkamalakunnu, 10°52'7.89"N, 76°42'19.8"E, 244m, 27 February 2020, Aswani & Maya, 6064 (GVCH) **(Plate 41: Fig. h)**.

Salacia L., *Mant. Pl. Altera* 159 (1771)

Key to species

Lobes of calyx fringed…....*S. macrosperma*
Lobes of calyx not fringed…….*S. chinensis*

Salacia chinensis L., *Mant. Pl. Altera* 293 (1771); Vajr., *Fl. Palghat Dist* 120 (1990); *Salacia prinoides* DC., Hook. f., *FBI* 1: 626 (1875); Gamble, *Fl. Madras* 215 (1918).

Habit : Climber
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In canopy rich forest floors
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : February - March
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Chacolas, 10°51'22.68"N , 76° 44 '41.28"E, 227m, 02 August 2019, Aswani & Maya, 4476 (GVCH) **(Plate 42: Fig. a)**.

Salacia macrosperma Wight, *Spicil. Neilgh*. i. 28. t. 32; Ic. t. 962; Hook. f., *FBI* 1: 628 (1875); Gamble, *Fl. Madras* 215 (1918).

Habit : Climber
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
Endemism : Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : In forest floors

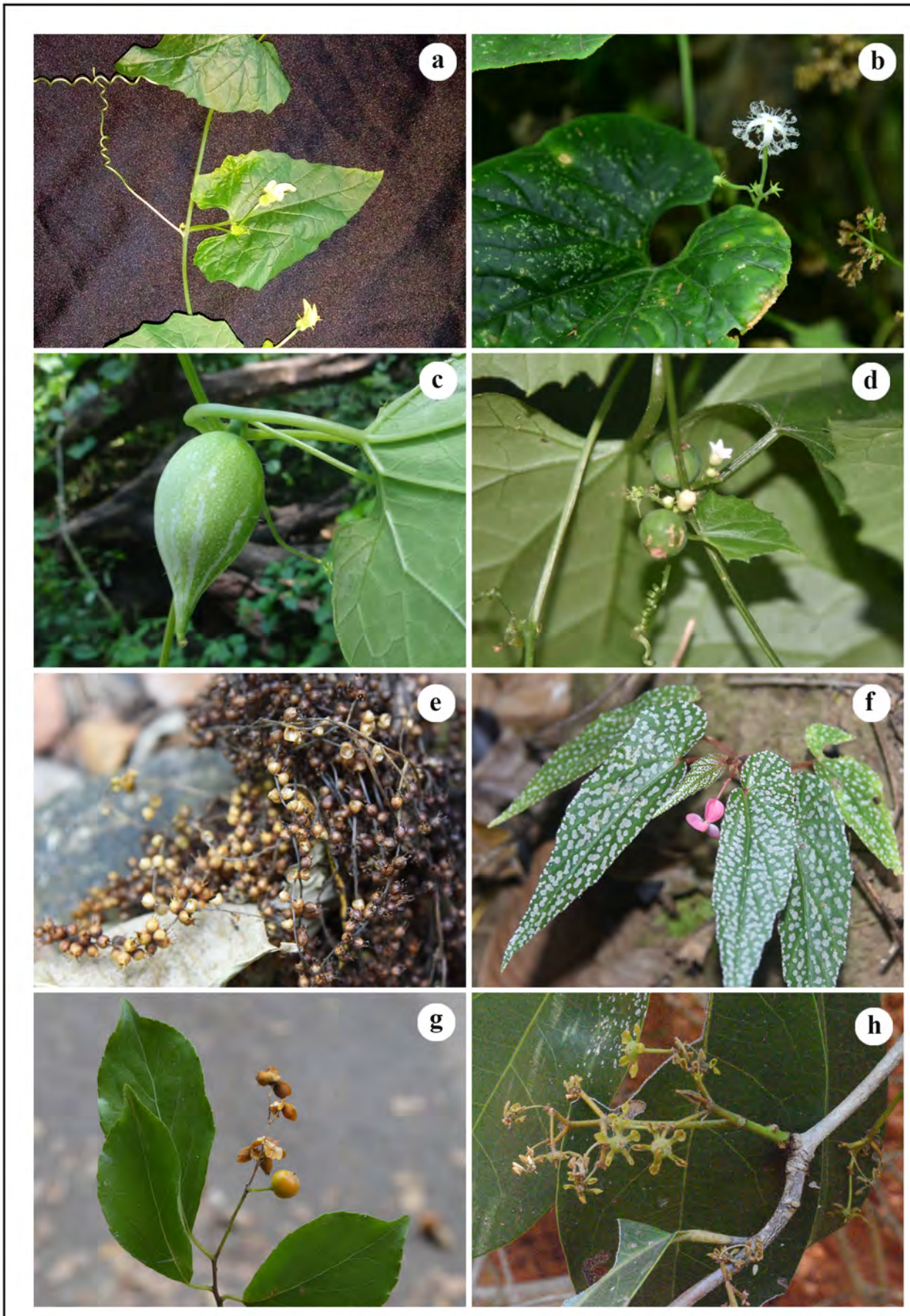

Plate 41: Fig. a. *Momordica sahyadrica* Kattuk. & V.T.Antony **b.** *Trichosanthes cucumerina* var. cucumerina L. **c.** *Trichosanthes tricuspidata* Lour. **d.** *Zehneria maysurensis* Arn. **e.** *Tetrameles nudiflora* R.Br. **f.** *Begonia dipetala* Graham **g.** *Celastrus paniculatus* Willd. **h.** *Pristimera arnottiana* (Wight) R.H.Archer.

Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : January - March
Altitude preference : Found in lower altitudes
Specimen examined :INDIA, Kerala: Palakkad District, Walayar range, Aduppukootimala, 10°50'42.72"N, 76°44'36.24"E, 713m, 16 February 2021, Aswani & Maya, 6494 (GVCH).

Oxalidales

Oxalidaceae

Key to genera

Leaves 3 or 4 foliate…...……..*Oxalis*
Leaves pinnately compound…....*Biophytum*

Biophytum DC., *Prodr. [A. P. de Candolle]* 1: 689 (1824)

Key to species

1. Sepals sparsely hairy; never glandular hairy…...…*B. reinwardtii*
- Sepals with strigose and glandular hairs……..……..2
2. Sepals 5 - nerved…….....*B. sensitivum*
- Sepals 7 - nerved….*B. umbraculum*

Biophytum reinwardtii (Zucc.) Klotzsch, *Naturw. Reise Mossambique [Peters]* 6 (*Bot*., 1): 85 (1861); Hook. f., *FBI* 1: 437 (1874); Gamble, *Fl. Madras* 133 (1915); Vajr., *Fl. Palghat Dist* 98 (1990); Sasidh., *Fl. Parambikulam WLS* 41 (2002).

Basionym : *Oxalis reinwardtii* Zucc., *Abh. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss.* 1: 274 (1831).

Habit : Herb
Ecosystem preference : Moist deciduous forests and also in the plains
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : In margins of forests and in open grasslands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : July - December
Altitude preference : Found commonly in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kezhakootimala, 10°51'53.30"N, 76°37'36.39"E, 362m, 15 September 2017, Aswani & Maya, 495 (GVCH); Poozhikunnu, 10°51'20.44"N, 76°43'38.28"E, 118m, 09 November 2017, Aswani & Maya, 846 (GVCH); Ayyappan Mala, 10°49'11.44"N, 76°44'24.46"E, 346m, 26 June 2018, Aswani & Maya, 2593 (GVCH); Pallakaadu, 10°51'30.96"N, 76°37'39.00"E, 151m, 09 October 2018, Aswani & Maya, 3021 (GVCH) **(Plate 42: Fig. b)**.

Biophytum sensitivum (L.) DC., *Prodr. [A. P. de Candolle]* 1: 690 (1824); Hook. f., *FBI* 1: 436 (1874); Gamble, *Fl. Madras* 133 (1915).

Basionym : *Oxalis sensitiva* L., *Sp. Pl.* 1: 434 (1753).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Shady forest floors
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : October - January
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thekke

Malampuzha, Guest house hillock, 10°50'04.20"N, 76°40'52.68"E, 120m, 08 September 2017, Aswani & Maya, 446 (GVCH); Pallakaadu, 10°51'30.96"N, 76°37'39.00"E, 151m, 09 October 2018, Aswani & Maya, 3060 (GVCH); Pazhampullikaadu, 10°50'09.55"N, 76°38'28.33"E, 89m, 16 October 2018, Aswani & Maya, 3118 (GVCH); Jamanthimala, 10°52'20.64"N, 76°46'57.00"E, 863m, 09 January 2020, Aswani & Maya, 5762 (GVCH).

Biophytum umbraculum Welw., *Apont.* 590 (1859); *Biophytum apodiscias* Turcz., Hook. f., *FBI* 1: 437 (1874); Gamble, *Fl. Madras* 133 (1928).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : In shady places and rocky crevices
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : August - November
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Guest house hillock, 10°51'33.12"N, 76°42'29.52"E, 142m, 02 August 2018, Aswani & Maya, 4453 (GVCH); Edamala, 10°50'8.57"N, 76°38'57.48"E, 104m, 16 October 2019, Aswani & Maya, 4715 (GVCH); Kaattadiunnu, 10°50'26.52"N, 76°39'2.16"E, 151m, 16 October 2019, Aswani & Maya, 4812 (GVCH); Mathappumala, 10°50'57.35"N, 76°49'44.27"E, 315m, 07 January 2020, Aswani & Maya, 5597 (GVCH); Ahalya campus 10°47'43.08"N, 76°50'5.43"E, 150m, 24 September 2020, Aswani & Maya, 6326 (GVCH) **(Plate 42: Fig. c)**.

Oxalis L., *Sp. Pl.* 1: 433 (1753)

Oxalis corniculata L., *Sp. Pl. [Linnaeus]* 1: 435 (1753); Hook. f., *FBI* 1: 436 (1874); Gamble, *Fl. Madras* 132 (1915); Vajr, *Fl. Palghat Dist* 98 (1990); Sasidh., *Fl. Parambikulam WLS* 41 (2002).

Habit : Herb
Ecosystem preference : Degraded forests and in plains
Distribution : Indo - Pacific, Holarctic, African, South American and Australian
IUCN Category : Not Evaluated (NE)
Habitat : In soil rich areas
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : March - December
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Cheranpara, 10°49'29.62"N , 76°40'38.63"E, 87m, 27 June 2017, Aswani & Maya, 199 (GVCH); G. P. Nair Estate, 10°53'23.22"N, 76°39'42.80"E, 190m, 24 March 2018, Aswani & Maya, 1638 (GVCH); On the way to Jamanthimala, 10°51'53.64"N, 76°47'16.80"E, 586m, 23 June 2019, Aswani & Maya, 3993 (GVCH); Malabar Cements Gateway, 10°51'03.09"N, 76°50'03.94"E, 218m, 23 June 2019, Aswani & Maya, 4074 (GVCH) **(Plate 42: Fig. d)**.

Elaeocarpaceae

Elaeocarpus L., *Sp. Pl.* 1: 515 (1753)

Elaeocarpus serratus L., *Sp. Pl.* 1: 515 (1753); Hook. f., *FBI* 1:401 (1874); Gamble, *Fl. Madras* 124 (1915); Vajr., *Fl. Palghat Dist* 96 (1990); Sasidh., *Fl. Parambikulam WLS* 39 (2002).

Habit : Tree
Ecosystem preference : In plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In road sides
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : April - September
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Akathethara - Malampuzha road, 10°49'34.77"N, 76°38'8.58"E, 100m, 28 February 2021, Aswani & Maya, 6525 (GVCH) **(Plate 42: Fig. e)**.

Malpighiales

Rhizophoraceae

Carallia Roxb., *Pl. Coromandel* 3(1): 8 (1811), nom. cons.

Carallia brachiata (Lour.) Merr., *Philipp. J. Sci.* 15: 249 (1919); Vajr., *Fl. Palghat Dist* 194 (1990); Sasidh., *Fl. Parambikulam WLS* 116 (2002); *Carallia integerrima* DC., Hook. f., FBI 2: 439 (1878); Gamble, *Fl. Madras* 459 (1919).

Basionym : *Diatoma brachiata Lour*., *Fl. Cochinch.* 1: 296 (1790).

Habit : Tree
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and Australian
IUCN Category : Not Evaluated (NE)
Habitat : Near water sources
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : October - April
Altitude preference : Rare occurrence in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thakaramada,10°52'05.16"N, 76°42'41.22"E, 206m, 30 November 2018, Aswani & Maya, 3252 (GVCH); Aduppukootimala, 10°49'59.16"N, 76°44'31.56"E, 298m, 16 February 2021, Aswani & Maya, 6460 (GVCH) **(Plate 42: Fig. f)**.

Clusiaceae

Garcinia L., *Sp. Pl.* 1: 443 (1753)

Key to species

Anther cells distinct with a square shaped connective; staminodes arranged in 4 distinct bundles……..….*G. cowa*
Anther cells contiguous; staminodesin irregular rings…...…..…….*G. gummi-gutta*

Garcinia cowa Roxb. ex Choisy in *Mém. Nouv. Gen. Guttif*.: 17 (1823); Hook. f., *FBI* 1: 262 (1874); Gamble, *Fl. Madras* 74 (1915); Vajr., *Fl. Palghat Dist* 70 (1990).

Habit : Tree
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific and Holarctic
IUCN Category : Least Concern (LC)
Habitat : In high altitude forest floors
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : December - September
Altitude preference : Found rarely in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Aatumala Thodu, 10°53'24"N, 76°41'24"E, 1080m, 27 February 2020, Aswani & Maya, 6160 (GVCH) **(Plate 42: Fig. g)**.

Garcinia gummi-gutta (L.) N.Robson, *Brittonia* 20: 103, adnot. (1968); Vajr., *Fl. Palghat Dist* 70 (1990); Sasidh., *Fl.*

Parambikulam WLS 22 (2002); *Garcinia cambogia* (Gaertn.) Desr., Hook. f., *FBI* 1: 261 (1874); Gamble, *Fl. Madras* 73 (1915).

Basionym : *Cambogia gummi-gutta* L., *Gen. Pl., ed.* 5. *Add. Fin.* [522] (1754).

Habit : Tree
Ecosystem preference : Cultivated
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat: Found grown in homesteads and in estates
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : January - September
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, G. P. Nair Estate, 10° 53 '40.83"N, 76° 39' 43.16"E, 104m, 24 March 2018, Aswani & Maya, 1722 (GVCH) **(Plate 42: Fig. h)**.

Calophyllaceae

Mesua L., *Sp. Pl.* 1: 515 (1753)

Mesua ferrea L., *Sp. Pl.* 1: 515 (1753); Hook. f., *FBI* 1: 277 (1874); Gamble, *Fl. Madras* 77 (1915); Sasidh., *Fl. Parambikulam WLS* 23 (2002); *Mesua nagassarium* (Burm. f.) Kosterm., Vajr., *Fl. Palghat Dist* 72 (1990).

Habit : Tree
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found in forest slopes
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : April - July
Altitude preference : Found in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kundanmala, 10°53'31.2"N, 76°41'52.8"E, 933m, 27 February 2020, Aswani & Maya, 6114 (GVCH).

Putranjivaceae

Drypetes Vahl, *Eclog. Amer.* 3: 49 (1807)

Key to species

Disc present; stamens usually 4 or more……..…….*Drypetes*
Disc absent; stamens usually 2-4 ……...……*Putranjiva*

Drypetes Vahl, *Eclog. Amer.* 3: 49 (1807)

Key to species

Disc large, glabrous; male flowers with short pedicel; stamens 15 - 20…...…… ……...…*D. confertiflora*
Disc small, villous; Male flowers sessile; stamens 30 - 40……..…..*D. oblongifolia*

Drypetes confertiflora Pax & K. Hoffm., *Pflanzenr. (Engler) Euphorb. - Phyllanthoid. -Phyllanth.* 246 (1922); *Cyclostemon confertiflorus* Hook.f., FBI 5: 341 (1887); Gamble, *Fl. Madras* 1302 (1925).

Habit : Tree
Ecosystem preference : Semi-evergreen forests
Distribution : Indo - Pacific
Endemism : Southern Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : In canopy rich forest floors
Raunkiaer's Life form : Phanerophyte

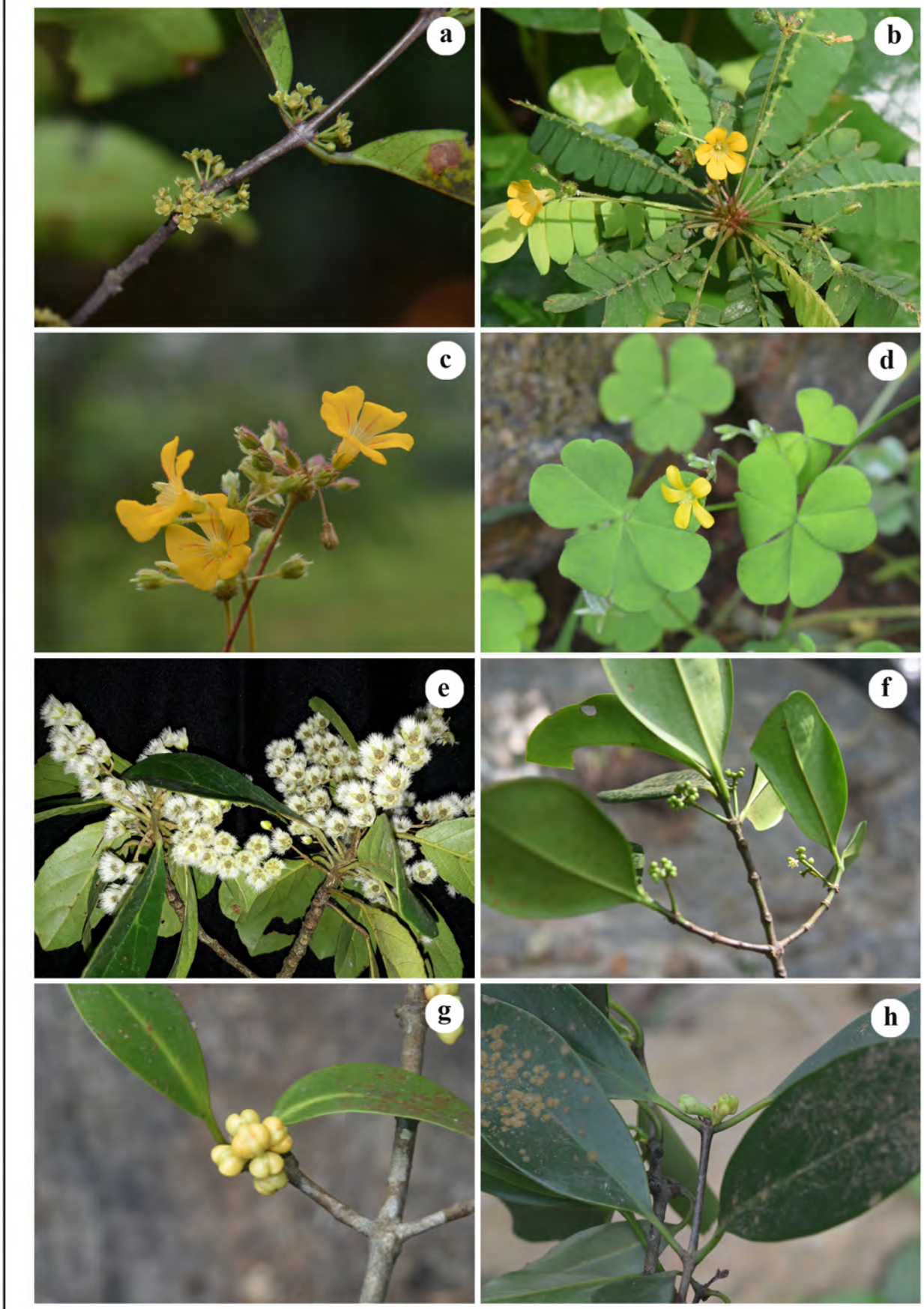

Plate 42: Fig. a. *Salacia chinensis* L. **b.** *Biophytum reinwardtii* (Zucc.) Klotzsch **c.** *Biophytum umbraculum* Welw. **d.** *Oxalis corniculata* L. **e.** *Elaeocarpus serratus* L. **f.** *Carallia brachiata* (Lour.) Merr. **g.** *Garcinia cowa* Roxb. **h.** *Garcinia gummi-gutta* (L.) N.Robson.

Distribution Frequency : Rare
Phenology : February - May
Altitude preference : Found in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Thanniplace, 10°52'43.32"N, 76°45'54.07"E, 972m, 28 January 2020, Aswani & Maya, 6032 (GVCH).

Drypetes oblongifolia (Bedd.) Airy Shaw, *Kew Bull.* 23(1): 57 (1969); Vajr., *Fl. Palghat Dist* 427 (1990); Sasidh., *Fl. Parambikulam WLS* 288 (2002); *Cyclostemon macrophyllus* Bl., Gamble, *Fl. Madras* 1302 (1925); *Cyclostemon macrophyllus* Blume var. *peninsularis* Hook. f., *FBI* 5: 341 (1887).

Habit : Tree
Ecosystem preference : Evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In canopy rich forest floors
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : January - December
Altitude preference : Found in higher altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Pettikallu, 10°53'6"N, 76°42'0"E, 812m, 27 February 2020, Aswani & Maya, 6112 (GVCH); Kundanmala, 10°53'33.48"N, 76°41'52.76"E, 943m, 28 February 2020, Aswani & Maya, 6180 (GVCH); Aduppukootimala, 10°50'42.72"N, 76°44'36.24"E, 712m, Aswani & Maya, 6503 (GVCH).

Putranjiva Wall., *Tent. Fl. Napal.* 2: 61 (1826)

Putranjiva roxburghii Wall., *Tent. Fl. Napal.* 2: 61 (1826); Hook. f., *FBI* 5: 336 (1887); Gamble, *Fl. Madras* 1311 (1925); *Drypetes roxburghii* (Wall.) Hurusawa, Sasidh., *Fl. Parambikulam WLS* 288 (2002).

Habit : Tree
Ecosystem preference : Moist and dry deciduous forests, also in sacred groves
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : In hill slopes
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : March - August
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kezhakootimala, 10°51'53.30"N, 76°37'36.39"E, 361m, 15 September 2017, Aswani & Maya, 513 (GVCH); G. P. Nair Estate, 10°53'40.83"N, 76°39'43.16"E, 230m, 24 March 2018, Aswani & Maya, 1726 (GVCH); Parakkallu- Neelikunnu, 10°51'34.19"N, 76°37'35.37"E, 192m, 27 April 2018, Aswani & Maya, 1969 (GVCH); Mannukunnu, 10°52'5.50"N, 76°38'30.27"E, 181m, 09 July 2019, Aswani & Maya, 44228 (GVCH) **(Plate 43: Fig. a)**.

Elatinaceae

Bergia L., *Mant. Pl. Altera* 152 (1771)

Bergia capensis L., *Mant. Pl. Altera* 241 (1771); Gamble, *Fl. Madras* 69 (1915); *Bergia verticillata* Willd., Hook. f., *FBI* 1: 252 (1874).

Habit : Herb
Ecosystem preference : In marshy regions
Distribution : Indo - Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : In marshy waters near dams
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : September - December

Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Cheranpara, 10°49'29.62"N, 76° 40 '38.63"E, 87m, 27 June 2017, Aswani & Maya, 206 (GVCH).

Malpighiaceae

Hiptage Gaertn., *Fruct. Sem. Pl.* ii. 69. t. 116 (1791)

Hiptage benghalensis **(**L.) Kurz, *J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist.* 43(2): 136 (1874); Vajr., *Fl. Palghat Dist* 97 (1990); Sasidh., *Fl. Parambikulam WLS* 40 (2002); *Hiptage madablota* Gaertn., Gamble, *Fl. Madras* 128 (1915).

Basionym : *Banisteria benghalensis* L., *Sp. Pl.* 1: 427 (1753).

Habit : Climber
Ecosystem preference : Wetlands
Distribution : Indo - Pacific and Holarctic
IUCN Category : Least Concern (LC)
Habitat : Near water sources in forests
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : January - November
Altitude preference : Found in medium altitudes
Specimen examined :INDIA, Kerala: Palakkad District, Walayar range, Aduppukootimala, 10°50'01.68"N, 76°44'33.00"E, 327m, 16 February 2021, Aswani & Maya, 6448 (GVCH) **(Plate 43: Fig. b)**.

Achariaceae

Hydnocarpus Gaertn., *Fruct. Sem. Pl. i.* 288. t. 60 (1788)

Key to species

Leaves entire; petals hairy…...…*H. alpinus*
Leaves serrate; petals glabrous……..
……...……*H. pentandrus*

Hydnocarpus alpinus Wight, *Icon. Pl. Ind. Orient. [Wight]* t. 942; Hook. f., FBI 1: 197 (1872); Gamble, *Fl. Madras* 52 (1915); Vajr., *Fl. Palghat Dist* 61 (1990); *Sasidh., Fl. Parambikulam WLS* 17 (2002).

Habit : Tree
Ecosystem preference : Semi-evergreen forests
Distribution : Indo - Pacific
IUCN Category : Vulnerable (VU)
Habitat : Near water sources
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : February - July
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Aduppukootimala, 10°49'59.16``N, 76°44'31.56"E, 298m, 12 January 2019, Aswani & Maya, 3710 (GVCH); Aduppukootimala flood site, 10°50'38.76"N, 76°43'51.96"E, 147m, 12 January 2019, Aswani & Maya, 3746 (GVCH); Jamanthimala, 10°51'59.76"N, 76°47'15.36"E, 641m, 01 July 2019, Aswani & Maya, 4162 (GVCH); Chaatapara waterfalls, 10°52'56.81"N, 76°42'11.22"E, 507m, 10 December 2019, Aswani & Maya, 5498 (GVCH) **(Plate 43: Fig. c)**.

Hydnocarpus pentandrus (Buch.-Ham.) Oken, *Allg. Naturgesch.* 3(2): 1381 (1841); Vajr., *Fl. Palghat Dist* 61 (1990); Sasidh., *Fl. Parambikulam WLS* 17 (2002); *Hydnocarpus wightiana* Blume, Hook. f., *FBI* 1: 196 (1872); Gamble, *Fl. Madras* 52 (1915).

Basionym : *Chilmoria pentandra* Buch.-Ham., *Trans. Linn. Soc. London* 13(2): 501 (1822).

Habit : Tree
Ecosystem preference : Moist deciduous, Semi-evergreen forests and also in the plains
Distribution : Indo - Pacific
Endemism : Western Ghats
IUCN Category : Vulnerable (VU)
Habitat : In forest floors
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : December- February
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, G. P. Nair Estate, 10°53'29.76"N , 76°39'50.76"E, 284m, 24 March 2018, Aswani & Maya, 1774 (GVCH); Adupukootimala, 10°49'59.16"N, 76°44'31.56"E, 298m, 12 January 2019, Aswani & Maya, 3709 (GVCH); Chottuppara waterfalls, 10°52'37.92"N, 76°41'39.84"E, 346m, 14 May 2019, Aswani & Maya, 3976 (GVCH); S Medu, 10°51'20.17"N, 76°47'4.18"E, 645m, 23 June 2019, Aswani & Maya, 4065 (GVCH); Chacolas, 10°51'21.60"N, 76°44'52.08"E, 265m, 02 August 2019, Aswani & Maya, 4523 (GVCH) **(Plate 43: Fig. d)**.

Violaceae

Pigea Ging., *Mém. Soc. Phys. Genève* 2(1): 28, t. 2, fig. 4 (1823)

Pigea enneasperma (L.) P. I. Forst., *Austrobaileya* 11: 29 (2021) ; *Ionidium suffruticosum* (L.) Ging., Hook. f., *FBI* 1: 185 (1872); Gamble, *Fl. Madras* 49 (1915).

Basionym : *Viola enneasperma* L., *Sp. Pl.* 2: 937 (1753).

Habit : Herb
Ecosystem preference : Moist deciduous forests, plains and wastelands
Distribution : Indo - Pacific, Holarctic, African and Australian
IUCN Category : Not Evaluated (NE)
Habitat : In soil rich areas
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : July - November
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Walayar Dam, 10°50'24.58"N, 76°51'01.52"E, 220m, 09 May 2018, Aswani & Maya, 1993 (GVCH); Mayyappallam, 10°48'0.36"N, 76°45'58.68"E, 140m, 10 May 2018, Aswani & Maya, 2096 (GVCH); Malampuzha irrigation dept. Guest house hillock, 10° 50 '04.20"N, 76° 40' 52.68"E, 152m, 18 May 2018, Aswani & Maya, 2195 (GVCH) **(Plate 43: Fig. e)**.

Passifloraceae

Passiflora L., *Sp. Pl. [Linnaeus]* 2: 955 (1753), nom. cons.

Passiflora foetida L., *Sp. Pl.* 2: 959 (1753); Gamble, *Fl. Madras* 524 (1919); Vajr., *Fl. Palghat Dist* 210 (1990); Sasidh., *Fl. Parambikulam WLS* 133 (2002).

Habit : Climber
Ecosystem preference : Degraded forests and wastelands
Distribution : Indo - Pacific, Holarctic, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Common climber in disturbed forest floors
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Common

Phenology : July - December
Altitude preference : Found commonly in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thonikadavu, 10°50'04.96"N, 76°40'48.72"E, 142m, 04 June 2017, Aswani & Maya, 27 (GVCH); Koyamarakadu, 10°47'44.88"N, 76°45'38.52"E, 151m, 06 September 2018, Aswani & Maya, 2682 (GVCH); Pazhampullikadu, 10°50'09.55"N, 76°38'28.33"E, 99m, 16 October 2018, Aswani & Maya, 3110 (GVCH); Kochuthodu, 10°51'55.44"N, 76° 42 '00.11"E, 195m, 18 December 2018, Aswani & Maya, 3406 (GVCH) **(Plate 43: Fig. f)**.

Salicaceae

Key to genera

Plants armed……..……..…*Flacourtia*
Plants unarmed…….……..……....*Casearia*

Casearia Jacq., *Enum. Syst. Pl.* 4, 21 (1760)

Key to species

Branchlets pubescent; calyx lobes 4; stigma 4 lobed …...……..….*C. wynadensis*
Branchlets glabrous; calyx lobes 5; stigma discoid…..……...……..…..*C. graveolens*

Casearia graveolens Dalzell, *Hooker's J. Bot. Kew Gard. Misc.* 4: 107 (1852); Hook. f., *FBI* 2: 592 (1879); Gamble, *Fl. Madras* 520 (1919); *Casearia esculenta* Roxb., Hook. f., *FBI* 2:592. (1879); Gamble, *Fl. Madras* 521 (1915); Vajr., *Fl. Palghat Dist* 59 (1990); *Casearia ovata* (Lam.) Willd., Sasidh., *Fl. Parambikulam WLS* 15 (2002).

Habit : Shrub
Ecosystem preference : Moist deciduous and semi - evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In margins of hills
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : January - May
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Ayyappan Mala, 10°49'07.19"N, 76°44'50.28"E, 191m, 07 March 2019, Aswani & Maya, 3811 (GVCH); Mannukunnu, 10°52'5.50"N, 76°38'30.27" E, 181m, 09 July 2019, Aswani & Maya, 4209 (GVCH) **(Plate 43: Fig. g)**.

Casearia wynadensis Bedd., *Icon. Pl. Ind. Or. [Beddome]* 34.; Hook. f., *FBI* 2: 594 (1879); Gamble, *Fl. Madras* 521 (1919); Vajr., *Fl. Palghat Dist* 60 (1990); Sasidh., *Fl. Parambikulam WLS* 15 (2002).

Habit : Tree
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
Endemism : Western Ghats
IUCN Category : Vulnerable
Habitat : In open forests
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : April - June
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Poolakunnu, 10°51'33.12"N , 76°42'29.52 "E, 142m, 10 March 2018, Aswani & Maya, 1399 (GVCH); Ayyappan Mala, 10°49'07.19"N, 76°44'50.28"E, 131m, 26 June 2018, Aswani & Maya, 2459 (GVCH). **(Plate 43: Fig. h)**.

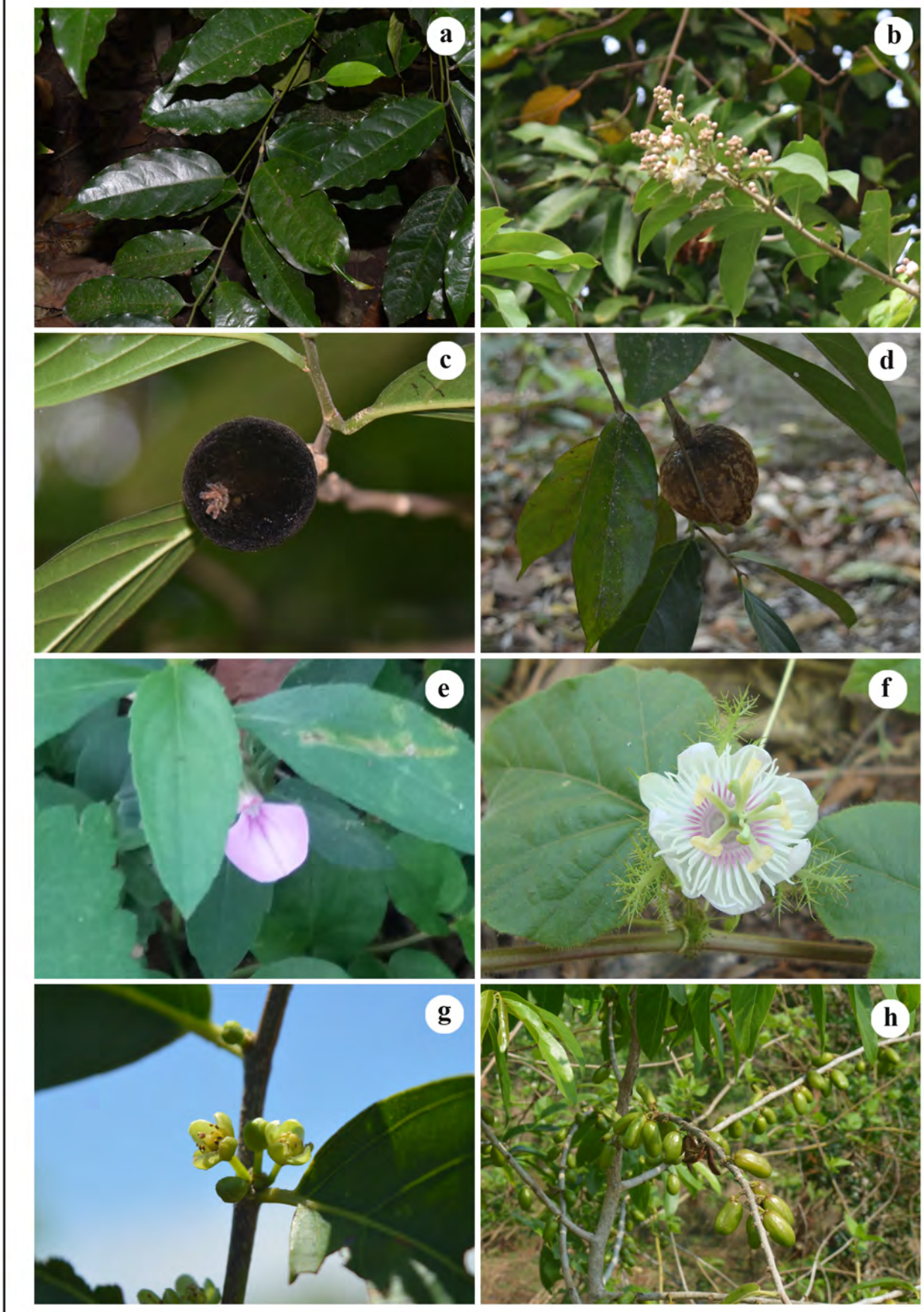

Plate 43: Fig. a. *Putranjiva roxburghii* Wall. **b.** *Hiptage benghalensis* (L.) Kurz **c.** *Hydnocarpus alpinus* Wight **d.** *Hydnocarpus pentandrus* (Buch.-Ham.) Oken **e.** *Pigea enneasperma* (L.) P.I.Forst. **f.** *Passiflora foetida* L. **g.** *Casearia graveolens* Dalzell **h.** *Casearia wynadensis* Bedd.

Flacourtia Comm. ex L'Hér., *Stirp. Nov.* 59 (1786)

Key to species

Leaves smaller (2.5 - 10cm long) in size…..……..…….*F. indica*
Leaves larger (12 - 28cm long) in size……..……..….. *F. montana*

Flacourtia indica (Burm.f.) Merr., *Interpr. Herb. Amboin.* 377 (1917); Vajr., *Fl. Palghat Dist* 60 (1990); *Flacourtia sepiaria* Roxb., Hook. f., *FBI* 1: 194 (1872); Gamble, *Fl. Madras* 54 (1915).

Basionym : *Gmelina indica Burm*.f., *Fl. Ind. (N. L. Burman)* 132, t. 39, fig. 5 (1768).

Habit : Shrub
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and African
IUCN Category : Least Concern (LC)
Habitat : In hillocks and forest margins in main hills
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : November - March
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Mayyappallam, 10°48'0.36"N, 76°45'58.68"E, 163m, 10 March 2018, Aswani & Maya, 2119 (GVCH); Kongampaadam, 10°48'36.72"N, 76°46'51.96"E, 174m, 15 June 2018, Aswani & Maya, 2334 (GVCH); Ayyappan Mala, 10°48'59.96"N, 76°45'22.61"E, 144m, 26 June 2018, Aswani & Maya, 2386 (GVCH); Cheekuzhi, 10°50'11.04"N, 76°38'57.48"E, 118 m, 16 October 2019, Aswani & Maya, 4753 (GVCH); Jamanthimala, 10°52'20.64"N, 76°46'57.00"E, 888m, 09 January 2020, Aswani & Maya, 5735 (GVCH) **(Plate 44: Fig. a)**.

Flacourtia montana J.Graham, *Cat. Bomb*. Pl. 10; Hook. f., *FBI* 1: 192 (1872); Gamble, *Fl. Madras* 54 (1915); Sasidh., *Fl. Parambikulam WLS* 16 (2002).

Habit : Shrub
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
Endemism : India
IUCN Category : Not Evaluated (NE)
Habitat : In forest floors
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : April - June
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Ayyappan Mala, 10°49'07.19"N, 76°44'50.28"E, 201m, 07 March 2019, Aswani & Maya, 3821 (GVCH) **(Plate 44: Fig. b)**.

Euphorbiaceae

Key to genera

1. Climbers……..……..…*Tragia*
- Herbs, shrubs or trees……..…...2
2. Flowers enclosed in involucre; perianth absent; stamens usually 1 per flower…….....……..*Euphorbia*
- Flowers not enclosed in involucre, perianth present; stamens 2 or more.....3
3. Staminal filaments inflexed in bud……..……..….*Croton*
- Staminal filaments erect…..……...4
4. Calyx valvate in male flowers..…..5
- Calyx imbricate in male flowers……..…...12
5. Filaments united into a column ……..…..*Hevea*

- Filaments free……...…6
6. Stamens numerous…….……....7
- Stamens definite……...…8
7. Leaves simple, spirally and closely arranged……..…*Homonoia*
- Leaves palmately 6 - 8 lobed, alternate……..….*Ricinus*
8. Leaves peltate…..…..…*Macaranga*
- Leaves not peltate…….…..…9
9. Style plumose or laciniate……10
- Style entire…….…….……..…12
10. Disc present……...*Micrococca*
- Disc absent……..……11
11. Anthers twisted or flexuous; ovary 3 - celled…….….. *Acalypha*
- Anthers linear; anthers 2 - 4 celled…..……..…..*Mallotus*
12. Fruit a drupe……....……*Givotia*
- Fruit a capsule……..……....13
13. Calyx of male flowers 3 - lobed; capsule with echinate processes on cocci…….….. *Microstachys*
- Calyx of male flowers 4 - 5 lobed; capsule without echinate processes……..……14
14. Style connate below…..... *Jatropha*
- Style free……...……....15
15. Stem with prominent petiolar scars; leaf base e – glandular ……*Manihot*
- Stem without prominent petiolar scars; leaf base glandular…… ……..….*Baliospermum*

Acalypha L., *Sp. Pl.* 2: 1003 (1753)

Key to species

1. Flowers in terminal panicles; female flowers pedicelled…...*A. paniculata*
- Flowers in terminal or axillary spikes; female flowers sessile…….2
2. Capsule with large yellow glands in the sinuses…….....…..*A. fruiticosa*
- Capsule glandless……..…….3
3. Bracts rather large; foliaceous……..*A. indica*
- Bracts moderate sized…...……..4
4. Male and female spikes all axillary and sessile…..…..….*A. malabarica*
- Male spikes axillary; female spikes terminal…...…….. *A. capitata*

Acalypha capitata Willd., *Sp. Pl., ed.* 4 [Willdenow] 4(1): 525 (1805); *Acalypha alnifolia* Klein ex Willd., Hook. f., *FBI* 5: 415 (1887); Gamble, *Fl. Madras* 1330 (1925); Vajr., *Fl. Palghat Dist* 418 (1990); Sasidh., *Fl. Parambikulam WLS* 280 (2002).

Habit : Shrub
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
Endemism : Peninsular India
IUCN Category : Not Evaluated (NE)
Habitat : In rocky hillocks
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Common
Phenology : October - March
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala, 10°49'44.76"N, 76°40'34.59"E, 108m, 20 June 2017, Aswani & Maya, 134 (GVCH); Karadikunnu, 10°50'23.64"N, 76°49'47.64" E, 221m, 30 December 2017, Aswani & Maya, 1098 (GVCH); Kongampaadam, 10°48'36.72"N, 76°46'51.96"E, 181m, 15 June 2018, Aswani & Maya, 2341 (GVCH); Anayappanchalla, 10°48'25.92"N, 76°48'35.19"E, 160m, 18 September 2018, Aswani & Maya, 2808 (GVCH); Edamala, 10°50'8.57"N, 76°38'57.48"E, 127 m, 16 October 2019, Aswani & Maya, 4728 (GVCH).

Acalypha fruticosa Forssk., *Fl. Aegypt.-Arab.* 161. (1775); Hook. f., *FBI* 5: 415 (1887); Gamble, *Fl. Madras* 1331 (1925); Vajr., *Fl. Palghat Dist* 418 (1990); Sasidh., *Fl. Parambikulam WLS* 280 (2002).
Habit : Shrub

Ecosystem preference : Planted
Distribution : Indo - Pacific and African
IUCN Category : Least Concern (LC)
Habitat : Grown in biofences in home and in hillocks
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : July - August
Altitude preference : Found in lower altitudes
Specimen examined: INDIA, Kerala: Palakkad District, Walayar range, Kongampadam, 10°48'36.72"N, 76°46'51.96"E, 181m, 06 September 2019, Aswani & Maya, 4631(GVCH) **(Plate 44: Fig. c)**.

Acalypha indica L., *Sp. Pl.* 2: 1003 (1753); Hook. f., *FBI* 5: 416 (1887); Gamble, *Fl. Madras* 1330 (1925); Sasidh., *Fl. Parambikulam WLS* 280 (2002).

Habit : Herb
Ecosystem preference : Dry deciduous forests and also in the plains
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Disturbed forest tracks and in residential places
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : July - December
Altitude preference : Found commonly in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Vedivachapara, 10°50'12.34"N, 76°40' 41. 15"E, 109m, 04 June 2017, Aswani & Maya, 54 (GVCH); Walayar Dam, 10°50'24.58"N, 76°51'01.52"E, 292m, 09 May 2018, Aswani & Maya, 2065 (GVCH);Ahalya campus, 10°47'43.08"N, 76°50'5.43"E, 150m, 24 September 2020, Aswani & Maya, 6286 (GVCH) **(Plate 44: Fig. d)**.

Acalypha malabarica Müll. Arg., *Linnaea* 34(1): 42 (1865); Hook. f., *FBI* 5: 416 (1887); Gamble, *Fl. Madras* 1330 (1925)

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
Endemism : Peninsular India
IUCN Category : Not Evaluated (NE)
Habitat : Understorey in canopy rich forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : July - December
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, G. P. Nair Estate, 10°53'40.83"N, 76°39'43.16"E, 239m, 24 March 2017, Aswani & Maya, 1743 (GVCH); Ayyappan Koil, 10°52'51.49"N, 76°47'39.48"E, 528m, 28 January 2020, Aswani & Maya, 5916 (GVCH).

Acalypha paniculata Miq., *Fl. Ned. Ind.* 1(2): 406 (1859); Hook. f., *FBI* 5: 415 (1887); Gamble, *Fl. Madras* 1330 (1925); *Acalypha racemosa* Wall. ex Baill., Vajr., *Fl. Palghat Dist* 418 (1990); Sasidh., *Fl. Parambikulam WLS* 281 (2002).

Habit : Herb
Ecosystem preference : Semi-evergreen forests
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Understorey of canopy rich forest floors
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : August - December
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Neelippara, 10°51'47.52"N 76°37'37.38"E,

324m, 15 September 2017, Aswani & Maya, 561 (GVCH); Poozhikunnu, 10° 51 '20.44"N, 76° 43' 38.28"E, 140m, 09 November 2017, Aswani & Maya, 857 (GVCH) **(Plate 44: Fig. e)**.

Baliospermum Blume, *Bijdr. Fl. Ned. Ind.* 12: 603 (1826)

Baliospermum solanifolium (Burm.) Suresh, *Interpr. Van Rheede's Hort. Malab.* 106 (1988); *Baliospermum axillare* Blume, Hook. f., *FBI* 5: 461 (1887); *Baliospermum montanum* (Willd.) Muell.-Arg., Gamble, *Fl. Madras* 1342 (1925); Vajr., *Fl. Palghat Dist* 421 (1990); Sasidh., *Fl. Parambikulam WLS* 283 (2002).

Basionym : *Croton solanifolius* Burm., *Fl. Malab. (Burman)* 6 (1769).

Habit : Shrub
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Hill slopes
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : August - March
Altitude preference : Found in lower and rarely in medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thakaramada, 10°52'05.16"N, 76°42'41.22"E, 216m, 30 November 2018, Aswani & Maya, 3233 (GVCH); Attippara, 10°52'18.68"N, 76°41'54.12"E, 275m, 18 December 2018, Aswani & Maya, 3497 (GVCH); Parachaathy, 10°50'49.97"N, 76°43'56.67"E, 167m, 02 January 2019, Aswani & Maya, 3624 (GVCH); Chottuppara waterfalls, 10°52'37.92"N, 76°41'39.84"E, 355m, 14 May 2019, Aswani & Maya, 3979 (GVCH); Chaavadippara, 10°52'42.20"N, 76°48'43.56"E, 280m, 28 January 2020, Aswani & Maya, 5837 (GVCH) **(Plate 44: Fig. f)**.

Croton L., *Sp. Pl. [Linnaeus]* 2: 1004 (1753)

Key to species

1. Habit are herbs……..…….2
- Habit are shrubs or trees……..….*C. aromaticus*
2. Leaves ovate - oblong; mature leaf blade and capsule stellate hairy; seeds trigonous…...……*C. hirtus*
- Leaves ovate - lanceolate; mature leaf blade stellate hairy below, glabrous above; capsule warty; seeds oblong…....*C. bonplandianus*

Croton aromaticus L., *Sp. Pl.* 2: 1005 (1753); Hook. f., *FBI* 5: 338 (1887); Vajr., *Fl. Palghat Dist* 425 (1990); *Croton laccifer* L., *Fl. Madras* 1315 (1925); Sasidh., *Fl. Parambikulam WLS* 286 (2002).
Habit : Shrub or small tree
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Margins of grasslands and in hill slopes in semi - evergreen forests
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : April - August
Altitude preference : Found commonly in medium and higher altitudes
Specimen examined :INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala,10°52'10.20"N, 76°47'15.00" E, 766m, 23 June 2019, Aswani & Maya, 4141 (GVCH).

Croton bonplandianus Baill., *Adansonia* 4: 339 (1864); Vajr., *Fl. Palghat Dist* 426 (1990); Sasidh., *Fl. Parambikulam WLS*

285 (2002); *Croton sparsiflorus* Morong., Gamble, *Fl. Madras* 1316 (1925).

Habit : Herb
Ecosystem preference : Degraded forest tracts and in plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : A common weed in plains
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : November- May
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thonikadavu,10°50'04.96"N, 76°40'48.72" E, 115m, 04 June 2017, Aswani & Maya, 01 (GVCH); Kava, 10°50'38.92"N, 76°43'34.63"E, 134m, 06 April 2018, Aswani & Maya, 1835 (GVCH); Walayar Dam, 10°50'24.58"N, 76°51'01.52"E, 219m, 09 May 2018, Aswani & Maya, 1992 (GVCH); Thekke Malampuzha, 10°50'01.23"N, 76°40'58.49"E, 127m, 08 July 2019, Aswani & Maya, 4183 (GVCH).

Croton hirtus L'Hér., *Stirp. Nov.* 17 (1785); Sunil & Sivadasan, *Fl. Alappuzha Dist* 625 (2009); *Croton glandulosus* L. var. hirtus (L'Herit) Muell.-Arg., N. P. Balakr. & Chakrab., F*am. Euphorbiaceae India 213* (2007).

Habit : Herb
Ecosystem preference : Wastelands
Distribution : Indo - Pacific, Holarctic and South American
IUCN Category : Not Evaluated (NE)
Habitat :Weed in the wastelands, roadsides, riverbanks and forest margins
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : Throughout the year
Altitude preference : Found commonly in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thonikadavu, 10°50'04.96"N, 76°40'48.72" E, 138m, 04 June 2017, Aswani & Maya, 24 (GVCH); Edamala, 10°51'15.84"N, 76°39'40.32"E, 139m, 05 October 2017, Aswani & Maya, 682 (GVCH); Valiya eri, 10°48'53.21"N, 76°44'52.53"E, 189m, 06 January 2018, Aswani & Maya, 1304 (GVCH);Ayyappan Mala, 10°49'07.19"N, 76°44'50.28"E, 162m, 26 June 2018, Aswani & Maya, 2490 (GVCH); Cheekuzhi, 10°50'11.04"N, 76°38'57.48"E, 158 m, 16 October 2019, Aswani & Maya, 4793 (GVCH) **(Plate 44: Fig. g)**.

Euphorbia L., *Sp. Pl.* 1: 450 (1753)

key to species

1. Plants prostrate…….....*E. thymifolia*
- Plants erect……..……...…2
2. Armed fleshy shrubs……..*E. tortilis*
- Unarmed shrubs or herbs……....3
3. Cyathea in terminal cymes……....4
- Cyathea aggregated in single or paired axillary clusters…..... *E. hirta*
4. Cymes subtended by pink petaloid bracts……..……*E. tithymaloides*
- Cymes never subtended by petaloid bracts……..…..*E. heterophylla*

Euphorbia heterophylla L., *Sp. Pl.* 1: 453 (1753); Gamble, *Fl. Madras* 1278 (1925); *Euphorbia prunifolia* Jacq., Hook. f., *FBI* 5: 266 (1887); *Euphorbia geniculata* Ortega., Gamble, *Fl. Madras* 1884 (1936).

Habit : Herb
Ecosystem preference : Waste places and degraded deciduous forests
Distribution : Indo - Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Weed in plains and forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : June - August

Altitude preference : Found commonly in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Akathethara - Malampuzha road, 10°49'34.77"N, 76°38'8.58"E, 100m, 28 February 2021, Aswani & Maya, 6527 (GVCH) **(Plate 44: Fig. h)**.

Euphorbia hirta L., *Sp. Pl.* 1: 454 (1753); Gamble, *Fl. Madras* 1275 (1925); Vajr., *Fl. Palghat Dist* 428 (1990); Sasidh., *Fl. Parambikulam WLS* 290 (2002); *Euphorbia pilulifera* Linn., Hook. f., *FBI* 5: 250 (1887).

Habit : Herb
Ecosystem preference : Degraded forests and in plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : In all places including wastelands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : Throughout the year
Altitude preference : Found commonly in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala,10°49'39.72"N, 76°40'28.20"E, 208m, 20 June 2017, Aswani & Maya, 115 (GVCH); Kezhakootimala, 10°51'53.30"N, 76°37'36.39"E, 367m, 15 September 2017, Aswani & Maya, 488 (GVCH); Kalliyara, 10°53'14.64"N, 76°39'39.96"E, 181m, 24 March 2018, Aswani & Maya, 1572 (GVCH); Ayyappan Mala, 10°49'07.19"N, 76°44'50.28"E, 197m, 26 June 2018, Aswani & Maya, 2525 (GVCH); Mannukunnu, 10°52'5.50"N, 76°38'30.27" E, 181m, 09 July 2019, Aswani & Maya, 4236 (GVCH).

Euphorbia thymifolia L., *Sp. Pl.* 1: 454 (1753); Hook. f., *FBI* 5: 252 (1887); Gamble, *Fl. Madras* 1276 (1925); Vajr., *Fl. Palghat Dist* 429 (1990); Sasidh., *Fl. Parambikulam WLS* 291 (2002).

Habit : Herb
Ecosystem preference : Riverbeds
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : In the water receded regions of dams
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : November - May
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thonikadavu, 10°50'04.96"N, 76°40'48.72"E, 117m, 04 June 2017, Aswani & Maya, 02 (GVCH); Kosavanidukku-Kaduvachal, 10°50'26.38" N, 76°40'30.88"E, 201m, 16 July 2017, Aswani & Maya, 330 (GVCH); Way to Ayyappan Mala, 10°48'59.96"N, 76°45'22.61"E, 167m, 06 January 2018, Aswani & Maya, 1238 (GVCH); Walayar Dam, 10°50'24.58"N, 76°51'01.52"E, 287m, 09 May 2018, Aswani & Maya, 2060 (GVCH).

Euphorbia tithymaloides L., *Sp. Pl.* 1: 453 (1753); *Pedilanthus tithymaloides* (L.) Poir., Hook. f., *FBI* 5: 239 (1887); Gamble, *Fl. Madras* 1346 (1925).

Habit : Shrub
Ecosystem preference : Moist deciduous forests and in plains
Distribution : Indo - Pacific and South American
IUCN Category : Least Concern (LC)
Habitat : Garden plant often runs wild
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : April - August
Altitude preference : Found commonly in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range,

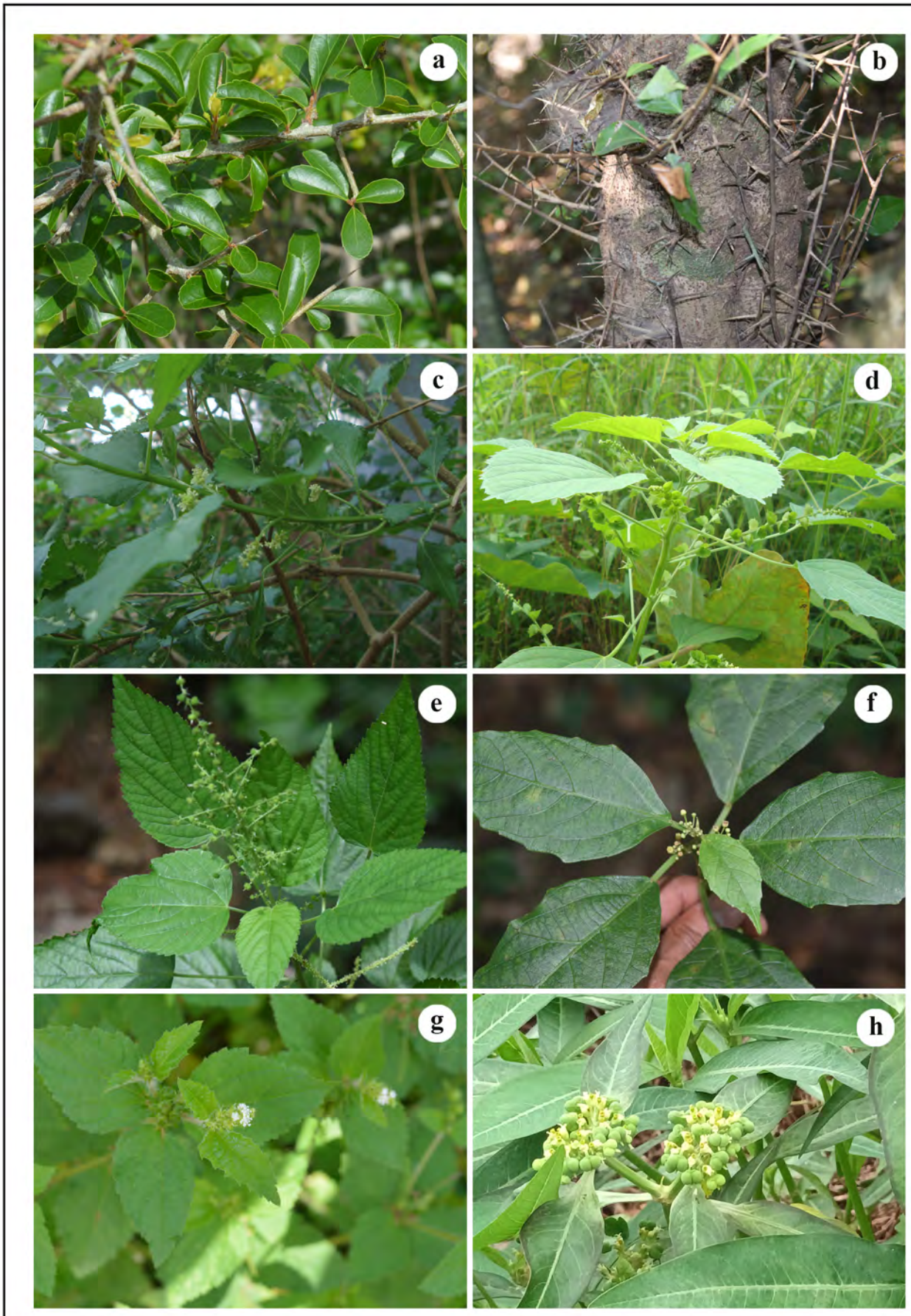

Plate 44: Fig. a. *Flacourtia indica* (Burm.f.) Merr. **b.** *Flacourtia montana* J.Graham **c.** *Acalypha fruticosa* Forssk. **d.** *Acalypha indica* L. **e.** *Acalypha paniculata* Miq. **f.** *Baliospermum solanifolium* (Burm.) Suresh **g.** *Croton hirtus* L'Hér. **h.** *Euphorbia heterophylla* L.

Parakkallu- Neelikunnu, 10°51'30.14"N, 76°37'30.67"E, 166m, 27 April 2018, Aswani & Maya, 1922 (GVCH); Pallakaadu, 10°51'30.96"N, 76°37'39.00"E, 239m, 09 October 2018, Aswani & Maya, 3098 (GVCH); Chacolas, 10°51'16.20"N, 76°45'05.76"E, 288m, 02 August 2019, Aswani & Maya, 4528 (GVCH) **(Plate 45: Fig. a)**.

Euphorbia tortilis Rottler ex Ainslie, *Mater. Ind.* 2: 424 (1826); Hook. f., *FBI* 5: 256 (1887); Gamble, *Fl. Madras* 1277 (1925).

Habit : Shrub
Ecosystem preference : Dry deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Exposed rocs in rocky hillocks
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional / Common
Phenology : June - August
Altitude preference : Found commonly in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Karadikunnu, 10°50'23.64"N , 76°49'47.64"E, 217m, 30 December 2017, Aswani & Maya, 1095 (GVCH);Valiya eri, 10°48'53.21"N, 76°44'52.53"E, 180m, 06 January 2018, Aswani & Maya, 1295 (GVCH); Mayyappallam, 10°48'01.78"N, 76°45'58.91"E, 144m, 10 May 2018, Aswani & Maya, 2151 (GVCH); Kongampaadam, 10°48'36.81"N, 76°46'43.06"E, 157m, 15 June 2018, Aswani & Maya, 2357 (GVCH); Anayappanchalla, 10°48'24.82"N, 76°48'30.73"E, 183m, 18 September 2018, Aswani & Maya, 2851 (GVCH) **(Plate 45: Fig. b)**.

Givotia Griff., *Calcutta J. Nat. Hist.* iv. (1844) 388

Givotia moluccana (L.) Sreem., *Taxon* 24(5-6): 696 (1975); Sasidh., *Fl. Parambikulam WLS* 292 (2002); *Givotia rottleriformis* Griff., Hook. f., *FBI* 5: 395 (1887); Gamble, *Fl. Madras* 1342 (1925); Vajr., *Fl. Palghat Dist* 430 (1990).

Habit : Tree
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Lower hill slopes in forests
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : October - February
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kongampaadam, 10°48'36.72"N, 76°46'51.96"E, 192m, 15 June 2018, Aswani & Maya, 2352 (GVCH); Koyamarakaadu, 10°47'44.88"N, 76°45'38.52"E, 171m, 06 September 2018, Aswani & Maya, 2702 (GVCH); Mangalathumchalla, 10°49'04.07"N, 76°48'16.50"E, 180m, 18 September 2018, Aswani & Maya, 2761 (GVCH); Anayappanchalla, 10°49'08.43"N, 76°48'56.51"E, 164m, 18 September 2018, Aswani & Maya, 2804 (GVCH) **(Plate 45: Fig. c)**.

Hevea Aubl., *Hist. Pl. Guiane* 871 (t. 335) (1775)

Hevea brasiliensis (Willd. ex A.Juss.) Müll. Arg., *Linnaea* 34(2): 204 (1865); Gamble, *Fl. Madras* 1346 (1925); Vajr., *Fl. Palghat Dist* 440 (1990).

Basionym : *Siphonia brasiliensis Willd*. ex A. Juss., *Euphorb. Gen. t.* 12 (1824).

Habit : Tree

Ecosystem preference : Cultivated
Distribution : Indo - Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Cultivated in estates
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : February - June
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kallanpuzha, 10°51'34.02"N , 76°42'40.16"E, 162m, 26 January 2018, Aswani & Maya, 1351 (GVCH); Poolakunnu, 10°51'33.12"N, 76°42'29.52"E, 157m, 10 March 2018, Aswani & Maya, 1414 (GVCH); Kalliyara, 10°52'51.24"N, 76°39'24.84"E, 139m, 24 March 2018, Aswani & Maya, 1534 (GVCH); Anakkal road, 10°51'33.84"N, 76°41'41.94"E, 124m, 24 March 2018, Aswani & Maya, 1800 (GVCH).

Homonoia Lour., *Fl. Cochinch.* 2: 636 (1790)

Homonoia riparia Lour., *Fl. Cochinch.* 2: 637 (1790); Hook. f., *FBI* 5: 455 (1887); Gamble, *Fl. Madras* 1333 (1925); Vajr., *Fl. Palghat Dist* 431 (1990); Sasidh., *Fl. Parambikulam WLS* 293 (2002).

Habit : Shrub
Ecosystem preference : Riparian systems
Distribution : Indo - Pacific and Holarctic
IUCN Category : Least Concern (LC)
Habitat : In riverbanks and near waterfalls
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : December - May
Altitude preference : Found commonly in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kallanpuzha, 10°51'34.02"N , 76°42'40.16"E, 152m, 26 January 2018, Aswani & Maya, 1341 (GVCH); Kavarakundu, 10°52'34.26"N, 76°42'40.48"E, 370m, 10 March 2018, Aswani & Maya, 1494 (GVCH); G. P. Nair Estate, 10°53'38.36"N, 76°39'44.27"E, 224m, 24 March 2018, Aswani & Maya, 1712 (GVCH); Kochuthodu, 10°51'55.44"N, 76°42'00.11"E, 168m, 18 December 2018, Aswani & Maya, 3381 (GVCH); Chottupara, 10°52'37.92"N, 76°41'39.84"E, 383m, 14 May 2019, Aswani & Maya, 3920 (GVCH); Chacolas, 10°51'15.48"N, 76°45'09.00"E, 281m, 02 August 2019, Aswani & Maya, 4560 (GVCH) **(Plate 45: Fig. d)**.

Jatropha L., *Sp. Pl.* 2: 1008 (1753)

Key to species

Younger stem greenish - white; flowers yellowish - green……..…..……..*J. curcas*
Younger stem purplish - green; flowers red……..…....*J. gossypifolia*

Jatropha curcas L., *Sp. Pl.* 2: 1006 (1753); Hook. f., *FBI* 5: 383 (1887); Gamble, *Fl. Madras* 1340 (1925); Vajr., *Fl. Palghat Dist* 431 (1990).

Habit : Shrub
Ecosystem preference : In plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Found as a bio fencing plant
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : May - August
Altitude preference : Found commonly in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Poolakunnu, 10°51'33.12"N ,

76°42'29.52"E, 145m, 10 March 2018, Aswani & Maya, 1402 (GVCH); Ayyappan Mala, 10°49'07.19"N, 76°44'50.28"E, 130m, 26 June 2018, Aswani & Maya, 2458 (GVCH); Koyamarakaadu, 10°47'44.88"N, 76°45'38.52"E, 167m, 06 September 2018, Aswani & Maya, 2698 (GVCH); Pazhampullikaadu, 10°50'09.55"N, 76°38'28.33"E, 148m, 16 October 2018, Aswani & Maya, 3159 (GVCH); Chacolas, 10°51'16.20"N, 76°45'05.76"E, 287m, 02 August 2019, Aswani & Maya, 4527 (GVCH) **(Plate 45: Fig. e)**.

Jatropha gossypifolia L., *Species Plantarum* (1753)**;** Hook. f., *FBI* 5: 383 (1887); Gamble, *Fl. Madras* 1340 (1925); Vajr., *Fl. Palghat Dist* 431(1990).

Habit : Shrub
Ecosystem preference : In forest margins and in plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Grown as a bio fencing plant, often found running wild
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : July - September
Altitude preference : Found commonly in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Karadikunnu, 10°50'23.64"N, 76°49'47.64" E, 233m, 30 December 2017, Aswani & Maya, 1110 (GVCH); Ayyankulam, 10°48'37.19"N, 76°44'56.27"E, 140m, 06 January 2018, Aswani & Maya, 1180 (GVCH); Koyyamarakaadu, 10°47'44.88"N, 76°45'38.52"E, 127m, 30 November 2019, Aswani & Maya, 5368 (GVCH); Chaavadippara, 10°52'42.20"N, 76°48'43.56"E, 252m, 28 January 2020, Aswani & Maya, 5809 (GVCH) **(Plate 45: Fig. f)**.

Macaranga Thouars, *Gen. Nov. Madagasc*. 26 (1806)

Macaranga peltata Müll.Arg., *Prodr. [A. P. de Candolle]* 15(2.2): 1010 (1866); Gamble, *Fl. Madras* 1326 (1925); Vajr., *Fl. Palghat Dist* 432 (1990); Sasidh., *Fl. Parambikulam WLS* 294 (2002); *Macaranga roxburghii* Wight, Hook. f., *FBI* 5: 448 (1887).

Habit : Tree
Ecosystem preference : Moist deciduous forests and also in the plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In open forests, near water sources, and also in roadsides
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : January - February
Altitude preference : Found commonly in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Karadikunnu, 10°51'34.02"N , 76°42'40.16"E, 151m, 26 January 2018, Aswani & Maya, 1340 (GVCH); G. P. Nair Estate, 10°53'17.51"N, 76°39'42.72"E, 180m, 24 March 2018, Aswani & Maya, 1589 (GVCH); Pallakaadu, 10°51'30.96"N, 76°37'39.00"E, 235m, 09 October 2018, Aswani & Maya, 3094 (GVCH); Parachaathy, 10°50'42.54"N, 76°43'49.14"E, 146m, 02 January 2019, Aswani & Maya, 3538 (GVCH) **(Plate 45: Fig. g)**.

Mallotus Lour., *Fl. Cochinch.* 2: 635 (1790)

Key to species

1. Leaves alternate……..……....……2
- Leaves alternate or opposite…...…3
2. Capsule echinate with soft villous spines; seeds angular……..……*M. tetracoccus*

- Capsule red - glandular; seeds globose……....*M. philippensis*

3. Leaves ovate - lanceolate; fruits brown stellate – tomentose……..….*M. rhamnifolius*
- Leaves oblanceolate; fruits covered with curved spines and yellow glands…..……....*M. resinosus*

Mallotus philippensis (Lam.) Müll.Arg., *Linnaea* 34(2): 196 (1865); Hook. f., *FBI* 5: 442 (1887); Gamble, *Fl. Madras* 1322 (1925); Vajr., *Fl. Palghat Dist* 433 (1990); Sasidh., *Fl. Parambikulam WLS* 295 (2002).

Basionym : *Croton philippensis Lam*., *Encycl. [J. Lamarck & al.]* 2(1): 206 (1786).

Habit : Tree
Ecosystem preference : Moist deciduous forests and in the plains
Distribution : Indo - Pacific and Australian
IUCN Category : Least Concern (LC)
Habitat : In forest floors
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : October - March
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kozhimala, 10°50'01.89"N, 76°42'58.61"E, 137m, 09 November 2017, Aswani & Maya, 787 (GVCH); Kalliyara, 10°52'51.24"N, 76°39'24.84"E, 129m, 24 March 2018, Aswani & Maya, 1524 (GVCH); Parakkallu- Neelikunnu, 10°51'30.14"N, 76°37'30.67"E, 180m, 27 April 2018, Aswani & Maya, 1936 (GVCH); Kottamutti waterfalls, 10°49'42.94"N, 76°46'47.87"E, 216m, 23 September 2018, Aswani & Maya, 2862 (GVCH); Parachaathy, 10°50'54.24"N, 76°43'55.92"E, 173m, 02 January 2019, Aswani & Maya, 3594 (GVCH); Jamanthimala on the way, 10°51'20.17"N, 76°47'4.18"E, 646m, 23 June 2019, Aswani & Maya, 4025 (GVCH) **(Plate 45: Fig. h)**.

Mallotus resinosus Merr., *Sp. Blancoanae* 222 (1918); *Mallotus resinosus* var. *resinosus* (Blanco) Merr., Vajr., *Fl. Palghat Dist* 434 (1990).

Habit : Tree
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
Endemism : Peninsular India
IUCN Category : Least Concern (LC)
Habitat : In hill slopes near water sources
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : December - March
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Akamalavaram - Pettikallu, 10°53'8.52"N, 76°39'38.88"E, 173m, 19 July 2019, Aswani & Maya, 4373 (GVCH); Chaatapara waterfalls, 10°53'11.76"N, 76°42'15.84"E, 632m, 10 December 2019, Aswani & Maya, 5491 (GVCH) **(Plate 46: Fig. a)**.

Mallotus rhamnifolius Müll.Arg., *Linnaea* 34(2): 196 (1865); Hook. f., *FBI* 5:440 (1887); Gamble, *Fl. Madras* 1322 (1925).

Habit : Tree
Ecosystem preference : Semi-evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Near waterfalls
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : August - December
Altitude preference : Found in medium altitudes

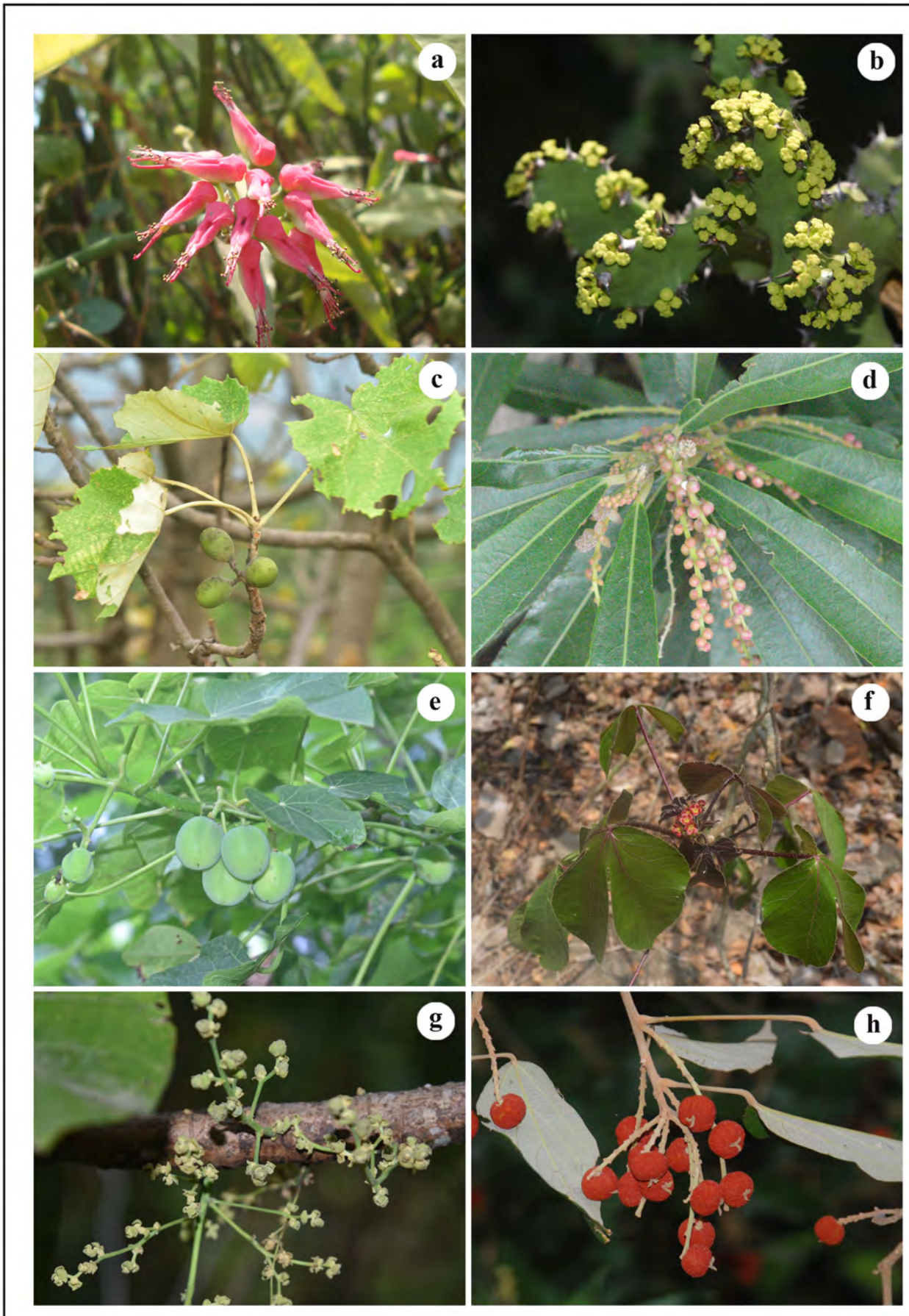

Plate 45: Fig. a. *Euphorbia tithymaloides* L. **b.** *Euphorbia tortilis* Rottler ex Ainslie **c.** *Givotia moluccana* (L.) Sreem. **d.** *Homonoia riparia* Lour. **e.** *Jatropha curcas* L. **f.** *Jatropha gossypifolia* L. **g.** *Macaranga peltata* Müll.Arg. **h.** *Mallotus philippensis* (Lam.) Müll.Arg.

Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Akamalavaram - Pettikallu, 10°52'13.80"N, 76°42'30.96"E, 262m, 19 July 2019, Aswani & Maya, 4337 (GVCH); Akamalavaram - Muchikadavu, 10°52'26.78"N, 76°42'42.09"E, 312m, 19 July 2019, Aswani & Maya, 4363 (GVCH) **(Plate 46: Fig. b)**.

Mallotus tetracoccus Kurz, *J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist.* 42(4): 245 (1874); Vajr., *Fl. Palghat Dist* 434 (1990); Sasidh., *Fl. Parambikulam WLS* 295 (2002); *Rottlera albus* var. *occidentalis* Hook. f., *FBI* 5: 429 (1887); Gamble, *Fl. Madras* 1321 (1925).

Basionym : *Rottlera tetracocca Roxb*., Fl. Ind. (Roxburgh) 3: 826 (1832).

Habit : Tree
Ecosystem preference : Semi-evergreen forests
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : In hill tops near grasslands
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : July - April
Altitude preference : Found rarely in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kallappara, 10°53'16.44"N, 76°45'50.4"E, 1023m , 28 January 2020, Aswani & Maya, 6004 (GVCH) **(Plate 46: Fig. c)**.

Manihot Mill., *Gard. Dict. Abr., ed.* 4. [851] (1754)

Key to species

Leaf lobes 3 or 5, pale bluish green below; capsule globose without wings……..
……*M. carthagenensis* subsp. *glaziovii*

Leaves palmately lobed; dark green above; pale greenish below; capsule 3 - winged when young…...……..……*M. esculenta*

Manihot carthagenensis* subsp. *glaziovii (Müll.Arg.) Allem in *Novon* 11: 160 (2001); *Manihot glaziovii* Muell.Arg. in Mart., Gamble, *Fl. Madras* 1346 (1925); Vajr., *Fl. Palghat Dist* 440 (1990).

Basionym: *Manihot glaziovii* Müll.Arg. in C.F.P.von *Martius & auct. suc. (eds.), Fl. Bras.* 11(2): 446 (1874).

Habit : Tree
Ecosystem preference : In bio fences
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Grown as a biofencing plant near agricultural lands and in home steads
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : October - January
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Valiya eri, 10°48'51.04"N, 76°45'01.67"E, 136m, 06 January 2018, Aswani & Maya, 1326 (GVCH); Mayyappallam, 10°48'06.93"N, 76°46'25.09"E, 135m, 10 May 2018, Aswani & Maya, 2121 (GVCH); Way to Ayyappan Mala, 10°49'07.40"N, 76°45'32.38"E, 170m, 26 June 2018, Aswani & Maya, 2475 (GVCH).

Manihot esculenta Crantz, *Inst. Rei Herb.* 1: 167 (1766); Vajr., *Fl. Palghat Dist* 440 (1990); *Manihot utilissima* Phol., Hook. f., *FBI* 5: 239 (1887); Gamble, *Fl. Madras* 1346 (1925).

Habit : Shrub
Ecosystem preference : In agricultural lands
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)

Habitat : Cultivated in farm lands
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : December - March
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Akathethara - Malampuzha road, 10°49'34.77"N, 76°38'8.58"E, 100m, 28 February 2021, Aswani & Maya, 6528 (GVCH).

Micrococca Benth., Niger Fl. [W. J. Hooker]. 503 (1849)

Micrococca mercurialis (L.) Benth., *Niger Fl. [W. J. Hooker]*. 503. (1849); Gamble, *Fl. Madras* 1328 (1925); Sasidh., *Fl. Parambikulam WLS* 295 (2002); *Claoxylon mercurialis* Thw., Hook. f., *FBI* 5: 412 (1887).

Habit : Herb
Ecosystem preference : Degraded deciduous forests and in plains
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : In forest plantations and in wastelands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : June - December
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Chacolas, 10°51'22.68"N, 76°44'41.28"E, 276m, 02 August 2019, Aswani & Maya, 4510 (GVCH).

Microstachys A. Juss., *Euphorb. Gen.* 48. t. 15 (1824)

Microstachys chamaelea (L.) Müll.Arg., *Linnaea* 32(1): 95 (1863); *Sebastiana chamaelea* (L.) Muell.-Arg., Hook. f., *FBI* 5: 475 (1888); Gamble, *Fl. Madras* 1344 (1925); Vajr., *Fl. Palghat Dist* 438 (1990); Sasidh., *Fl. Parambikulam WLS* 300 (2002).

Basionym : *Tragia chamaelea* L., *Sp. Pl* 2: 981 (1753).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and Australian
IUCN Category : Not Evaluated (NE)
Habitat : Grassy patches in moist deciduous forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : July - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thekke Malampuzha irrigation dept. guest house hillock, 10°50'04.20"N, 76°40'52.68"E, 120m, 08 September 2017, Aswani & Maya, 411 (GVCH); Neelippara, 10°51'47.52"N, 76°37'37.38"E, 330m, 15 September 2017, Aswani & Maya, 567 (GVCH); Cheekuzhi, 10°50'11.04"N, 76°38'57.48"E, 121 m, 16 October 2019, Aswani & Maya, 4756 (GVCH); Thekke Malampuzha irrigation dept. guest house hillock, 10°50'04.20"N, 76°40'52.68"E, 120m, 23 November 2019, Aswani & Maya, 4963 (GVCH) **(Plate 46: Fig. d).**

Ricinus L., *Sp. Pl*. 2: 1007 (1753)

Ricinus communis L., *Sp. Pl.* 2: 1007 (1753); Hook. f., *FBI* 5: 457 (1887); Gamble, *Fl. Madras* 1335 (1925); Vajr., *Fl. Palghat Dist* 440 (1990); Sasidh., *Fl. Parambikulam WLS* 299 (2002).

Habit : Shrub

Ecosystem preference : In plains and wastelands
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Found growing along wastelands and roadsides
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : May - June
Altitude preference : Found commonly in wastelands
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala, 10°49'39.72"N, 76°40'28.20"E, 186m, 20 June 2017, Aswani & Maya, 93 (GVCH); Ayyappan Mala, 10°49'07.40"N, 76°45'32.38"E, 190m, 26 June 2018, Aswani & Maya, 2449 (GVCH); Chacolas, 10°51'15.48"N, 76°45'09.00"E, 266m, 02 August 2019, Aswani & Maya, 4545 (GVCH); Akathethara - Malampuzha road, 10°49'34.77"N, 76°38'8.58"E, 100m, 28 February 2021, Aswani & Maya, 4545 (GVCH) **(Plate 46: Fig. e)**.

Tragia L., *Sp. Pl*. 2: 980 (1753)

Key to species

Leaves cordate at base; fruiting calyx lobes with midrib hispid within ……...……..…....*T. bicolor*
Leaves rounded at base; fruiting calyx lobes with midrib glabrous ……...……..……..*T. involucrata*

Tragia bicolor Miq., *Linnaea* 26(2): 222 (1854); Hook. f., *FBI* 5: 465 (1888); Gamble, *Fl. Madras* 1332 (1925).

Habit : Climber
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
Endemism : South India
IUCN Category : Not Evaluated (NE)
Habitat : Open forests near water sources
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : November - December
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Ayyappan Koil, 10°52'51.49"N, 76°47'39.48"E, 535m, 28 January 2020, Aswani & Maya, 5923 (GVCH); Thanniplace, 10°52'20.64"N, 76°46'27.12" E, 855m, 28 January 2020, Aswani & Maya, 6035 (GVCH).

Tragia involucrata L., *Sp. Pl.* 2: 980 (1753); Hook. f., *FBI* 5: 465 (1888); Gamble, *Fl. Madras* 1332 (1925); Sasidh., *Fl. Parambikulam WLS* 299 (2002).

Habit : Herb
Ecosystem preference : Wastelands
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In open forests
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Common
Phenology : July- December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thonikadavu, 10°50'04.96"N , 76°40'48.72"E, 145m, 04 June 2017, Aswani & Maya, 30 (GVCH); Cheranpara, 10°49'29.62"N, 76°40'38.63"E, 125m, 27 June 2017, Aswani & Maya, 197 (GVCH); Ollappallam, 10°49'53.78"N, 76°43'34.38"E, 146m, 25 November 2017, Aswani & Maya, 997 (GVCH);Chemanamkadu, 10°48'46.03"N, 76°44'47.99"E, 121m, 06 January 2018, Aswani & Maya, 1143 (GVCH); Akamalavaram - Pettikallu, 10°53'6"N, 76°42'0"E, 813m, 28 February 2020, 10°53'6"N, 76°42'0"E, 813m, 28 February

2020, Aswani & Maya, 1143 (GVCH) **(Plate 46: Fig. f)**.

Phyllanthaceae

Key to genera

1. Flowers in racemose spikes in fascicles on the tree trunk ……..…..*Baccaurea*
- Flowers in inflorescence arising from the branchlets……..……...2
2. Petals present…….……...…..3
- Petals absent…….…..4
3. Ovary 2 - loculed…….....…*Bridelia*
- Ovary 3 - loculed ….....*Cleistanthus*
4. Disc present……..……..5
- Disc absent……..……...7
5. Ovary 1 - loculed …...….*Antidesma*
- Ovary usually 3 - loculed or 3 - 15 loculed ……..……6
6. Stamens 3; filaments connate…..... ……..…….*Phyllanthus*
- Stamens 5; filaments free……..….*Fluggea*
7. Capsule 6 valved…….....*Breynia*
- Capsule 2 - 4 valved……...…8
8. Stamens connate into a column by their connectives; calyx 6 lobed……....……..*Glochidion*
- Stamens free; calyx 4 – lobed ….. ……..……..*Aporosa*

Antidesma Burm. ex L., *Sp. Pl.* 2: 1027 (1753)

Key to species

1. Stamens 2……...…..……*A. acidum*
- Stamens 3 - 5…….…..…...2
2. Leaves coriaceous; main nerves upto 10 pairs…….*A. alexiteria*
- Leaves chartaceous; main nerves 7-8 pairs…….……..….*A. montanum*

Antidesma acidum Retz., *Observ. Bot. (Retzius)* v. 30 (1788); Vajr., *Fl. Palghat Dist* 420 (1990); Sasidh., *Fl. Parambikulam WLS* 281 (2002); *Antidesma diandrum* (Roxb.) Spreng.; Hook. f., *FBI* 5: 361 (1887); Gamble, *Fl. Madras* 1298 (1925).

Habit : Shrub
Ecosystem preference : Moist deciduous forests and semi - evergreen forests
Distribution : Indo - Pacific and Holarctic
IUCN Category : Least Concern (LC)
Habitat : In understorey of forests
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : July - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kochithodu, 10°52'7.89"N, 76°42'19.8"E, 264m, 14 May 2019, Aswani & Maya, 3951 (GVCH); Mannukunnu, 10°52'5.50" N, 76°38'30.27"E, 181m, 09 July 2019, Aswani & Maya, 4217 (GVCH) **(Plate 46: Fig. g)**.

Antidesma alexiteria L., *Sp. Pl.* 2: 1027 (1753); Hook. f., *FBI* 5:359 (1887); Sasidh., *Fl. Parambikulam WLS* 282 (2002); *Antidesma zeylanicum* Lam., Gamble, *Fl. Madras* 1297 (1925).

Habit : Tree
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Understorey of forest floor near waterfalls
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : March - May
Altitude preference : Found in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Chaatapara waterfalls, 10°53'11.76"N, 76°42'15.84"E, 634m, 10 December 2019, Aswani & Maya, 5493 (GVCH).

Antidesma montanum Blume, *Bijdr. Fl. Ned. Ind.* 17: 1124; Sasidh., *Fl. Parambikulam WLS* 282 (2002); *Antidesma acuminatum* Wight, Hook. f., *FBI* 5: 363 (1887); *Antidesma moritzii* (Tul.) Muell.-Arg., Hook. f., *FBI* 5: 362 (1887); *Antidesma menasu* (Tul.) Miq. ex Muell.-Arg., Hook. f., *FBI* 5: 364 (1887); Gamble, *Fl. Madras* 1297 (1925); Vajr., *Fl. Palghat Dist* 420 (1990); *Antidesma menasu* (Tul.) Miq. ex Muell.-Arg. var. *linearifolia* Hook. f., *FBI* 5: 364 (1887).

Habit : Tree
Ecosystem preference : Moist deciduous and semi - evergreen forests
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Understorey in forest floors
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : January - December
Altitude preference : Found commonly in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Mannukunnu, Akathethara Section, 10°52'5.50"N, 76°38'30.27"E, 181m, 09 July 2019, Aswani & Maya, 4251 (GVCH); Akamalavaram - Pettikallu, 10°52'13.80"N, 76°42'30.96"E, 261m, 19 July 2019, Aswani & Maya, 4336(GVCH); Malampuzha irrigation dept hillock, 10°50'04.20"N, 76°40'52.68"E, 140m, 23 November 2019, Aswani & Maya, 5492(GVCH); Chaatapara waterfalls, 10° 53 '11.76"N, 76° 42' 15.84"E, 594m, 10 December 2019, Aswani & Maya, 5551(GVCH).

Aporosa Blume, *Bijdr. Fl. Ned. Ind.* 10: 514

Aporosa cardiosperma (Gaertn.) Merr., *J. Arnold Arbor.* 35: 139 (1954); *Aporosa lindleyana* (Wight) Baill., Hook. f., *FBI* 5: 349 (1887); Gamble, *Fl. Madras* 1309 (1925); Vajr., *Fl. Palghat Dist* 421 (1990); Sasidh., *Fl. Parambikulam WLS* 283 (2002).

Habit : Tree
Ecosystem preference : Semi-evergreen forests
Distribution : Indo - Pacific
IUCN Category : Vulnerable (VU)
Habitat : Valleys of semi evergreen forests
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : December - June
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kochuthodu, 10°51'55.44"N, 76°42'00.11" E, 171m, 18 December 2018, Aswani & Maya, 3429 (GVCH); Ponthancheeni, 10°50'03.12"N, 76°44'33.36"E, 334m, 12 January 2019, Aswani & Maya, 3726 (GVCH); Mannukunnu, 10°52'5.50"N, 76°38'30.27" E, 181m, 09 July 2019, Aswani & Maya, 4242 (GVCH).

Baccaurea Lour., *Fl. Cochinch.* 2: 651 (1790)

Baccaurea courtallensis (Wight) Müll.Arg., *Prodr. [A. P. de Candolle]* 15(2.2): 459 (1866); Hook. f., *FBI* 5: 367 (1887); Gamble, *Fl. Madras* 1310 (1925); Vajr., *Fl. Palghat Dist* 421 (1990); Sasidh., *Fl. Parambikulam WLS* 282 (2002).
Habit : Tree
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
Endemism : Peninsular India
IUCN Category : Not Evaluated (NE)
Habitat : Hill slopes
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : January - June
Altitude preference : Found in medium altitudes

Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Chaatapara waterfalls, 10°53'11.76"N, 76°42'15.84"E, 599m, 10 December 2019, Aswani & Maya, 5566 (GVCH) **(Plate 46: Fig. h)**.

Breynia J. R. Forst. & G. Forst., *Char. Gen. Pl.*, ed. 2. [145] (1776), nom. cons.

Key to species

Perianth of female flowers broadly ovate; emarginate……..……*B. quadrangularis*
Perianth of female flowers campanulate……..…….*B. retusa*

Breynia quadrangularis (J.G.Klein ex Willd.) Chakrab. & N.P.Balakr., *Bangladesh J. Pl. Taxon.* 19(2): 121 (2012); *Sauropus quadrangularis* (Willd.) Muell.-Arg., Hook. f., *FBI* 5: 335 (1887); Gamble, *Fl. Madras* 1303 (1925); Vajr., *Fl. Palghat Dist* 438 (1990); Sasidh., *Fl. Parambikulam WLS* 299 (2002); *Sauropus compressus* Muell.-Arg, Hook. f., *FBI* 5: 336 (1887).

Basionym: *Phyllanthus quadrangularis* J. G. Klein ex Willd., *Sp. Pl., ed. 4 [Willdenow]* 4(1): 585 (1805).

Habit : Shrub
Ecosystem preference : Moist deciduous and semi - evergreen forests
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : Understorey in forest floors
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : Throughout the year
Altitude preference : Found commonly in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kalliyara, 10°53'8.52"N, 76°39'38.88"E, 177m, 24 March 2018, Aswani & Maya, 1546 (GVCH); Parakkallu- Neelikunnu, 10°51'30.14"N, 76°37'30.67"E, 156m, 27 April 2018, Aswani & Maya, 1912 (GVCH); Kochuthodu, 10°51'58.32"N, 76°42'22.32"E, 221m, 18 December 2018, Aswani & Maya, 3341 (GVCH); Poolakunnu, 10°51'30.60"N, 76°43'53.76"E,167m, 02 August 2019, Aswani & Maya, 4422 (GVCH); Chaatapara waterfalls, 10°52'56.81"N, 76°42'11.22"E, 507m, 10 December 2019, Aswani & Maya, 5446 (GVCH) **(Plate 47: Fig. a)**.

Breynia retusa (Dennst.) Alston, *Ann. Roy. Bot. Gard. (Peradeniya)* 11: 204 (1929); Vajr., *Fl. Palghat Dist* 422 (1990); Sasidh., *Fl. Parambikulam WLS* 284 (2002); *Breynia patens* (Roxb.) Rolfe, Hook. f., *FBI* 5: 329 (1887); Gamble, *Fl. Madras* 1304 (1925).

Basionym : *Phyllanthus retusus Dennst*., *Schlüssel Hortus Malab. 31 (Breyniae sp.).* (1818).

Habit : Shrub
Ecosystem preference : Moist deciduous and semi - evergreen forests
Distribution: Indo - Pacific and Holarctic
IUCN Category : Least Concern (LC)
Habitat : In understorey of forest floor
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : February - September
Altitude preference : Found in lower altitudes
Specimens examined: INDIA, Kerala: Palakkad District, Walayar range, Kosavanidukku-Kaduvachal, 10°50'26.38" N, 76°40'30.88"E, 163m, 16 July 2017, Aswani & Maya, 284 (GVCH); Thaanikunnu, 10°51'55.44"N, 76°42'00.11 "E, 193m, 18 December 2018, Aswani & Maya, 3451 (GVCH); Mannukunnu, 10°52'5.50"N, 76°38'30.27" E, 181m, 09 July 2019, Aswani & Maya, 4200 (GVCH); Chaavadippara, 10°52'39.57"N, 76°48'39.85"E, 264m, 28 January 2020,

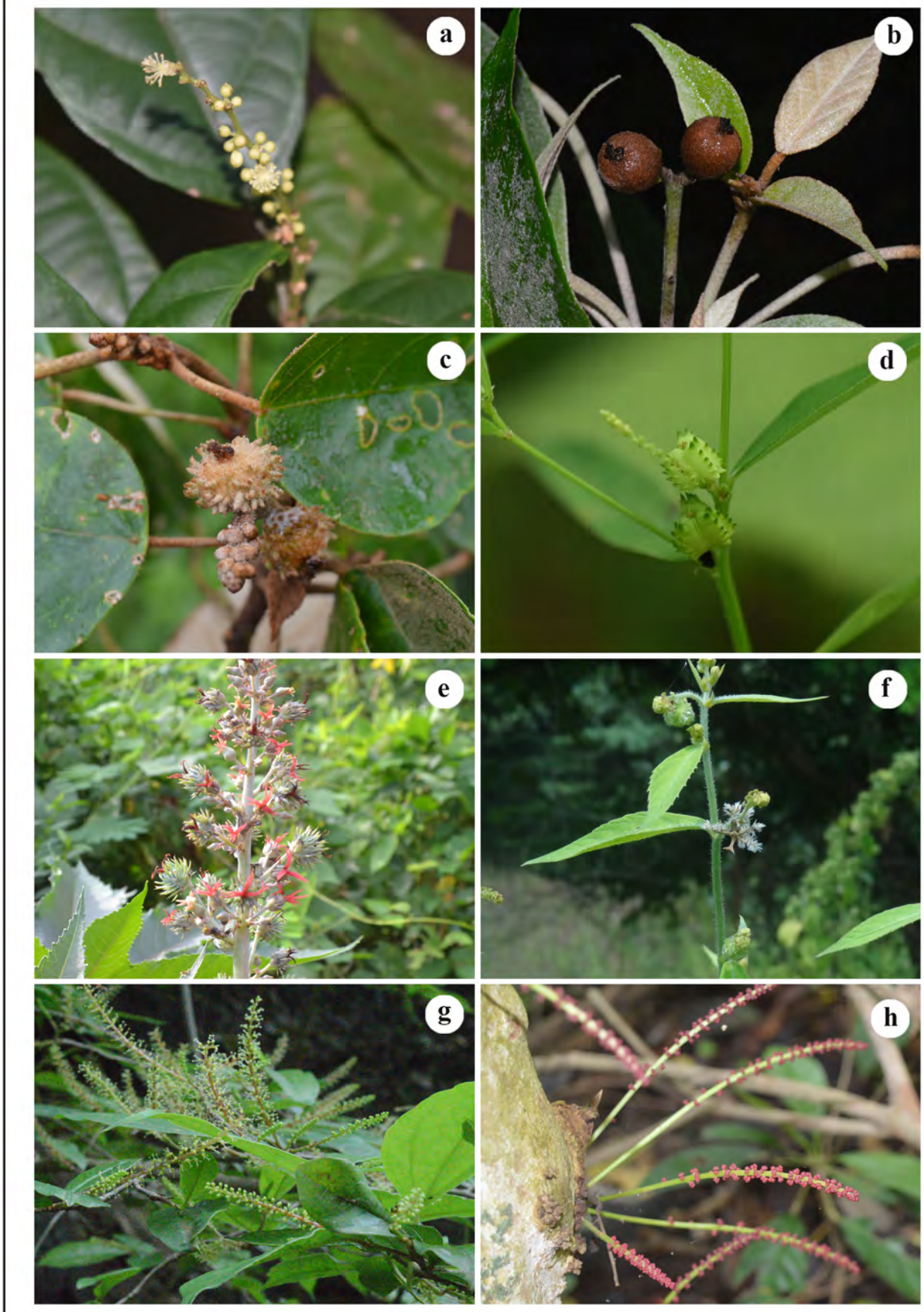

Plate 46: Fig. a. *Mallotus resinosus* Merr. **b.** *Mallotus rhamnifolius* Müll.Arg. **c.** *Mallotus tetracoccus* Kurz **d.** *Microstachys chamaelea* (L.) Müll.Arg. **e.** *Ricinus communis* L. **f.** *Tragia involucrata* L. **g.** *Antidesma acidum* Retz. **h.** *Baccaurea courtallensis* (Wight) Müll.Arg.

Aswani & Maya, 5863 (GVCH).

Bridelia Willd., *Sp. Pl., ed.* 4 *[Willdenow]* 4(2): 978 (1805)

Key to species

Habit - Tree……..……*B. retusa*
Habit - scandent woody climber……..……...*B. stipularis*

Bridelia retusa (L.) A. Juss., *Euphorb. Gen.* 27, t. 7 (1824); Hook. f., *FBI* 5: 268 (1887); Gamble, *Fl. Madras* 1280 (1925); Sasidh., *Fl. Parambikulam WLS* 285 (2002); *Bridelia retusa* A.Juss. var. *roxburghiana*, Hook. f., *FBI* 5: 268 (1887); *Briedelia roxburghiana* (Muell.-Arg.) Gehrm., Gamble, *Fl. Madras* 1280 (1925).

Basionym : *Clutia retusa* L., *Sp. Pl*. 1: 1042 (1753).

Habit : Tree
Ecosystem preference : Moist deciduous forests and in the plains
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : In open places and forest margins
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : August - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Karadikunnu, 10°50'23.64"N , 76°49'47.64"E, 203m, 30 December 2017, Aswani & Maya, 1080 (GVCH); Valiya eri, 10°48'53.21"N, 76°44'52.53"E, 170m, 06 January 2018, Aswani & Maya, 1285 (GVCH); Akamalavaram - Thakaramada, 10°52'07.34"N, 76°42'43.33"E, 217m, 30 November 2018, Aswani & Maya, 3236 (GVCH); Jamanthimala, 10°51'53.64"N, 76°47'16.80"E, 625m, 23 June 2019, Aswani & Maya, 4105 (GVCH); Mathappumala, 10°51'9.36"N, 76°49'55.56"E, 230m, 07 January 2020, Aswani & Maya, 5594 (GVCH).

Bridelia stipularis (L.) Blume, *Bijdr. Fl. Ned. Ind.* 12: 597 (1826); Hook. f., *FBI* 5: 270 (1887); Gamble, *Fl. Madras* 1281 (1925); *Briedelia scandens* (Roxb.) Willd., Hook. f., *FBI* 5: 270 (1887); Gamble, *Fl. Madras* 1281 (1925); Vajr., *Fl. Palghat Dist* 424 (1990); Sasidh., *Fl. Parambikulam WLS* 285 (2002).
Basionym : *Clutia stipularis* L., *Mant. Pl.* 127 (1767).

Habit : Shrub
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
Endemism : Peninsular India
IUCN Category : Least Concern (LC)
Habitat : Straggling shrub in forests
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : December - February
Altitude preference : Found commonly in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Chacolas, 10°51'22.68"N, 76° 44 '41.28"E, 227m, 02 August 2019, Aswani & Maya, 1080 (GVCH) **(Plate 47: Fig. b)**.

Cleistanthus Hook.f. ex Planch., *Icon. Pl.* 4: t. 779 (1848)

Cleistanthus collinus Benth. & Hook. f., *Gen. Pl. [Bentham & Hooker f.]* 3(1): 268 (1880); Hook.f., *FBI* 5: 274 (1887); Gamble, *Fl. Madras* 1282 (1925); Vajr., *Fl. Palghat Dist* 425 (1990); Sasidh., *Fl. Parambikulam WLS* 286 (2002).

Habit : Tree
Ecosystem preference : Moist deciduous forests and in plains
Distribution : Indo - Pacific
IUCN Category : Vulnerable (VU)

Habitat : Found near outskirts of dam, forest margins and hillock systems
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : December - November
Altitude preference : Found commonly in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thonikadavu, 10°50'04.96"N, 76°40'48.72" E, 145m, 04 June 2017, Aswani & Maya, 31 (GVCH); Kosavanidukku-Kaduvachal, 10°50'26.38" N, 76°40'30.88"E, 122m, 16 July 2017, Aswani & Maya, 243 (GVCH); Way to Ayyappan mala, 10°48'59.96"N, 76°45'22.61"E, 132m, 06 January 2018, Aswani & Maya, 1203 (GVCH); Koyamarakaadu,10°47'44.88"N, 76°45'38.52"E, 165m, 06 September 2018, Aswani & Maya, 2697 (GVCH); Kochuthodu, 10°51'58.32"N, 76°42'22.32" E, 226m, 18 December 2018, Aswani & Maya, 2697 (GVCH) **(Plate 47: Fig. c)**.

Flueggea Willd., *Sp. Pl., ed.* 4 [*Willdenow*] 4: 637, 757 ('Fluggea') (1806)

Key to species

Shrubs armed (Branchlets ending in spines).....*F. leucopyrus*
Shrubs unarmed…...…..……*F. virosa*

Flueggea leucopyrus Willd., *Sp. Pl., ed.* 4 [Willdenow] 4(2): 757 (1806); Hook. f., *FBI* 5: 328. 1887; Gamble, *Fl. Madras* 1296 (1925).

Habit : Shrub
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In forest margins
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : June - September
Altitude preference : Found commonly in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Ayyappan Mala, 10°49'07.19"N, 76°44'50.28"E, 196m, 26 June 2018, Aswani & Maya, 2524 (GVCH); Thekke Malampuzha, 76°40'36.16"E, 76°40'34.59"E, 122m , 08 July 2019, Aswani & Maya, 4170 (GVCH) **(Plate 47: Fig. d)**.

Flueggea virosa (Roxb. ex Willd.) Royle, *Ill. Bot. Himal. Mts. [Royle]* 9: 328 (1836); Gamble, *Fl. Madras* 1296 (1925); Sasidh., *Fl. Parambikulam WLS* 292 (2002); *Flueggea microcarpa* Blume, Hook. f., *FBI* 5: 328 (1887); *Securinega virosa* (Roxb. ex Willd.) Baill., Vajr., *Fl. Palghat Dist* 439 (1990).

Basionym : *Phyllanthus virosus Roxb*. ex Willd., *Sp. Pl., ed. 4 [Willdenow]* 4(1): 578 (1805).

Habit : Shrub
Ecosystem preference : Moist deciduous forests and in wastelands
Distribution : Indo - Pacific, Holarctic, African and Australian
IUCN Category : Least Concern (LC)
Habitat : Outskirts of hillocks and in the the open forests
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : March - September
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kongampaadam, 10°48'36.81"N, 76°46'43.06"E, 171m, 15 June 2018, Aswani & Maya, 2371 (GVCH); Ayyappan Mala, 10°49'07.19"N, 76°44'50.28"E, 166m, 07 March 2019, Aswani & Maya, 3786 (GVCH) **(Plate 47: Fig. e)**.

Glochidion J. R. Forst. & G. Forst., *Char. Gen. Pl., ed.* 2. [113] (1776), nom. cons.

Key to species

Stamens 4 or more ……..*G. zeylanicum*
Stamens 3……..……..*G. ellipticum*

Glochidion ellipticum Wight, *Icon. Pl. Ind. Orient. [Wight] t.* 1606; Hook. f., *FBI* 5: 321 (1887); Gamble, *Fl. Madras* 1308 (1925); Sasidh., *Fl. Parambikulam WLS* 292 (2002); Glochidion malabaricum (Muell.-Arg.) Bedd., Hook. f., *FBI* 5: 319 (1887); Gamble, *Fl. Madras* 1308 (1925); *Glochidon hohenackeri* Bedd., *FBI* 5: 314 (1887).

Habit : Tree
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
Endemism : Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : In hill slopes
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : January - July
Altitude preference : Found in higher altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Aatumala Thodu, 10°53'52.08"N, 76°41'24"E, 1012m, 27 February 2020, Aswani & Maya, 6135 (GVCH); Aduppukootimala,10°50'42.72"N, 76°44'36.24"E, 714m, 16 February 2021, Aswani & Maya, 6499 (GVCH).

Glochidion zeylanicum (Gaertn.) A.Juss., *Euphorb. Gen.* 107 (1824); Hook. f., *FBI* 5: 310 (1887); Gamble, *Fl. Madras* 1306 (1925); Sasidh., *Fl. Parambikulam WLS* 293 (2002).

Basionym: *Bradleia zeylanica Gaertn*., *Fruct. Sem. Pl.* 2: 128, t. 109 (1790).

Habit : Tree
Ecosystem preference : Moist deciduous forests and semi-evergreen forests
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : In valleys of forests
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : March - May
Altitude preference : Found in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Parachaathy flood site, 10°50'08.16"N, 76°44'33.36"E, 370m, 12 January 2019, Aswani & Maya, 3742 (GVCH) **(Plate 47: Fig. f)**.

Phyllanthus L., *Sp. Pl. [Linnaeus]* 2: 981 (1753)

Key to species

1. Habit - trees……..….*P. emblica*
- Habit - herbs or shrubs…….……2
2. Fruit a berry……..….*P. reticulatus*
- Fruit a capsule……..……..……..3
3. Young stem and leaves reddish……...…….*P. urinaria*
- Young stem and leaves greenish……..……..…….……4
4. Diffuse herbs……...…....*P. virgatus*
- Erect herbs……..……....5
5. Leaves apiculate at apex…….. ……..….*P. maderaspatensis*
- Leaf apex acute to obtuse…….....6
6. Leaves glabrous…...……*P. rheedei*
- Leaves glaucous beneath…..…..…7
7. Styles recurved; disc of male flowers with minute glands……. ……..……*P. amarus*
- Styles erect; disc of male flowers with star-like glands ……..... ……...……..*P. airy - shawii*

Phyllanthus airy-shawii Jean F.Brunel & Jacq.Roux, Nordic J. Bot 4(4): 470 (1984); N.P.Balakr. & Chakrab., *Fam. Euphorbiaceae India* 385 (2007); *Phyllanthus debilis* sensu Hook. f., FBI 5: 299 (1887); Gamble, *Fl. Madras* 1290 (1925).

Habit : Herb
Ecosystem preference :Degraded deciduous forests and in plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In wastelands, wet regions near agricultural lands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : July - October
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Vedivachapaara, 10°50'04.96"N, 76°40'48.72"E, 115m, 04 June 2017, Aswani & Maya, 76 (GVCH); Koomachimala, 10°49'44.76"N, 76°40'30.72"E, 108m, 20 June 2017, Aswani & Maya, 135 (GVCH) **(Plate 47: Fig. g)**.

Phyllanthus amarus Schumach. & Thonn., *Beskr. Guin. Pl.* 421 (1827); Vajr., *Fl. Palghat Dist* 435 (1990); Sasidh., *Fl. Parambikulam WLS* 297 (2002); *Phyllanthus niruri* Linn., Hook. f., *FBI* 5: 298 (1887); Gamble, *Fl. Madras* 1290 (1925).

Habit : Herb
Ecosystem preference : Degraded moist deciduous forest and in plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Disturbed forest tracts and near residential areas
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : July - October
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, G. P. Nair Estate, 10°53'20.76"N, 76°39'41.04"E, 180m, 24 March 2018, Aswani & Maya, 1619 (GVCH); Walayar Dam, 10°50'24.58"N, 76°51'01.52"E, 288m, 09 May 2018, Aswani & Maya, 2061 (GVCH); Mayyappallam, 10°48'0.36"N, 76°45'58.68"E, 122m, 10 May 2018,Aswani & Maya, 2078 (GVCH).

Phyllanthus emblica L., *Sp. Pl.* 2: 982 (1753); Hook. f., *FBI* 5: 289 (1887); Vajr., *Fl. Palghat Dist* 436 (1990); Sasidh., *Fl. Parambikulam WLS* 297 (2002); *Emblica officinalis* Gaertn., Gamble, *Fl. Madras* 1295 (1925).

Habit : Tree
Ecosystem preference : Moist deciduous forests and in the plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Found rarely in forest grasslands and found cultivated in plains and roadsides
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : July - February
Altitude preference : Found in all altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Poozhikunnu, 10°51'20.44"N, 76°43'38.28"E, 135m, 09 November 2017, Aswani & Maya, 851 (GVCH); Moochikadavu, 10°52'7.32"N, 76°42'28.44"E, 250m, 10 March 2018, Aswani & Maya, 1455 (GVCH), Ayyappan Mala, 10°49'11.44"N, 76°44'24.46"E, 368m, 26 June 2018, Aswani & Maya, 2585 (GVCH); Parachaathy, 10°50'38.76"N, 76°43'51.96" E, 150m, 02 January 2019, Aswani &

Maya, 3630 (GVCH); Chacolas, 10°51'30.60"N, 76°43'53.76"E, 204m, Aswani & Maya, 4459 (GVCH) **(Plate 47: Fig. h)**.

Phyllanthus maderaspatensis L., *Sp. Pl.* 2: 982 (1753); Hook. f., *FBI* 5: 292 (1887); Gamble, *Fl. Madras* 1289 (1925); Vajr., *Fl. Palghat Dist* 436 (1990).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and African
IUCN Category : Least Concern (LC)
Habitat : In exposed rocky regions in hillocks
Raunkiaer's Life form : Hemicryptophyte
Distribution Frequency : Occasional
Phenology : Throughout the year
Altitude preference : Found in lower altitude hillocks
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Karadikunnu, 10°50'23.64"N, 76°49'47.64"E, 230m, 30 December 2017, Aswani & Maya, 1108 (GVCH); Walayar Dam, 10°50'24.58"N, 76°51'01.52"E, 235m, 09 May 2018, Aswani & Maya, 2008 (GVCH); Ahalia campus, 10° 47 '43.08"N, 76° 50' 5.43"E, 150m, 24 September 2020, Aswani & Maya, 6290 (GVCH) **(Plate 48: Fig. a)**.

Phyllanthus reticulatus Poir., *Encycl. [J. Lamarck & al.]* 5: 298 (1804); Hook. f., *FBI* 5: 288 (1887); Sasidh., *Fl. Parambikulam WLS* 298 (2002); *Kirganelia reticulata* (Poir.) Baill., Gamble, *Fl. Madras* 1294 (1925); Vajr., *Fl. Palghat Dist* 432 (1990).

Habit : Shrub
Ecosystem preference : moist deciduous forests and in plains
Distribution : Indo - Pacific and African
IUCN Category : Least Concern (LC)
Habitat : Found in the outskirts of forests and grown as a bio fencing plant
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : August - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kosavanidukku - Kaduvachal, 10°50'26.38"N, 76°40'30.88"E, 180m, 16 July 2017, Aswani & Maya, 309 (GVCH); Chemanamkadu, 10°48'46.03"N, 76°44'47.99"E, 131m, 06 January 2018, Aswani & Maya, 1153 (GVCH);Valiya eri, 10°48'53.21"N, 76°44'52.53"E, 144m, 06 January 2018, Aswani & Maya, 1259 (GVCH); Ayyappan Mala, 10°49'07.19"N, 76°44'50.28"E, 164m, 07 March 2019, Aswani & Maya, 3784 (GVCH) **(Plate 48: Fig. b)**.

Phyllanthus rheedei Wight, *Icon. Pl. Ind. Orient. [Wight] t.* 1895; Hook. f., *FBI* 5: 293 (1887); Gamble, *Fl. Madras* 1289 (1925); Vajr., *Fl. Palghat Dist* 436 (1990).

Habit : Herb
Ecosystem preference : Moist deciduous and semi-evergreen and forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found growing as a understory of forest floors
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : November - January
Altitude preference : Found in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Ayyappan Mala, 10°49'11.44"N, 76°44'24.46"E, 386m, 26 June 2018, Aswani & Maya, 2603 (GVCH) **(Plate 48: Fig. c)**.

Phyllanthus urinaria L., *Sp. Pl.* 2: 982 (1753); Hook. f., *FBI* 5: 293 (1887);

Gamble, *Fl. Madras* 1289 (1925); Vajr., *Fl. Palghat Dist.* 437 (1990); Sasidh., *Fl. Parambikulam WLS* 297 (2002).

Habit : Herb
Ecosystem preference :Degraded deciduous forests and in plains
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : In the understorey of forest floors and in wastelands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : July - October
Altitude preference : Found commonly in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kosavanidukku-Kaduvachal, 10°50'26.38" N, 76°40'30.88"E, 184m, 16 July 2017, Aswani & Maya, 313 (GVCH); Kozhimala, 10°50'01.89"N, 76°42'58.61"E, 145m, 09 November 2017, Aswani & Maya, 795 (GVCH); G. P. Nair Estate, 10°53'20.76"N, 76°39'41.04"E, 201m, 24 March 2018, Aswani & Maya, 1640 (GVCH); Parachaathy, 10°50'42.54"N, 76°43'49.14"E, 139m, 02 January 2019, Aswani & Maya, 3531 (GVCH); Chacolas, 10°51'22.68"N, 76°44'41.28"E, 280m, 02 August 2019, Aswani & Maya, 4514 (GVCH) **(Plate 48: Fig. d)**.

Phyllanthus virgatus G. Forst., *Pred.* 65; Vajr., *Fl. Palghat Dist* 437 (1990); Sasidh., *Fl. Parambikulam WLS* 298 (2002); *Phyllanthus simplex* Retz., Hook. f., *FBI* 5: 295 (1887); Gamble, *Fl. Madras* 1289 (1925).

Habit : Herb
Ecosystem preference :Moist deciduous forests and in the plains
Distribution : Indo - Pacific, Holarctic and Australian
IUCN Category : Not Evaluated (NE)
Habitat : Exposed rocky regions in hillocks, hill slopes and in open plains
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : Throughout the year
Altitude preference : Found in lower altitudes

Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thonikadavu, 10°50'04.96"N, 76°40'48.72"E, 133m, 04 June 2017, Aswani & Maya, 19 (GVCH); Pallippara, 10°49'48.36"N, 76°43'44.04"E, 143m, 29 October 2017, Aswani & Maya, 19 (GVCH); Mayyappallam, 10°48'0.36"N, 76°45'58.68"E, 155m, 10 May 2018, Aswani & Maya, 2111 (GVCH); Kongampadam, 10°48'39.80"N, 76°47'2.67"E, 158m, 06 September 2019, Aswani & Maya, 4595 (GVCH) **(Plate 48: Fig. e)**.

Combretaceae

Key to genera

1. Habit - Trees……..……*Terminalia*
- Habit - climbers……..……....2
2. Petals present……*Combretum*
- Petals absent……..……..…*Getonia*

Combretum Loefl., *Iter Hispan.* 308 (1758), nom. cons.

Key to species

1. Inflorescence terminal; flowers fragrant, showy; calyx tube upto 8cm long…….……...….*C. indicum*
- Inflorescence axillary; flowers non - fragrant and non - showy; calyx tube very short upto 1 cm long……..……...2
2. Flowers in spikes; calyx tube funnel shaped above the ovary……..…...…*C. latifolium*

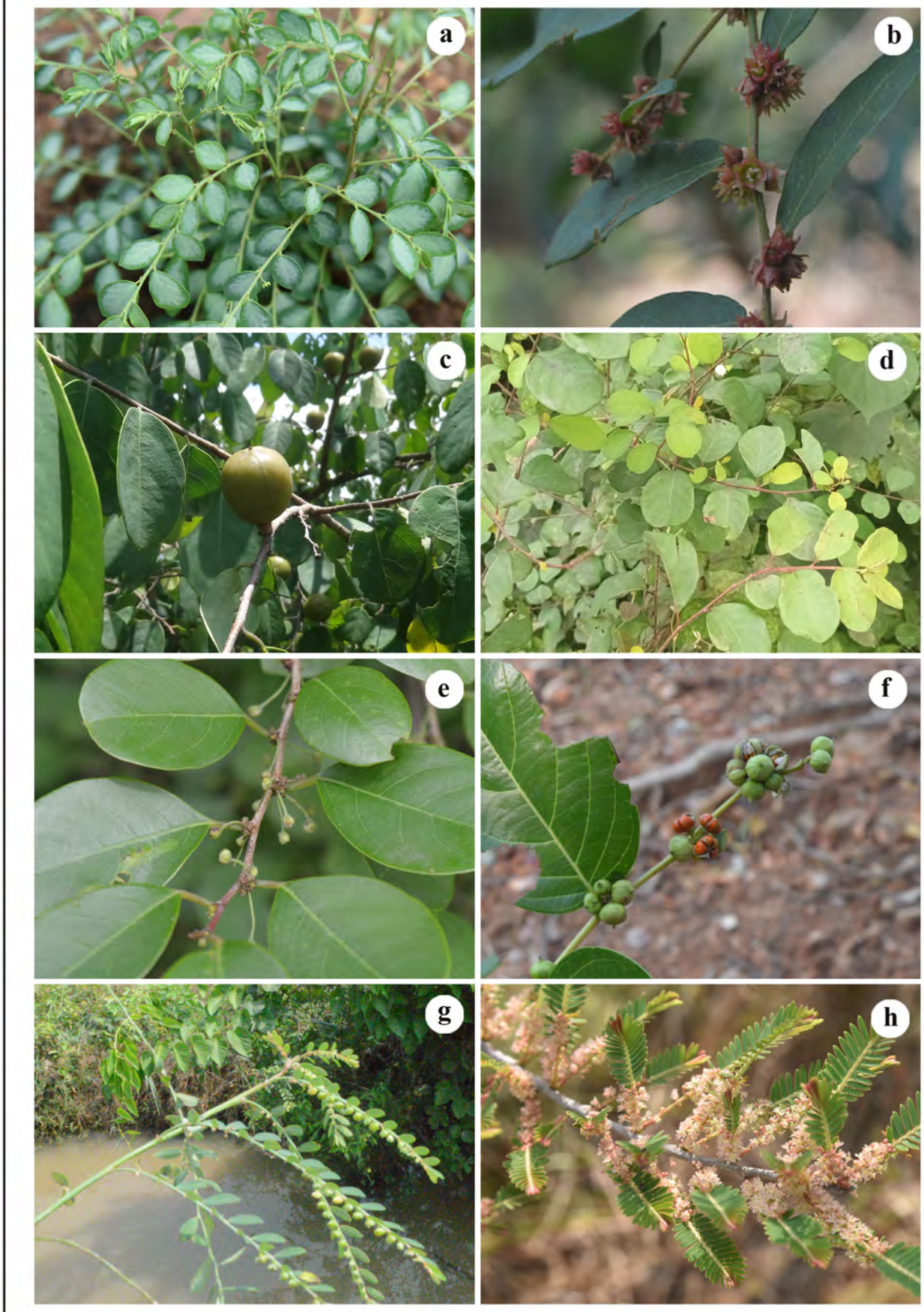

Plate 47: Fig. a. *Breynia quadrangularis* (J.G.Klein ex Willd.) Chakrab. & N.P.Balakr. **b.** *Bridelia stipularis* (L.) Blume **c.** *Cleistanthus collinus* Benth. & Hook.f. **d.** *Flueggea leucopyrus* Willd. **e.** *Flueggea virosa* (Roxb. ex Willd.) Royle **f.** *Glochidion zeylanicum* (Gaertn.) A.Juss. **g.** *Phyllanthus airy-shawii* Jean F.Brunel & Jacq.Roux **h.** *Phyllanthus emblica* L.

- Flowers in panicles; calyx tube campanulate above the ovary……..... *C. albidum*

Combretum albidum G.Don*, Trans. Linn. Soc. London 15(2): 429 (1827);* Sasidh., *Fl. Parambikulam WLS* 117 (2002); *Combretum ovalifolium* Roxb., *Fl. Ind. (Roxburgh)* 2: 226 (1832); Hook. f., *FBI* 2: 458 (1878); Gamble, *Fl. Madras* 469 (1919); Vajr., *Fl. Palghat Dist* 196 (1990)

Habit : Climber
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found as a climber near water sources
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Occasional
Phenology : December - March
Altitude preference : Found lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kavarakundu, 10°52'7.32"N, 76°42'28.44" E, 245m, 10 March 2018, Aswani & Maya, 1450 (GVCH); Ayyappan Mala, 10°48'59.96"N, 76°45'22.61"E, 164m, 26 June 2018, Aswani & Maya, 2406 (GVCH); Kottamutti waterfalls, 10°49'42.94"N, 76°46'47.87"E, 239m, 23 September 2018, Aswani & Maya, 2885 (GVCH); Chaatapara waterfalls, 10°53'11.76"N, 76°42'15.84"E, 624m, 10 December 2019, Aswani & Maya, 5483 (GVCH) **(Plate 48: Fig. f)**.

Combretum indicum (L.) DeFilipps, *Useful Pl. Dominica* 277 (1998); *Quisqualis indica L.* in *Sp. Pl*., ed. 2.: 556 (1762), Hook. f., *FBI* 2: 459 (1878); Gamble, *Fl. Madras* 469 (1919); Vajr., *Fl. Palghat Dist* 197 (1990).

Habit : Climber
Ecosystem preference : Deciduous forests, plains and wastelands
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found as a climber running wild in forest tracts
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Occasional
Phenology : July - March
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Vedivachapara, 10°50'12.34"N, 76°40'41.15"E, 124m, 04 June 2017, Aswani & Maya, 69 (GVCH); Cheranpara, 10°49'29.62"N, 76°40'38.63"E, 111m, 27 June 2017, Aswani & Maya, 183 (GVCH); Akathethara - Malampuzha road, 10°49'34.77"N, 76°38'8.58"E, 100m, 28 February 2021, Aswani & Maya, 6531 (GVCH) **(Plate 48: Fig. g)**.

Combretum latifolium Blume, *Bijdr. Fl. Ned. Ind.* 13: 641 (1826); Vajr., *Fl. Palghat Dist* 195 (1990); *Combretum extensum* Roxb. ex G. Don, Hook. f., *FBI* 2: 458 (1878); Gamble, *Fl. Madras* 469 (1919).

Habit : Climber
Ecosystem preference : Moist deciduous and semi-evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found near water sources
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Occasional
Phenology : December - April
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Parakkallu- Neelikunnu, 10°51'30.14"N, 76°37'30.67"E, 212m, 27 April 2018, Aswani & Maya, 1968 (GVCH); Ayyappan Mala, 10°48'59.96"N, 76°45'22.61"E, 157m, 26 June 2018,

Aswani & Maya, 2399 (GVCH); Mannukunnu, 10°52'5.50"N, 76°38'30.27" E, 181m, 09 July 2019, Aswani & Maya, 4197 (GVCH); Jamanthimala, 10°51'59.76"N, 76°47'15.36"E, 649m, 09 January 2020, Aswani & Maya, 5646 (GVCH) **(Plate 48: Fig. h)**.

Getonia Roxb., *Pl. Coromandel* 1(4): 61, t. 87 (1798)

Getonia floribunda Roxb., *Pl. Coromandel* 1(4): 61, t. 87 (1798); *Calycopteris floribunda* Lam., Hook. f., *FBI* 2: 449 (1878); Gamble, *Fl. Madras* 467 (1919); Vajr., *Fl. Palghat Dist* 195 (1990); Sasidh., *Fl. Parambikulam WLS* 117 (2002).

Habit : Climber
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat :Common climber in forest floors and in hillocks
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Common
Phenology : January - May
Altitude preference : Found commonly in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kava, 10°49'34.95"N, 76°43'5.18"E, 119m, 06 April 2018, Aswani & Maya, 1888 (GVCH); Ayyappan Mala, 10°48'59.96"N, 76°45'22.61"E, 150m, 26 June 2018, Aswani & Maya, 2392 (GVCH); Kottamutti waterfalls, 10°49'42.94"N, 76°46'47.87"E, 242m, 23 September 2018, Aswani & Maya, 2888 (GVCH); Pazhampullikaadu, 10°50'09.55"N, 76°38'28.33"E, 164m, 16 October 2018, Aswani & Maya, 3175 (GVCH); Parachaathy, 10°50'42.54"N, 76°43'49.14"E, 140m, 02 January 2019, Aswani & Maya, 3532 (GVCH) **(Plate 49: Fig. a)**.

Terminalia L., *Mant. Pl.* 21 (1767)

Key to species

1. Flowers in dense globose heads……..…...…. *T. anogeissiana*
- Flowers in spikes or in panicles.....2
2. Fruits fleshy, wingless……...……3
- Fruits dry, winged…….....5
3. Branchlets without leaf clusters… ……..…...*T. chebula*
- Branchlets with leaves clustered at ends…….……..……..4
4. Leaves alternate; fruits ellipsoid, 2 - ridged when dry……..... *T. cattappa*
- Leaves opposite or sub - opposite; fruits subglobose, faintly 5 - ridged when dry…….....*T. billerica*
5. Unequally 3 - winged fruits….....*T. paniculata*
- Equally 5 - winged fruits…..……..6
6. Calyx lobes densely villous inside; fruits rounded at apex…. *T. elliptica*
- Calyx lobes glabrous; fruits notched at the apex……..*T. arjuna*

Terminalia anogeissiana Gere & Boatwr., *Bot. J. Linn. Soc.* 184(3): 319 (2017); *Anogeissus latifolia* (Roxb. ex DC.) Wall. ex Guill. & Perr., Hook. f., *FBI* 2: 450 (1878); Gamble, *Fl. Madras* 466 (1919); Vajr., *Fl. Palghat Dist* 195 (1990); Sasidh., *Fl. Parambikulam WLS* 116 (2002).

Habit : Tree
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In canopy and open forests, seen in hillocks near to main tracts
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : April - December
Altitude preference : Found in lower altitudes

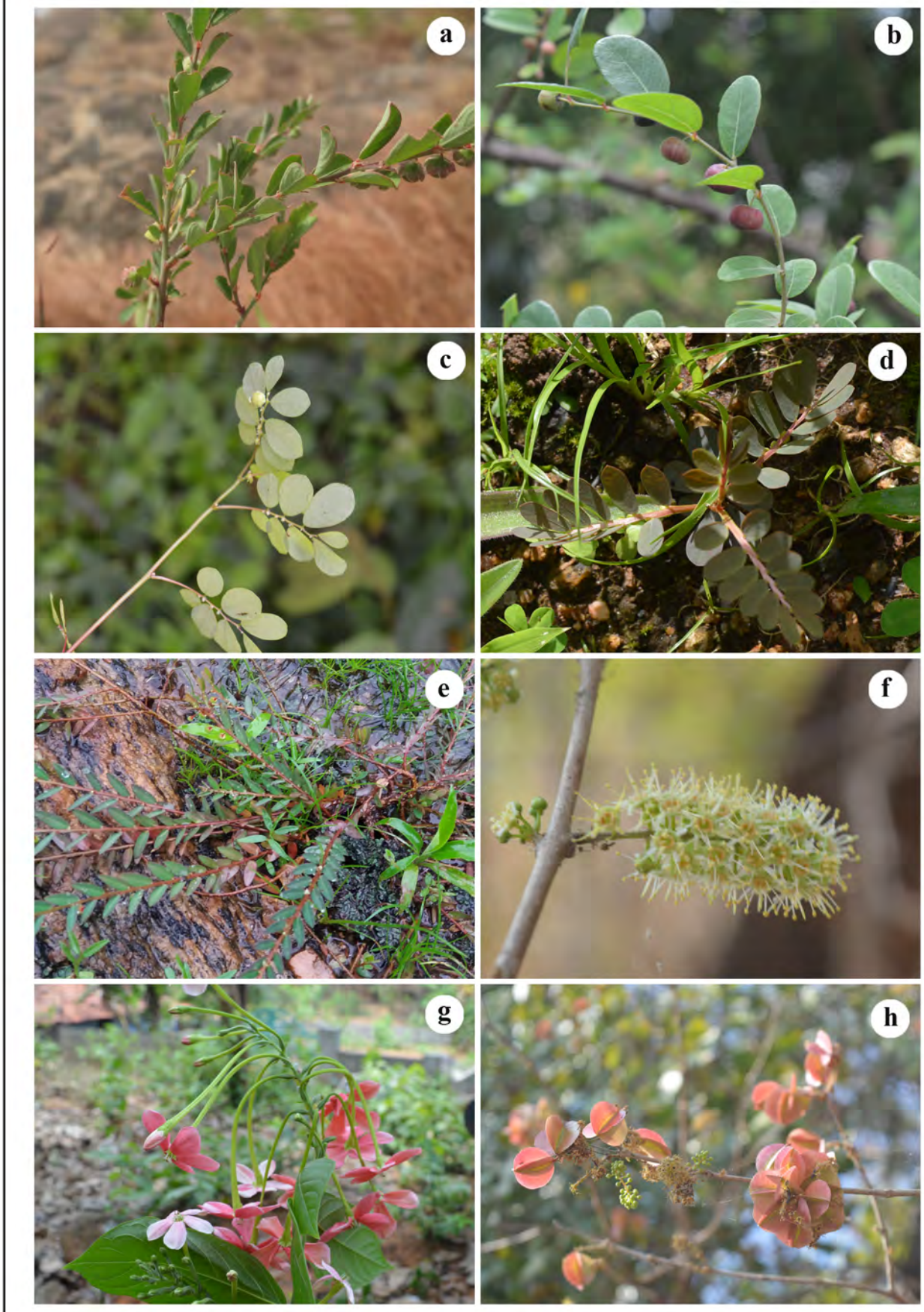

Plate 48: Fig. a. *Phyllanthus maderaspatensis* L. **b.** *Phyllanthus reticulatus* Poir. **c.** *Phyllanthus rheedei* Wight **d.** *Phyllanthus urinaria* L. **e.** *Phyllanthus virgatus* G.Forst. **f.** *Combretum albidum* G.Don **g.** *Combretum indicum* (L.) DeFilipps **h.** *Combretum latifolium* Blume.

Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Ollappallam, 10°49'53.78"N, 76°43'34.38"E, 150m, 25 November 2017, Aswani & Maya, 1001 (GVCH); Parakkallu- Neelikunnu, 10°51'30.14"N, 76°37'30.67"E, 208m, 27 April 2018, Aswani & Maya, 1964 (GVCH); Kottamutti waterfalls, 10°49'42.94"N, 76°46'47.87"E, 283m, 23 September 2018, Aswani & Maya, 2929 (GVCH); Kochuthodu, 10°51'58.32"N, 76°42'22.32"E, 234m, 18 December 2018, Aswani & Maya, 3354 (GVCH); Aduppukootimala, 10°49'38.80"N , 76° 44 '16.08"E, 152m, 12 January 2019, Aswani & Maya, 3645 (GVCH) **(Plate 49: Fig. b)**.

Terminalia arjuna (Roxb. ex DC.) Wight & Arn., *Prodr. Fl. Ind. Orient.* 1: 314 (477) (1834); Hook. f., *FBI* 2: 447 (1878); Gamble, *Fl. Madras* 465 (1919); Vajr., *Fl. Palghat Dist* 196 (1990).

Basionym: *Pentaptera arjuna* Roxb. ex DC. in *Prodr*. 3: 15 (1828), nom. cons.

Habit : Tree
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Drier regions of the forest tracks
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : November - June
Altitude preference : Found rarely in lower altitude forests
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Poozhikunnu, 10°51'20.44"N, 76°43'38.28"E, 168m, 09 November 2017, Aswani & Maya, 884 (GVCH) **(Plate 49: Fig. c)**.

Terminalia bellirica (Gaertn.) Roxb., *Pl. Coromandel* 2(4): 54, t. 198 (1805); Hook. f., *FBI* 2: 445 (1878); Gamble, *Fl. Madras* 463 (1919); Vajr., *Fl. Palghat Dist* 196 (1990); Sasidh., *Fl. Parambikulam WLS* 117 (2002).

Basionym: *Myrobalanus bellirica* Gaertn. in *Fruct. Sem. Pl.* 2: 90 (1790).

Habit : Tree
Ecosystem preference : Moist deciduous forests and often in the plains
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Common tree in the forest track
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : December - January
Altitude preference : Found commonly in lower forest tracts
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kosavanidukku-Kaduvachal, 10°50'26.38"N, 76°40'30.88"E, 161m, 16 July 2017, Aswani & Maya, 282 (GVCH); Kozhimala, 10°50'01.89"N, 76°42'58.61"E, 128m, 09 November 2017, Aswani & Maya, 778 (GVCH); Vettiyil Sandal estate, 10°51'33.12"N, 76°42'29.52"E, 166m, 10 March 2018, Aswani & Maya, 1423 (GVCH); G. P. Nair Estate, 10°53'20.76"N, 76°39'41.04"E , 207m, 24 March 2018, Aswani & Maya, 1646 (GVCH); Parachaathy, 10°50'54.24"N, 76°43'55.92"E, 177m, 02 January 2019, Aswani & Maya, 3598 (GVCH); Jamanthimala on the way, 10°50'26.52"N, 76°50'04.56"E, 236m, 23 June 2019, Aswani & Maya, 4014 (GVCH) **(Plate 49: Fig. d)**.

Terminalia catappa L., *Mant. Pl.* 128 (1767); Hook. f., *FBI* 2: 444 (1878); Gamble, *Fl. Madras* 463 (1919).

Habit : Tree

Ecosystem preference : In degraded forests, homesteads and roadsides
Distribution : Indo - Pacific, African, South American and Australian
IUCN Category : Least Concern (LC)
Habitat : Often grown as ornamental tree and shade tree
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : March - January
Altitude preference : Found commonly in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Akathethara - Malampuzha road, 10°49'34.77"N, 76°38'8.58"E, 100m, 28 February 2021, Aswani & Maya, 6530 (GVCH).

Terminalia chebula Retz., *Observ. Bot. (Retzius)* v. 31. (1788); Hook. f., *FBI* 2: 446 (1878); Gamble, *Fl. Madras* 464 (1919)

Habit : Tree
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : In forest tracts
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : February - August
Altitude preference : Found rarely in lower forest floors
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Aduppukootimala - Kanyarmuttu, 10°49'38.80"N, 76°44'16.08"E, 159m, 12 January 2019, Aswani & Maya, 3652 (GVCH) **(Plate 49: Fig. e)**.

Terminalia elliptica Willd., *Sp. Pl., ed.* 4 [Willdenow] 4(2): 969 (1806); Sasidh., *Fl. Parambikulam WLS* 118 (2002); *Terminalia crenulata* Roth, Gamble, *Fl. Madras* 465 (1919); Vajr., *Fl. Palghat Dist* 197 (1990); *Terminalia coriacea* (Roxb.) Wight & Arn., Gamble, *Fl. Madras* 465 (1919); *Terminalia tomentosa* (Roxb. ex DC.) Wight & Arn., Hook. f., *FBI* 2: 447 (1878); Gamble, *Fl. Madras* 465 (1919); *Terminalia tomentosa* (Roxb. ex DC.) Wight & Arn. var. *crenulata* (Roth) Clarke, Hook. f., *FBI* 2: 448 (1878).

Habit : Tree
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In forest floors very rarely planted in margins of forests
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : April - May
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Parakkallu- Neelikunnu, 10°51'30.14"N, 76°37'30.67"E, 206m, 12 January 2019, Aswani & Maya, 3652 (GVCH); Ayyappan Mala, 10°48'59.96"N, 76°45'22.61"E, 158m, 26 June 2018, Aswani & Maya, 2400 (GVCH); Aduppukootimala - Kanyarmuttu, 10°49'50.52"N, 76°44'24.72"E, 228m, 12 January 2019, Aswani & Maya, 3676 (GVCH); Anakundu, 10°49'42.90"N, 76°46'13.00"E, 142m, 07 March 2019, Aswani & Maya, 3863 (GVCH); Chottuppara waterfalls,10°52'37.92"N, 76°41'39.84"E, 348m, 14 May 2019, Aswani & Maya, 3972 (GVCH) **(Plate 49: Fig. f)**.

Terminalia paniculata Roth, *Nov. Pl. Sp.* 383 (1821); Hook. f., *FBI* 2:448 (1878); Gamble, *Fl. Madras* 465 (1919);Vajr., *Fl. Palghat Dist* 197 (1990); Sasidh., *Fl. Parambikulam WLS* 118 (2002).

Habit : Tree

Ecosystem preference : Moist deciduous forest, and in the plains
Distribution : Indo - Pacific
Endemism : Peninsular India
IUCN Category : Not Evaluated (NE)
Habitat : Very common tree in the hill tracts
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : August - February
Altitude preference : Found very commonly in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kezhakootimala, 10°51'53.30"N, 76°37'36.39"E, 362m, 15 September 2017, Aswani & Maya, 483 (GVCH); Vettiyil Sandal estate, 10°51'33.12"N, 76°42'29.52"E, 165m, 10 March 2018, Aswani & Maya, 1422 (GVCH); Ayyappan Mala, 10°48'59.96"N, 76°45'22.61"E, 160m, 26 June 2018, Aswani & Maya, 2402 (GVCH); Kottamutti waterfalls, 10°49'42.94"N, 76°46'47.87"E, 245m, 23 September 2018, Aswani & Maya, 2891 (GVCH); Parachaathy, 10°50'42.54"N, 76°43'49.14" E, 150m, 02 January 2019, Aswani & Maya, 3542 (GVCH); Jamanthimala on the way, 10°50'26.52"N, 76°50'04.56"E, 234m, 23 June 2019, Aswani & Maya, 4012 (GVCH) **(Plate 49: Fig. g)**.

Lythraceae

Key to genera

1. Aquatic or wetland herbs…..……..…2
- Large shrubs or trees……..……....4
2. Leaves dimorphic, submerged root like leaves and floating leaves……..……...……..*Trapa*
- Leaves monomorphic……..……...3
3. Fruits dehiscent; opening in valves……..……...…..*Rotala*
- Fruits indehiscent; opens irregularly…..……..……*Ammannia*
4. Flowers tetramerous; stamens 8; armed trees……..……..….*Lawsonia*
- Flowers hexamerous; stamens numerous; unarmed trees……. ……..……*Lagerstroemia*

Ammannia L., *Sp. Pl.* 1: 119 (1753)

Key to species

Petals present; stamens 8; style filiform……..……*A. octandra*
Petals absent; stamens 4; style thick……..……..……..*A. baccifera*

Ammannia baccifera L., *Sp. Pl.* 1: 120 (1753); Hook. f., *FBI* 2: 569 (1879); Gamble, *Fl. Madras* 510 (1919); ssp *baccifera*, Vajr., *Fl. Palghat Dist* 204 (1990); Sasidh., *Fl. Parambikulam WLS* 131 (2002).

Habit : Herb
Ecosystem preference : Wetlands
Distribution : Indo - Pacific, Holarctic, African and Australian
IUCN Category : Least Concern (LC)
Habitat : Found along river beds, canals, bunds and other wet regions near hillocks and in paddy fields
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : September - December
Altitude preference : Found common in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Way to Ayyappan Mala, 10°48'59.96"N, 76°45'22.61"E, 159m, 06 January 2018, Aswani & Maya, 1230 (GVCH); Anakundu, 10°49'53.76"N, 76°46'14.88"E, 164m, 07 March 2019, Aswani & Maya, 3877 (GVCH); Chacolas, 10°51'15.48"N, 76°45'09.00"E, 273m, 02 August 2019, Aswani & Maya, 4552 (GVCH); Mayappallam, 10°48'01.78"N, 76°45'58.91"E, 133m, 06 September 2019, Aswani & Maya, 4669 (GVCH); Walayar

dam, 10° 50 '15.57"N, 76°51'5.13"E, 191m, 30 January 2021, Aswani & Maya, 6365 (GVCH) **(Plate 49: Fig. h)**.

Ammannia octandra L.f., *Suppl. Pl.* 127 (1782); Hook. f., *FBI* 2: 571 (1879); Gamble, *Fl. Madras* 510 (1919).

Habit : Herb
Ecosystem preference : Wetlands
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Marshy regions near river banks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : January - May
Altitude preference : Found rarely in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Walayar river, 10°47'43.99"N , 76°46'54.71"E, 18m, 14 March 2021, Aswani & Maya, 6532 (GVCH).

Lagerstroemia L., *Syst. Nat., ed.* 10. 2: 1068, 1076, 443\=i1372 (1759)

Key to species

Petals small, usually white....*L. microcarpa*
Petals large, usually pink or mauve coloured……..……..…..……*L. speciosa*

Lagerstroemia microcarpa Wight, *Icon. Pl. Ind. Orient. [Wight]* 1(4-5): no. IV (1838); Vajr., *Fl. Palghat Dist* 205 (1990); Sasidh., *Fl. Parambikulam WLS* 131 (2002); *Lagerstroemia lanceolata* Wall. ex Clarke, Hook. f., *FBI* 2: 576 (1879); Gamble, *Fl. Madras* 513 (1919); *Lagerstroemia thomsonii* Koehne, Gamble, *Fl. Madras* 513 (1919).

Habit : Tree
Ecosystem preference : Moist deciduous forests and grasslands
Distribution : Indo - Pacific
Endemism : Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Found in open deciduous forests and open grasslands
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : June - February
Altitude preference : Found very often in higher altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala, 10°52'20.64"N, 76°46'57.00"E, 879m, 09 January 2020, Aswani & Maya, 5725 (GVCH); Thanniplace, 10°52'20.64"N, 76°46'27.12"E, 857m, 28 January 2020, Aswani & Maya, 6037 (GVCH); Aduppukootimala,10°50'30.12"N, 76°44'28.32"E, 612m, 16 February 2021, Aswani & Maya, 6496 (GVCH).

Lagerstroemia speciosa Pers., *Syn. Pl. [Persoon]* 2(1): 72 (1806); *Lagerstroemia reginae* Roxb., Vajr., *Fl. Palghat Dist* 205 (1990); Lagerstroemia flos-reginae Retz., Hook. f., *FBI* 2: 577 (1879); Gamble, *Fl. Madras* 513 (1919); *Lagerstroemia hirsuta* (Lam.) Willd., Sasidh., *Fl. Parambikulam WLS* 131 (2002).

Basionym: *Munchausia speciosa* L., *Hausvater* 5: 357 (1770).

Habit : Tree
Ecosystem preference : Moist deciduous forests and in plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Often found in forests, common in outskirts of hillocks and often planted as avenue tree
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : March - November
Altitude preference : Found in lower altitudes

Plate 49: Fig. a. *Getonia floribunda* Roxb. **b.** *Terminalia anogeissiana* Gere & Boatwr. **c.** *Terminalia arjuna* (Roxb. ex DC.) Wight & Arn. **d.** *Terminalia bellirica* (Gaertn.) Roxb.**e.** *Terminalia chebula* Retz. **f.** *Terminalia elliptica* Willd. **g.** *Terminalia paniculata* Roth **h.** *Ammannia baccifera* L.

Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kavarakundu, 10°52'28.20"N, 76°42'38.52" E, 349m, 10 March 2018, Aswani & Maya, 1488 (GVCH); G. P. Nair Estate, 10°53'26.52"N, 76°39'41.04"E, 194m, 24 March 2018, Aswani & Maya, 1689 (GVCH); Chaatapara waterfalls, 10°53'11.76"N, 76°42'15.84"E, 661m, 10 December 2019, Aswani & Maya, 5520 (GVCH) **(Plate 50: Fig. a)**.

Lawsonia L., *Sp. Pl.* 1: 349 (1753)

Lawsonia inermis L., *Sp. Pl.* 1: 349 (1753); Gamble, *Fl. Madras* 514 (1919); Vajr., *Fl. Palghat Dist* 206 (1990); *Lawsonia alba* Lam., Hook. f., *FBI* 2: 573 (1879).

Habit : Shrub
Ecosystem preference : In plains
Distribution : Indo - Pacific and Holarctic
IUCN Category : Least Concern (LC)
Habitat : Found as a hedge plant near forest margins
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : December - May
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Ayyankulam, 10°48'37.19"N, 76°44'56.27"E, 157m, 06 January 2018, Aswani & Maya, 1197 (GVCH); Anakkal road, 10°51'33.84"N, 76°41'41.94"E, 124m, 24 March 2018, Aswani & Maya, 1797 (GVCH); Koyyamarakaadu,10°47'41.24"N, 76°45'35.17"E, 164m, 30 November 2019, Aswani & Maya, 5313 (GVCH) **(Plate 50: Fig. b)**.

Rotala L., *Mant. Pl. Altera* 143, 175 (1771)

Key to the species

Sepals 4 triangular; petals 4; stamens 4……..…..*R. indica*
Sepals 3, ovate; petals 3; stamens 3……..……..*R. malampuzhensis*

Rotala indica (Willd.) Koehne, *Bot. Jahrb. Syst.* 1(2): 172 (1880); Gamble, *Fl. Madras* 508 (1919); Vajr., *Fl. Palghat Dist* 206 (1990); Sasidh., *Fl. Parambikulam WLS* 131 (2002); *Ammannia peploides* Spreng., C.B. Clarke in Hook.f., *FBI* 2: 566 (1879).

Basionym: *Peplis indica* Willd. in *Sp. Pl*., *ed*. 4. 2: 244 (1799).

Habit : Herb
Ecosystem preference : Wetlands
Distribution : Indo - Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : In marshy stream basin
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : July - November
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Valiya eri, 10°48'53.76"N, 76°44'59.07"E, 124m, 06 January 2018, Aswani & Maya, 1253 (GVCH).

Rotala malampuzhensis R.V.Nair ex C.D.K.Cook, *Boissiera* 29: 98, with type (1979); Vajr., *Fl. Palghat Dist* 207 (1990).

Habit : Herb
Ecosystem preference : Wetlands
Distribution : Indo - Pacific
Endemism : Southern Western Ghats (Kerala)
IUCN Category : Least Concern (LC)
Habitat : Found in small ephemeral pools in hillocks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : July - September

Altitude preference : Found in lower altitudes in wet marshy regions
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kongampaadam, 10°48'36.72"N, 76°46'51.96"E, 170m, 15 June 2018, Aswani & Maya, 2330 (GVCH).

Trapa L., *Sp. Pl.* 1: 120 (1753)

Trapa natans L., *Sp. Pl.* 1: 120 (1753); Vajr., *Fl. Palghat Dist* 209 (1990); *Trapa bispinosa* Roxb., Hook. f., *FBI* 2: 590 (1879); Gamble, *Fl. Madras* 518 (1919); *Trapa quadrispinosa* Roxb., Hook. f., *FBI* 2: 590 (1879).

Habit : Herb
Ecosystem preference : Wetlands
Distribution : Indo - Pacific, Holarctic, African, South American and Australian
IUCN Category : Least Concern (LC)
Habitat : Found in rivers
Raunkiaer's Life form : Hydrophyte
Distribution Frequency : Rare
Phenology : September - May
Altitude preference : Found in lower altitudes in river sources
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Walayar river, 10°47'43.99"N, 76°46'54.71"E, 18m, 14 March 2021, Aswani & Maya, 6533 (GVCH) **(Plate 50: Fig. c)**.

Onagraceae

Ludwigia L., *Sp. Pl. [Linnaeus]* 1: 118 [1204] (1753)

Key to species

Flowers small; capsule linear, terete, 8 - ribbed……..….*L. hyssopifolia*
Flowers large; capsule villous, 4 angled and 4 dark ribs……..……..….*L. peruviana*

Ludwigia hyssopifolia (G.Don) Exell, *Garcia de Orta* v. 471 (1957); Vajr., *Fl. Palghat Dist* 208 (1990); Sasidh., *Fl. Parambikulam WLS* 132 (2002); *Jussiaea linifolia* Vahl, Gamble, *Fl. Madras* 1875 (1936).

Basionym: *Jussiaea hyssopifolia* G.Don in *Gen. Hist*. 2: 693 (1832).

Habit : Herb
Ecosystem preference : Wetlands
Distribution : Indo - Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Marshes and other wet regions in forests and in hillocks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : August - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Vedivachapara, 10°50'12.34"N , 76°40'41.15"E, 130m, 04 June 2017, Aswani & Maya, 75 (GVCH); Ollappallam, 10°49'52.20"N, 76°43'44.19" E, 130m, 25 November 2017, Aswani & Maya, 904 (GVCH); Way to Ayyappan Mala, 10° 48 '59.96"N, 76° 45' 22.61"E, 151m, 06 January 2018, Aswani & Maya, 1222 (GVCH); G. P. Nair Estate, 10°53'20.76"N, 76°39'41.04"E, 198m, 24 March 2018, Aswani & Maya, 1637 (GVCH); Parachaathy, 10°50'42.54"N, 76°43'49.14"E, 126m, 02 January 2019, Aswani & Maya, 3518(GVCH) **(Plate 50: Fig. d)**.

Ludwigia peruviana (L.) H.Hara, *J. Jap. Bot.* 28: 293 (1953); Vajr., *Fl. Palghat Dist* 208 (1990); *Jussiaea speciosa Ridley, Gamble, Fl.Madras* 1875 (1936).

Basionym : *Jussiaea peruviana* L., *Sp. Pl. [Linnaeus]* 1: 388 (1753).

Habit : Herb
Ecosystem preference : Wetlands
Distribution : South American
IUCN Category : Not Evaluated (NE)
Habitat : In marshy regions in rivers of forests
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Rare
Phenology : March - April
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kavarakundu, 10°52'34.26"N, 76°42'40.48" E, 368m, 10 March 2018, Aswani & Maya, 1492 (GVCH); Anakundu, 10°49'53.76"N, 76°46'14.88"E, 163m, 07 March 2019, Aswani & Maya, 3876 (GVCH) **(Plate 50: Fig. e)**.

Myrtaceae

Key to genera

1. Leaves alternate; fruits dehiscent……..…..….*Eucalyptus*
- Leaves opposite……..……2
2. Ovary many loculed…...….*Psidium*
- Ovary 2 - loculed……....3
3. Calyx tube produced beyond the ovary; stamens bent back inwards in the bud at the middle……...….*Syzygium*
- Calyx tube not produced beyond the ovary; stamens erect or incurved never bend inwards at the middle……..…….....…..*Eugenia*

Eucalyptus L'Hér., *Sert. Angl.* 18 (1788)

Eucalyptus globulus Labill., *Voy. Rech. Pérouse* 1: 153, t. 13 (1800); Gamble, *Fl. Madras* 486 (1919).

Basionym : *Eucalyptus maidenii subsp. globulus* (Labill.) J. B. Kirkp., *Bot. J. Linn. Soc*. 69: 101 (1975).

Habit : Tree
Ecosystem preference : In Plains and plantations
Distribution : Indo - Pacific and Australian
IUCN Category : Least Concern (LC)
Habitat : Grown as an avenue tree in plains and planted in plantations
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : September - December
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Near Vanadurga temple Malampuzha, 10°49'48.81"N, 76°39'58.80"E, 99m, 03 September 2020, Aswani & Maya, 6202 (GVCH).

Eugenia L., *Sp. Pl. [Linnaeus]* 1: 470 (1753)

Eugenia wynadensis Bedd., *Madras J. Lit. Sci. Ser.* III, i. (1864) 47; *Meteoromyrtus wynaadensis* (Bedd.) Gamble, *Fl. Madras* 485 (1919); *Eugenia wynaadensis* Bedd., Hook. f., *FBI* 2: 506 (1879).

Habit : Tree
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Hillslopes in canopy rich forests
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : February - August
Altitude preference: Found in higher altitudes
Specimen examined: INDIA, Kerala: Palakkad District, Walayar range, Aduppukootimala, 10°50'08.16"N, 76°44'33.36"E, 361m, 16 February 2021, Aswani & Maya, 6475 (GVCH) **(Plate 50: Fig. f)**.

Psidium L., *Sp. Pl.* 1: 470 (1753)

Psidium guajava L., *Sp. Pl.* 1: 470 (1753); Hook. f., *FBI* 2: 468 (1878); Gamble, *Fl. Madras* 472 (1919); Vajr., *Fl. Palghat Dist* 201 (1990); Sasidh., *Fl. Parambikulam WLS* 120 (2002).

Habit : Tree
Ecosystem preference : In plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Planted in homesteads and grown in margins of plantations
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : March - May
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, G. P. Nair Estate, 10°53'20.76"N, 76°39'41.04"E, 225m, 24 March 2018, Aswani & Maya, 1664 (GVCH); Kochuthodu, 10°51'58.32"N, 76°42'22.32"E, 229m, 18 December 2018, Aswani & Maya, 3349 (GVCH); Ayyappan Mala, 10°49'07.19"N, 76°44'50.28"E, 175m, 07 March 2019, Aswani & Maya, 3795 (GVCH); Chacolas, 10°51'15.48"N, 76°45'09.00"E, 283m, 02 August 2019, Aswani & Maya, 4562 (GVCH); Pothukunnu, 10°53'21.84"N, 76°46'33.24" E, 975m, 28 January 2020, Aswani & Maya, 5968 (GVCH); Ahalya campus, 10°47'43.08"N, 76°50'5.43"E,150m, 24 September 2020, Aswani & Maya, 6324 (GVCH).

Syzygium P. Browne ex Gaertn., *Fruct. Sem. Pl.* 1: 166 (1788), nom. cons.

Key to species

1. Inflorescence branches diverge in right angles……..…..*S. gardneri*
- Inflorescence branches never diverging in right angles…..…..….2
2. Flowers small, subsessile, non - showy…….…….……..….*S. cumini*
- Flowers large, pedicelled, showy…..……..……..…..*S. laetum*

Syzygium cumini (L.) Skeels, *Bull. Bur. Pl. Industr. U.S.D.A.* 25: 248 (1912); Vajr., *Fl. Palghat Dist* 199 (1990); Sasidh., *Fl. Parambikulam WLS* 120 (2002); *Eugenia jambolana* Lam., Hook. f., *FBI* 2: 499 (1879); *Syzygium jambolanum* (Lam.) DC., Gamble, *Fl. Madras* 481 (1919).

Basionym : *Myrtus cumini* L., *Sp. Pl.* 1: 471 (1753).

Habit : Tree
Ecosystem preference : Moist deciduous forests and in plains
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Found in forest tracks as well as grown along roadsides, margins of forests etc
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : December - April
Altitude preference : Found commonly in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Vedivachapara, 10°50'12.34"N, 76°40'41.15"E, 120m, 04 June 2017, Aswani & Maya, 65 (GVCH); G. P. Nair Estate, 10°53'17.51"N, 76°39'42.72"E, 188m, 24 March 2018, Aswani & Maya, 1597 (GVCH); Parachaathy, 10°50'42.54"N, 76°43'49.14"E, 133m, 02 January 2019, Aswani & Maya, 3525 (GVCH); Aduppukootimala, 10°49'50.52" N, 76°44'24.72"E, 227m, 12 January 2019, Aswani & Maya, 3675 (GVCH); Edasherikunnu, 10°52'42.6"N, 76°46'53.32"E, 647m, 28 January 2020, Aswani & Maya, 5951 (GVCH) **(Plate 50: Fig. g)**.

Syzygium gardneri Thwaites, *Enum. Pl. Zeyl. [Thwaites]* 117 (1859).; Gamble, *Fl. Madras* 479 (1919); Sasidh., *Fl. Parambikulam WLS* 121 (2002); *Eugenia gardneri* (Thw.) Bedd., Hook. f., *FBI* 2: 489 (1878).; *Eugenia cymosa* Lam. var. *rostrata* Duthie in Hook. f., *FBI* 2: 482 (1878).

Habit : Tree
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In valleys near grasslands
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : March - April
Altitude preference : Found rarely in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Aduppukootimala, 10°50'42.72"N, 76°44'36.24" E, 713m, 16 February 2021, Aswani & Maya, 6498 (GVCH) **(Plate 50: Fig. h)**.

Syzygium laetum (Buch.-Ham.) Gandhi, *Fl. Hassan Dist. [Saldanha & Nicolson]* 282 (1976); Vajr., *Fl. Palghat Dist* 200 (1990); Sasidh., *Fl. Parambikulam WLS* 121 (2002); *Eugenia laeta* Buch.-Ham. in *Mem. Wern. Nat. Hist. Soc*. 5: 338 (1826)., Hook. f., *FBI* 2: 479 (1878); *Jambosa laeta* (Buch.-Ham) Blume, Gamble, *Fl. Madras* 474 (1919).

Habit : Tree
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
Endemism : Southern Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : In hill slopes
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : December - July
Altitude preference : Found in medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Chaatapara waterfalls, 10°53'11.76"N, 76°42'15.84"E, 643m, 10 December 2019, Aswani & Maya, 5502 (GVCH); Aduppukootimala, 10°50'20.07"N, 76°44'24.52"E, 505m, 16 February 2021, Aswani & Maya, 6486 (GVCH) **(Plate 51: Fig. a)**.

Melastomataceae

Key to genera

Herbs or shrubs; leaves 3 or more ribbed to the base; ovary 4 - 5 loculed; many ovuled; many seeded……..…..……*Osbeckia*
Trees; leaves penni nerved; ovary 1 - loculed; few ovuled; one seeded……..…..……....*Memecylon*

Memecylon L., *Sp. Pl.* 1: 349 (1753)

Key to species

Leaf apex obtusely acuminate; flowers sessile in compound clusters; berries - yellow…….……*M. talbotianum*
Leaf apex notched at apex; flowers pedicellate in thyrsoid umbels; berries yellowish - green, black when mature…….……*M. umbellatum*

Memecylon talbotianum D. Brandis, *in W.A. Talbot, Trees, Shrubs, Woody Climbers Bombay appendix* (1902); Gamble, *Fl. Madras* 503 (1919); Ramach. & V.J. Nair, *Fl. Cannanore Dist* 186 (1988); Antony, *Syst. Stud. Fl. Kottayam Dist* 165 (1989); Sasidh., *Fl. Shenduruny WLS* 130 (1997); Sivar. & Mathew, Fl. Nilambur 271 (1997); Sasidh., *Fl. Periyar Tiger Reserve* 143 (1998); Mohanan & Sivad., *Fl. Agasthyamala* 276 (2002); Anil Kumar *et al*., *Fl. Pathanamthitta* 226

(2005); Ratheesh Narayanan, *Fl. Stud. Wayanad Dist* 370 (2009).

Habit : Tree
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
Endemism : Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : In open forests
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : February - May
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Pazhampullikaadu, Akathethara section, 10°50'20.14"N, 76°38'07.09"E, 95m, 16 October 2018, Aswani & Maya, 3208 (GVCH) **(Plate 51: Fig. b)**.

Memecylon umbellatum Burm.f., *Fl. Ind. (N. L. Burman)* 87 (1768); Gamble, *Fl. Madras* 504 (1919); Vajr., *Fl. Palghat Dist* 202 (1990); Sasidh., *Fl. Parambikulam WLS* 127 (2002); *Memecylon edule* Roxb., Hook. f., *FBI* 2:563 (1879); Gamble, *Fl. Madras* 504 (1919).

Habit : Tree
Ecosystem preference : Moist deciduous forests and in the plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Near water sources
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : February - March
Altitude preference : Found in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Aduppukootimala, 10°49'58.80"N, 76°44'31.92"E, 309m, 16 February 2021, Aswani & Maya, 6475 (GVCH) **(Plate 51: Fig. c)**.

Osbeckia L., *Sp. Pl.* 1: 345 (1753)

Key to species

1. Habit - herbs……..….*O. muralis*
- Habit - shrubs……..……..…2
2. Flowers pentamerous…....*O. aspera*
- Flowers tetramerous…....*O.gracilis*

Osbeckia aspera Blume, *Flora* 14: 474 (1831). var. ***aspera***; Hook. f., *FBI* 2: 519 (1879); Gamble, *Fl. Madras* 492 (1919); Vajr., *Fl. Palghat Dist* 203 (1990); Sasidh., *Fl. Parambikulam WLS* 127 (2002); *Osbeckia kleinii* Wight & Arn., Gamble, *Fl. Madras* 492 (1919); *Osbeckia courtallensis* Gamble, Gamble, *Fl. Madras* 492 (1919); *Osbeckia lawsonii* Gamble, Gamble, *Fl. Madras* 503 (1919).

Habit : Shrub
Ecosystem preference : Evergreen forests and grasslands
Distribution : Indo - Pacific
Endemism : Peninsular India
IUCN Category : Not Evaluated (NE)
Habitat : Found in open grassy regions
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Rare
Phenology : November - April
Altitude preference : Found in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala, 10°52'18.19"N , 76° 46 '47.14"E, 921m, 09 January 2020, Aswani & Maya, 5753 (GVCH).

Osbeckia gracilis Bedd., *Madras J. Lit. Sci. Ser*. 3, i. (1864) 45; et in *Trans. Linn. Soc.* xxv. (1865) 216; Hook. f., *FBI* 2: 518 (1879); Gamble, *Fl. Madras* 494 (1919); Sasidh., *Fl. Parambikulam WLS* 127 (2002); *Osbeckia sublaevis* Cogn., Gamble, *Fl. Madras* 492 (1919); *Osbeckia lineolata* Gamble, Gamble, *Fl. Madras* 492 (1919).

Habit : Shrub

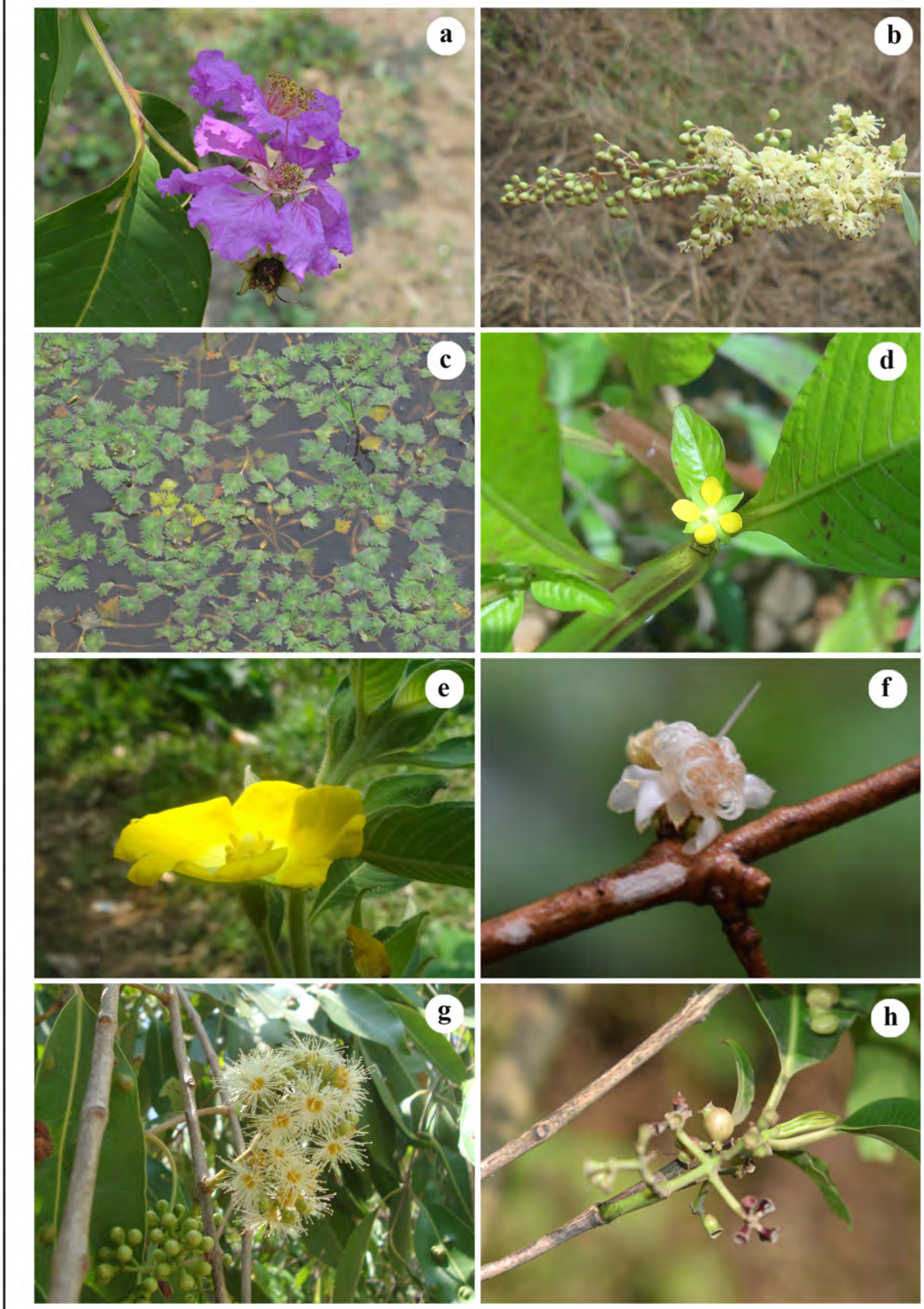

Plate 50: Fig. a. *Lagerstroemia speciosa* Pers. **b.** *Lawsonia inermis* L. **c.** *Trapa natans* L. **d.** *Ludwigia hyssopifolia* (G.Don) Exell **e.** *Ludwigia peruviana* (L.) H.Hara **f.** *Eugenia wynadensis* Bedd. **g.** *Syzygium cumini* (L.) Skeels **h.** *Syzygium gardneri* Thwaites.

Ecosystem preference : Grasslands
Distribution : Indo - Pacific
Endemism : Southern Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Found in open grasslands
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Rare
Phenology : January -April
Altitude preference : Found in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kundanmala - Akamalavaram, 10°53'39.12"N, 76°41'47.20"E, 1011m, 27 February 2020, Aswani & Maya, 6123 (GVCH).

Osbeckia muralis Naudin, *Ann. Sci. Nat., Bot. sér.* 3, 14: 56 (1850); Sasidh., *Fl. Parambikulam WLS* 129 (2002); *Osbeckia truncata* D. Don ex Wight & Arn. Hook. f., *FBI* 2: 514 (1879); Gamble, *Fl. Madras* 494 (1919); *Osbeckia truncata* var. *kurzii* Clarke, Hook.f., *FBI* 2: 514 (1879).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Open grassy regions in deciduous forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : September - December
Altitude preference : Found in medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Neelippara, 10°51'53.30"N, 76°37'36.39"E, 421m, 15 September 2017, Aswani & Maya, 542 (GVCH); Koomachimala, 10°49'39.72"N, 76°40'28.20"E, 200m, 17 September 2017, Aswani & Maya, 621 (GVCH); Pallakaadu, 10°51'30.96"N, 76°37'39.00"E, 214m, 09 October 2018, Aswani & Maya, 3073 (GVCH); Pazhampullikaadu, 10°50'09.55"N, 76°38'28.33"E, 161m, 16 October 2018, Aswani & Maya, 3172 (GVCH) **(Plate 51: Fig. d)**.

Sapindales

Burseraceae

Key to genera

Flowers trimerous; disc free…....*Canarium*
Flowers 4 - 6 merous; disc adnate to calyx
……...……...……*Garuga*

Canarium L., *Amoen. Acad., Linnaeus ed.* 4: 121, 143 (1759)

Canarium strictum Roxb., *Hort. Bengal.* 49; *Fl. Ind*. iii. 138; Bennett in Hook. f., *FBI* 1: 534 (1875); Gamble, *Fl. Madras* 172 (1915); Vajr., *Fl. Palghat Dist* 107 (1990);Sasidh., *Fl. Parambikulam WLS* 52 (2002).

Habit : Tree
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In the hill slopes of the semi - evergreen forests
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : January - December
Altitude preference : Found in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Ayyappan Koil, 10°52'54.12"N, 76°47'27.96"E, 512m, 28 January 2020, Aswani & Maya, 5941 (GVCH).

Garuga Roxb., *Pl. Coromandel* 3(1): 5 (1811)

Garuga pinnata Roxb., *Hort. Bengal.* 33; *Pl. Corom.* iii. 5. t. 208; *Fl. Ind.* ii. 400;

Hook. f., *FBI* 1: 528. 1875; Gamble, *Fl. Madras* 169 (1915); Vajr., *Fl. Palghat Dist* 107 (1990).

Habit : Tree
Ecosystem preference : Moist deciduous forest
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In the forest floors and in outskirts of forests
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : January - August
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Parachaathy, 10°50'42.54"N, 76°43'49.14"E, 187m, 02 January 2019, Aswani & Maya, 3579 (GVCH); Aduppukootimala - Kanyarmuttu, 10°49'38.80"N, 76°44'16.08"E 144m, 12 January 2019, Aswani & Maya, 3637 (GVCH); Ayyappan Mala, 10°49'16.35"N, 76°44'56.03"E, 154m, 07 March 2019, Aswani & Maya, 3849(GVCH) **(Plate 51: Fig. e)**.

Anacardiaceae

Key to genera

1. Leaves simple……..……...2
- Leaves compound…..……..…4
2. Flowers polygamous; style single……..…....3
- Flowers bisexual; style 3……...……..…….*Holigarna*
3. Stamens 1 - 5; only one fertile; fruit a fleshy drupe…..*Mangifera*
- Stamens 5 - 10; almost all fertile; fruit a reniform nut.….. *Anacardium*
4. Leaves with intramarginal nerve; petals imbricate…..…..... *Spondias*
- Leaves without intramarginal nerve; petals valvate……...*Lannea*

Anacardium L., *Sp. Pl.* 1: 383 (1753)

Anacardium occidentale L., *Sp. Pl.* 1: 383 (1753); Hook. f., *FBI* 2: 20 (1876); Gamble, *Fl. Madras* 260 (1918); Vajr., *Fl. Palghat Dist* 135 (1990); Sasidh., *Fl. Parambikulam WLS* 77 (2002).

Habit : Tree
Ecosystem preference : Deciduous forests and in plains
Distribution : Indo - Pacific, Holarctic, African and South American
IUCN Category : Least Concern (LC)
Habitat : Cultivated in plantations and in plains
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : November - April
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Vettiyil Sandal estate, 10°51'33.12"N, 76°42'29.52"E, 179m, 10 March 2018, Aswani & Maya, 1436 (GVCH); Kalliyara, 10°52'51.24"N, 76°39'24.84"E, 138m, 24 March 2018, Aswani & Maya, 1533 (GVCH); Kochuthodu, 10°51'58.32"N, 76°42'22.32"E, 190m, 18 December 2018, Aswani & Maya, 3311 (GVCH); Anayappanchalla, 10°48'20.42"N, 76°48'05.00"E, 147m, 30 November 2019, Aswani & Maya, 5221 (GVCH).

Holigarna Buch.-Ham. ex Roxb., *Pl. Coromandel* 3(4): 79 (1820), nom. cons.

Holigarna arnottiana Hook.f., *FBI* [J. D. Hooker] 2(4): 36 (1876); Gamble, *Fl. Madras* 268 (1918); Vajr., *Fl. Palghat Dist* 136 (1990); Sasidh., *Fl. Parambikulam WLS* 78 (2002).

Habit : Tree
Ecosystem preference : Moist deciduous forests and in the plains

Distribution : Indo - Pacific
Endemism : Southern Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Near water sources
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : January - July
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Moochikadavu, 10°52'13.80"N , 76°42'30.96"E, 266m, 10 March 2018, Aswani & Maya, 1466 (GVCH); Kalliyara, 10°52'51.24"N, 76°39'24.84"E, 128m, 24 March 2018, Aswani & Maya, 1523 (GVCH); Chaatapara waterfalls, 10°53'11.76"N, 76°42'15.84"E, 640m, 10 December 2019, Aswani & Maya, 5499 (GVCH); Aatumala - Kundanmala, 10°53'31.2"N, 76°41'52.8"E, 946m, 28 February 2020, Aswani & Maya, 6187 (GVCH); Aduppukootimala, 10°50'30.12" N, 76°44'28.32"E, 642m, 16 February 2021, Aswani & Maya, 6458 (GVCH).

Lannea A. Rich. in Guill., *Fl. Seneg. Tent.* 153 (1831)

Lannea coromandelica (Houtt.) Merr., *J. Arnold Arbor.* 19: 353 (1938); Vajr., *Fl. Palghat Dist* 137 (1990); Sasidh., *Fl. Parambikulam WLS* 79 (2002); *Odina wodier* Roxb., Hook. *FBI* 2: 29 (1876); Gamble, *Fl. Madras* 263 (1918).

Habit : Tree
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and Holarctic
IUCN Category : Least Concern (LC)
Habitat : Found in hill slopes
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : January - May
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Aduppukootimala, 10°49'36.48"N, 76°44'4.92"E, 139m, 16 February 2021, Aswani & Maya, 6399 (GVCH) **(Plate 51: Fig. f)**.

Mangifera L., *Sp. Pl.* 1: 200 (1753)

Mangifera indica L., *Sp. Pl.* 1: 200 (1753); Hook. f., *FBI* 2: 13 (1876); Gamble, *Fl. Madras* 259 (1918); Vajr., *Fl. Palghat Dist* 138 (1990); Sasidh., *Fl. Parambikulam WLS* 79 (2002).

Habit : Tree
Ecosystem preference : Moist deciduous forests and in plains
Distribution : Indo - Pacific
IUCN Category : Data Deficient (DD)
Habitat : Planted in estates and in plains
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional (in forest area), Common (in Walayar forest range)
Phenology : January - May
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kavarakundu on the way, 10°51'59.76"N, 76°42'26.64"E, 216m, 10 March 2018, Aswani & Maya, 1444 (GVCH); Kochuthodu, 10°51'58.32"N, 76°42'22.32"E, 195m, 18 December 2018, Aswani & Maya, 3315 (GVCH); Anayappanchalla, 10°48'24.15"N, 76°48'32.06"E, 163m, 30 November 2019, Aswani & Maya, 5183 (GVCH); Aduppukootimala, 10°49'58.80"N, 76°44'31.92"E, 300m, 16 February 2021, Aswani & Maya, 6466 (GVCH).

Spondias L., *Sp. Pl.* 1: 371 (1753)

Spondias pinnata (L.f.) Kurz, *Prelim. Rep. Forest Pegu Appendix A*: xliv, no. 334 (1875); Vajr., *Fl. Palghat Dist* 139 (1990); Sasidh., *Fl. Parambikulam WLS* 81 (2002); *Spondias mangifera* Willd., Hook. f., *FBI* 2: 42 (1876); Gamble, *Fl. Madras* 261 (1918).

Basionym : *Mangifera pinnata* L.f., *Suppl. Pl.* 156 (1782).

Habit : Tree
Ecosystem preference : Moist deciduous forests and in the plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Planted in forest margins and in home steads
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : March - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Valiya eri, 10°48'53.21"N, 76°44'52.53"E, 165m, 06 January 2018, Aswani & Maya, 1280 (GVCH); Ayyappan Mala, 10°49'07.19"N, 76°44'50.28"E, 143m, 26 June 2018, Aswani & Maya, 2471 (GVCH); Parachaathy, 10°50'42.54"N, 76°43'49.14" E, 149m, 02 January 2019, Aswani & Maya, 3541 (GVCH).

Sapindaceae

Key to genera

1. Climbing herbs…...*Cardiospermum*
- Shrubs or trees…..……..2
2. Leaves simple; fruits winged…….……..…*Dodonaea*
- Leaves 2 - 3 foliate or pinnately compound……..…...……..3
3. Flowers actinomorphic……..…..4
- Flowers zygomorphic…..…...……8
4. Petals absent……....….*Schleichera*
- Petals present…….……..……..….5
5. Ovules solitary in each cell; fruits a drupe……..……..….....……6
- Ovules 2 in each cell; fruits an inflated 2 lobed capsule... *Harpullia*
6. Fruit a smooth globose drupe…… ……..…….*Sapindus*
- Fruit a tubercled or echinate globose drupe…….……7
7. Sepals free or connate half way; stigma recoiled…....…..*Nephelium*
- Sepals fused; cupular; stigma spreading…...…….….*Dimocarpus*
8. Sepals 4……...……....*Allophylus*
- Sepals 5…….……....*Lepisanthes*

Allophylus L., *Sp. Pl.* 1: 348 (1753)

Allophylus serratus Kurz, *J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist.* 44(3): 185 (1876); Gamble, *Fl. Madras* 246 (1918); *Allophylus cobbe forma serratus* (Roxb.) Hiern, Hook. f., *FBI* 1: 673 (1875).

Habit : Shrub
Ecosystem preference : Semi - evergreen and Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Understorey of forest floors
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : July - October
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Pettikallu, 10°52'51.24"N, 76°39'24.84"E, 136m, 19 July 2019, Aswani & Maya, 4389 (GVCH); Chacolas,10°51'30.60"N, 76°43'53.76"E, 203m, 02 August 2019, Aswani & Maya, 4458 (GVCH) **(Plate 51: Fig. g)**.

Cardiospermum L., *Sp. Pl.* 1: 366 (1753)

Cardiospermum halicacabum L., *Sp. Pl.* 1: 366 (-367) (1753); Hook. f., *FBI* 1: 670 (1875); Gamble, *Fl. Madras* 244 (1918); Vajr., *Fl. Palghat Dist* 130 (1990); Sasidh., *Fl. Parambikulam WLS* 73 (2002).

Habit : Climber
Ecosystem preference : Moist deciduous forests, scrub jungles and in plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Found in the forest outskirts, hillocks, road sides and in plains
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Common
Phenology : July - February
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thonikadavu, 10°50'04.96"N, 76°40'48.72"E, 136m, 04 June 2017, Aswani & Maya, 21 (GVCH); Way to Ayyappan Mala, 10°48'59.96"N, 76°45'22.61"E, 148m, 06 January 2018, Aswani & Maya, 1219 (GVCH); Walayar Dam, 10°50'24.58"N, 76°51'01.52"E, 205m, 09 May 2018, Aswani & Maya, 1978 (GVCH); Kongampaadam, 10°48'31.45"N, 76°46'38.56"E, 139m, 15 June 2018, Aswani & Maya, 2373 (GVCH);Mangalathumchalla, 10°49'04.07" N, 76°48'16.50"E, 165m, 18 September 2018, Aswani & Maya, 2746 (GVCH) **(Plate 51: Fig. h)**.

Dimocarpus Lour., *Fl. Cochinch.* 1: 233 (1790)

Dimocarpus longan Lour., *Fl. Cochinch.* 1: 233 (1790); Vajr., *Fl. Palghat Dist* 131 (1990); Sasidh., *Fl. Parambikulam WLS* 74 (2002); *Nephelium longana* (Lam.) Camp., Hook. f., *FBI* 1: 688 (1875); Gamble, *Fl. Madras* 252 (1918).

Habit : Tree
Ecosystem preference : Semi-evergreen forests
Distribution : Indo - Pacific
IUCN Category : Near Threatened
Habitat : In open grassy forest tracks
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : March - August
Altitude preference : Found in higher altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala, 10°52'04.24"N, 76°47'13.29"E, 728m, 23 June 2019, Aswani & Maya, 4120 (GVCH); Jamanthimala, 10°52'20.64"N, 76°46'57.00"E, 880m, 09 January 2020, Aswani & Maya, 5726 (GVCH); Thanniplace, 10°52'20.64"N, 76°46'27.12"E, 858m, 28 January 2020, Aswani & Maya, 6038 (GVCH).

Dodonaea Mill., *Gard. Dict. Abr.*, ed. 4. 1: [450] (1754)

Dodonaea viscosa Jacq., *Enum. Syst. Pl.* 19 (1760); Hook. f., *FBI* 1: 697 (1875); Gamble, *Fl. Madras* 253 (1918).

Habit : Shrub
Ecosystem preference : Deciduous forests
Distribution : Indo - Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Rocky hillock systems
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : January - May
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Anayappanchalla, 10°48'24.82"N,

76°48'30.73"E, 169m, 30 November 2019, Aswani & Maya, 5164 (GVCH).

Harpullia Roxb., *Fl. Ind. (Carey & Wallich ed.)* 2: 441 (1824)

Harpullia arborea (Blanco) Radlk., *Sitzungsber. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. München* 16(3): 404 (1887); Vajr., *Fl. Palghat Dist* 131 (1990); Sasidh., *Fl. Parambikulam WLS* 74 (2002); *Harpullia imbricata* (Blume) Thw., Gamble, *Fl. Madras* 253 (1918); *Harpullia cupanoides* Hiern in Hook. f., *FBI* 1: 692 (1875).

Basionym : *Ptelea arborea Blanco*, *Fl. Filip. [F.M. Blanco]* 63 (1837).

Habit : Tree
Ecosystem preference : Semi-evergreen forests
Distribution : Indo - Pacific and Australian
IUCN Category : Least Concern (LC)
Habitat : Near water sources
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : January - April
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Ponthancheeni, 10°49'59.16"N, 76°44'31.56"E, 308m, 12 January 2019, Aswani & Maya, 3712 (GVCH); Chaatapara waterfalls, 10°53'11.76"N, 76°42'15.84"E, 662m, 10 December 2019, Aswani & Maya, 5527 (GVCH); Jamanthimala, 10°51'53.64"N, 76°47'16.80"E, 603m, 09 January 2020, Aswani & Maya, 5629 (GVCH); Akamalavaram - Pettikallu, 10°53'2.04"N, 76°42'13.92"E, 548m, 27 February 2020, Aswani & Maya, 6093 (GVCH) **(Plate 52: Fig. a)**.

Lepisanthes Blume, *Bijdr. Fl. Ned. Ind.* 5: 237 (1825)

Lepisanthes tetraphylla Radlk., *Sitzungsber. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. München* viii. (1878) 276.; Gamble, *Fl. Madras* 247 (1918); Vajr., *Fl. Palghat Dist* 132 (1990); Sasidh., *Fl. Parambikulam WLS* 75 (2002); *Hemigyrosa canescens* (Roxb.) Blume, Hook. f., *FBI* 1: 671 (1875); *Lepisanthes deficiens* (Wight & Arn.) Radlk., Gamble, *Fl. Madras* 247 (1918).

Habit : Tree
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific and African
IUCN Category : Least Concern (LC)
Habitat : Found in hill slopes
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : February - July
Altitude preference : Found in medium and higher altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Chaatapara waterfalls, 10°53'11.76"N, 76°42'15.84"E, 647m, 10 December 2019, Aswani & Maya, 5506 (GVCH); Jamanthimala, 10°51'59.76"N, 76°47'15.36"E, 666m, 09 January 2020, Aswani & Maya, 5663 (GVCH); Thanniplace, 10°52'43.32"N, 76°45'54.07" E, 976m, 28 January 2020, Aswani & Maya, 6009 (GVCH); Aatumala, 10°53'24"N, 76°41'24"E, 1057m, 28 February 2020,Aswani & Maya, 6173 (GVCH) **(Plate 52: Fig. b)**.

Nephelium L., *Mant. Pl.* 18 (1767)

Nephelium lappaceum L., *Mant. Pl. Altera* 566 (1771); Ratheesh Narayanan, *Fl. Stud. Wayanad Dist* 247 (2009).

Habit : Tree

Plate 51: Fig. a. *Syzygium laetum* (Buch.-Ham.) Gandhi **b.** *Memecylon talbotianum* D.Brandis **c.** *Memecylon umbellatum* Burm.f. **d.** *Osbeckia muralis* Naudin **e.** *Garuga pinnata* Roxb. **f.** *Lannea coromandelica* (Houtt.) Merr. **g.** *Allophylus serratus* Kurz **h.** *Cardiospermum halicacabum* L.

Ecosystem preference : In plains
Distribution : Indo - Pacific and Holarctic
IUCN Category : Least Concern (LC)
Habitat : Cultivated in plains and in estates
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : March - July
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, G. P. Nair Estate 10° 53 '20.76"N, 76° 39' 41.04"E, 213m, 24 March 2018, Aswani & Maya, 1652 (GVCH) **(Plate 52: Fig. c)**.

Sapindus L., *Sp. Pl.* 1: 367 (1753), nom. cons.

Key to species

Leaflets lanceolate; apex acuminate, shining above; petals slightly woolly inside……..…..... *S. trifoliatus*
Leaflets oblong; apex emarginate, dull above; petals glabrous inside……..…
……..….*S. emarginatus*

Sapindus emarginatus Vahl, *Symb. Bot. (Vahl)* 3: 54 (1794); Gamble, *Fl. Madras* 250 (1918); Sasidh., *Fl. Parambikulam WLS* 75 (2002); *Sapindus trifoliata* Hiern in Hook. f., *FBI* 1: 682 (1875).

Habit : Tree
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Margins of grasslands
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : November - March
Altitude preference : Found in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala, 10°52'04.24"N, 76°47'13.29"E, 737m, 09 January 2020, Aswani & Maya, 5679 (GVCH) **(Plate 52: Fig. d)**.

Sapindus trifoliatus L., *Sp. Pl.* 1: 367 (1753); Hook. f., *FBI* 1: 682 (1875); Sasidh., *Fl. Parambikulam WLS* 75 (2002); *Sapindus laurifolius* Vahl, Gamble, *Fl. Madras* 250 (1918); Vajr., *Fl. Palghat Dist* 132 (1990).

Habit : Tree
Ecosystem preference : moist deciduous and semi-evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Near water sources
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : December - April
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, G. P. Nair Estate, 10°53'26.52"N, 76°39'41.04"E, 188m, 24 March 2018, Aswani & Maya, 1683 (GVCH); Kochuthodu,10°51'58.32"N, 76°42'22.32"E, 211m, 18 December 2018, Aswani & Maya, 3331 (GVCH); Parachaathy, 10°50'42.54"N, 76°43'49.14"E, 154m, 02 January 2019, Aswani & Maya, 3546 (GVCH); Jamanthimala, 10°52'10.20"N, 76°47'15.00"E, 767m, 01 July 2019, Aswani & Maya, 4156 (GVCH); Chaatapara waterfalls, 10°53'11.76"N, 76°42'15.84"E, 662m, 10 December 2019, Aswani & Maya, 5522 (GVCH) **(Plate 52: Fig. e)**.

Schleichera Willd., Sp. Pl., *ed. 4 [Willdenow]* 4(2): 892, 1096 (1806)

Schleichera oleosa (Lour.) Oken, *Allg. Naturgesch.* iii. (2) 1341 (1841); Vajr., *Fl. Palghat Dist* 133 (1990); Sasidh., *Fl.*

Parambikulam WLS 76 (2002); *Schleichera trijuga* Willd., Hook. f., *FBI* 1: 681 (1875); Gamble, *Fl. Madras* 248 (1915).

Habit : Tree
Ecosystem preference : Semi-evergreen, moist deciduous forests and in the plains
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Found commonly in forest floors and in plains
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : March - June
Altitude preference : Found in all altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Poozhikunnu, 10°51'20.44"N, 76°43'38.28"E, 128m, 09 November 2017, Aswani & Maya, 844 (GVCH); Vettiyil Sandal estate, 10°51'33.12"N, 76°42'29.52"E, 171m, 10 March 2018, Aswani & Maya, 1428 (GVCH); Kalliyara, 10°53'8.52"N, 76°39'38.88"E, 199m, 24 March 2018, Aswani & Maya, 1569 (GVCH); Kottamutti waterfalls, 10°49'42.94"N, 76°46'47.87"E, 261m, 23 September 2018, Aswani & Maya, 2907 (GVCH); Parachaathy, 10°50'42.54"N, 76°43'49.14"E, 163m, 02 January 2019, Aswani & Maya, 3555 (GVCH) **(Plate 52: Fig. f)**.

Rutaceae

Key to genera

1. Fruits dehiscent; 3–loculed ……..*Chloroxylon*
- Fruits indehiscent; 2 - 5 or many loculed…….……...…2
2. Flowers unisexual……*Zanthoxylum*
- Flowers bisexual…….……...…3
3. Armed plants……..…...4
- Unarmed plants…….....7
4. Ovary many loculed; stamens numerous……...…….…..*Citrus*
- Ovary 2 - 4 loculed or 3 - 5 loculed; stamens definite……...…..…….5
5. Disc columnar; style elongate…...…….....….*Paramignya*
- Disc annular or cupular; style short…….……..…….……6
6. Leaves 1 - foliolate…..…...*Atalantia*
- Leaves 3 - foliolate or imparipinnate…….……..….*Naringi*
7. Style persistent…….…....*Glycosmis*
- Style deciduous……...…...….8
8. Anther small; filaments slender, not dilated below…….……*Bergera*
- Anther large; filaments dilated below ……..…….……*Clausena*

Atalantia Corrêa, *Ann. Mus. Natl. Hist. Nat.* 6: 383, 385-386 (1805), nom. cons.

Key to species

Flowers in umbels or corymbs; calyx irregularly lobed…….…..*A. monophylla*
Flowers in racemes; calyx regularly lobed……...…….....….*A. racemosa*

Atalantia monophylla (L.) DC., *Prodr. [A. P. de Candolle]* 1: 535 (1824); Hook. f., *FBI* 1: 511 (1875); Gamble, *Fl. Madras* 159 (1915); Sasidh., *Fl. Parambikulam WLS* 47 (2002).

Basionym : *Limonia monophylla* L., *Mant. Pl. Altera* 237 (1771), nom. cons.

Habit : Shrub
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Common straggling shrub in forest floors
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : December - Marchs
Altitude preference : Found in all altitudes

Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kalliyara, 10°53'8.52"N, 76°39'38.88"E, 188m, 24 March 2018, Aswani & Maya, 1557 (GVCH); Mangalathumchalla, 10°49'04.76"N, 76°48'17.12"E, 151m, 18 September 2018, Aswani & Maya, 2766 (GVCH); Parachaathy, 10°50'54.24"N, 76°43'55.92"E, 168m, 02 January 2019, Aswani & Maya, 3589 (GVCH); Aduppukootimala - Kanyarmuttu, 10°49'50.52"N, 76°44'24.72"E, 251m, 12 January 2019, Aswani & Maya, 3699 (GVCH); Ayyappan Mala, 10°49'07.19"N, 76°44'50.28"E, 133m, 07 March 2019, Aswani & Maya, 3753 (GVCH); Jamanthimala, 10°51'53.64"N, 76°47'16.80"E, 606m, 23 June 2019, Aswani & Maya, 4086 (GVCH).

Atalantia racemosa Wight & Arn., *Prodr. Fl. Ind. Orient.* 1: 91 (1834); Hook. f., *FBI* 1:512 (1875); Gamble, *Fl. Madras* 159 (1915).

Habit : Shrub
Ecosystem preference : Semi-evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Straggling shrubs in forest floors
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : October - January
Altitude preference : Found in medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala, 10°51'59.76"N, 76°47'15.36"E, 647m, 09 January 2020, Aswani & Maya, 5644 (GVCH); Aduppukootimala, 10°50'20.07"N, 76°44'24.52"E, 507m, 16 February 2021, Aswani & Maya, 6488 (GVCH) **(Plate 52: Fig. g)**.

Bergera J. Koenig, *Mant. Pl. Altera [Linnaeus]* 555, 563 (1771)

Bergera koenigii L., *Mant. Pl. Altera* 565 (1771); *Murraya koenigii* (L.) Spreng., Hook. f., *FBI* 1: 503 (1875); Gamble, *Fl. Madras* 156 (1915).

Habit : Shrub
Ecosystem preference : Deciduous forests and plains
Distribution : Indo - Pacific and Holarctic
IUCN Category : Least Concern (LC)
Habitat : Found to be in wild in forests and planted in plains
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional (Forest Area), Common in plains
Phenology : March - July
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Vettiyil Sandal estate, 10°51'33.12"N, 76°42'29.52"E, 176m, 10 March 2018, Aswani & Maya, 1433 (GVCH); Ayyappan Mala, 10°49'07.19"N, 76°44'50.28"E, 160m, 07 March 2019, Aswani & Maya, 3780 (GVCH); Chottuppara waterfalls, 10°52'37.92"N, 76°41'39.84"E, 362m, 14 May 2019, Aswani & Maya, 3986 (GVCH); Poolakunnu, 10°51'30.60"N, 76°43'53.76"E, 194m, 02 August 2019, Aswani & Maya, 4449 (GVCH).

Chloroxylon DC., *Prodr. [A. P. de Candolle]* 1: 625 (1824)

Chloroxylon swietenia DC., *Prodr. [A. P. de Candolle]* 1: 625 (1824); Hook. f., *FBI* 1: 569 (1875); Gamble, *Fl. Madras* 152 (1915).

Habit : Tree
Ecosystem preference : Deciduous forests
Distribution : Indo - Pacific and African

IUCN Category : Vulnerable (VU)
Habitat : Found in the drier forest tracts
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : March - October
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Mangalathumchalla, 10°49'04.76"N, 76°48'17.12"E, 155m, 18 September 2018, Aswani & Maya, 2770 (GVCH); Parachaathy, 10°50'54.24"N, 76°43'55.92" E, 182m, 18 September 2018, Aswani & Maya, 3603 (GVCH); Mathappumala, 10°51'9.36"N, 76°49'55.56"E, 230m, 07 January 2020, Aswani & Maya, 5606 (GVCH).

Citrus L., *Sp. Pl.* 2: 782 (1753)

Key to species

Calyx creamy yellow - white, 4 - 5 toothed…..……..……...*C. hystrix*
Calyx greenish - white; 4 – lobed…….…….*Citrus* × *aurantium*

Citrus* × *aurantium L., *Sp. Pl.* 2: 782 (1753); Hook. f., *FBI* 1: 515 (1875); Gamble, *Fl. Madras* 162 (1915).

Habit : Tree
Ecosystem preference : Cultivated
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Remnants of earlier cultivation in estates near grasslands
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : April - December
Altitude preference : Found in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Pothukunnu, 10°53'21.84"N, 76°46'33.24" E, 973m, 28 January 2020, Aswani & Maya, 5965 (GVCH).

Citrus hystrix DC., *Cat. Pl. Horti Monsp*. 97 (1813); *Citrus megaloxycarpa* Lush. var. *pennivesiculata* Lush., *Indian Forester* 36: 345 (1910); *Citrus pennivesiculata* (Lush.) Tanaka, *J. Indian Bot. Soc.* 16:239 (1937).

Habit : Tree
Ecosystem preference : Margins of forests and in the plains
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : Found to be a escape to wild; found planted in plantations
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : February - September
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Akamalavaram - Moochikadavu, 10°52'7.32"N, 76°42'28.44"E, 251m, 10 March 2018, Aswani & Maya, 1456 (GVCH) **(Plate 52: Fig. h)**.

Clausena Burm.f., *Fl. Ind. (N. L. Burman)* 87, 243, t. 29, fig. 2 (1768).

Clausena indica Oliv., *J. Proc. Linn. Soc., Bot.* 5(Suppl. 2): 36 (1861); Hook. f., *FBI* 1: 505 (1875); Gamble, *Fl. Madras* 155 (1915); Vajr., *Fl. Palghat Dist* 103 (1990); Sasidh., *Fl. Parambikulam WLS* 48 (2002).

Habit : Shrub
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Understorey in forest floors
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : February - June

Plate 52: Fig. a. *Harpullia arborea* (Blanco) Radlk. **b.** *Lepisanthes tetraphylla* Radlk. **c.** *Nephelium lappaceum* L. **d.** *Sapindus emarginatus* Vahl **e.** *Sapindus trifoliatus* L. **f.** *Schleichera oleosa* (Lour.) Oken **g.** *Atalantia racemosa* Wight & Arn. **h.** *Citrus hystrix* DC.

Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Akamalavaram - Moochikadavu, 10°52'28.20"N, 76°42'38.52"E, 385m, 19 July 2019, Aswani & Maya, 4310 (GVCH); Chacolas, 10°51'16.20"N, 76°45'05.76"E, 293m, 02 August 2019, Aswani & Maya, 4533 (GVCH); Jamanthimala,10°51'59.76"N,76°47'15.36" E, 660m, 09 January 2020, Aswani & Maya, 5657 (GVCH); Pothukunnu, 10°53'21.84"N, 76°46'33.24"E, 990m, 28 January 2020, Aswani & Maya, 5983 (GVCH) **(Plate 53: Fig. a)**.

Glycosmis Corrêa, *Ann. Mus. Natl. Hist. Nat.* 6: 384 (1805)

Key to species

Flowers 1 - 4 flowered axillary cymes; petals ovate, obtuse at apex with hyaline hairs……..…...……..*G. nelliyampathiensis*
Flowers many flowered axillary racemes; petals obovate, naked…..…..*G. pentaphylla*

Glycosmis nelliyampathiensis Jabeena & Maya, *Phytotaxa* 496(3): 270 (2021).

Habit : Tree
Ecosystem preference : Evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Near grasslands
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : June - January
Altitude preference : Found rarely in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kallappara, 10°53'16.44"N, 76°45'50.4"E, 1021m, 28 January 2020, Aswani & Maya, 6002 (GVCH) **(Plate 53: Fig. b)**.

Glycosmis pentaphylla (Retz.) DC., *Prodr. [A. P. de Candolle]* 1: 538 (1824); Hook. f., *FBI* 1:499 (1875); Sasidh., *Fl. Parambikulam WLS* 49 (2002); *Glycosmis cochinchinensis* Gamble, *Fl. Madras* 153 (1915); *Glycosmis arborea* (Roxb.) DC., Vajr., *Fl. Palghat Dist* 104 (1990).

Habit : Shrub
Ecosystem preference : Semi-evergreen, moist deciduous forests and in the plains
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Understorey in forest tracks and often planted along plantations in plains
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : September - April
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kezhakootimala, 10°51'53.30"N, 76°37'36.39"E, 395m, 15 September 2017, Aswani & Maya, 517 (GVCH); G. P. Nair Estate, 10°53'40.83"N, 76°39'43.16"E, 234m, 24 March 2018, Aswani & Maya, 1738 (GVCH); Pallakaadu,10°51'32.04"N, 76°37'25.68"E, 164m, 09 October 2018, Aswani & Maya, 3009 (GVCH); Parachaathy, 10°50'42.54"N, 76°43'49.14"E, 162m, 02 January 2019, Aswani & Maya, 3554 (GVCH); On the way to Jamanthimala, 10°51'20.17"N, 76°47'4.18"E, 652m, 23 June 2019, Aswani & Maya, 4031 (GVCH) **(Plate 53: Fig. c).**

Naringi Adans., *Fam. Pl. (Adanson)* 2: 341 (1763)

Naringi crenulata (Roxb.) Nicolson, *Fl. Hassan Dist. [Saldanha & Nicolson]* 387 (1976); Vajr., *Fl. Palghat Dist* 106 (1990); Sasidh., *Fl. Parambikulam WLS* 50 (2002); *Limonia crenulata* Roxb., Gamble, *Fl.*

Madras 157 (1915); *Limonia acidissima* sensu Hook.f., *FBI* 1: 507 (1875).

Basionym : *Limonia crenulata* Roxb., *Pl. Coromandel* 1(4): 60, t. 86 (1798).

Habit : Tree
Ecosystem preference : Moist deciduous and semi - evergreen forests
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Found in forest tracks
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : June - December
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Poozhikunnu, 10°51'20.44"N, 76°43'38.28" E, 136m, 09 November 2017, Aswani & Maya, 852 (GVCH); on the way to Kavarakundu, 10°51'59.76"N, 76°42'26.64" E, 219m, 10 March 2018, Aswani & Maya, 1447 (GVCH); Parakkallu- Neelikunnu, 10°51'30.14"N, 76°37'30.67"E, 185m, 27 April 2018, Aswani & Maya, 1941 (GVCH); Parachaathy, 10°50'49.97"N, 76°43'56.67"E, 169m, 02 January 2019, Aswani & Maya, 3626 (GVCH) **(Plate 53: Fig. d)**.

Paramignya Wight, *Ill. Ind. Bot.* i. 108. t. 42 (1838)

Paramignya monophylla Wight, *Ill. Ind. Bot. i*. 109. t. 42; Hook. f., *FBI* 1:510 (1875); Gamble, *Fl. Madras* 158 (1915); Sasidh., *Fl. Parambikulam WLS* 51 (2002).

Habit : Climber
Ecosystem preference : Semi evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Straggling climber in forest tracks
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : October - March
Altitude preference : Found in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala, 10°51'59.76"N, 76°47'15.36"E, 646m, 23 June 2019, Aswani & Maya, 4114 (GVCH) **(Plate 53: Fig. e)**.

Zanthoxylum L., *Sp. Pl.* 1: 270 (1753)

Zanthoxylum asiaticum (L.) Appelhans, *Groppo & J.Wen, Molec. Phylogen. Evol.* 126: 43 (2018); *Toddalia asiatica* (L.) Lam., Gamble, *Fl. Madras* 150 (1915); Sasidh., *Fl. Parambikulam WLS* 51 (2002); *Toddalia aculeata* (Smith) Pers., Hook. f., *FBI* 1: 497 (1875); *Toddalia asiatica* (L.) Lam. var. *floribunda* (Wall.) Kurz, Gamble, *Fl. Madras* 151 (1915); Vajr., *Fl. Palghat Dist* 106 (1990); *Toddalia asiatica* (L.) Lam. var. *obtusifolia* Gamble, *Fl. Madras* 151 (1915); *Toddalia asiatica* (L.) Lam. var. *gracilis* Gamble, *Fl. Madras* 151 (1915).

Basionym : *Paullinia asiatica* L., *Sp. Pl*. 1: 365 (1753), nom. cons.

Habit : Climber
Ecosystem preference : Moist deciduous and semi - evergreen forests
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Found in rocky forest tracks near water sources
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : September - July
Altitude preference : Prefer lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Pallakaadu, 10°51'32.04"N, 76°37'25.68"E, 144m, 09 October 2018, Aswani & Maya, 2989(GVCH) **(Plate 53: Fig. f)**.

Simaroubaceae

Key to genera

Fruits drupe; leaves small, rounded at apex……..……..……*Simarouba*
Fruits samara; leaves larger, acute at apex……..……*Ailanthus*

Ailanthus Desf., *Hist. Acad. Roy. Sci. Mém. Math. Phys. (Paris, 4°)* 1786 (Mém.) : 265 (1788), nom. cons.

Key to species

Samara twisted; leaves toothed...*A. excelsus*
Samra straight; leaves entire or wavy……
…….……..…*A. triphysus*

Ailanthus excelsus Roxb., *Pl. Coromandel* 1(1): t. 23 (1795); Hook. f., *FBI* 1: 518 (1875); Gamble, *Fl. Madras* 163 (1915); Sasidh., *Fl. Parambikulam WLS* 52 (2002).

Habit : Tree
Ecosystem preference : In plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Planted in plantations
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : December - July
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kozhimala, 10°50'01.89"N, 76°42'58.61"E,154m, 09 November 2017, Aswani & Maya, 804 (GVCH); Pazhampullikaadu, 10°50'09.55"N, 76°38'28.33"E,123m, 16 October 2018, Aswani & Maya, 3134 (GVCH);On the way to Ayyappan Mala, 10°50'26.52"N, 76°50'04.56"E, 228m, 23 June 2019, Aswani & Maya, 4006 (GVCH); Akamalavaram - Chaatapara waterfalls, 10°53'11.76"N, 76°42'15.84"E,608m, 10 December 2019, Aswani & Maya, 5422 (GVCH) **(Plate 53: Fig. g)**.

Ailanthus triphysus (Dennst.) Alston, in Trimen, *Hand-Book Fl. Ceylon* vi. *Suppl.*, 41 (1931); *Ailanthus malabarica* DC., Hook. f., *FBI* 1: 518 (1875); Gamble, *Fl. Madras* 163 (1915).

Basionym: *Adenanthera triphysa* Dennst. in *Schlüssel Hortus Malab*.: 32 (1818).

Habit : Tree
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and Australian
IUCN Category : Not Evaluated (NE)
Habitat : In forest outskirts or often planted in plantations
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : January - May
Altitude preference : Prefer low altitude forest tracts
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kalliyara, 10°52'51.24"N, 76°39'24.84"E, 135m, 24 March 2018, Aswani & Maya, 1530 (GVCH); G. P. Nair Estate, 10°53'26.52"N, 76°39'41.04"E, 193m, 24 March 2018, Aswani & Maya, 1688 (GVCH); Kochithodu, 10°52'7.89"N, 76°42'19.8"E, 271m, 14 May 2019, Aswani & Maya, 3958 (GVCH).

Simarouba Aubl., *Hist. Pl. Guiane* 859 (1775), nom. cons.

Simarouba glauca DC., *Ann. Mus. Natl. Hist. Nat.* xvii. (1811) 424.

Habit : Tree
Ecosystem preference : In plains
Distribution : South American
IUCN Category : Least Concern (LC)
Habitat : Planted in homesteads, road sides and other wastelands
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : January - May

Altitude preference : Found commonly in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Ahalia campus, 10°47'43.08"N, 76°50'5.43"E, 150m, 24 September 2020, Aswani & Maya, 6319 (GVCH); Walayar river, 10°47'43.99"N, 76°46'54.71"E, 18m, 14 March 2021, Aswani & Maya, 6534 (GVCH) **(Plate 53: Fig. h)**.

Meliaceae

Key to genera

1. Seeds winged…..……..…*Swietenia*
- Seeds wingless…….……..…….2
2. Leaves 3 - foliolate; petioles winged…...……..…..*Naregamia*
- Leaves pinnately compound..……3
3. Leaflets entire……..…..*Aglaia*
- Leaflets toothed……..……..…..4
4. Ovary 3 - loculed…..... *Azadirachta*
- Ovary 5 - loculed or 5 - 8 loculed..5
5. Disc annular; leaves 2 - 3 pinnate; staminal tube dark purple…....*Melia*
- Disc cupular; leaves single pinnate; staminal tube creamy white…….……...…*Cipadessa*

Aglaia Lour., *Fl. Cochinch.* 1: 98, 173 (1790)

Aglaia lawii (Wight) C.J.Saldanha, *Fl. Hassan Dist. [Saldanha & Nicolson]* 392 (1976); Vajr., *Fl. Palghat Dist* 109 (1990); Sasidh., *Fl. Parambikulam WLS* 54 (2002); *Amoora lawii* (Wight) Bedd., Hook. f., *FBI* 1: 561 (1875); Gamble, *Fl. Madras* 182 (1915); *Aglaia andamanica* Hiern in Hook.f., *FBI* 1: 555 (1875); *Amoora canarana* (Turcz.) Hiern in Hook.f., *FBI* 1: 560 (1875); Gamble, *Fl. Madras* 182 (1915).

Basionym : *Nimmoia lawii* Wight, *Calcutta J. Nat. Hist.* 7(no. 25): 13 (1846).

Habit : Tree
Ecosystem preference : Semi-evergreen forests
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Found in the margins of evergreen forests
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : December - February
Altitude preference : Found often in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kundanmala - Akamalavaram, 10°53'39.12"N, 76°41'47.20"E, 1020m, 28 February 2020, Aswani & Maya, 6132 (GVCH) **(Plate 54: Fig. a)**.

Azadirachta A.Juss., *Bull. Sci. Nat. Geol.* 23: 236 (1830)

Azadirachta indica A.Juss., *Mém. Mus. Hist. Nat.* 19: 221 (1830); Gamble, *Fl. Madras* 177 (1915); Vajr., *Fl. Palghat Dist* 113 (1990); Sasidh., *Fl. Parambikulam WLS* 56 (2002); *Melia azadirachta* L., Hook. f., *FBI* 1: 544 (1875).

Habit : Tree
Ecosystem preference : Moist deciduous forests and in plains
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Planted in forest margins, roadsides, hillocks and often running in wild
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : February - September
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Vedivachapara, 10°50'12.34"N, 76°40'41.15"E, 142m, 04 June 2017, Aswani & Maya, 87 (GVCH);

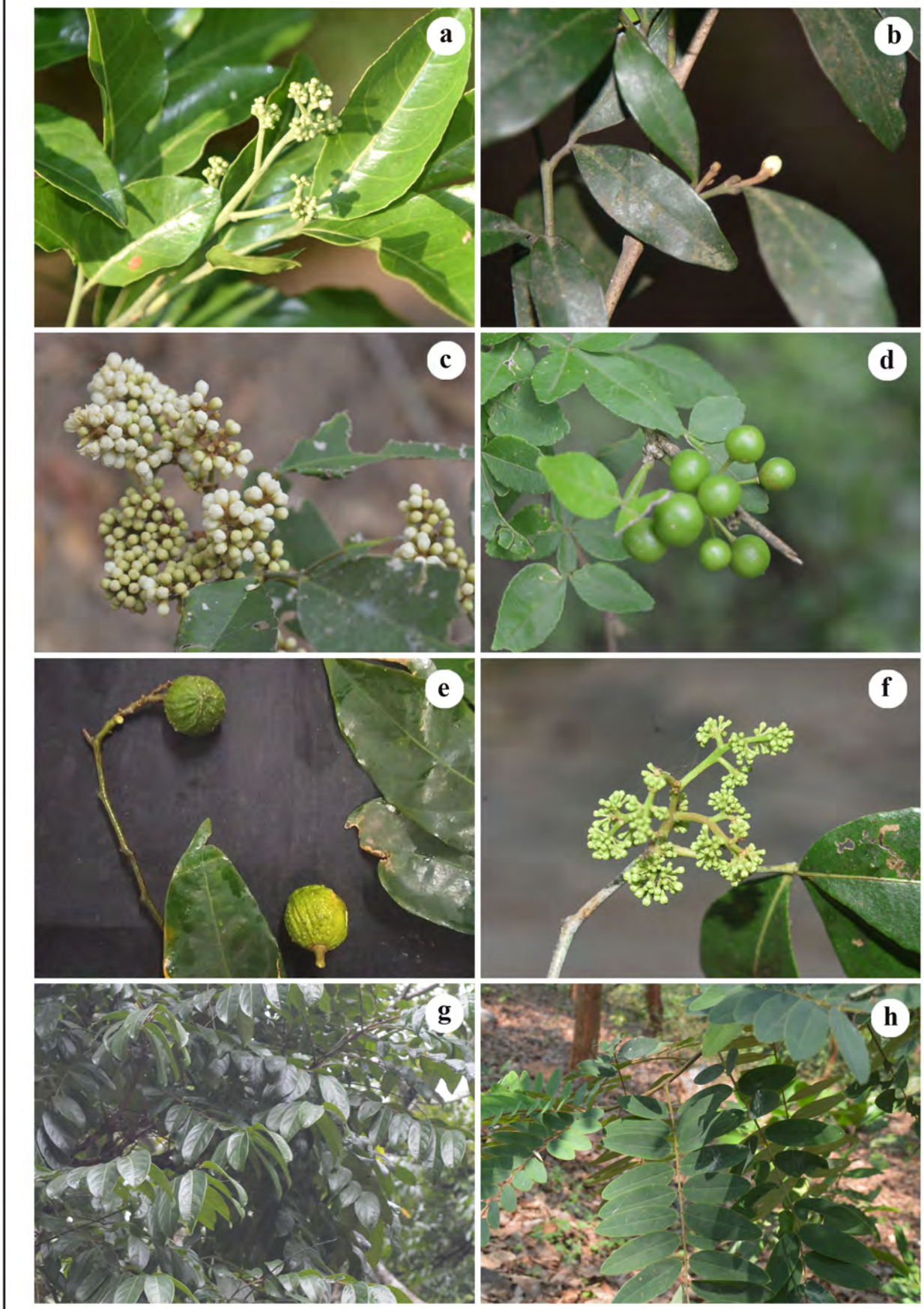

Plate 53: Fig. a. *Clausena indica* Oliv. **b.** *Glycosmis nelliyampathiensis* Jabeena & Maya **c.** *Glycosmis pentaphylla* (Retz.) DC. **d.** *Naringi crenulata* (Roxb.) Nicolson **e.** *Paramignya monophylla* Wight **f.** *Zanthoxylum asiaticum* (L.) Appelhans **g.** *Ailanthus triphysus* (Dennst.) Alston **h.** *Simarouba glauca* DC.

Ollappallam, 10°49'52.20"N, 76°43'44.19" E, 160m, 25 November 2017, Aswani & Maya, 934 (GVCH); Kavarakundu on the way, 10°51'59.76"N, 76°42'26.64"E, 215m, 10 March 2018, Aswani & Maya, 1443 (GVCH); Mathappumala, 10°51'9.36"N, 76°49'55.56"E, 230m, 07 January 2020, 07 January 2020, Aswani & Maya, 5590 (GVCH); Aduppukootimala, 10°50'30.12" N, 76°44'28.32"E, 639m, 16 February 2021, Aswani & Maya, 6379 (GVCH).

Cipadessa Blume, *Bijdr. Fl. Ned. Ind.* 4: 162 (1825)

Cipadessa baccifera Miq., *Ann. Mus. Bot. Lugduno-Batavi* 4: 6 (1868); Gamble, *Fl. Madras* 176 (1915); Vajr., *Fl. Palghat Dist* 110 (1990); Sasidh., *Fl. Parambikulam WLS* 56 (2002); *Cipadessa fruticosa* Blume, Hook. f., *FBI* 1: 545 (1875).

Habit : Shrub
Ecosystem preference : Moist deciduous and semi-evergreen forests
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Understorey of forest floors
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : November - July
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kavarakundu, 10°52'14.88"N, 76°42'38.88"E, 268m, 10 March 2018, Aswani & Maya, 1475 (GVCH); Kalliyara, 10°53'8.52"N, 76°39'38.88"E, 171m, 24 March 2018, Aswani & Maya, 1540 (GVCH); Parakkallu- Neelikunnu, 10°51'30.14"N, 76°37'30.67"E, 167m, 27 April 2018, Aswani & Maya, 1923 (GVCH) **(Plate 54: Fig. b)**.

Melia L., *Sp. Pl.* 1: 384 (1753)

Melia azedarach L., *Sp. Pl.* 1: 384 (1753); Hook. f., *FBI* 1: 544 (1875); Gamble, *Fl. Madras* 176 (1915); Antony, *Syst. Stud. Fl. Kottayam Dist* 101 (1989); Sivar. & Mathew, *Fl. Nilambur* 134 (1997); Anil Kumar *et al*., *Fl. Pathanamthitta* 119 (2005); Sunil & Sivadasan, *Fl. Alappuzha Dist* 168 (2009); Ratheesh Narayanan, *Fl. Stud. Wayanad Dist* 213 (2009).

Habit : Tree
Ecosystem preference : In plains
Distribution : Indo - Pacific, Holarctic, African and Australian
IUCN Category : Least Concern (LC)
Habitat : Grown as avenue tree in roadsides, margins of plains
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : May - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Vedivachapara, 10°50'12.34"N, 76°40'41.15"E, 121m, 04 June 2017, Aswani & Maya, 66 (GVCH); Mucuroni, 10°48'37.19"N, 76°44'56.27"E, 130m, 06 January 2018, Aswani & Maya, 1170 (GVCH); Mannukunnu, 10°52'5.50"N, 76°38'30.27"E, 181m, 09 July 2019, Aswani & Maya, 4220 (GVCH) **(Plate 54: Fig. c)**.

Naregamia Wight & Arn., *Prodr. Fl. Ind. Orient.* 1: 116 (1834)

Naregamia alata Wight & Arn., *Prodr. Fl. Ind. Orient.* 1: 117 (1834); Hook. f., *FBI* 1: 542 (1875); Gamble, *Fl. Madras* 175 (1915); *Vajr., Fl. Palghat Dist* 111 (1990); Sasidh., *Fl. Parambikulam WLS* 58 (2002).

Habit : Herb
Ecosystem preference : Moist deciduous forests

Distribution : Indo - Pacific
Endemism : Peninsular India
IUCN Category : Not Evaluated (NE)
Habitat : Found in the understorey of forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : August - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kosavanidukku - Kaduvachal, 10°50'26.38"N, 76°40'30.88"E, 182m, 16 July 2017, Aswani & Maya, 311 (GVCH); Valiya eri, 10°48'53.21"N, 76°44'52.53"E, 177m, 06 January 2018, Aswani & Maya, 1292 (GVCH); Pazhampullikaadu, 10°50'09.55"N,76°38'28.33"E, 183m, 16 October 2018, Aswani & Maya, 3194 (GVCH); Mannukunnu, 10°52'5.50"N, 76°38'30.27"E, 181m, 09 July 2019, Aswani & Maya, 4214 (GVCH);Chacolas, 10°51'22.68"N, 76°44'41.28"E, 291m, 02 August 2019, Aswani & Maya, 4525 (GVCH).

Swietenia Jacq., *Enum. Syst. Pl.* 4 (1760)

Swietenia mahagoni (L.) Jacq., *Enum. Syst. Pl.* 20 (1760); Gamble, *Fl. Madras* 187 (1915); Vajr., *Fl. Palghat Dist* 113 (1990).

Basionym: *Cedrela mahagoni* L. in *Syst. Nat*., ed. 10. 2: 940 (1759).

Habit : Tree
Ecosystem preference : Moist deciduous forests and in plains
Distribution : South American
IUCN Category : Near Threatened (NT)
Habitat : Often planted in forest margins and road sides
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : April - November
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Parakkallu- Neelikunnu,10°51'30.14"N, 76°37'30.67"E, 175m, 27 April 2018, Aswani & Maya, 1931 (GVCH); Pallakaadu, 10°51'32.04"N, 76°37'25.68"E, 145m, 09 October 2018, Aswani & Maya, 2990 (GVCH); Pazhampullikaadu, 10°50'09.55"N, 76°38'28.33"E, 104m, 16 October 2018, Aswani & Maya, 3115 (GVCH); Chacolas, 10°51'15.48"N, 76°45'09.00"E, 280m, 02 August 2019, Aswani & Maya, 4559 (GVCH).

Malvales

Muntingiaceae

Muntingia L., *Sp. Pl.* 1: 509 (1753)

Muntingia calabura L., *Sp. Pl.* 1: 509 (1753); Manilal & Sivar., *Fl. Calicut* 54 (1982); Babu, *Fl. Malappuram Dist* 90 (1990); Sunil & Sivadasan, *Fl. Alappuzha Dist* 146 (2009); Ratheesh Narayanan, *Fl. Stud. Wayanad Dist* 175 (2009).

Habit : Tree
Ecosystem preference : Plains and wastelands
Distribution : Indo - Pacific and South American
IUCN Category : Not Evaluated (NE)
Habitat : Found growing in the outskirts of hillocks, other waste places and roadsides
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : Throughout the year
Altitude preference : Found usually in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Mayappalam, 10°48'0.36"N, 76°45'58.68"E, 115m, 30 November 2019, Aswani & Maya, 5373 (GVCH);

Chaavadippara,10°52'42.20"N, 76°48'43.56"E, 274m, 28 January 2020, Aswani & Maya, 5831 (GVCH) **(Plate 54: Fig. d)**.

Malvaceae

1. Anther one celled……..….2
- Anther 2 - celled……..……..…11
2. Style branches twice as many as carpels…..……..……..3
- Style as many as the carpels…..….4
3. Leaves e- glandular..…..….*Pavonia*
- Leaves glandular (Large gland at the base of midrib beneath)....*Urena*
4. Fruit a schizocarp…..…….……5
- Fruit a capsule…….…….……..6
5. Mericarp with one seed…….….*Sida*
- Mericarp with two or more seeds……...……..…...……*Abutilon*
6. Leaves digitate…….…...……7
- Leaves simple……..……...8
7. Stamens numerous……...…*Bombax*
- Stamens 5……..……*Ceiba*
8. Younger plant parts covered with peltate scales……....……..9
- Young plant parts devoid of peltate scales…….……..……10
9. Leaves entire……..…...*Thespesia*
- Leaves 3 - 5 lobed (usually 3 lobed).....*Azanza*
10. Calyx spathaceous, irregularly 2 - 3 lobed…….……..….*Abelmoschus*
- Calyx non - spathaceous, regularly 5 lobed…….……..…*Hibiscus*
11. Petals lacking…….……..…….12
- Petals present…….....…..13
12. Ripe carpels samaroid; anthers 5 - 10……..…….*Heritiera*
- Ripe carpels follicular; anthers 10 - 30…….……..……..…..*Sterculia*
13. Stamens indefinite……..…….….14
- Stamens definite……..……16
14. Habit trees; fruits drupe…...*Grewia*
- Habit herbs or shrubs; fruits capsule……..……..……..15
15. Petals glandular at base...*Triumfetta*
- Petals e - glandular at base…….…....*Corchorus*
16. Flowers cauliflorous…...*Theobroma*
- Flowers in axillary or terminal racemes or panicles……..…..17
17. Fruit a straight or spirally twisted follicles……..…..…..…..*Helicteres*
- Fruit a capsule…….…….....18
18. Capsule 2 - valved…….…...*Waltheria*
- Capsule 5 - valved…….....*Melochia*

Abelmoschus Medik., *Malvenfam.* 45 (1787)

Key to species

1. Epicalyx lobes 4 - 6, leaf nerves tomentose…….……....*A. angulosus*
- Epicalyx lobes 6 - 16, leaf nerves not tomentose…….2
2. Capsules ovoid to oblong…….... ……..…..*A. moschatus*
- Capsule linear - elongate……. ……..…...*A. esculentus*

Abelmoschus angulosus Wight & Arn., *Prodr. Fl. Ind. Orient.* 1: 53 (1834); Vajr., *Fl. Palghat Dist* 77 (1990); *Hibiscus angulosus* (Wall. ex Wight & Arn.) Steud., Hook. f., *FBI* 1: 341 (1874); Gamble, *Fl. Madras* 97 (1915)

Habit : Shrub
Ecosystem preference : Moist deciduous
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : In open forests near water sources
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : August - December
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Azakumpara waterfalls, 10°50'28.32"N, 76°38'45.96"E, 202 m, 16 October 2019, Aswani & Maya, 4850 (GVCH).

Abelmoschus esculentus (L.) Moench, *Methodus (Moench)* 617 (1794); *Hibiscus esculentus* L., Hook. f., *FBI* 1: 343 (1874). Basionym: *Hibiscus esculentus* L., *Sp. Pl*. 2: 696 (1753).

Habit : Herb
Ecosystem preference : In plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Cultivated in farms, homesteads
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : Throughout the year
Altitude preference : Found cultivated in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kadukkamkunnam, 10°48'48.76"N, 76°39'48.98"E, 107m, 23 March 2023, Aswani & Maya, 6569 (GVCH).

Abelmoschus moschatus Medik., *Malvenfam.* 46 (1787); Vajr., *Fl. Palghat Dist* 77 (1990); Sasidh., *Fl. Parambikulam WLS* 26 (2002); *Hibiscus abelmoschus* L., Hook. f., *FBI* 1: 342 (1874); Gamble, *Fl. Madras* 97 (1915).

Habit : Shrub
Ecosystem preference : Moist deciduous forests and in plains
Distribution : Indo - Pacific, Holarctic, African and Australian
IUCN Category : Least Concern (LC)
Habitat : Rocky areas in hillocks and very rarely in the plains
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : August - December
Altitude preference : Found commonly in low altitude hill tracks
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala, 10°49'39.72"N, 76°40'28.20"E, 185m, 20 June 2017, Aswani & Maya, 92 (GVCH);Thekke malampuzha,10°51'14.32"N, 76°39'43.84" E, 108m, 05 October 2017, Aswani & Maya, 661(GVCH); Karadikunnu, 10°50'25.97"N, 76°49'42.92"E, 226m, 30 December 2017, Aswani & Maya, 1041 (GVCH); Kottamutti waterfalls, 10°49'46.20"N, 76°46'47.28"E, 300m, 23 September 2018, Aswani & Maya, 2949 (GVCH); Kongampadam, 10°48'36.72"N, 76°46'51.96"E, 193m, 06 September 2019, Aswani & Maya, 4643 (GVCH) **(Plate 54: Fig. e)**.

Abutilon Mill., *Gard. Dict. Abr*., ed. 4. [23] (1754)

Key to species

Filaments longer than staminal column; mericarp 4 - 6 seeded…..……..*A. persicum*
Filaments shorter than staminal column; mericarp 2 - 3 seeded…….....*A. indicum*

Abutilon indicum (L.) Sweet, *Hort. Brit. [Sweet]* 1: 54 (1826); Hook. f., *FBI* 1: 326 (1874); Gamble, *Fl. Madras* 91 (1915); Vajr., *Fl. Palghat Dist* 78 (1990).

Basionym: *Sida indica* L. in *Cent. Pl*. II: 26 (1756).

Habit : Shrub
Ecosystem preference : Scrub jungles and wastelands
Distribution : Indo - Pacific, Holarctic, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : In road sides often in the the hillock systems
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : September - April
Altitude preference : Found in lower altitudes

Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Walayar Dam, 10°50'24.58"N, 76°51'01.52"E 10.84016111, 285m, 09 May 2018, Aswani & Maya, 2058 (GVCH); Ayyappan Mala, 10°49'07.40"N, 76°45'32.38"E, 196m, 26 June 2018, Aswani & Maya, 2455 (GVCH); Koyyamarakaadu, 10°47'41.24" N, 76°45'35.17"E, 152m,30 November 2019, Aswani & Maya, 5301 (GVCH) **(Plate 54: Fig. f)**.

Abutilon persicum (Burm.f.) Merr., *Philipp. J. Sci.* 19: 364 (1921); Vajr., *Fl. Palghat Dist* 78 (1990); Sasidh., *Fl. Parambikulam WLS* 26 (2002); *Abutilon polyandrum* (Roxb.) Wight & Arn. ex Wight, Hook. f., *FBI* 1: 325 (1874); Gamble, Fl. Pres. Madras 91 (1915).

Habit : Shrub
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : Found in open forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : November - April
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Chaatapara waterfalls, 10°53'11.76"N, 76°42'15.84"E, 654m, 10 December 2019, Aswani & Maya, 5513 (GVCH); Ayyappan Koil, 10°52'43.68"N, 76°47'6"E, 441m, 28 January 2020, Aswani & Maya, 5944 (GVCH) **(Plate 54: Fig. g)**.

Azanza Alef., *Bot. Zeitung (Berlin)* 19: 298 (1861)

Azanza lampas Alef., *Bot. Zeitung (Berlin)* 19: 297 (1861); *Thespesia lampas* (Cav.) Dalz. & Gibs., Hook. f., *FBI* 1: 345 (1874); Vajr., *Fl. Palghat Dist* 84 (1990); Sasidh., *Fl. Parambikulam WLS* 30 (2002); *Hibiscus lampas* Cav. Gamble, *Fl. Madras* 98 (1915).

Habit : Shrub
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : In open hill slopes
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : August - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Malampuzha irrigation dept guest house hillock, 10°50'04.20"N, 76°40'52.68"E, 124m, 18 May 2018, Aswani & Maya, 2247 (GVCH); Ayyappan Mala, 10°48'59.96"N, 76°45'22.61"E, 170m, 26 June 2018, Aswani & Maya, 2412 (GVCH); Kottamutti waterfalls, 10°49'42.94"N, 76°46'47.87"E, 269m, 23 September 2018, Aswani & Maya, 2915 (GVCH); Pazhampullikaadu, 10°50'09.55"N, 76°38'28.33"E, 185m, 16 October 2018, Aswani & Maya, 3196 (GVCH); Chacolas, 10°51'22.68"N, 76°44'41.28"E, 271m, 02 August 2019, Aswani & Maya, 4505 (GVCH) **(Plate 54: Fig. h)**.

Bombax L., *Sp. Pl. [Linnaeus]* 1: 511 (1753), nom. cons.

Key to species

Flowers dark red; leaflets petioluled…..……..…..……..*B. ceiba*
Flowers creamy yellow; leaflets nearly sessile or petiolules nearly 2 mm long……..…...… *B. insigne*

Bombax ceiba L., *Sp. Pl.* 1: 511 (1753); Vajr., *Fl. Palghat Dist* 86 (1990); Sasidh.,

Fl. Parambikulam WLS 31 (2002); *Bombax malabaricum* DC., Hook. f., *FBI* 1: 349 (1874); Gamble, *Fl. Madras* 99 (1915).

Habit : Tree
Ecosystem preference : Moist deciduous forests and in the plains
Distribution : Indo - Pacific and Holarctic
IUCN Category : Least Concern (LC)
Habitat : In the lower forest tracks and road sides near forests
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : January - April
Altitude preference : Found commonly in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Vedivachapara, 10°50'12.34"N, 76°40'41.15"E, 140m, 04 June 2017, Aswani & Maya, 85 (GVCH); Kavarakundu on the way, 10°51'59.76"N, 76°42'26.64"E, 218m, 10 March 2018, Aswani & Maya, 1446 (GVCH); G. P. Nair Estate, 10°53'20.76"N, 76°39'41.04"E, 209m, 24 March 2018, Aswani & Maya, 1648 (GVCH); Kongampaadam, 10°48'36.81"N, 76°46'43.06"E, 165m, 15 June 2018, Aswani & Maya, 2365 (GVCH); Ayyappan Mala, 10°49'06.39"N, 76°44'39.99"E, 227m, 26 June 2018, Aswani & Maya, 2551 (GVCH) **(Plate 55: Fig. a)**.

Bombax insigne Wall., *Pl. Asiat. Rar. (Wallich).* 1: 74, t. 79 et 80 (1830); Hook. f., *FBI* 1: 349 (1784); Gamble, *Fl. Madras* 100 (1915); Vajr., Fl. Palghat Dist 87 (1990); Sasidh., *Fl. Parambikulam WLS* 31 (2002).

Habit : Tree
Ecosystem preference : moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In lower forest tracks and in forest margins
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : November - March
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kozhimala, 10°50'01.89"N, 76°42'58.61"E, 130m, 09 November 2017, Aswani & Maya, 780 (GVCH); Kavarakundu , 10°52'28.20"N, 76°42'38.52"E, 350m, 10 March 2018,Aswani & Maya, 1489 (GVCH); Kochuthodu, 10°51'58.32"N, 76°42'22.32"E, 198m, 18 December 2018, Aswani & Maya, 3318 (GVCH); Aduppukootimala, 10°49'38.80"N, 76°44'16.08"E, 143m, 12 January 2019, Aswani & Maya, 3636 (GVCH) **(Plate 55: Fig. b)**.

Ceiba Mill., *Gard. Dict. Abr*., ed. 4. [287] (1754)

Ceiba pentandra (L.) Gaertn., *Fruct. Sem. Pl*. 2: 244 (1791); Vajr., *Fl. Palghat Dist* 87 (1990); *Eriodendron anfractuosum* DC., Hook. f., *FBI* 1: 350 (1874); *Eriodendron pentandrum* (L.) Kurz, Gamble, *Fl. Madras* 100 (1915).

Basionym: *Bombax pentandrum* L. in *Sp. Pl*.: 511 (1753).

Habit : Tree
Ecosystem preference : Degraded forests and in plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Cultivated in plains
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : February - June

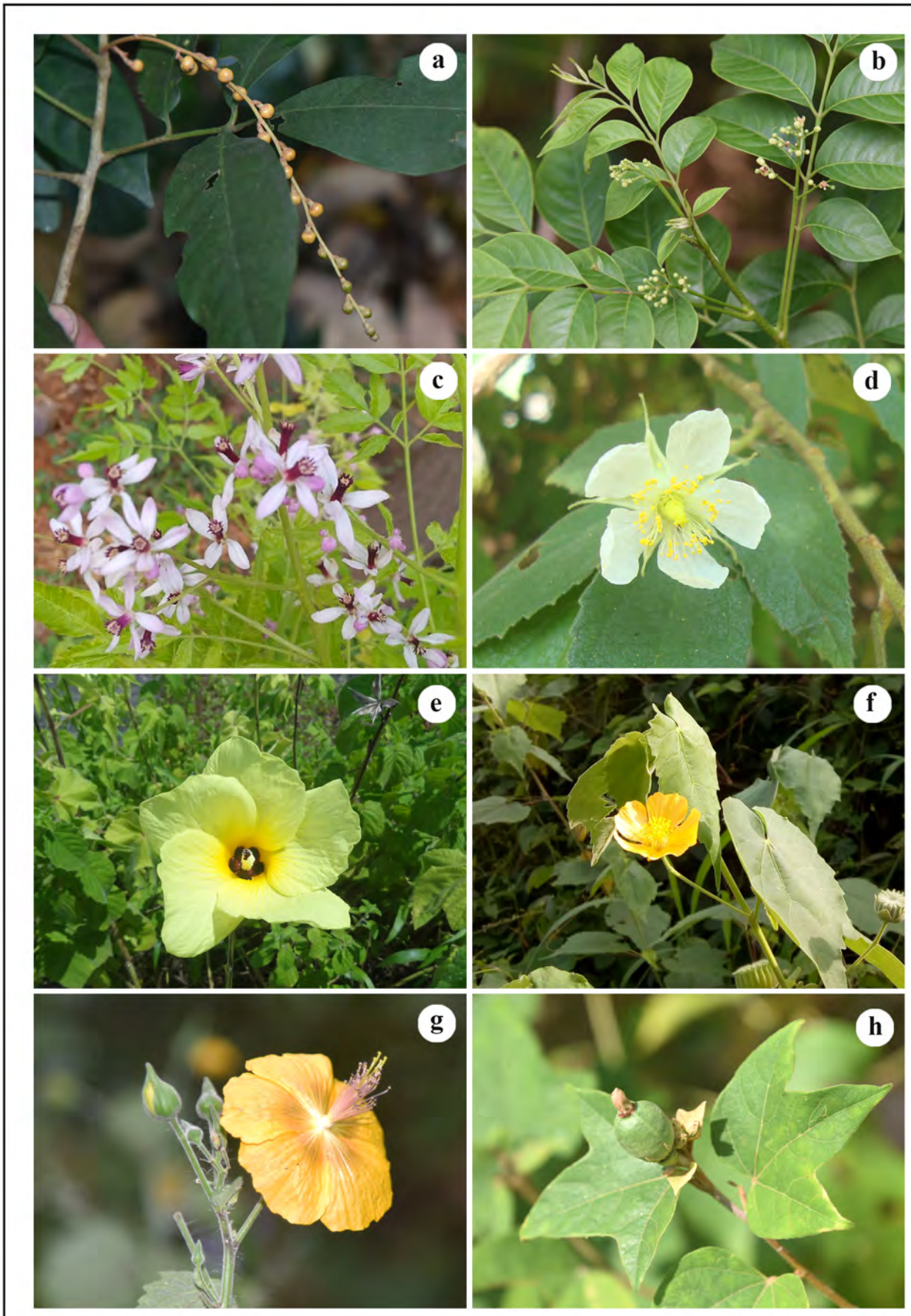

Plate 54: Fig. a. *Aglaia lawii* (Wight) C.J.Saldanha **b.** *Cipadessa baccifera* Miq. **c.** *Melia azedarach* L. **d.** *Muntingia calabura* L. **e.** *Abelmoschus moschatus* Medik. **f.** *Abutilon indicum* (L.) Sweet **g.** *Abutilon persicum* (Burm.f.) Merr. **h.** *Azanza lampas* Alef.

Altitude preference : Found occasionally in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Parakkallu- Neelikunnu, 10°51'30.14"N, 76°37'30.67"E, 173m, 27 April 2018, Aswani & Maya, 1929 (GVCH); Mayyappallam, 10°48'01.78"N, 76°45'58.91"E, 129m, 10 May 2018, Aswani & Maya, 2136 (GVCH); Malampuzha irrigation dept guest house hillock, 10°50'04.20"N, 76°40'52.68"E, 127m, 18 May 2018, Aswani & Maya, 2170 (GVCH); Parachaathy, 10°50'42.54"N, 76°43'49.14"E, 145m, 02 January 2019, Aswani & Maya, 3537 (GVCH).

Corchorus L., *Sp. Pl.* 1: 529 (1753)

Corchorus aestuans L., *Syst. Nat*., ed. 10. 2: 1079 (1759); Vajr., *Fl. Palghat Dist* 92 (1990); Sasidh., *Fl. Parambikulam WLS* 35 (2002); *Corchorus acutangulus* Lam., Hook. f., *FBI* 1: 398 (1874); Gamble, *Fl. Madras* 121 (1915).

Habit : Herb
Ecosystem preference :Degraded deciduous forests and in the wastelands
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : In disturbed forest floors
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : August - February
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Neelippara, 10°51'53.30"N, 76°37'36.39"E, 418m, 15 September 2017, Aswani & Maya, 539 (GVCH); Pallippara, 10°49'48.36"N, 76°43'44.04"E, 138m, 29 October 2017, Aswani & Maya, 704 (GVCH); Koyamarakaadu,10°47'44.88"N, 76°45'38.52"E, 150m, 06 September 2018, Aswani & Maya, 2681 (GVCH); Ayyappan Mala, 10°49'06.91"N, 76°44'44.91"E, 155m, 07 March 2019, Aswani & Maya, 3826 (GVCH) **(Plate 55: Fig. c)**.

Grewia L., *Sp. Pl.* 2: 964 (1753)

Grewia tiliifolia Vahl, *Symbolae Botanicae* 1 (1790); Hook. f., *FBI* 1: 386 (1874); Gamble, *Fl. Madras* 118 (1915); Vajr., *Fl. Palghat Dist* 94 (1990); Sasidh., *Fl. Parambikulam WLS* 37 (2002).

Habit : Tree
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific, Holarctic and African
IUCN Category : Not Evaluated (NE)
Habitat : In forest floors
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : February - June
Altitude preference : Found commonly in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Karadikunnu, 10°50'25.97"N, 76°49'42.92"E, 232m, 30 December 2017, Aswani & Maya, 1047 (GVCH); Vettiyil Sandal estate, 10°51'33.12"N, 76°42'29.52"E, 182m, 10 March 2018, Aswani & Maya, 1439 (GVCH); Ayyappan Mala, 10°49'11.44"N, 76°44'24.46"E, 355m, 26 June 2018, Aswani & Maya, 2572 (GVCH); Pallakaadu, 10°51'32.04"N, 76°37'25.68"E, 150m, 09 October 2018, Aswani & Maya, 2995 (GVCH); Parachaathy,10° 50 '42.54"N, 76° 43' 49.14"E, 138m, 02 January 2019, Aswani & Maya, 3530 (GVCH) **(Plate 55: Fig. d)**.

Helicteres L., *Sp. Pl.* 2: 963 (1753)

Helicteres isora L., *Sp. Pl*. 2: 963 (1753); Hook. f., *FBI* 1: 365 (1874); Gamble, *Fl.*

Madras 107 (1915); Vajr., *Fl. Palghat Dist* 89 (1990); Sasidh., *Fl. Parambikulam WLS* 33 (2002).

Habit : Shrub
Ecosystem preference : Moist deciduous forests and in plains
Distribution : Indo - Pacific, Holarctic and Australian
IUCN Category : Not Evaluated (NE)
Habitat : Understorey of forest floors
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : September - March
Altitude preference : Found commonly in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kosavanidukku-Kaduvachal, 10°50'26.38" N, 76°40'30.88"E, 168m, 16 July 2017, Aswani & Maya, 289 (GVCH); Karadikunnu, 10°50'25.97"N, 76°49'42.92" E, 218m, 30 December 2017, Aswani & Maya, 1033 (GVCH); Kottamutti waterfalls, 10°49'42.94"N, 76°46'47.87"E, 235m, 23 September 2018, Aswani & Maya, 2881 (GVCH); Jamanthimala, 10°51'53.64"N, 76°47'16.80"E, 630m, 01 July 2019, Aswani & Maya, 4151 (GVCH); Aduppukootimala, 10°49'36.48"N, 76°44'4.92"E, 143m, 16 February 2021, Aswani & Maya, 6404 (GVCH).

Heritiera Aiton, *Hort. Kew. [W. Aiton]* 3: 546 (1789)

Heritiera papilio Bedd., *Fl. Sylvat. t.* 218; Hook. f., *FBI* 1: 363 (1874); Gamble, *Fl. Madras* 104 (1915); Sasidh., *Fl. Parambikulam WLS* 33 (2002).

Habit : Tree
Ecosystem preference : Evergreen forests and grasslands
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Margins of evergreen forests and grassland valleys
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : January - May
Altitude preference : Found commonly in higher altitudes rarely in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Pettikallu, Chaatapara waterfalls, 10°52'56.81"N, 76°42'11.22"E, 443m, 10 December 2019, Aswani & Maya, 5540 (GVCH); Jamanthimala, 10°51'53.64"N, 76°47'16.80"E, 613m, 23 June 2019, Aswani & Maya, 4093 (GVCH); Kundanmala, 10°53'39.12"N, 76°41'47.20"E, 1015m, 28 February 2020, Aswani & Maya, 6127 (GVCH); Aduppukootimala, 10°50'30.12"N, 76°44'28.32"E, 638m, 16 February 2021, Aswani & Maya, 6454 (GVCH).

Hibiscus L., *Sp. Pl. [Linnaeus]* 2: 693 (1753), nom. cons.

Key to species

1. Capsule winged……*H. vitifolius*
- Capsule wingless……..…….2
2. Trailing or climbing shrubs with recurved prickles……..…….3
- Erect shrubs; unarmed…..…….4
3. Stipules foliaceous; filaments creamy yellow…...…*H. surattensis*
- Stipules non - foliaceous; filaments purplish……..... *H. hispidissimus*
4. Staminal column longer than corolla……..……...5
- Staminal column shorter than corolla…….…..……..…6
5. Petals entire……...*H. rosa-sinensis*
- Petals laciniate (divided into many linear oblong segments)..... ……..…..*H. schizopetalus*
6. Epicalyx caducous; petals creamy yellow or white…..……..*H. lobatus*
- Epicalyx persistent; petals purple……..……*H. radiatus*

Hibiscus hispidissimus Griff., *Not. Pl. Asiat*. 4: 521 (1854); Sasidh., *Fl. Parambikulam WLS* 27 (2002); *Hibiscus furcatus* Roxb. ex DC., Hook. f., *FBI* 1: 335 (1874); Gamble, *Fl. Madras* 97 (1915); *Hibiscus aculeatus* Roxb., Vajr., *Fl. Palghat Dist* 79 (1990).

Habit : Shrub
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : In open forests near water sources
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : September - March
Altitude preference : Found rarely in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Thanniplace 10°52'43.32"N, 76°45'54.07" E, 977m, 28 January 2020, Aswani & Maya, 6010 (GVCH) **(Plate 55: Fig. e).**

Hibiscus lobatus (Murray) Kuntze, *Revis. Gen. Pl.* 3[3]: 19 (1898); Vajr., *Fl. Palghat Dist* 79 (1990); Sasidh., *Fl. Parambikulam WLS* 27 (2002); *Hibiscus solandra* L' Herit., Hook. f., *FBI* 1: 336 (1874); Gamble, *Fl. Madras* 98 (1915).

Basionym : *Solandra lobata Murray*, *Commentat. Soc. Regiae Sci. Gott.* vi. 1783-84 (1785), 20.

Habit : Shrub
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : In open forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : July - January
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Cheranpara, 10°49'29.62"N, 76°40'38.63" E, 99m, 27 June 2017, Aswani & Maya, 171 (GVCH); Ayyappan Mala, 10°49'07.40"N, 76°45'32.38"E, 179m, 26 June 2018, Aswani & Maya, 2438 (GVCH); Kongampadam, 10°48'42.95"N, 76°48'14.01"E, 155m, 30 November 2019, Aswani & Maya, 5262 (GVCH); Vettumadavu, 10°52'45.01"N, 76°48'8.60" E, 363m, 28 January 2020,Aswani & Maya, 5892 (GVCH) **(Plate 55: Fig. f).**

Hibiscus radiatus Cav., *Diss. 3, Tertia Diss. Bot.* 150 (1787); Hook. f., *FBI* 1: 335 (1874).

Habit : Shrub
Ecosystem preference : Ornamental plant in plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found as an escape to wild
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : August - February
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Vattappara,10°49'29.47"N,76°49'05.26"E, 162m, 18 September 2018, Aswani & Maya, 2772 (GVCH) **(Plate 55: Fig. g).**

Hibiscus rosa-sinensis L., *Sp. Pl*. 2: 694 (1753); Hook. f., *FBI* 1: 334 (1874); Gamble, *Fl. Madras* 99 (1915).

Habit : Shrub
Ecosystem preference : Ornamental plant
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat :Planted in homesteads, holy temples in hillock systems Raunkiaer's Life form : Phanerophyte

Distribution Frequency : Common
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Ahalya campus, 10°47'43.08"N, 76°50'5.43"E, 150m, 24 September 2020, Aswani & Maya, 6318 (GVCH).

Hibiscus schizopetalus (Dyer) Hook. f., *Bot. Mag.* 106: t. 6524 (1880); Manilal & Sivar., *Fl. Calicut* 48 (1982); Babu, *Fl. Malappuram Dist* 62 (1990); T. M. Mohanan & Henry, *Fl. Thiruvananthapuram* 80 (1994); Sivar. & Mathew, *Fl. Nilambur* 86 (1997); *Hibiscus rosa-sinensis* L. var. *schizopetalus* Dyer, Sivar. & Pradeep, *Malvac. Southern Peninsular India* 123 (1996); Sunil & Sivadasan, *Fl. Alappuzha Dist* 120 (2009).

Basionym: *Hibiscus rosa-sinensis* f. *schizopetalus* Mast., *Gard. Chron. n.s.,* 11(278): 538 (1879).

Habit : Shrub
Ecosystem preference : In plains often ornamental
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Ornamental plant grown in hillock system in holy grounds
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Mayyappallam,10°48'0.36"N,76°45'58.68" E, 118m, 10 May 2018, Aswani & Maya, 2074 (GVCH) **(Plate 55: Fig. h).**

Hibiscus surattensis L., Sp. Pl 2: 696 (1753); Hook. f., *FBI* 1: 334 (1874); Gamble, *Fl. Madras* 97 (1915); Vajr., *Fl. Palghat Dist* 80 (1990); Sasidh., *Fl. Parambikulam WLS* 28 (2002).

Habit : Climber
Ecosystem preference : Moist deciduous forests and in the plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Climber in understorey of forest floors
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Occasional
Phenology : October - January
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Poozhikunnu,10°51'20.44"N, 76°43'38.28" E, 149m, 09 November 2017, Aswani & Maya, 865 (GVCH); Ollappallam, 10°49'52.20"N, 76°43'44.19"E, 177m, 25 November 2017, Aswani & Maya, 951 (GVCH); Kottamutti waterfalls, 10°49'46.20"N, 76°46'47.28"E, 308m, 23 September 2018, Aswani & Maya, 2957(GVCH);Parachaathy,10°50'42.54"N, 76°43'49.14"E, 172m, 02 January 2019, Aswani & Maya, 3564 (GVCH); Chacolas, 10°51'22.68"N, 76°44'41.28"E, 239m, 02 August 2019, Aswani & Maya, 4473 (GVCH) **(Plate 56: Fig. a).**

Hibiscus vitifolius L., *Sp. Pl.* 2: 696 (1753); Hook. f., *FBI* 1: 338 (1874); Gamble, *Fl. Madras* 98 (1915); Vajr., *Fl. Palghat Dist* 80 (1990); *Fioria vitifolia* (L.) Mattei, Sasidh., *Fl. Parambikulam WLS* 26 (2002).

Habit : Shrub
Ecosystem preference : Degraded forests and plains
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)

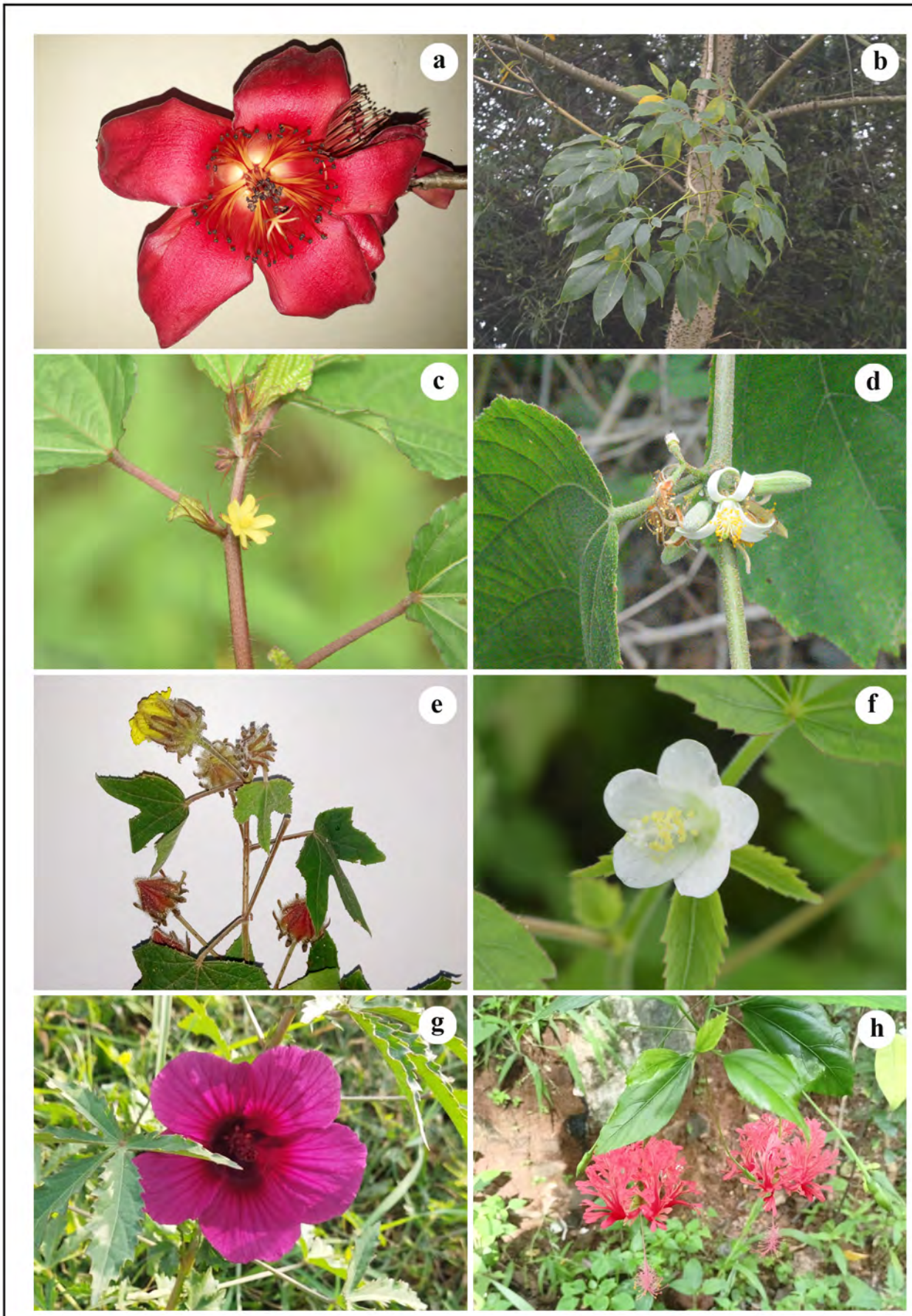

Plate 55: Fig. a. *Bombax ceiba* L. **b.** *Bombax insigne* Wall. **c.** *Corchorus aestuans* L. **d.** *Grewia tiliifolia* Vahl **e.** *Hibiscus hispidissimus* Griff. **f.** *Hibiscus lobatus* (Murray) Kuntze **g.** *Hibiscus radiatus* Cav. **h.** *Hibiscus schizopetalus* (Dyer) Hook.f.

Habitat : In hillock outskirts, road sides and in wastelands
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Common
Phenology : April - December
Altitude preference : Found commonly in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala, 10°49'39.72"N, 76°40'28.20"E, 20m, 17 September 2017, Aswani & Maya, 618 (GVCH); Ollappallam, 10°49'53.04"N, 76°43'41.52" E, 144m, 25 November 2017, Aswani & Maya,618 (GVCH); Karadikunnu, Walayar range, 10°50'25.97"N, 76°49'42.92"E, 223m, 30 December 2017, Aswani & Maya, 1038 (GVCH); Way to Ayyappan Mala, 10°48'59.96"N, 76°45'22.61"E, 138m, 06 January 2018, Aswani & Maya, 1209 (GVCH); Mayappalam, 10°48'01.78" N, 76°45'58.91"E, 118m, 06 September 2019, Aswani & Maya, 4654 (GVCH) **(Plate 56: Fig. b)**.

Melochia L., *Sp. Pl.* 2: 674 [774] (1753), nom. cons.

Melochia corchorifolia L., *Sp. Pl.* 2: 675 (1753); Hook. f., *FBI* 1: 374 (1874); Gamble, *Fl. Madras* 110 (1915); Sasidh., *Fl. Parambikulam WLS* 33 (2002).

Habit : Shrub
Ecosystem preference : Degraded deciduous forests areas and other wastelands
Distribution : Indo - Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Disturbed forest systems and hillock systems
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : July - April
Altitude preference : Found commonly in pen forest systems
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala, 10°49'39.72"N, 76°40'28.20"E, 20m, 20 June 2017, Aswani & Maya, 112(GVCH); Poozhikunnu, 10°51'20.44"N, 76°43'38.28"E, 153m, 09 November 2017, Aswani & Maya, 869 (GVCH); Mayyappallam, 10°48'0.36"N, 76°45'58.68"E, 115m, 10 May 2018, Aswani & Maya, 2071 (GVCH); Pallakaadu, 10°51'30.96"N, 76°37'39.00"E, 186m, 09 October 2018, Aswani & Maya, 3046 (GVCH); Cheekuzhi, 10°50'8.57"N, 76°38'57.48"E, 131m, 16 October 2019, Aswani & Maya, 4732 (GVCH).

Pavonia Cav., *Diss. 2, Secunda Diss. Bot. App.*: [5] (1786)

Pavonia zeylanica (L.) Cav., *Diss.* 3, *Tertia Diss. Bot.* 134 (1787); Hook. f., *FBI* 1:330 (1874); Gamble, *Fl. Madras* 93 (1915); Vajr., *Fl. Palghat Dist* 82 (1990).

Basionym : *Hibiscus zeylanicus* L., *Sp. Pl.* 2: 697 (1753).

Habit : Herb
Ecosystem preference : Deciduous forests
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Found in dry regions of forests similar to scrub jungles
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : July - December
Altitude preference : Found rarely in lower altitudes
Specimen examined :INDIA, Kerala: Palakkad District, Walayar range, Mathappumala, 10°51'9.36"N, 76°49'55.56"E, 230m, 07 January 2020, Aswani & Maya, 5599 (GVCH) **(Plate 56: Fig. c)**.

Sida L., *Sp. Pl. [Linnaeus]* 2: 683 (1753)

Key to species

1. Trailing or prostrate herbs…..……2
- Erect herbs…….……...…3
2. Calyx lobes longer than the tube; stem rooting at lower nodes…….. *S. beddomei*
- Calyx lobes equal to the tube; stem with main root system only……...…..... *S. cordata*
3. Leaves glabrescent; stipules dissimilar……..…..…….*S. acuta*
- Leaves hairy; stipules similar…..…4
4. Stem, petioles and pedicels densely pubescent; mericarp 8 - 10, apically 2 - awned…….*S. cordifolia*
- Stem, petioles and pedicels glabrascent or scarcely hairy; mericarp 7 - 10, mucro at apex……..……..….5
5. Petioles very short ca. 4mm long; style 7 - 10……...……*S. alnifolia*
- Petioles 10 - 15mm long; style 9 - 12…...……..…..*S. rhombifolia*

Sida acuta Burm.f., *Fl. Ind. (N. L. Burman)* 147 (1768); Gamble, *Fl. Madras* 90 (1915); Vajr., *Fl. Palghat Dist* 82 (1990); Sasidh., *Fl. Parambikulam WLS* 29 (2002); *Sida carpinifolia* Mast., Hook.f., *FBI* 1: 323 (1874).

Habit : Shrub
Ecosystem preference : Plains and wastelands
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : In road sides, disturbed forest floors and hillock systems
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Common
Phenology : August - October
Altitude preference : Found commonly in lower plains
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala, 10°49'39.72"N, 76°40'28.20"E, 14m, 20 June 2017, Aswani & Maya, 94 (GVCH); Ayyappan Mala, 10°49'07.40"N, 76°45'32.38"E, 188m, 26 June 2018, Aswani & Maya, 2447 (GVCH); Kottamutti waterfalls, 10°49'42.94"N, 76°46'47.87"E, 209m, 23 September 2018, Aswani & Maya, 2855 (GVCH); Jamanthimala, 10°51'53.64"N, 76°47'16.80"E, 628m, 01 July 2019, Aswani & Maya, 4149 (GVCH).

Sida beddomei Jacob, *J. Bombay Nat. Hist. Soc.* 47: 50, plate 3 (1947); Sasidh., *Fl. Parambikulam WLS* 29 (2002).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
Endemism : Southern Western Ghats (Kerala)
IUCN Category : Not Evaluated (NE)
Habitat : In open forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : January - March
Altitude preference : Found rarely in forest floors in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Akamalavaram- Thakaramada, 10°52'11.03"N, 76°42'59.76"E, 240m, 30 November 2018, Aswani & Maya, 3246 (GVCH); Akamalavaram - Pettikallu, 10°52'51.24"N, 76°39'24.84"E, 133m, 19 July 2019, Aswani & Maya, 4386 (GVCH); Kattadikunnu, 10°50'19.32"N, 76°39'13.63"E, 267m, 16 October 2019, Aswani & Maya, 4807 (GVCH).

Sida cordata (Burm.f.) Borss. Waalk., *Blumea* xiv. 182 (1966); Vajr., *Fl. Palghat Dist* 83 (1990); Sasidh., *Fl. Parambikulam WLS* 29 (2002); *Sida veronicaefolia* Lam., Gamble, *Fl. Madras* 89 (1915); *Sida humilis* Cav. var. *veronicaefolia* (Lam.) Mast., Hook. f., *FBI* 1: 322 (1874).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : In the open forests and in the hillock systems
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : January - April
Altitude preference : Found commonly in lower altitudes in plains
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thonikadavu, 10°50'04.96"N, 76°40'48.72" E, 133m, 04 June 2017, Aswani & Maya, 18 (GVCH);Valiya eri, 10°48'53.21"N, 76°44'52.53"E, 210m, 06 January 2018, Aswani & Maya, 1325 (GVCH); Anayappanchalla, 10°48'20.42"N, 76°48'05.00"E, 148m, 30 November 2019, Aswani & Maya, 5222 (GVCH); Pazhampullikaadu, 10°50'09.55"N, 76°38'28.33"E, 98m, 16 October 2018, Aswani & Maya, 3109 (GVCH); Ayyappan Koil, 10°52'54.12"N, 76°47'27.96"E, 514m, 28 January 2020, Aswani & Maya, 5935 (GVCH) **(Plate 56: Fig. d)**.

Sida cordifolia L., *Sp. Pl*. 2: 684 (1753); Hook. f., *FBI* 1: 324 (1874); Gamble, *Fl.. Madras* 89 (1915); Vajr., *Fl. Palghat Dist* 83 (1990).

Habit : Shrub
Ecosystem preference : Wastelands and plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : In road sides and outskirts of hillocks
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Common
Phenology : Throughout the year
Altitude preference : Found commonly in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Pallippara, 10°49'48.36"N, 76°43'44.04"E, 126m, 29 October 2017, Aswani & Maya, 692 (GVCH); Ollappallam, 10°49'52.20"N, 76°43'44.19"E, 40m, 25 November 2017, Aswani & Maya, 906 (GVCH); Parakkallu- Neelikunnu, 10°51'30.14"N, 76°37'30.67"E, 198m, 27 April 2018, Aswani & Maya, 1954 (GVCH); Kongampaadam, 10°48'39.80"N, 76°47'2.67"E, 155m, 15 June 2018, Aswani & Maya, 1954 (GVCH); Koyamarakaadu, 10°47'44.88"N, 76°45'38.52"E, 138m, 06 September 2018, Aswani & Maya, 2669 (GVCH) **(Plate 56: Fig. e)**.

Sida rhombifolia L., *Sp. Pl*. 2: 684 (1753); Hook. f., *FBI* 1: 323 (1874); Gamble, *Fl. Madras* 90 (1915); Vajr., *Fl. Palghat Dist* 84 (1990); Sasidh., *Fl. Parambikulam WLS* 30 (2002).

Habit : Shrub
Ecosystem preference : Plains and wastelands
Distribution : Indo - Pacific
Endemism : Peninsular India
IUCN Category : Not Evaluated (NE)
Habitat : Disturbed forest tracks
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Common
Phenology : July - September
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range,

Cheranpara, 10°49'29.62"N, 76°40'38.63"E, 123m, 27 June 2017, Aswani & Maya, 195 (GVCH); Thonikadavu,10°50'04.96"N,76°40'48.72"E , 116m, 17 September 2017, Aswani & Maya, 598 (GVCH); Ollappallam, 10°49'52.20"N, 76°43'44.19"E, 149m, 25 November 2017, Aswani & Maya, 923 (GVCH); Ayyappan Mala, 10°48'59.96"N, 76°45'22.61"E, 145m, 26 June 2018, Aswani & Maya, 2387 (GVCH).

Sida rhombifolia subsp. ***alnifolia*** (L.) Ugbor., *Bol. Soc. Brot. sér.* 2, 54: 70 (1980); *Sida rhombifolia* L. var. *retusa* (L.) Mast., Hook. f., *FBI* 1: 324 (1874); *Sida alnifolia* L., Sasidh., *Fl. Parambikulam WLS* 29 (2002).

Basionym : *Sida alnifolia* L., *Sp. Pl.* 2: 684 (1753).

Habit : Shrub
Ecosystem preference : Moist deciduous forests and in the plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Soil rich areas
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Occasional
Phenology : September - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Ayyappan Mala, 10°48'59.96"N, 76°45'22.61"E, 133m, 26 June 2018, Aswani & Maya, 2375 (GVCH); Kottamutti waterfalls, 10°49'42.94"N, 76°46'47.87"E, 295m, 23 September 2018, Aswani & Maya, 2941 (GVCH); Pallakaadu, 10°51'30.96"N, 76°37'39.00"E, 189m, 09 October 2018, Aswani & Maya, 3049 (GVCH); Chottuppara, 10°52'37.92"N, 76°41'39.84"E, 354m, 14 May 2019, Aswani & Maya, 3891 (GVCH); Poolakunnu, 10°51'30.60"N, 76°43'53.76"E, 171m, 02 August 2019, Aswani & Maya, 4426 (GVCH) **(Plate 56: Fig. f).**

Sterculia L., *Sp. Pl.* 2: 1007 (1753)

Key to species

1. Leaves palmately compound ……..……..……....*S. foetida*
- Leaves simple, entire or 3 - 5 lobed……..…….2
2. Flowers white dotted with pink in simple cymes……....……*S. guttata*
- Flowers greenish - yellow in axillary panicles…..…..…..*S. urens*

Sterculia foetida L., *Sp. Pl.* 2: 1008 (1753); Hook. f., *FBI* 1: 354 (1874); Gamble, *Fl. Madras* 105 (1915); M. Mohanan & Henry, *Fl. Thiruvananthapuram* 87 (1994); Sasidh., *Fl. Chinnar WLS* 42 (1999); V. Chithra in P. Daniel, *Fl. Kerala* 1: 472 (2005); Sunil & Sivadasan, *Fl. Alappuzha Dist* 139 (2009); Ratheesh Narayanan, *Fl. Stud. Wayanad Dist* 166 (2009).

Habit : Tree
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Near water sources
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : February - August
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Parakkallu- Neelikunnu, 10°51'30.14"N, 76°37'30.67"E, 168m, 27 April 2018, Aswani & Maya, 1924 (GVCH); Aduppukootimala, 10°50'30.12"N,

76°44'28.32"E, 643m, 16 February 2021, Aswani & Maya, 6459 (GVCH).

Sterculia guttata Roxb., *Hort. Bengal.* 50 (1814); Hook. f., *FBI* 1:355 (1874); Gamble, *Fl. Madras* 106 (1915); Vajr., *Fl. Palghat Dist* 91 (1990); Sasidh., *Fl. Parambikulam WLS* 34 (2002).

Habit : Tree
Ecosystem preference : Semi-evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Canopy rich forest floors
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : September - March
Altitude preference : Found in all altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Ayyappan Mala, 10°49'10.78"N, 76°44'14.15"E, 387m, 26 June 2018, Aswani & Maya, 2561 (GVCH); Pallakaadu, 10°51'32.04"N, 76°37'25.68"E, 163m, 09 October 2018, Aswani & Maya, 3008 (GVCH); Chacolas,10°51'22.68"N, 76°44'41.28"E, 281m, 02 August 2019, Aswani & Maya, 4516 (GVCH); Kallappara, 10°53'16.44"N, 76°45'50.4"E, 1017m, 28 January 2020, Aswani & Maya, 5998 (GVCH) **(Plate 56: Fig. g)**.

Sterculia urens Roxb., *Pl. Coromandel* 1(1): 25, t. 24 (1795); Hook. f., *FBI* 1: 355 (1874); Gamble, *Fl. Madras* 106 (1915); Vajr., *Fl. Palghat Dist* 91 (1990); Sasidh., *Fl. Parambikulam WLS* 35 (2002).

Basionym : *Cavallium urens* (Roxb.) Schott & Endl., *Melet. Bot* 33 (1832).

Habit : Tree
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Lower forest tracks
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : October - April
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kosavanidukku-Kaduvachal, 10°50'26.38"N, 76°40'30.88"E, 133m, 16 July 2017, Aswani & Maya, 254 (GVCH); Ollappallam, 10°49'53.04"N, 76°43'41.52"E, 131m, 25 November 2017, Aswani & Maya, 961 (GVCH); Kavarakundu on the way, 10°51'59.76"N, 76°42'26.64"E, 217m, 10 March 2018, Aswani & Maya, 1445 (GVCH); Mayyappallam, 10°48'01.78"N, 76°45'58.91"E, 143m, 10 May 2018, Aswani & Maya, 2150 (GVCH); Parachaathy, 10°50'42.54"N, 76°43'49.14"E, 142m, 02 January 2019, Aswani & Maya, 3534 (GVCH) **(Plate 56: Fig. h)**.

Theobroma L., *Sp. Pl*. 2: 782 (1753)

Theobroma cacao L., *Sp. Pl*. 2: 782 (1753); Sunil & Sivadasan, *Fl. Alappuzha Dist* 141 (2009); Ratheesh Narayanan, *Fl. Stud. Wayanad Dist* 168 (2009).

Habit : Tree
Ecosystem preference : Cultivated
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : In agricultural farms
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common (Agriculture) Rare in forest
Phenology : November - May
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kalliyara, 10°52'51.24"N, 76°39'24.84"E, 142m, 24 March 2018, Aswani & Maya,

1537 (GVCH); Chacolas, 10°51'15.48"N, 76°45'09.00"E, 272m, 02 August 2019, Aswani & Maya, 4551 (GVCH) **(Plate 57: Fig. a)**.

Thespesia Sol. ex Corrêa, *Ann. Mus. Natl. Hist. Nat.* 9: 290 (1807)

Thespesia populnea (L.) Sol. ex Corrêa, Ann. Mus. Natl. Hist. Nat. 9: 290. (1807); Hook. f., *FBI* 1:345 (1874); Gamble, *Fl. Madras* 101 (1915); Vajr., *Fl. Palghat Dist* 84 (1990).
Basionym: *Hibiscus populneus* L., Sp. Pl. 2: 694 (1753).

Habit : Tree
Ecosystem preference : In plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Grown as fencing pol and found often as a avenue tree
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : March - June
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kadukkamkunnam, 10°48'48.76"N, 76°39'48.98"E, 107m, 23 March 2023, Aswani & Maya, 6562 (GVCH) **(Plate 57: Fig. b)**.

Triumfetta L., *Sp. Pl.* 1: 444 (1753)

Key to species

Leaves 3 - 5 lobed; capsule bristles glabrous……..……..……*T. rhomboidea*
Leaves simple; capsule bristles hairy……..……..……..*T. pilosa*

Triumfetta pilosa Roth, *Nov. Pl. Sp*. 223 (1821); Hook. f., *FBI* 1: 394 (1874); Gamble, *Fl. Madras* 120 (1915); Vajr., *Fl. Palghat Dist* 95 (1990); Sasidh., *Fl. Parambikulam WLS* 38 (2002).

Habit : Shrub
Ecosystem preference : Semi-evergreen forests
Distribution : Indo - Pacific, Holarctic and African
IUCN Category : Not Evaluated (NE)
Habitat : Open forests in semi - evergreen forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : November - February
Altitude preference : Found in medium and higher altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Ayyappan Koil, 10°52'43.68"N, 76°47'6"E, 440m, 28 January 2020, Aswani & Maya, 5943 (GVCH); Pothukunnu, 10°53'21.84"N, 76°46'33.24"E, 975m, 28 January 2020, Aswani & Maya, 5967 (GVCH) **(Plate 57: Fig. c)**.

Triumfetta rhomboidea Jacq., *Enum. Syst. Pl.* 22 (1760); Hook. f., *FBI* 1: 395 (1874); Gamble, *Fl. Madras* 120 (1915); Vajr., *Fl. Palghat Dist* 95 (1990); Sasidh., *Fl. Parambikulam WLS* 38 (2002).

Habit : Shrub
Ecosystem preference : Degraded deciduous forests, also in the plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : In the soil rich regions in hillocks and in wastelands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : August - January
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Pallippara, 10°49'48.36"N, 76°43'44.04"E, 158m, 29 October 2017, Aswani & Maya,

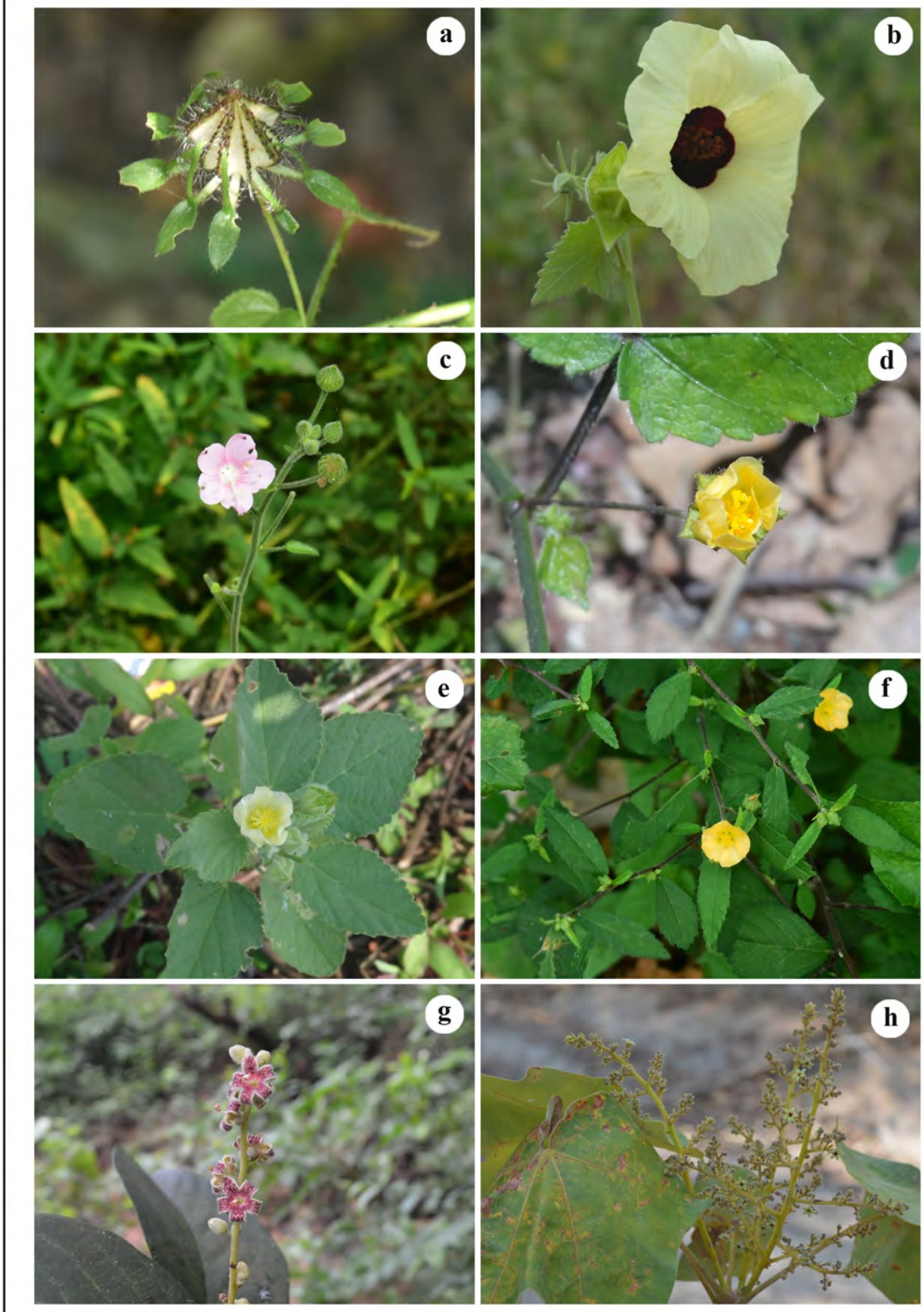

Plate 56: Fig. a. *Hibiscus surattensis* L. **b.** *Hibiscus vitifolius* L. **c.** *Pavonia zeylanica* (L.) Cav. **d.** *Sida cordata* (Burm.f.) Borss.Waalk. **e.** *Sida cordifolia* L. **f.** *Sida rhombifolia* subsp. *alnifolia* (L.) Ugbor. **g.** *Sterculia guttata* Roxb. **h.** *Sterculia urens* Roxb.

724 (GVCH); Karadikunnu, 10°50'25.97"N, 76°49'42.92"E, 230m, 30 December 2017, Aswani & Maya, 1045 (GVCH); Mayyappallam, 10°48'0.36"N, 76°45'58.68"E, 123m, 10 May 2018, Aswani & Maya, 2079 (GVCH); Edamala, 10°50'8.57"N, 76°38'57.48"E, 124m, 16 October 2019, Aswani & Maya, 4725 (GVCH); Anayappanchalla, 10°48'20.42" N, 76°48'05.00"E, 150m, 30 November 2019, Aswani & Maya, 5202 (GVCH).

Urena L., *Sp. Pl.* 2: 692 (1753)

Key to species

Fruiting epicalyx cupular; leaves shallowly lobed……..……*U. lobata* subsp. *lobata*
Fruiting epicalyx spreading or reflexed; leaves deeply lobed……..*U. lobata* subsp. *sinuata*

Urena lobata L., *Sp. Pl*. 2: 692 (1753).; Hook. f., *FBI* 1: 329 (1874); Gamble, *Fl. Madras* 92 (1915); Vajr., *Fl. Palghat Dist* 85 (1990); Sasidh., *Fl. Parambikulam WLS* 31 (2002).

Habit : Shrub
Ecosystem preference :Degraded deciduous forests and in the plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Found in disturbed forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : August - December
Altitude preference : Found in lower altitudes
Specimens examined: INDIA, Kerala: Palakkad District, Walayar range, Ollappallam, 10°49'53.04"N, 76°43'41.52" E, 138m, 25 November 2017, Aswani & Maya, 968 (GVCH); Kallanpuzha, 10°51'34.02"N, 76°42'40.16"E, 166m, 26 January 2018, Aswani & Maya, 1355 (GVCH); Kattadikunnu, 10°50'34.80" N, 76°38'54.60" E, 236 m, 16 October 2019, Aswani & Maya, 4830 (GVCH); Chaavadippara, 10°52'39.57"N, 76°48'39.85"E, 274m, 28 January 2020, Aswani & Maya, 5873 (GVCH) **(Plate 57: Fig. d)**.

Urena lobata subsp. ***sinuata*** (L.) Borss.Waalk., *Blumea* 14: 142 (1966); Hook. f., *FBI* 1: 329 (1874); Vajr., *Fl. Palghat Dist* 85 (1990); Sasidh., *Fl. Parambikulam WLS* 30 (2002);*Urena sinuata* L., Hook. f., *FBI* 1: 329 (1874); Gamble, *Fl. Madras* 92 (1915).

Basionym : *Urena sinuata* L., *Sp. Pl* 2: 692 (1753).

Habit : Shrub
Ecosystem preference : Moist deciduous forests and in the plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : In degraded forest tracks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : August - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kozhimala, 10°50'01.89"N, 76°42'58.61"E, 152m, 09 November 2017, Aswani & Maya, 802 (GVCH); Parakkallu-Neelikunnu, 10°51'30.14"N, 76°37'30.67" E, 186m, 27 April 2018, Aswani & Maya, 1942 (GVCH); Ayyappan Mala, 10°49'07.40"N, 76°45'32.38"E, 175m, 26 June 2018, Aswani & Maya, 2434 (GVCH); Jamanthimala, 10°52'20.64"N, 76°46'57.00"E, 900m, 09 January 2020, Aswani & Maya, 5747 (GVCH);

Anayappanchalla, 10°48'19.16"N, 76°48'15.25"E, 143m, 30 November 2019, Aswani & Maya, 5199 (GVCH) **(Plate 57: Fig. e)**.

Waltheria L., *Sp. Pl*. 2: 673 (1753)

Waltheria indica L., *Sp. Pl.* 2: 673 (1753); Hook. f., *FBI* 1: 374 (1874); Gamble, *Fl. Madras* 111 (1915); Vajr., *Fl. Palghat Dist* 92 (1990); Sasidh., *Fl. Parambikulam WLS* 35 (2002).

Habit : Herb
Ecosystem preference :Degraded deciduous forest areas and in the plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Found in the outskirts of hillocks and in plains
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : October - January
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kozhimala,10°50'01.89"N,76°42'58.61"E, 152m, 09 November 2017, Aswani & Maya, 802 (GVCH); Kongampaadam, 10°48'36.72"N, 76°46'51.96"E, 157m, 15 June 2018, Aswani & Maya, 2317 (GVCH);Anayappanchalla, 10°48'24.82"N, 76°48'30.73"E, 169m, 18 September 2018, Aswani & Maya, 2838 (GVCH); Edamala, 10°50'11.04"N, 76°38'57.48"E, 140 m, 16 October 2019, Aswani & Maya, 4775 (GVCH); Kaatadikunnu,10°50'17.16"N, 76°38'59.64"E, 142m, 16 October 2019, Aswani & Maya, 4797 (GVCH) **(Plate 57: Fig. f)**.

Bixaceae

Cochlospermum Kunth, *Nov. Gen. Sp. [H.B.K.]* 5: 297 (ed. qu.); 231 (ed. f.) (1822), nom. cons.

Cochlospermum religiosum (L.) Alston, *Handb. Fl. Ceylon* 6 (suppl.): 14 (1931); Vajr., *Fl. Palghat Dist* 58 (1990); Sasidh., *Fl. Parambikulam WLS* 14 (2002); *Cochlospermum gossypium* DC., Hook. f., *FBI* 1: 190 (1872); Gamble, *Fl. Madras* 50 (1915).

Basionym : *Bombax religiosum* L., *Sp. Pl* 1: 512 (1753).

Habit : Tree
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In lower hilly slopes and open forests
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : February - March
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kosavanidukku-Kaduvachal, 10°50'26.38" N, 76°40'30.88"E, 225m, 16 July 2017, Aswani & Maya, 354 (GVCH); Parakkallu- Neelikunnu, 10°51'30.14"N, 76°37'30.67"E, 207m, 27 April 2018, Aswani & Maya, 1963 (GVCH); Kottamutti waterfalls, 10°49'42.94"N, 76°46'47.87"E, 255m, 23 September 2018, Aswani & Maya, 2901 (GVCH); Parachaathy,10°50'42.54"N, 76°43'49.14" E, 143m, 02 January 2019, Aswani & Maya, 3535 (GVCH) **(Plate 57: Fig. g)**.

Dipterocarpaceae

Hopea Roxb., *Pl. Coromandel* 3(1): 7 (1811), nom. cons.

Hopea parviflora Bedd., *Rep. Conservator Forests* 1863-64: 31, (1864); Hook. f., *FBI* 1: 308 (1874); Gamble, *Fl. Madras* 82 (1915); Vajr., *Fl. Palghat Dist* 74 (1990); Sasidh., *Fl. Parambikulam WLS* 24 (2002).

Habit : Tree
Ecosystem preference : Semi-evergreen forests
Distribution : Indo - Pacific
Endemism : Southern Western Ghats
IUCN Category : Least Concern (LC)
Habitat : In hill slopes near water sources
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : January - June
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Aduppukootimala, 10°49'50.52"N, 76°44'24.72"E, 225m, 12 January 2017, Aswani & Maya, 3673 (GVCH) **(Plate 57: Fig. h)**.

Brassicales

Moringaceae

Moringa Adans., *Fam. Pl. (Adanson)* 2: 318 (1763)

Moringa oleifera Lam., *Encycl. [J. Lamarck & al.]* 1(2): 398 (1785); Gamble, *Fl. Madras* 269 (1918); *Moringa pterygosperma* Gaertn., Hook. f., *FBI* 2: 45 (1876); Vajr., *Fl. Palghat Dist* 140 (1990).

Habit : Tree
Ecosystem preference : Cultivated
Distribution : Indo - Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Found grown in homesteads and in the margins of agricultural lands near forests
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : November - March
Altitude preference : Found commonly in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kavarakundu, 10°52'28.20"N , 76°42'38.52"E, 348m, 10 March 2018, Aswani & Maya, 1487 (GVCH); Anayappanchalla,10°48'25.92"N, 76°48'35.19"E, 200m, 30 November 2019, Aswani & Maya, 5139 (GVCH).

Caricaceae

Carica L., *Sp. Pl.* 2: 1036 (1753)

Carica papaya L., *Sp. Pl.* 2: 1036 (1753); Hook. f., *FBI* 2: 599 (1879); Gamble, *Fl. Madras* 525 (1919); Vajr., *Fl. Palghat Dist* 211 (1990).

Habit : Shrub
Ecosystem preference : Cultivated in homesteads
Distribution : Indo - Pacific, African and South American
IUCN Category : Data Deficient (DD)
Habitat : Found cultivated often runs wild in hillocks
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Akathethara - Malampuzha road, 10°49'34.77"N, 76°38'8.58"E, 100m, 28 February 2021, Aswani & Maya, 6526 (GVCH).

Capparaceae

Key to genera

Leaves simple……*Capparis*
Leaves digitately trifoliate……..…*Crateva*

Capparis L., *Sp. Pl.* 1: 503 (1753)

Key to species

Flowering shoots always leafy; Small tree…….…….……*C. brevispina*
Flowering shoots are apparently leafless; straggling shrub…….…….. *C. zeylanica*

Capparis brevispina DC., *Prodr. [A. P. de Candolle]* 1: 246 (1824); Gamble, *Fl. Madras* 45 (1915); *Capparis zeylanica* Hook.f. & Thoms., Hook.f., *FBI* 1: 174 (1872).

Habit : Shrub
Ecosystem preference : Dry deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In hill slopes with rich humus
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : Indo - Pacific
Altitude preference : Found rarely in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Adupukootimala - Ponthancheeni, 10°49'59.16"N, 76°44'31.56"E, 313m,, 12 January 2019, Aswani & Maya, 3717 (GVCH) **(Plate 58: Fig. a)**.

Capparis zeylanica L., *Sp. Pl*., ed. 2. 1: 720 (1762); Gamble, *Fl. Madras* 46 (1915); Sasidh., *Fl. Parambikulam WLS* 12 (2002); *Capparis horrida* L.f., Hook. f., *FBI* 1: 178 (1872).

Habit : Shrub
Ecosystem preference : Dry deciduous forests
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : In disturbed forest tracks
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : March - May
Altitude preference : Found in lower altitudes
Specimen examined: INDIA, Kerala: Palakkad District, Walayar range, Pazhampullikaadu, 10°50'25.25"N, 76°38'05.83"E, 95m, 16 October 2018, Aswani & Maya, 3220 (GVCH) **(Plate 58: Fig. b)**.

Crateva L., *Sp. Pl. [Linnaeus]* 1: 444 (1753)

Crateva magna DC., *Prodr.* [A. P. de Candolle] 1: 243 (1824); Vajr., *Fl. Palghat Dist* 58 (1990); Sasidh., *Fl. Parambikulam WLS* 14 (2002); *Crateva religiosa* var. *nurvala* (Buch.-Ham.) Hook. f. & Thoms. in Hook.f., *FBI* 1: 172 (1872).

Habit : Tree
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : Along river banks and near banks of water sources
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : March - April
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kottamutti waterfalls, 10°49'42.94"N, 76°46'47.87"E, 206m, 23 September 2018, Aswani & Maya, 2897 (GVCH); Chaatapara waterfalls, 10°53'11.76"N, 76°42'15.84"E, 600m, 10 December 2019,

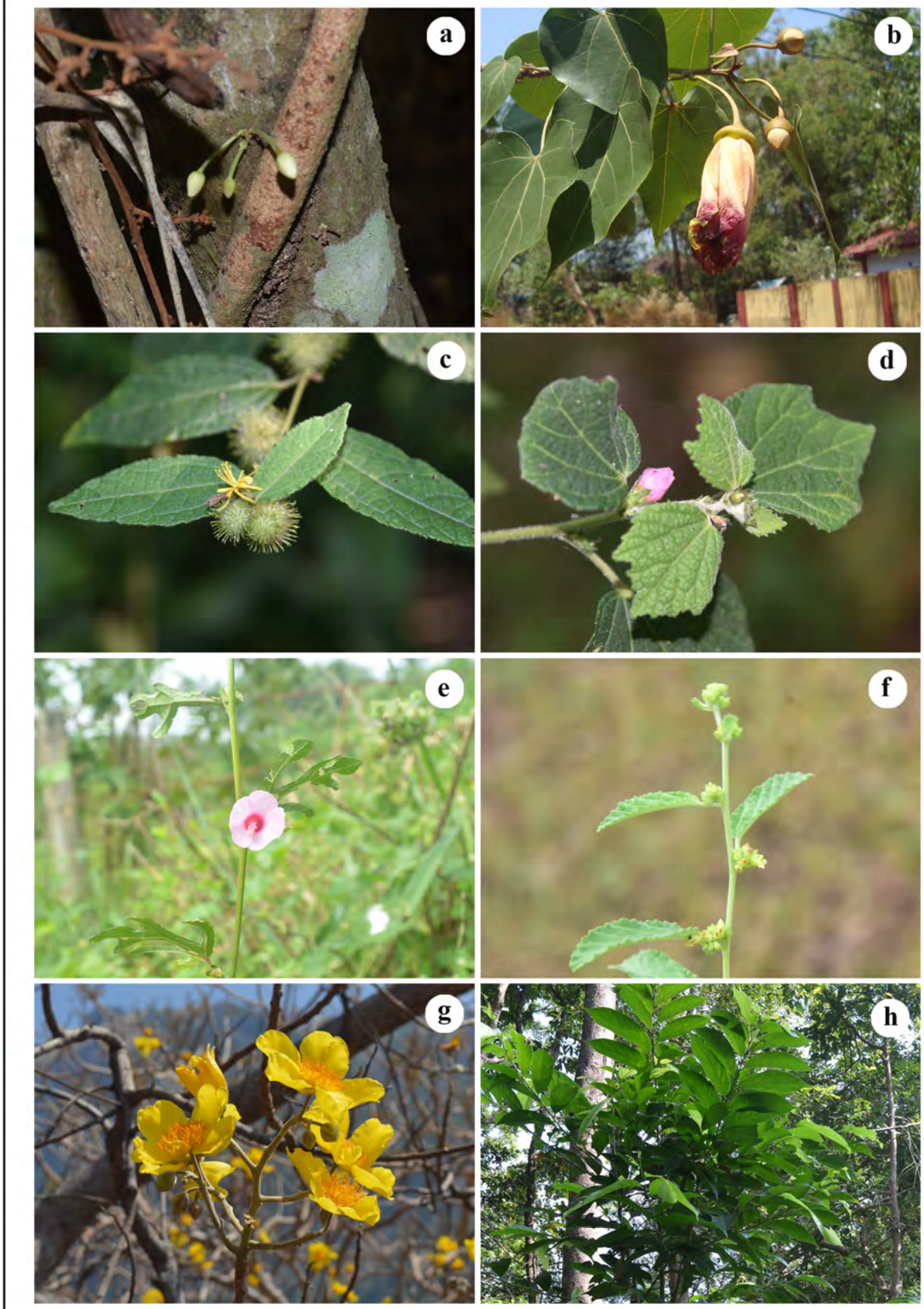

Plate 57: Fig. a. *Theobroma cacao* L. **b.** *Thespesia populnea* (L.) Sol. ex Corrêa **c.** *Triumfetta pilosa* Roth **d.** *Urena lobata* L. **e.** *Urena lobata* subsp. sinuata (L.) Borss.Waalk. **f.** *Waltheria indica* L. **g.** *Cochlospermum religiosum* (L.) Alston **h.** *Hopea parviflora* Bedd.

Aswani & Maya, 5556 (GVCH) **(Plate 58: Fig. c)**.

Cleomaceae

Cleome L., *Sp. Pl*. 2: 671 (1753)

Key to species

1. Plants prostrate or decumbent……..…….. *C. aspera*
- Plants erect……...…….……2
2. Ovary long stalked; stamens about 6 inserted on gynophore; leaves 5-foliolate……....*C. gynandra*
- Ovary sessile; stamens 6 - 20 inserted to the disc; leaves 3 - 5 foliolate……..…… 3
3. Flowers yellow…….…..... *C. viscosa*
- Flowers pink or bluish – violet ….....*C. rutidosperma* var. *burmanni*

Cleome aspera J. Koenig ex DC., *Prodr. [A. P. de Candolle]* 1: 241 (1824); Hook. f., *FBI* 1: 169 (1872); Gamble, *Fl. Madras* 41 (1915).

Basionym : *Corynandra aspera* (J.Koenig) Roalson, Syst. Bot. 42(4): 706 (2017).

Habit : Herb
Ecosystem preference : Deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Soil rich areas in hillocks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Mayyappallam, 10°48'01.78"N, 76°45'58.91"E, 121m, 10 May 2018, Aswani & Maya, 2128 (GVCH); Kongampaadam, 10°48'39.80"N, 76°47'2.67"E, 139m, 15 June 2018, Aswani & Maya, 2294 (GVCH).

Cleome gynandra L., Sp. Pl. 2: 671 (1753); *Gynandropsis pentaphylla* (L.) DC., Hook.f. & Thoms. in Hook.f., *FBI* 1: 171 (1872); Dunn in Gamble, *Fl. Madras* 40 (1915).

Habit : Herb
Ecosystem preference : In plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Wastelands and roadsides
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : March - April
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Paampampallam, 10°48'45.85"N, 76°47'47.61"E, 166m, 27 March 2023, Aswani & Maya, 6578 (GVCH) **(Plate 58: Fig. d)**.

Cleome rutidosperma var. ***burmanni*** (Wight & Arn.) M. O. Siddiqui & S. N. Dixit, *Pl. Sci. (Lucknow)* 6: 68 (1974); Hook. f., *FBI* 1: 170 (1872); Gamble, *Fl. Madras* 41 (1915); Sasidh., *Fl. Parambikulam WLS* 13 (2002).

Habit : Herb
Ecosystem preference : Degraded forests and in the plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In wastelands and road sides
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : February - August
Altitude preference : Found in lower altitudes
Specimens examined: INDIA, Kerala: Palakkad District, Walayar range, Vedivachapara, 10°50'12.34"N, 76°40'41.15"E, 137m, 04 June 2017, Aswani & Maya, 82 (GVCH); Cheranpara,

10°49'29.62"N, 76°40'38.63" E, 142m, 27 June 2017, Aswani & Maya, 214 (GVCH); G. P. Nair Estate, 10°53'20.76"N, 76°39'41.04"E, 194m, 24 March 2018, Aswani & Maya, 1633 (GVCH); Ayyappan Mala, 10°49'11.44"N, 76°44'24.46"E, 366m, 26 June 2018, Aswani & Maya, 2583 (GVCH) **(Plate 58: Fig. e)**.

Cleome viscosa L., *Sp. Pl.* 2: 672 (1753); Hook. f., *FBI* 1: 170 (1872); Gamble, *Fl. Madras* 41 (1915); Vajr., *Fl. Palghat Dist* 57 (1990); Sasidh., *Fl. Parambikulam WLS* 13 (2002).

Habit : Herb
Ecosystem preference : In plains, wastelands and roadsides
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Weed in agricultural farms and in plains
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : March- July
Altitude preference : Found commonly in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thonikadavu, 10°50'04.96"N , 76°40'48.72"E, 130m, 04 June 2017, Aswani & Maya, 15 (GVCH); Cheranpara, 10°49'29.62"N, 76°40'38.63"E, 141m, 27 June 2017, Aswani & Maya, 213 (GVCH); Ayyankulam, 10°48'37.19"N, 76°44'56.27"E, 145m, 06 January 2018, Aswani & Maya, 1185 (GVCH); Walayar Dam, 10°50'24.58"N, 76°51'01.52"E, 207m, 09 May 2018, Aswani & Maya, 1980 (GVCH); Kottamutti waterfalls, 10°49'46.20"N, 76°46'47.28"E, 306m, 23 September 2018, Aswani & Maya, 2955 (GVCH) **(Plate 58: Fig. f)**.

Brassicaceae

Brassica L., *Sp. Pl*. 2: 666 (1753)

Brassica juncea (L.) Czern., *Conspect. Pl. Charc.* 8 (1859); Hook. f., *FBI* 1: 157 (1872); Gamble, *Fl. Madras* 38 (1915); Vajr., *Fl. Palghat Dist* 54 (1990); Sasidh., *Fl. Parambikulam WLS* 11 (2002).

Basionym : *Sinapis juncea L. in Sp. Pl*.: 668 (1753).

Habit : Herb
Ecosystem preference : Cultivated
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : Often found running wild
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : May - July
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala, 10°49'39.72"N, 76°40'28.20"E, 194m, 20 July 2018, Aswani & Maya, 2625 (GVCH) **(Plate 58: Fig. g)**.

IV.1.2.9. Superasterids

Santalales

Olacaceae

Erythropalum Blume, *Bijdr. Fl. Ned. Ind.* 15: 921 (1826)

Erythropalum scandens Blume, *Bijdr. Fl. Ned. Ind.* 15: 922 (1826); Hook. f., *FBI* 1: 578 (1875); Sasidh., *Fl. Parambikulam WLS* 63 (2002); *Erythropalum populifolium* (Arn.) Mast., Hook. f., *FBI* 1: 578 (1875); Gamble, *Fl. Madras* 191 (1915); Vajr., *Fl. Palghat Dist* 113 (1990).

Habit : Climber

Ecosystem preference : Semi-evergreen forests
Distribution : Indo - Pacific and Holarctic
IUCN Category : Least Concern (LC)
Habitat : Climber in canopy rich forests
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : December - March
Altitude preference : Found in higher altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala, 10°52'04.24"N, 76° 47' 13. 29"E, 723m, 09 January 2020, Aswani & Maya, 5665 (GVCH); Thanniplace, 10°52'43.32"N, 76°45'54.07"E, 982m, 28 January 2020, Aswani & Maya, 6015 (GVCH) **(Plate 58: Fig. h)**.

Santalaceae

Santalum L., *Sp. Pl.* 1: 349 (1753)

Santalum album L., *Sp. Pl.* 1: 349 (1753); Hook. f., *FBI* 5: 231 (1886); Gamble, *Fl. Madras* 1261 (1925); Vajr., *Fl. Palghat Dist* 414 (1990); Sasidh., *Fl. Parambikulam WLS* 277 (2002).

Habit : Tree
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Vulnerable
Habitat : Found in forest tracks as well as grown in plantations
Raunkiaer's Life form : Semi parasite
Distribution Frequency : Occasional
Phenology : November - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kavarakundu, 10°52'10.56"N, 76°42'45.18"E, 229m, 10 March 2018, Aswani & Maya, 1514 (GVCH); G. P. Nair Estate, 10°53'40.83"N, 76°39'43.16"E, 242m, 24 March 2018, Aswani & Maya, 1746 (GVCH); Ayyappan Mala, 10°48'59.96"N, 76°45'22.61"E, 167m, 26 June 2018, Aswani & Maya, 2409 (GVCH); Pallakaadu, 10°51'30.96"N, 76°37'39.00"E, 209m, 09 October 2018, Aswani & Maya, 3068 (GVCH); Pettikallu, 10°52'28.20"N, 76°42'38.52"E, 404m, 19 July 2019, Aswani & Maya, 4329 (GVCH).

Loranthaceae

Key to genera

1. Flowers pentamerous; actinomorphic……...*Dendrophthoe*
- Flowers tetramerous; zygomorphic……..…..……..2
2. Calyx pyriform; base attenuate; fruit base narrowly attenuate……..……..…...*Scurrula*
- Calyx ellipsoid or ovoid; base never attenuate; Fruit base rounded……..… *Taxillus*

Dendrophthoe Mart., *Flora* 13(1): 109 (1830)

Dendrophthoe falcata (L.f.) Ettingsh., *Denkschriften der Kaiselichen Akademie der Wissenschaften, Mathematisch-Naturwissenschaftliche Klasse* 32 (1871); Vajr., *Fl. Palghat Dist* 409 (1990); Sasidh., *Fl. Parambikulam WLS* 274 (2002); *Loranthus longiflorus* Desr.. Hook. f., *FBI* 5: 214 (1886); Gamble, *Fl. Madras* 1253 (1925).

Basionym: *Loranthus falcatus* L.f. in *Suppl. Pl.*: 211 (1782).

Habit : Shrub
Ecosystem preference : Moist deciduous forests and in the plains
Distribution : Indo - Pacific and Australian

IUCN Category : Not Evaluated (NE)
Habitat : Common stem parasite in mango, tea trees
Raunkiaer's Life form : Semi - parasite
Distribution Frequency : Common
Phenology : December - May
Altitude preference : Found commonly in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range,Valiyaeri, 10°48'53.76"N, 76°44'59.07"E, 124m, 06 January 2018, Aswani & Maya, 1278 (GVCH); Vettiyil Sandal estate, 10°51'34.30"N, 76°42'28.02"E, 145m, 10 March 2018, Aswani & Maya, 1427 (GVCH); Ahalia campus, 10°47'43.08"N, 76°50'5.43"E, 150m, 24 September 2020, Aswani & Maya, 6315 (GVCH) **(Plate 59: Fig. a)**.

Scurrula L., *Sp. Pl.* 1: 110 (1753)

Scurrula cordifolia G. Don, Gen. Hist. 3: 421 (1834); Vajr., *Fl. Palghat Dist* 411 (1990); *Loranthus cordifolius* Wall., Hook. f., *FBI* 5: 209 (1886); Gamble, *Fl. Madras* 1252 (1925).

Habit : Shrub
Ecosystem preference : Semi-evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found as a semi parasite in forest trees
Raunkiaer's Life form : Semi parasite
Distribution Frequency : Rare
Phenology : September - February
Altitude preference : Found in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala,10°52'20.64"N,76°46'57.00" E, 864m, 23 June 2019, Aswani & Maya, 4130 (GVCH) **(Plate 59: Fig. b)**.

Taxillus Tiegh., *Bull. Soc. Bot. France* 42: 256 (1895)

Key to species

Calyx teeth long; irregularly lobed…..……..……..*T. recurvus*
Calyx teeth short; regularly lobed……..……..……..*T. tomentosa*

Taxillus recurvus (Wall. ex DC.) Tiegh., *Bull. Soc. Bot. France* 42: 256 (1895); *Loranthus recurvus* Wall. ex DC., Hook. f., *FBI* 5: 213 (1886); Gamble, *Fl. Madras* 1252 (1925).

Basionym : *Loranthus recurvus* Wall. ex DC., *Prodr. [A. P. de Candolle]* 4: 299 (1830).

Habit : Shrub
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
Endemism : Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Semi - parasite in trees
Raunkiaer's Life form : Semi parasite
Distribution Frequency : Rare
Phenology : October - December
Altitude preference : Found in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala, 10°52'21.00"N, 76°47'00.24"E, 848m, 09 January 2020, Aswani & Maya, 5710 (GVCH)

Taxillus tomentosus (B.Heyne ex Roth) Tiegh., *Bull. Soc. Bot. France* 42: 256 (1895); Vajr., *Fl. Palghat Dist* 412 (1990); Sasidh., *Fl. Parambikulam WLS* 276 (2002); *Loranthus tomentosus* Heyne ex Roth, Hook. f., *FBI* 5: 212 (1886); Gamble, *Fl. Madras* 1252 (1925).

Basionym : *Loranthus tomentosus* B.Heyne ex Roth, *Nov. Pl. Sp.* 191 (1821

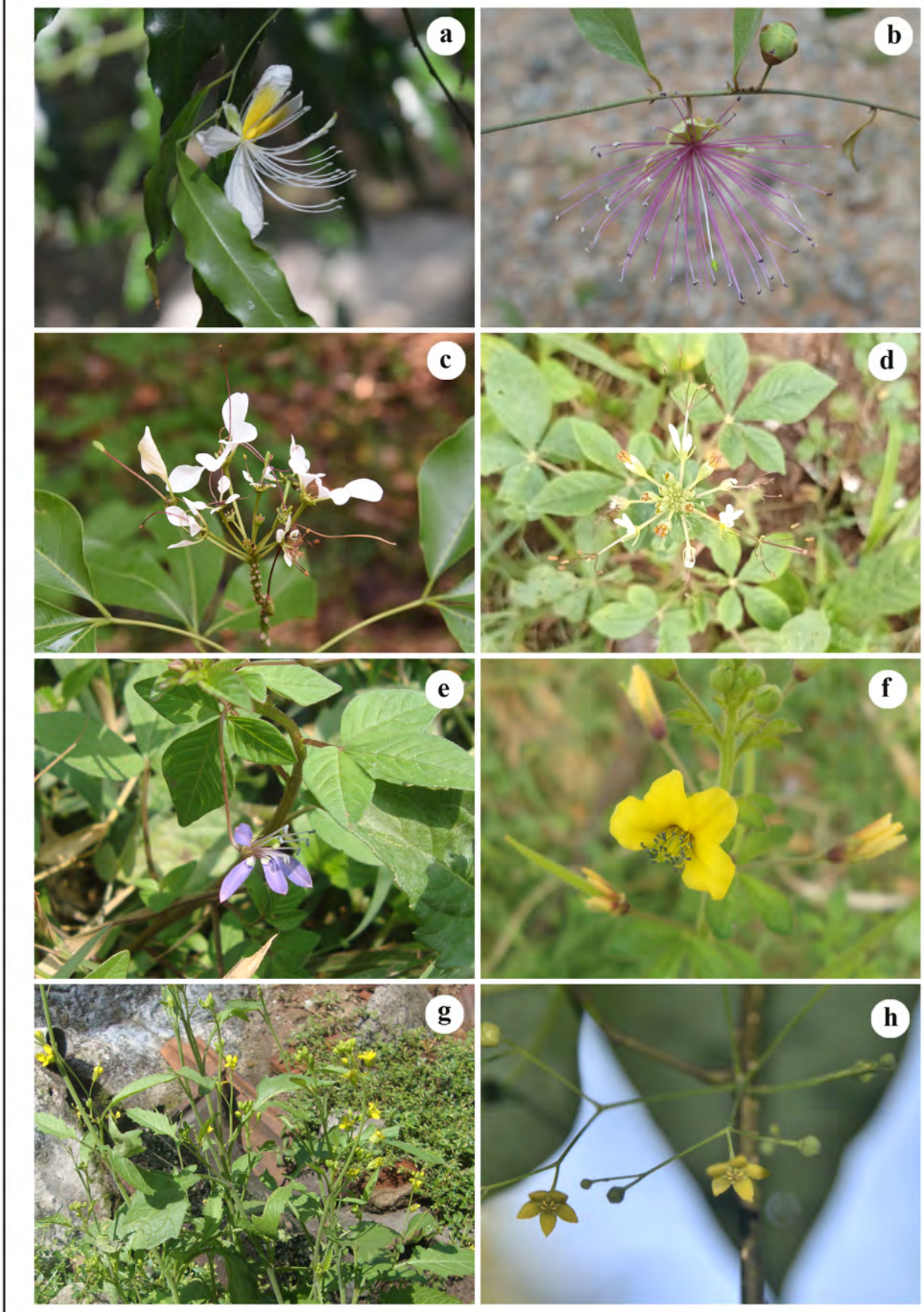

Plate 58: Fig. a. *Capparis brevispina* DC. **b.** *Capparis zeylanica* L. **c.** *Crateva magna* DC. **d.** *Cleome gynandra* L. **e.** *Cleome rutidosperma* var. *burmanni* (Wight & Arn.) M.O.Siddiqui & S.N.Dixitf. **f.** *Cleome viscosa* L. **g.** *Brassica juncea* (L.) Czern. **h.** *Erythropalum scandens* Blume.

Habit : Shrub
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Semi - parasite in semi evergreen forests
Raunkiaer's Life form : Semi parasite
Distribution Frequency : Rare
Phenology : December - January
Altitude preference : Found very rarely in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Aatumala Adivaram, 10° 53' 24" N, 76° 41' 24" E, 1064m, 27 February 2020, Aswani & Maya, 6167 (GVCH) **(Plate 59: Fig. c)**.

Caryophyllales

Plumbaginaceae

Plumbago L., *Sp. Pl.* 1: 151 (1753)

Key to species

Flowers red……..……..……..*P. indica*
Flowers white……..……..*P. zeylanica*

Plumbago indica L., *Herb. Amboin. (Linn.)* 24 (1754); *Plumbago rosea* L., Hook. f., *FBI* 3: 481 (1882); Gamble, *Fl. Madras* 745 (1921).

Habit : Shrub
Ecosystem preference : In open degraded forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found as an escape to wild
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : September - March
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Cheranpara, 10°49'29.62"N, 76°40'38.63"E, 86m, 27 June 2017, Aswani & Maya, 209 (GVCH).

Plumbago zeylanica L., *Sp. Pl.* 1: 151 (1753); Hook. f., *FBI* 3: 480 (1882); Gamble, *Fl. Madras* 744 (1921); Vajr., *Fl. Palghat Dist* 262 (1990); Sasidh., *Fl. Parambikulam WLS* 176 (2002).

Habit : Shrub
Ecosystem preference : Deciduous forests and also in the plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Disturbed forest tracks, roadsides and in other wastelands
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : November - March
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Karadikunnu, 10°50'25.97"N, 76°49'42.92" E, 202m, 30 December 2017, Aswani & Maya, 1040 (GVCH); Valiya eri, 10°48'51.04"N, 76°45'01.67"E, 135m, 06 January 2018, Aswani & Maya, 1263 (GVCH); Koyyamarakaadu, 10°47'44.88"N, 76°45'38.52"E, 110m, 06 September 2018, Aswani & Maya, 2647 (GVCH); Vettumaadavu, 10° 52' 45.012" N, 76° 48' 8.6076" E, 363m, 28 January 2020, Aswani & Maya, 5909 (GVCH) **(Plate 59: Fig. d)**.

Polygonaceae

Key to species

Climbing shrubs with tuberous roots……..……..……..*Antigonon*
Erect herbs; non tuberous……...*Persicaria*

Antigonon Endl., *Gen. Pl. [Endlicher]* 310 (1837)

Antigonon leptopus Hook. & Arn., *Bot. Beechey Voy.* 308 (1838); Vajr., *Fl. Palghat Dist* 391 (1990).

Basionym : *Corculum leptopus* (Hook. & Arn.) Stuntz, *Bull. Bur. Pl. Industr. U.S.D.A.* 86 (1913).

Habit : Climber
Ecosystem preference : In plains and wastelands
Distribution : South American
IUCN Category : Not Evaluated (NE)
Habitat : Weed getting naturalised in forest tracks, wastelands and in plains
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Common
Phenology : November - March
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Cheranpara, 10°49'29.62"N, 76°40'38.63" E, 86m, 27 June 2017, Aswani & Maya, 198 (GVCH); Koyyamarakaadu, 10°47'44.88"N, 76°45'38.52"E, 108m, 30 November 2019, Aswani & Maya, 5350 (GVCH).

Persicaria (L.) Mill., *Gard. Dict. Abr., ed.* 4. [1054] (1754)

Key to species

1. Nutlets biconvex; perianth rose or pink coloured……..…..…*P. glabra*
- Nutlets trigonous; perianth white……..…….2
2. Flowers in axillary or terminal panicled heads; stamens 8……...……..*P. chinensis*
- Flowers in terminal spikes; stamens 5…….……...…..*P. barbata*

Persicaria barbata (L.) H.Hara, *Fl. E. Himalaya* 70 (1966); Sasidh., *Fl. Parambikulam WLS* 258 (2002); *Polygonum barbatum* L., Hook. f., *FBI* 5: 37 (1886); Gamble, *Fl. Madras* 1189 (1925); Vajr., *Fl. Palghat Dist* 390 (1990).

Basionym : *Polygonum barbatum* L., *Sp. Pl*. 1: 362 (1753).

Habit : Herb
Ecosystem preference : Wetlands
Distribution : Indo - Pacific and African
IUCN Category : Least Concern (LC)
Habitat : Along banks of rivers
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : August - March
Altitude preference : Found in lower altitudes
Specimen examined :INDIA, Kerala: Palakkad District, Walayar range, Koyyamarakaadu, 10°47'44.88"N, 76°45'38.52"E, 110m, 06 September 2018, Aswani & Maya, 2729 (GVCH) **(Plate 59: Fig. e)**.

Persicaria chinensis (L.) H.Gross, *Bot. Jahrb. Syst.* 49(2): 269 (1913); Sasidh., *Fl. Parambikulam WLS* 258 (2002); *Polygonum chinense* L., Hook. f., *FBI* 5: 44 (1886); Gamble, *Fl. Madras* 1190 (1925); Vajr., *Fl. Palghat Dist* 390 (1990).

Basionym *: Polygonum chinense* L., *Sp. Pl.* 1: 363 (1753).

Habit : Herb
Ecosystem preference : Moist deciduous forests and semi-evergreen forests
Distribution : Indo - Pacific and Holarctic
IUCN Category : Least Concern (LC)
Habitat : In rock slopes near waterfalls
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : Throughout the year
Altitude preference : Found in lower and medium altitudes

Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Chaatapara waterfalls, 10°53'11.76"N, 76°42'15.84"E, 600m, 10 December 2019, Aswani & Maya, 5572 (GVCH); Jamanthimala,10°52'17.83"N,76°46'42.12" E, 909m, 09 January 2020, Aswani & Maya, 5789 (GVCH) **(Plate 59: Fig. f)**.

Persicaria glabra (Willd.) M.Gómez, *Anales Inst. Segunda Enseñ.* 2: 278 (1896); *Polygonum glabrum* Willd. in *Sp. Pl*., *ed*. 4. 2: 447 (1799), Hook. f., *FBI* 5:34 (1886); Gamble, *Fl. Madras* 1189 (1925); Vajr., *Fl. Palghat Dist* 391 (1990).

Habit : Herb
Ecosystem preference : Wetlands
Distribution : Indo - Pacific and African
IUCN Category : Least Concern (LC)
Habitat : Marshy places near rivers
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : August - December
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Koyyamarakaadu, 10°47'44.88"N, 76°45'38.52"E, 110m, 30 November 2019, Aswani & Maya, 5323 (GVCH) **(Plate 59: Fig. g)**.

Droseraceae

Drosera L., *Sp. Pl.* 1: 281 (1753)

Key to species

Leaves all in basal rosettes..…*D. burmanni*
Leaves cauline, numerous, alternate in weak stem……..……....……..*D. indica*

Drosera burmanni Vahl, *Symb. Bot. (Vahl)* 3: 50 (1794); Hook. f., *FBI* 2: 424 (1878); Gamble, *Fl. Madras* 452 (1919); Vajr., *Fl. Palghat Dist* 193 (1990); Sasidh., *Fl. Parambikulam WLS* 115 (2002).

Habit : Herb
Ecosystem preference : Wetlands
Distribution : Indo - Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Water receded places in dam
Raunkiaer's Life form : Therophyte
Distribution Frequency: Rare
Phenology : August - December
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Malampuzha dam - Kava, 10°50'36.42"N, 76°43'31.74"E, 109m, 06 April 2018, Aswani & Maya, 1862 (GVCH) **(Plate 59: Fig. h)**.

Drosera indica L., *Sp. Pl.* 1: 282 (1753); Hook. f., *FBI* 2: 424 (1878); Gamble, *Fl. Madras* 452 (1919); Vajr., *Fl. Palghat Dist* 193 (1990); Sasidh., *Fl. Parambikulam WLS* 115 (2002).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and African
IUCN Category : Least Concern (LC)
Habitat :Water sweeping regions in wet hillocks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : August - November
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kosavanidukku-Kaduvachal, 10°50'26.38"N, 76°40'30.88"E, 105m, 16 July 2017, Aswani & Maya, 241 (GVCH); Koomachimala, 10°49'44.76"N, 76°40'34.59"E, 102m, 24 July 2017, Aswani & Maya, 356 (GVCH);

Kongampaadam, 10°48'36.72"N, 76°46'51.96"E, 151m, 06 September 2019, Aswani & Maya, 4640 (GVCH); Anayappanchalla, 10°48'24.82"N, 76°48'30.73"E, 146m, 30 November 2019, Aswani & Maya, 5160 (GVCH) **(Plate 60: Fig. a)**.

Ancistrocladaceae

Ancistrocladus Wall., *Numer. List [Wallich] n.* 1052 (1829), nom. cons.

Ancistrocladus heyneanus Wall. ex J.Graham, *Cat. Pl. Bombay [Graham]* 28 (1839); Wight, *Ic. Pl. Ind. Or.* vi. tt. 1987-88 (1853). (1839); Hook. f., *FBI* 1: 299 (1874); Gamble, *Fl. Madras* 86 (1915); Vajr., *Fl. Palghat Dist* 76 (1990); Sasidh., *Fl. Parambikulam WLS* 25 (2002).

Habit : Climber
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Understorey of canopy rich forests
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Occasional
Phenology : March - April
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Parachaathy, 10°50'54.96"N, 76°43'59.16"E, 185m, 12 January 2019, Aswani & Maya, 3741 (GVCH); Chottuppara waterfalls, 10°52'37.92"N, 76°41'39.84"E, 345m, 14 May 2019, Aswani & Maya, 3982 (GVCH); S - Medu, 10°50'26.52"N, 76°50'04.56"E, 214m, 23 June 2019, Aswani & Maya, 4049 (GVCH); Jamanthimala, 10°51'53.64"N, 76°47'16.80"E, 586m, 09 January 2020, Aswani & Maya, 4049 (GVCH) **(Plate 60: Fig. b)**.

Caryophyllaceae

Key to genera
Erect herbs; sepals terete……*Polycarpaea*
Prostrate herbs; sepals keeled...*Polycarpon*

Polycarpaea Lam., *J. Hist. Nat.* 2: 3, 5 (1792)

Polycarpaea corymbosa (L.) Lam., *Tabl. Encycl.* 2: 129 (1797); Hook. f., *FBI* 1: 245 (1874); Gamble, *Fl. Madras* 65 (1915); Sasidh., *Fl. Parambikulam WLS* 19 (2002).

Basionym : *Achyranthes corymbosa* L., *Sp. Pl.* 1: 205 (1753).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Rock crevices and fissures in hillock systems and in open forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : August - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Pallippara, 10°49'49.08"N, 76°43'47.28"E, 119m, 29 October 2017, Aswani & Maya, 718 (GVCH); Ollappallam, 10°49'53.04"N, 76°43'41.52"E, 127m, 25 November 2017, Aswani & Maya, 976 (GVCH); Pazhampullikaadu,10°50'25.25"N,76°38'05 .83"E, 92m, 16 October 2018, Aswani & Maya, 3218 (GVCH) **(Plate 60: Fig. c)**.

Polycarpon Loefl., *Syst. Nat., ed.* 10. 2: 881, 1360 (1759)

Polycarpon prostratum (Forssk.) Asch. & Schweinf., *Oesterr. Bot. Z.* 39: 128, in obs. (1889); Vajr., *Fl. Palghat Dist* 67 (1990); *Polycarpon loeflingiae* (Wall. ex Wight &

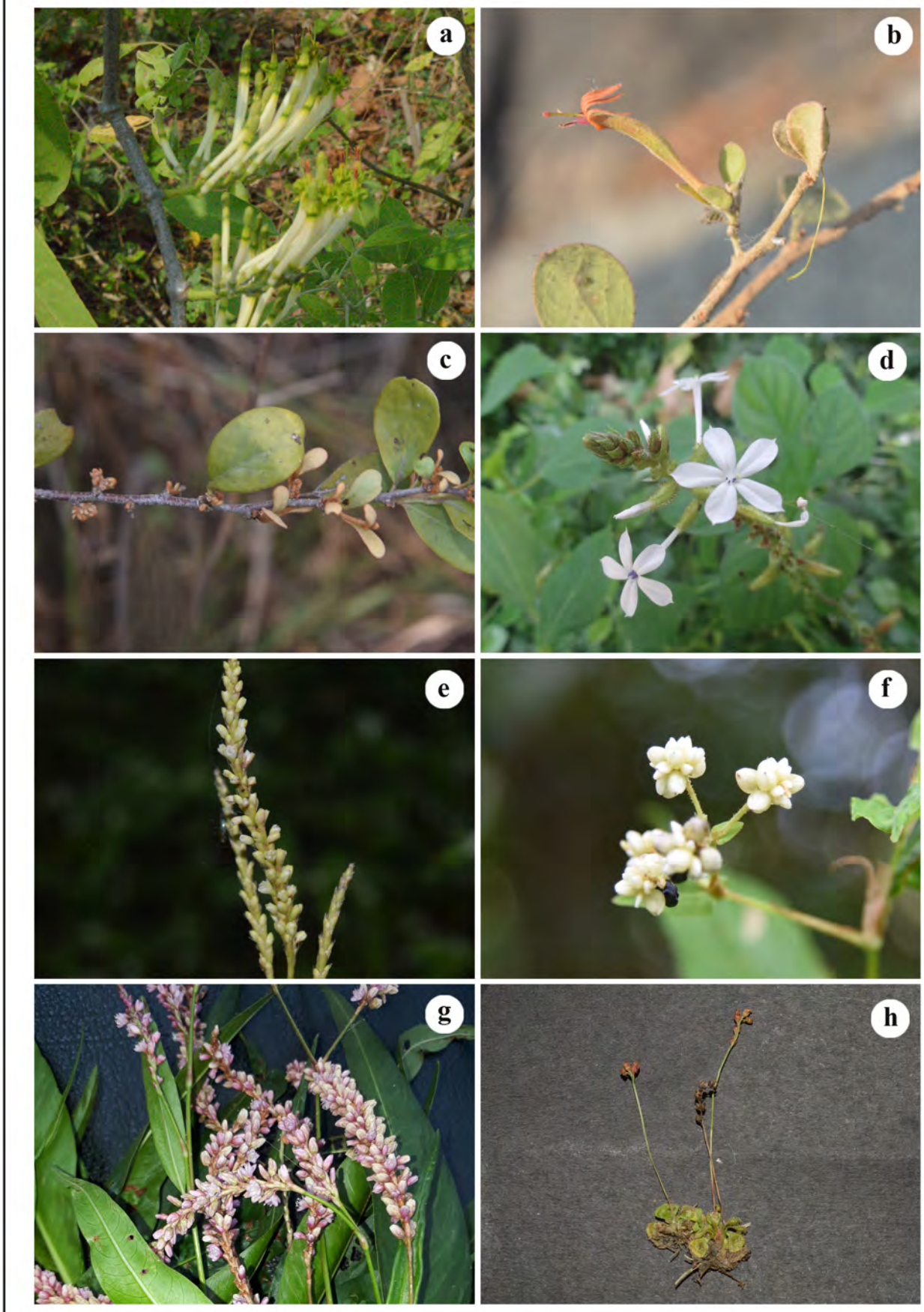

Plate 59: Fig. a. *Dendrophthoe falcata* (L.f.) Ettingsh. **b.** *Scurrula cordifolia* G.Don **c.** *Taxillus tomentosus* (B.Heyne ex Roth) Tiegh. **d.** *Plumbago zeylanica* L. **e.** *Persicaria barbata* (L.) H.Hara **f.** *Persicaria chinensis* (L.) H.Gross **g.** *Persicaria glabra* (Willd.) M.Gómez **h.** *Drosera burmanni* Vahl.

Arn.) Benth. ex Edgew. & Hook. f., *FBI* 1: 245 (1874); Gamble, *Fl. Madras* 64 (1915).

Basionym : *Alsine prostrata* A.Heller, *Cat. N. Amer. Pl.* 3 (1898).

Habit : Herb
Ecosystem preference : In plains
Distribution : Indo - Pacific and African
IUCN Category : Least Concern (LC)
Habitat : Water receded regions in dam
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : January - March
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thonikadavu,10°50'04.96"N, 76°40'48.72"E, 116m, 04 June 2017, Aswani & Maya, 29(GVCH); Parachaathy, 10°50'49.97"N, 76°43'56.67"E, 160m, 02 January 2019, Aswani & Maya, 3620 (GVCH) **(Plate 60: Fig. d)**.

Amaranthaceae

Key to genera

1. Leaves opposite……..……....2
- Leaves alternate……..……7
2. Anthers one chambered ……*Alternanthera*
- Anthers two chambered …….....3
3. Bracteoles spinescent; flowers all fertile……...….*Achyranthes*
- Bracteoles non - spinescent; flowers both fertile and Sterile ……..…..……...….4
4. Stamens along with staminodes; fruits bladder shaped…….....…...*Cyathula*
- Stamens 5; staminodes absent……5
5. Stigma bifid……..….*Gomphrena*
- Stigma capitate……..……..…6
6. Spikes always axillary……..…...*Psilotrichum*
- Spikes terminal……..…..*Pupalia*
7. Unisexual flowers…….*Amaranthus*
- Bisexual flowers…….8
8. Ovules 2 or more……..…... *Celosia*
- Ovules solitary……..….....9
9. Staminodes usually present….*Ouret*
- Staminodes absent……..……..10
10. Flowers in axillary or terminal globose heads……....*Allmania*
- Flowers in axillary peduncled spikes……..…...*Digera*

Achyranthes L., *Sp. Pl*. 1: 204 (1753), nom. cons.

Key to species
Spikes with stout rachis; leaves orbicular ovate or elliptic……..……..*A. aspera*
Spikes with slender rachis; leaves broadly elliptic…....*A. aspera* var *porphyristachya*

Achyranthes aspera L., *Sp. Pl*. 1: 204 (1753), nom. cons.; Hook. f., *FBI* 4: 730 (1885); Gamble, *Fl. Madras* 1176 (1925); Vajr., *Fl. Palghat Dist* 385 (1990); Sasidh., *Fl. Parambikulam WLS* 253 (2002).

Habit : Herb
Ecosystem preference : Deciduous forests and in the plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Found in degraded forests, outskirts of hillocks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : October - March
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Ollappallam,10°49'53.04"N,76°43'41.52"E, 127m, 25 November 2017, Aswani & Maya, 965 (GVCH); Karadikunnu, 10°50'25.10"N, 76°49'43.70"E, 211m, 30 December 2017, Aswani & Maya, 1058 (GVCH); G. P. Nair Estate, 10°53'20.76"N,

76°39'41.04"E, 179m, 24 March 2018, Aswani & Maya, 1657 (GVCH); Parachaathy,10°50'54.96"N,76°43'59.16"E, 185m, 02 January 2019, Aswani & Maya, 3610 (GVCH) **(Plate 60: Fig. e)**.

Achyranthes aspera var. ***porphyristachya*** (Wall. ex Moq.) Hook.f., *Fl. Brit. India* [J. D. Hooker] 4(12): 730 (1885); Gamble, *Fl. Madras* 1176 (1925); Anil Kumar *et al*., *Fl. Pathanamthitta* 405 (2005).
Basionym: *Achyranthes porphyristachya* Wall. ex Moq. in A.P.de Candolle, *Prodr*. 13(2): 316 (1849).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found in open deciduous forests and outskirts of forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : September - January
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kallanpuzha,10°51'34.02"N 76°42'40.16"E, 140m, 26 January 2018, Aswani & Maya, 1381 (GVCH); G. P. Nair Estate, 10° 53 '20.76 "N, 76°39'41.04"E, 179m, 24 March 2018, Aswani & Maya, 1665 (GVCH)**.**

Allmania R.Br. ex Wight, *J. Bot. (Hooker)* 1: 226 (1834)

Allmania nodiflora (L.) R.Br. ex Wight, *J. Bot. (Hooker)* 1: 226 (1834); Hook. f., *FBI* 4: 716 (1885); Gamble, *Fl. Madras* 1167 (1925); Sasidh., *Fl. Parambikulam WLS* 254 (2002); Vajr., *Fl. Palghat Dist* 386 (1990); *Allmania longipedunculata* (Trimen) Gamble, *Fl. Madras* 1168 (1925).
Basionym : *Celosia nodiflora* L., *Sp. Pl*. 1: 205 (1753).

Habit : Herb
Ecosystem preference : Deciduous forests and wastelands
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : Found in the soil rich areas in hillocks and open forest tracks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : July - October
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kosavanidukku-Kaduvachal, 10°50'26.38" N, 76°40'30.88"E, 105m, 16 July 2017, Aswani & Maya, 249 (GVCH); Kezhakootimala,10°51'53.30"N,76°37'36.39"E, 361m, 15 September 2017, Aswani & Maya, 489 (GVCH); Kongampaadam, 10°48'40.59"N,76°46'51.94"E, 128m, 15 June 2018, Aswani & Maya, 2305 (GVCH); Akamalavaram - Pettikallu, 10°52'34.26"N, 76°42'40.48"E, 365m, 19 July 2019, Aswani & Maya, 4303 (GVCH) **(Plate 60: Fig. f)**.

Alternanthera Forssk., *Fl. Aegypt.-Arab.* 28 (lix) (1775)

Key to species

1. Flowers in pedunculate heads..…...2
- Flowers in sessile heads…….……...3
2. Leaves greenish above and reddish below……..……..….*A. brasiliana*
- Leaves greenish above and below…...…..……*A. philoxeroides*
3. Tepals hairy……..……..4
- Tepals glabrous…..…..….*A. sessilis*
4. Stem prostrate; sparsely hairy; staminodes half the length of stamens……..…..*A. paronychioides*

- Stem ascending; young branches glabrescent; staminodes as long as stamens……..…...*A. bettzickiana*

Alternanthera bettzickiana (Regel) G. Nicholson, Ill. *Dict. Gard.* 1: 59 (1884); Sasidh., *Fl. Shenduruny WLS* 253 (1997).

Basionym: *Telanthera bettzickiana* Regel in *Index Seminum (LE, Petropolitanus)* 1862: 28 (1862).

Habit : Herb
Ecosystem preference : Degraded deciduous forests, plains and other wastelands
Distribution : Indo - Pacific, Holarctic and South American
IUCN Category : Not Evaluated (NE)
Habitat : Found as a fast growing weed in plains and wastelands
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Common
Phenology : October - February
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala, 10°49'44.76"N, 76°40'34.59"E, 102m, 05 October 2017, Aswani & Maya, 641 (GVCH); Pallippara, 10°49'49.08"N, 76°43'47.28"E, 120m, 29 October 2017, Aswani & Maya, 688 (GVCH); Koyamarakaadu, 10°47'44.88"N, 76°45'38.52"E, 111m, 06 September 2018, Aswani & Maya, 2646 (GVCH); Vattappara, 10°49'29.47"N, 76°49'05.26"E, 162m, 18 September 2018, Aswani & Maya, 2782 (GVCH) **(Plate 60: Fig. g)**.

Alternanthera brasiliana (L.) Kuntze, *Revis. Gen. Pl.* 2: 537 (1891); Sunil & Sivadasan, *Fl. Alappuzha Dist* 597 (2009); Ratheesh Narayanan, *Fl. Stud. Wayanad Dist* 674 (2009).

Basionym: *Gomphrena brasiliana* L. in *Amoen. Acad.* 4: 10 (1759).

Habit : Herb
Ecosystem preference : Deciduous forests and in plains
Distribution : South American
IUCN Category : Not Evaluated (NE)
Habitat : Ornamental plant which is found to be running wild
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Rare
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala, 10°51'32.04"N, 76°37'25.68"E, 138m, 09 October 2018, Aswani & Maya, 3058 (GVCH).

Alternanthera paronychioides A.St.-Hil., *Voy. Distr. Diam.* 2: 439 (1833); Sasidh., *Fl. Parambikulam WLS* 255 (2002).

Habit : Herb
Ecosystem preference : Wet regions in plains and wetlands
Distribution : Indo - Pacific, Holarctic and South American
IUCN Category : Not Evaluated (NE)
Habitat : Water receded regions in dam and waste lands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : June - August
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Vedivachapara, 10°50'12.34"N, 76°40'41.15"E, 109m, 04 June 2017, Aswani & Maya, 62 (GVCH).

Alternanthera philoxeroides (Mart.) Griseb., *Abh. Königl. Ges. Wiss. Göttingen* 24: 36 (1879); Sunil & Sivadasan, *Fl. Alappuzha Dist* 590 (2009).

Habit : Herb
Ecosystem preference : Marshy regions

Distribution : Indo - Pacific, South American and Australian
IUCN Category : Not Evaluated (NE)
Habitat : In canal bunds and other marshes
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : September - March
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Korayar river, 10°47'44.46"N, 76°45'44.04"E, 105m, 22 February 2021, Aswani & Maya, 6536 (GVCH).

Alternanthera sessilis (L.) DC., *Cat. Pl. Horti Monsp*. 77 (1813); Vajr., *Fl. Palghat Dist* 386 (1990); Sasidh., *Fl. Parambikulam WLS* 254 (2002); *Alternanthera triandra* Lam., Gamble, *Fl. Madras* 1179 (1925).

Basionym : *Gomphrena sessilis* L., *Sp. Pl.* 1: 225 (1753).

Habit : Herb
Ecosystem preference : Marshy areas and other areas
Distribution : Indo - Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Water receded regions in dam
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thonikadavu, 10°50'04.96"N, 76°40'48.72"E, 115m, 04 June 2017, Aswani & Maya, 51 (GVCH); Kosavanidukku-Kaduvachal, 10°50'26.38"N, 76°40'30.88"E, 105m, 16 July 2017, Aswani & Maya, 238 (GVCH) **(Plate 60: Fig. h)**.

Amaranthus L., *Sp. Pl*. 2: 989 (1753)

Key to species

1. Plants armed……..…….*A. spinosus*
- Plants unarmed……..……2
2. Tepals 5; stamens 5...…*A. hybridus*
- Tepals 3; stamens 3…….……...3
3. Length of bracteoles equal or longer than perianth lobes…….*A. tricolor*
- Length of bracteoles shorter than the perianth lobes…….……*A. viridis*

Amaranthus spinosus L., *Sp. Pl.* 2: 991 (1753); Hook. f., *FBI* 4: 718 (1885); Gamble, *Fl. Madras* 1170 (1925); Vajr., *Fl. Palghat Dist* 387 (1990); Sasidh., *Fl. Parambikulam WLS* 255 (2002).

Habit : Herb
Ecosystem preference : Plains and other waste lands
Distribution : South American
IUCN Category : Least Concern (LC)
Habitat : Found near roadsides and other wastelands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : June - December
Altitude preference : Found commonly in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Walayar Dam, 10°50'15.57"N, 76°51'5.13"E, 190m, 09 May 2018, Aswani & Maya, 2029 (GVCH) **(Plate 61: Fig. a)**.

Amaranthus hybridus L., *Sp. Pl*. 2: 990 (1753); *Amaranthus paniculatus* L., Hook. f., *FBI* 4: 718 (1885); Gamble, *Fl. Madras* 1170 (1925).

Habit : Herb
Ecosystem preference : Cultivated
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : Cultivated in agricultural farms and in home steads

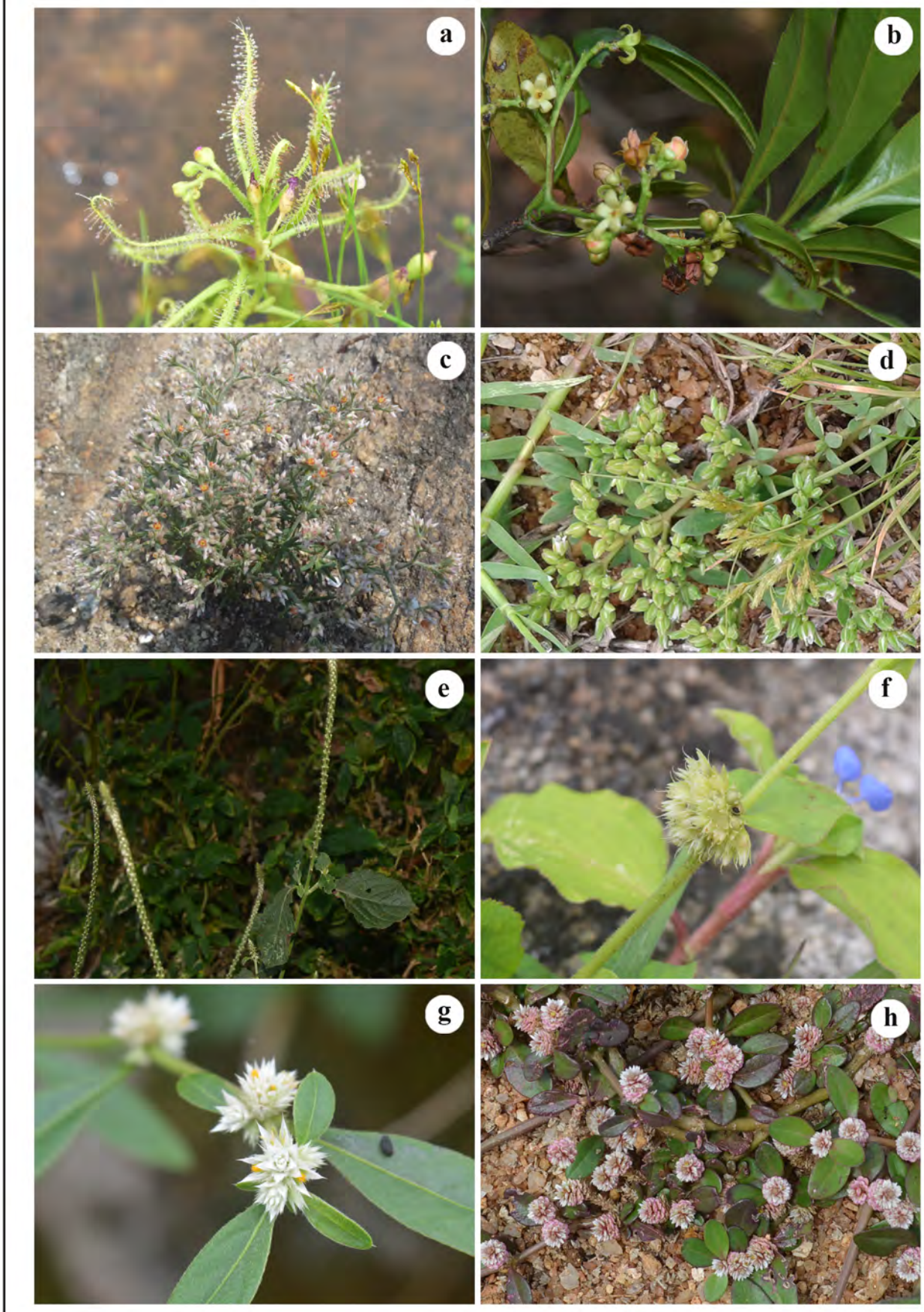

Plate 60: Fig. a. *Drosera indica* L. **b.** *Ancistrocladus heyneanus* Wall. ex J.Graham **c.** *Polycarpaea corymbosa* (L.) Lam. **d.** *Polycarpon prostratum* (Forssk.) Asch. & Schweinf. **e.** *Achyranthes aspera* L. **f.** *Allmania nodiflora* (L.) R.Br. ex Wight **g.** *Alternanthera bettzickiana* (Regel) G.Nicholson **h.** *Alternanthera sessilis* (L.) DC.

Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Common
Phenology : November - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Nadupathy colony, 10°51'27.72"N, 76°47'0.96"E, 546m, 17 March 2023, Aswani & Maya, 6531 (GVCH); Kadukaamkunnu,10°48'48.76"N,76°39'48.98"E, 107m, 23 March 2023, Aswani & Maya, 6564 (GVCH).

Amaranthus tricolor L., Sp. Pl. [Linnaeus] 2: 989 (1753); *Amaranthus mangostanus* L., Hook. f., *FBI* 4: 720 (1885); Gamble, *Fl. Madras* 1171 (1925); *Amaranthus gangeticus* L., Hook. f., *FBI* 4: 719 (1885); Gamble, *Fl. Madras* 1171 (1925).

Habit : Herb
Ecosystem preference : Cultivated
Distribution : Indo - Pacific, Holarctic and African
IUCN Category : Not Evaluated (NE)
Habitat : Cultivated in agricultural farms and in home steads
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : November - January
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kadukkamkunnam, 10°48'48.76"N, 76°39'48.98"E, 107m, 23 March 2023, Aswani & Maya, 6573 (GVCH).

Amaranthus viridis L., *Sp. Pl*., ed. 2. 2: 1405 (1763); Hook. f., *FBI* 4: 720 (1885); Gamble, *Fl. Madras* 1171 (1925); Vajr., *Fl. Palghat Dist* 387 (1990); Sasidh., *Fl. Parambikulam WLS* 255 (2002).

Habit : Herb
Ecosystem preference : Degraded forests and in plains
Distribution: Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : In Wastelands, road sides and in other plains
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : July - December
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Parachaathy 10°50'42.54"N, 76°43'49.14"E, 121m, 02 January 2019, Aswani & Maya, 3521 (GVCH).

Celosia L., *Sp. Pl. [Linnaeus]* 1: 205 (1753).

Celosia argentea L., *Sp. Pl.* 1: 205 (1753); Hook. f., *FBI* 4: 714 (1885); Gamble, *Fl. Madras* 1166 (1925); Vajr., *Fl. Palghat Dist* 387 (1990).

Habit : Herb
Ecosystem preference : Wastelands and in plains
Distribution : Indo - Pacific, Holarctic, African, South American and Australian
IUCN Category : Least Concern (LC)
Habitat : Weed in plains and in wastelands
Raunkiaer's Life form : Hemicryptophyte
Distribution Frequency : Common
Phenology : November - December
Altitude preference : Found in lower altitudes
Specimens examined :INDIA, Kerala: Palakkad District, Walayar range, Anayappanchalla,10°48'20.42"N, 76°48'05.00"E, 146m, 30 November 2019, Aswani & Maya, 5206 (GVCH); Ahaliya campus, 10°47'43.08"N, 76°50'5.43"E, 150m, 24 September 2020, Aswani & Maya, 6255 (GVCH) **(Plate 61: Fig. b)**.

Cyathula Blume*, Bijdr. Fl. Ned. Ind.* 11: 548 (1826)

Cyathula prostrata (L.) Blume*, Bijdr. Fl. Ned. Ind.* 11: 549 (1826); Hook. f., *FBI* 4: 722 (1885); Gamble, *Fl. Madras* 1172 (1925); Sasidh., *Fl. Parambikulam WLS* 256 (2002).

Habit : Herb
Ecosystem preference : Deciduous forests and plains
Distribution: Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Understorey of degraded deciduous forests, plains and other wastelands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : September - April
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Cheranpara,10°49'29.62"N, 76°40'38.63"E, 86m, 27 June 2017, Aswani & Maya, 169 (GVCH); Kozhimala, 10°50'06.45"N, 76°43'38.99"E, 188m, 09 November 2017, Aswani & Maya, 774 (GVCH); Karadikunnu,10°50'25.97"N,76°49'42.92", 203m, 30 December 2017, Aswani & Maya, 1027 (GVCH) **(Plate 61: Fig. c)**.

Digera Forssk., *Fl. Aegypt.-Arab.* 65 (1775)

Digera muricata Mart., *Nova Acta Phys.-Med. Acad. Caes. Leop.-Carol. Nat. Cur.* 13: 285 (1826); Vajr., *Fl. Palghat Dist* 388 (1990); *Digera arvensis* Forssk., Hook. f., *FBI* 4:717 (1885); Gamble, *Fl. Madras* 1169 (1925).

Habit : Herb
Ecosystem preference : Plains
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Weed in plains
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : December - July
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Ahaliya campus, 10°47'43.08"N, 76°50'5.43"E, 150m, 24 September 2020, Aswani & Maya, 6256 (GVCH).

Gomphrena L., *Sp. Pl. [Linnaeus]* 1: 224 (1753)

Gomphrena celosioides Mart., *Nova Acta Phys.-Med. Acad. Caes. Leop.-Carol. Nat. Cur.* 13: 301 (1826); Vajr., *Fl. Palghat Dist* 388 (1990); Sasidh., *Fl. Parambikulam WLS* 256 (2002); *Gomphrena decumbens* Gamble, *Fl. Madras* 1179 (1925).

Habit : Herb
Ecosystem preference :In plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : In wastelands and in plains
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : September- December
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Malampuzha Dam - Kava, 10°50'38.92"N, 76°43'34.63"E, 114m, 06 April 2018, Aswani & Maya, 1823 (GVCH) **(Plate 61: Fig. d)**.

Ouret Adans., *Fam. Pl. (Adanson)* 2: 268 (1763)

Key to species

Small herbs; Plants hairy, but not densely hairy……..….*O. lanata*
Robust shrubs; whole plant ……...*Ouret sp. nov*

Ouret lanata (L.) Kuntze, *Revis. Gen. Pl.* 2: 544 (1891); *Aerva lanata* (L.) Juss. ex Schult., Hook. f., *FBI* 4: 728 (1885); Gamble, *Fl. Madras* 1178 (1925); Vajr., *Fl. Palghat Dist* 385 (1990); Sasidh., *Fl. Parambikulam WLS* 254 (2002).

Basionym : *Achyranthes lanata* L., *Sp. Pl.* 1: 204 (1753).

Habit : Herb
Ecosystem preference : Moist deciduous forests, waste lands and in the plains
Distribution : Indo - Pacific, Holarctic, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Found in plains and in wastelands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : September - April
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Karadikunnu, 10°50'20.20"N, 76°49'48.92"E, 201m, 30 December 2017, Aswani & Maya, 1085 (GVCH); Kottamutti waterfalls, 10°49'42.94"N, 76°46'47.87"E, 206m, 23 September 2018, Aswani & Maya, 2861 (GVCH); Parachaathy,10°50'54.24"N, 76°43'55.92" E, 159m, 02 January 2019, Aswani & Maya, 3609 (GVCH); Ayyappan Mala, 10°49'16.35"N, 76°44'56.03"E, 144m, 07 March 2019, Aswani & Maya, 3823 (GVCH) **(Plate 61: Fig. e)**.

Ouret sp. nov., Aswani, Prabhukumar & Maya

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
Endemism : Southern Western Ghats (Kerala)
IUCN Category : Not Evaluated (NE)
Habitat : Found in open forests and as ground storey in deciduous forests
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Rare
Phenology : September - May
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Ayyappan Mala, 10°49'07.19"N, 76°44'50.28"E, 130m, 26 June 2018, Aswani & Maya, 2501 (GVCH); Ayyappan Mala - Velanchery hills, 10°48'59.96"N, 76°45'22.61"E, 132m, 07 March 2019, Aswani & Maya, 3824 (GVCH).

Psilotrichum Blume, *Bijdr. Fl. Ned. Ind.* 11: 544 (1826)

Psilotrichum elliottii Baker, *Fl. Trop. Afr. [Oliver et al.]* 6(1.1): 58 (1909); *Psilotrichum calceolatum* Moq. ex Hook. f., *FBI* 4: 725 (1885); Gamble, *Fl. Madras* 1174 (1925).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Phytogeograph : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Understorey in hill slopes
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : December - February
Altitude preference : Found in lower altitudes

Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Ahalia campus, 10°47'43.08"N, 76°50'5.43"E, 150m, 24 September 2020, Aswani & Maya, 6253 (GVCH).

Pupalia Juss., *Ann. Mus. Natl. Hist. Nat.* 2: 132 (1803)

Pupalia lappacea (L.) Juss., *Ann. Mus. Natl. Hist. Nat.* 2: 132 (1803); Hook. f., *FBI* 4: 724 (1885); Gamble, *Fl. Madras* 1173 (1925); Vajr., *Fl. Palghat Dist* 389 (1990); Sasidh., *Fl. Parambikulam WLS* 257 (2002); *Pupalia atropurpurea* (Lam.) Moq., Hook. f., *FBI* 4:723 (1885); Gamble, *Fl. Madras* 1173 (1925).

Basionym : *Achyranthes lappacea* L., *Sp. Pl.* 1: 204 (1753).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and African
IUCN Category : Least Concern (LC)
Habitat : Understorey of forest floor
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : September - November
Altitude preference : Found in all altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Poozhikunnu,10°51'20.44"N,76°43'38.28", 117m, 09 November 2017, Aswani & Maya, 849 (GVCH); Karadikunnu, 10°50'23.64"N, 76°49'47.64"E, 203m, 30 December 2017, Aswani & Maya, 1089 (GVCH); Ayyappan Mala, 10°49'07.19"N, 76°44'50.28"E, 130m, 26 June 2018, Aswani & Maya, 2456 (GVCH); Jamanthimala,10°52'18.21"N,76°46'37.80" E, 876m, 09 January 2020, Aswani & Maya, 5706 (GVCH) **(Plate 61: Fig. f)**.

Aizoaceae

Trianthema L., *Sp. Pl.* 1: 223 (1753)

Trianthema portulacastrum L., *Sp. Pl.* 1: 223 (1753); Gamble, *Fl. Madras* 550 (1919); Vajr., *Fl. Palghat Dist* 221 (1990); *Trianthema monogyna* L., Hook. f., *FBI* 2: 660 (1879).
Habit : Herb
Ecosystem preference : In plains and wastelands
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Moist localities
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : April- June
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thonikadavu, 10°50'04.96"N, 76°40'48.72" E, 115m, 04 June 2017, Aswani & Maya, 09 (GVCH); Walayar Dam; 10°50'24.58"N, 76°51'01.52"E, 199m, 09 May 2018, Aswani & Maya, 2022 (GVCH); Mayyappallam,10°48'0.36"N,76°45'58.68" E, 114m, 10 May 2018, Aswani & Maya, 2125 (GVCH); Ayyappan Mala, 10°49'06.91"N, 76°44'44.91"E, 150m, 26 June 2018, Aswani & Maya, 2473 (GVCH) **(Plate 61: Fig. g)**.

Nyctaginaceae

Boerhavia L., *Sp. Pl.* 1: 3 (1753)

Key to species
Perianth red or pink; flowers 4 - 10 in umbels; stem pubescent or glabrous……..…….…… *B. diffusa*
Perianth white with pink stripes; flowers 2 - 4 in umbels; stem glandular stick…….…….…… *B. erecta*

Boerhavia diffusa L., *Sp. Pl*. 1: 3 (1753); Gamble, *Fl. Madras* 1162 (1925); Vajr., *Fl. Palghat Dist* 383 (1990); Sasidh., *Fl. Parambikulam WLS* 252 (2002); *Boerhavia repens* L., Hook. f., *FBI* 4: 709 (1885).

Habit : Herb
Ecosystem preference : Degraded deciduous forests and in the plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Disturbed forest tracts, outskirts of hillocks and in plains
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : August - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thonikadavu, 10°50'04.96"N, 76°40'48.72"E, 115m, 04 June 2017, Aswani & Maya, 03 (GVCH); Kongampaadam,10°48'36.72"N,76°46'51.96"E, 151m, 15 June 2018, Aswani & Maya, 2344 (GVCH); Pazhampullikaadu, 10°50'09.55"N, 76°38'28.33"E, 89m, 16 October 2018, Aswani & Maya, 3113 (GVCH); Ahaliya campus, 10°47'37.00"N, 76°49'33.40"E, 156m, 24 September 2020, Aswani & Maya, 6325 (GVCH) **(Plate 61: Fig. h)**.

Boerhavia erecta L., *Sp. Pl*. 1: 3 (1753); Manilal & Sivar., *Fl. Calicut* 242 (1982); Mohanan, *Fl. Quilon Dist* 328 (1984); Ramach. & V.J. Nair, *Fl. Cannanore Dist* 374 (1988); Antony, *Syst. Stud. Fl. Kottayam Dist* 330 (1989); Babu, *Fl. Malappuram Dist* 658 (1990); Vajr., *Fl. Palghat Dist* 384 (1990); Sasidh., *Fl. Chinnar WLS* 256 (1999); Anil Kumar *et al*., *Fl. Pathanamthitta* 404 (2005); Sunil & Sivadasan, *Fl. Alappuzha Dist* 586 (2009).

Habit : Herb
Ecosystem preference : Moist deciduous forests and wastelands
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Disturbed forest tracks, outskirts of hillocks and in plains
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : August- December
Altitude preference : Found mostly in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thonikadavu, 10°50'04.96"N, 76°40'48.72"E, 115m, 04 June 2017, Aswani & Maya, 16 (GVCH); Pallippara, 10°49'48.36"N, 76°43'44.04"E, 120m, 29 October 2017, Aswani & Maya, 698 (GVCH); Kongampaadam, 10°48'36.72"N, 76°46'51.96"E, 151m, 15 June 2018, Aswani & Maya, 2345 (GVCH) **(Plate 62: Fig. a)**.

Molluginaceae

Key to genera

1. Flowers in axillary fascicles……..*Glinus*
- Flowers in terminal cymes…...….2
2. Leaves in rosettes; acaulescent herbs…..……..…...*Paramollugo*
- Leaves in whorls; caulescent herbs…...……...…*Trigastrotheca*

Glinus Loefl. ex L., *Sp. Pl*. 1: 463 (1753)

Glinus oppositifolius **(**L.) Aug.DC., *Bull. Herb. Boissier ser.* 2, 1: 559. (1901); Vajr., *Fl. Palghat Dist* 220 (1990); Sasidh., *Fl. Parambikulam WLS* 140 (2002); *Mollugo oppositifolia* L., Gamble, *Fl. Madras* 552 (1919); *Mollugo spergula* L., Hook. f., *FBI* 2: 662 (1879).

Basionym : *Mollugo oppositifolia* L., *Sp. Pl*. 1: 89 (1753).

Habit : Herb
Ecosystem preference : Degraded forests and plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Wet regions in the forest tracks, degraded forests, hillocks and plains
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : February - April
Altitude preference : Found usually in lower altitudes
Specimenss examined : INDIA, Kerala: Palakkad District, Walayar range, Vedivachapara, 10°50'12.34"N, 76°40'41.15"E, 109m, 04 June 2017, Aswani & Maya, 88 (GVCH); Koomachimala,10°49'39.72"N,76°40'28.20 "E, 184m, 20 June 2017, Aswani & Maya, 125 (GVCH); Kottamutti waterfalls, 10°49'42.94"N, 76°46'47.87"E, 206m, 23 September 2018, Aswani & Maya, 2884 (GVCH); Ayyappan Mala, 10°49'16.35"N, 76°44'56.03"E, 144m, 07 March 2019, Aswani & Maya, 3830 (GVCH) **(Plate 62: Fig. b)**.

Paramollugo Thulin, *Taxon* 65(4): 784 (2016)

Paramollugo nudicaulis (Lam.) Thulin, *Taxon* 65(4): 786 (2016); *Mollugo nudicaulis* Lam., Hook. f., *FBI* 2: 664 (1879); Gamble, *Fl. Madras* 553 (1919).

Basionym : *Mollugo nudicaulis Lam*., *Encycl. [J. Lamarck & al.]* 4(1): 234 (1797).

Habit : Herb
Ecosystem preference : Deciduous forests and in plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Degraded deciduous forests, wastelands and in plains
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : March- September
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Vedivachapara, 10°50'12.34"N, 76°40'41.15"E, 109m, 04 June 2017, Aswani & Maya, 52 (GVCH); Kosavanidukku - Kaduvachal, 10°50'26.38"N, 76°40'30.88"E, 105m, 16 July 2017, Aswani & Maya, 329 (GVCH); Kongampaadam,10°48'36.72"N,76°46'51.9 6"E, 151m, 15 June 2018, Aswani & Maya, 2349 (GVCH); Mayyappallam, 10°48'0.36" N, 76°45'58.68"E, 114m, 06 September 2019, Aswani & Maya, 4673 (GVCH); Olappalam, 10°49'52.20"N, 76°43'44.19"E, 121m, 23 November 2019, Aswani & Maya, 5063 (GVCH).

Trigastrotheca F.Muell., *Hooker's J. Bot. Kew Gard. Misc.* 9: 16 (1857)

Trigastrotheca pentaphylla (L.) Thulin, *Taxon* 65(4): 784 (2016); *Mollugo pentaphylla* L., Gamble, *Fl. Madras* 553 (1919); Vajr., *Fl. Palghat Dist* 221 (1990); Sasidh., *Fl. Parambikulam WLS* 140 (2002); *Mollugo stricta* Clarke in Hook. f., *FBI* 2: 663 (1879).

Basionym : *Mollugo pentaphylla* L., *Sp. Pl*. 1: 89 (1753).

Habit : Herb
Ecosystem preference : Deciduous forests and in plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Open forests and in plains
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : July - September
Altitude preference : Found in lower altitudes

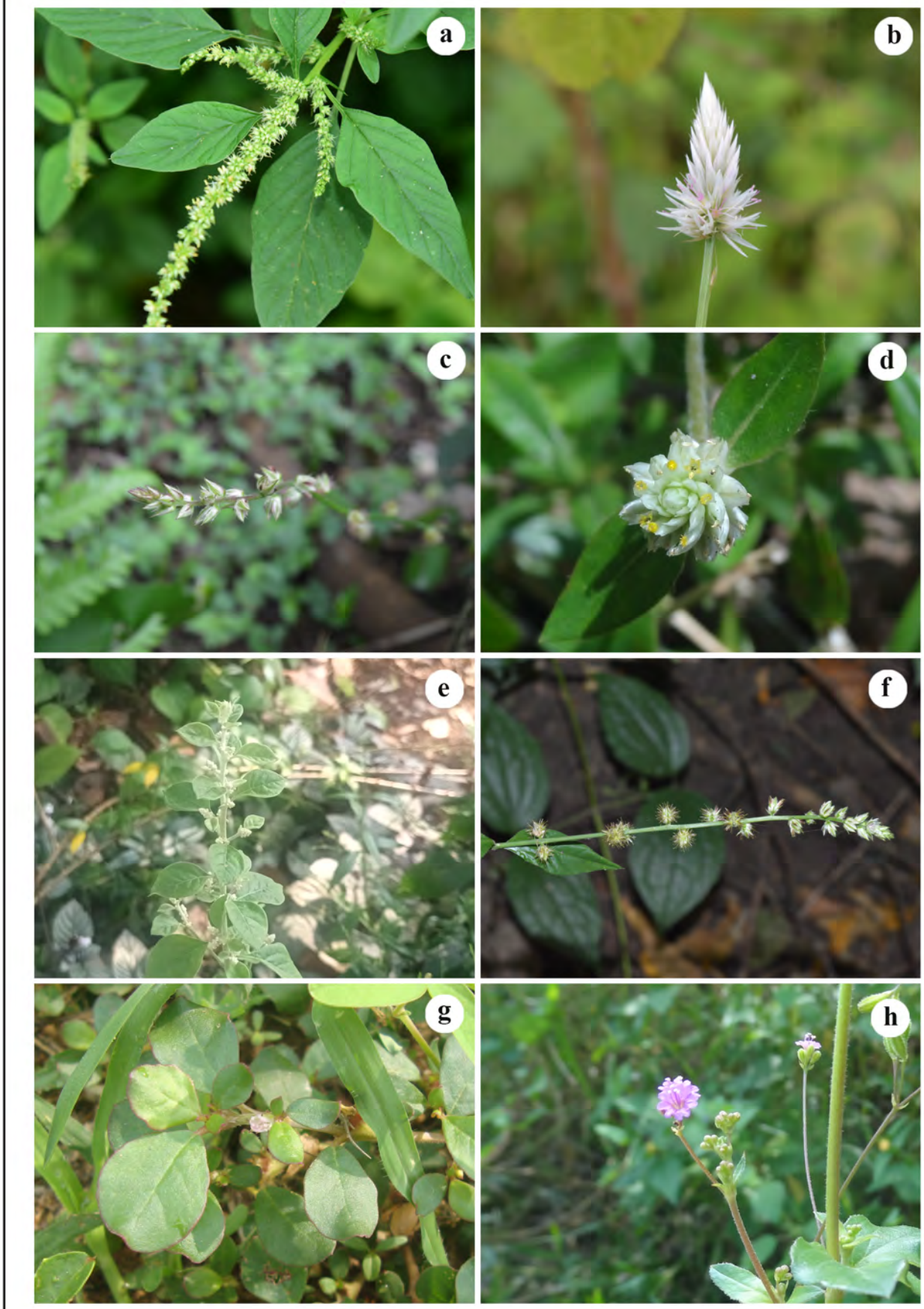

Plate 61: Fig. a. *Amaranthus spinosus L.* **b.** *Celosia argentea* L. **c.** *Cyathula prostrata* (L.) Blume **d.** *Gomphrena celosioides* Mart. **e.** *Ouret lanata* (L.) Kuntze **f.** *Pupalia lappacea* (L.) Juss. **g.** *Trianthema portulacastrum* L. **h.** *Boerhavia diffusa* L.

Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thonikadavu, 10°50'04.96"N, 76°40'48.72" E, 115m, 04 June 2017, Aswani & Maya, 45 (GVCH); Koomachimala, 10°49'39.72" N, 76°40'28.20"E, 184m, 20 June 2017, Aswani & Maya, 99 (GVCH); Ollappallam, 10°49'52.20"N, 76°43'44.19" E, 121m, 25 November 2017, Aswani & Maya, 916 (GVCH); G. P. Nair Estate, 10°53'23.22"N, 76°39'42.80"E, 190m, 24 March 2018, Aswani & Maya, 1630 (GVCH); Mayyappallam, 10°48'0.36"N, 76°45'58.68"E, 114m, Aswani & Maya, 2132(GVCH) **(Plate 62: Fig. c)**.

Basellaceae

Basella L., *Sp. Pl.* 1: 272 (1753)

Basella alba L., *Sp. Pl*. 1: 272 (1753); Sasidh., *Fl. Parambikulam WLS* 258 (2002); *Basella rubra* L., Hook. f., *FBI* 5: 20 (1886); Gamble, *Fl. Madras* 1185 (1925).

Habit : Herb
Ecosystem preference : Moist deciduous and semi - evergreen forests
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Open wet forest floors near rocky patches
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : December - February
Altitude preference : Found rarely in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kallappara, 10° 53' 16.44" N, 76° 45' 50.4" E, 1016m, 28 January 2020, Aswani & Maya, 5999 (GVCH) **(Plate 62: Fig. d)**.

Portulacaceae

Key to species

Prostate herbs……..……..….*Portulaca*
Erect herbs…….……..*Talinum*

Portulaca L., *Sp. Pl*. 1: 445 (1753)

Key to species

Nodes naked without hairs…....*P. oleracea*
Nodes densely hairy……..….*P. tuberosa*

Portulaca oleracea L., *Sp. Pl*. 1: 445 (1753); Hook. f., *FBI* 1: 246 (1874); Gamble, *Fl. Madras* 66 (1915); Vajr., *Fl. Palghat Dist* 68 (1990); Sasidh., *Fl. Parambikulam WLS* 20 (2002).

Habit : Herb
Ecosystem preference : Degraded deciduous forests and plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Wet regions in degraded forests, hillocks and in plains
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Occasional
Phenology : June - September
Altitude preference : Found usually in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, G. P. Nair Estate, 10°53'20.76"N, 76°39'41.04"E, 179m, 24 March 2018, Aswani & Maya, 1622 (GVCH); Mayyappallam,10°48'08.64"N, 76°46'34.68"E, 127m, 10 May 2018, Aswani & Maya, 2091 (GVCH) **(Plate 62: Fig. e)**.

Portulaca pilosa L., *Sp. Pl.* 1: 445 (1753); Vajr., *Fl. Palghat Dist* 68 (1990); *Portulaca tuberosa* Roxb., Hook. f., *FBI* 1: 247 (1874); Gamble, *Fl. Madras* 66 (1915);

Portulaca suffruticosa Wall. ex Wight & Arn., *FBI* 1: 247 (1874); Gamble, *Fl. Madras* 66 (1915); *Portulaca pilosa* L. ssp. *pilosa* var. *tuberosa* (Roxb.) Sivar., Sasidh., *Fl. Parambikulam WLS* 20 (2002).

Habit : Herb
Ecosystem preference : Moist deciduous forests and in the plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Wet regions in forest floors
Raunkiaer's Life form : Geophyte (Cryptophyte)
Distribution Frequency : Rare
Phenology : July - September
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Mayyappallam,10°48'08.64"N, 76°46'34.68"E, 127m, 10 May 2018, Aswani & Maya, 2104 (GVCH); Thekke Malampuzha, 10°50'01.23"N, 76°40'58.49"E, 127m, 18 May 2018, Aswani & Maya, 2268 (GVCH); Kongampadam, 10°48'36.72"N, 76°46'51.96"E, 151m, 15 June 2018, Aswani & Maya, 2319 (GVCH); Ayyappan Mala, 10°49'06.91"N, 76°44'44.91"E, 150m, 26 June 2018, Aswani & Maya, 2536 (GVCH) **(Plate 62: Fig. f)**.

Talinum Adans., *Fam. Pl. (Adanson)* 2: 245 (609) (1763)

Talinum portulacifolium Asch. ex Schweinf., *Bull. Herb. Boissier* iv. *App*. II. 172; Vajr., Fl. Palghat Dist. 68. 1990; *Talinum cuneifolium* (Vahl) Willd., Hook. f., *FBI* 1: 247 (1874); Gamble, *Fl. Madras* 66 (1915).

Habit : Herb
Ecosystem preference : In plains and wastelands
Distribution : Indo - Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Found growing in wastelands, near riverbanks, and in the outskirts of hillocks, often found running in wild near estates
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : February - August
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, G. P. Nair Estate, 10°53'20.76"N, 76°39'41.04"E, 179m, 24 March 2018, Aswani & Maya, 1624 (GVCH); Nadupathy colony, 10°51'27.72"N, 76°47'0.96"E, 546m, 17 February 2023, Aswani & Maya, 6532 (GVCH); Kadukkamkunnam, 10°48'48.76"N, 76°39'48.98"E, 107m, 23 March 2023, Aswani & Maya, 6565 (GVCH) **(Plate 62: Fig. g)**.

Cactaceae

Key to species

Stem columnar; 3 - 9 winged or angular……..…..……..*Cereus*
Stem flat……..……..……..*Opuntia*

Cereus Mill., *Gard. Dict. Abr., ed.* 4. [308] (1754)

Cereus pterogonus Lem, *Cact. Gen. Sp. Nov.* 59; Vajr., *Fl. Palghat Dist* 219 (1990).

Habit : Shrub
Ecosystem preference : In degraded forests and plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Grown as a bio fencing plant, often found in the outskirts of hillocks and margins of forests
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : April - June

Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koyyamarkadu, 10°47'44.88"N, 76°45'38.52"E, 110m, 06 September 2018, Aswani & Maya, 2728 (GVCH); Mangalathumchalla, 10°49'04.07"N, 76°48'16.50"E, 151m, 18 September 2018, Aswani & Maya, 2741 (GVCH); Mayyappallam, 10°48'07.06"N, 76°46'14.88"E, 157m, 06 September 2019, Aswani & Maya, 4699 (GVCH); Anayappanchalla, 10°48'25.92"N, 76°48'35.19"E, 157m, 30 November 2019, Aswani & Maya, 5127 (GVCH) **(Plate 62: Fig. h)**.

Opuntia (L.) Mill., *Gard. Dict. Abr., ed.* 4. [974] (1754)

Key to species

Spines yellowish - brown; petals lemon - yellow……..……..……..……*O. dillenii*
Spines white - greyish to reddish - brown; petals yellow to orange…..... *O. ficus-indica*

Opuntia dillenii Haw., *Suppl. Pl. Succ*. 79 (1819); Hook. f., *FBI* 2: 657 (1879); Gamble, *Fl. Madras* 548 (1919); Vajr., *Fl. Palghat Dist* 219 (1990); *Opuntia striata* Haw. var. *dillenii* (Ker-Gawl.) L., Benso, Sasidh., *Fl. Parambikulam WLS* 139 (2002).

Habit : Shrub
Ecosystem preference : Deciduous forests, scrub jungles and in the plains
Distribution : South American
IUCN Category : Not Evaluated (NE)
Habitat : In dry rocky regions of forests and scrub jungles
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : Throughout the year
Altitude preference : Found mostly in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Mayyappallam,10°48'07.06"N,76°46'14.88 "E, 157m, 10 May 2018, Aswani & Maya, 2108 (GVCH); Kongampaadam, 10°48'36.72"N, 76°46'51.96"E, 151m, 15 June 2018, Aswani & Maya, 2370 (GVCH);Anayappanchalla, 10°48'25.92"N, 76°48'35.19"E, 157m, 18 September 2018, Aswani & Maya, 2806 (GVCH); Koyyamarakaadu,10°47'40.58"N,76°45'27. 05"E, 140m, 30 November 2019, Aswani & Maya, 5366 (GVCH) **(Plate 63: Fig. a)**.

Opuntia ficus-indica (L.) Mill., *Gard. Dict., ed*. 8. Opuntia no. 2 (1768); *Opuntia monacantha* (Willd.) Haw., Gamble, *Fl. Madras* 548 (1919); *Opuntia vulgaris* Mill., Sasidh., *Fl. Chinnar WLS* 140 (1999); Anil Kumar *et al*., *Fl. Pathanamthitta* 240 (2005); Ratheesh Narayanan, *Fl. Stud. Wayanad Dist* 400 (2009).
Basionym: *Cactus ficus-indica* L. in *Sp. Pl*.: 468 (1753).

Habit : Shrub
Ecosystem preference : Deciduous forests
Distribution : South American
IUCN Category : Data Deficient (DD)
Habitat : In open dry grasslands
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : Throughout the year
Altitude preference : Found in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kallappara, 10°52'54.66"N, 76°45'52.09"E, 1058m, 28 January 2020, Aswani & Maya, 5994 (GVCH) **(Plate 63: Fig. b)**.

IV.1.2.10. Asterids

Cornales

Cornaceae

Alangium salviifolium (L.f.) Wangerin, *Pflanzenr. (Engler)* IV. 220B(Heft 41):9 (1910); subsp. *salviifolium*; Gamble, *Fl. Madras* 572 (1919); Vajr., *Fl. Palghat Dist* 224 (1990); Sasidh., *Fl. Parambikulam WLS* 144 (2002); *Alangium lamarckii* Thw., Hook. f., *FBI* 2: 741 (1879).

Basionym: *Grewia salviifolia* L.f., *Suppl. Pl.* 409 (1782).

Habit : Tree
Ecosystem preference : Deciduous forests and plains
Distribution : Indo - Pacific, Holarctic and African
IUCN Category : Not Evaluated (NE)
Habitat : Margins of rocky out crops, forest margins and often grown in homesteads
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : March - June
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Karadikunnu,10°50'25.97"N,76°49'42.92", 203m, 30 December 2017, Aswani & Maya, 1039 (GVCH); G. P. Nair estate, 10°53'40.83"N, 76°39'43.16"E, 230m, 24 March 2018, Aswani & Maya, 1737 (GVCH); Kottamutti waterfalls, 10°49'42.94"N, 76°46'47.87"E, 206m, 23 September 2018, Aswani & Maya, 2864 (GVCH);Chaavadippara,10°52'42.20"N,76° 48'43.56"E, 243m, 28 January 2020, Aswani & Maya, 5813 (GVCH).

Ericales

Balsaminaceae

Impatiens L., *Sp. Pl.* 2: 937 (1753)

Key to species

1. Plants scapigerous; leaves radical……..…..……. *I. scapiflora*
- Plants non - scapigerous; leaves cauline……..……..2
2. Sepals small or minute……..….3
- Sepals elongate - linear…….....5
3. Capsule tomentose….. *I. balsamina*
- Capsule glabrous……4
4. Spur of lip less than 1.5cm long; capsule obliquely ovoid ……..……..……. *I. dasysperma*
- Spur of lip 1.5 to 2.5cm long; capsule ellipsoid…...….. *I. flaccida*
5. Fruits a terete capsule; seeds hairy; spur nearly 1.8cm long……. ……...*I. gardneriana*
- Fruits ellipsoid capsule; seeds glabrous; spur very short 2 - mm long……...……... *I. sp. nov.*

Impatiens balsamina L., *Sp. Pl.* 2: 938 (1753); Hook. f., *FBI* 1: 453 (1874); Gamble, *Fl. Madras* 142 (1915); Sasidh., *Fl. Parambikulam WLS* 42 (2002).

Habit : Herb
Ecosystem preference : Deciduous forests and plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Open deciduous grassy patches
Raunkiaer's Life form: Therophyte
Distribution Frequency : Occasional
Phenology : March - October
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range,

Plate 62: Fig. a. *Boerhavia erecta* L. **b.** *Glinus oppositifolius* (L.) Aug.DC. **c.** *Trigastrotheca pentaphylla* (L.) Thulin **d.** *Basella alba* L. **e.** *Portulaca oleracea* L. **f.** *Portulaca pilosa* L. **g.** *Talinum portulacifolium* Asch. ex Schweinf. **h.** *Cereus pterogonus* Lem.

Akamalavaram - Pettikallu, 10°53'6"N, 76°42'0"E, 812m, 19 July 2019, Aswani & Maya, 4298 (GVCH).

Impatiens sp. nov. Aswani, Maya & Prabhuumar
Habit : Herb
Ecosystem preference : Grasslands
Distribution : Indo - Pacific
Endemism : Southern Western Ghats (Kerala)
IUCN Category : Not Evaluated (NE)
Habitat : Dry rocky areas in grasslands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : September - November
Altitude preference : Found in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Ayyappan Mala, 10°49'11.44"N , 76°44'24.46"E, 346m, 26 June 2018, Aswani & Maya, 2594 (GVCH).

Impatiens dasysperma Wight, *Madras J. Lit. Sci. Ser.* I, v. (1837) 7; Hook. f., *FBI* 457 (1874); Gamble, *Fl. Madras* 143 (1915); Sasidh., *Fl. Parambikulam WLS* 43 (2002); *Impatiens lucida* Heyne ex Hook. f., *FBI* 1: 451 (1874); Gamble, *Fl. Madras* 142 (1915).

Habit : Herb
Ecosystem preference : Semi - evergreen forests and grasslands
Distribution : Indo - Pacific
Endemism : Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Wet rocky open grassy patches
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : November - December
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Neelippara, 10°51'47.52"N, 76°37'37.38"E, 312m, 15 September 2017, Aswani & Maya, 557 (GVCH) **(Plate 63: Fig. c)**.

Impatiens flaccida Arn., Hook. f., *FBI* 1:457 (1874); Gamble, *Fl. Madras* 143 (1915); Sasidh., *Fl. Parambikulam WLS* 43 (2002).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In wet rocks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : July - October
Altitude preference : Found rarely in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Akamalavaram - Pettikallu, 10°52'28.20"N, 76°42'38.52"E, 346m, 19 July 2019, Aswani & Maya, 4302 (GVCH).

Impatiens gardneriana Wight, *Icon. Pl. Ind. Orient.* [Wight] t. 1050; Hook. f., *FBI* 1: 445 (1874); Gamble, *Fl. Madras* 141 (1915); Vajr., *Fl. Palghat Dist* 99 (1990); *Impatiens setosa* Hook.f. & Thoms., Hook. f., *FBI* 1: 445 (1874).

Habit : Herb
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
Endemism : Southern Western Ghats
IUCN Category : Near Threatened (NT)
Habitat : Wet rocky grasslands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : July - November
Altitude preference : Found in medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kezhakootimala, 10°51'53.30"N,

76°37'36.39"E, 361m, 15 September 2017, Aswani & Maya, 493 (GVCH); Pallakaadu, 10°51'30.96"N, 76°37'39.00"E, 151m, 09 October 2018, Aswani & Maya, 3053 (GVCH).

Impatiens minor (DC.) Bennet, *Indian J. Forest.* 2(3): 283 (1979); Sasidh., *Fl. Parambikulam WLS* 44 (2002); *Impatiens kleinii* Wight & Arn., Hook. f., *FBI* 1:445 (1874); Gamble, *Fl. Madras* 140 (1915); Vajr., *Fl. Palghat Dist* 100 (1990).

Habit : Herb
Ecosystem preference : Moist deciduous and semi-evergreen forests
Distribution : Indo - Pacific
Endemism : Peninsular India
IUCN Category : Not Evaluated (NE)
Habitat : Wet moist forest floor, Wood log and rock crevices
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : August - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kosavanidukku-Kaduvachal, 10°50'26.38"N, 76°40'30.88"E, 105m, 16 July 2017, Aswani & Maya, 229 (GVCH); Kezhakootimala,10°51'53.30"N, 76°37'36.39"E, 361m, 15 September 2017, Aswani & Maya, 492 (GVCH); Kottamutti waterfalls,10°49'42.94"N, 76°46'47.87"E, 206m, 23 September 2018, Aswani & Maya, 2938 (GVCH); Chacolas, 10°51'22.68"N, 76°44'41.28"E, 226m, 02 August 2019, Aswani & Maya, 4469 (GVCH).

Impatiens scapiflora B. Heyne, *Fl. Ind. (Carey & Wallich ed.)* 2: 464 (1824); Hook. f., *FBI* 1: 443 (1874); Gamble, *Fl. Madras* 138 (1915); Vajr., *Fl. Palghat Dist* 101 (1990); Sasidh., *Fl. Parambikulam WLS* 45 (2002).

Habit : Herb
Ecosystem preference : Wet rocks in evergreen forests and grasslands
Distribution : Indo - Pacific
Endemism : Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Wet rocks near waterfalls
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : July- December
Altitude preference : Found in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Chaatappara waterfalls, 10°53'11.76"N, 76°42'15.84"E, 599m, 10 December 2019, Aswani & Maya, 5557 (GVCH).

Lecythidaceae

Careya Roxb., *Pl. Coromandel* 3(1): 13 (1811), nom. cons.

Careya arborea Roxb., *Pl. Coromandel* 3(1): 14, t. 218 (1811); Hook. f., *FBI* 2: 511 (1879); Gamble, *Fl. Madras* 488 (1919); Vajr., *Fl. Palghat Dist* 201 (1990); Sasidh., *Fl. Parambikulam WL*S 124 (2002).

Habit : Tree
Ecosystem preference : Moist deciduous forests and in the plains
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : In forest floors and hillocks
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : February - July
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Valiya eri, 10°48'51.04"N , 76°45'01.67"E, 135m, 06 January 2018, Aswani & Maya, 1296 (GVCH); Moochikadavu, 10°52'13.80"N, 76°42'30.96"E, 258m, 10 March 2018, Aswani & Maya, 1463

(GVCH); G. P. Nair estate, 10°53'26.52"N, 76°39'41.04"E, 181m, 24 March 2018, Aswani & Maya, 1681 (GVCH); Parakkallu- Neelikunnu, 10°51'30.14"N, 76°37'30.67"E, 155m, 27 April 2018, Aswani & Maya, 1956 (GVCH); Aduppukootimala, 10°49'38.80"N, 76°44'16.08"E, 139m, 12 January 2019, Aswani & Maya, 3642 (GVCH) **(Plate 63: Fig. d)**.

Sapotaceae

Key to genera

1. Staminodes absent....*Chrysophyllum*
- Staminodes present……..……..2
2. Corolla lobes 24 (8 lobes each in 3 series); stamens 8…….……*Mimusops*
- Corolla lobes 6; stamens 6…….……....…….*Manilkara*

Chrysophyllum L., *Sp. Pl.* 1: 192 (1753)

Chrysophyllum oliviforme L., *Syst. Nat., ed.* 10. 2: 937 (1759); *Chrysophyllum cainito* L., Gamble, *Fl. Madras* 759 (1921).

Habit : Tree
Ecosystem preference : Cultivated
Distribution : South American
IUCN Category : Least Concern (LC)
Habitat : Cultivated, also found running wild in abandoned estates
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : July - September
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Chacolas, 10°51'15.48"N, 76°45'09.00"E, 265m, 02 August 2019, Aswani & Maya, 4550 (GVCH) **(Plate 63: Fig. e)**.

Manilkara Adans., *Fam. Pl. (Adanson)* 2: 166, 574 (1763), nom. cons.

Manilkara zapota (L.) P. Royen, *Blumea* 7: 410 (1953); Vajr., *Fl. Palghat Dist* 268 (1990); *Achras sapota* L., Hook. f., *FBI* 3: 534 (1882); Gamble, *Fl. Madras* 759 (1921).

Habit : Tree
Ecosystem preference : Cultivated
Distribution : Indo - Pacific, Holarctic and South American
IUCN Category : Least Concern (LC)
Habitat : Planted in estates, homesteads and found in abandoned estates
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : February - June
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, G. P. Nair Estate, 10°53'44.88"N, 76°39'46.08"E, 248m, 24 March 2018, Aswani & Maya, 1756 (GVCH); Kadukamkunnam, 10°48'48.76"N, 76°39'48.98"E, 107m, 23 March 2023, Aswani & Maya, 6566 (GVCH).

Mimusops L., *Sp. Pl.* 1: 349 (1753)

Mimusops elengi L., *Sp. Pl.* 1: 349 (1753); Hook. f., *FBI* 3: 548 (1882); Gamble, *Fl. Madras* 765 (1921); Sasidh., *Fl. Parambikulam WLS* 180 (2002).

Habit : Tree
Ecosystem preference : Semi-evergreen forests and also in homesteads
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : In forest floors in abandoned estates
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare

Phenology : December - August
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, G. P. Nair Estate, 10° 53 '20.76"N, 76° 39' 41.04"E, 179m, 24 March 2018, Aswani & Maya, 1653 (GVCH) **(Plate 63: Fig. f).**

Ebenaceae

Diospyros L., *Sp. Pl. [Linnaeus]* 2: 1057 (1753)

Key to species

1. Calyx and corolla lobes 5 each…..……..….*D. melanoxylon*
- Calyx and corolla lobes 4 each…...……..……....2
2. Lateral nerves of leaves 2 or 3 pairs……...…..…..*D. buxifolia*
- Lateral nerves of leaves 5 - 11 pairs……..……..3
3. Stamens 6 - 12, unequal……..... ……..……...*D. ebenum*
- Stamens 12 - 14, connate into a central column.....….*D. trichophylla*

Diospyros buxifolia (Blume) Hiern, *Trans. Cambridge Philos. Soc.* 12: 218 (1873); Vajr., *Fl. Palghat Dist* 269 (1990); Sasidh., *Fl. Parambikulam WLS* 181 (2002); *Diospyros microphylla* Bedd., Hook. f., *FBI* 3: 559 (1882); Gamble, *Fl. Madras* 776 (1923).

Basionym : *Leucoxylum buxifolium Blume*, *Bijdr. Fl. Ned. Ind.* 17: 1169.

Habit : Tree
Ecosystem preference : Moist deciduous and semi-evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In hill slopes
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : March - May
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kavarakundu , 10°52'26.78"N , 76°42'42.09"E, 297m, 10 March 2018, Aswani & Maya, 1485 (GVCH); Parachaathy,10°50'54.24"N, 76°43'55.92" E, 158m, 02 January 2019, Aswani & Maya, 3592 (GVCH); Akamalavaram - Pettikallu,10°52'23.35"N, 76°42'39.58"E, 312m, 19 July 2019, Aswani & Maya, 4364 (GVCH); Jamanthimala; 10°51'59.76"N, 76°47'15.36"E, 641m, 09 January 2020, Aswani & Maya, 5656 (GVCH) **(Plate 63: Fig. g)**.

Diospyros ebenum J. Koenig, *Physiogr. Salsk. Handl.* 1: 176 (1776); Hook. f., *FBI* 3: 558 (1882); Gamble, *Fl. Madras* 775 (1923).

Habit : Tree
Ecosystem preference : Deciduous forests
Distribution : Indo - Pacific
IUCN Category : Data Deficient (DD)
Habitat : In forest floors and in hillocks
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : February - April
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Neelippara - Akathethara , 10°51'47.52"N, 76°37'37.38"E , 312m, 15 September 2017, Aswani & Maya, 588 (GVCH); Koyamarakaadu,10°47'44.88"N,76°45'38.52"E, 111m, 06 September 2018, Aswani & Maya, 2717 (GVCH); Anayappanchalla, 10°48'25.92"N, 76°48'35.19"E, 157m, 30 November 2019, Aswani & Maya, 5111 (GVCH); Mayyappallam, 10°48'09.35"N, 76°46'28.60"E, 137m, 30 November 2019,

Aswani & Maya, 5409 (GVCH) **(Plate 63: Fig. h)**.

Diospyros melanoxylon Roxb., *Pl. Coromandel* 1(2): 36, t. 46 (1795); Hook. f., *FBI* 3: 564 (1882); Gamble, *Fl. Madras* 772 (1923).

Habit : Tree
Ecosystem preference : Deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In hillocks
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : March - July
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kongampaadam, 10°48'36.72"N, 76°46'51.96"E, 151m, 15 June 2018, Aswani & Maya, 2346 (GVCH) **(Plate 64: Fig. a)**.

Diospyros trichophylla Alston, *in Trimen, Hand-Book Fl. Ceylon vi. Suppl*., 181 (1931); *Handb. Fl. Ceylon* 3: 29 (1981); Pandura. *et al*., *J. Econ. Tax. Bot.* 6: 272 (1985); Sasidh., *Biodiv. Doc. Kerala- Fl. Pl*. 272 (2004); V. Singh, Monogr. *Indian Diospyros* 235 (2005).

Habit : Tree
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
IUCN Category : Vulnerable
Habitat : In hill slopes
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : October - January
Altitude preference : Found in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Aduppukootimala, 10°50'40.20"N, 76°44'35.52"E, 718m, 16 February 2021, Aswani & Maya, 6504 (GVCH).

Primulaceae

Key to species

1. Berry many seeded; anthers introrse……..……*Maesa*
- Berry single seeded; anthers exerted…..……..……....2
2. Corolla imbricate in bud; anther base cordate…..……..….*Embelia*
- Corolla lobes twisted in bud; anther base sagittate…...……..……*Ardisia*

Ardisia Sw., *Prodr. [O. P. Swartz]* 3, 48 (1788), nom. cons.

Ardisia solanacea Roxb., *Hort. Bengal.* 16; *Fl. Ind*. i. 580; Gamble, *Fl. Madras* 756 (1921); Vajr., *Fl. Palghat Dist* 263 (1990); *Ardisia humilis* Wight, Hook. f., *FBI* 3: 529 (1882).

Habit : Shrub
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : Hill slopes
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : March - August
Altitude preference : Found in medium altitudes
Specimen examined: INDIA, Kerala: Palakkad District, Walayar range, Neelippara, Akathethara, 10°51'47.52"N, 76°37'37.38"E , 312m, 15 September 2017, Aswani & Maya, 562 (GVCH) **(Plate 64: Fig. b)**.

Embelia Burm.f., *Fl. Ind. (N. L. Burman)* 62 (1768)

Embelia tsjeriam-cottam (Roem. & Schult.) A.DC., *Trans. Linn. Soc. London* 17(1): 131 (1834); Hook. f., *FBI* 3: 515 (1882); Gamble, *Fl. Madras* 753 (1921); Sasidh., *Fl. Parambikulam WLS* 177 (2002); *Embelia villosa* Wall. ex Roxb., Gamble, *Fl. Madras* 753 (1921); *Embelia robusta* Clarke, Hook.f., *FBI* 3: 515 (1882); *Embelia acutipetala* (Lam. ex Hassk.) M.R. & S.M. Almeida, Vajr., *Fl. Palghat Dist* 264 (1990).

Basionym : *Ardisia tsjeriam-cottam Roem. & Schult*., *Syst. Veg., ed.* 15 *bis [Roemer & Schultes]* 4: 518 (1819).

Habit : Shrub
Ecosystem preference : Moist deciduous forests, also in the plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In forest floors
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : February - March
Altitude preference : Found in medium altitudes
Specimen examined: INDIA, Kerala: Palakkad District, Walayar range, Chottuppara,10°52'37.92"N,76°41'39.84"E, 345m, 14 May 2019, Aswani & Maya, 3896 (GVCH) **(Plate 64: Fig. c)**.

Maesa Forssk., *Fl. Aegypt.-Arab*. 66 (1775)

Maesa indica (Roxb.) Sweet, *Hort. Brit. [Sweet]* [2]: 268 (1826); Vajr., *Fl. Palghat Dist* 264 (1990); Sasidh., *Fl. Parambikulam WLS* 177 (2002); *Maesa dubia* (Wall.) DC., Hook. f., *FBI* 3: 510 (1882); Gamble, *Fl. Madras* 749 (1921); *Maesa perrottetiana* A. DC, Gamble, *Fl. Madras* 749 (1921); *Maesa indica* (Roxb.) DC. var. *perrottetiana* (A. DC.) Clarke, Hook. f., *FBI* 3:509 (1882).

Basionym : *Baeobotrys indicus Roxb*., *Fl. Ind. (Carey & Wallich ed.)* 2: 230 (1824).

Habit : Shrub
Ecosystem preference : Semi - evergreen forests and grasslands
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Margins of grasslands
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : September - May
Altitude preference : Found in higher altitudes
Specimens examined: INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala,10°52'14.73"N,76°46'46.15" E, 894m, 09 January 2020, Aswani & Maya, 5690 (GVCH); Thanniplace, 10°52'43.32"N,76°45'54.07"E, 972m, 28 January 2020, Aswani & Maya, 6014 (GVCH); Akamalavaram - Pettikallu, 10°53'2.04"N, 76°42'13.92"E, 539m, 27 February 2020, Aswani & Maya, 6094 (GVCH); Aatumala Adivaram, 10°53'24"N, 76°41'24"E, 1064m, 28 February 2020, Aswani & Maya, 6168 (GVCH) **(Plate 64: Fig. d)**.

Theaceae

Polyspora Sweet, *News Lit. Fashion* 2: 205 (1825)

Polyspora obtusa (Wall. ex Wight & Arn.) Niissalo & L. M. Choo, *Phytotaxa* 458(2): 164 (2020); *Gordonia obtusa* Wall.ex Wight & Arn., Hook. f., *FBI* 1: 291 (1874); Gamble, *Fl. Madras* 79 (1915); Vajr., *Fl. Palghat Dist* 73 (1990).

Basionym : *Gordonia obtusa Wall*. ex Wight & Arn., *Prodr. Fl. Ind. Orient. [Wight & Arnott]* 1: 87 (1834).

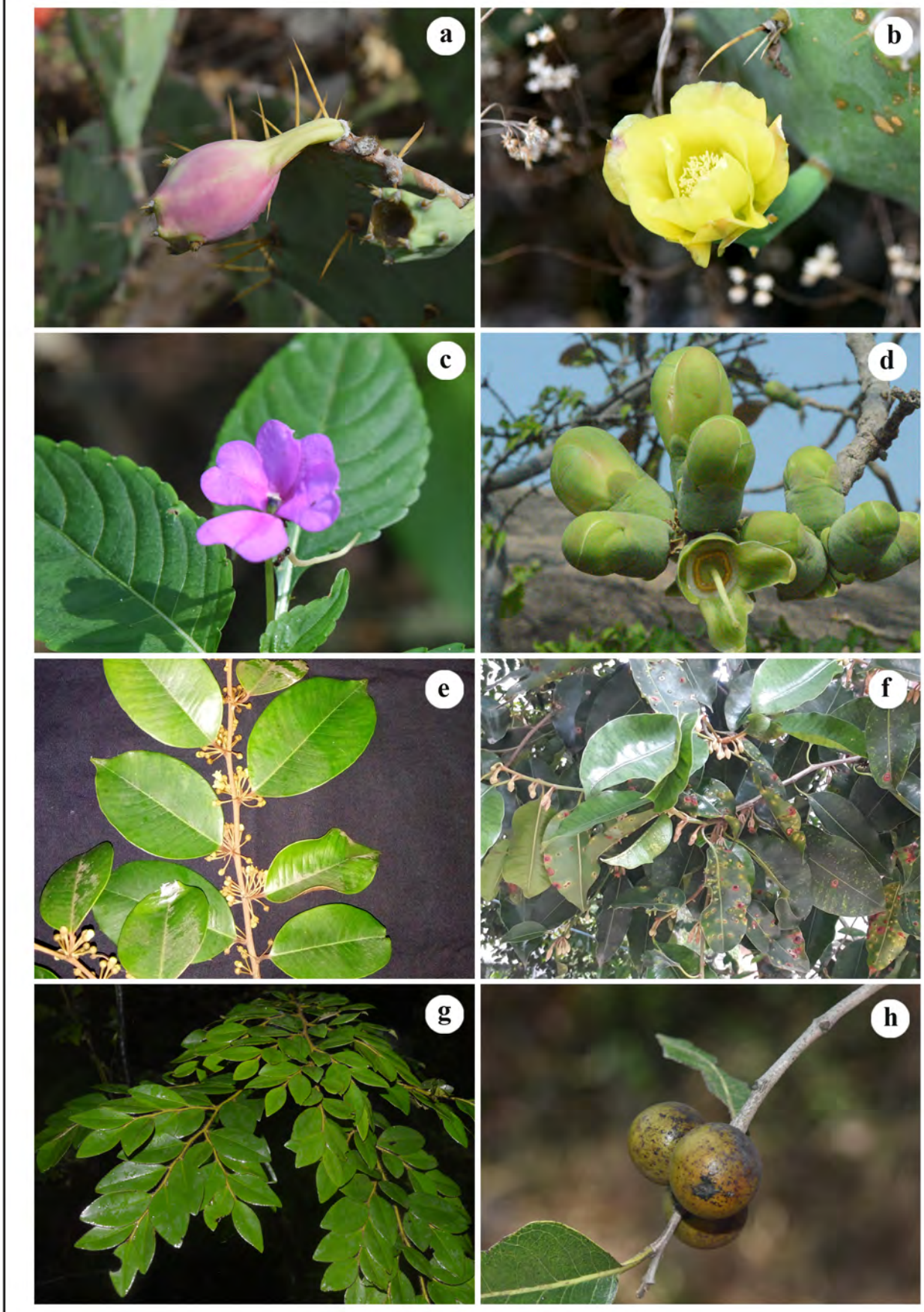

Plate 63: Fig. a. *Opuntia dillenii* Haw. **b.** *Opuntia ficus-indica* (L.) Mill. **c.** *Impatiens dasysperma* Wight **d.** *Careya arborea* Roxb. **e.** *Chrysophyllum oliviforme* L. **f.** *Mimusops elengi* L. **g.** *Diospyros buxifolia* (Blume) Hiern **h.** *Diospyros ebenum* J.Koenig.

Habit :Tree
Ecosystem preference : Semi - evergreen and evergreen forests
Distribution : Evergreen forests
Endemism : Western Ghats
IUCN Category : Least Concern (LC)
Habitat : Margins of grasslands
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : October - May
Altitude preference : Found in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Aatumala Thodu, 10°53'24"N, 76°41'24"E, 1080m, 27 February 2020, Aswani & Maya, 6141 (GVCH) **(Plate 64: Fig. e)**.

Symplocaceae

Symplocos Jacq., *Enum. Syst. Pl.* 5, 24 (1760)

Symplocos acuminata Miq., *Fl. Ned. Ind.* 1(2): 467 (1859); *Symplocos spicata* Roxb., Hook. f., *FBI* 3: 573 (1882); *Symplocos spicata* Roxb. var. *laurina* (Retz.) Clarke, Hook. f., *FBI* 3: 573 (1882); Gamble, *Fl. Madras* 782 (1921); *Symplocos spicata* Roxb. var. *malasica* Clarke, Hook. f., *FBI* 3: 573 (1882); *Symplocos spicata* Roxb. var. *attenuata* (A.DC.) Clarke, Hook. f., *FBI* 3: 573 (1882); *Symplocos cochinchinensis* (Lour.) Moore ssp. *laurina* (Retz.) Nooteb., Vajr., *Fl. Palghat Dist* 271 (1990); Sasidh., *Fl. Parambikulam WLS* 183 (2002).

Habit : Tree
Ecosystem preference : Semi-evergreen forests
Distribution : Indo - Pacific and Holarctic
IUCN Category : Least Concern (LC)
Habitat : Margins of grasslands
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : March - May
Altitude preference : Found in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Aatumala Thodu, 10°53'24"N, 76°41'24"E, 1080m, 27 February 2020, Aswani & Maya, 6149 (GVCH) **(Plate 64: Fig. f)**.

Icacinales

Icacinaceae

Key to genera

Climbing shrub; flowers in pendulous spikes…..……..…..…….*Sarcostigma*
Trees; flowers in corymbose cymes…...……..……..……*Mappia*

Mappia Jacq., *Pl. Rar. Hort. Schoenbr.* 1: 22 (1797)

Mappia nimmoniana (J.Graham) Byng & Stull, *Global Fl.* 4: 145 (2018); *Mappia tomentosa* Miers, Hook. f., *FBI* 1: 589 (1875); Gamble, *Fl. Madras* 196 (1915); *Mappia ovata* Miers, Hook. f., *FBI* 1: 589 (1852); Gamble, *Fl. Madras* 196 (1915); *Mappia wightiana* Miers, Hook. f., *FBI* 1: 589 (1852); Gamble, *Fl. Madras* 197 (1915); *Mappia foetida* (Wight) Miers, Hook. f., *FBI* 1: 589 (1852); Gamble, *Fl. Madras* 196 (1915); *Nothapodytes nimmoniana* (Graham) Mabb. Vajr., *Fl. Palghat Dist* 115 (1990); Sasidh., *Fl. Parambikulam WLS* 61 (2002).

Basionym: *Premna nimmoniana J. Graham*, *Cat. Pl. Bombay [Graham]* 155 (1839).

Habit : Shrub
Ecosystem preference : Moist deciduous and semi - evergreen forests
Distribution : Indo - Pacific and Holarctic

IUCN Category : Not Evaluated (NE)
Habitat : Understorey of forest floors
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : July - September
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, G. P. Nair estate, 10°53'40.83"N, 76°39'43.16"E, 230m, 24 March 2018, Aswani & Maya, 1734 (GVCH); Mannukunnu, 10°52'5.50" N, 76°38'30.27"E, 181m, 09 July 2019, Aswani & Maya, 4229 (GVCH) **(Plate 64: Fig. g)**.

Sarcostigma Wight & Arn., *Edinburgh New Philos. J.* xiv. (1853) 299

Sarcostigma kleinii Wight & Arn., *Edinburgh New Philos. J.* xiv. (1833) 299; Hook. F., *FBI* 1: 594 (1875); Gamble, *Fl. Madras* 199 (1915); Vajr., *Fl. Palghat Dist* 115 (1990); Sasidh., *Fl. Parambikulam WLS* 63 (2002).

Habit : Climber
Ecosystem preference : Semi-evergreen forests
Distribution : Indo – Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Canopy rich forest floors
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : February – June
Altitude preference : Found in lower and medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Aduppukootimala, 10°49'59.16"N, 76°44'31.56''E, 298m, 12 January 2019, Aswani & Maya, 3703 (GVCH) **(Plate 64: Fig. h)**.

Gentianales

Rubiaceae

Key to genera

1. Flowers in globose heads…..…….2
- Flowers not in globose heads…..……..……...4
2. Corolla imbricate……...*Neonauclea*
- Corolla valvate……..…….3
3. Calyx limb very short; stigma mitriform…..……...…….*Mitragyna*
- Calyx limb 5 - lobed; stigma globose……...……...…… *Adina*
4. Prostrate herbs……..…..……5
- Erect herbs, shrubs or trees……..…7
5. Ovary 2 - celled; one ovule per each cell……...……..……*Geophila*
- Ovary 2 - celled; many ovules per each cell……..……...6
6. Style short, inserted…...…*Dentella*
- Style exerted than the corolla lobes……..…..*Scleromitrion*
7. Ovules many in each cell…..…..…8
- Ovules solitary or 2 per cell…....15
8. Fruit a berry…..……..…....9
- Fruit a capsule…..……...…11
9. Calyx lobes 5, one lobe transformed to leaf like structure…..……..……..*Mussaenda*
- Calyx lobes 5, lobes equal or subequal……..…..…10
10. Armed plants…..…....*Catunaregam*
- Unarmed plants…...……*Oxyceros*
11. Corolla lobes imbricate in bud……...……..……*Wendlandia*
- Corolla lobes valvate in bud……..……..12
12. Habit - trees; seeds winged…….…..…..*Hymenodictyon*
- Habit - herbs or sub- shrubs; seeds wingless….……..……..…13
13. Stigma capitate; anthers shortly connivant……..…*Argostemma*
- Stigma bifid……..……14
14. Calyx lobes 5……....*Ophiorrhiza*

Plate 64: Fig. a. *Diospyros melanoxylon* Roxb. **b.** *Ardisia solanacea* Roxb. **c.** *Embelia tsjeriam-cottam* (Roem. & Schult.) A.DC. **d.** *Maesa indica* (Roxb.) Sweet **e.** *Polyspora obtusa* (Wall. ex Wight & Arn.) Niissalo & L.M.Choo **f.** *Symplocos acuminata* Miq. **g.** *Mappia nimmoniana* (J.Graham) Byng & Stull **h.** *Sarcostigma kleinii* Wight & Arn.

- Calyx lobes 4……..….*Oldenlandia*
15. Armed plants…..……..…..*Canthium*
- Unarmed plants…….…..……..…16
16. Ovary with two ovules per cell…….……..…*Discospermum*
- Ovules solitary per cell…...……..17
17. Corolla lobes valvate in bud…....18
- Corolla lobes twisted in bud…....22
18. Flowers sessile in capitate heads……...……...….*Morinda*
- Flowers pedicelled in axillary or terminal cymes or fascicles…..…19
19. Stipules connate with the petiole; corolla straight……...……..….20
- Stipules bifid, intrapetiolar; corolla curved……..…..…..….*Chassalia*
20. Stem terete or obscurely angled; e - bracteolate…...……...…..*Knoxia*
- Stem tetragonous; bracteoles many forming filiform bristles…..……21
21. Calyx lobes unequal.....*Mitracarpus*
- Calyx lobes equal……..*Spermacoce*
22. Flowers in axillary fascicles…..…23
- Flowers in corymbose cymes…...24
23. Corolla lobes 4…...….*Nostolachma*
- Corolla lobes 5…..…….*Coffea*
24. Style much exerted from corolla; stigma fusiform; undivided…....…. ……*Pavetta*
- Style not much exerted from corolla; stigma fusiform, 2 branched……...……..…..……*Ixora*

Adina Salisb., *Parad. Lond. t.* 115 (1807)

Adina cordifolia (Roxb.) Hook.f. & Benth., *Forest Fl. N.W. India [Brandis]* 263 (1874); Hook. f., *FBI* 3: 24 (1880); Gamble, *Fl. Madras* 584 (1921); *Haldina cordifolia* (Roxb.) Ridsd. Vajr., *Fl. Palghat Dist* 231 (1990); Sasidh., *Fl. Parambikulam WLS* 148 (2002).

Basionym : *Nauclea cordifolia Roxb*., *Pl. Coromandel* 1(3): 40, t. 53 (1796).

Habit : Tree
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : Open forest tracks
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : October - March
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Poolakunnu,10°51'33.12"N, 76°42'29.52"E, 142m, 10 March 2018, Aswani & Maya, 1407 (GVCH); Velanchery, 10°49'12.37"N, 76°45'55.81"E, 132m, 07 March 2019, Aswani & Maya, 3881 (GVCH); Kochithodu,10°52'20.16"N, 76°42'39.96"E, 304m, 14 May 2019, Aswani & Maya, 3950 (GVCH); On the way of Jamanthimala,10°51'59.76"N,76°47'15.36" E, 641m, 23 June 2019, Aswani & Maya, 4001 (GVCH) **(Plate 65: Fig. a)**.

Argostemma Wall., *Fl. Ind. (Carey & Wallich ed.)* 2: 324 (1824)

Argostemma courtallense Arn., *Ann. Nat. Hist.* 3(14): 22 (1839); Hook. f., *FBI* 3: 42 (1880); Gamble, *Fl. Madras* 590 (1921); Vajr., *Fl. Palghat Dist* 227 (1990); Sasidh., *Fl. Parambikulam WLS* 146 (2002).

Habit : Herb
Ecosystem preference : Semi-evergreen forests
Distribution : Indo - Pacific
Endemism : India
IUCN Category : Not Evaluated (NE)
Habitat : Mud slips in forest tracks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : July - September
Altitude preference : Found in lower and higher altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range,

Kezhakootimala,10°51'53.30"N,76°37'36.39"E, 362m, 15 September 2017, Aswani & Maya, 535 (GVCH); Akamalavaram - Pettikallu, 10°52'28.20"N, 76°42'38.52"E, 346m, 19 July 2019, Aswani & Maya, 4312 (GVCH); Chacolas estate, 10°51'16.20"N, 76°45'05.76"E, 286m, 02 August 2019, Aswani & Maya, 4530 (GVCH).

Canthium Lam., *Encycl. [J. Lamarck & al.]* 1(2): 602 (1785)

Key to species

Flowers 5 - merous……....…….*C. rheedei*
Flowers 4 - merous…...*C. coromandelicum*

Canthium coromandelicum (Burm.f.) Alston, in Trimen, *Hand-Book Fl. Ceylon* vi. *Suppl.,* 152 (1931); Sasidh., *Fl. Parambikulam WLS* 146 (2002); *Canthium parviflorum* Lam., Hook. f., FBI 3: 136 (1880); *Plectronia parviflora* (Lam.) Bedd., Gamble, *Fl. Madras* 625 (1921).

Basionym: *Gmelina coromandelina* Burm.f. in *Fl. Indica*: 132 (1768).

Habit : Shrub
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Understorey in forests and in hillocks
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : April - June
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Vedivachapara, 10°50'04.96"N, 76°40'48.72"E, 116m, 04 June 2017, Aswani & Maya, 66 (GVCH); Kongampaadam,10°48'36.72"N,76°46'51.96"E, 151m, 15 June 2018, Aswani & Maya, 2320 (GVCH); Pazhampullikaadu, 10°50'09.55"N, 76°38'28.33"E, 89m, 16 October 2018, Aswani & Maya, 3187 (GVCH);Aduppukootimala,10°49'50.52"N, 76°44'24.72"E, 222m, 12 January 2019, Aswani & Maya, 3689 (GVCH); S Medu, 10°50'26.52"N, 76°50'04.56"E, 214m, 23 June 2019, Aswani & Maya, 4044 (GVCH).

Canthium rheedei DC., *Prodr. [A. P. de Candolle]* 4: 474 (1830); Hook. f., *FBI* 3: 134 (1880); Vajr., *Fl. Palghat Dist* 229 (1990); Sasidh., *Fl. Parambikulam WLS* 147 (2002); *Plectronia rheedei* (DC.) Bedd., Gamble, *Fl. Madras* 625 (1921).

Habit : Shrub
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
Endemism : Peninsular India
IUCN Category : Not Evaluated (NE)
Habitat : In open hill slopes and in hillocks
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : March - June
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kosavanidukku - Kaduvachal, 10°50'26.38"N, 76°40'30.88"E, 105m, 16 July 2017, Aswani & Maya, 226 (GVCH); Akamalavaram - Moochikadavu, 10°52'13.80"N, 76°42'30.96"E, 258m, 10 March 2018, Aswani & Maya, 1461 (GVCH); Ayyappan Mala, 10°49'07.19"N, 76°44'50.28"E, 130m, 26 June 2018, Aswani & Maya, 2389 (GVCH); Kottamutti waterfalls, 10°49'42.94"N, 76°46'47.87"E, 206m, 23 September 2018, Aswani & Maya, 2919 (GVCH)

Catunaregam Wolf, *Gen. Pl.* 75 (1776)*; vide Ross in Acta Bot. Neerl.* xv. 156 (1966)

Catunaregam spinosa (Thunb.) Tirveng., *Bull. Mus. Natl. Hist. Nat*., Sér. 3, *Bot.* 35: 13 (1978).; Vajr., *Fl. Palghat Dist* 230 (1990); Sasidh., *Fl. Parambikulam WLS* 147 (2002); *Randia spinosa* (Thunb.) Poir., Hook. f., *FBI* 3:110 (1880); *Randia dumetorum* (Retz.) Poir. var. *floribunda* (DC.) Gamble, *Fl. Madras* 615 (1921); *Randia brandisii* Gamble, *Fl. Madras* 616 (1921).

Basionym : *Gardenia spinosa* Thunb., *Diss. Gard.* 16.

Habit : Tree
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific, Holarctic and African
IUCN Category : Least Concern (LC)
Habitat : In open forest floors
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : April - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Ollappallam, 10°49'53.04"N, 76°43'41.52" E, 127m, 25 November 2017, Aswani & Maya, 983 (GVCH); Vettiyil Sandal estate, 10°51'34.30"N, 76°42'28.02"E, 145m, 10 March 2018, Aswani & Maya, 1442 (GVCH); Parakkallu- Neelikunnu, 10°51'34.19"N, 76°37'35.37"E. 193m, 27 April 2018, Aswani & Maya, 1967 (GVCH); Mayyappallam, 10°48'0.36"N, 76°45'58.68"E, 114m, 10 May 2018, Aswani & Maya, 1967 (GVCH) **(Plate 65: Fig. b)**.

Chassalia Comm. ex Poir., *Dict. Sci. Nat., ed.* 2. [F. Cuvier] 8: 198 (1817)

Chassalia curviflora (Wall.) Thwaites, *Enum. Pl. Zeyl. [Thwaites]* 150 (1859); *Chassalia curviflora* (Wall. ex Kurz) Thw. var. *ophioxyloides* (Wall.) Deb & Krishna, Sasidh., *Fl. Parambikulam WLS* 147 (2002); *Chassalia ophioxyloides* (Wall. ex Kurz) Craib, Vajr., *Fl. Palghat Dist* 230 (1990).

Basionym : *Psychotria curviflora Wall*., *Fl. Ind. (Carey & Wallich ed.)* 2: 167 (1824).

Habit : Shrub
Ecosystem preference : Moist deciduous and semi - evergreen forests and in plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Under storey in all types of forests
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Occasional
Phenology : July - February
Altitude preference : Found mostly in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Chacolas, 10°51'30.60"N, 76°43'53.76"E, 164m, 02 August 2019, Aswani & Maya, 4534 (GVCH); Chaatapara waterfalls, 10°52'56.81"N, 76°42'11.22"E , 507m, 10 December 2019, Aswani & Maya, 5548 (GVCH); Jamanthimala, 10°51'53.64"N, 76°47'16.80"E, 586m, 09 January 2020, Aswani & Maya, 5622 (GVCH); Pettikallu, 10°53'6" N, 76°42'0"E, 812m, 28 February 2020, Aswani & Maya, 6106 (GVCH) **(Plate 65: Fig. c)**.

Coffea L., *Sp. Pl.* 1: 172 (1753)

Coffea arabica L., *Sp. Pl.* 1: 172 (1753); Hook. f., *FBI* 3: 153 (1880); Gamble, *Fl. Madras* 636 (1921); Vajr., *Fl. Palghat Dist* 245 (1990).

Habit : Shrub

Ecosystem preference : Cultivated
Distribution : African
IUCN Category : Endangered
Habitat : Cultivated near forest margins; often found naturalised in the rejuvenating forest tracks
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : March - December
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kalliyara, 10°52'51.24"N , 76°39'24.84"E, 127m, 24 March 2018, Aswani & Maya, 1536 (GVCH); G. P. Nair estate,10° 53 '40.83 "N, 76° 39' 43.16"E, 230m, 24 March 2018, Aswani & Maya, 1536 (GVCH).

Dentella J. R. Forst. & G. Forst., *Char. Gen. Pl*., ed. 2. 25 (1776)

Key to species

Corolla lobes white with purplish spot at the base; Fruits glabrous…….. ……..…..*D. repens* var *serpyllifolia*
Corolla lobes white; Fruits tomentose ……..…….…….*D. repens*

Dentella repens J. R. Forst. & G. Forst., R. Br. ex Airy-Shaw, in *Kew Bull.* 1934, 292, descr. ampl; Hook. f., *FBI* 3: 42 (1880); Gamble, *Fl. Madras* 590 (1921); Vajr., *Fl. Palghat Dist* 230 (1990); Sasidh., *Fl. Parambikulam WLS* 148 (2002).

Habit : Herb
Ecosystem preference : Wetlands and plains
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : water receded areas on dam, other marshy lands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : March - May
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thonikadavu,10°50'04.96"N,76°40'48.72", 32m, 04 June 2017, Aswani & Maya, 49 (GVCH); Kosavanidukku - Kaduvachal, 10°50'26.38"N, 76°40'30.88" E, 105m, 16 July 2017, Aswani & Maya, 319 (GVCH); Kava, 10°49'25.18"N, 76°43'29.96"E, 115m, 06 April 2018, Aswani & Maya, 319 (GVCH) **(Plate 65: Fig. d)**.

Dentella repens var. ***serpyllifolia*** (Wall. ex Craib) Verdc., *Kew Bull*. 37(4): 545 (1983); Sasidh., *Biodiv. Doc. Kerala- Fl. Pl.* 212 (2004).

Basionym : *Dentella serpyllifolia Wall.* ex Craib, *Fl. Siam. ii.* 27 (1932); *Airy-Shaw, in Kew Bull.* 1932, 289, *latine.*

Habit : Herb
Ecosystem preference : Moist localities in the plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Water receded regions in dam and other wet areas
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : March - May
Altitude preference : Found rarely in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Vedivachapara, 10°50'04.96"N, 76°40'48.72"E, 115m, 04 June 2017, Aswani & Maya, 64 (GVCH); Kava, 10°49'25.18"N, 76° 43 '29.96"E, 115m, 06 April 2018, Aswani & Maya, 1859 (GVCH).

Discospermum Dalzell, *Hooker's J. Bot. Kew Gard. Misc.* 2: 257 (1850)

Discospermum sphaerocarpum Dalzell, *Hooker's J. Bot. Kew Gard. Misc.* 2: 257

(1850); *Tricalysia sphaerocarpa* (Dalz. ex Hook. f.) Gamble, *Fl. Madras* 620 (1921); *Diplospora sphaerocarpa* (Dalz. ex Hook.f.) Hook.f., *FBI* 3: 123 (1880).

Habit : Shrub
Ecosystem preference : Semi - evergreen and moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Canopy rich forests
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : January - March
Altitude preference : Found in lower and medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Charalmudi,10°52'27.48"N,76°42'28.728", 385m, 28 February 2020, Aswani & Maya, 6075 (GVCH) **(Plate 65: Fig. e)**.

Geophila D. Don, *Prodr. Fl. Nepal.* 136 (1825)

Geophila repens (L.) I.M.Johnst., *Sargentia* 8: 281 (1949); Vajr., *Fl. Palghat Dist* 231 (1990); Sasidh., *Fl. Parambikulam WLS* 148 (2002); *Geophila reniformis* D. Don, Hook. f., *FBI* 3:178 (1880); Gamble, *Fl. Madras* 643 (1921).

Habit : Herb
Ecosystem preference : Moist deciduous and semi - evergreen forests
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Small creeper in the understorey of forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : October - April
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Pallakaadu, 10°51'32.04"N, 76°37'25.68"E, 138m, 09 October 2018, Aswani & Maya, 2983 (GVCH); Mannukunnu, 10°52'5.50"N, 76°38'30.27"E, 181m, 09 July 2019, Aswani & Maya, 4245 (GVCH); Akamalavaram - Kalliyara, 10°52'51.24"N, 76°39'24.84"E, 128m, 19 July 2019, Aswani & Maya, 4245 (GVCH); Chaatapara waterfalls, 10°53'11.76"N, 76°42'15.84"E, 599m, 10 December 2019, Aswani & Maya, 5568 (GVCH) **(Plate 65: Fig. f)**.

Hymenodictyon Wall., *Fl. Ind. (Carey & Wallich ed.)* 2: 148 (1824)

Key to species

Flowers pedicelled; capsules pendulous……..…….*H. orixense*
Flowers sessile; capsules erect……..……..……..*H. obovatum*

Hymenodictyon obovatum Wall., *Fl. Ind. (Carey & Wallich ed.)* 2: 153 (1824); Hook. f., *FBI* 3: 36 (1880); Gamble, *Fl. Madras* 589 (1921); Vajr., *Fl. Palghat Dist* 232 (1990).

Habit : Tree
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
Endemism : Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : In open rocky forests
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : June - October
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Chacolas, 10°51'22.68"N, 76°44'41.28"E, 226m, 02 August 2019, Aswani & Maya, 4483 (GVCH).

Hymenodictyon orixense (Roxb.) Mabb., *Taxon* 31(1): 66 (1982); Vajr., *Fl. Palghat Dist* 233 (1990); Sasidh., *Fl. Parambikulam WLS* 151 (2002); *Hymenodictyon excelsum* (Roxb.) Wall. in Roxb., Hook. f., *FBI* 3: 35 (1880); Gamble, *Fl. Madras* 589 (1921).

Habit : Tree
Ecosystem preference : Moist deciduous forests and in the plains
IUCN Category : Not Evaluated (NE)
Habitat : In open rocky forest tracks
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : July - January
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thekke Malampuzha, 10°50'26.52"N, 76°39'2.16" E, 151m, 05 October 2017, Aswani & Maya, 668 (GVCH); Kottamutti waterfalls, 10°49'42.94"N, 76°46'47.87"E, 206m, 23 September 2018, Aswani & Maya, 2944 (GVCH) **(Plate 65: Fig. g)**.

Ixora L., *Sp. Pl.* 1: 110 (1753)

Key to species

1. Calyx lobes distinct, equal to the tube....2
- Calyx lobes minute, very much shorter than the tube……..…….……..3
2. Corolla lobes glabrous, corolla lobes never deflexed ……..*I. cuneifolia*
- Corolla lobes puberulous, deflexed ……..……..……..……..*I. ravikumarii*
3. Flowers sessile; calyx lobes representing mere teeth……..……..……*I. brachiata*
- Flowers pedicellate; calyx lobes minute …….…….……..*I. coccinea*

Ixora coccinea L., *Sp. Pl.* 1: 110 (1753); Hook. f., *FBI* 3: 145 (1880); Gamble, *Fl. Madras* 631 (1921); E. Vajr., *Fl. Palghat Dist* 233 (1990).

Habit : Shrubs
Ecosystem preference : In plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Grown in homesteads
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kadukkamkunnam,10°48'48.76"N,76°39'48.98"E, 107m, 23 March 2023, Aswani & Maya, 6567 (GVCH).

Ixora brachiata Roxb., *Hort. Bengal*. [10]; Fl. Ind. i. 381; Hook. f., *FBI* 3: 142 (1880); Gamble, *Fl. Madras* 631 (1921); Vajr., *Fl. Palghat Dist* 233 (1990); Sasidh., *Fl. Parambikulam WLS* 151 (2002).

Habit : Tree
Ecosystem preference : Semi-evergreen forests
Distribution : Indo - Pacific
Endemism : Western Ghats
IUCN Category Not Evaluated (NE)
Habitat : In forest floors
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : January - May
Altitude preference : Found in medium and higher altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kavarakundu, 10°52'20.16"N, 76°42'39.96"E, 304m, 10 March 2018, Aswani & Maya, 1480 (GVCH); Chaatapara waterfalls, 10°53'11.76"N, 76°42'15.84"E, 600m, 10 December 2019, Aswani & Maya, 5472 (GVCH); Jamanthimala, 10°51'53.64"N, 76°47'16.80"E, 586m, 09 January 2020, Aswani & Maya, 5631 (GVCH); Aatumala - Kundanmala, 10°53'33.48"N, 76°41' 52.76"E, 943m, 28 February 2020, Aswani & Maya, 6184 (GVCH).

Ixora cuneifolia Roxb., *Hort. Bengal*. [10]; *Fl. Ind. i.* 380; Hook. f., *FBI* 3: 144 (1880); Gamble, *Fl. Madras* 631 (1921); Vajr., *Fl. Palghat Dist* 234 (1990); Sasidh., *Fl. Parambikulam WLS* 151 (2002).

Habit : Shrub
Ecosystem preference : Semi -evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Near water sources in canopy rich forests
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : December - April
Altitude preference : Found very rarely in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Aatumala Thodu, 10°53'52.08"N, 76°41'24"E, 1010m, 28 February 2020, Aswani & Maya, 6134 (GVCH) **(Plate 65: Fig. h)**.

Ixora ravikumarii Kottaim., *Phytotaxa* 263(1): 79 (2016); *Ixora monticola* Gamble, *Fl. Madras* 631 (1921); Vajr., *Fl. Palghat Dist* 234 (1990); Sasidh., *Fl. Parambikulam WLS* 152 (2002).

Habit : Shrub
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
Endemism : Southern Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : In the valley of grasslands
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : March - April
Altitude preference : Found rarely in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Pettikallu, 10°52'48"N, 76°42'7.2"E, 594m, 19 July 2019, Aswani & Maya, 4362 (GVCH).

Knoxia L., *Sp. Pl.* 1: 104 (1753)

Knoxia sumatrensis (Retz.) DC., *Prodr. [A. P. de Candolle]* 4: 569 (1830); Vajr., *Fl. Palghat Dist* 235 (1990); Sasidh., *Fl. Parambikulam WLS* 152 (2002); *Knoxia corymbosa* Willd., Hook. f., *FBI* 3: 129 (1880); Gamble, *Fl. Madras* 622 (1921); *Knoxia mollis* Wight & Arn., Hook. f., *FBI* 3: 129 (1880); Gamble, *Fl. Madras* 622 (1921); Vajr., *Fl. Palghat Dist* 235 (1990).

Basionym : *Spermacoce sumatrensis* Retz., *Observ. Bot. (Retzius)* 4: 23 (1786).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and Australian
IUCN Category : Not Evaluated (NE)
Habitat : In forest floors
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : August - September
Altitude preference : Found in lower altitudes
Specimen examined: INDIA, Kerala: Palakkad District, Walayar range, Akamalavaram - Thakaramada, 10°52'11.03"N, 76°42'59.76"E, 240m, 30 November 2018, Aswani & Maya, 3249 (GVCH) **(Plate 66: Fig. a)**.

Mitracarpus Zucc., Mant. 3 (Schultes & Schultes f.) 210 (text), 319 (index) (1827)

Mitracarpus hirtus (L.) DC., *Prodr. [A. P. de Candolle]* 4: 572 (1830); Vajr., *Fl. Palghat Dist* 236 (1990); *Mitracarpus villosus* (Sw.) DC., Sasidh., *Fl. Parambikulam WLS* 153 (2002).

Basionym : *Spermacoce hirta* L., *Sp. Pl.*, ed. 2. 1: 148 (1762).

Habit : Herb

Ecosystem preference : Degraded moist deciduous forests, wastelands and in plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : In wastelands and degraded forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : July - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koyamarakaadu,10°47'44.88"N,76°45'38.52"E, 110m, 06 September 2018, Aswani & Maya, 2676 (GVCH); Ahaliya campus, 10°48'24.82"N, 76°48'30.73"E, 146m, 18 September 2018, Aswani & Maya, 2830 (GVCH); Komattichalla, 10°48'40.59"N, 76°46'51.94"E, 128m, 06 September 2019, Aswani & Maya, 4580 (GVCH) **(Plate 66: Fig. b)**.

Mitragyna Korth., *Observ. Naucl. Indic.* 19 (1839)

Mitragyna parvifolia Korth., *Obs. Naucl. Ind.* 19. Gamble, *Fl. Madras* 585 (1921); Vajr., *Fl. Palghat Dist* 236 (1990); Sasidh., *Fl. Parambikulam WLS* 154 (2002); *Stephegyne parvifolia* (Roxb.) Korth., Hook. f., *FBI* 3: 25 (1880).

Habit : Tree
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In forest floors
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : March - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Parakkallu- Neelikunnu,10°51'34.19"N, 76°37'35.37"E, 192m, 27 April 2018, Aswani & Maya, 1949 (GVCH); Kottamutti waterfalls,10°49'42.94"N, 76°46'47.87"E, 206m, 23 September 2018, Aswani & Maya, 2966 (GVCH); Kochithodu,10°51'55.44"N, 76°42'00.11"E, 165m, 14 May 2019, Aswani & Maya, 3938 (GVCH); Akamalavaram, - Pettikallu, 10°53'2.04"N, 76°42'13.92"E, 19 July 2019, Aswani & Maya, 4353 (GVCH) **(Plate 66: Fig. c)**.

Morinda L., *Sp. Pl.* 1: 176 (1753)

Morinda coreia Buch.-Ham., *Trans. Linn. Soc. London* 13(2): 537 (1822); *Morinda pubescens* J. E. Smith, Vajr., *Fl. Palghat Dist* 237 (1990); Sasidh., *Fl. Parambikulam WLS* 154 (2002); *Morinda tinctoria* Roxb., Hook. f., *FBI* 3: 156 (1880); Gamble, *Fl. Madras* 651 (1921).

Habit : Tree
Ecosystem preference : Moist deciduous forests and in the plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In the margins of forests
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : March - June
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Malampuzha irrigation dept guest house hillock, 10°50'04.20"N, 76°40'52.68"E, 119m, 18 May 2018, Aswani & Maya, 2184 (GVCH); Thekke Malampuzha, 10°50'01.23"N, 76°40'58.49"E, 310m, 26 June 2018, Aswani & Maya, 2420 (GVCH); Mangalathumchalla, 10°49'04.07"N, 76°48'16.50"E, 151m, 18 September 2018, Aswani & Maya, 2754 (GVCH) **(Plate 66: Fig. d)**.

Plate 65: Fig. a. *Adina cordifolia* (Roxb.) Hook.f. & Benth. **b.** *Catunaregam spinosa* (Thunb.) Tirveng. **c.** *Chassalia curviflora* (Wall.) Thwaites **d.** *Dentella repens* J.R.Forst. & G.Forst. **e.** *Discospermum sphaerocarpum* Dalzell **f.** *Geophila repens* (L.) I.M.Johnst. **g.** *Hymenodictyon orixense* (Roxb.) Mabb. **h.** *Ixora cuneifolia* Roxb.

Mussaenda L., *Sp. Pl*. 1: 177 (1753)

Mussaenda frondosa L., *Sp. Pl*. 1: 177 (1753); Hook. f., *FBI* 3: 89 (1880); Gamble, *Fl. Madras* 610 (1921); *Mussaenda belilla* Buch.-Ham., Vajr., *Fl. Palghat Dist* 237 (1990); Sasidh., *Fl. Parambikulam WLS* 155 (2002); *Mussaenda laxa* (Hook. f.) Hutch. ex Gamble, *Fl. Madras* 610 (1921); *Mussaenda frondosa* L. var. *laxa* Hook. f., *FBI* 3: 89 (1880).

Habit : Shrub
Ecosystem preference : Moist deciduous, semi-evergreen forests, also in the plains
Distribution : Indo – Pacific
Endemism : Peninsular India
IUCN Category : Not Evaluated (NE)
Habitat : In forest floors near water sources and other wet regions
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : September - March
Altitude preference : Found in all altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Chottuppara, 10°52'37.92"N, 76°41'39.84" E, 346m, 14 May 2019, Aswani & Maya, 3915 (GVCH); S - Medu, 10°50'26.52"N, 76°50'04.56"E, 214m, 23 June 2019, Aswani & Maya, 4046 (GVCH); Jamanthimala,10°51'53.64"N,76°47'16.80" E, 586m, 01 July 2019, Aswani & Maya, 4163 (GVCH); Akamalavaram - Pettikallu, 10°52'48"N, 76°42'7.2"E, 594m, 19 June 2019, Aswani & Maya, 4273 (GVCH).

Neonauclea Merr., *J. Wash. Acad. Sci.* 5(no. 15): 538 (1915)

Neonauclea purpurea (Roxb.) Merr., *Interpr. Herb. Amboin*. 483 (1917); Gamble, *Fl. Madras* 584 (1921); *Nauclea purpurea* Roxb., Hook. f., *FBI* 3: 26 (1880).

Basionym : *Nauclea purpurea Roxb*., *Pl. Coromandel* 1(3): 41, t. 54 (1796).

Habit : Tree
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
Endemism : Peninsular India
IUCN Category : Not Evaluated (NE)
Habitat : Riverbanks in forests
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : December - May
Altitude preference : Found in lower and medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Aduppukootimala, 10°49'38.80"N, 76°44'16.08"E, 140m, 16 February 2021, Aswani & Maya, 6425 (GVCH).

Nostolachma T. Durand, *Index Gen. Phan.* 182 (1888)

Nostolachma crassifolia (Gamble) Deb & J. Lahiri, *Bull. Bot. Surv. India* 17(1-4): 162 (1978); *Coffea crassifolia* Gamble, Gamble, *Fl. Madras* 637 (1921).

Habit : Shrub
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
Endemism : Western Ghats
IUCN Category : Endangered
Habitat : Understorey of forest floors
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : January - October
Altitude preference : Found very rarely in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Akamalavaram - Pettikallu, 10°53'2.04"N, 76°42'13.92"E, 539m, 19 July 2019, Aswani & Maya, 4371 (GVCH).

Oldenlandia L., *Sp. Pl.* 1: 119 (1753)

Key to species

1. Corolla blue.……..…..…..*O. hygrophila*
- Corolla white or pinkish…….…….....2
2.Erect herbs; flowers solitary or 2 - nate…….……...……..*O. herbacea*
- Diffuse herbs; flowers in cymes…..…....3
3. Stamens exerted…….....….*O. umbellata*
- Stamens included……..…*O. corymbosa*

Oldenlandia corymbosa L., *Sp. Pl.* 1: 119 (1753); Hook. f., *FBI* 3: 64 (1880); Gamble, *Fl. Madras* 600 (1921); Vajr., *Fl. Palghat Dist* 239 (1990); *Hedyotis corymbosa* (L.) Lam., Sasidh., *Fl. Parambikulam WLS* 150 (2002).

Habit : Herb
Ecosystem preference : Degraded forest areas and in the plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : In wet regions of forests, hillocks, other marshes
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : April - September
Altitude preference : Found in all altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Vedivachapara,10°50'12.34"N,76°40'41.15 "E, 109m, 04 June 2017, Aswani & Maya, 61(GVCH);Koomachimala,10°49'44.76"N, 76°40'34.59"E. 102m, 31 July 2017, Aswani & Maya, 394 (GVCH); Kozhimala, 10°50'01.89"N, 76°42'58.61"E, 105m, 09 November 2017, Aswani & Maya, 810 (GVCH); Kallanpuzha, 10°51'34.02"N,76°42'40.16"E, 140m, 26 January 2018, Aswani & Maya, 1362 (GVCH); Mayyappallam, 10°48'06.93"N, 76°46'25.09"E, 135m, 10 May 2018, Aswani & Maya, 2090 (GVCH) **(Plate 66: Fig. e)**.

Oldenlandia herbacea (L.) Roxb., *Hort. Bengal.* 11, *adnot*. 11 (1814); Gamble, *Fl. Madras* 601 (1921); Vajr., *Fl. Palghat Dist* 240 (1990); *Hedyotis herbacea* L., Sasidh., *Fl. Parambikulam WLS* 150 (2002); *Oldenlandia heynei* R. Br. ex G. Don, Hook. f., *FBI* 3: 65 (1880).

Basionym: *Hedyotis herbacea* L. in *Sp. Pl*.: 102 (1753).

Habit : Herb
Ecosystem preference : Moist deciduous forests and in the plains
Distribution : Indo - Pacific, Holarctic and African
IUCN Category : Not Evaluated (NE)
Habitat : In the outskirts of hillocks and forest tracks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : July - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Neelippara, 10°51'47.52"N, 76°37'37.38"E, 312m, 15 September 2017, Aswani & Maya, 558 (GVCH); Pallippara, 10°49'49.08"N, 76°43'47.28"E, 120m, 29 October 2017, Aswani & Maya, 727 (GVCH);Koyamarakaadu, 10°47'40.58"N, 76°45'27.05"E, 139m, 06 September 2018, Aswani & Maya, 2722 (GVCH); Cheekuzhi - Edamala, 10°50'11.04"N, 76°38'57.48"E, 114m, 16 October 2019, Aswani & Maya, 4757 (GVCH) **(Plate 66: Fig. f)**.

Oldenlandia hygrophila Bremek., *Kew Bull*. 29(2): 359 (1974); Sasidh. & Sivar., *Fl. Pl. Thrissur For.* 221 (1996); Dutta & Deb, *Taxon. Rev. Hedyotis* 140 (2004); Sasidh., *Biodiv. Doc. Kerala- Fl. Pl.* 215 (2004); Aswani *et al*., *Journ. of Threatened Taxa* 15400 (2020).

Habit : Herb

Ecosystem preference : Open grasslands
Distribution : Indo - Pacific
Endemism : Southern Western Ghats (Kerala)
IUCN Category : Not Evaluated (NE)
Habitat : Ephemeral flush vegetation in hillocks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : August - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala,10°49'44.76"N,76°40'36.16 "E, 100m, 31 July 2017,Aswani & Maya, 380 (GVCH); Neelippara, 10°51'47.52"N, 76°37'37.38"E, 312m, 15 September 2017, Aswani & Maya, 543(GVCH); Koomachimala,10°49'44.76"N,76°40'36.16 "E, 100m, 17 July 2018, Aswani & Maya, 2608 (GVCH); Thekke Malampuzha, 10°50'02.52"N, 76°40'58.49"E, 120m, 08 July 2019, Aswani & Maya, 4173 (GVCH).

Oldenlandia umbellata L., *Sp. Pl*. 1: 119 (1753); Hook. f., *FBI* 3: 66 (1880); Gamble, *Fl. Madras* 601 (1921); Vajr., *Fl. Palghat Dist* 240 (1990); *Oldenlandia wightii* Hook.f., *FBI* 3: 66 (1880); Gamble, *Fl. Madras* 601 (1921).

Habit : Herb
Ecosystem preference : Moist deciduous forests and in the plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In moist regions in plains
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : November - March
Altitude preference : Found very rarely in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Walayar Dam, 10°50'15.57"N , 76°51'5.13"E , 190m, 09 May 2018, Aswani & Maya, 1975 (GVCH) **(Plate 66: Fig. g)**.

Ophiorrhiza L., *Sp. Pl*. 1: 150 (1753)

Key to species

Decumbent herbs leaf apex acute , flower pink……..*O. rugosa* var. *decumbens*
Erect herbs leaf apex acuminate flowers white with pink shade……...*O. mungos*

Ophiorrhiza mungos L., *Sp. Pl*. 1: 150 (1753); Hook. f., *FBI* 3: 77 (1880); Gamble, *Fl. Madras* 607 (1921); Vajr., *Fl. Palghat Dist* 241 (1990); Sasidh., *Fl. Parambikulam WLS* 157 (2002).

Habit : Herb
Ecosystem preference : Semi-evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Understorey of forest floors
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : August - October
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Akamalavaram - Pettikallu, 10°51'59.76"N, 76°42'26.64"E, 213m, 19 July 2019, Aswani & Maya, 4313 (GVCH) **(Plate 66: Fig. h).**

Ophiorrhiza rugosa var. ***decumbens*** **(**Gardner ex Thwaites) Deb & Mondal, *Bull. Bot. Surv. India* 24(1-4): 228 (1983); *Ophiorrhiza harrisiana* Heyne var. *decumbens* (Gard. ex Thw.) Hook. f., *FBI* 3: 78 (1880).

Basionym: *Ophiorrhiza decumbens Gardner* ex Thwaites, *Enum. Pl. Zeyl. [Thwaites]* 419 (1864).

Habit : Herb
Ecosystem preference : Semi-evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Understorey of forest floors
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : June - October
Altitude preference : Found in medium altitudes
Specimen examined: INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala, 10°51'53.64"N, 76°47'16.80"E, 586m, 23 June 2019, Aswani & Maya, 4121 (GVCH).

Oxyceros Lour., *Fl. Cochinch.* 1: 96, 150-151 (1790)

Oxyceros rugulosus (Thwaites) Tirveng., *Nordic J. Bot.* 3(4): 466 (1983); Sasidh., *Fl. Parambikulam WLS* 158 (2002); *Randia rugulosa* (Thw.) Hook.f., *FBI* 3: 113 (1880); Gamble, *Fl. Madras* 617 (1921).

Habit : Climber
Ecosystem preference : Semi-evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Climber in canopy rich forest floors
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : February - April
Altitude preference : Found in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Aatumala Thodu, 10°53'24"N, 76°41'24"E, 1064m, 28 February 2020, Aswani & Maya, 6154 (GVCH) **(Plate 67: Fig. a)**.

Pavetta L., *Sp. Pl*. 1: 110 (1753)

Key to species

Stem glabrous; leaves narrowly oblanceolate; calyx puberulous.……... ……..……*P. zeylanica*
Stem pubescent; leaves elliptic - lanceolate; calyx grey villous……..*P. hispidula*

Pavetta hispidula Wight & Arn., *Prodr. Fl. Ind. Orient*. 1: 431 (1834); Hook. f., *FBI* 3: 151 (1880); Gamble, *Fl. Madras* 633 (1921); Vajr., *Fl. Palghat Dist* 241 (1990); Sasidh., *Fl. Parambikulam WLS* 158 (2002).

Habit : Shrub
Ecosystem preference : Moist deciduous forests and semi - evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Understorey of forest floors
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Rare
Phenology : March - December
Altitude preference : Found rarely in medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Akamalavaram - Chaatappara waterfalls, 10°53'11.76"N, 76°42'15.84"E, 600m, 10 December 2019, Aswani & Maya, 5504 (GVCH); Thanniplace, 10°52'20.64"N, 76°46'27.12"E, 848m, 28 January 2020, Aswani & Maya, 6030 (GVCH) **(Plate 67: Fig. b).**

Pavetta zeylanica Gamble, *Fl. Madras* 633 (1921); *Pavetta hispidula* Wight & Arn. var. *zeylanica* Hook. f., *FBI* 3: 151 (1880); *Pavetta calophylla* Bremek., Gamble, *Fl. Madras* 1878 (1936); Sasidh., *Fl. Parambikulam WLS* 158 (2002).

Habit : Shrub
Ecosystem preference : Semi - evergreen forests

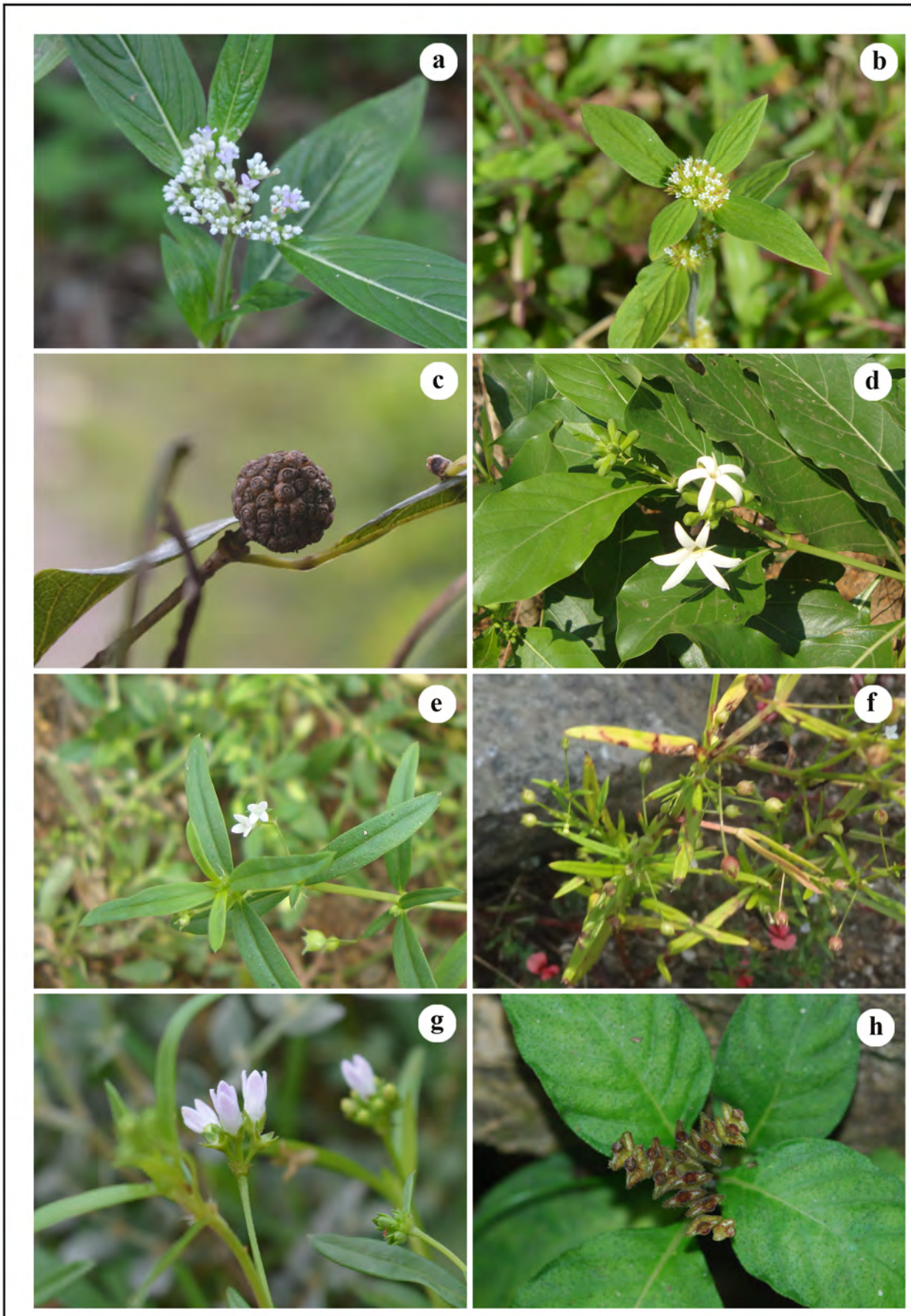

Plate 66: Fig. a. *Knoxia sumatrensis (*Retz.) DC. **b.** *Mitracarpus hirtus* (L.) DC. **c.** *Mitragyna parvifolia* Korth. **d.** *Morinda coreia* Buch.-Ham. **e.** *Oldenlandia corymbosa* L. **f.** *Oldenlandia herbacea* (L.) Roxb. **g.** *Oldenlandia umbellata* L. **h.** *Ophiorrhiza mungos* L.

Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Understorey in canopy rich forest floors
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Rare
Phenology : August - March
Altitude preference : Found in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kundanmala, 10°53'39.12"N , 76°41'47.20"E, 1011m, 27 February 2020, Aswani & Maya, 6131 (GVCH) **(Plate 67: Fig. c)**.

Scleromitrion (Wight & Arn.) Meisn., *Pl. Vasc. Gen. [Meisner]* 5(*Tab. Diagn*.): 160 (1838)

Scleromitrion diffusum (Willd.) R.J.Wang, *J. Trop. Subtrop. Bot.* 22(5): 440 (2014); *Oldenlandia diffusa* (Willd.) Roxb., Hook. f., *FBI* 3: 65 (1880); Gamble, *Fl. Madras* 601 (1921); *Hedyotis brachypoda* (DC.) Sivar. & Biju, Sasidh., *Fl. Parambikulam WLS* 149 (2002).

Basionym : *Hedyotis diffusa* Willd., *Sp. Pl., ed. 4 [Willdenow]* 1(2): 566 (1798).

Habit : Herb
Ecosystem preference : Degraded forests, Wastelands and in other wet regions
Distribution : Indo - Pacific, Holarctic and South American
IUCN Category : Not Evaluated (NE)
Habitat : In wet regions in forests as well as in plains
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : August - November
Altitude preference : Found very rarely in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Ahaliya campus, 10°47'43.08"N, 76°50'5.43"E, 150m, 24 September 2020, Aswani & Maya, 6332 (GVCH) **(Plate 67: Fig. d).**

Spermacoce L., *Sp. Pl*. 1: 102 (1753)

Key to species

1. Stem glabrous……..…….…….S. *pusilla*
- Stem hairy……..……..……..2
2. Erect herbs……..3
- Diffuse herbs.…...…..……..4
3. Calyx lobes; capsule truncate …….……..……..S. *ocymoides*
- Calyx lobes 2-4; capsule globose interposed with bristles ……S. *lasiocarpa*
4. Lateral nerves prominent; stem winged…...……..……S. *latifolia*
- Lateral nerves visible; stem angled; but never winged……...……..…….5
5. Corolla tubes much longer than lobes; stem greenish brown- appressed hairs; capsule globose …….....S. *articularis*
- Corolla tubes not much longer; stem blush- hispid; capsule sub-globose…….…….....…S. *hispida*

Spermacoce articularis L. f., Suppl. Pl. 119 (1782); Sasidh., *Fl. Parambikulam WLS* 162 (2002); *Borreria articularis* (L.f.) F.N. Will., Vajr., *Fl. Palghat Dist* 227 (1990); *Spermacoce hispida* Hook.f., *FBI* 3: 200 (1881).

Habit : Herb
Ecosystem preference : Moist deciduous forests and in the plains
Distribution : Indo - Pacific, Holarctic and African
IUCN Category : Not Evaluated (NE)
Habitat : In wet regions
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : October - December
Altitude preference : Found very rarely in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range,

Anakundu, 10°49'53.76"N, 76°46'14.88"E, 161m, 27 March 2023, Aswani & Maya, 6562 (GVCH).

Spermacoce hispida L., *Sp. Pl*. 1: 102 (1753); *Borreria hispida* (L.) K. Schum., Hook.f., *FBI* 3: 200 (1881); Gamble, *Fl. Madras* 654 (1921).

Habit : Herb
Ecosystem preference : Moist deciduous forests and in plains
Distribution : Indo - Pacific
Endemism : Peninsular India
IUCN Category : Not Evaluated (NE)
Habitat : Found in the outskirts of hillocks, river banks, sandy plains and in other moist areas
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : May - August
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Pallippara, 10°49'49.08"N , 76°43'47.28"E, 120m, 29 October 2017, Aswani & Maya, 703 (GVCH); Mayyappallam, 10°48'0.36"N, 76°45'58.68"E, 114m, 10 May 2018, Aswani & Maya, 2095 (GVCH); Ayyappan Mala, 10°48'59.96"N, 76°45'22.61"E, 132m, 26 June 2018, Aswani & Maya, 2472 (GVCH); Koyamarakaadu,10°47'44.88"N,76°45'38.52"E, 111m, 06 September 2018, Aswani & Maya, 2706 (GVCH); Cheekuzhi, 10°50'11.04"N, 76°38'57.48"E, 114m, 16 October 2019, Aswani & Maya, 4761 (GVCH).

Spermacoce lasiocarpa R.Br., *Numer. List [Wallich] n.* 832 (1829); *Spermacoce stricta* auct., Hook.f., *FBI* 2: 200 (1881); *Spermacoce ramanii* Sivar. & R.V. Nair, Manilal, *Fl. Silent Valley* 144 (1988); Babu, *Fl. Malappuram Dist* 352 (1990).

Habit : Herb
Ecosystem preference : Grasslands
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Open grassy areas in hillocks and in main hills
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : October - November
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Olappalam, 10°49'52.20"N, 76°43'44.19"E, 121m, 23 November 2019, Aswani & Maya, 5078 (GVCH); Kongampaadam, 10°48'36.81"N, 76°46'43.06"E, 153m, 30 November 2019, Aswani & Maya, 5281 (GVCH) **(Plate 67: Fig. e).**

Spermacoce latifolia Aubl., *Hist. Pl. Guiane* 1: 55, t. 19 (1775); Sasidh., *Fl. Parambikulam WLS* 162 (2002).

Habit : Herb
Ecosystem preference : Moist deciduous forests and in other waste lands
Distribution : Indo - Pacific, Holarctic, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : In degraded forests and in open forest tracks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : August - October
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kozhimala, 10°50'04.17"N, 76°43'23.82"E, 207m, 09 November 2017, Aswani & Maya, 797 (GVCH); Pallakaadu, 10°51'30.96"N, 76°37'39.00"E, 151m, 09 October 2018, Aswani & Maya, 3029 (GVCH); Pazhampullikaadu, 10°50'09.55"N, 76°38'28.33"E, 89m, 16 October 2018, Aswani & Maya, 3158(GVCH); Cheekuzhi - Edamala,

10°50'11.04"N, 76°38'57.48"E, 114m, 16 October 2019, Aswani & Maya, 4762(GVCH).

Spermacoce ocymoides Burm. f., *Fl. Ind. (N. L. Burman)* 34 (1768); Hook. f., *FBI* 3: 200 (1881); *Borreria ocymoides* (Burm.f.) DC., Gamble, *Fl. Madras* 654 (1921); Vajr., *Fl. Palghat Dist* 228 (1990).

Habit : Herb
Ecosystem preference Deciduous forests
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : In hillocks and in open forest tracks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Found in lower altitudes
Phenology : November - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Neelippara, 10°51'47.52"N, 76°37'37.38" E, 312m, 15 September 2017, Aswani & Maya, 579 (GVCH); Pallippara, 10°49'49.08"N, 76°43'47.28"E, 120m, 29 October 2017, Aswani & Maya, 754 (GVCH); Ahaliya campus, 10°47'37.00"N, 76°49'33.40"E, 156m, 24 September 2020, Aswani & Maya, 6334 (GVCH) **(Plate 67: Fig. f).**

Spermacoce pusilla Wall., *Fl. Ind. (Carey & Wallich ed.)* 1: 379 (1820); *Borreria pusilla* (Wall.) DC., Vajr., *Fl. Palghat Dist* 228 (1990).

Habit : Herb
Ecosystem preference : Moist deciduous forests, grasslands and in plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In open forests and in grasslands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : October - November
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala, 10°49'44.76"N, 76°40'30.72"E, 108m, 05 October 2017, Aswani & Maya, 630 (GVCH); Pazhampullikaadu, 10°50'09.55"N, 76°38'28.33"E, 89m, 16 October 2018, Aswani & Maya, 3169 (GVCH) **(Plate 67: Fig. g).**

Wendlandia Bartl. ex DC., *Prodr. [A. P. de Candolle]* 4: 411 (1830)

Wendlandia thyrsoidea Steud., *Nomencl. Bot. [Steudel], ed.* 2. ii. 786; Vajr., *Fl. Palghat Dist* 244 (1990); Sasidh., *Fl. Parambikulam WLS* 163 (2002); *Wendlandia notoniana* Wall. ex Wight & Arn., Hook. f., *FBI* 3: 40 (1880); Gamble, *Fl. Madras* 588 (1921).

Habit : Tree
Ecosystem preference : Grasslands
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Open rocky grasslands
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : December - April
Altitude preference : Found in higher altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala, 10°52'20.64"N, 76°46'57.00"E, 863m, 09 January 2020, Aswani & Maya, 5755 (GVCH); Thanniplace, 10°52'20.64"N, 76°46'27.12"E, 848m, 28 January 2020, Aswani & Maya, 6039 (GVCH); Kundanmala, 10°53'33.48" N, 76°41'52.76"E, 943m, 28 February 2020, Aswani & Maya, 6116 (GVCH); Aatumala Thodu, 10°53'52.08"N, 76°41'24"E, 1010m, 28 February 2020, Aswani & Maya, 6140 (GVCH) **(Plate 67: Fig. h)**.

Gentianaceae

Key to genera

1. Corolla base with 1 - 2 glandular nectaries…..……..…..….*Swertia*
- Corolla base devoid of any nectaries……..…..….2
2. Stigma 2 - lobed; flowers creamy - white……..…..*Hoppea*
- Stigma deeply 2 - lobed; flowers pink or white…….……*Canscora*

Canscora Lam., *Encycl. [J. Lamarck & al.*] 1(2): 601 (-602) (1785)

Key to species

1. Calyx wingless..……..…..*C. diffusa*
- Calyx winged…..……...…2
2. Bracts perfoliate in branches……..…….*C. perfoliata*
- Bracts not perfoliate in branches……..……*C. pauciflora*

Canscora diffusa (Vahl) R.Br. ex Roem. & Schult., *Syst. Veg., ed*. 15 *bis [Roemer & Schultes]* 3: 301 (1818); Hook. f., *FBI* 4: 103 (1883); Gamble, *Fl. Madras* 878 (1923); Vajr., *Fl. Palghat Dist* 298 (1990); Sasidh., *Fl. Parambikulam WLS* 199 (2002); *Canscora decurrens* Dalz., Gamble, *Fl. Madras* 878 (1923); Vajr., *Fl. Palghat Dist* 298 (1990).

Basionym : *Gentiana diffusa* Vahl, *Symb. Bot. (Vahl)* 3: 47 (1794).

Habit : Herb
Ecosystem preference : Moist deciduous forests and in grasslands
Distribution : Indo - Pacific, Holarctic, African and Australian
IUCN Category : Not Evaluated (NE)
Habitat : Ephemeral flush vegetation in hillocks and in open grasslands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : October - January
Altitude preference : Found in all altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, G. P. Nair estate, 10°53'40.83"N , 76°39'43.16"E, 230m, 24 March 2018, Aswani & Maya, 1744 (GVCH); Pazhampullikaadu, 10°50'09.55"N, 76°38'28.33"E, 89m, 16 October 2018, Aswani & Maya, 3170 (GVCH); Akamalavaram - Thakaramada, 10°52'05.16"N, 76°42'41.22"E, 206m, 30 November 2018, Aswani & Maya, 3230 (GVCH); Kongampaadam, 10°48'36.72"N , 76°46'51.96"E, 151m, 06 September 2019, Aswani & Maya, 4628 (GVCH); Anayappanchalla, 10°48'24.95"N, 76°48'32.77"E, 150m, 30 November 2019, Aswani & Maya, 5156 (GVCH) **(Plate 68: Fig. a)**.

Canscora pauciflora Dalzell, *Hooker's J. Bot. Kew Gard. Misc.* 2: 136 (1850); Hook. f., *FBI* 4: 103 (1883); Gamble, *Fl. Madras* 878 (1923).

Habit : Herb
Ecosystem preference : Grasslands
Distribution : Evergreen forests
Endemism : Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : In open grasslands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : October - November
Altitude preference : Found in all altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kozhimala, 10°50'06.45"N , 76°43'38.99"E, 188m, 09 November 2017, Aswani & Maya, 830 (GVCH); Jamanthimala,10°52'20.64"N, 76°46'57.00"E, 863m, 09 January 2020, Aswani & Maya, 5767 (GVCH).

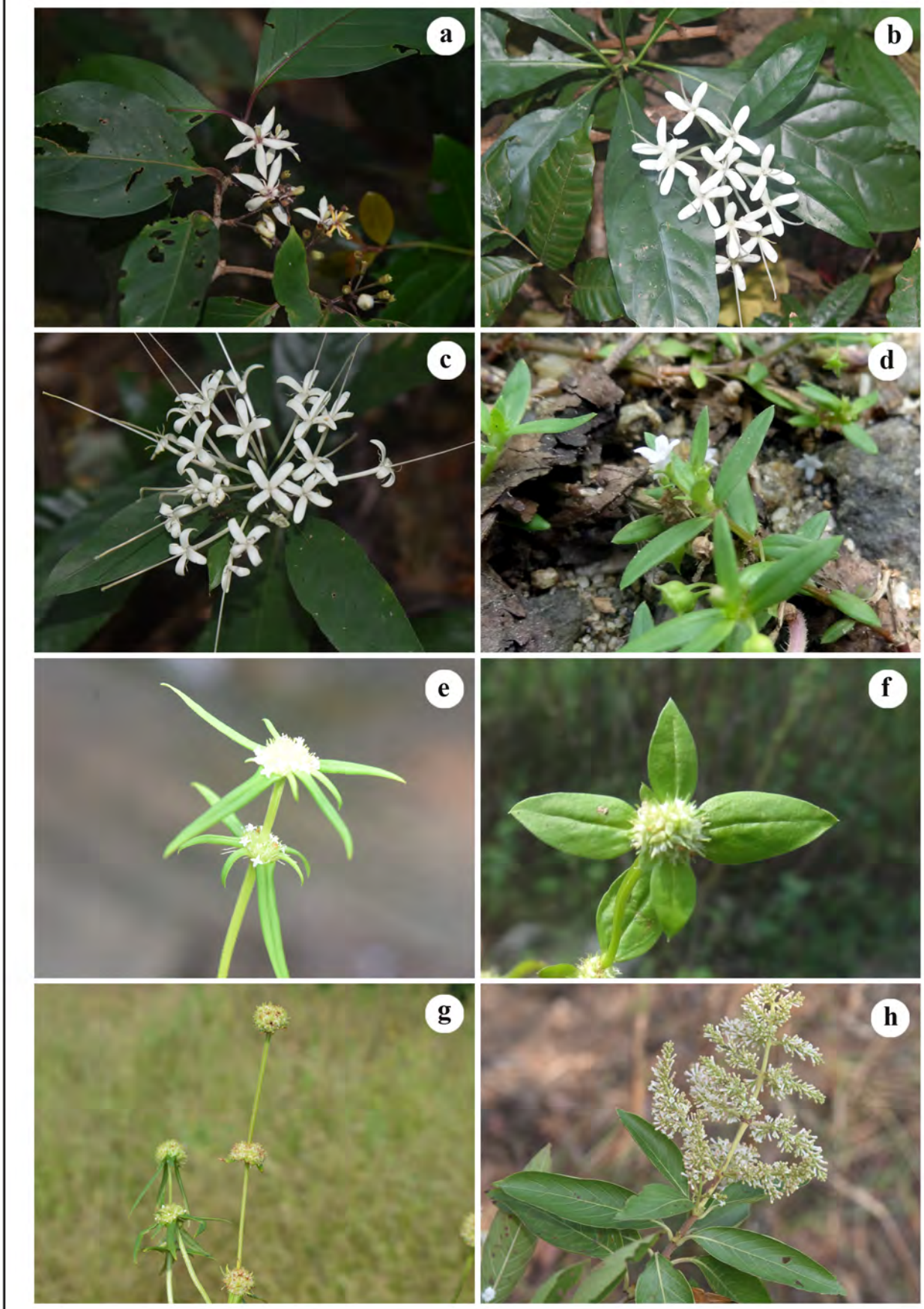

Plate 67: Fig. a. *Oxyceros rugulosus* (Thwaites) Tirveng. **b.** *Pavetta hispidula* Wight & Arn. **c.** *Pavetta zeylanica* Gamble **d.** *Scleromitrion diffusum* (Willd.) R.J.Wang **e.** *Spermacoce lasiocarpa* R.Br. **f.** *Spermacoce ocymoides* Burm.f. **g.** *Spermacoce pusilla* Wall. **h.** *Wendlandia thyrsoidea* Steud.

Canscora perfoliata Lam., *Encycl. [J. Lamarck & al.]* 1(2): 601 (1785); Hook. f., *FBI* 4: 1094 (1884); Gamble, *Fl. Madras* 879 (1923); Vajr., *Fl. Palghat Dist* 298 (1990); Sasidh., *Fl. Parambikulam WLS* 200 (2002).

Habit : Herb
Ecosystem preference : Grasslands
Distribution : Indo - Pacific
Endemism : Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Found in open grasslands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : November - February
Altitude preference : Found in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala, 10°52'17.83"N, 76°46'42.12"E, 909m, 09 January 2020, Aswani & Maya, 5758 (GVCH) **(Plate 68: Fig. b)**.

Hoppea Willd., *Neue Schriften Ges. Naturf. Freunde Berlin* 3: 434 (1801)

Hoppea fastigiata (Griseb.) C.B.Clarke in Hook.f., *FBI* [J. D. Hooker] 4(10): 100 (1883); Gamble, *Fl. Madras* 877 (1923); Vajr., *Fl. Palghat Dist* 300 (1990); Sasidh., *Fl. Parambikulam WLS* 201 (2002).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Ephemeral flush vegetation in hillocks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : September - October
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala,10°49'39.72"N,76°40'28.20 "E, 184m, 17 September 2017, Aswani & Maya, 609 (GVCH); Pallippara, 10°49'49.08"N, 76°43'47.28"E, 120m, 29 October 2017, Aswani & Maya, 748 (GVCH); Ollappallam, 10°49'53.04"N, 76°43'41.52"E, 127m, 25 November 2017, Aswani & Maya, 962 (GVCH); Pallakaadu, 10°51'30.96"N, 76°37'39.00"E, 151m, 09 October 2018, Aswani & Maya, 3076 (GVCH) **(Plate 68: Fig. c)**.

Swertia L., *Sp. Pl.* 1: 226 (1753)

Swertia corymbosa (Griseb.) Wight ex C. B. Clarke*, FBI [J. D. Hooker]* 4(10): 126 (1883); Gamble, *Fl. Madras* 881 (1923).

Basionym: *Ophelia corymbose Griseb*., *Gen. Sp. Gent.* 317 (1838).

Habit : Herb
Ecosystem preference : Grasslands
Distribution : Indo - Pacific
Endemism : Peninsular India
IUCN Category : Not Evaluated (NE)
Habitat : Open rocky grassy patches
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : October - December
Altitude preference : Found in higher altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala,10°52'21.00"N,76°47'00.24" E, 848m, 09 January 2020, Aswani & Maya, 5749 (GVCH); Way to Jamanthimala,10°52'18.19"N,76°46'47.13" E, 922m, 29 January 2020, Aswani & Maya, 6042 (GVCH).

Loganiaceae

Key to genera

1. Plants are trees……..*Strychnos*
- Plants are herbs……..……..…..2
2. Flowers pentamerous…..…*Mitreola*
- Flowers tetramerous…..*Mitrasacme*

Mitrasacme Labill., *Nov. Holl. Pl.* 1: 35, t. 49 (1805)

Mitrasacme prolifera R.Br., *Prodr. Fl. Nov. Holland.* 453. (1810); *Mitrasacme indica* Wight, Sasidh., *Fl. Parambikulam WLS* 198 (2002); *Mitrasacme alsinoides* R. Br., Hook.f., *FBI* 4: 80 (1883); Gamble, *Fl. Madras* 864 (1923).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific, Holarctic and Australian
IUCN Category : Not Evaluated (NE)
Habitat : In open grassy patches in hillocks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : September - October
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala,10°49'44.76"N,76°40'30.72 "E, 108m, 12 August 2017, Aswani & Maya, 401 (GVCH); Ollappallam, 10°49'53.04"N,76°43'41.52"E, 127m, 25 November 2017, Aswani & Maya, 1009 (GVCH); Malampuzha Dam - Kava, 10°50'29.74"N, 76°42'1.65"E, 105m, 06 April 2018, Aswani & Maya, 1861 (GVCH); Kongampaadam, 10°48'36.72"N, 76°46'51.96"E, 151m, 06 September 2019, Aswani & Maya, 4641 (GVCH) **(Plate 68: Fig. d)**.

Mitreola L., *Opera Var*. 214 (1758)

Mitreola petiolata **(**J. F. Gmel.) Torr. & A.Gray, *Fl. N. Amer. (Torr. & A. Gray)* 2(1): 45 (1841); *Mitreola oldenlandioides* G. Don, Hook. f., *FBI* 4:79 (1883); Gamble, *Fl. Madras* 863 (1923).

Basionym : *Cynoctonum petiolatum* J. F. Gmel., *Syst. Nat., ed. 13[bis]*. 2(1): 443 (1791).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : In rocky open forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : October - December
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kozhimala, 10°50'04.17"N, 76°43'23.82"E, 207m, 09 November 2017, Aswani & Maya, 805 (GVCH).

Strychnos L., *Sp. Pl.* 1: 189 (1753)

Key to species

1. Habit of plants are climbers……..…..*S. wallichiana*
- Habit of plants are trees……..……..…..…2
2. Bark rough with deep and narrow vertical cracks, brownish - black; corolla tube equal to the lobes…..……..…..…..*S. potatorum*
- Bark smooth, lenticellate, blackish - grey; corolla tubes longer than the lobes……..…….*S. nux - vomica*

Strychnos nux-vomica L., *Sp. Pl*. 1: 189 (1753); Hook. f., *FBI* 4: 90 (1883); Gamble, *Fl. Madras* 868 (1923); Vajr., *Fl. Palghat Dist* 296 (1990); Sasidh., *Fl. Parambikulam WLS* 199 (2002).

Habit : Tree
Ecosystem preference : Moist deciduous forests and in the plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)

Habitat : In forest floors and in plains
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : March - December
Altitude preference : Found commonly in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Neelippara, 10°51'47.52"N, 76°37'37.38"E, 312m, 15 September 2017, Aswani & Maya, 554 (GVCH); Moochikadavu, 10°52'13.80"N, 76°42'30.96"E, 258m, 10 March 2018, Aswani & Maya, 1465 (GVCH); Malampuzha - Kava, 10°50'36.42"N, 76°43'31.74"E, 109m, 06 April 2018, Aswani & Maya, 1870 (GVCH); Ayyappan Mala,10°49'06.39"N, 76°44'39.99"E, 217m, 07 March 2019, Aswani & Maya, 3758 (GVCH).

Strychnos potatorum L.f., Suppl. Pl. 148 (1782); Hook. f., *FBI* 4: 90 (1883); Gamble, *Fl. Madras* 868 (1923); Vajr., *Fl. Palghat Dist* 296 (1990); Sasidh., *Fl. Parambikulam WLS* 199 (2002).

Habit : Tree
Ecosystem preference : Moist deciduous forests and scrub jungles
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In hillocks and in forest margins
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : March - May
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kongampaadam,10°48'36.72"N,76°46'51.96"E, 151m, 15 June 2018, Aswani & Maya, 2335 (GVCH); Mangalathumchalla, 10°49'04.76"N, 76°48'17.12"E, 147m, 18 September 2018, Aswani & Maya, 2764 (GVCH);Aduppukootimala,10°49'59.16"N, 76°44'31.56"E, 298m, 16 February 2021, Aswani & Maya, 6393 (GVCH) **(Plate 68: Fig. e)**.

Strychnos wallichiana Steud. ex A. DC., *Prodr. [A. P. de Candolle]* 9: 13 (1845); Vajr., *Fl. Palghat Dist* 296 (1990); *Strychnos rheedei* Clarke, Hook. f., *FBI* 4: 87 (1883); *Strychnos cinnamomifolia* Thw., Gamble, *Fl. Madras* 869 (1923); *Strychnos colubrina* L., Hook. f., *FBI* 4: 87 (1883); Gamble, *Fl. Madras* 868 (1923); Sasidh., *Fl. Parambikulam WLS* 199 (2002).

Habit : Climber
Ecosystem preference :Semi-evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In forest floors
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : February - July
Altitude preference : Found rarely in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Parachaathy, 10°50'54.24"N, 76°43 '55.92" E, 159m, 02 January 2019, Aswani & Maya, 3600 (GVCH).

Apocynaceae

Key to genera

1. Flowers with only sepals and petals; pollen grains not cohering in masses……..……...…....2
- Flowers with corona; pollen grains coherent in masses……..……..16
2. Anthers connivent together to form a cone which is coherent to stigma……...…..…3
- Anthers free or not coherent to stigma……...….8
3. Habit of plants are either shrubs or trees……..…….....4
- Habit climbers……..……..5
4. Anthers included...…..…..….*Nerium*
- Anthers exerted……....*Wrightia*

5. Anthers exerted……..…*Gymnema*
- Anthers included……..……...6
6. Calyx e - glandular…...*Anodendron*
- Calyx glandular……..……....7
7. Flowers medium sized; corolla tubes bearded behind the anthers only; calyx lobes divided near to the base……..*Aganosma*
- Flowers small sized; corolla throat densely white villous; calyx lobes with not divided to the base……..…….*Ichnocarpus*
8. Ovary 2 - celled with fused carpels……..…....*Carissa*
- Ovary 2 - celled with 2 distinct carpels……..……...9
9. Calyx glandular inside…….....…10
- Calyx e - glandular…….…….…12
10. Leaves opposite; blades broader……..……11
- Leaves alternate; blades narrow - linear……..……..*Cascabela*
11. Fruits many seeded; leaves ovate - lanceolate; petioles pubescent…...……..…..*Holarrhena*
- Fruits few seeded; leaves elliptic - oblong; petioles glabrous ……....*Tabernaemontana*
12. Leaves alternate……...…..*Plumeria*
- Leaves opposite or whorled…….....13
13. Flowers axillary, solitary or paired…..……..….*Catharanthus*
- Flowers in corymbose cymes or umbels……..……....14
14. Phyllotaxy is opposite…....*Hunteria*
- Phyllotaxy is whorled…….....…..15
15. Habit are shrubs; fruits are globose or ovoid capsule……..…..*Rauvolfia*
- Habit are trees; fruits - 2 follicular mericarp……..…....*Alstonia*
16. Pollen masses granular…..……17
- Pollen masses waxy……..……18
17. Corolla lobes imbricate in bud; leaves always opposite...*Cryptolepis*
- Corolla lobes valvate in bud; leaves opposite or whorled often variegated……..……...*Hemidesmus*
18. Habit herbs or shrubs……..….19
- Habit climbers.……..…..……..21
19. Stem fleshy, 4 - angled, leaves minute deciduous very early (leafless usually)…….*Boucerosia*
- Stem usually terete; leaves distinct……..……20
20. Flowers orange - red; habit are herbs……..…....*Asclepias*
- Flowers pale purplish - white or greenish white; Habit are shrubs…….…….....*Calotropis*
21. Pollen masses pendulous……..……...22
- Pollen masses erect or horizontal……..……....24
22. Follicles smooth, never echinate; corolla lobes triangular, ciliate at margins, pale pink with dark pink stripes…… ……..…….23
- Follicles softly echinate; corolla lobes ovate, densely villous on margins; creamy white; ……....…….*Pergularia*
23. Corolla lobes thin…….....*Oxystelma*
- Corolla lobes thick..……..*Cynanchum*

24.Style apex conical or convex.....…*Wattakaka*
- Style apex 5 - angled……...25

25.Waxy rim present on style apex ……..…..……..*Cosmostigma*
- Waxy rim absent on style apex……..……*Tylophora*

Aganosma G. Don, *Gen. Hist.* iv. 77 (1837)

Aganosma cymosa (Roxb.) G.Don, *Gen. Hist.* 4: 77 (1837); Hook. f., *FBI* 3: 663 (1882); Gamble, *Fl. Madras* 819 (1923); Vajr., *Fl. Palghat Dist* 277 (1990); Sasidh., *Fl. Parambikulam WLS* 186 (2002).

Basionym : *Echites cymosus* Roxb., *Hort. Bengal.* [84]; *Fl. Ind.* ii. 16.

Habit : Climber
Ecosystem preference : Semi- evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Climber in canopy rich forest floors
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : April - December
Altitude preference : Found in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Akamalavaram - Pettikkallu, 10°52'28.20"N, 76°42'38.52"E, 346m, 19 July 2019, Aswani & Maya, 4392 (GVCH).

Alstonia R.Br., *Asclepiadeae* 64 (1810), nom. cons.

Key to species

Flowers in umbellate cymes; habit - trees…..……..……..*A. scholaris*
Flowers in corymbose cymes; Habit - shrubs……..……..…..……..*A. venenata*

Alstonia scholaris (L.) R.Br., *Asclepiadeae* 65 (1810); Hook. f., *FBI* 3: 642 (1882); Gamble, *Fl. Madras* 810 (1923); Vajr., *Fl. Palghat Dist* 278 (1990); Sasidh., *Fl. Parambikulam WLS* 187 (2002).

Basionym : *Echites scholaris* L., *Mant. Pl.* 53 (1767).

Habit : Tree
Ecosystem preference : Moist deciduous forests and in the plains
Distribution : Indo - Pacific and Australian
IUCN Category : Least Concern (LC)
Habitat : Along road sides, hillocks and residential places
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : October - February
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kozhimala, 10°50'01.89"N, 76°42'58.61"E, 105m, 09 November 2017, Aswani & Maya, 765 (GVCH); Nadupathy colony, 10°51'27.72"N, 76°47'0.96"E, 546m, 17 February 2023, Aswani & Maya, 6533 (GVCH).

Alstonia venenata R.Br., *Asclepiadeae* 64 (1810); Hook. f., *FBI* 3: 642 (1882); Gamble, *Fl. Madras* 810 (1923); Vajr., *Fl. Palghat Dist* 278 (1990); Sasidh., *Fl. Parambikulam WLS* 187 (2002).

Habit : Shrub
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
Endemism : Peninsular India
IUCN Category : Not Evaluated (NE)
Habitat : In the valleys of semi - evergreen forests
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : February - August
Altitude preference : Found in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kundanmala, 10°53'39.12"N, 76°41'47.20"E, 1011m, 28 February 2020, Aswani & Maya, 6125 (GVCH).

Anodendron A.DC., *Prodr. [A. P. de Candolle]* 8: 443 (1844)

Anodendron parviflorum (Roxb.) I.M.Turner, *Webbia* 71(2): 227 (2016); *Anodendron paniculatum* (Roxb.) A.DC.; Hook. f., *FBI* 3: 668 (1882); Gamble, *Fl. Madras* 820 (1923); Vajr., *Fl. Palghat Dist*

279 (1990); *Anodendron rhinosporum* Thwaites; Vajr., Fl. Palghat Dist 279 (1990); Sasidh., *Fl. Parambikulam WLS* 187 (2002).
Basionym: *Echites parviflorus* Roxb., *Hort. Bengal*. 85; *Fl. Ind.* ii. 20.
Habit : Climber
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Climber in deciduous forests
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : February - October
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Akamalavaram - Pettikallu, 10°52'28.20"N, 76°42'38.52"E, 346m, 19 July 2019, Aswani & Maya, 4324 (GVCH); Chacolas estate, 10°51'16.20"N, 76°45'05.76"E, 286m, 02 August 2019, Aswani & Maya, 4538 (GVCH) **(Plate 68: Fig. f)**.

Asclepias L., *Sp. Pl*. 1: 214 (1753)

Asclepias curassavica L., *Sp. Pl*. 1: 215 (1753); Hook. f., *FBI* 4: 18 (1883); Gamble, *Fl. Madras* 833 (1923); Vajr., *Fl. Palghat Dist* 293 (1990); Sasidh., *Fl. Parambikulam WLS* 192 (2002).

Habit : Herb
Ecosystem preference : Grasslands, degraded forests and in wastelands
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Found as an escape to wild
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : February - November
Altitude preference : Found rarely in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Pothukunnu,10°53'21.84"N, 76°46'33.24"E, 969m, 28 January 2020, Aswani & Maya, 5977 (GVCH).

Boucerosia Wight & Arn., *Contrib. Bot. Ind.* 34 (1834)

Boucerosia umbellata Wight & Arn., *Contrib. Bot. Ind.* 34; Hook. f., *FBI* 4: 77 (1883); *Caralluma umbellata* Haw., Gamble, *Fl. Madras* 861 (1923); Sasidh., *Fl. Parambikulam WLS* 192 (2002).

Basionym : *Desmidorchis umbellata* (Wight & Arn.) Decne., *Ann. Sci. Nat., Bot. sér.* 2, 9: 266 (1838).

Habit : Herb
Ecosystem preference : Deciduous forests and scrub jungles
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In open rocks in forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : July - October
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kosavanidukku - Kaduvachal, 10°50'40.79"N, 76°39'53.08"E, 212m, 16 July 2017, Aswani & Maya, 286 (GVCH); Thekke malampuzha - Idamala, 10°50'01.23"N, 76°40'58.49"E, 127m, 05 October 201, Aswani & Maya, 676 (GVCH).

Calotropis R.Br., *Asclepiadeae* 28 (1810)

Key to species

Corolla pale lavender; corolla lobes spreading…..……..……. *C. gigantea*

Corolla pink or purple spotted; lobes erect……..……..*C. procera*

Calotropis gigantea (L.) W.T.Aiton, *Hort. Kew., ed.* 2 [W.T. Aiton] 2: 78 (1811); Hook. f., *FBI* 4: 17 (1883); Gamble, *Fl. Madras* 832 (1923); Vajr., *Fl. Palghat Dist* 285 (1990); Sasidh., *Fl. Parambikulam WLS* 192 (2002).

Basionym : *Asclepias gigantea* L., *Sp. Pl*. 1: 214 (1753).

Habit : Shrub
Ecosystem preference : In plains and wastelands
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : In outskirts of hillocks, roadsides and in other wastelands
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala,10°49'39.72"N,76°40'28.20"E, 184m, 20 June 2017, Aswani & Maya, 114 (GVCH); Ollappallam, 10°49'52.20"N, 76°43'44.19" E, 121m, 25 November 2017, Aswani & Maya, 909 (GVCH); Mayyappallam,10°48'0.36"N,76°45'58.68" E, 114m, 10 May 2018, Aswani & Maya, 2138 (GVCH); Vettumadavu, 10°52'44.72"N, 76°48'8.64"E, 456m, 28 January 2020, Aswani & Maya, 5888 (GVCH) **(Plate 68: Fig. g)**.

Calotropis procera (Aiton) W.T.Aiton, *Hort. Kew., ed. 2 [W.T. Aiton*] 2: 78 (1811); Hook. f., *FBI* 4: 17 (1883); Gamble, *Fl. Madras* 832 (1923).
Basionym: *Asclepias procera* Aiton in *Hort. Kew*. 1: 305 (1789).

Habit : Shrub
Ecosystem preference : In plains
Distribution : Indo - Pacific, Holarctic and African
IUCN Category : Least concern (LC)
Habitat : Along roadsides and in other wastelands
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Paampampallam,10°48'45.85"N,76°47'47.61"E, 166m, 27 March 2023, Aswani & Maya, 6579 (GVCH) **(Plate 68: Fig. h)**.

Carissa L., *Mant. Pl.* 7 (1767)

Carissa carandas L., *Mant. Pl.* 52 (1767); Hook. f., *FBI* 3:630 (1882); Gamble, *Fl. Madras* 804 (1923).

Habit : Shrub
Ecosystem preference : Deciduous forests and plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Margins of forests and in grown in home steads
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : January - June
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kadukkamkunnam,10°48'48.76"N,76°39'48.98"E, 107m, 23 March 2023, Aswani & Maya, 6572 (GVCH).

Carissa spinarum L., *Mant. Pl. Altera* 559 (1771); *Carissa inermis* Vahl, Hook. f., *FBI* 3: 631 (1882); Gamble, *Fl. Madras* 805 (1923); Vajr., *Fl. Palghat Dist* 279 (1990); Sasidh., *Fl. Parambikulam WLS* 187 (2002).

Habit : Climber

Ecosystem preference : Semi-evergreen forests
Distribution : Indo - Pacific
Endemism : Peninsular India
IUCN Category : Least Concern (LC)
Habitat : Climber in canopy rich forest floors
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : January - June
Altitude preference : Found in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Aatumala Adivaram, 10°53'24"N, 76°41'24"E, 1064m, 28 February 2020, Aswani & Maya, 6165 (GVCH).

Cascabela Raf., *Sylva Tellur.* 162 (1838)

Cascabela thevetia (L.) Lippold, *Feddes Repert.* 91: 52 (1980); *Thevetia neriifolia* Juss ex Steud., Gamble, *Fl. Madras* 821 (1923); *Thevetia peruviana* (Pers.) Merr., Vajr., *Fl. Palghat Dist* 284 (1990).

Basionym: *Cerbera thevetia* L. in *Sp. Pl.*: 209 (1753).

Habit : Shrub
Ecosystem preference : In plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Grown in bio-fences, outskirts of hillocks
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : Throughout the year
Altitude preference : Found commonly in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Ayyankulam, 10°48'10.29"N , 76°44'39.61"E, 116m, 06 January 2018, Aswani & Maya, 1195 (GVCH); Ayyappan Mala, 10°48'59.96"N, 76°45'22.61"E, 132m, 26 June 2018, Aswani & Maya, 2433 (GVCH); Pallippara, 10°49'49.08"N, 76°43'47.28"E, 120m, 23 November 2019, Aswani & Maya, 5039 (GVCH) **(Plate 69: Fig. a)**.

Catharanthus G. Don, *Gen. Hist.* 4(1): 95 (1837)

Key to species

Flowers small sized; follicles glabrous……..…. *C. pusillus*
Flowers larger; follicles puberulous……*C. roseus*

Catharanthus pusillus G. Don, *Gen. Hist.* iv. 95 (1836); Vajr., *Fl. Palghat Dist* 279 (1990); Sasidh., *Fl. Parambikulam WLS* 188 (2002); *Vinca pusilla* Murr, Hook. f., *FBI* 3: 640 (1882); *Lochnera pusilla* (Murr.) K. Schum., Gamble, *Fl. Madras* 809 (1923).

Habit : Herb
Ecosystem preference : In plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In hillock systems and degraded forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : April - October
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kava, 10°50'48.62"N, 76°41'6.62"E, 113m, 06 April 2018, Aswani & Maya, 1885 (GVCH); Mayyappallam,10°48'01.78"N, 76°45'58.91"E, 116m, 10 May 2018, Aswani & Maya, 2109 (GVCH); Kongampaadam,10°48'36.72"N,76°46'51.96"E, 151m, 15 June 2018, Aswani & Maya, 2315 (GVCH); Olappalam, 10°49'52.20"N, 76°43'44.19"E, 121m, 23 November 2019,

Plate 68: Fig. a. *Canscora diffusa* (Vahl) R.Br. ex Roem. & Schult. **b.** *Canscora perfoliata* Lam. **c.** *Hoppea fastigiata* (Griseb.) C.B.Clarke **d.** *Mitrasacme prolifera* R.Br. **e.** *Strychnos potatorum* L.f. **f.** *Anodendron parviflorum* (Roxb.) I.M.Turner **g.** *Calotropis gigantea* (L.) W.T.Aiton **h.** *Calotropis procera* (Aiton) W.T.Aiton.

Aswani & Maya, 5066 (GVCH) **(Plate 69: Fig. b)**.

Catharanthus roseus (L.) G.Don, *Gen. Hist.* 4(1): 95 (1837); Vajr., *Fl. Palghat Dist* 280 (1990); *Vinca rosea* L., Hook. f., *FBI* 3: 640 (1882).

Basionym : *Vinca rosea* L., *Syst. Nat., ed.* 10. 2: 944 (1759).

Habit : Herb
Ecosystem preference : In plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Found in hillock systems as grown in holy places
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Common
Phenology : August - January
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Mayyappallam, 10°48'01.78"N, 76°45'58.91"E, 116m, 10 May 2018, Aswani & Maya, 2133 (GVCH).

Cosmostigma Wight, *Contrib. Bot. Ind.* 41 (1834)

Cosmostigma cordatum (Poir.) M. R. Almeida, *Fl. Maharashtra* 3A: 239 (2001); *Cosmostigma racemosum* (Roxb.) Wight, Hook. f., *FBI* 4: 46 (1883); Gamble, *Fl. Madras* 846 (1923); Sasidh., *Fl. Parambikulam WLS* 194 (2002).

Basionym : *Periploca cordata Poir*., *Encycl. [J. Lamarck & al.]* 5: 191 (1804).

Habit : Climber
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In forest floors
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : April - June
Altitude preference : Found in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Ayyappan Mala, 10°49'10.38"N, 76°44'28.29"E, 310m, 26 June 2018, Aswani & Maya, 2418 (GVCH).

Cryptolepis R.Br., *Mem. Wern. Nat. Hist. Soc. i.* (1809) 69

Cryptolepis buchananii Roem. & Schult., *Syst. Veg., ed. 15 bis [Roemer & Schultes]* 4: 409 (1819); Hook. f., *FBI* 4: 5 (1883); Gamble, *Fl. Madras* 826 (1923); Vajr., *Fl. Palghat Dist* 288 (1990); Sasidh., *Fl. Parambikulam WLS* 194 (2002).

Habit : Climber
Ecosystem preference : Moist deciduous forests and in grasslands
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In open forests and in grasslands
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Occasional
Phenology : March - August
Altitude preference : Found in medium and higher altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Ayyappan Mala, 10°49'10.38"N, 76°44'28.29"E, 310m, 26 June 2018, Aswani & Maya, 2573 (GVCH); Kottamutti waterfalls, 10°49'42.94"N, 76°46'47.87"E, 206m, 23 September 2019, Aswani & Maya, 2914 (GVCH); Malabar Cements Gateway, 10°51'03.09"N, 76°50'03.94"E, 218m, 23 June 2019, Aswani & Maya, 4070 (GVCH); Akamalavaram - Pettikallu, 10°53'2.04"N, 76°42'13.92"E, 539m, 19 July 2019, Aswani & Maya, 4330 (GVCH) **(Plate 69: Fig. c)**.

Cynanchum L., Sp. Pl. 1: 212 (1753)

Cynanchum annularium (Roxb.) Liede & Khanum, Taxon 65(3): 477 (2016); *Holostemma rheedei* Spreng. ex Wall., Hook. f., *FBI* 4: 21 (1883); *Holostemma annulare* (Roxb.) K. Schum., Gamble, *Fl. Madras* 834 (1923); *Holostemma ada-kodien* Schult., Vajr., *Fl. Palghat Dist* 290 (1990); Sasidh., *Fl. Parambikulam WLS* 196 (2002).

Habit : Climber
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In open forests
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : September - November
Altitude preference : Found in medium and higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Way to Ayyappan Mala, 10°49'07.40"N, 76°45'32.38"E, 170m, 26 June 2018, Aswani & Maya, 2385 (GVCH).

Gymnema R.Br., *Mem. Wern. Nat. Hist. Soc. i.* (1809) 33

Key to species

Branchlets tomentose; leaves densely tomentose below; flowers in umbellate cymes……..……...*G. sylvestre*
Branchlets glabrous; leaves glabrous; flowers in corymbose cymes…….……..……*G. inodorum*

Gymnema inodorum (Lour.) Decne., *Prodr. [A. P. de Candolle]* 8: 551 (1844); *Parsonsia spiralis* Wall. ex G.Don, Hook. f., *FBI* 3: 650 (1882); Gamble, *Fl. Madras* 814 (1923); *Parsonsia alboflavescens* (Dennst.) Mabb.; Vajr., *Fl. Palghat Dist* 282 (1990); *Parsonsia inodora* (Lour.) M.R. & S.M. Almeida; Sasidh., *Fl. Parambikulam WLS* 189 (2002).

Basionym: *Cynanchum inodorum* Lour., Fl. Cochinch. 1: 166 (1790).

Habit : Climber
Ecosystem preference : Moist deciduous forests and semi - evergreen forests
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : Climber near wet regions in forests
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : March - April
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Aduppukootimala - Kanyarmuttu, 10°49'59.16"N, 76°44'31.56"E, 297m, 16 February 2021, Aswani & Maya, 6449 (GVCH) **(Plate 69: Fig. d)**.

Gymnema sylvestre (Retz.) R.Br. ex Sm., *Cycl. [A. Rees], (London ed.)* 17 (1): n. 4 (1811); Hook. f., *FBI* 4: 29 (1883); Gamble, *Fl. Madras* 839 (1923); Vajr., *Fl. Palghat Dist* 289 (1990); Sasidh., *Fl. Parambikulam WLS* 196 (2002).

Basionym : *Periploca sylvestris* Retz., *Observ. Bot. (Retzius)* ii. 15 (1781).

Habit : Climber
Ecosystem preference : Moist deciduous forests and in the plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In rocky outcrops
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : July - January

Altitude preference : Found in lower altitudes

Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Valiya eri, 10°48'51.04"N, 76°45'01.67"EE, 136m, 06 January 2018, Aswani & Maya, 1321 (GVCH); Malampuzha irrigation dept guest house hillock, 10°50'04.20"N, 76°40'52.68"E, 120m, 18 May 2018, Aswani & Maya, 2221 (GVCH).

Hemidesmus R.Br., *Asclepiadeae* 45 (1810)

Hemidesmus indicus (L.) R.Br., *Hort. Kew.*, ed. 2 [*W.T. Aiton*] 2: 75 (1811); Hook. f., *FBI* 4: 5 (1883); Gamble, *Fl. Madras* 825 (1923); Vajr., *Fl. Palghat Dist* 290 (1990); Sasidh., *Fl. Parambikulam WLS* 196 (2002).

Basionym : *Periploca indica* L., *Sp. Pl.* 1: 211 (1753).

Habit : Herb
Ecosystem preference : Deciduous forests and in the plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Common in degraded forests, deciduous forest tracks and in plains
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Common
Phenology : August - December
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kezhakootimala, 10°51'53.30"N, 76°37'36.39"E, 362m, 15 September 2017, Aswani & Maya, 516 (GVCH);Vettiyil sandal estate, 10°51'34.30"N, 76°42'28.02"E, 10 March 2018, Aswani & Maya, 1430 (GVCH); Ayyappan Mala, 10°49'10.38"N, 76°44'28.29"E, 311m, 24 March 2018, Aswani & Maya, 2378 (GVCH); Kottamutti waterfalls, 10°49'42.94"N, 76°46'47.87"E, 206m, 23 September 2018, Aswani & Maya, 2909 (GVCH) **(Plate 69: Fig. e)**.

Holarrhena R.Br., *Mem. Wern. Nat. Hist. Soc.* i. (1809) 62

Holarrhena pubescens Wall. & G.Don, *Gen. Hist.* iv. 78 (1837), descr; Vajr., *Fl. Palghat Dist* 280 (1990); Sasidh., *Fl. Parambikulam WLS* 188 (2002); *Holarrhena antidysenterica* (Roth) A. DC., Hook. f., *FBI* 3: 644 (1882); Gamble, *Fl. Madras* 811 (1923).

Habit : Tree
Ecosystem preference : Moist deciduous forests and in the plains
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : In rocky outcrops, degraded forest tracks and outskirts of deciduous forests
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : April - October
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Poolakunnu, 10°51'30.60"N, 76°43'53.76"E, 164m, 10 March 2018, Aswani & Maya, 1400 (GVCH); G. P. Nair estate, 10°53'20.38"N, 76°39'41.73"E, 176m, 24 March 2018, Aswani & Maya, 1668 (GVCH); Kongampaadam, 10°48'36.72"N, 76°46'51.96"E, 151m, 15 June 2018, Aswani & Maya, 2333 (GVCH); Kottamutti waterfalls, 10°49'42.94"N, 76°46'47.87"E, 206m, 23 September 2018, Aswani & Maya, 2867 (GVCH); Pazhampullikaadu, 10°50'09.55"N, 76°38'28.33"E, 89M, 16 October 2018, Aswani & Maya, 3157 (GVCH) **(Plate 69: Fig. f)**.

Hunteria Roxb., *Hort. Bengal*. 84 (1814), *nomen; Fl. Ind., ed. Carey & Wall*., ii. 531 (1824); *Fl.Ind., ed. Carey*, i. 695 (1832)

Hunteria zeylanica Gardner ex Thwaites, *Enum. Pl. Zeyl. [Thwaites]* 191 (1860); Sasidh., *Fl. Parambikulam WLS* 189 (2002); *Hunteria corymbosa* Roxb., Hook. f., *FBI* 3: 637 (1882); Gamble, *Fl. Madras* 808 (1923); Vajr., *Fl. Palghat Dist* 281 (1990).

Habit : Tree
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : In forest floors
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : February - June
Altitude preference: Found in higher altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala,10°52'20.64"N,76°46'57.00" E, 864m, 23 June 2019, Aswani & Maya, 4142 (GVCH); Thanniplace, 10°52'20.64"N, 76°46'27.12" E, 28 January 2020, Aswani & Maya, 6033. (GVCH) **(Plate 69: Fig. g)**.

Ichnocarpus R.Br., *Asclepiadaceae* 50 (1810)

Ichnocarpus frutescens **(**L.) W.T.Aiton, *Hort. Kew., ed. 2 [W.T. Aiton]* 2: 69 (1811); Hook. f., *FBI* 3: 669 (1882); Gamble, *Fl. Madras* 820 (1923); Vajr., *Fl. Palghat Dist* 281 (1990); Sasidh., *Fl. Parambikulam WLS* 189 (2002).

Basionym : *Apocynum frutescens* L., *Sp. Pl.* 1: 213 (1753).

Habit : Climber
Ecosystem preference : Moist deciduous forests and in the plains
Distribution : Indo - Pacific and Australian
IUCN Category : Not Evaluated (NE)
Habitat : Found in the outskirts of hillocks, degraded forest tracks and bio fences
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Common
Phenology : August - March
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Pallippara, 10°49'49.08"N, 76°43'47.28"E, 120m, 29 October 2017, Aswani & Maya, 721 (GVCH); Karadikunnu, 10°50'25.97"N, 76°49'42.92"E, 203m, 30 December 2017, Aswani & Maya, 1026 (GVCH); Valiya eri, 10°48'51.04"N, 76°45'01.67"E, 136m, 06 January 2018, Aswani & Maya, 1289 (GVCH); Parachaathy, 10°50'54.24"N, 76°43'55.92"E, 158m, 02 January 2019, Aswani & Maya, 3585 (GVCH) **(Plate 69: Fig. h)**.

Nerium L., *Sp. Pl. [Linnaeus]* 1: 209 (1753)

Nerium oleander L., *Sp. Pl.* 1: 209 (1753); *Nerium odorum* Soland., Hook. f., *FBI* 3: 655 (1882); Gamble, *Fl. Madras* 821 (1923).

Habit : Shrub
Ecosystem preference : In plains
Distribution : Indo - Pacific and African
IUCN Category : Least Concern (LC)
Habitat : Grown as a ornamental plant in home steads as well as planted in highways
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : November - May
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kadukkamkunnam, 10°48'48.76"N,

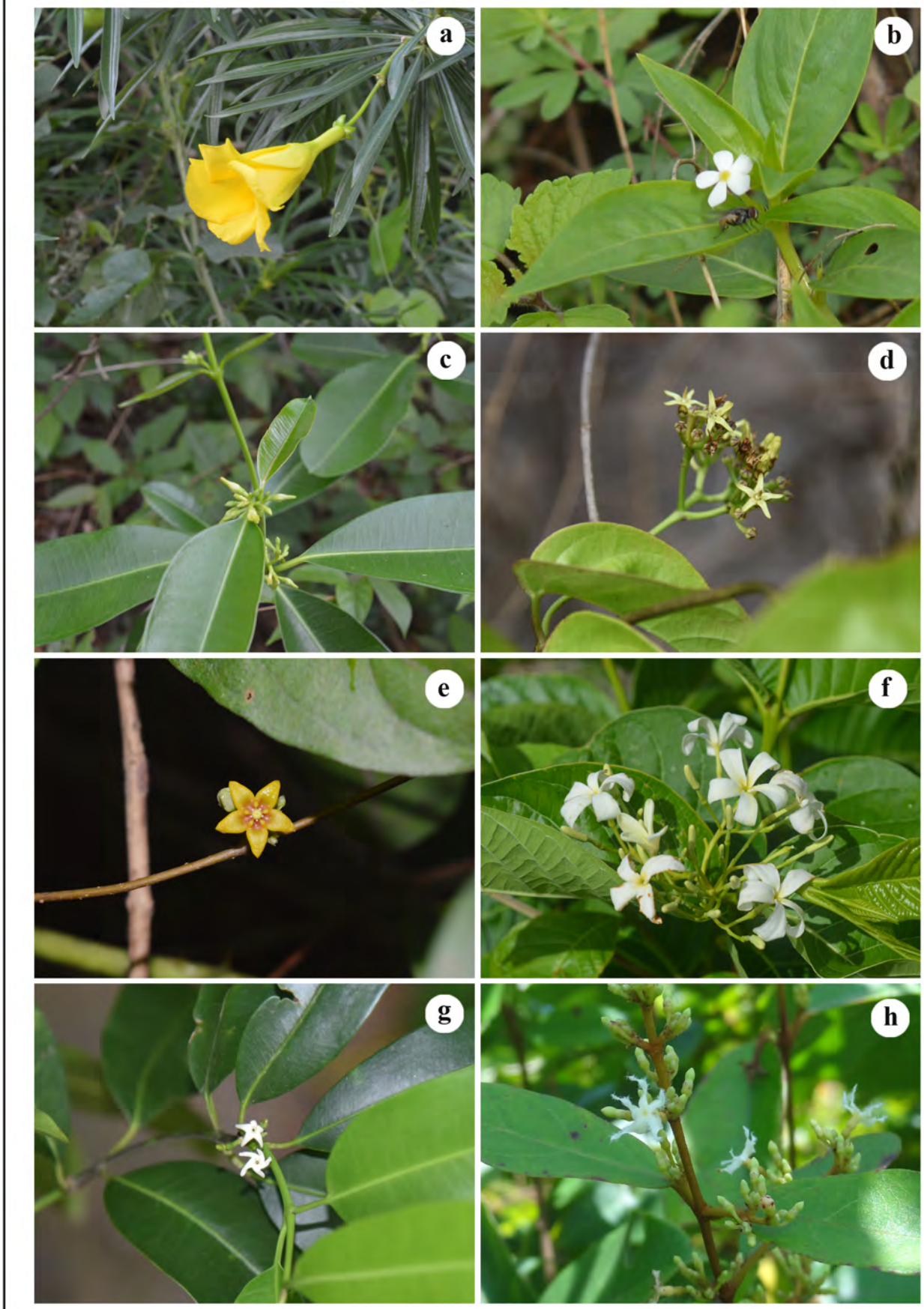

Plate 69: Fig. a. *Cascabela thevetia* (L.) Lippold **b.** *Catharanthus pusillus* G.Don **c.** *Cryptolepis buchananii* Roem. & Schult. **d.** *Gymnema inodorum* (Lour.) Decne. **e.** *Hemidesmus indicus* (L.) R.Br. **f.** *Holarrhena pubescens* Wall. & G.D on **g.** *Hunteria zeylanica* Gardner ex Thwaites **h.** *Ichnocarpus frutescens* (L.) W.T.Aiton.

76°39'48.98"E, 107m, 23 March 2023, Aswani & Maya, 6571 (GVCH).

Oxystelma R.Br., *Prodr. Fl. Nov. Holland.* 462 (1810)

Oxystelma esculentum (L.f.) Sm., *Cycl. [A. Rees], (London ed.)* 25: [sine page no.] *Oxystelma* sp. no. 1 (1813); Hook. f., *FBI* 4: 17 (1883); Gamble, *Fl. Madras* 2: 833 (1923).

Basionym : *Periploca esculenta* L.f., *Suppl. Pl.* 168 (1782).

Habit : Climber
Ecosystem preference : In plains
Distribution : Indo - Pacific and Holarctic
IUCN Category : Least Concern (LC)
Habitat : Climber in the banks of river and dam
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : September - April
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Vedivachapara, 10°50'12.34"N , 76° 40 '41.15"E, 109m, 04 June 2017, Aswani & Maya, 74 (GVCH).

Pergularia L., *Mant. Pl.* 8 (1767)

Pergularia daemia (Forssk.) Chiov., *Res. Sci. Somalia Ital.* 1: 115 (1916); Vajr., *Fl. Palghat Dist* 291 (1990); *Daemia extensa* (Jacq.) R. Br., Hook. f., *FBI* 4: 20 (1833).

Basionym : *Asclepias daemia Forssk*., *Fl. Aegypt.-Arab*. 51 (1775).

Habit : Climber
Ecosystem preference : Degraded deciduous forests and in the plains
Distribution : Indo - Pacific and African
IUCN Category : Least Concern (LC)
Habitat : In bio fences and as a common climber in plains and wastelands
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Common
Phenology : December - June
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Koyyamarakaadu, 10°47'40.58"N, 76°45'27.05"E, 139m, 30 November 2019, Aswani & Maya, 5311 (GVCH) **(Plate 70: Fig. a)**.

Plumeria L., *Sp. Pl.* 1: 209 (1753).

Plumeria alba L., *Sp. Pl*. 1: 210 (1753); Vajr., *Fl. Palghat Dist* 284 (1990).

Habit : Tree
Ecosystem preference : Degraded forests and plains
Distribution : South American
IUCN Category : Least Concern (LC)
Habitat : In hillocks, temple premises and in plains
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : August - March
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Valiya eri, 10°48'51.04"N, 76°45'01.67"E, 135m, 06 January 2018, Aswani & Maya, 1298 (GVCH); Parachaathy, 10°50'38.76"N, 76°43'51.96"E, 147m, 02 January 2019, Aswani & Maya, 3545 (GVCH); Edamala - Azakumpara waterfalls, 10°50'28.32"N, 76°38'45.96"E, 184m, 16 October 2019, Aswani & Maya, 4835 (GVCH); Pallippara, 10°49'49.08"N, 76°43'47.28"E, 120m, 23 November 2019, Aswani & Maya, 5037 (GVCH).

Rauvolfia L., *Sp. Pl*. 1: 208 (1753)

Key to species

Leaves 3 in whorls, lanceolate; corolla tube long……...…….*R. serpentina*
Leaves 4 in whorls, elliptic; corolla tube short……..……..……*R. tetraphylla*

Rauvolfia serpentina Benth. ex Kurz, *Forest Fl. Burma* ii. 171. (1877); Hook. f., *FBI* 3: 632 (1882); Gamble, *Fl. Madras* 807 (1923); Vajr., *Fl. Palghat Dist* 282 (1990); Sasidh., *Fl. Parambikulam WLS* 190 (2002).

Basionym : *Ophioxylon serpentinum* L., *Sp. Pl.* 2: 1043 (1753).

Habit : Shrub
Ecosystem preference : Moist deciduous forests and in the plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In forest floors
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Occasional
Phenology : April - October
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Mannukunnu,10°52'5.50"N,76°38'30.27"E, 181m, 09 July 2019, Aswani & Maya, 4206 (GVCH); Chacolas, 10°51'22.68"N, 76°44'41.28"E, 227m, 02 August 2019, Aswani & Maya, 4500 (GVCH).

Rauvolfia tetraphylla L., *Sp. Pl.* 1: 208 (1753); *Rauvolfia canescens* L., Gamble, *Fl. Madras* 808 (1923).

Habit : Shrub
Ecosystem preference : In plains
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Degraded forest tracks and in the plains
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Rare
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Way to Ayyappan Mala, 10°48'59.96"N, 76°45'22.61"E, 132m, 06 January 2018, Aswani & Maya, 1205 (GVCH) **(Plate 70: Fig. b)**.

Tabernaemontana L., *Sp. Pl.* 1: 210 (1753)

Tabernaemontana alternifolia L., *Sp. Pl.* 1: 211 (1753); *Tabernaemontana heyneana* Wall., Vajr., *Fl. Palghat Dist* 283 (1990); Sasidh., *Fl. Parambikulam WLS* 191 (2002); *Ervatamia heyneana* (Wall.) Cooke, Gamble, *Fl. Madras* 813 (1923).

Basionym : *Ervatamia alternifolia* (L.) S.M.Almeida, *Fl. Savantwadi* 1: 252 (1990).

Habit : Tree
Ecosystem preference : Moist deciduous and semi - evergreen forests
Distribution : Indo - Pacific
Endemism : Southern Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Understorey of forest floors
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : April - October
Altitude preference : Found in medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Adupukootimala - Ponthancheeni, 10°50'01.68"N, 76°44'33.00"E, 327m, 12 January 2019, Aswani & Maya, 3713 (GVCH); Jamanthimala,10°51'53.64"N, 76°47'16.80"E, 586m, 23 June 2019, Aswani & Maya, 4079(GVCH).

Vincetoxicum Wolf, *Gen. Pl. [Wolf]* 130 (1776)

Vincetoxicum indicum (Burm.f.) Mabb., *Mabberley's Pl.-Book* 1102 (2017); *Tylophora asthmatica* (L. f.) Wight & Arn. in Wight, Hook. f., *FBI* 4: 44 (1883); Gamble, *Fl. Madras* 843 (1923); *Tylophora indica* (Burm. f.) Merr., var. *indica*; Manilal & Sivar., Vajr., *Fl. Palghat Dist* 292 (1990).

Basionym : *Cynanchum indicum Burm*. f., *Fl. Ind. (N. L. Burman)* 70 (1768).

Habit : Climber
Ecosystem preference : Deciduous forests and in degraded forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In forest margins and plains
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : February - July
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Vettiyil Sandal estate, 10°51'34.30"N, 76°42'28.02"E, 145m, 10 March 2018, Aswani & Maya, 1441 (GVCH); Kochuthodu, 10°51'58.32"N, 76°42'22.32" E, 177m, 18 December 2018, Aswani & Maya, 3334 (GVCH) **(Plate 70: Fig. c)**.

Wattakaka Hassk., *Flora* 40: 99 (1857)

Wattakaka volubilis Stapf, *Bot. Mag.* 148: *sub t*. 8976 (1923); Vajr., *Fl. Palghat Dist* 293 (1990); *Dragea volubilis* (L. f.) Benth. ex Hook. f., *FBI* 4: 46 (1883); *Marsdenia volubilis* (L. f.) Cooke, Gamble, *Fl. Madras* 846 (1923).

Habit : Climber
Ecosystem preference : Moist deciduous forests and in the plains
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : Common climber in hillocks, plains and in wastelands
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Common
Phenology : March - July
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Poolakunnu, 10°51'30.60"N, 76°43'53.76" E, 164m, 10 March 2018, Aswani & Maya, 1420 (GVCH); Akamalavaram - Kalliyara, 10°53'8.52"N, 76°39'38.88"E, 170m, 24 March 2018, Aswani & Maya, 1547 (GVCH); Mayyappallam, 10°48'07.06"N, 76°46'14.88"E, 157m, 10 May 2018, Aswani & Maya, 2116 (GVCH); Ponthancheeni,10°50'03.12"N,76°44'33.36" E, 330m, 12 January 2019, Aswani & Maya, 3723 (GVCH) **(Plate 70: Fig. d)**.

Wrightia R.Br., *On the Asclepiadeae* (1810)

Wrightia tinctoria R.Br., *Asclepiadeae* 63 (-64) (1810); Hook. f., *FBI* 3: 653 (1882); Gamble, *Fl. Madras* 815 (1923); Vajr., *Fl. Palghat Dist* 283 (1990); Sasidh., *Fl. Parambikulam WLS* 191 (2002).

Habit : Tree
Ecosystem preference : Deciduous forests and in the Plains
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : In rocky outcrops, margins of forests and in plains
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : February - November
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kosavanidukku-Kaduvachal, 10°50'26.38" N, 76°40'30.88"E, 106m, 16 July 2017, Aswani & Maya, 273 (GVCH);

Kezhakootimala, 10°51'53.30"N, 76°37'36.39"E, 362m, 15 September 2017, Aswani & Maya, 496 (GVCH); Kozhimala, 10°49'56.45"N, 76°43'11.80"E, 117m, 09 November 2017, Aswani & Maya, 819 (GVCH); Ayyappan Mala, 10°49'07.19"N, 76°44'50.28"E, 130m, 26 June 2018, Aswani & Maya, 819 (GVCH); Parachaathy, 10°50'42.54"N, 76°43'49.14"E, 121m, 02 January 2019, Aswani & Maya, 3543 (GVCH).

Boraginales

Boraginaceae

Key to genera

1. Erect plants……..……...2
- Prostrate plants……..…….5
2. Fruit an ovoid or ellipsoid drupe; habit - trees……..…….*Cordia*
- Fruit a 4 lobed nutlets; habit - herbs…….……..……3
3. Style terminal; leaves smooth-pubescent; fruiting calyx never enlarged…….……..…...4
- Style sub - terminal; stem and leaves rough with tubercled hairs; fruiting calyx enlarged……...*Trichodesma*
4. Habit - shrubs; style bifid…….……....……*Ehretia*
- Habit - herbs; style conical with a horizontal rig below stigma …….……..…….*Heliotropium*
5. Style bifid…….……..*Coldenia*
- Style conical….……..….*Euploca*

Coldenia L., *Sp. Pl.* 1: 125 (1753)

Coldenia procumbens L., *Sp. Pl.* 1: 125 (1753); Hook. f., *FBI* 4: 144 (1883); Gamble, *Fl. Madras* 892 (1923); Vajr., *Fl. Palghat Dist* 302 (1990); Sasidh., *Fl. Parambikulam WLS* 201 (2002).

Habit : Herb
Ecosystem preference : Wet and moist places
Distribution : Indo - Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : In water receded areas in dam and in wet areas in plains
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : February - May
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range,Thonikadavu, 10°50'04.96"N, 76°40'48.72"E, 116m, 04 June 2017, Aswani & Maya, 34 (GVCH); Way to Ayyappan Mala, 10°49'07.40"N, 76°45'32.38"E, 170m, 06 January 2018, Aswani & Maya, 1214 (GVCH); Ayyappan Mala, 10°49'06.91"N, 76°44'44.91"E, 151m, 07 March 2019, Aswani & Maya, 3790 (GVCH) **(Plate 70: Fig. e)**.

Cordia L., *Sp. Pl.* 1: 190 (1753), nom. cons.

Cordia dichotoma G. Forst., *Fl. Ins. Austr.* 18, n. 110 (1786); *Cordia obliqua* Willd., Hook. f., *FBI* 4: 137 (1883); Gamble, *Fl. Madras* 887 (1923).

Habit : Tree
Ecosystem preference : Moist deciduous forests and in the plains
Distribution : Indo - Pacific and African
IUCN Category : Least Concern (LC)
Habitat : In forest floors
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : March - August
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range,

Akamalavaram - Moochikadavu, 10°52'13.80"N, 76°42'30.96"E, 258m, 10 March 2018, Aswani & Maya, 1458 (GVCH); G. P. Nair Estate, 10°53'20.38"N, 76°39'41.73"E, 176m, 24 March 2018, Aswani & Maya, 1613 (GVCH); Kottamutti waterfalls, 10°49'42.94"N, 76°46'47.87"E, 206m, 23 September 2018, Aswani & Maya, 2899 (GVCH); Aduppukootimala - Kanyarmuttu,10°49'42.94"N, 76°46'47.87"E, 298m, 12 January 2019, Aswani & Maya, 3635 (GVCH).

Ehretia P. Browne, *Civ. Nat. Hist. Jamaica* 168 (1756)

Ehretia microphylla Lam., Tabl. Encycl. i. 425; Gamble, *Fl. Madras* 891 (1923); *Ehretia buxifolia* Roxb., Hook. f., *FBI* 4: 144 (1883); *Carmona retusa* (Vahl) Masamune, Vajr., *Fl. Palghat Dist* 302 (1990).

Habit : Shrub
Ecosystem preference : Moist deciduous forests and in scrub jungles
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In understorey of dry forest tracks
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : November - December
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Ayyappan Mala, 10°49'06.39"N, 76°44'39.99"E, 218m, 26 June 2018, Aswani & Maya, 2411 (GVCH); Mathappumala, 10°50'57.35"N, 76°49'44.27"E, 315m, 07 January 2020, Aswani & Maya, 5604 (GVCH) **(Plate 70: Fig. f)**.

Euploca Nutt., *Trans. Amer. Philos. Soc. ser.* 2, 5: 189 (1836)

Key to species

Corolla lobes fully pubescent outside; intercalary lobes less prominent ……..…....*E. marifolia* var. *rottleri*
Corolla pubescent outside only along the corolla throat; intercalary lobes prominent……..…..……..*E. marifolia*

Euploca marifolia **(**J. Koenig ex Retz.) Ancy & P. Javad, *Nordic J. Bot.* 38(11)-e02913: 2 (2020); *Heliotropium marifolium* Retz., Hook. f., *FBI* 4: 152 (1883); *Heliotropium scabrum* Retz., Hook. f., *FBI* 4: 152 (1883); Gamble, *Fl. Madras* 897 (1923); Vajr., *Fl. Palghat Dist* 304 (1990).

Basionym : *Heliotropium marifolium* J. Koenig *ex* Retz., *Observ. Bot. (Retzius)* ii. 8. (1781).

Habit : Herb
Ecosystem preference : Degraded forests and in plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Exposed Rock Surfaces and in Soil filled depressions
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : April - June
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thonikadavu, 10°50'04.96"N, 76°40'48.72" E, 15m, 04 June 2017, Aswani & Maya, 41 (GVCH); Kosavanidukku - Kaduvachal, 10°50'04.96"N, 76°40'48.72"E, 100m, 04 June 2017, Aswani & Maya, 333 (GVCH); Kava, 10°49'25.18"N, 76°43'29.96"E, 115m, 06 April 2018, Aswani & Maya, 1884 (GVCH) **(Plate 70: Fig. g)**.

Euploca marifolia var**. *rottleri*** (Lehm.) Ancy & P. Javad, *Nordic J. Bot.* 38(11)-e02913: 4 (2020); *Heliotropium rottleri* Lehm., Hook. f., *FBI* 4: 151 (1883); Gamble, *Fl. Madras* 897 (1923).

Basionym : *Heliotropium rottleri Lehm*., *Gött. Gel. Anz.* 152: 1515 (1817).

Habit : Herb
Ecosystem preference : Scrub jungle and dry deciduous forests
Distribution : Indo - Pacific
Endemism : Peninsular India
IUCN Category : Not Evaluated (NE)
Habitat : Exposed Rock Surfaces
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : September - January
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala, 10°49'44.76" N, 76°40'34.59"E, 102m, 20 June 2017, Aswani & Maya, 130 (GVCH); Kosavanidukku-Kaduvachal, 10°50'26.38"N, 76°40'30.88"E, 105m, 16 July 2017, Aswani & Maya, 244 (GVCH); Kongampaadam, 10°48'36.72"N, 76°46'51.96"E, 151m, 15 June 2018, Aswani & Maya, 2318 (GVCH); Mayappalam,10°48'08.64"N, 76°46'34.68"E, 127m, 06 September 2019, Aswani & Maya, 4690 (GVCH).

Heliotropium L., *Sp. Pl.* 1: 130 (1753)

Key to species

Corolla pale violet or pink; leaf petiole short upto 6cm; stigma conical…….....……..*H. indicum*
Corolla white; leaf petiole 8cm or above; stigma lobed……..……*H. keralense*

Heliotropium indicum L., *Sp. Pl.* 1: 130 (1753); Hook. F., *FBI* 4: 152 (1883); Gamble, *Fl. Madras* 896 (1923); Vajr., *Fl. Palghat Dist* 303 (1990); Sasidh., *Fl. Parambikulam WLS* 203 (2002).

Habit : Herb
Ecosystem preference : Wet regions near water sources and in wastelands
Distribution : Indo – Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Water receded regions in dam during summer
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : September – March
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thonikadavu, 10°50'04.96"N, 76°40'48.72"E, 115m, 04 June 2017, Aswani & Maya, 38 (GVCH); Kava – Malampuzha dam, 10°50'38.92"N, 76°43'34.63"E, 113m, 06 April 2018, Aswani & Maya, 1845 (GVCH); Malampuzha irrigation dept guest house hillock,10°50'04.20"N, 76°40'52.68"E, 119m, 18 May 2018, Aswani & Maya, 2223 (GVCH) **(Plate 70: Fig. h).**

Heliotropium keralense Sivar. & Manilal, J. Indian Bot. Soc. 51(3-4): 348 (1973); Manilal & Sivar., *Fl. Calicut* 176 (1982); Antony, *Syst. Stud. Fl. Kottayam Dist* 256 (1989); Babu, *Fl. Malappuram Dist* 462 (1990); Sivar. & Mathew, *Fl. Nilambur* 440 (1997); Sasidh., *Fl. Parambikulam WLS* 203 (2002); Sunil & Sivadasan, *Fl. Alappuzha Dist* 461 (2009).

Habit : Herb
Ecosystem preference : Along the banks of water bodies

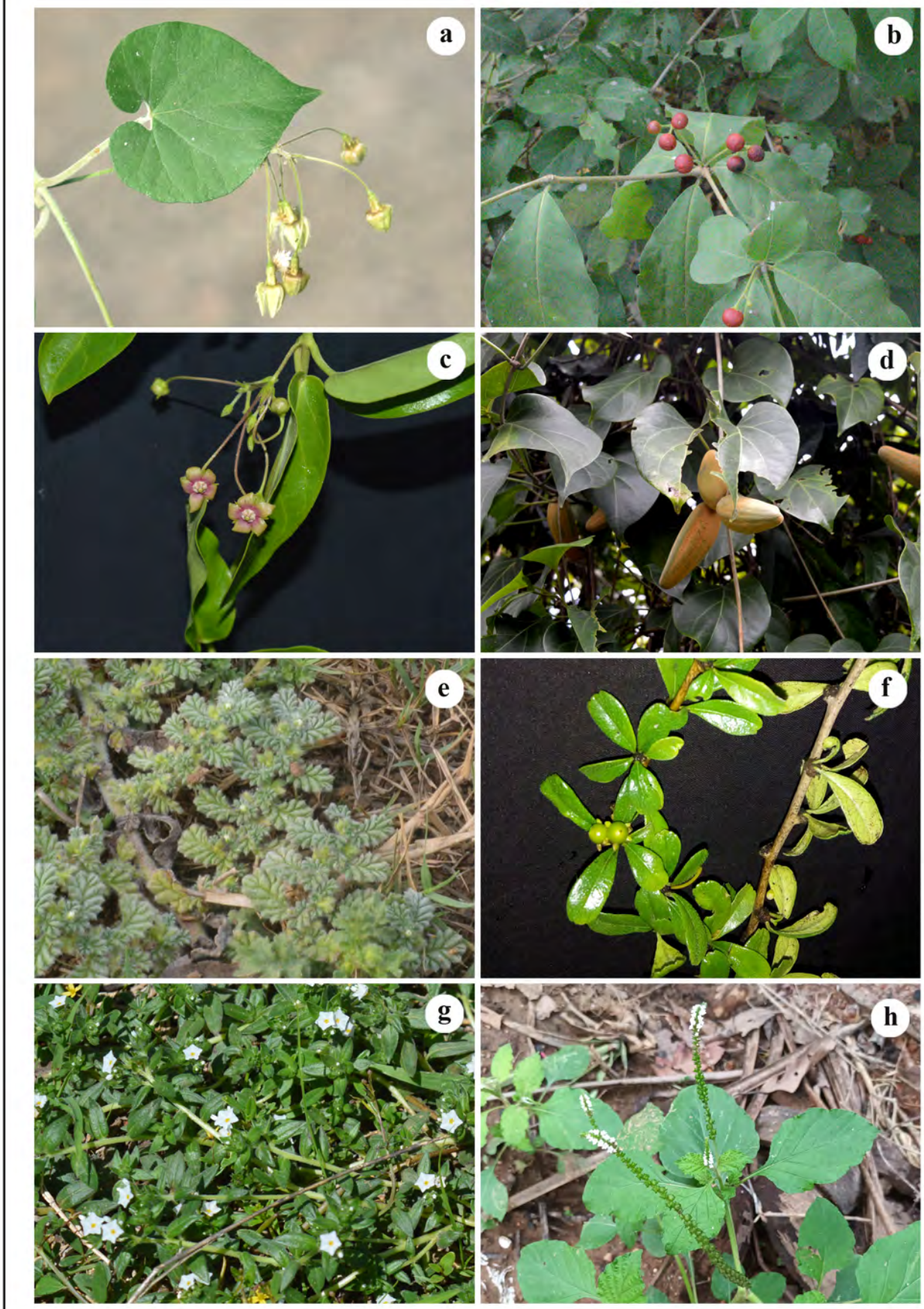

Plate 70: Fig. a. *Pergularia daemia* (Forssk.) Chiov. **b.** *Rauvolfia tetraphylla* L. **c.** *Vincetoxicum indicum* (Burm.f.) Mabb. **d.** *Wattakaka volubilis* Stapf **e.** *Coldenia procumbens* L. **f.** *Ehretia microphylla* Lam. **g.** *Euploca marifolia* (J.Koenig ex Retz.) Ancy & P.Javad **h.** *Heliotropium indicum* L.

Distribution : Indo – Pacific
Endemism : Southern Western Ghats (Kerala)
IUCN Category : Not Evaluated (NE)
Habitat : Sandy soils
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : March – May
Altitude preference : Found in lower altitudes near water sources
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Pazhampullikaadu, 10°50'09.55"N, 76°38'28.33"E, 89m, 16 October 2018, Aswani & Maya, 3162 (GVCH).

Trichodesma R.Br., *Prodr. Fl. Nov. Holland.* 496 (1810)

Key to species

Corolla tube longer than the lobes; corolla lobes e – glandular……*T. zeylanicum*
Corolla tube as long as the lobes; corolla lobes with two glandular spots on the throat…….……..…..……..*T. indicum*

Trichodesma indicum (L.) Sm., *Cycl. [A. Rees], (London ed.) 36: Trichodesma* no. 1 (1817); Hook. F., *FBI* 4: 153 (1883); Gamble, *Fl. Madras* 899 (1923); Vajr., *Fl. Palghat Dist* 304 (1990).

Basionym : *Borago indica* L., *Sp. Pl.* 1: 137 (1753).

Habit : Herb
Ecosystem preference : Dry deciduous forests
Distribution : Indo – Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : Degraded forests and wastelands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : February – August
Altitude preference : Found in degraded forests in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kallanpuzha, 10°51'34.02"N, 76°42'40.16"E, 140m, 26 January 2018, Aswani & Maya, 1373 (GVCH); Walayar Dam, 10°50'15.57"N, 76°51'5.13"E, 108m, 09 May 2018, Aswani & Maya, 2004 (GVCH); Ahalya campus, 10°47'37.00"N, 76°49'33.40"E, 156m, 24 September 2020, Aswani & Maya, 6273 (GVCH) **(Plate 71: Fig. a)**.

Trichodesma zeylanicum (Burm.f.) R.Br., *Prodr. Fl. Nov. Holland.* 496. (1810); Hook. F., *FBI* 4: 154 (1883); Gamble, *Fl. Madras* 899 (1923); Vajr., *Fl. Palghat Dist* 305 (1990); Sasidh., *Fl. Parambikulam WLS* 204 (2002).

Basionym : *Borago zeylanica Burm*.f., *Fl. Ind. (N. L. Burman)* 41 (1768).

Habit : Herb
Ecosystem preference : Degraded forest areas, also in the plains
Distribution : Indo – Pacific and Australian
IUCN Category : Not Evaluated (NE)
Habitat : Wastelands in the outskirts of hills
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : November – February
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Anayappanchalla, 10°48'20.42"N, 76°48'05.00"E, 146m, 30 November 2019, Aswani & Maya, 5228 (GVCH) **(Plate 71: Fig. b)**.

Solanales

Convolvulaceae

Key to genera

1. Climbers; leafless parasitic plants……..……..……*Cuscuta*
- Climbers with leaves; non - parasitic plants……..……..2
2. Pollen grains spinulose……...…....3
- Pollen grains non - spinulose….....4
3. Fruits dehiscent, dehiscing along 4 valves……...……..……*Ipomoea*
- Fruits indehiscent…….…..…*Argyreia*
4. Style 2……...…..….*Evolvulus*
- Style single……..…..…….5
5. Ovary imperfectly 2 locular; 3 seeded…..…..……..…*Hewittia*
- Ovary 2 - 4 locular; usually 4 seeded……..…...……6
6. Branchlets winged…..…*Operculina*
- Branchlets wingless……..……..…7
7. Corolla hairy outside…....*Camonea*
- Corolla glabrous outside…...…..…8
8. Flowers large; corolla 2.5cm or little more…….*Distimake*
- Flowers small; corolla below 2.00cm……..……..9
9. Flowers 1 - 3 in axillary peduncles; leaves linear – hastate.....*Xenostegia*
- Flowers many in axillary cymes; leaves ovate or rarely 3 - lobed……..……..… *Merremia*

Argyreia Lour., *Fl. Cochinch*. 1: 95, 134 (1790)

Key to species

1. Ovary 2 - loculed…...….*A. elliptica*
- Ovary 4 - loculed……....2
2. Stem glabrous, young parts sparsely pubescent……....*A. populifolia*
- Stem with reddish - brown trichomes…….……..….*A. pomacea*

Argyreia elliptica (Roth) Choisy, *Convolv. Orient.* 35 (1834); Sasidh., *Fl. Parambikulam WLS* 205 (2002); *Lettsomia elliptica* (Roth) Wight, Hook. f., *FBI* 4: 192 (1883); Gamble, *Fl. Madras* 911 (1923).

Basionym: *Ipomoea elliptica* Roth, *Nov. Pl. Sp.* 113 (1821).

Habit : Climber
Ecosystem preference : Semi – evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Margins of shola forests
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : November - March
Altitude preference : Found in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Parachaathy - flood site, 10°50'08.16"N, 76°44'33.36"E, 371m, 12 January 2019, Aswani & Maya, 3743 (GVCH) **(Plate 71: Fig. c)**.

Argyreia pomacea Choisy, *Convolv. Orient.* 32 (1834); Hook. f., *FBI* 4: 188 (1883); Gamble, *Fl. Madras* 908 (1923).

Habit : Climber
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
Endemism : South India
IUCN Category : Not Evaluated (NE)
Habitat : Climber in margins of forests
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : September - April
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Parachaathy, 10°50'54.24"N , 76° 43 '55.92"E, 165m, 02 January 2019, Aswani & Maya, 3586 (GVCH).

Argyreia populifolia Choisy, *Prodr. [A. P. de Candolle]* 9: 329 (1845); Hook. f., *FBI* 4:187 (1883); Gamble, *Fl. Madras* 907 (1923).

Habit : Climber
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found in the degraded forest tracks
Raunkiaer's Life form : Lianas (Euliana)
Distribution Frequency : Rare
Phenology : November - January
Altitude preference : Found in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Vettumadavu, 10°52'45.01"N, 76°48'8.60"E, 379m, 28 January 2020, Aswani & Maya, 5908 (GVCH).

Camonea Raf., *Fl. Tellur.* 4: 81 (1838)

Camonea umbellata (L.) A. R. Simões & Staples, *Bot. J. Linn. Soc.* 183(4): 583 (2017); *Ipomoea cymosa* Roem. & Schult., Hook. f., *FBI* 4: 211 (1883); *Merremia umbellata* (L.) Hall. f., Gamble, *Fl. Madras* 928 (1923); Vajr., *Fl. Palghat Dist* 313 (1990); Sasidh., *Fl. Parambikulam WLS* 209 (2002).

Basionym: *Convolvulus umbellatus* L., *Sp. Pl.* 1: 155 (1753).

Habit : Climber
Ecosystem preference : Semi - evergreen forests
Distribution : Indo Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Found in canopy rich areas
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : January - April
Altitude preference : Found in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Aduppukootimala, 10°50'43.08"N, 76° 44 '28.68"E, 819m, 16 February 2021, Aswani & Maya, 6508 (GVCH) **(Plate 71: Fig. d)**.

Cuscuta L., *Sp. Pl.* 1: 124 (1753)

Cuscuta chinensis Lam., *Encycl. [J. Lamarck & al.]* 2(1): 229 (1786); Hook. f., *FBI* 4: 226 (1883); Gamble, *Fl. Madras* 931 (1923).

Basionym: *Grammica chinensis* (Lam.) Hadac & Chrtek, *Folia Geobot. Phytotax.* 5: 445 (1970).

Habit : Climbing stem parasite
Ecosystem preference : Deciduous forests, plains and in wastelands
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : Fast spreading stem parasitic weed in dam sites and farm lands
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Occasional
Phenology : November - March
Altitude preference : Found in lower altitudes
Specimens examined :INDIA, Kerala: Palakkad District, Walayar range, Kava, 10°50'38.92"N, 76°43'34.63"E, 121m, 06 April 2018, Aswani & Maya, 1869 (GVCH); Koomachimala, 10°49'44.76"N, 76°40'34.59"E, 154m, 23 November 2019, Aswani & Maya, 1869 (GVCH); Anayappanchalla, 10°48'25.92"N, 76°48'35.19"E, 176m, 30 November 2019, Aswani & Maya, 5115 (GVCH).

Distimake Raf., *Fl. Tellur.* 4: 82 (1838)

Distimake aegyptius (L.) A.R.Simões & Staples, *Bot. J. Linn. Soc.* 183(4): 573 (2017); *Merremia aegyptia* (L.) Urban, Gamble, *Fl. Madras* 928 (1923); *Ipomoea*

pentaphylla (L.) Jacq., Hook. f., *FBI* 4: 202 (1883).

Basionym: *Ipomoea aegyptia* L., *Sp. Pl.* 1: 162 (1753).

Habit : Climber
Ecosystem preference : Waste lands and in plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Found in margins of hillocks and in wastelands
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : December - March
Altitude preference : Found in Lower Altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Malampuzha irrigation dept. guest house hillock, 10°50'04.20"N, 76°40'52.68"E, 121m, 23 November 2019, Aswani & Maya, 4926 (GVCH); Olappalam, 10°49'52.20"N, 76°43'44.19"E, 153m, 23 November 2019, Aswani & Maya, 5080 (GVCH).

Evolvulus L., *Sp. Pl., ed.* 2. 1: 391 (1762)

Key to species

Branches rooting at nodes with white flowers……..……*E. nummularius*
Branches radiating from root stockt with blue flowers……..……..…….*E. alsinoides*

Evolvulus alsinoides (L.) L., *Sp. Pl*., ed. 2. 1: 392 (1762); Hook. f., *FBI* 4: 220 (1883); Gamble, *Fl. Madras* 923 (1923); Sasidh., *Fl. Parambikulam WLS* 206 (2002).

Basionym: *Convolvulus alsinoides* L., *Sp. Pl.* 1: 157 (1753).

Habit : Herb
Ecosystem preference : Moist deciduous forests and in the plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Found in dam sites mostly in the rain fed regions
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : March - August
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Ayyappan Mala, 10°49'16.35"N, 76°44'56.03"E, 152m, 07 March 2019, Aswani & Maya, 3847 (GVCH) **(Plate 71: Fig. e)**.

Evolvulus nummularius (L.) L., *Sp. Pl.,* ed. 2. 1: 391 (1762); Vajr., *Fl. Palghat Dist* 307 (1990); Sasidh., *Fl. Parambikulam WLS* 206 (2002).

Basionym: *Convolvulus nummularius* L., *Sp. Pl.* 1: 157 (1753).

Habit : Herb
Ecosystem preference : Degraded moist deciduous forests and also in the plains
Distribution : Indo - Pacific, African, Holarctic and South American
IUCN Category : Not Evaluated (NE)
Habitat : Found in the dam site and other forest plains
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Malampuzha Dam, 10°50'38.92"N , 76°43'34.63"E, 139m, 06 April 2018, Aswani & Maya, 1840 (GVCH); Kava, 10°49'34.95"N, 76°43'5.18"E, 111m, 06 April 2018, Aswani & Maya, 1880 (GVCH);Walayar Dam, 10°50'24.58"N,

76°51'01.52"E, 244m, 09 May 2018, Aswani & Maya, 2017 (GVCH); Malampuzha irrigation dept guest house hillock, 10°50'03.76"N, 76°40'56.19"E, 142m, 18 May 2018, Aswani & Maya, 2231 (GVCH) **(Plate 71: Fig. f)**.

Hewittia Wight & Arn., *Madras J. Lit. Sci. Ser*. 1, 5: 22 (1837)

Hewittia malabarica (L.) Suresh, *Interpr. Van Rheede's Hort. Malab.* 88 (1988); Sasidh., *Fl. Parambikulam WLS* 206 (2002); *Hewittia scandens* (Milne) Mabb., Vajr., *Fl. Palghat Dist* 307 (1990); *Hewittia bicolor* (Vahl) Wight & Arn., Hook. f., *FBI* 4: 216 (1883); Gamble, Fl. Madras 924 (1923).

Basionym: *Convolvulus malabaricus* L., *Sp. Pl.* 1: 155 (1753).

Habit : Climber
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific, Holarctic, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Open forest areas
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : October - January
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Akamalavaram- Thakaramada, 10°52'07.34"N, 76°42'43.33"E, 218m, 30 November 2018, Aswani & Maya, 3238 (GVCH) **(Plate 71: Fig. g)**.

Ipomoea L., *Sp. Pl.* 1: 159 (1753), nom. cons.

Key to species

1. Stamens exerted…..……...*I. alba*
- Stamens included……..…….2
2. Habit - erect shrubs……....*I. carnea* subsp. *fistulosa*
- Habit -climbers……..…….3
3. Sepals aristate; flowers red……...…..……..*I. hederifolia*
- Sepals not aristate; flowers not red……..……..……..4
4. Leaves lobed…….……..……....5
- Leaves entire……...…..…10
5. Capsule glabrous……..……..…6
- Capsule hairy……...……...8
6. Seeds puberulous……...…*I. wightii*
- Seeds glabrous……...…….7
7. Flowers in 1 - 5 flowered cymes; pedicels 1.5cm or more……..…… *I. purpurea*
- Flowers mostly solitary or rarely few flowered cymes; pedicels upto 1.0cm long……..…..…*I. nil*
8. Leaves 3 - lobed…….……*I. triloba*
- Leaves 5 - 7 lobed……..……...….9
9. Seeds pubescent; non - tuberous twiners……..….*I. pes - tigridis*
- Seeds pubescent along margins only; climbers with tuberous root……...…..…..… *I. cairica*
10. Aquatic herbs; stem hollow…...……..…….*I. aquatica*
- Terrestrial herbs; stem solid…....11
11. Flowers in axillary panicles……..……..….*I. staphylina*
- Flowers solitary or in sub – umbellate cymes……..…..……12
12. Seeds glabrous; staminal filaments glandular hairy at base……..…...….. *I. eriocarpa*
- Seeds pubescent; staminal filaments hairy at base (never glandular hairy).....13
13. Corolla pinkish - white; apex of sepals obovate…..….... *I. sagittifolia*
- Corolla creamish - yellow; apex of sepals acute – apiculate....*I. obscura*

Ipomoea alba L., *Sp. Pl.* 1: 161 (1753); Vajr., *Fl. Palghat Dist* 309 (1990); Sasidh., *Fl. Parambikulam WLS* 207 (2002); *Ipomoea bona-nox* L., Hook. f., *FBI* 4: 197

(1883); *Calonyction bona-nox* (L.) Boj., Gamble, *Fl. Madras* 920 (1923).

Basionym : *Calonyction album* (L.) House, *Bull. Torrey Bot. Club* 31(11): 591 (1904).

Habit : Climber
Ecosystem preference : Semi – evergreen forests
Distribution : Indo - Pacific, Holarctic and South American
IUCN Category : Least Concern (LC)
Habitat : Canopy rich forest tracks
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : October - December
Altitude preference : Found in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala, 10°51'59.76"N, 76°47'15.36"E, 642m, 09 January 2020, Aswani & Maya, 5639 (GVCH) **(Plate 71: Fig. h)**.

Ipomoea aquatica Forssk., *Fl. Aegypt.-Arab.* 44. (1775); Hook. f., *FBI* 4: 210. 1883; Vajr., *Fl. Palghat Dist* 309 (1990); *Ipomoea reptans* Poir. Gamble, *Fl. Madras* 916 (1923).

Habit : Herb
Ecosystem preference : Marshy areas in pools and plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Found in rock pools
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : November - March
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Mayappalam, 10°48'0.36"N, 76°45'58.68"E, 120m, 30 November 2019, Aswani & Maya, 5378 (GVCH) **(Plate 72: Fig. a)**.

Ipomoea cairica (L.) Sweet, *Hort. Brit. [Sweet]* 287 (1826); Gamble, *Fl. Madras* 918 (1923); Sasidh., *Fl. Parambikulam WLS* 207 (2002); *Ipomoea palmata* Forssk., *Fl. Aeg.-Arab.* 43. 1775; Hook. f., *FBI* 4: 214 (1883).

Basionym : *Convolvulus cairicus* L., *Syst. Nat., ed*. 10. 2: 922 (1759).

Habit : Climber
Ecosystem preference : Moist deciduous forests, also in the plains
Distribution : Indo - Pacific and African
IUCN Category : Least Concern (LC)
Habitat : Found in forest margins
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : September - May
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Chaavadippara, 10°52'42.20"N, 76°48'43.56"E, 275m, 28 January 2020, Aswani & Maya, 5832 (GVCH) **(Plate 72: Fig. b)**.

Ipomoea carnea subsp. ***fistulosa*** (Mart. ex Choisy) D.F.Austin, *Taxon* 26(2-3): 237 (1977).
Basionym: *Ipomoea fistulosa* Mart. ex Choisy in A.P.de Candolle, *Prodr.* 9: 349 (1845)

Habit : Shrub
Ecosystem preference : Marshy wetlands
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : In marshes along dam sites, rock pools, other wetlands
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : Throughout the year

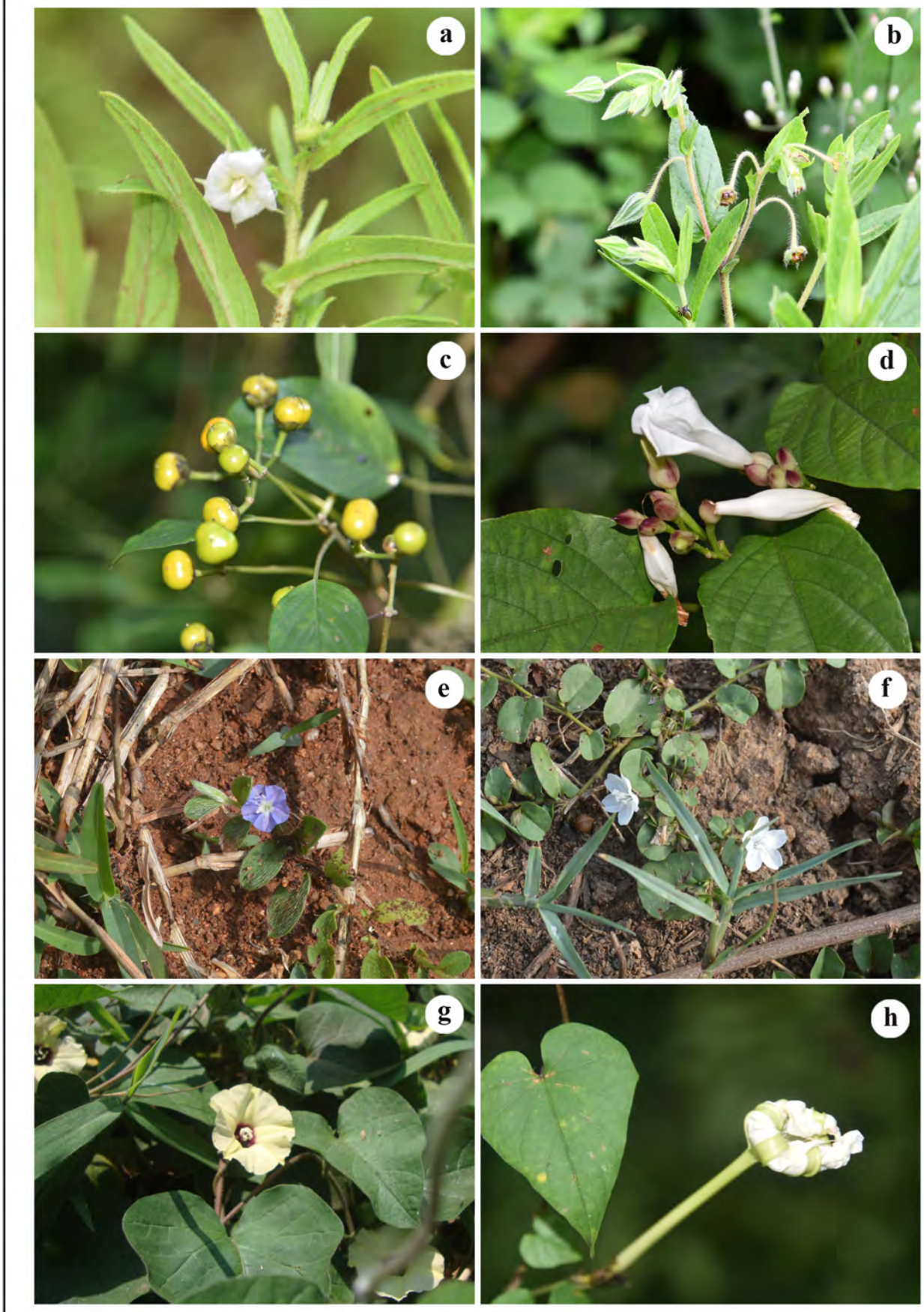

Plate 71: Fig. a. *Trichodesma indicum* (L.) Sm. **b.** *Trichodesma zeylanicum* (Burm.f.) R.Br. **c.** *Argyreia elliptica* (Roth) Choisy **d.** *Camonea umbellata* (L.) A. R. Simões & Staples **e.** *Evolvulus alsinoides* (L.) L. **f.** *Evolvulus nummularius* (L.) L. **g.** *Hewittia malabarica* (L.) Suresh **h.** *Ipomoea alba* L.

Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Vedivachapara, 10°50'12.34"N, 76°40'41.15"E, 123m, 04 June 2017, Aswani & Maya, 68 (GVCH); Malampuzha Dam - Kava, 10°50'38.92"N, 76°43'34.63"E, 132m, 06 April 2018, Aswani & Maya, 1833 (GVCH); Walayar Dam, 10°50'24.58"N, 76°51'01.52"E, 284m, 09 May 2018, Aswani & Maya, 2057 (GVCH); Mayapallam, 10°48'0.36"N, 76°45'58.68"E, 143m, 10 May 2018, Aswani & Maya, 2099 (GVCH); Koyyamarakadu, 10°47'40.58"N, 76°45'27.05"E, 141m, 30 November 2019, Aswani & Maya, 5316 (GVCH).

Ipomoea eriocarpa R.Br., *Prodr. Fl. Nov. Holland.* 484. (1810); Hook. f., *FBI* 4: 204 (1883); Vajr., *Fl. Palghat Dist* 310 (1990); *Ipomoea hispida* (Vahl) Roem. & Schult., Gamble, *Fl. Madras* 915 (1923).

Habit : Climber
Ecosystem preference : Moist deciduous forests and also in the plains
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Found in open forest tracks
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : October - January
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Ayyankulam, 10°48'37.19"N , 76° 44 '56.27"E, 142m, 06 January 2018, Aswani & Maya, 1182 (GVCH).

Ipomoea hederifolia L., *Syst. Nat.*, ed. 10. 2: 925 (1759); Vajr., *Fl. Palghat Dist* 311 (1990); Sasidh., *Fl. Parambikulam WLS* 207 (2002); *Ipomoea coccinea* Clarke, Hook. f., *FBI* 4: 199 (1883); *Quamoclit phoenicea* (Roxb.) Choisy, Gamble, *Fl. Madras* 919 (1923).

Habit : Climber
Ecosystem preference : Moist deciduous forests and plains
Distribution : Indo - Pacific, Holarctic and South American
IUCN Category : Not Evaluated (NE)
Habitat : Along stream sides and degraded forest areas, also in the plains
Raunkiaer's Life form : Liana (Eulianas)
Distribution Frequency : Common
Phenology : October - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Pallippara, 10°49'48.36"N, 76°43'44.04"E, 145m, 29 October 2017, Aswani & Maya, 711 (GVCH); Ollappallam, 10°49'53.78"N, 76°43'34.38"E, 143m, 25 November 2017, Aswani & Maya, 994 (GVCH); Karadikunnu, 10°50'23.64"N, 76°49'47.64" E, 234m, 30 December 2017, Aswani & Maya,1111 (GVCH); Thaanikunnu, 10°51'55.44"N, 76°42'00.11"E, 187m, 18 December 2018, Aswani & Maya, 3445 (GVCH); Koyyamarakadu, 10°47'40.58"N, 76°45'27.05"E, 145m, 30 November 2019, Aswani & Maya, 5320 (GVCH).

Ipomoea nil (L.) Roth, *Catal. Bot.* 1: 36 (1797); *Ipomoea hederacea* Hook.f., *FBI* 4:199 (1883); Gamble, *Fl. Madras* 917 (1923).

Basionym : *Convolvulus nil* L., *Sp. Pl.*, ed. 2. 1: 219 (1762).

Habit : Climber
Ecosystem preference : Deciduous forests and also in the plains
Distribution : Indo - Pacific, Holarctic and South American
IUCN Category : Not Evaluated (NE)
Habitat : Found in forest margins and in bio fences

Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : November - January
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Edamala, 10°50'8.57"N, 76°38'57.48"E, 130 m, 16 October 2019, Aswani & Maya, 4731 (GVCH) **(Plate 72: Fig. c)**.

Ipomoea obscura (L.) Ker Gawl., *Bot. Reg.* 3: t. 239 (1817); Hook. f., *FBI* 4: 207 (1883); Gamble, *Fl. Madras* 916 (1923); Sasidh., *Fl. Parambikulam WLS* 208 (2002).

Basionym : *Convolvulus obscurus* L., *Sp. Pl.*, ed. 2. 1: 220 (1762).

Habit : Climber
Ecosystem preference : Degraded Forest areas and also in the plains
Distribution : Indo - Pacific, Holarctic, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Found in the margins of the forests
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Common
Phenology : October - March
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala, 10°49'44.76"N, 76°40'34.59"E, 103m, 05 October 2017, Aswani & Maya, 623 (GVCH);Way to Ayyappan Mala, 10°48'59.96"N, 76°45'22.61"E, 152m, 06 January 2018, Aswani & Maya, 1223 (GVCH); Edamala, 10°50'8.57"N, 76°38'57.48"E, 10.835715° E, 128m, 16 October 2019, Aswani & Maya, 4729 (GVCH); Mathappu Mala, 10°50'57.35"N, 76°49'44.27"E, 315m, 07 January 2020, Aswani & Maya, 5608 (GVCH).

Ipomoea pes-tigridis L., *Sp. Pl.* 1: 162 (1753); Hook. f., *FBI* 4: 204 (1883); Gamble, *Fl. Madras* 918 (1923); Vajr., *Fl. Palghat Dist* 311 (1990); *Ipomoea pes-tigridis* L. var. *hepaticifolia* (L.) Clarke, Hook. f., *FBI* 4: 204 (1883).

Habit : Climber
Ecosystem preference : Moist deciduous forests and also in the plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Found in the margins of hillocks
Raunkiaer's Life form : Lianas (Euliana)
Distribution Frequency : Common
Phenology : September - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Cheranpara, 10°49'29.62"N, 76°40'38.63"E, 102m, 27 June 2017, Aswani & Maya, 174 (GVCH); Ayyankulam, 10°48'37.19"N, 76°44'56.27"E, 147m, 06 January 2018, Aswani & Maya, 1187 (GVCH); Mayappalam, 10°48'0.36"N, 76°45'58.68"E, 154m, 10 May 2018, Aswani & Maya, 2110(GVCH); Ayyappan Mala, 10°49'07.19"N, 76°44'50.28"E, 193m, 26 June 2018, Aswani & Maya, 2521 (GVCH); Pallakadu, 10° 51 '30.96"N, 76° 37' 39.00"E, 230m, 09 October 2018, Aswani & Maya, 3089 (GVCH).

Ipomoea purpurea (L.) Roth, *Bot. Abh. Beobacht.* 27 (1787); Hook. f., *FBI* 4: 200 (1883); Gamble, *Fl. Madras* 919 (1923).

Basionym : *Convolvulus purpureus* L., *Sp. Pl*., ed. 2. 1: 219 (1762).

Habit : Climber
Ecosystem preference : Plains
Distribution : South American
IUCN Category : Not Evaluated (NE)

Habitat : Found in forest margins and in biofences
Raunkiaer's Life form : Lianas (Euliana)
Distribution Frequency : Common
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kottamutti waterfalls, 10°49'46.20"N, 76°46'47.28"E, 302m, 23 September 2018, Aswani & Maya, 2951 (GVCH); Anayappanchalla, 10°48'20.42"N, 76°48'05.00"E, 146m, 30 November 2019, Aswani & Maya, 5192 (GVCH); Vettumadavu, 10°52'45.01"N, 76°48'8.60" E, 374m, 28 January 2020, Aswani & Maya, 5903 (GVCH) **(Plate 72: Fig. d)**.

Ipomoea sagittifolia Burm.f., *Fl. Ind. (N. L. Burman)* 50 (1768); *Ipomoea sepiaria* Roxb., Hook. f., *FBI* 4: 209 (1883); Gamble, *Fl. Madras* 916 (1923); Vajr., *Fl. Palghat Dist* 312 (1990).

Habit : Climber
Ecosystem preference : Wasteland, scrub jungles and roadsides
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Found in forest margins and in hillocks
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Common
Phenology : December - March
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Ayyankulam, 10°48'37.19"N, 76°44'56.27" E, 144m, 06 January 2018, Aswani & Maya, 1184 (GVCH); Mayyappallam, 10°48'0.36"N, 76°45'58.68"E, 119m, 10 May 2018, Aswani & Maya, 2075 (GVCH); Ayyappan Mala, 10°49'07.19"N, 76°44'50.28"E, 163m, 07 March 2019, Aswani & Maya, 3783 (GVCH); Koyyamarakaadu,10°47'41.24"N,76°45'35. 17"E, 160m, 30 November 2019, Aswani & Maya, 5309 (GVCH).

Ipomoea staphylina Roem. & Schult., *Syst. Veg., ed*. 15 *bis [Roemer & Schultes]* 4: 249 (1819); Hook. f., *FBI* 4: 210 (1883); Gamble, *Fl. Madras* 917 (1923); Vajr., *Fl. Palghat Dist* 312 (1990).

Habit : Climber
Ecosystem preference : Deciduous forests
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : Found in forest margins
Raunkiaer's Life form : Lianas (Euliana)
Distribution Frequency : Occasional
Phenology : January - April
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Karadikunnu, 10°50'23.64"N, 76°49'47.64" E, 213m, 30 December 2017, Aswani & Maya, 1090 (GVCH); Way to Ayyappan Mala, 10°48'59.96"N, 76°45'22.61"E, 140m, 30 December 2017, Aswani & Maya, 1211 (GVCH); Mathappumala, 10° 51'0.15"N, 76°49'53.62"E, 240m, 07 January 2020, Aswani & Maya, 5581 (GVCH) **(Plate 72: Fig. e)**.

Ipomoea triloba L., *Sp. Pl.* 1: 161 (1753); Chandra. *et al*., *Indian J. For*. 2: 23 (1979); Anil Kumar *et al*., *Fl. Pathanamthitta* 344 (2005); Sunil & Sivadasan, *Fl. Alappuzha Dist* 476 (2009**).**

Habit : Climber
Ecosystem preference : Degraded forest areas and also in the plains
Distribution : Indo - Pacific, Holarctic and South American
IUCN Category : Least Concern (LC)
Habitat : Found in hillock margins
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Occasional
Phenology : September - March

Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala, 10°49'44.76"N, 76°40'34.59"E, 128m, 05 October 2017, Aswani & Maya, 648 (GVCH); Koyyamarakaadu, 10°47'40.58"N, 76°45'27.05"E, 140m, 30 November 2019, Aswani & Maya, 5315 (GVCH) **(Plate 72: Fig. f)**.

Ipomoea wightii Choisy, *Mém. Soc. Phys. Genève* 6: 470 (1833); Hook. f., *FBI* 4: 203 (1883); Gamble, *Fl. Madras* 917 (1923); Vajr., *Fl. Palghat Dist* 312 (1990); Sasidh., *Fl. Parambikulam WLS* 208 (2002).

Habit : Climber
Ecosystem preference : Grasslands
Distribution : Indo - Pacific and African
IUCN Category : Least Concern (LC)
Habitat : In open grassy regions of forests
Raunkiaer's Life form : Lianas (Euliana)
Distribution Frequency : Rare
Phenology : December - January
Altitude preference : Found in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Pothukunnu, 10°53'21.84"N, 76°46'33.24" E, 978m, 28 January 2020, Aswani & Maya, 5970 (GVCH) **(Plate 72: Fig. g)**.

Merremia Dennst. ex Endl., *Gen. Pl. [Endlicher] Suppl.* 1: 1403 (1841)

Merremia hederacea (Burm.f.) Hallier f., Bot. Jahrb. Syst. 18(1-2): 118 (1893); Sasidh., *Fl. Parambikulam WLS* 209 (2002); *Ipomoea chryseides* Ker-Gawl., Hook. f., *FBI* 4: 206 (1883); *Merremia chryseides* (Ker-Gawl.) Hall. f., Gamble, *Fl. Madras* 929 (1923).

Basionym : *Evolvulus hederaceus Burm*.f., *Fl. Ind. (N. L. Burman)* 77 (1768).

Habit : Climber
Ecosystem preference : Degraded forest tracks
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Found in forest outskirts
Raunkiaer's Life form : Lianas (Euliana)
Distribution Frequency : Rare
Phenology : October - January
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Way to Ayyappan Mala, 10°48'59.96"N, 76°45'22.61"E, 144m, 06 January 2018, Aswani & Maya, 1215 (GVCH) **(Plate 72: Fig. h)**.

Operculina Silva Manso, *Enum. Subst. Braz.* 16 (1836)

Operculina turpethum (L.) Silva Manso, *Enum. Subst. Braz.* 16, 49 (1836); Gamble, *Fl. Madras* 929 (1923); Vajr., *Fl. Palghat Dist* 314 (1990); *Ipomoea turpethum* (L.) R. Br., Hook. f., *FBI* 4: 212 (1883).

Basionym : *Convolvulus turpethum* L., *Sp. Pl.* 1: 155 (1753).

Habit : Climber
Ecosystem preference : Degraded Forest areas and also in moist localities in the plains
Distribution : Indo - Pacific, African
IUCN Category : Not Evaluated (NE)
Habitat : Found in margins of hillocks
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Occasional
Phenology : May - June
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Anayappanchalla, 10°48'19.16"N,

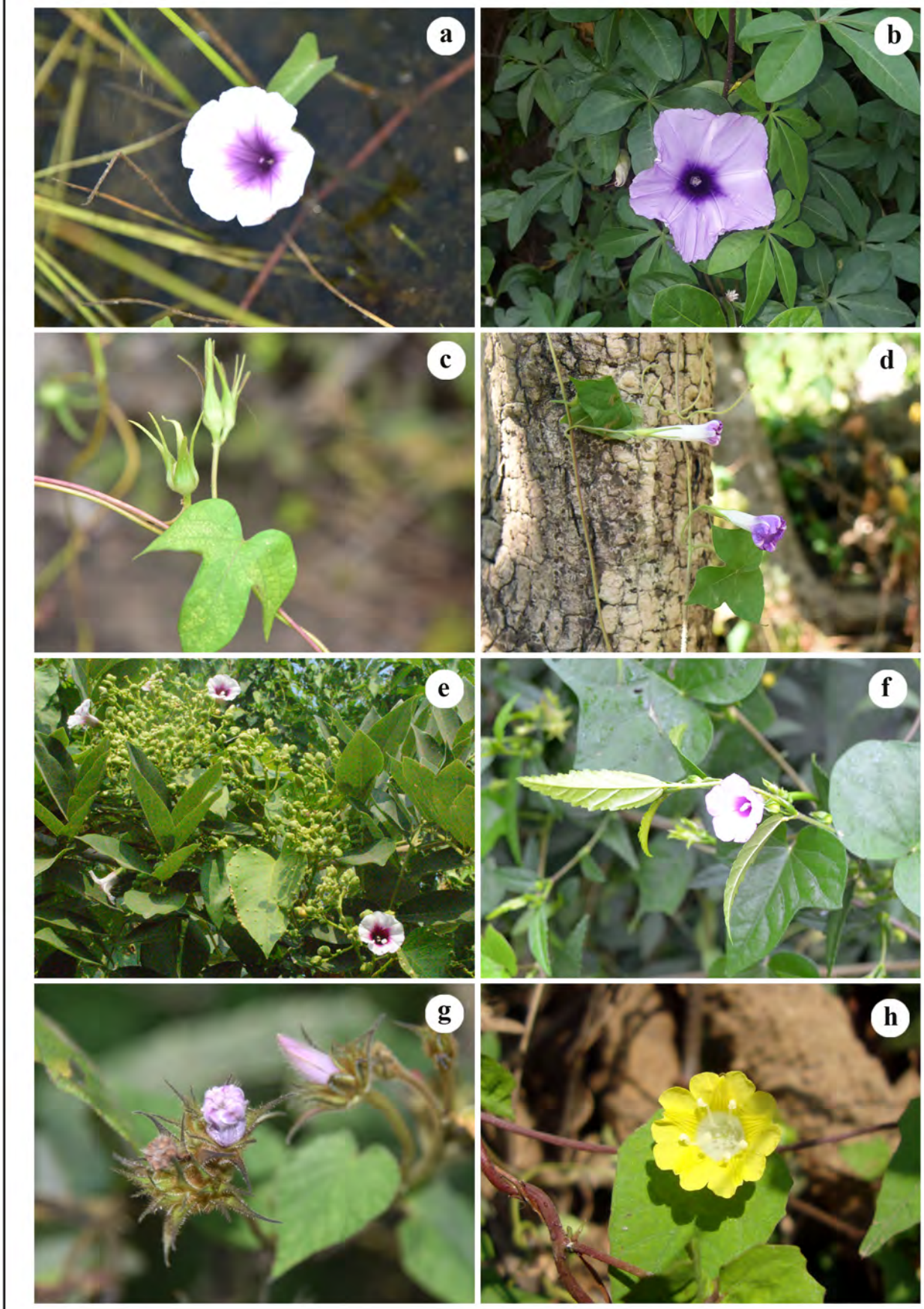

Plate 72: Fig. a. *Ipomoea aquatica* Forssk. **b.** *Ipomoea cairica* (L.) Sweet **c.** *Ipomoea nil* (L.) Roth **d.** *Ipomoea purpurea* (L.) Roth **e.** *Ipomoea staphylina* Roem. & Schult. **f.** *Ipomoea triloba* L. **g.** *Ipomoea wightii* Choisy **h.** *Merremia hederacea* (Burm.f.) Hallier f.

76°48'15.25"E, 145m, 30 November 2019, Aswani & Maya, 5232 (GVCH); Koyyamarakadu,10°47'41.24"N,76°45'35.17"E, 158m, 30 November 2019, Aswani & Maya, 5307 (GVCH) **(Plate 73: Fig. a)**.

Xenostegia D. F. Austin & Staples, *Brittonia* 32(4): 533 (1981)

Xenostegia tridentata (L.) D.F.Austin & Staples, *Brittonia* 32(4): 533 (1981); *Ipomoea tridentata* (L.) Roth in Roem., Hook. f., *FBI* 4: 205 (1883); *Merremia tridentata* (L.) Hall. f., Gamble, *Fl. Madras* 928 (1923); Vajr., *Fl. Palghat Dist* 313 (1990); Sasidh., *Fl. Parambikulam WLS* 209 (2002).

Basionym : *Convolvulus tridentatus* L., *Sp. Pl.* 1: 157 (1753).

Habit : Herb
Ecosystem preference : Moist deciduous forests and also in plains
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Found in open forest tracks
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Common
Phenology : November - January
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala, 10°49'44.76"N, 76°40'34.59"E, 115m, 20 June 2017, Aswani & Maya, 141 (GVCH); Ollappallam, 10°49'52.20"N, 76°43'44.19" E, 154m, 25 November 2017, Aswani & Maya, 928 (GVCH); Kongampadam, 10°48'39.80"N, 76°47'2.67"E, 151m, 15 June 2018, Aswani & Maya, 2306 (GVCH); Pallippara, 10°49'48.36"N, 76°43'44.04"E, 123m, 23 November 2019, Aswani & Maya, 4992 (GVCH) **(Plate 73: Fig. b)**.

Solanaceae

Key to genera

1. Fruit a capsule……..…..…..*Datura*
- Fruit a berry……...……2
2. Calyx enlarged in fruit, covering the berry……..……..*Physalis*
- Calyx small in fruit……..…….……..3
3. Anthers connivant into a cone ……..……..….*Solanum*
- Anthers not connivant into a cone ……...……..…….*Capsicum*

Capsicum L., *Sp. Pl. [Linnaeus]* 1: 188 (1753)

Key to species

Fruits erect……...……*C. frutescens*
Fruits drooping……..…...……*C. annum*

Capsicum annuum L., Sp. Pl. [Linnaeus] 1: 188 (1753); *Capsicum annuum* L. var. *annuum*; Gamble, *Fl. Madras* 941(661); *Capsicum frutescens* Clarke in Hook. f., FBI 4: 239 (1883).

Habit : Herb
Ecosystem preference : Plains
Distribution : South American
IUCN Category : Not Evaluated (NE)
Habitat : Found in forest tracks and often found cultivated
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Common
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimen examined :INDIA, Kerala: Palakkad District, Walayar range, Nadupathy tribal colony, 10°51'22.24"N, 76°49'39.27"E, 115m, 20 June 2017, Aswani & Maya, 6559 (GVCH).

Capsicum frutescens L., *Sp. Pl.* 1: 189 (1753); Gamble, *Fl. Madras* 941 (1923);

Capsicum minimum Clarke, Hook. f., *FBI* 4: 239 (1883).

Habit : Herb
Ecosystem preference : Moist deciduous forests and also in plains
Distribution : South American
IUCN Category : Least Concern (LC)
Habitat : Found in forest tracks and often found cultivated
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Common
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, G. P. Nair Estate, 10°53'20.76"N, 76°39'41.04"E, 179m, 24 March 2018, Aswani & Maya, 1618 (GVCH); Thannikunnu, 10°51'55.44"N, 76°42'00.11"E, 178m, 18 December 2018, Aswani & Maya, 3436 (GVCH).

Datura L., *Sp. Pl*. 1: 179 (1753)

Key to species

Branches purplish; corolla white or purple suffused…….……...…….*D. metal*
Branches greenish; corolla creamy - white……..……..…..…..*D. stramonium*

Datura metel L., *Sp. Pl.* 1: 179 (1753). Hook. f., *FBI* 4: 243 (1883); Gamble, *Fl. Madras* 941 (1923); Vajr., *Fl. Palghat Dist* 315 (1990); Sasidh., *Fl. Parambikulam WLS* 210 (2002); *Datura fastuosa* L., Hook. f., *FBI* 4: 242 (1883); Gamble, *Fl. Madras* 941 (1923); *Datura fastuosa* L. var. *alba* (Nees) Clarke in Hook. F., *FBI* 4: 243 (1883); Gamble, *Fl. Madras* 941 (1924).

Habit : Shrub
Ecosystem preference : Plains and in wastelands
Distribution : Indo – Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Found in margins of hillocks and in roadsides
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Common
Phenology : March – December
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala, 10°49'44.76"N, 76° 40 '34.59"E, 134m, 05 October 2017, Aswani & Maya, 654 (GVCH).

Datura stramonium L., *Sp. Pl.* [Linnaeus] 1: 179 (1753); Hook. F., *FBI* 4: 242 (1883); Gamble, *Fl. Madras* 941 (1923); *Datura stramonium* L. var. *tatula* Clarke in Hook. F., *FBI* 4: 242 (1883).

Habit : Shrub
Ecosystem preference : Plains, Scrub jungles and wastelands
Distribution : Indo – Pacific, Holarctic, South American
IUCN Category : Not Evaluated (NE)
Habitat : Found in roadsides and in other wastelands
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Common
Phenology : July – September
Altitude preference : Found in lower and medium altitudes
Specimen examined :INDIA, Kerala: Palakkad District, Walayar range, Nadupathy colony, 10°51'27.72"N, 76°47'0.96"E, 500m, 17 February 2023, Aswani & Maya, 6528 (GVCH) **(Plate 73: Fig. c)**.

Physalis L., *Sp. Pl.* 1: 182 (1753)

Physalis angulata L., *Sp. Pl.* 1: 183 (1753); Sasidh., *Fl. Parambikulam WLS* 211 (2002); *Physalis minima* L., *Sp. Pl*. 183 (1753); Hook. F., *FBI* 4: 238 (1883); Gamble, *Fl. Madras* 939 (1923); Vajr., *Fl. Palghat Dist* 316 (1990).

Habit : Herb
Ecosystem preference : Deciduous forests and plains
Distribution : Indo – Pacific, Holarctic, African, South American and Australian
IUCN Category : Least concern (LC)
Habitat : Found in open forests and other plains
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : July – December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Vedivachapara, 10°50'12.34"N, 76°40'41.15"E, 113m, 04 June 2017, Aswani & Maya, 58 (GVCH); Neelippara, 10°51'53.30"N, 76°37'36.39"E, 424m, 15 September 2017, Aswani & Maya, 545 (GVCH) **(Plate 73: Fig. d)**.

Solanum L., *Sp. Pl.* 1: 184 (1753)

Key to species

1. Leaves pinnatisect…..……..*S. lycopericum*
- Leaves simple……..……..……..2
2. Unarmed plants…….....*S. americanum*
- Armed plants……..……..3
3. Flowers white……..…....*S. torvum*
- Flowers blue……..……..…….4
4. Inflorescence - many flowered; racemes; calyx lobes – triangular……..……5
- Inflorescence – few flowered; racemes; calyx lobes – lanceolate…….……6
5. Leaves stellate wooly below; berry orange - yellow ……..……*S. violaceum*
- Leaves stellate hairy below; berry orange - red…..……..…..…….*S. multiflorum*
6. Lateral nerves stellately pubescent; prickly along the nerves; berry oblong – globose …….*S. melongena* subsp. *cumingii*
- Lateral nerves less pubescent; rarely prickly along nerves; berry variable in size …….…*S. melongena* (Cultivated brinjal)

Solanum americanum Mill., *Gard. Dict., ed. 8. [unpaged] Solanum no.* 5 (1768); Sasidh., *Fl. Parambikulam WLS* 212 (2002); *Solanum nigrum* Gamble, *Fl. Madras* 936 (1923); Vajr., *Fl. Palghat Dist* 319 (1990).

Habit : Herb
Ecosystem preference : Degraded Forest areas, plains and in wastelands
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated(NE)
Habitat : Road sides and other wastelands
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : July - March
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Chemanamkadu, 10°48'46.03"N, 76°44'47.99"E, 121m, 06 January 2018, Aswani & Maya, 1152 (GVCH).

Solanum lycopersicum L., *Sp. Pl. [Linnaeus]* 1: 185 (1753); *Lycopersicon esculentum* Mill., C.B. Clarke in Hook. f., FBI 4: 237 (1883); Gamble, *Fl. Madras* 941 (1923).

Habit : Herb
Ecosystem preference : In plains
Distribution : South American
IUCN Category : Not Evaluated (NE)
Habitat : Cultivated in agricultural lands and in home steads
Raunkiaer's Life form :Therophyte
Distribution Frequency : Occasional
Phenology : Throughout the year
Altitude preference : Found cultivated in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Nadupathy colony, 10°51'27.72"N, 76°47'0.96"E, 546m, 17 February 2023, Aswani & Maya, 6535 (GVCH).

Solanum melongena L., *Sp. Pl*. 1: 186 (1753); Hook. f., *FBI* 4: 234 (1883); Gamble, *Fl. Madras* 937 (1923); Vajr., *Fl. Palghat Dist* 319 (1990); Sasidh., *Fl. Parambikulam WLS* 213 (2002); *Solanum coagulans* Forssk., Hook. f., *FBI* 4: 236 (1883).

Habit : Shrub
Ecosystem preference : Plains
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Cultivated in homesteads and in farm lands
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : August - March
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Nadupathy tribal colony, 10°51'22.24"N, 76°49'39.27"E, 527m, 29 March 2023, Aswani & Maya, 6560 (GVCH).

Solanum melongena subsp. ***cumingii*** (Dunal) J.Samuel*, Breakthroughs Genet. Breed. Capsicum and Eggplant* 258 (2013); *Solanum melongena* L. var. *insanum* (L.) Prain, Gamble, *Fl. Madras* 937 (1923).

Basionym: *Solanum cumingii* Dunal in A.P.de Candolle, *Prodr*. 13(1): 363 (1852).

Habit : Shrub
Ecosystem preference : Deciduous forests and other plains
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : Open forest tracks
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Rare
Phenology : April - December
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Chaavadippara, 10°52'39.57"N, 76°48'39.85"E, 273m, 28 January 2020, Aswani & Maya, 5872 (GVCH) **(Plate 73: Fig. e)**.

Solanum multiflorum Roth, *Syst. Veg., ed. 15 bis [Roemer & Schultes]* 4: 669 (1819); *Solanum indicum* var. *multiflorum* C.B. Clarke in Hook.f., *FBI* 4: 235 (1883); Gamble, *Fl. Madras* 938 (1923); *Solanum anguivi* Lam. var. *multiflora* (Roth ex Roem. & Schult.), Vajr., *Fl. Palghat Dist* 318 (1990); Sasidh., *Fl. Parambikulam WLS* 212 (2002).

Habit : Shrub
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : In forest tracks
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : November-January
Altitude preference : Found in higher altitudes
Specimen examined: INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala,10°52'10.20"N,76°47'15.00" E, 766m, 23 March 2019, Aswani & Maya, 4123 (GVCH).

Solanum torvum Sw., Prodr. [O. P. Swartz] 47. (1788).; Hook. f., *FBI* 4: 234 (1883); Gamble, *Fl. Madras* 937 (1923); Vajr., *Fl. Palghat Dist* 320 (1990); Sasidh., *Fl. Parambikulam WLS* 213 (2002).

Habit : Shrub
Ecosystem preference : Degraded Forest areas and also in the plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated(NE)
Habitat : Road sides and other wastelands
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : July - March

Altitude preference: Found in lower altitudes
Specimens examined: INDIA, Kerala: Palakkad District, Walayar range, Kallanpuzha, 10°51'34.02"N , 76°42'40.16"E, 173m, 26 January 2018, Aswani & Maya, 1363 (GVCH); G. P. Nair Estate, 10°53'26.52"N, 76°39'41.04"E, 192m, 24 March 2018, Aswani & Maya, 1687 (GVCH); Pazhampullikadu, 10°50'09.55"N, 76°38'28.33"E, 90m, 16 October 2018, Aswani & Maya, 3101 (GVCH); Ayyappan Mala, 10°49'07.19"N, 76°44'50.28"E, 147m, Aswani & Maya, 3767 (GVCH); Chaatappara waterfalls, 10°53'11.76"N, 76°42'15.84"E, 601m, Aswani & Maya, 5415 (GVCH).

Solanum violaceum Ortega, *Nov. Rar. Pl. Descr. Dec.* 56; *Jacq. Fragm.* 82.; *Solanum anguivi* auct. non Lam., Vajr., *Fl. Palghat Dist* 318 (1990); Sasidh., *Fl. Parambikulam WLS* 212 (2002); *Solanum indicum* Hook. f., *FBI* 4: 234 (1883), Gamble, *Fl. Madras* 938 (1923).

Habit : Shrub
Ecosystem preference : Moist Deciduous forests, Semi - evergreen forests and often found in plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found along dam sites and other wet regions
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Common
Phenology : August - April
Altitude preference : Found in all altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Walayar Dam, 10°50'24.58"N , 76°51'01.52"E, 266m, 09 May 2018, Aswani & Maya, 2039 (GVCH); Kochuthodu,10°51'55.44"N,76°42'00.11"E, 173m, 18 December 2018, Aswani & Maya, 3431 (GVCH); Ashramam, 10°51'23.40"N, 76°43'34.72"E, 116m, 02 August 2019, Aswani & Maya, 4404 (GVCH); Pothukunnu, 10°53'21.84"N, 76°46'33.24"E, 980m, 28 January 2020, Aswani & Maya, 5972 (GVCH) **(Plate 73: Fig. f)**.

Sphenocleaceae

Sphenoclea Gaertn., *Fruct. Sem. Pl.* 1: 113 (1788)

Sphenoclea zeylanica Gaertn., *Fruct. Sem. Pl.* i. 113. t. 24. (1788); Hook. f., *FBI* 3: 438 (1881); Gamble, *Fl. Madras* 739 (1921); Vajr., *Fl. Palghat Dist* 261 (1990).

Habit : Herb
Ecosystem preference : In water sources
Distribution : Indo - Pacific
IUCN Category : Least concern (LC)
Habitat : Found in dam sites
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : November - January
Altitude preference : Found in lower altitudes
Specimen examined: INDIA, Kerala: Palakkad District, Walayar range, Vedivachapara, 10°50'12.34"N, 76°40'41.15"E, 122m, 04 June 2017, Aswani & Maya, 67 (GVCH) **(Plate 73: Fig. g)**.

Hydroleaceae

Hydrolea L., *Sp. Pl., ed.* 2. 1: 328 (1762), nom. cons

Hydrolea zeylanica (L.) Vahl, *Symb. Bot. (Vahl)* 2: 46 (1791); Hook. f., *FBI* 4: 133 (1883); Gamble, *Fl. Madras* 884 (1923); Sasidh., *Fl. Parambikulam WLS* 201 (2002).

Basionym : *Nama zeylanica* L., Sp. Pl. 1: 226 (1753).

Habit : Herb
Ecosystem preference : Wetlands
Distribution : Indo Pacific, African and South American
IUCN Category : Least concern (LC)
Habitat : Found along the banks of water sources
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : August - January
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Valiya Eri, 10°48'53.21"N, 76°44'52.53"E, 134m, 06 January 2018, Aswani & Maya, 1711 (GVCH);Anayappanchalla, 10°48'24.15"N, 76°48'32.06"E, 166m, 30 November 2019, Aswani & Maya, 1711 (GVCH); Mayappalam,10°48'01.78"N,76°45'58.91", 133m, 30 November 2019, Aswani & Maya, 5405 (GVCH) **(Plate 73: Fig. h)**.

Lamiales

Oleaceae

Key to genera

Habit – climbing or scandent shrubs…....2
- Habit – trees……..…….…….3
2. Branches quadrangular; corolla lobes valvate…..……..……*Myxopyrum*
- Branches terete; corolla lobes imbricate…….…..…..…..*Jasminum*
3. Corolla lobes valvate in bud……..…..4
- Corolla lobes imbricate in bud…….……..……..…….*Nyctanthus*
4. Flowers polygamo – dioecious; corolla lobes tubular……..……..*Tetrapilus*
- Flowers bisexual; corolla lobes nearly free or connate in pairs…….....*Chionanthus*

Chionanthus D. Royen, *Sp. Pl.* 1: 8 (1753)

Chionanthus mala-elengi (Dennst.) P.S.Green, *Bull. Bot. Surv. India* 26(1-2): 124 (1985); Vajr., *Fl. Palghat Dist* 273 (1990); Sasidh., *Fl. Parambikulam WLS 183* (2002); *Linociera malabarica* Wall. ex G. Don, Hook. f., *FBI* 3: 607 (1882); Gamble, *Fl. Madras* 794 (1923).

Basionym : *Forsythia mala-elengi* Dennst., *Schlüssel Hortus Malab*. 31 (1818).

Habit : Tree
Ecosystem preference : Moist deciduous and semi - evergreen forests
Distribution : Indo - Pacific
Endemism : Peninsular India
IUCN Category : Not Evaluated (NE)
Habitat : Found in hill slopes
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : December - April
Altitude preference : Found in all altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, G. P. Nair estate, 10°53'38.36"N, 76°39'44.27"E, 104m, 24 March 2018, Aswani & Maya, 1711 (GVCH); Thaanikunnu, 10°51'55.44"N, 76°42'00.11"E, 188m, 18 December 2018, Aswani & Maya, 3446 (GVCH); Kanyarmuttu, 10°49'50.52"N, 76°44'24.72"E, 243m, 12 January 2019, Aswani & Maya, 3691 (GVCH); Chottuppara, 10°52'37.92"N, 76°41'39.84"E, 390m, 14 May 2019, Aswani & Maya, 3927 (GVCH).

Jasminum L., *Sp. Pl. [Linnaeus]* 1: 7 (1753)

Key to species

1. Stem glabrous.……...…….*J. flexile*
- Stem pubescent…….……....2
2. Calyx 7 lobed……..….*J. coarctatum*
- Calyx 5 lobed…..…..*J. auriculatum*

Jasminum auriculatum Vahl, *Symb. Bot. (Vahl)* 3: 1 (1794); Hook. f., *FBI* 3: 600 (1882); Gamble, *Fl. Madras* 790 (1923); Vajr., *Fl. Palghat Dist* 274 (1990); Sasidh., *Fl. Parambikulam WLS* 184 (2002).

Habit : Climber

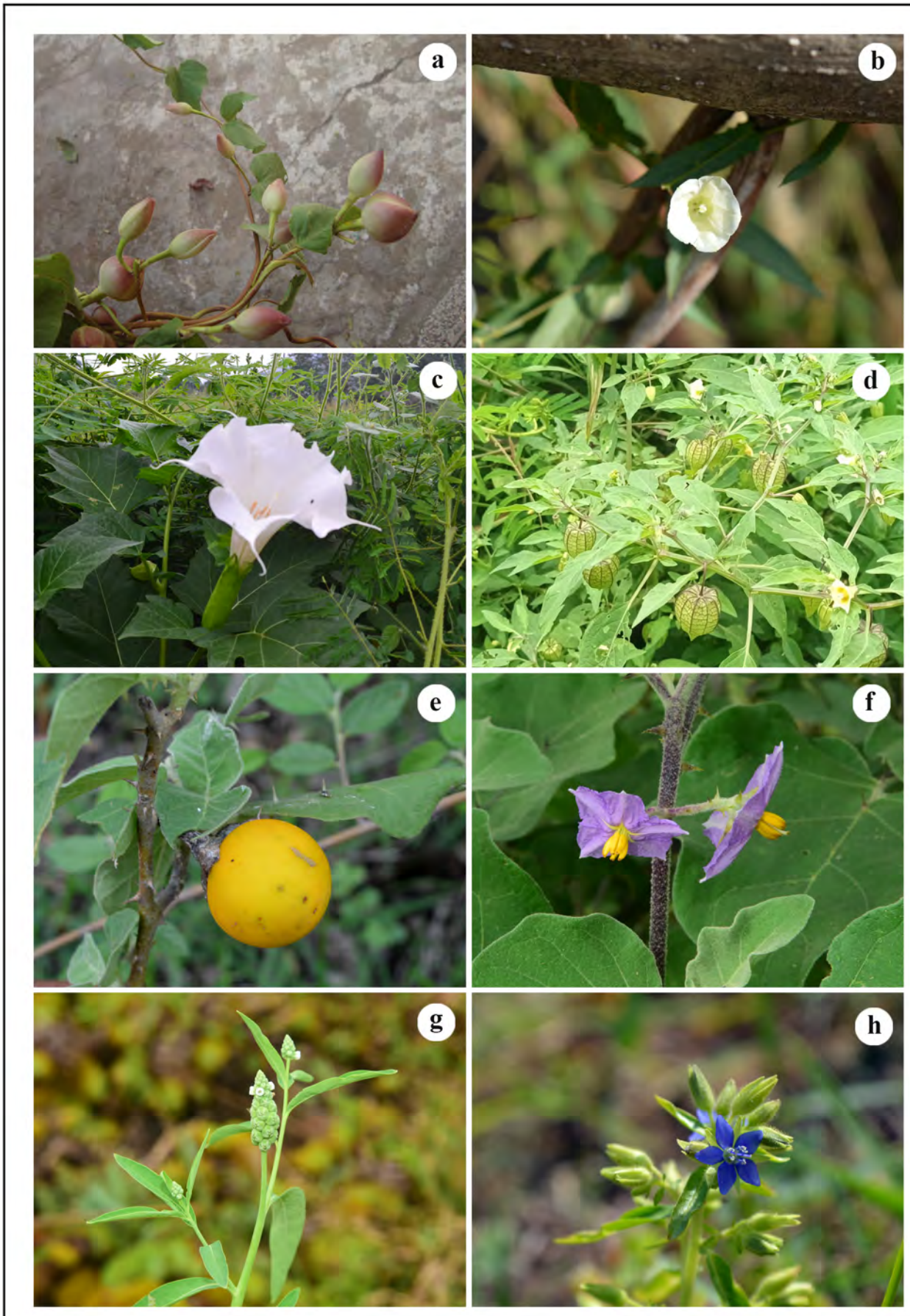

Plate 73: Fig. a. *Operculina turpethum* (L.) Silva Manso **b.** *Xenostegia tridentata* (L.) D.F.Austin & Staples **c.** *Datura stramonium* L. **d.** *Physalis angulata* L. **e.** *Solanum melongena* subsp. *cumingii (Dunal) J.Samuel* **f.** *Solanum violaceum* Ortega **g.** *Sphenoclea zeylanica* Gaertn. **h.** *Hydrolea zeylanica Vahl.*

Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found in forest margins and in biofences
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Common
Phenology : February - April
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kalliyara, 10°53'8.52"N, 76°39'38.88"E, 185m, 24 March 2018, Aswani & Maya, 1554 (GVCH).

Jasminum coarctatum Roxb., *Hort. Bengal*. 3; *Fl. Ind. i.* 92; *Jasminum rottlerianum* Wall. Hook. f., *FBI* 3: 593 (1882); Gamble, *Fl. Madras* 789 (1923); Vajr., *Fl. Palghat Dist* 275 (1990); Sasidh., *Fl. Parambikulam WLS* 185 (2002); *Jasminum rottlerianum* Wall. ex A. DC. var. *glabrior* Clarke, Hook.f., *FBI* 3:593 (1882).

Habit : Climber
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Along the outskirts of forests and often in bio fences
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : January - June
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Mannukunnu,10°52'5.50"N,76°38'30.27"E, 181m, 09 July 2019, Aswani & Maya, 4265 (GVCH); Kalliyara, 10°53'8.52"N, 76°39'38.88"E, 177m, 24 March 2018,Aswani & Maya, 4265 (GVCH) **(Plate 74: Fig. a).**

Jasminum flexile Vahl, *Symb. Bot. (Vahl)* 3: 1 (1794); Hook. f., *FBI* 3: 601 (1882); Gamble, *Fl. Madras* 791 (1923); *Jasminum flexile* Vahl var. *travancorense* Gamble, *Fl. Madras* 791 (1921); *Jasminum azoricum* Mohanan, Vajr., *Fl. Palghat Dist* 274 (1990); Sasidh., *Fl. Parambikulam WLS* 184 (2002); *Jasminum azoricum* L. var. *travancorense* (Gamble) M. Mohanan, Vajr., *Fl. Palghat Dist* 275 (1990).

Habit : Climber
Ecosystem preference : Moist deciduous and semi-evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Near water sources
Raunkiaer's Life form : Lianas (Euliana)
Distribution Frequency : Occasional
Phenology : October - March
Altitude preference : Found in all altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Chaatapara waterfalls, 10°53'11.76"N, 76°42'15.84"E, 653m, 10 December 2019, Aswani & Maya, 5512 (GVCH); Pettikallu, 10°53'11.76"N, 76°42'15.84"E, 594m, 10 December 2019, Aswani & Maya, 5562 (GVCH) **(Plate 74: Fig. b)**.

Myxopyrum Blume, *Bijdr. Fl. Ned. Ind.* 13: 683 (1826)

Myxopyrum smilacifolium Blume, *Mus. Bot.* 1(20): 320 (1851); Hook. f., *FBI* 3: 618 (1882); Sasidh., *Fl. Parambikulam WLS* 185 (2002); *Myxopyrum serratulum* Hill., Gamble, *Fl. Madras* 798 (1923); Vajr., *Fl. Palghat Dist* 276 (1990).

Habit : Climber
Ecosystem preference : Semi-evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Canopy rich forests
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare

Phenology : February - August
Altitude preference : Found in all altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, G. P. Nair estate, 10°53'29.76"N,76° 39 '50.76"E, 10.8916, 289m, 24 March 2018, Aswani & Maya, 1775 (GVCH) **(Plate 74: Fig. c)**.

Nyctanthes L., *Sp. Pl*. 1: 6 (1753)

Nyctanthes arbor-tristis L., *Sp. Pl.* 1: 6 (1753); Hook. f., *FBI* 3: 603 (1882); Gamble, *Fl. Madras* 792 (1923).

Habit : Tree
Ecosystem preference : In plains
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Planted in homesteads
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : September - April
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Nadupathy tribal colony, 10°51'22.24"N, 76° 49 '39.27"E, 527m, 29 March 2023, Aswani & Maya, 6561 (GVCH).

Tetrapilus Lour., *Fl. Cochinch.* 2: 611 (1790)

Tetrapilus dioicus (Roxb.) L.A.S.Johnson, *Contr. New South Wales Natl. Herb.* 2: 408 (1957); *Olea dioica* Roxb., *Hort. Bengal.* 3; *Fl. Ind. i*. 106; Hook. f., *FBI* 3: 612 (1882); Gamble, *Fl. Madras* 796 (1923); Vajr., *Fl. Palghat Dist* 276 (1990); Sasidh., *Fl. Parambikulam WLS* 185 (2002).

Basionym: *Olea dioica* Roxb. in *Fl. Ind.* 1: 105 (1820).

Habit : Tree
Ecosystem preference : Moist deciduous forests and Semi-evergreen forests
Distribution : Indo - Pacific
Endemism : India
IUCN Category : Not Evaluated (NE)
Habitat : Near water sources and hill slopes
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : November - April
Altitude preference : Found in medium and higher altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kochithodu, 10°52'7.89"N, 76°42'19.8"E, 282m, 14 May 2019, Aswani & Maya, 3969 (GVCH); Jamanthimala, 10°52'18.19"N, 76°46'47.14"E, 962m, 09 January 2020, Aswani & Maya, 5794 (GVCH); Ayyappan Koil, 10°52'54.12"N, 76°47'27.96"E, 515m, 28 January 2020, Aswani & Maya, 5936 (GVCH); Pettikallu, 10°53'2.04"N, 76°42'13.92"E, 542m, 27 February 2020, Aswani & Maya, 6087 (GVCH); Aatumala Thodu, 10°53'52.08"N, 76°41'24"E, 1015m, 28 February 2020, Aswani & Maya, 6138 (GVCH).

Gesneriaceae

Epithema Blume, *Bijdr. Fl. Ned. Ind.* 14: 737 (1826)

Key to genera

1. Stamens 4; fruit a globose capsule with circumscissile dehiscence ……..…….....*Epithema*
- Stamens 2; fruit 2 - valved capsule with loculicidal dehiscence……2
2. Capsule ellipsoid or ovoid; leaves oblique at base…...*Rhynchoglossum*
- Capsule linear; leaves not oblique at base……..…….*Henckelia*

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Epithema carnosum Benth., *Scroph. Ind.* 57. (1835); *Epithema carnosum* (G. Don) Benth. var. hispida Clarke, Hook.f., *FBI* 4: 369 (1884); Gamble, *Fl. Madras* 992 (1924); Vajr., *Fl. Palghat Dist* 333 (1990); Sasidh., *Fl. Parambikulam WLS* 222 (2002).

Habit : Herb
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
Endemism : Western Ghats
IUCN Category : Not Evaluated(NE)
Habitat : Mud cliffs in semi evergreen forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : July - October
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Attippara, 10°52'06.24"N, 76°41'53.16"E, 194m, 18 December 2018, Aswani & Maya, 3491 (GVCH); Chottupara waterfalls, 10°53'11.76"N, 76°42'15.84"E, 600m, 14 May 2019, Aswani & Maya, 3985 (GVCH) **(Plate 74: Fig. d)**.

Henckelia Spreng., *Anleit. Kenntn. Gew., ed.* 2. 2(1): 402 (1817)

Key to species

1. Margins of leaves single crenate; leaves in whorls of three ……...*H. humboldtiana*
   - Margins of leaves double crenate; the lower ones irregular……..…...2
2. Lateral nerves 4 paired; petioles short upto 3 cm long…….....*H.incana*
   - Lateral nerves 6-8 pairs; petioles long upto 6 cm or above, winged…….....….*H.fischeri*

Henckelia fischeri (Gamble) A.Weber & B.L.Burtt, *Beitr. Biol. Pflanzen* 70(2-3): 344 (1998); *Didymocarpus fischeri* Gamble, Gamble, *Fl. Madras* 989 (1924).

Basionym : *Didymocarpus fischeri* Gamble, *Bull. Misc. Inform. Kew* 1923(3): 117 (1923).

Habit : Herb
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
Endemism : Southern Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Exposed wet rocks in semi - evergreen forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : October - November
Altitude preference : Found in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Ayyappan Mala, 10°49'10.78"N , 76°44'14.15"E, 383m, 26 June 2018, Aswani & Maya, 2556 (GVCH).

Henckelia humboldtiana (Gardner) A.Weber & B.L.Burtt, *Beitr. Biol. Pflanzen* 70 (2-3): 346 (1998); *Didymocarpus humboldtiana* Gard., Hook. f., *FBI* 4: 353 (1884); Gamble, *Fl. Madras* 989 (1924).

Basionym : *Didymocarpus humboldtianus* Gardner, *Calcutta J. Nat. Hist.* 6: 477 (1846).

Habit : Herb
Ecosystem preference : Grasslands
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : wet rocks in hill slopes
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : September - November
Altitude preference : Found in lower altitudes

Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Ayyappan Mala, 10°49'06.91"N, 76°44'44.91"E, 166m, 26 June 2018, Aswani & Maya, 2541 (GVCH) **(Plate 74: Fig. e)**.

Henckelia incana (Vahl) Spreng., *Syst. Veg., ed.* 16 [Sprengel] 1: 38 (1824); *Didymocarpus tomentosa* Wight, Hook. f., *FBI* 4: 353 (1884); Gamble, *Fl. Madras* 989 (1924); Vajr., *Fl. Palghat Dist* 332 (1990); Sasidh., *Fl. Parambikulam WLS* 222 (2002).

Basionym : *Roettlera incana* Vahl, E*num. Pl. [Vahl]* i. 88 (1805) (1804).

Habit : Herb
Ecosystem preference : Grasslands
Distribution : Indo - Pacific
Endemism : Peninsular India
IUCN Category : Not Evaluated (NE)
Habitat : Wet rocks in grasslands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : May - October
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Ayyappan Mala, 10°49'10.78"N, 76°44'14.15"E, 383m, 26 June 2018, Aswani & Maya, 2557 (GVCH).

Rhynchoglossum Blume, *Bijdr. Fl. Ned. Ind.* 14: 741 (1826)

Key to species

1. Stamens 2……..…..…..…….*R. obliqum*
- Stamens 4…….……..……..2
2. Inflorescence lax, 5 to 6 flowered; corolla throat without a yellow blotch, anther 1 celled……..…….*R. scabrum*
- Inflorescence condensed, 10 – 15 flowered, corolla throat with a yellow blotch, anther 2 celled…..….*R. notonianum*

Rhynchoglossum notonianum (Wall.) B.L.Burtt, *Notes Roy. Bot. Gard. Edinburgh* 24: 170 (1962); Vajr., *Fl. Palghat Dist* 333 (1990); Sasidh., *Fl. Parambikulam WLS* 222 (2002); *Klugia notoniana* (Wall.) A. DC., Hook. f., *FBI* 4: 367 (1889); Gamble, *Fl. Madras* 990 (1924).

Habit : Herb
Ecosystem preference : Semi-evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Moist shady areas in semi-evergreen forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : July - December
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Chacolas, 10°51'22.68"N, 76° 44 '41.28"E, 256m, 02 August 2019, Aswani & Maya, 4490 (GVCH) **(Plate 74: Fig. f).**

Rhynchoglossum obliqum Blume, *Bijdr. Fl. Ned. Ind.* 14: 741 (1826); Hook. f., *FBI* 4: 367 (1884); Gamble, *Fl. Madras* 990 (1924).

Habit : Herb
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Moist shady regions in semi - evergreen forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : July - November
Altitude preference : Found in all altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kezhakootimala, 10°51'53.30"N, 76°37'36.39"E, 380m, 15 September 2017,

Aswani & Maya, 501 (GVCH); Karadikunnu, 10°50'23.64"N, 76°49'47.64"E, 204m, 30 December 2017, Aswani & Maya, 1081 (GVCH); Chacolas, 10°51'22.68"N, 76°44'41.28"E, 256m, 02 August 2019, Aswani & Maya, 4490 (GVCH); Chaatapara waterfalls, 10°53'11.76"N, 76°42'15.84"E, 651m, 10 December 2019, Aswani & Maya, 5510 (GVCH) **(Plate 74: Fig. g)**.

Rhynchoglossum scabrum Dalzell, *Hooker's J. Bot. Kew Gard. Misc.* 2: 140 (1850); Janeesha *et al. Plant Syst Evol* 309, 26 (2023).

Habit : Herb
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
Endemism : South India
IUCN Category : Not Evaluated (NE)
Habitat : Moist shady regions in semi - evergreen forests on rocks and mud clifs
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : July - December
Altitude preference : Found in lower and medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Mannukunnu,10°52'5.50"N,76°38'30.27"E, 181m, 09 July 2019, Aswani & Maya, 4246 (GVCH); Chacolas, 10°51'16.20"N, 76°45'05.76"E, 286m, 02 August 2019, Aswani & Maya, 4531 (GVCH).

Plantaginaceae

Key to genera

1. Aquatic or marshy plants……..……..2
- Terrestrial herbs…..…….……3
2. Stamens 4……..…….....*Limnophila*
- Stamens 2 perfect, staminodes 2……...…….……..…..*Dopatrium*
3. Diffuse herbs; stem 4 angled ……..…….……..….*Mecardonia*
- Erect herbs; stem terete……...…..……4
4. Flowers white, almost regular, corolla throat densely hairy….……...….*Scoparia*
- Flowers blue; lobes unequal; glandular corolla tube with minute hairs; throat never densely hairy…..……..…..*Stemodia*

Dopatrium Buch.-Ham. ex Benth., *Edwards's Bot. Reg.* 21: ad t. 1770, no. 46 (1835)

Dopatrium junceum (Roxb.) Buch.-Ham. *ex* Benth., *Scroph. Ind.* 31 (1835).; Hook. f., *FBI* 4: 274 (1884); Gamble, *Fl. Madras* 954 (1923); Vajr., *Fl. Palghat Dist* 322 (1990).

Basionym : *Gratiola juncea Roxb*., Pl. Coromandel 2(1): 16, t. 129 (1799).

Habit : Herb
Ecosystem preference : Wetlands and other marshes
Distribution : Indo - Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Rock pools and other water sources
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : August - October
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Ayyappan Mala, 10°49'07.19"N, 76°44'50.28"E, 170m, 26 June 2018, Aswani & Maya, 2498 (GVCH); Mayappallam,10°48'0.36"N,76°45'58.68"E, 118m, 06 September 2019, Aswani & Maya, 4675 (GVCH); Kongampadam, 10°48'42.95"N, 76°48'14.01"E, 151m, 30 November 2019, Aswani & Maya, 5271 (GVCH) **(Plate 74: Fig. h)**.

Limnophila R.Br., *Prodr. Fl. Nov. Holland.* 442 (1810)

Key to species

1. Leaves 3 - 5 ribbed from the base; lower leaves pinnatifid or multifid……..……..……...2
- Leaves pinnately nerved, not ribbed; lower leaves never multifid or pinnatifid…….....*L. repens*
2. Calyx lobes glabrous; upper leaves opposite, middle ones whorled, lower ones multifid; …….....…….*L. heterophylla*
- Calyx lobes pubescent; leaves variously dissected…..…...*L. indica*

Limnophila heterophylla Benth., *Numer. List [Wallich] n.* 905. 1829; *Scroph. Ind.* 25.; Hook. f., *FBI* 4: 270 (1884); Gamble, *Fl. Madras* 952 (1923).

Habit: Herb
Ecosystem preference : Wetlands
Distribution : Indo - Pacific and Holarctic
IUCN Category : Least Concern (LC)
Habitat : Found in pond beds and in banks of rock pools
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : August - December
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Mayyappallam,10°48'0.36"N,76°45'58.68" E, 125m, 30 November 2019, Aswani & Maya, 5383 (GVCH).

Limnophila indica (L.) Druce, *Rep. Bot. Exch. Club Soc. Brit. Isles* 3: 420 (1914); Vajr., *Fl. Palghat Dist* 323 (1990); *Limnophila gratioloides* R. Br., Hook. f., *FBI* 4: 271 (1884); Gamble, *Fl. Madras* 952 (1923).

Basionym : *Hottonia indica* L., Syst. Nat., ed. 10. 2: 919 (1759).

Habit : Herb
Ecosystem preference : Wetlands and other marshy areas
Distribution : Indo Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Banks of rock pools
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : September - December
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Mayyappallam, 10°48'0.36"N, 76°45'58.68"E, 125m, 30 November 2019, Aswani & Maya, 5386 (GVCH) **(Plate 75: Fig. a)**.

Limnophila repens Benth., *Prodr. [A. P. de Candolle]* 10: 387 (1846); Sasidh., *Fl. Parambikulam WLS* 215 (2002); *Limnophila conferta* Benth., Hook. f., *FBI* 4: 266 (1884); Gamble, *Fl. Madras* 951 (1923).

Habit : Herb
Ecosystem preference : Wetlands and other marshes
Distribution : Indo - Pacific and Holarctic
IUCN Category : Least Concern (LC)
Habitat : Rock pools
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : July - December
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Mayyappallam, 10°48'01.78"N , 76° 45 '58.91"E, 128m, 30 November 2019,

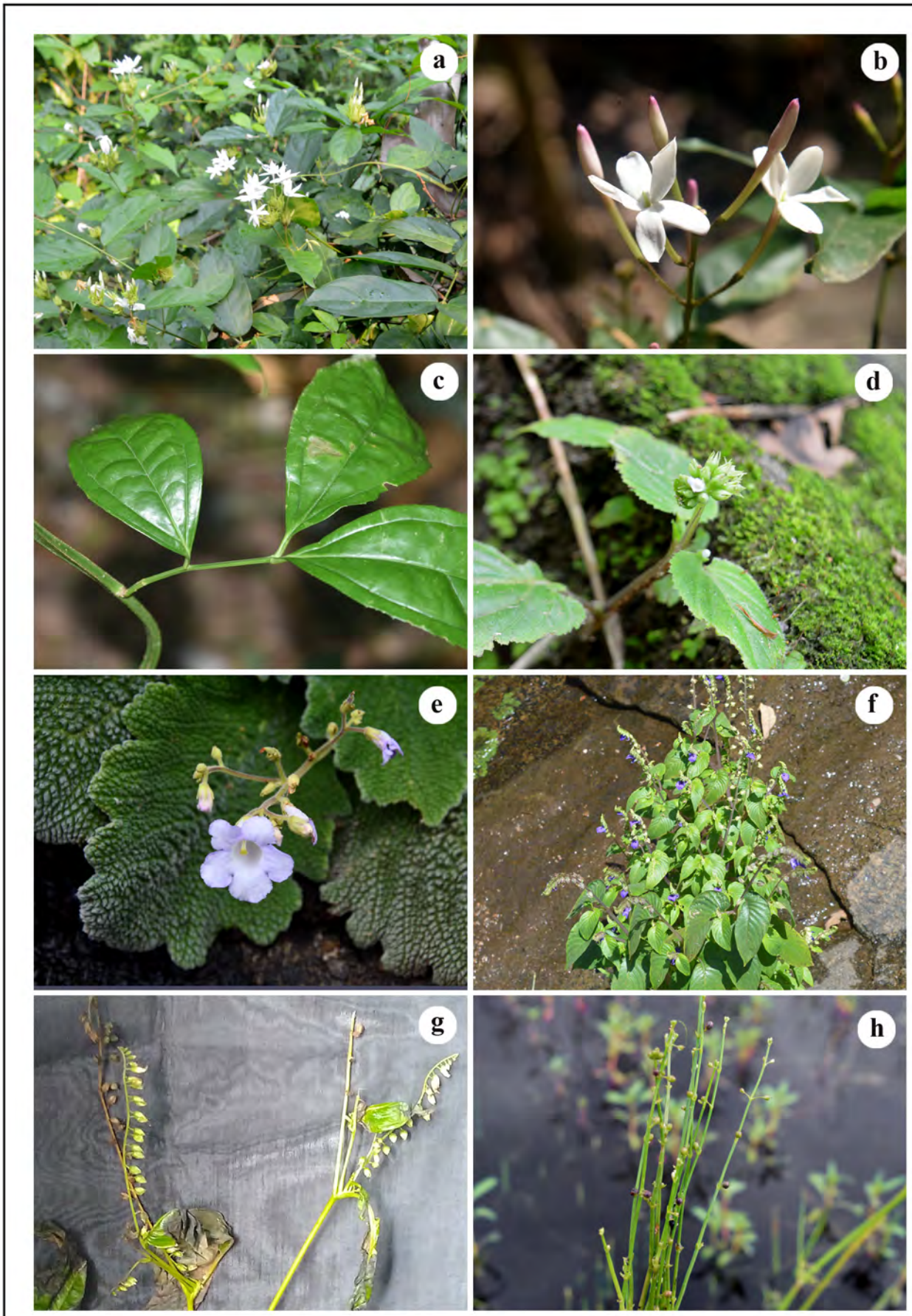

Plate 74: Fig. a. *Jasminum coarctatum* Roxb. **b.** *Jasminum flexile* Vahl **c.** *Myxopyrum smilacifolium* Blume **d.** *Epithema carnosum* Benth. **e.** *Henckelia humboldtiana* (Gardner) A.Weber & B.L.Burtt **f.** *Rhynchoglossum notonianum* (Wall.) B.L.Burtt **g.** *Rhynchoglossum obliqum* Blume **h.** *Dopatrium junceum* (Roxb.) Buch.-Ham. ex Benth.

Aswani & Maya, 5400 (GVCH) **(Plate 75: Fig. b)**.

Mecardonia Ruiz & Pav., *Fl. Peruv. Prodr.* 95 (1794)

Mecardonia procumbens (Mill.) Small, *Fl. S.E. U.S. [Small]*. 1065, 1338 (1903); Sasidh., *Fl. Parambikulam WLS* 216 (2002).

Basionym : *Erinus procumbens Mill*., . 6 (1768).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and South American
IUCN Category : Not Evaluated (NE)
Habitat : Degraded forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : October - December
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, G. P. Nair Estate, 10° 53 '17.51"N, 76° 39' 42.72"E, 194m, 24 March 2018, Aswani & Maya, 1604 (GVCH).

Scoparia L., *Sp. Pl.* 1: 116 (1753)

Scoparia dulcis L., *Sp. Pl.* 1: 116 (1753); Hook. f., *FBI* 4: 289 (1884); Gamble, *Fl. Madras* 964 (1924); Vajr., *Fl. Palghat Dist* 326 (1990); Sasidh., *Fl. Parambikulam WLS* 217 (2002).

Habit : Herb
Ecosystem preference : Wastelands
Distribution : Indo Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Degraded forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thonikadavu, 10°50'04.96"N , 76°40'48.72"E, 121m, 04 June 2017, Aswani & Maya, 06 (GVCH); Kallanpuzha, 10°51'34.02"N, 76°42'40.16"E, 171m, 26 January 2018, Aswani & Maya, 1361 (GVCH); G. P. Nair Estate, 10°53'17.51"N, 76°39'42.72"E, 202m, 24 March 2018, Aswani & Maya, 1611 (GVCH); Thekke Malampuzha, 10°50'03.76"N, 76°40'56.19"E, 172m, 18 May 2018, Aswani & Maya, 2283 (GVCH).

Stemodia L., *Syst. Nat., ed.* 10. 2: 1091, 1118 (1759)

Stemodia verticillata (Mill.) Hassl., *Trab. Mus. Farmacol. no.* 21: 110 (1909); Ramach. & V.J. Nair, *Fl. Cannanore Dist* 320 (1988); Babu, *Fl. Malappuram Dist* 540 (1990); Sunil & Sivadasan, *Fl. Alappuzha Dist* 511 (2009).

Habit : Herb
Ecosystem preference : River banks
Distribution : Indo Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Banks of disturbed rivers
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : March - April
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, G. P. Nair estate, 10° 53 '20.76"N, 76° 39' 41.04"E, 187m, 24 March 2018, Aswani & Maya, 1626 (GVCH) **(Plate 75: Fig. c)**.

Linderniaceae

Key to genera

1. Calyx winged……..….*Torenia*
- Calyx wingless…….……2
2. Stamens 4; all perfect.....*Yamazakia*
- Stamens 2 perfect; staminodes 2....3
3. Leaves 3 - 5 ribbed from base; staminodes bilobed…..….*Lindernia*
- Leaves penninerved; staminodes entire……..…….…..*Bonnaya*

Bonnaya Link & Otto, *Icon. Pl. Select.* 25 (1828)

Key to species

Leaves sharply and deeply serrate; corolla pink or bluish - pink; seeds black……...…...…*B. ciliata*

Leaves distantly or shallowly serrate; corolla bluish with yellow mouth; seeds yellow……...….*B. antipoda*

Bonnaya antipoda Druce, *Bot. Exch. Club Brit. Isles Rep.* 3(5): 415 (1914); *Bonnaya veronicifolia* (Retz.) Urban, Hook. f., *FBI* 4: 285 (1884); *Ilysanthes veronicifolia* (Retz.) Urban, Gamble, *Fl. Madras* 962 (1923); *Lindernia antipoda* (L.) Alston, Vajr., *Fl. Palghat Dist* 324 (1990).

Habit : Herb
Ecosystem preference : Marshes and other wetlands
Distribution : Indo - Pacific, Holarctic and Australian
IUCN Category : Least Concern(LC)
Habitat : Dam sites and other wet marshy areas in hillocks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : August - October
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thonikadavu, 10°50'04.96"N , 76°40'48.72"E, 162m, 04 June 2017, Aswani & Maya, 47 (GVCH); Ollappallam, 10°49'52.20"N, 76°43'44.19"E, 122m, 25 November 2017, Aswani & Maya, 896 (GVCH); Kochthodu, 10°51'58.32"N, 76°42'22.32"E, 251m, 18 December 2018, Aswani & Maya, 3372 (GVCH); Parachaathy, 10°50'42.54"N, 76°43'49.14"E, 125m, 02 January 2019, Aswani & Maya, 3514 (GVCH); Olappalam, 10°49'52.20"N, 76°43'44.19"E, 125m, 23 November 2019, Aswani & Maya, 5052 (GVCH) **(Plate 75: Fig. d)**.

Bonnaya ciliata Spreng., *Syst. Veg., ed. 16 [Sprengel]* 1: 41 (1824); *Bonnaya brachiata* Link & Otto, Hook. f., *FBI* 4: 284 (1884); *Ilysanthes serrata* (Roxb.) Urban, Gamble, *Fl. Madras* 962 (1923); *Lindernia ciliata* (Colsm.) Pennell, Vajr., *Fl. Palghat Dist* 324 (1990).

Habit : Herb
Ecosystem preference : Moist deciduous forests and in the plains
Distribution : Indo - Pacific
IUCN Category : Least concern(LC)
Habitat : Wet rocky regions in hillocks and other wetlands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : June - October
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Cheranpara,10°49'29.62"N, 76°40'38.63"E, 123m, 27 June 2017, Aswani & Maya, 196 (GVCH); Ollappallam, 10°49'52.20"N, 76°43'44.19"E, 174m, 25 November 2017, Aswani & Maya, 948 (GVCH); Ayyappan Mala, 10°49'07.19"N, 76°44'50.28"E, 178m, 26 June 2018, Aswani & Maya, 2506 (GVCH); Kongampadam, 10°48'39.80"N, 76°47'2.67"E, 133m, 06 September 2019, Aswani & Maya, 4570 (GVCH) **(Plate 75: Fig. e)**.

Lindernia All., *Mélanges Philos. Math. Soc. Roy. Turin* 3(1): 178, t. 5, fig. 1 (1766)

Key to species

1. Stem 4 - angled……..……....2
- Stem terete……....*L. rotundifolia*
2. Flowers very small upto 8mm long; pedicels, calyx, staminodes all glandular hairy…...*L. tamilnadensis*
- Flowers medium sized; 1.2 - 1.5cm long; pedicels filiform, calyx glabrous; staminode base hairy (never glandular hairy)…….....*L. hyssopioides*

Lindernia hyssopioides Haines, *Bot. Bihar & Orissa Pt.* 4, 635 (1922); Vajr., *Fl. Palghat Dist* 325 (1990); *Ilysanthes hyssopioides* (L.) Benth., Hook. f., *FBI* 4: 283 (1884); Gamble, *Fl. Madras* 961 (1923).

Habit : Herb
Ecosystem preference : Marshes
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : Dam sites and other wet regions in hillocks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : March - September
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kava, 10°50'36.42"N, 76°43'31.74"E, 118m, 06 April 2018, Aswani & Maya, 1860 (GVCH);Anayappanchalla, 10°48'20.42"N, 76°48'05.00"E, 157m, 30 November 2019, Aswani & Maya, 5209 (GVCH) **(Plate 75: Fig. f)**.

Lindernia rotundifolia (L.) Alston, *Handb. Fl. Ceylon 6(suppl.)*: 214 (1931); Sasidh., *Fl. Parambikulam WLS* 216 (2002); *Ilysanthes rotundifolia* (L.) Benth., Hook. f., *FBI* 4: 284 (1885); Gamble, *Fl. Madras* 962 (1923).

Habit : Herb
Ecosystem preference : Marshy areas
Distribution : Indo Pacific and African
IUCN Category : Least Concern (LC)
Habitat : Dam sites and other wetlands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : August - November
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kava, 10°50'36.42"N, 76° 43 '31.74"E, 111m, 06 April 2018, Aswani & Maya, 1853 (GVCH).

Lindernia tamilnadensis M. G. Prasad & Sunojk., *Phytotaxa* 162(1): 57 (2014).

Habit : Herb
Ecosystem preference : Marshes and other wet regions in forests
Distribution : Indo - Pacific
Endemism : Yes (India)
IUCN Category : Not Evaluated (NE)
Habitat : Wet areas in hillocks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : October - March
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Olappalam, 10°49'52.20"N , 76° 43 '44.19"E, 124m, 25 November 2017, Aswani & Maya, 898 (GVCH).

Torenia L., *Sp. Pl*. 2: 619 (1753)

Key to species

1. Erect herbs……..…*T. lindernioides*
- Prostrate or decumbent herbs...…..2

2. Flowers very small upto 6mm long……..……....*T. crustacea*
- Flowers larger upto 3cm long…..……..……..3
3. Calyx glabrous……..…*T. bicolor*
- Calyx hairy…….…..……*T. hirsuta*

Torenia crustacea (L.) Cham. & Schltdl., *Linnaea* 2(4): 570 (1827); *Vandellia crustacea* (L.) Benth., Hook. f., *FBI* 4: 279 (1884); Gamble, *Fl. Madras* 959 (1923); *Lindernia crustacea* (L.) F.v. Muell., Vajr., *Fl. Palghat Dist* 324 (1990); Sasidh., *Fl. Parambikulam WLS* 216 (2002).

Habit : Herb
Ecosystem preference : Wetlands and other plains
Distribution : Indo - Pacific, Holarctic, African and South American
IUCN Category : Least Concern(LC)
Habitat : Dam sites and other marshy regions
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : August - November
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kosavanidukku - Kaduvachal, 10°50'26.38"N, 76°40'30.88"E, 109m, 16 July 2017, Aswani & Maya, 230 (GVCH); Kozhimala, 10°50'01.89"N, 76°42'58.61"E,146m,09 November 2017, Aswani & Maya, 796 (GVCH);Kava, 10°50'38.92"N, 76°43'34.63"E, 115m 06 April 2018, Aswani & Maya, 1863 (GVCH); Kochuthodu, 10°51'58.32"N, 76°42'22.32"E, 253m, 18 December 2018, Aswani & Maya, 3373 (GVCH); Aashramam, 10°51'23.40"N, 76°43'34.72"E, 128m, 02 August 2019, Aswani & Maya, 4416 (GVCH) **(Plate 75: Fig. g)**.

Torenia bicolor Dalzell, Hooker's J. Bot. Kew Gard. Misc. 3: 38 (1851); Hook. f., *FBI* 4: 278 (1884); Gamble, *Fl. Madras* 957 (1923); Vajr., *Fl. Palghat Dist* 327 (1990); Sasidh., *Fl. Parambikulam WLS* 218 (2002).

Habit : Herb
Ecosystem preference : Marshy areas
Distribution : Indo - Pacific
Endemism : Western Ghats
IUCN Category : Least Concern(LC)
Habitat : Wet areas in semi - evergreen forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : Throughout the year
Altitude preference : Found in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Pothukunnu, 10°53'6.54"N, 76°45' 59.72"E, 1045m, 28 January 2020, Aswani & Maya, 5991 (GVCH).

Torenia hirsuta Willd., *Sp. Pl.*, ed. 4 [*Willdenow*] 3(1): 266 (1800); Gamble, *Fl. Madras* 957 (1923); Vajr., *Fl. Palghat Dist* 327 (1990); *Torenia asiatica* L. var. *hirsuta* (Willd.) Hook.f., *FBI* 4: 277 (1884).

Habit : Herb
Ecosystem preference : Marshy areas
Distribution : Indo - Pacific
Endemism : Southern Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Marshy regions in semi evergreen forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : February - March
Altitude preference : Found in medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Aduppukootimala, 10°49'59.16"N, 76°44'31.56"E, 310m, 12 January 2019, Aswani & Maya, 3714 (GVCH); Aduppukootimala, 10°50'30.12"N,

76°44'28.32"E, 635m, 16 February 2021, Aswani & Maya, 6452 (GVCH).

Torenia lindernioides C. J. Saldanha, *Bull. Bot. Surv. India* 8: 130 **(1967);** Manilal & Sivar., *Fl. Calicut* 197 (1982); Ramach. & V.J. Nair, *Fl. Cannanore Dist* 322 (1988); Babu, *Fl. Malappuram Dist.* 547 (1990); Joseph, *Aquatic Angiosp. Malabar* 250 (1991**);** Sivar. & Mathew, *Fl. Nilambur* 478 (1997); Sasidh., *Fl. Periyar Tiger Reserve* 283 (1998); Ratheesh Narayanan, *Fl. Stud. Wayanad Dist* 589 (2009).

Habit : Herb
Ecosystem preference : Wet regions and other wetlands
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Dam sites
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : July - March
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Thonikadavu, 10°50'04.96"N , 76° 40 '48.72"E, 151m, 04 June 2017, Aswani & Maya, 36 (GVCH).

Yamazakia W. R. Barker, *Y.S.Liang & Wannan, Austral. Syst. Bot.* 31(3): 249 (2018)

Key to species

Flowers lax in terminal many flowered raceme……..……..….*Y. viscosa*
Flowers -axillary solitary or 2 per node…...……..…..….*Y. pusilla*

Yamazakia pusilla **(**Willd.) W.R.Barker, *Y.S.Liang & Wannan, Austral. Syst. Bot.* 31(3): 250 (2018); *Vandellia scabra* Benth., Hook. f., *FBI* 4: 281 (1884); Gamble, *Fl. Madras* 959 (1923); *Lindernia pusilla* (Willd.) Boldingh, Vajr., *Fl. Palghat Dist* 325 (1990).

Basionym : *Gratiola pusilla Willd*., *Sp. Pl., ed. 4 [Willdenow]* 1(1): 105 (1797).

Habit : Herb
Ecosystem preference : Marshy regions in moist deciduous forests
Distribution : Indo - Pacific, Holarctic and African
IUCN Category : Least Concern (LC)
Habitat : Marshy regions in hillocks and other plains
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : August - October
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Neelippara, 10°51'47.52"N, 76°37'37.38"E, 353m, 15 September 2017, Aswani & Maya, 590 (GVCH); Ollappallam, 10°49'52.20"N, 76°43'44.19"E, 121m, 25 November 2017, Aswani & Maya, 865 (GVCH); Ollappallam, 10°49'52.20"N, 76°43'44.19"E, 121m, 23 November 2019, Aswani & Maya, 5049 (GVCH) **(Plate 75: Fig. h)**.

Yamazakia viscosa (Hornem.) W. R. Barker, *Y. S. Liang & Wannan, Austral. Syst. Bot.* 31(3): 249 (2018); *Vandellia hirsuta* Benth., Hook.f., *FBI* 4: 280 (1884).Gamble, *Fl. Madras* 959 (1923); *Lindernia viscosa* (Hornem.) Merr., *Sp. Blanc.* 14 (1918).

Basionym : *Gratiola viscosa* Hornem., *Enum. Pl. Hort. Hafn. Suppl.* [1807] 19 (1807).

Habit : Herb
Ecosystem preference : Moist deciduous forests and also in plains
Distribution : Indo - Pacific and Holarctic

IUCN Category : Least Concern(LC)
Raunkiaer's Life form :Therophyte
Distribution Frequency : Rare
Phenology : July - October
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Parachaathy, 10°50'42.54"N , 76° 43 '49.14"E, 121m, 02 January 2019, Aswani & Maya, 3513 (GVCH).

Martyniaceae

Martynia L., *Sp. Pl*. 2: 618 (1753)

Martynia annua L., *Sp. Pl*. 2: 618 (1753); Gamble, *Fl. Madras* 1003 (1924); Vajr., *Fl. Palghat Dist* 336 (1990); *Martynia diandra* Gloxin, Hook. f., *FBI* 4: 386 (1884).

Habit : Shrub
Ecosystem preference : Wastelands
Distribution : Indo - Pacific and South American
IUCN Category : Not Evaluated (NE)
Habitat : Invasive plant in forest margins, roadsides and other wastelands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : July - August
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Vedivachapara, 10°50'12.34"N, 76°40'41.15"E, 134m, 04 June 2017, Aswani & Maya, 79 (GVCH); Walayar Dam, 10°50'24.58"N, 76°51'01.52"E, 218m, 09 May 2018, Aswani & Maya, 1991 (GVCH); Mayyappallam, 10°48'0.36"N, 76°45'58.68"E, 151m, 10 May 2018, Aswani & Maya, 2107 (GVCH); Ayyappan Mala, 10°49'07.40"N, 76°45'32.38"E, 181m, 26 June 2018, Aswani & Maya, 2440 (GVCH).

Pedaliaceae

Key to species

Fruits dehiscent, surface non - spinous; seeds numerous in each cell……*Sesamum*
Fruits indehiscent; 4 spines on margins; seeds 2 in each cell…….....…..*Pedalium*

Pedalium D. Royen, *Syst. Nat., ed.* 10. 2: 1123 (1759)

Pedalium murex L., *Syst. Nat., ed.* 10. 2: 1123 (1759); Hook. f., *FBI* 4: 386 (1884); Gamble, *Fl. Madras* 1001 (1924); Vajr., *Fl. Palghat Dist* 337 (1990).

Habit : Herb
Ecosystem preference : Wastelands
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Dam sites, moisture rich rocky hillocks and other river banks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : November - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Walayar Dam, 10°50'24.58"N , 76°51'01.52"E, 213m, 09 May 2018, Aswani & Maya, 1986 (GVCH); Mayyappallam, 10°48'01.78"N, 76°45'58.91"E, 128m, 10 May 2018, Aswani & Maya, 2135 (GVCH); Walayar dam, 10°50'15.57"N, 76°51'5.13"E, 193m, 30 January 2021, Aswani & Maya, 6367 (GVCH).

Sesamum L., *Sp. Pl.* 2: 634 (1753)

Key to species

1. Prostrate herbs……...*S. prostratum*
- Erect herbs…….……..……...2

Plate 75: Fig. a. *Limnophila indica* (L.) Druce **b.** *Limnophila repens* Benth. **c.** *Stemodia verticillata* (Mill.) Hassl. **d.** *Bonnaya antipoda* Druce **e.** *Bonnaya ciliata* Spreng. **f.** *Lindernia hyssopioides* Haines **g.** *Torenia crustacea* (L.) Cham. & Schltdl. **h.** *Yamazakia pusilla* (Willd.) W.R.Barker.

2. Capsule short, 1.5 - 2cm long; corolla white or light pink colour…….....…..……*S. indicum*
- Capsule larger, 2 - 2.5cm long; corolla pink coloured.....*S. radiatum*

Sesamum indicum L., *Sp. Pl.* 2: 634 (1753), nom. cons.; Hook. f., *FBI* 4: 387 (1884); Gamble, *Fl. Madras* 1002 (1924); *Sesamum orientale* L., Vajr., *Fl. Palghat Dist* 337 (1990); Sasidh., *Fl. Parambikulam WLS* 224 (2002).

Habit : Herb
Ecosystem preference : Cultivated
Distribution : Indo -Pacific, Holarctic and African
IUCN Category : Not Evaluated (NE)
Habitat : Plains and wastelands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : July - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala,10°49'44.76"N,76°40'30.72 "E, 150m, 31 July 2017, Aswani & Maya, 396(GVCH); Mayappalam, 10°48'01.78"N, 76°45'58.91", 119m, 10 May 2018, Aswani & Maya, 2126 (GVCH); Ayyappan Mala, 10°49'07.40"N, 76°45'32.38"E, 178m, 26 June 2018, Aswani & Maya, 2437 (GVCH) **(Plate 76: Fig. a)**.

Sesamum prostratum Retz., *Observ. Bot. (Retzius)* iv. 28. (1786); Hook. f., *FBI* 4: 387 (1884); Gamble, *Fl. Madras* 1002 (1924); Vajr., *Fl. Palghat Dist* 338 (1990).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
Endemism : India
IUCN Category : Not Evaluated (NE)
Habitat : Exposed rocky surfaces in hillocks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : October - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala,10°49'39.72"N,76°40'28.20 "E, 219m, 20 June 2017, Aswani & Maya, 126 (GVCH); Neelippara, 10°51'53.30"N, 76°37'36.39"E, 420m, 15 September 2017, Aswani & Maya, 541 (GVCH);Thekke Malampuzha,10°50'03.76"N,76°40'56.19", 146m, 18 May 2018, Aswani & Maya, 2257 (GVCH); Kongampaadam, 10°48'36.72"N, 76°46'51.96"E, 163m, Aswani & Maya, 2323 (GVCH); Koyamarakaadu, 10°47'44.88"N, 76°45'38.52"E, 174m, Aswani & Maya, 2705 (GVCH).

Sesamum radiatum Thonn. *ex* Hornem., *Enum. Pl. Hort. Hafn. Suppl.* [1806] 2: 12 (1806)

Basionym : *Sesamopteris radiata* (Thonn. ex Hornem.) DC. ex Meisn., Pl. Vasc. Gen. [Meisner] 2: 206 (1840).

Habit : Herb
Ecosystem preference : Forest margins in rocky patches
Distribution : Indo -Pacific and Holarctic
IUCN Category : Not Evaluated(NE)
Habitat : Rocky patches in forests and other rocky road sides
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : January - September
Altitude preference : Common in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kosavanidukku-Kaduvachal, 10°50'26.38"N, 76°40'30.88"E, 126m, 16 July 2017, Aswani & Maya, 247 (GVCH); Thekke Malampuzha irrigation dept. Guest

house hillock, 10°50'04.20"N, 76°40'52.68"E, 136m, Aswani & Maya, 427 (GVCH); Kongampadam, 10°48'36.81"N, 76°46'43.06"E, 161m, Aswani & Maya, 2361 (GVCH).

Acanthaceae

Key to genera

1. Climbers……..……..*Thunbergia*
- Erect or prostrate plants…..…..….2
2. Upper lip of corolla reduced and lower lip expanded……...*Blepharis*
- Upper lip of corolla expanded…....3
3. Corolla lobes distinctly bilipped……..…….4
- Corolla lobes equal or sub – equal……..…...15
4. Flowers in axillary clusters……..….*Hygrophila*
- Flowers solitary or in axillary or terminal spikes or panicles…….5
5. Stamens 4……..……...*Lepidagathis*
- Stamens 6…….....6
6. Anther cells bearded.....*Andrographis*
- Anther cells naked……..…....7
7. Inflorescence subtended by spine like cladode…….....*Haplanthodes*
- Inflorescence not subtended by cladodes……..……8
8. Flowers in umbellate or paniculate cymes…….……..…*Dicliptera*
- Flowers in racemes or panicles….9
9. Anther theca spurred or either appendaged……..….*Rungia*
- Anther theca neither spurred nor appendaged……...……10
10. Fruits clavate……...11
- Fruits oblong or elliptic…..…....14
11. Bracteoles and bracts and small……..….*Rhinacanthus*
- Bracteoles and bracts much larger and distinct……..…….……12
12. Bracts white with green nerves…….....*Nicoteba*
- Bracts green……..……13
13. Erect herbs……...…*Rostellularia*
- Erect under shrubs or shrubs……..…….*Justicia*
14. Seeds 2 or 4; bracts foliaceous; capsules ovoid……..….*Ecbolium*
- Seeds 16 - 24; bracts non - foliaceous; capsules linear……..……*Gymnostachyum*
15. Corolla lobes twisted in bud…..…16
- Corolla lobes imbricate in bud……..……..19
16. Seeds 10 or more……..…....*Ruellia*
- Seeds less than 10…….....17
17. Corolla smaller than sepals; sepals unequal……...….*Phaulopsis*
- Corolla larger than sepals; sepals unequal……..……...18
18. Flowers enclosed in strobiloid spikes; Leaf margins usually crenate……..... *Strobilanthes*
- Flowers in elongate spikes; leaf margins entire…....….*Eranthemum*
19. Fertile stamens 2……...….*Barleria*
- Fertile stamens 4…....…..*Asystasia*

Andrographis Wall. ex Nees, *Pl. Asiat. Rar. (Wallich).* 3: 77, 116 (1832)

Key to species

1. Capsule elliptic…….……*A. echioides*
- Capsule linear – oblong……..…..2
2. Anthers bearded at base; anther cells more or less hirsute…… *A. paniculata*
- Anthers not bearded at base; anther filaments nearly glabrous……...3
3. Capsule glandular hairy……..….*A. alata*
- Capsule e- glandular hairy…..*A. elongate*

Andrographis alata (Vahl) Nees, *Prodr. [A. P. de Candolle]* 11: 516 (1847); Hook. f., *FBI* 4: 502 (1884); Gamble, *Fl. Madras* 1049 (1925); Vajr., *Fl. Palghat Dist* 341 (1990).

Basionym : *Justicia alata* Vahl, *Enum. Pl. [Vahl]* i. 139 (1804).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Shady regions in forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : November - February
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Thakaramada,10°52'11.03"N,76°42'59.76" E, 247m, 30 November 2018, Aswani & Maya, 3253 (GVCH) **(Plate 76: Fig. b)**.

Andrographis echioides Nees, *Pl. Asiat. Rar. (Wallich).* iii. 117; Hook. f., *FBI* 4: 505 (1884); Gamble, *Fl. Madras* 1051 (1924); Vajr., *Fl. Palghat Dist* 341 (1990).

Habit : Herb
Ecosystem preference : Moist deciduous forests and other plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Outskirts of hillocks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : April - July
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Mayyappallam,10°48'01.78"N,76°45'58.91 "E, 138m, 10 May 2018, Aswani & Maya, 2145 (GVCH); Anayappanchalla, 10°48'19.16"N, 76°48'15.25"E, 149m, 30 November 2019, Aswani & Maya, 5218 (GVCH);Mathappumala, 10°51'9.36"N, 76° 49 '55.56"E, 230m, 07 January 2020, Aswani & Maya, 5603 (GVCH) **(Plate 76: Fig. c)**.

Andrographis elongata (Vahl) T. Anderson, *J. Linn. Soc., Bot.* 9: 502 (1867); Hook. f., *FBI* 4: 502 (1884); Gamble, *Fl. Madras* 1048 (1924).

Basionym : *Justicia elongata Vahl*, *Enum. Pl. [Vahl] i.* 130 (1804).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
Endemism : Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat: Understorey of moist deciduous forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : March - May
Altitude preference : Found in lower altitudes in open areas
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Karadikunnu, 10°50'19.96"N, 76°49'39.56"E, 202m, 30 December 2017, Aswani & Maya, 1018 (GVCH); Vettiyil Sandal estate, 10°51'33.12"N, 76°42'29.52"E, 175m, 10 March 2018, Aswani & Maya, 1432 (GVCH); Kochuthodu, 10°51'58.32"N, 76°42'22.32" E, 177m, 18 December 2018,Aswani & Maya, 3297 (GVCH); Aduppukootimala (Kanyarmuttu), 10°49'50.52" N, 76°44'24.72"E, 231m, 12 January 2019, Aswani & Maya, 3679 (GVCH); Chaavadippara, 10°52'42.20"N, 76°48'43.56"E, 265m, 28 January 2020, Aswani & Maya, 5822 (GVCH).

Andrographis paniculata (Burm.f.) Wall. ex Nees, *Pl. Asiat. Rar. (Wallich).* 3 (pt. 12): 116 (1832); Hook. f., *FBI* 4: 501 (1884); Gamble, *Fl. Madras* 1048 (1924); *Andrographis subspathulata* Clarke, Hook. f., *FBI* 4: 502 (1884).

Basionym : *Justicia paniculata Burm*.f., *Fl. Ind. (N. L. Burman)* 9 (1768).

Habit : Herb
Ecosystem preference : Degraded forests and in plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Disturbed forests, roadsides and in other wastelands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : March - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Parakkallu- Neelikunnu, 10°51'30.14"N, 76°37'30.67"E, 210m, 27 April 2018, Aswani & Maya, 1966 (GVCH); Anayappanchalla,10°48'24.82"N,76°48'30.73"E, 168m, 18 September 2018, Aswani & Maya, 2836 (GVCH).

Asystasia Blume, *Bijdr. Fl. Ned. Ind.* 14: 796 (1826)

Key to species

Branches and leaves grey puberulous……....*A. gangetica*
Branches and leaves glabrous or tomentose, but never grey puberulous…. *A. dalzelliana*

Asystasia dalzelliana Santapau, *Kew Bull.* 3(2): 276 (1948); Vajr., *Fl. Palghat Dist* 343 (1990); *Asystasia violacea* Dalz. ex Clarke in Hook. f., *FBI* 4:494 (1884); Gamble, *Fl. Madras* 1063 (1884).

Habit : Herb
Ecosystem preference : Moist deciduous forests and also in the plains
Distribution : Indo - Pacific, Holarctic and African
IUCN Category : Not Evaluated (NE)
Habitat : Open forest tracks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : September - January
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koyamarakaadu, 10°47'44.88"N, 76°45'38.52"E, 117m, 16 September 2018, Aswani & Maya, 2731 (GVCH); Chaavadippara, 10°52'42.20"N, 76°48'43.56"E, 276m, 28 January 2020, Aswani & Maya, 5833 (GVCH); S Medu, 10°50'26.52"N, 76°50'04.56"E, 221m, 25 November 2020, Aswani & Maya, 6351 (GVCH) **(Plate 76: Fig. d)**.

Asystasia gangetica (L.) T. Anderson, *Enum. Pl. Zeyl. [Thwaites]* 235 (1860); Hook. f., *FBI* 4: 493 (1884); Gamble, *Fl. Madras* 1063 (1924); Sasidh., *Fl. Parambikulam WLS* 226 (2002).

Basionym : *Justicia gangetica* L., *Cent. Pl.* II. 3 (1756).

Habit : Herb
Ecosystem preference : Degraded Forests and also in plains
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Open forests and also in the roadsides
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : September - December
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Pazhampullikaadu, 10°50'09.55"N, 76°38'28.33"E, 152m, 16 October 2018, 3163 (GVCH). Aswani & Maya,

Barleria L., *Sp. Pl.* 2: 636 (1753)

Key to species

1. Plants with intrapetiolar spines……...2
- Plants without any spines…….3
2. Capsule ovoid, 2 – seeded…..*B. prionitis*

- Capsule oblong or ellipsoid, 4 – seeded.....*B. buxifolia*
3. Leaves hairy……..…..*B. tomentosa*
- Leaves glabrous……4
4. Seeds glabrous……..*B. prattensis*
- Seeds hairy……..……*B. courtallica*

Barleria buxifolia L., *Sp. Pl.* 2: 636 (1753); Hook. f., *FBI* 4: 483 (1884); Gamble, *Fl. Madras* 1059 (1924); Vajr., *Fl. Palghat Dist* 344 (1990).

Habit : Shrub
Ecosystem preference : Open forests
Distribution : Indo - Pacific
Endemism : Peninsular India
IUCN Category : Not Evaluated (NE)
Habitat : Disturbed forest and outskirts of hillocks
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Rare
Phenology : November - April
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Walayar Dam, 10°50'24.58"N , 76° 51 '01.52"E, 286m, 09 May 2018, Aswani & Maya, 2059 (GVCH).

Barleria courtallica Nees, *Icon. Pl. Ind. Orient. [Wight]* 4(pt. 4): 4, t. 1529 (1850); Hook. f., *FBI* 4: 489 (1884); Gamble, *Fl. Madras* 1060 (1924); Vajr., *Fl. Palghat Dist* 344 (1990); Sasidh., *Fl. Parambikulam WLS* 227 (2002).

Habit : Herb
Ecosystem preference : Semi-evergreen forests
Distribution : Indo - Pacific
Endemism : Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Margins of grasslands
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Rare
Phenology : January - May
Altitude preference : Found in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kundanmala, 10°53'39.12"N, 76°41'47.20" E, 1018m, 28 February 2020, Aswani & Maya, 6130 (GVCH).

Barleria prattensis Santapau, *Kew Bull.* 3(3): 487 (1949); Vajr., *Fl. Palghat Dist* 345 (1990); *Barleria montana* Bedd., Hook. f., *FBI* 4: 487 (1884); Gamble, *Fl. Madras* 1061 (1924).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
Endemism : Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Forest slopes and mud cliffs
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : October - January
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thaanikunnu,10°51'55.44"N,76°42'00.11", 200m, 18 December 2018, Aswani & Maya, 3459 (GVCH); Jamanthimala, 10°51'53.64"N,76°47'16.80"E, 592m, 09 January 2020, Aswani & Maya, 5618 (GVCH); Chaavadippara, 10°52'42.20"N, 76°48'43.56"E, 273m, 28 January 2020, Aswani & Maya, 5830 (GVCH).

Barleria prionitis L., *Sp. Pl.* 2: 636 (1753); Hook. f., *FBI* 4: 482 (1884); Gamble, *Fl. Madras* 1058 (1924); Vajr., *Fl. Palghat Dist* 346 (1990).

Habit : Shrub
Ecosystem preference : Moist deciduous forests and other wastelands
Distribution : Indo - Pacific, Holarctic and African
IUCN Category : Not Evaluated (NE)

Habitat : Open forests and other wastelands
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : September - February
Altitude preference : Found in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Chaatapara waterfalls, 10°53'11.76"N, 76°42'15.84"E, 594m, 10 December 2019, Aswani & Maya, 5574 (GVCH) **(Plate 76: Fig. e)**.

Barleria tomentosa Roth, *Nov. Pl. Sp.* 314.; Hook. f., *FBI* 4: 485 (1884); Gamble, *Fl. Madras* 1059 (1924); Sasidh., *Fl. Parambikulam WLS* 227 (2002).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
Endemism : Peninsular India
IUCN Category : Not Evaluated (NE)
Habitat : Open forests tracks and rocky areas
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Rare
Phenology : December - March
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Olappalam, 10°49'52.20"N, 76°43'44.19"E, 154m, 23 November 2019, Aswani & Maya, 5081(GVCH); S Medu, 10°50'26.52"N, 76°50'04.56"E, 220m, 25 November 2020, Aswani & Maya, 6350 (GVCH).

Blepharis Juss., *Gen. Pl. [Jussieu]* 103 (1789)

Key to species

Bracts coarsely serrate; leaves petiolate……..*B. integrifolia*

Bracts entire with scattered long hairs; leaves sub sessile…….B. maderaspatensis

Blepharis integrifolia E. Mey. & Drège, *Zwei Pflanzengeogr. Docum. (Drège)* 168; *Blepharis molluginifolia* Pers., Hook. f., *FBI* 4: 479 (1884); Gamble, *Fl. Madras* 1013 (1924).

Habit : Herb
Ecosystem preference : Scrub jungles
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Open dam sites
Raunkiaer's Life form : Hemicryptophyte
Distribution Frequency : Rare
Phenology : November - December
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Walayar Dam, 10°50'24.58"N, 76°51'01.52"E, 221m, 09 May 2018, Aswani & Maya, 1994 (GVCH).

Blepharis maderaspatensis (L.) B.Heyne, *Nov. Pl. Sp.* 320 (1821); Hook. f., *FBI* 4: 478 (1884); Vajr., *Fl. Palghat Dist* 346 (1990); Sasidh., *Fl. Parambikulam WLS* 228 (2002); *Blepharis boerhaviifolia* Pers., Hook. f., *FBI* 4: 478 (1884); Gamble, *Fl. Madras* 1013 (1924).

Habit : Herb
Ecosystem preference : Deciduous forests, degraded forest tracks and other plains
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Biofences near forests and margins of forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : November - February
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range,

Kalliyara, 10°53'14.64"N, 76°39'39.96"E, 189m, 24 March 2018, Aswani & Maya, 1580 (GVCH); Walayar Dam, 10°50'24.58"N, 76°51'01.52"E, 245m, 09 May 2018, Aswani & Maya, 2018 (GVCH); Pazhampullikaadu, 10°50'09.55" N, 76°38'28.33"E, 156m, 16 October 2018, Aswani & Maya, 3167 (GVCH) **(Plate 76: Fig. f)**.

Dicliptera Juss., *Ann. Mus. Natl. Hist. Nat.* 9: 267 (1807)

Key to species

Stem 6 – angular, hispid; leaves glabrascent above, tomentose below…… *D. paniculata*
Stem terete, glabrous; leaves glabrous except for nerves below……....*D. foetida*

Dicliptera foetida Blatt., *Rec. Bot. Surv. India* viii. 361 (1921); *Dicliptera zeylanica* Nees Hook. f., *FBI* 4: 552 (1884); Gamble, *Fl. Madras* 1073 (1924); Vajr., *Fl. Palghat Dist* 347 (1990).

Habit : Herb
Ecosystem preference : Moist deciduous forests and Semi - evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Lower storey of forests
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Occasional
Phenology : December - April
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Parachaathy, 10°50'54.24"N, 76°43'55.92"E, 166m, 02 January 2019, Aswani & Maya, 3587 (GVCH); Chaatapara waterfalls,10°53'11.76"N, 76°42'15.84"E, 635m, 10 December 2019, Aswani & Maya, 5494 (GVCH); Charalmudi, 10°52'41.26"N, 76°42'24.3"E, 438m, 27 February 2020, Aswani & Maya, 6083 (GVCH) **(Plate 76: Fig. g)**.

Dicliptera paniculata (Forssk.) I. Darbysh., *Kew Bull.* 62(1): 122 (2007); *Peristrophe bicalyculata* (Retz.) Nees, Hook. f., *FBI* 4: 554 (1885); Gamble, *Fl. Madras* 1084 (1924); *Peristrophe paniculata* (Forssk.) Brummitt, Sasidh., *Fl. Parambikulam WLS* 234 (2002).

Basionym : *Dianthera paniculata Forssk*., *Fl. Aegypt.-Arab.* 7 (1775).

Habit : Herb
Ecosystem preference : Deciduous forests and wastelands
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Outskirts of hillocks, sides of railway tracks and other disturbed forest tracks
Raunkiaer's Life form: Chamaephyte
Distribution Frequency : Common
Phenology : December - February
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Poozhikunnu,10°51'20.44"N,76°43'38.28", 164m, 09 November 2017, Aswani & Maya, 880 (GVCH); Kottamutti waterfalls, 10°49'42.94"N, 76°46'47.87"E, 285m, 23 September 2018, Aswani & Maya, 2931 (GVCH); Parachaathy, 10°50'42.54"N, 76°43'49.14"E, 177m, 02 January 2019, Aswani & Maya, 3569 (GVCH); Chaavadippara,10°52'42.20"N,76°48'43.56" E, 259m, 28 January 2020, Aswani & Maya, 5816 (GVCH).

Ecbolium Kurz, *J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist.* 40(1): 75 (1871)

Ecbolium viride (Forssk.) Alston, *in Trimen, Hand-Book Fl. Ceylon vi. Suppl.*, 229 (1931); *Ecbolium linneanum* Kurz var.

rotundifolia (Nees) Clarke, Hook. f., *FBI* 4: 545 (1885); Gamble, *Fl. Madras* 1074 (1924).

Basionym : *Justicia viridis Forssk*., *Fl. Aegypt.-Arab*. 5 (1775).

Habit : Herb
Ecosystem preference : Deciduous forests and in plains
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Margins of degraded forests and near homesteads
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : November - February
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Walayar Dam, 10°50'24.58"N, 76°51'01.52"E, 248m, 09 May 2018, Aswani & Maya, 2021 (GVCH) **(Plate 76: Fig. h)**.

Eranthemum L., *Sp. Pl*. 1: 9 (1753)

Eranthemum capense L., *Sp. Pl.* 1: 9 (1753); Vajr., *Fl. Palghat Dist* 348 (1990); Sasidh., *Fl. Parambikulam WLS* 228 (2002); *Daedalacanthus montanus* T. And., Hook. f., *FBI* 4: 421 (1884); *Eranthemum montanum* Roxb., Gamble, *Fl. Madras* 1025 (1924).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Degraded forests and open forest tracks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : January - March
Altitude preference : Found in all altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Karadikunnu,10°50'25.10"N,76°49'43.70", 231m, 30 December 2017, Aswani & Maya, 1073 (GVCH); Parachaathy, 10°50'54.24"N, 76°43'55.92"E, 170m, 02 January 2019, Aswani & Maya, 3591 (GVCH);Aduppukootimala,10°49'50.52"N, 76°44'24.72"E, 248m, 12 January 2019, Aswani & Maya, 3696 (GVCH); **(Plate 77: Fig. a)**.

Gymnostachyum Nees in N. Wallich, *Pl. Asiat. Rar*. 3: 76 (1832)

Gymnostachyum pubescens (Lam.) M. R. Almeida, *Fl. Maharashtra* 4A: 45 (2003); *Gymnostachyum canescens* (Nees) Anders., J Hook. f., *FBI* 4: 509 (1884); Gamble, *Fl. Madras* 1053 (1924); Vajr., *Fl. Palghat Dist* 349 (1990); Sasidh., *Fl. Parambikulam WLS* 229 (2002).

Basionym : *Justicia pubescens* Lam., *Tabl. Encycl. i.* 40 (1791).

Habit : Shrub
Ecosystem preference : Evergreen forests
Distribution : Indo - Pacific
Endemism : Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Canopy rich forests
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Rare
Phenology : September - January
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Neelippara, 10°51'47.52"N , 76° 37 '37.38"E, 331m, 15 September 2017, Aswani & Maya, 568 (GVCH).

Haplanthodes Kuntze, *Lex. Gen. Phan. [Post & Kuntze]* 265 (1903)

Haplanthodes tentaculata var. ***neilgherryensis*** **(**Wight) J. R. I. Wood, *Novon* 23(3): 386 (2014); *Haplanthus*

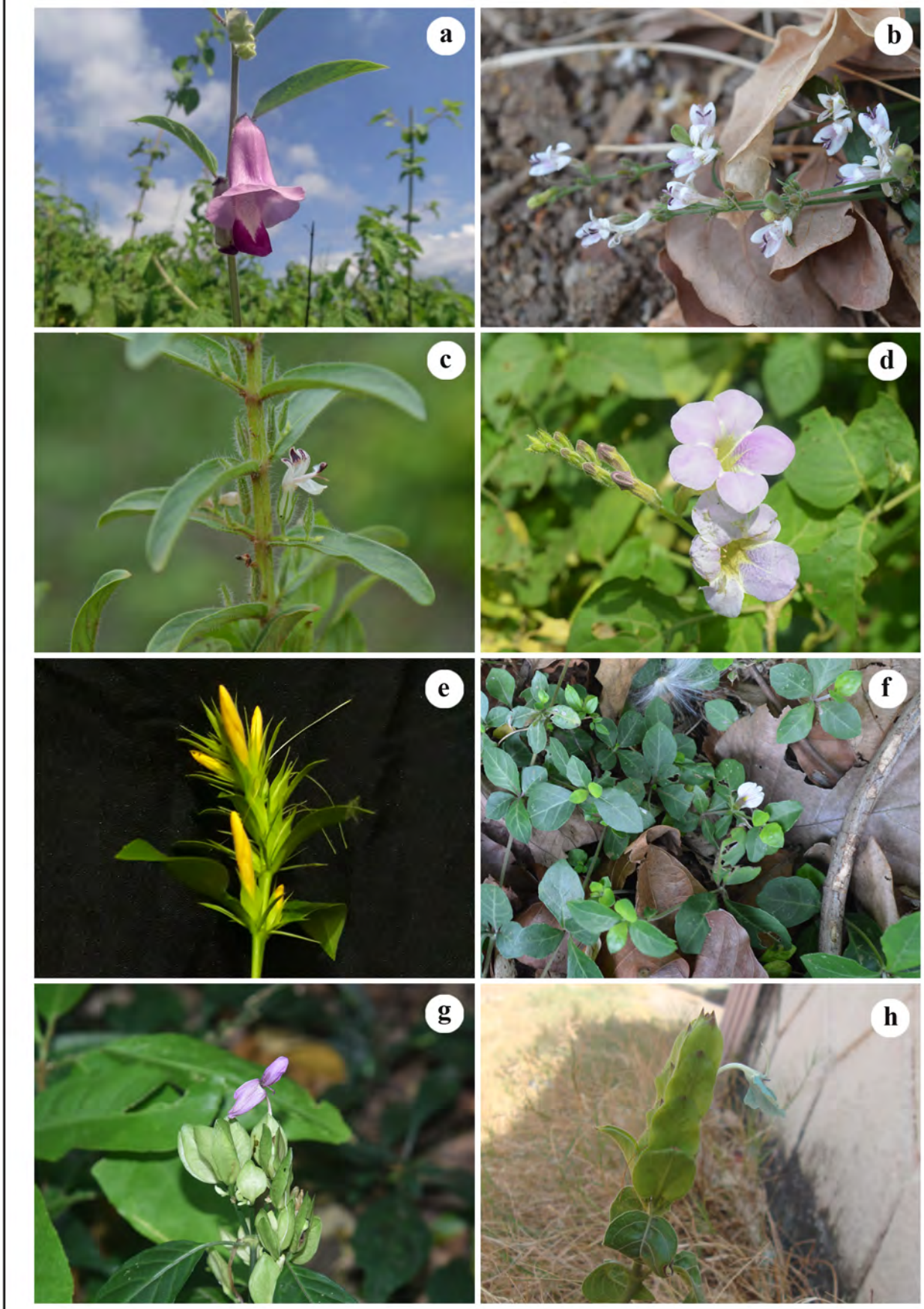

Plate 76: Fig. a. *Sesamum radiatum* Thonn. ex Hornem. **b.** *Andrographis alata* (Vahl) Nees **c.** *Andrographis echioides* Nees **d.** *Asystasia dalzelliana* Santapau **e.** *Barleria prionitis* L. **f.** *Blepharis maderaspatensis* (L.) B.Heyne **g.** *Dicliptera foetida* Blatt. **h.** *Ecbolium viride* (Forssk.) Alston.

tentaculatus Nees. var. *neilgherryensis* (Wight) Clarke, Hook. f., *FBI* 4: 507 (1884); *Haplanthodes neilgherryensis* (Wight) Majumdar, Vajr., *Fl. Palghat Dist* 349 (1990); Sasidh., *Fl. Parambikulam WLS* 229 (2002); *Haplanthus neilgherryensis* Wight, Hook. f., *FBI* 4: 507 (1884); Gamble, *Fl. Madras* 1052 (1924).

Basionym: *Haplanthus neilgherryensis Wight*, *Icon. Pl. Ind. Orient. [Wight]* 4: t. 1556 (1850).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
Endemism : Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Open forest tracks and ud cliffs
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : January - March
Altitude preference : Found in higher altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Parachaathy,10°50'54.24"N,76°43'55.92"E, 181m, 02 January 2019, Aswani & Maya, 3602 (GVCH); Chaatapara waterfalls, 10°53'11.76"N, 76°42'15.84"E, 600m, 10 December 2019, Aswani & Maya, 5459 (GVCH);Jamanthimala,10°51'53.64"N,76° 47'16.80"E, 610m, 09 January 2020, Aswani & Maya, 5636 (GVCH); Aduppukootimala,10°49'55.92"N,76°44'29. 40"E, 271m, 16 February 2021, Aswani & Maya, 6436 (GVCH).

Hygrophila R.Br., *Prodr. Fl. Nov. Holland.* 479 (1810)

Key to species

Plants armed; calyx deeply 4 – partite……..*H. auriculata*

Plants unarmed; calyx tubular 5 – fid…….*H. ringens*

Hygrophila auriculata (Schumach.) Heine, Kew Bull. 16(2): 172 (1962); Vajr*., Fl. Palghat Dist* 350 (1990); *Asteracantha longifolia* (L.) Nees, Hook. f., *FBI* 4: 408 (1884); Gamble, *Fl. Madras* 1015 (1924); *Hygrophila schulli* (Buch.-Ham.) M. R. & S. M. Almeida, Sasidh., *Fl. Parambikulam WLS* 229 (2002).

Basionym : *Barleria auriculata Schumach. & Thonn*., *Beskr. Guin. Pl.* 285 (1827).

Habit : Herb
Ecosystem preference : Marshes
Distribution : Indo - Pacific and Holarctic
IUCN Category : Least Concern (LC)
Habitat : Paddy fields, Outskirts of hillocks and other wet regions
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : September - April
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Way to Ayyappan Mala, 10°48'59.96"N, 76°45'22.61"E, 06 January 2018, 132m, Aswani & Maya, 1217 (GVCH) **(Plate 77: Fig. b)**.

Hygrophila ringens (L.) R.Br. ex Steud., *Nomencl. Bot. [Steudel]* 1: 418 (1821); *Hygrophila quadrivalvis* Nees, Hook. f., *FBI* 4: 408 (1884); Gamble, *Fl. Madras* 1016 (1924); *Hygrophila angustifolia* R. Br., Gamble, *Fl. Madras* 1016 (1924); *Hygrophila salicifolia* (Vahl) Nees, Vajr., *Fl. Palghat Dist* 350 (1990).

Basionym : *Ruellia ringens* L., *Sp. Pl.* 2: 635 (1753).

Habit : Herb
Ecosystem preference : Moist localities in the plains

Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Dam sites
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : October - March
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Cheranpara, 10°49'29.62"N, 76°40'38.63"E, 136m, 27 June 2017, Aswani & Maya, 208 (GVCH) **(Plate 77: Fig. c)**.

Justicia L., *Sp. Pl.* 1: 15 (1753)

Key to species

1. Anther cells without any spur like appendage at base……..….*J. adhatoda*
- Anther cells with a white spur like appendage at base……...2
2. Flowers in terminal panicles……...3
- Flowers in axillary or terminal panicles...4
3. Stem with purplish bark, puberulous……..*J. glauca*
- Stem green, glabrous...*J. tranquebariensis*
4. Capsule glabrous……..….*J. gendarussa*
- Capsule villous…….…..*J. wynaadensis*

Justicia adhatoda L., *Sp. Pl.* 1: 15 (1753); *Adhatoda vasica* Nees., Hook. f., *FBI* 4: 540 (1885); Gamble, *Fl. Madras* 1082 (1924); *Adhatoda zeylanica* Medic.,Vajr., *Fl. Palghat Dist* 340 (1990).

Habit : Shrub
Ecosystem preference : Plains
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Planted as biofence plant and in home steads
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Poozhikunnu, 10°51'20.44"N, 76°43'38.28" E, 177m, 09 November 2017, Aswani & Maya, 893 (GVCH); Ayyankulam, 10°48'37.19"N, 76°44'56.27"E, 146m, 06 January 2018, Aswani & Maya, 1186 (GVCH); Ayyappan Mala, 10°48'59.96"N, 76°45'22.61"E, 149m, 26 June 2018, Aswani & Maya, 2391 (GVCH) ; Parachaathy, 10°50'38.76"N, 76°43'51.96" E, 147m, 02 January 2019, Aswani & Maya, 3627 (GVCH); Chottuppara waterfalls, 10°52'37.92"N,76° 41 '39.84"E, 350m, 14 May 2019, Aswani & Maya, 3974 (GVCH).

Justicia gendarussa Burm. f., *Fl. Ind. (N. L. Burman)* 10 (1768); Hook. f., *FBI* 4: 532 (1885); Gamble, *Fl. Madras* 1079 (1924); Sasidh., *Fl. Parambikulam WLS* 230 (2002).

Habit : Shrub
Ecosystem preference : Moist deciduous forests and also in the plains
Distribution : Indo - Pacific, Holarctic and African
IUCN Category : Not Evaluated (NE)
Habitat : Forest margins and in homesteads
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Occasional
Phenology : January - April
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Chottuppara waterfalls, 10°52'37.92"N, 76°41'39.84"E, 351m, 14 May 2019, Aswani & Maya, 3975 (GVCH); Chaavadippara, 10°52'39.57"N, 76°48'39.85"E, 277m, 28 January 2020, Aswani & Maya, 5876 (GVCH).

Justicia glauca Rottler, *Neue Schriften Ges. Naturf. Freunde Berlin iv.* (1802) 219; Hook. f., *FBI* 4: 529 (1885); Gamble, *Fl. Madras* 1079 (1924).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not evaluated (NE)
Habitat : Open hill slopes
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : January - June
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Ayyappan Mala, 10°49'06.91"N, 76°44'44.91"E, 150m, 07 March 2019, Aswani & Maya, 3852 (GVCH).

Justicia tranquebariensis L. f., *Suppl. Pl.* 85 (1782); Hook. f., *FBI* 4: 530 (1885); Gamble, *Fl. Madras* 1079 (1924); Sasidh., *Fl. Parambikulam WLS* 232 (2002).

Habit : Herb
Ecosystem preference : Deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated
Habitat : Outskirts of hillocks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : November - February
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Walayar Dam, 10°50'24.58"N, 76°51'01.52"E, 212m, 09 May 2018, Aswani & Maya, 1985 (GVCH).

Justicia wynaadensis B. Heyne, *Numer. List [Wallich] n.* 2474 (1830); Hook. f., *FBI* 4: 533 (1885); Gamble, *Fl. Madras* 1079 (1924); Vajr., *Fl. Palghat Dist* 353 (1990); Sasidh., *Fl. Parambikulam WLS* 232 (2002).

Habit : Shrub
Ecosystem preference : Semi - evergreen forests and margins of grasslands
Distribution : Indo - Pacific
Endemism : Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Open forest areas
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Occasional
Phenology : November – March
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Parachaathy, 10°50'49.97"N, 76°43'56.67" E, 162m, 02 January 2019, Aswani & Maya, 3619 (GVCH); Chaavadippara, 10°52'32.16"N, 76°48'28.04"E, 303m, 28 January 2020, Aswani & Maya, 5879 (GVCH);; Aatumala Thodu, 10°53'52.08"N, 76°41'24"E, 1010m, 28 February 2020, Aswani & Maya, 6133 (GVCH).

Lepidagathis Willd., *Sp. Pl., ed.* 4 [*Willdenow*] 3(1): 400 (1800)

Key to species

Capsule 2 – seeded……...*L. spinosa*
Capsule 4 – seeded……...…*L. incurva*

Lepidagathis incurva Buch.-Ham. *ex* D.Don, *Prodr. Fl. Nepal.* 119 (1825); Sasidh., *Fl. Parambikulam WLS* 233 (2002); *Lepidagathis hyalina* Nees., Hook. f., *FBI* 4: 521 (1884); Gamble, *Fl. Madras* 1068 (1924).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)

Habitat : Open forest tracks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : February - April
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Chaavadippara,10°52'42.20"N,76°48'43.56" E, 268m, 28 January 2020, Aswani & Maya, 5825 (GVCH); Thanniplace, 10°52'43.32"N, 76°45'54.07"E, 979m, 28 January 2020, Aswani & Maya, 6012 (GVCH) **(Plate 77: Fig. d)**.

Lepidagathis spinosa Wight *ex* Nees, *Pl. Asiat. Rar. (Wallich).* iii. 97; Hook. f., *FBI* 4: 517 (1885); Gamble, *Fl. Madras* 1067 (1924).

Basionym : *Barleria spinosa* (Wight ex Nees) Wall. *ex* Steud., *Nomencl. Bot. [Steudel], ed.* 2. 1: 188 (1840).

Habit : Herb
Ecosystem preference : Grasslands
Distribution : Indo - Pacific
Endemism : Southern Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Margins of grasslands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : November - April
Altitude preference : Found in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, AatumalaThodu,10°53'52.08"N,76°41'24", 1022m, 28 February 2020, Aswani & Maya, 6145 (GVCH) **(Plate 77: Fig. e)**.

Nicoteba Lindau, *Bot. Jahrb. Syst.* 18(1-2): 56 (1893)

Nicoteba betonica Lindau, *Bot. Jahrb. Syst.* 18(1-2): 56 (1893); *Justicia betonica* L., var. *betonica*, Hook. f., *FBI* 4:525 (1885); Gamble, *Fl. Madras* 1078 (1924); Vajr., *Fl. Palghat Dist* 351 (1990); Sasidh., *Fl. Parambikulam WLS* 230 (2002).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Open forest tracks
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Rare
Phenology : November - January
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Karadikunnu, 10°50'25.10"N , 76°49'43.70"E, 219m, 30 December 2017, Aswani & Maya, 1061 (GVCH); G. P. Nair Estate, 10° 53 '26.52 "N, 76° 39' 41.04"E, 200m, 24 March 2018, Aswani & Maya, 1696 (GVCH) **(Plate 77: Fig. f)**.

Phaulopsis Willd., *Sp. Pl., ed. 4 [Willdenow]* 3(1): 4, 342 (1800), nom. et orth. cons.

Phaulopsis imbricata (Forssk.) Sweet, *Hort. Brit. [Sweet]* 327 (1826); Sasidh., *Fl. Parambikulam WLS* 234 (2002); *Phaylopsis parviflora* Willd., Hook. f., *FBI* 4: 417 (1884); *Micranthus oppositifolius* Wendl., Gamble, *Fl. Madras* 1022 (1924); *Phaulopsis dorsiflora* (Retz.) Sant., Vajr., *Fl. Palghat Dist* 358 (1990).

Basionym : *Ruellia imbricata Forssk*., *Fl. Aegypt.-Arab.* 113 (1775).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific, Holarctic and African
IUCN Category : Least Concern (LC)
Habitat : Open hill tracks and mud cliffs
Raunkiaer's Life form : Therophyte

Distribution Frequency : Common
Phenology : November - March
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Parachaathy, 10°50'54.96"N, 76°43'59.16"E, 186m, 02 January 2019, Aswani & Maya, 3607 (GVCH); Aduppukootimala, 10°50'15.72"N, 76°44'28.68"E, 448m, 16 February 2021, Aswani & Maya, 6417 (GVCH) **(Plate 77: Fig. g**).

Rhinacanthus Nees, *Pl. Asiat. Rar. (Wallich).* iii. 76 (1832)

Rhinacanthus nasutus (L.) Kurz, *J. Asiat. Soc. Bengal, Pt.* 2, *Nat. Hist.* 39(2): 79 (1870); Vajr., *Fl. Palghat Dist* 359 (1990); Sasidh., *Fl. Parambikulam WLS* 234 (2002); *Rhinacanthus communis* Nees, Hook. f., *FBI* 4: 541 (1885); Gamble, *Fl. Madras* 1083 (1924).

Basionym : *Justicia nasuta* L., *Sp. Pl.* 1: 16 (1753).

Habit : Shrub
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Degraded forests, near water sources etc
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : November - February
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, G. P. Nair Estate, 10°53'17.51"N, 76°39'42.72"E, 186m, 24 March 2018, Chaavadippara, 10°52'32.16"N, 76°48'28.04"E, 305m, 28 January 2020, Aswani & Maya, 5881 (GVCH); Way to Jamanthimala, 10°52'18.01"N, 76°46'38.28"E, 893m, 29 January 2020, Aswani & Maya, 6052 (GVCH) **(Plate 77: Fig. h)**.

Rostellularia Rchb., *Handb. Nat. Pfl.-Syst.* 190 (1837)

Key to species

1. Bracts and bracteoles as long as or longer than the calyx lobes; spikes cylindric……*R. procumbens*
- Bracts and bracteoles shorter than the calyx lobes; spikes linear……....2
2. Capsule glabrous throughout…….
……...*R. hedyotidifolia*
- Capsule hairy above……..…..*R. diffusa*

Rostellularia hedyotidifolia **(**Nees) Nees, *Prodr. [A. P. de Candolle]* 11: 370 (1847); *Justicia diffusa* Willd. var. *hedyotidifolia* (Nees) Clarke, Hook. f., *FBI* 4: 538 (1885); Gamble, *Fl. Madras* 1081 (1924); Vajr., *Fl. Palghat Dist* 352 (1990); *Justicia gambleana* K.M.P. Kumar, Robi & Hareesh, *Kew Bull*. 71:39 (2016).

Habit : Herb
Ecosystem preference : Moist deciduous forests and Grasslands
Distribution : Indo - Pacific
Endemism : Southern Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Open forests and grasslands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : October
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kavarakundu, 10°52'10.56"N , 76°42'45.18"E, 232m, 10 March 2018, Aswani & Maya, 1517 (GVCH); Koomachimala, 10°49'44.76"N, 76°40'34.59"E, 168m, 23 November 2019, Aswani & Maya, 4917 (GVCH); Pettikallu, 10°53'2.04"N, 76°42'13.92"E,

541m, 27 February 2020, Aswani & Maya, 6086 (GVCH) **(Plate 78: Fig. a)**.

Rostellularia diffusa (Nees) Nees, *Prodr. [A. P. de Candolle]* 11: 371 (1847); *Justicia diffusa* Willd. var. diffusa; Hook. f., *FBI* 4: 538 (1885); Gamble, *Fl. Madras* 1081 (1924); Vajr., *Fl. Palghat Dist* 352 (1990); Sasidh., *Fl. Parambikulam WLS* 230 (2002).

Basionym : *Rostellaria diffusa Nees*, *Pl. Asiat. Rar. (Wallich).* iii. 100 (1832).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Mud cliffs
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : August - October
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Chaavadippara,10°52'42.20"N,76°48'43.56" E, 266m, 28 January 2020, Aswani & Maya, 5823 (GVCH); Vettumadavu, 10°52'45.01"N, 76°48'8.60"E, 375m, 28 January 2020, Aswani & Maya, 5904 (GVCH) **(Plate 78: Fig. b)**.

Rostellularia procumbens (L.) Nees, *Prodr. [A. P. de Candolle]* 11: 371 (1847); *Justicia simplex* D. Don, Hook. f., *FBI* 4: 539 (1885); Gamble, *Fl. Madras* 1080 (1924); Vajr., *Fl. Palghat Dist* 353 (1990); *Justicia japonica* Thunb., Sasidh., *Fl. Parambikulam WLS* 231 (2002).

Basionym : *Justicia procumbens* L., *Sp. Pl.* 1: 15 (1753).

Habit : Herb
Ecosystem preference : Deciduous forests and plains
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Open forest tracks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : August - February
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala,10°49'44.76"N,76°40'34.59 "E, 13m, 20 June 2017, Aswani & Maya, 139 (GVCH); Kozhimala, 10°50'01.89"N, 76°42'58.61"E, 113m, 09 November 2017, Aswani & Maya, 763 (GVCH); Chacolas, 10°51'22.68"N, 76°44'41.28"E, 240m, 02 August 2019, Aswani & Maya, 4474 (GVCH); Mayappallam, 10°48'0.36"N, 76°45'58.68"E, 139m, 06 September 2019, Aswani & Maya, 4696 (GVCH).

Ruellia L., *Sp. Pl. [Linnaeus*] 2: 634 (1753)

Ruellia prostrata Poir., *Encycl. [J. Lamarck & al.]* 6(1): 349 (1804); Hook. f., *FBI* 4: 411 (1884); Gamble, *Fl. Madras* 1016 (1924); *Ruellia prostrata* Poir. var. *dejecta* (Nees) Clarke, Hook. f., *FBI* 4: 412 (1884); *Dipteracanthus prostratus* (Poir.) Nees, Vajr., *Fl. Palghat Dist* 347 (1990).

Habit : Herb
Ecosystem preference : Deciduous forests and in plains
Distribution : Indo - Pacific
Endemism : India
IUCN Category : Not Evaluated (NE)
Habitat : Found in degraded forests and other open regions
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : October - April
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala, 10°49'44.76"N, 76°40'34.59"E, 13m, 05 October 2017,

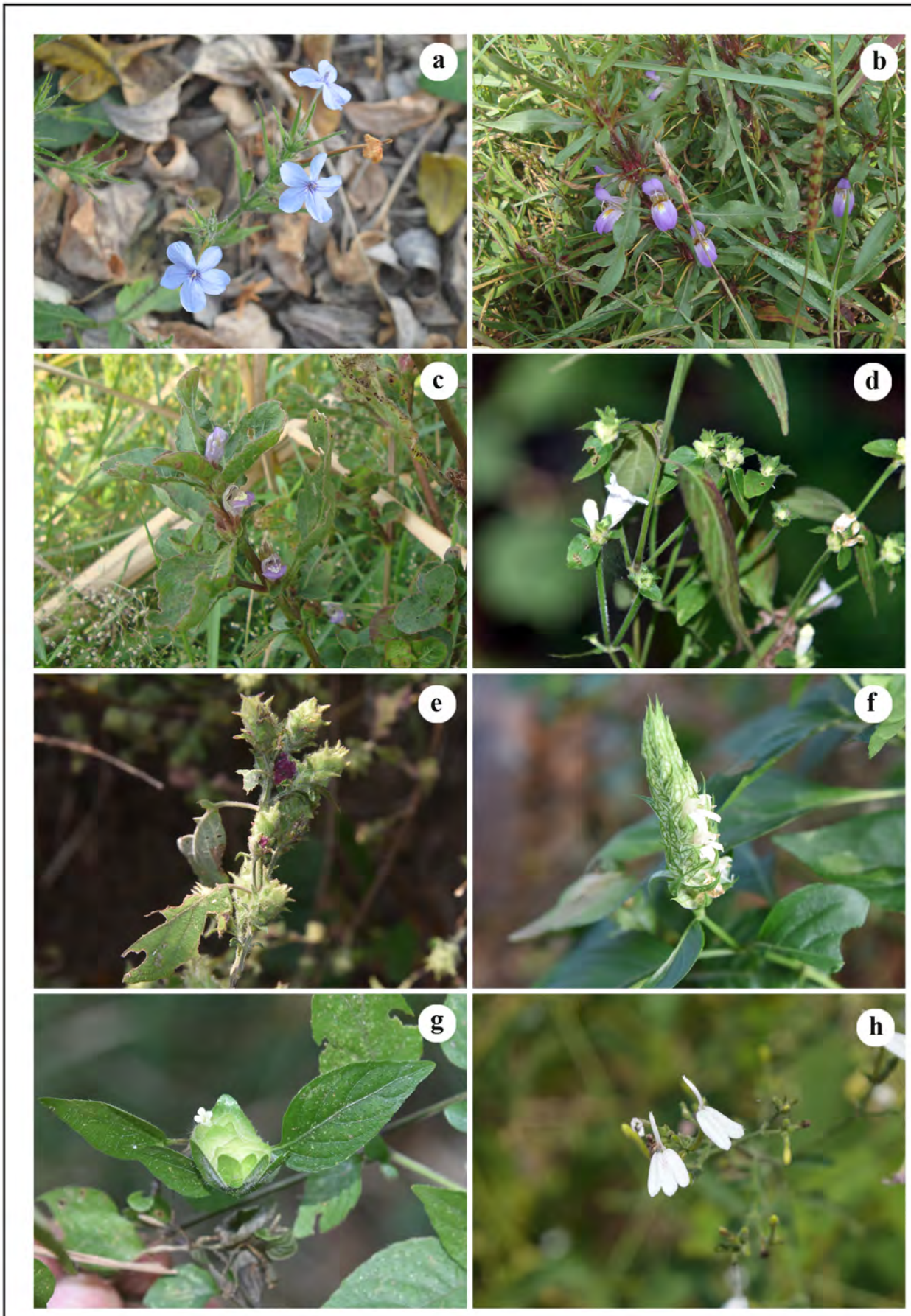

Plate 77: Fig. a. *Eranthemum capense L.* **b.** *Hygrophila auriculata* (Schumach.) Heine **c.** *Hygrophila ringens* (L.) R.Br. ex Steud. **d.** *Lepidagathis incurva* Buch.-Ham. ex D.Don **e.** *Lepidagathis spinosa* Wight ex Nees **f.** *Nicoteba betonica* Lindau **g.** *Phaulopsis imbricata* (Forssk.) Sweet **h.** *Rhinacanthus nasutus* (L.) Kurz.

Aswani & Maya, 650 (GVCH); Neelikunnu,10°51'30.14"N, 76°37'30.67"E, 155m, 27 April 2018, Aswani & Maya, 1911(GVCH); Walayardam,10°50'24.58"N, 76°51'01.52"E, 222m, 09 May 2018, Aswani & Maya, 1995 (GVCH).

Rungia Nees, *Pl. Asiat. Rar. (Wallich)*. 3: 77 (1832)

Key to species

Stem hairy; sepals linear, hairy; capsule glabrous……*R. pectinata*
Stem glabrous; sepals glabrous; capsules hairy……..…*R. wightiana*

Rungia pectinata Nees, *Prodr. [A. P. de Candolle]* 11: 470 (1847); Vajr., *Fl. Palghat Dist* 360 (1990); Sasidh., *Fl. Parambikulam WLS* 235 (2002); *Rungia parviflora* (Retz.) Nees var. *pectinata* (L.) Clarke, Hook. f., *FBI* 4: 550 (1885); Gamble, *Fl. Madras* 1071 (1924).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Degraded and other open forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : November - February
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Karadikunnu,10°50'25.97"N,76°49'42.92", 228m, 30 December 2017, Aswani & Maya, 1043 (GVCH); Parachaathy, 10°50'42.54"N, 76°43'49.14"E, 168m, 02 January 2019, Aswani & Maya, 3560(GVCH); Aduppukootimala, 10°50'15.72"N, 76°44'28.68"E, 447m, 16 February 2021, Aswani & Maya, 6416 (GVCH) **(Plate 78: Fig. c)**.

Rungia wightiana Nees, Pl. Asiat. Rar. (Wallich). 3: 110 (1832); Hook. f., *FBI* 4: 546 (1885); Gamble, *Fl. Madras* 1071 (1924); Sasidh., *Fl. Parambikulam WLS* 236 (2002).

Habit : Herb
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
Endemism : Southern Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Canopy rich forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : December - February
Altitude preference : Valley of grasslands
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala, 10°51'59.76"N, 76°47'15. 36"E, 644m, 09 January 2020, Aswani & Maya, 5641 (GVCH).

Strobilanthes Blume, *Bijdr. Fl. Ned. Ind.* 14: 781, 796-797 (1826)

Key to species

1. Ovules more than 2 in each locule……...…...*S. crossandra*
- Ovules 2 in each locule……...2
2. Spikes sub-tetragonous …….*S. dupenii*
- Spikes cylindric or elongate……..…3
3. Heads and leaves glabrous…....*S. ciliates*
- Heads and leaves hairy……....4
4. Branches hirsute; floral bracts ovate glabrous……..….*S. heyneanus*
- Branches glabrous; floral bracts linear, glandular hairy…….*S. aurita*

Strobilanthes aurita J. R. I. Wood, Kew Bull. 50(1): 12 (1995); *Strobilanthes caudatus* Beed., Hook. f., *FBI* 4: 441 (1884); Gamble, *Fl. Madras* 1040 (1924); *Mackenziea caudata* (Anders.)

Ramamoorthy, Vajr., *Fl. Palghat Dist* 355 (1990).

Habit : Shrub
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Hill slopes of semi - evergreen forests
Raunkiaer's Life form : Chamaephytes
Distribution Frequency : Rare
Phenology : September - December
Altitude preference : Found in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Aduppukootimala, 10°49'58.80"N, 76° 44 '31.92"E, 303m, 16 February 2021, Aswani & Maya, 6469 (GVCH) **(Plate 78: Fig. d)**.

Strobilanthes ciliata Nees, *Pl. Asiat. Rar. (Wallich).* iii. 85; Hook. f., *FBI* 4: 439 (1884); Gamble, *Fl. Madras* 1039 (1924); Sasidh., *Fl. Parambikulam WLS* 237 (2002); *Strobilanthes warreensis* Dalz., Hook. f., *FBI* 4: 439 (1884); Gamble, *Fl. Madras* 1039 (1924).

Habit : Shrub
Ecosystem preference : Semi-evergreen forests
Distribution : Indo - Pacific
Endemism : Southern Western Ghats
IUCN Category : Vulnerable
Habitat : Canopy rich forest floor
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Occasional
Phenology : December - May
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Chottuppara waterfalls, 10°52'37.92"N, 76°41'39.84"E, 359m, 14 May 2019, Aswani & Maya, 3983 (GVCH); On the way to Jamanthimala, 10°50'26.52"N, 76°50'04.56"E, 244m, 23 June 2019, Aswani & Maya, 4022 (GVCH);; Chacolas, 10°51'16.20"N, 76°45'05.76"E, 286m, 02 August 2019, Aswani & Maya, 4526 (GVCH).

Strobilanthes crossandra (Steud.) J.R.I.Wood, *Novon* 23(3): 391 (2014); *Hemigraphis elegans* (Hook.) Nees in DC., Hook. f., *FBI* 4:424 (1884); Gamble, *Fl. Madras* 1019 (1924).

Basionym : *Ruellia crossandra Steud*., *Nomencl. Bot. [Steudel], ed.* 2. 2: 481 (1841).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Degraded forests and in open forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : December - February
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kozhimala, 10°50'01.89"N, 76°42'58.61"E, 156m, 09 November 2017, Aswani & Maya, 806 (GVCH); Akamalavaram – Chaatappara waterfalls, 10°52'56.81"N, 76°42'11.22"E, 507m, 10 December 2019, Aswani & Maya, 5433 (GVCH); Chaavadippara,10°52'42.20"N,76°48'43.56" E, 271m, 28 January 2020, Aswani & Maya, 5828 (GVCH); Aduppukootimala, 10°51'58.32"N, 76°42'22.32"E, 451m, 16 February 2021, Aswani & Maya, 6420 (GVCH).

Strobilanthes dupeni Bedd. ex C.B.Clarke, *FBI* [J. D. Hooker] 4(11): 453 (1884); Gamble, *Fl. Madras* 1043 (1924); *Kanjarum palghatense* Ramam., Vajr., *Fl. Palghat Dist* 354 (1990).

Habit : Shrub
Ecosystem preference : Semi-evergreen forests and grasslands
Distribution : Indo - Pacific
Endemism : Southern Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Valley of grasslands
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Rare
Phenology : August - October
Altitude preference : Found in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala, 10°52'18.19"N, 76°46'47.14"E, 959m, 09 January 2020, Aswani & Maya, 5791 (GVCH).

Strobilanthes heyneana Nees, *in Wall. [Pl. As. Rar.* iii. 85; Hook. f., *FBI* 4: 443 (1884); Gamble, *Fl. Madras* 1041 (1924); Sasidh., *Fl. Parambikulam WLS* 238 (2002); *Nilgirianthus heyneanus* (Nees) Bremek., Vajr., *Fl. Palghat Dist* 357 (1990); *Strobilanthes asperrimus* Nees in DC., Hook. f., *FBI* 4: 443 (1884); Gamble, *Fl. Madras* 1041 (1924); Sasidh., *Fl. Parambikulam WLS* 237 (2002).

Habit : Shrub
Ecosystem preference : Margins of grasslands
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found as gregarious forest in valleys of grasslands
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Rare
Phenology : October - December
Altitude preference : Found in higher altitudes
Specimens examined: INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala, 10°51'53.64"N, 76°47'16.80"E, 604m, 09 January 2020, Aswani & Maya, 5630 (GVCH); Thanniplace, 10°52'43.32"N, 76°45'54.07"E, 975m, 28 January 2020, Aswani & Maya, 6008 (GVCH) **(Plate 78: Fig. e)**.

Thunbergia Retz., *Physiogr. Salsk. Handl.* 1(3): 163 (1780), nom. cons.

Key to species

Flowers white……*T. tomentosa*
Flowers bright yellow or orange……*T. mysorensis*

Thunbergia mysorensis (Wight) T.Anderson, *J. Linn. Soc., Bot.* 9: 448 (1867); Hook. f., *FBI* 4: 393 (1884); Gamble, *Fl. Madras* 1008 (1924); Vajr., *Fl. Palghat Dist* 362 (1990); Sasidh., *Fl. Parambikulam WLS* 239 (2002).

Basionym : *Hexacentris mysorensis* Wight, *Icon. Pl. Ind. Orient. [Wight]* 3(2): 6, t. 871 (1845).

Habit : Climber
Ecosystem preference : Semi-evergreen forests
Distribution : Indo - Pacific
Endemism : Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Near water sources in semi - evergreen forests
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : December - March
Altitude preference : Found in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Chaatapara waterfalls, 10°53'11.76"N, 76°42'15.84"E, 594m, 10 December 2019, Aswani & Maya, 5563 (GVCH) **(Plate 78: Fig. f)**.

Thunbergia tomentosa Wall. ex Nees, *Pl. Asiat. Rar. (Wallich).* iii. 78; Hook. f., *FBI* 4: 391 (1884); Gamble, *Fl. Madras* 1008 (1924).

Habit : Climber
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
Endemism : Southern Western Ghats
IUCN Category : Not Evaluated (NE)
Habitat : Degraded forests
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : January - March
Altitude preference : Found in medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Ayyappan Koil, 10°52'43.68"N, 76°47'6"E, 439m, 28 January 2020, Aswani & Maya, 5942 (GVCH); Edasherikunnu, 10°52'42.6"N, 76°46'53.32"E, 649m, 28 January 2020, Aswani & Maya, 5953 (GVCH) **(Plate 78: Fig. g)**.

Bignoniaceae

Key to genera

1. Habit - Climbers…....…….*Mansoa*
- Habit - Trees……..…….2
2. Calyx spathaceous…..….*Spathodea*
- Calyx campanulate or cupular…....3
3. Leaves simple pinnate……..….4
- Leaves multi-pinnate……..….5
4. Flowers in dense terminal panicles, flowers bright yellow ….. *Tecoma*
- Flowers in lax terminal panicles, flowers pale yellow with red stripes……..…..... *Stereospermum*
5. Perfect stamens 5…....….*Oroxylum*
- Perfect stamens 4…….……..….6
6. Capsule elongate, warty and tubercled……...*Radermachera*
- Capsule elongate, laterally compressed……..*Millingtonia*

Mansoa DC., *Biblioth. Universelle Genève xvii.* (1838) 128 [Rev. Bign. 12]

Mansoa alliacea (Lam.) A. H. Gentry, *Ann. Missouri Bot. Gard.* 66: 782 (1980); *Adenocalymna alliaceum* Miers., Ratheesh Narayanan, *Fl. Stud. Wayanad Dist* 603 (2009).

Habit : Climber
Ecosystem preference : Outskirts of deciduous forests
Distribution : South American
IUCN Category : Not Evaluated (NE)
Habitat : Wild escape to forests
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : September - February
Altitude preference : Found in medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Akamalavarm - Pettikallu, 10°52'28.20"N, 76°42'38.52"E, 347m, 19 July 2019, Aswani & Maya, 4397 (GVCH) **(Plate 78: Fig. h)**.

Millingtonia L. f., *Suppl. Pl.* 45, 291 (1782)

Millingtonia hortensis L. f., *Suppl. Pl.* 291 (1782); Hook. f., *FBI* 4: 377 (1884); Gamble, *Fl. Madras* 994 (1924); Vajr., *Fl. Palghat Dist* 336 (1990).

Habit : Tree
Ecosystem preference : In degraded forests and in plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Often found as escape to wild
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : March - August
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Malampuzha irrigation dept guest house hillock, 10°50'04.20"N, 76°40'52.68"E, 130m, 18 May 2018, Aswani & Maya, 2173 (GVCH).

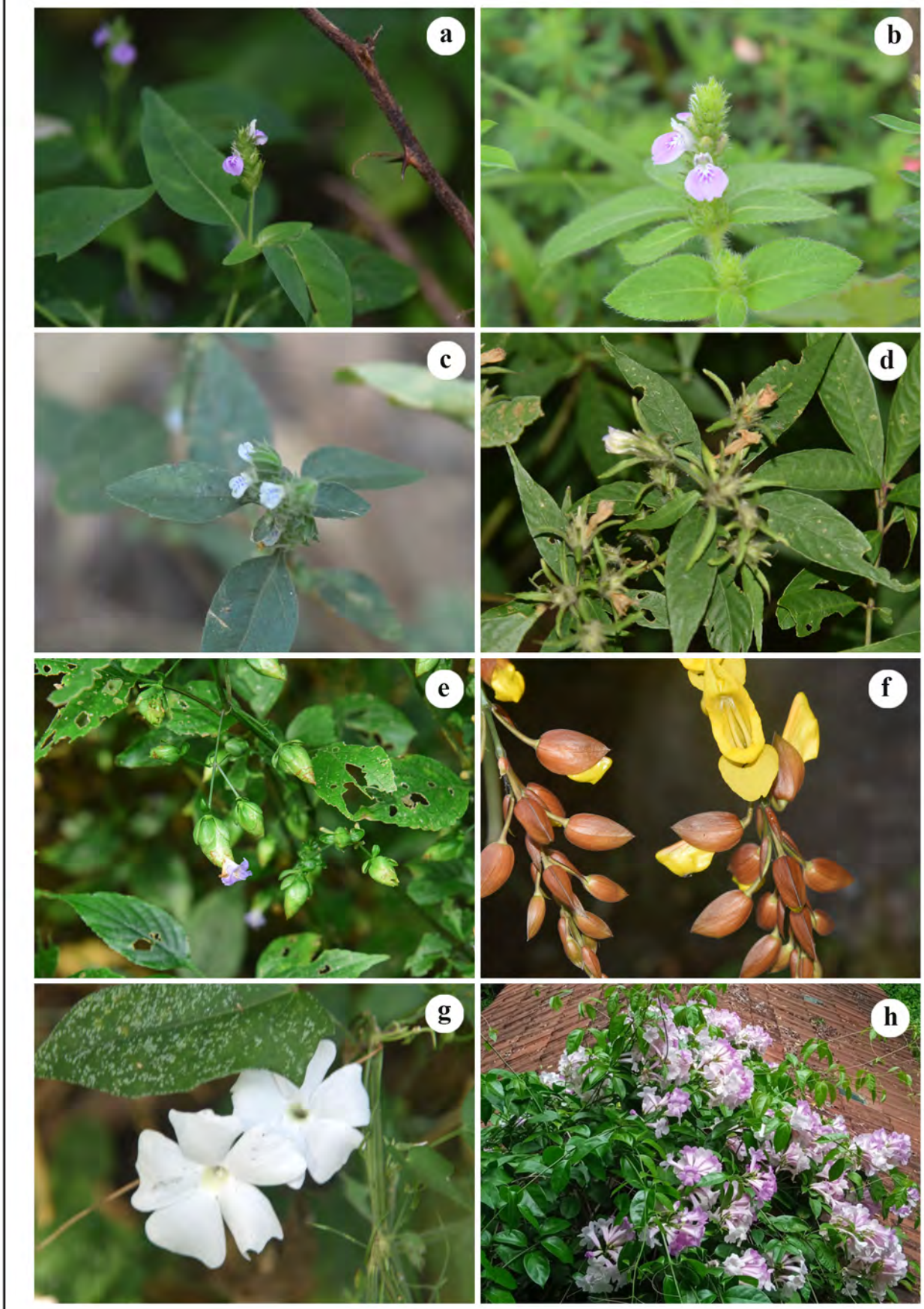

Plate 78: Fig. a. *Rostellularia hedyotidifolia* (Nees) Nees **b.** *Rostellularia diffusa* (Nees) Nees **c.** *Rungia pectinata* Nees **d.** *Strobilanthes aurita* J.R.I.Wood **e.** *Strobilanthes heyneana* Nees **f.** *Thunbergia mysorensis* (Wight) T.Anderson **g.** *Thunbergia tomentosa* Wall. ex Nees **h.** *Mansoa alliacea* (Lam.) A.H.Gentry.

Oroxylum Vent., *Dec. Gen. Nov.* (1808)

Oroxylum indicum (L.) Benth. ex Kurz, *Forest Fl. Burma* 2: 237 (1877); Hook. f., *FBI* 4: 378 (1884); Gamble, *Fl. Madras* 994 (1924); Vajr., *Fl. Palghat Dist* 335 (1990); Sasidh., *Fl. Parambikulam WLS* 223 (2002).

Basionym: *Bignonia indica* L., *Sp. Pl.* 2: 625 (1753).

Habit : Tree
Ecosystem preference : Moist deciduous forests and semi - evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : In forest floors
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : July - December
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, G.P. Nair estate, 10°53'47.40"N, 76°39'47.16"E, 267m, 24 March 2018, Aswani & Maya, 1776 (GVCH); Kochuthodu, 10°51'58.32"N, 76°42'22.32"E, 205m, 18 December 2018, Aswani & Maya, 3325 (GVCH); Jamanthimala, 10°51'59.76"N, 76°47'15.36"E, 645m, 23 June 2019, Aswani & Maya, 4113 (GVCH); Vettumadavu,10°52'45.01"N, 76°48'8.60"E, 364m, 28 January 2020, Aswani & Maya, 5893 (GVCH) **(Plate 79: Fig. a)**.

Radermachera Zoll. & Moritzi, *Syst. Verz. (Zollinger)* 53 (1854)

Radermachera xylocarpa (Roxb.) K. Schum., *Nat. Pflanzenfam. [Engler & Prantl]* 4(Abt. 3b): 243 (1895); Gamble, *Fl. Madras* 999 (1924); Vajr., *Fl. Palghat Dist* 335 (1990); Sasidh., *Fl. Parambikulam WLS* 224 (2002); *Stereospermum xylocarpum* (Roxb.) Benth., Hook. f., *FBI* 4: 383 (1884).

Basionym: *Bignonia xylocarpa* Roxb., *Fl. Ind. (Roxburgh)* 3: 108 (1832).

Habit : Tree
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
Endemism : Peninsular India
IUCN Category : Not Evaluated (NE)
Habitat : Open forests near water sources
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Rare
Phenology : March - April
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, G.P. Nair estate, 10°53'47.40"N, 76°39'47.16"E, 267m, 24 March 2018, Aswani & Maya, 1776 (GVCH); Chottupara waterfalls, 10°52'37.92"N, 76°41'39.84"E, 364m, 14 May 2019, Aswani & Maya, 3988 (GVCH).

Spathodea P. Beauv., *Fl. Oware* 1: 46 (1805)

Spathodea campanulata P. Beauv., *Fl. Oware* 1: 47, tt. 27-28 (1805); Gamble, *Fl. Madras* 1000 (1924); Sasidh., *Fl. Parambikulam WLS* 224 (2002).

Habit : Tree
Ecosystem preference : Moist deciduous forests and plains
Distribution : African
IUCN Category : Least Concern (LC)
Habitat : Degraded forest tracks
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : November - May
Altitude preference : Lower plains and forest margins
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range,

Cheranpara, 10°49'29.62"N, 76°40'38.63"E, 126m, 27 June 2017, Aswani & Maya, 198 (GVCH); Kezhakootimala, 10°51'53.30"N, 76°37'36.39"E, 383m, 15 September 2017, Aswani & Maya, 504 (GVCH); Thekke Malampuzha, 10°51'15.84"N, 76°39'40.32"E, 131m, 05 October 2017, Aswani & Maya, 674 (GVCH).

Stereospermum Cham., *Linnaea* 7(6): 720 (1833)

Stereospermum colais (Buch.-Ham. ex Dillwyn) Mabb., Taxon 27(5-6): 553 (1979); var. *colais*, Vajr., *Fl. Palghat Dist* 336 (1990); Sasidh., *Fl. Parambikulam WLS* 224 (2002); *Stereospermum tetragonum* DC, Gamble, *Fl. Madras* 998 (1924); *Stereospermum chelonoides* Wight, Hook. f., *FBI* 4: 382 (1884).

Habit : Tree
Ecosystem preference : Moist deciduous and semi-evergreen forests
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : Found in deciduous forests
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : February - October
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Moochikadavu, 10°52'13.80"N, 76°42'30.96"E, 264m, 10 March 2018, Aswani & Maya, 1464 (GVCH); G. P. Nair Estate, 10°53'20.76"N, 76°39'41.04"E, 206m, 24 March 2018, Aswani & Maya, 1645 (GVCH); Kochuthodu, 10°51'55.44"N, 76°42'00.11"E, 169m, 18 December 2018, Aswani & Maya, 3382 (GVCH); Ayyappan Mala, 10°49'07.19"N, 76°44'50.28"E, 179m, 07 March 2019, Aswani & Maya, 3799 (GVCH) **(Plate 79: Fig. b)**.

Tecoma Juss., *Gen. Pl. [Jussieu]* 139 (1789)

Tecoma stans (L.) Kunth, *Nov. Gen. Sp. [H.B.K.]* 3: 144 (1819); Vajr., *Fl. Palghat Dist* 336 (1990); *Stenolobium stans* (L.) D.Don, Gamble, *Fl. Madras* 1000 (1924).

Basionym : *Bignonia stans* L., *Sp. Pl.*, ed. 2. 2: 871 (1763).

Habit : Tree
Ecosystem preference : Seen in plains
Distribution : South American
IUCN Category : Least Concern (LC)
Habitat : Found as wild escape in drier hills
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : December - April
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Karadikunnu,10°50'25.97"N,76°49'42.92", 212m, 30 December 2017, Aswani & Maya,1027(GVCH);Mathaappumala,10°50' 57.35"N,76°49'44.27"E, 315m, 07 January 2020, Aswani & Maya, 5609 (GVCH); Chaavadippara,10°52'39.57"N,76°48'39.85" E, 270m, 28 January 2020, Aswani & Maya, 5869 (GVCH).

Lentibulariaceae

Utricularia L., *Sp. Pl.* 1: 18 (1753)

Key to species

Capsule thickened along the margin of dehiscence…..……..……*U. graminifolia*
Capsule uniformly thickened…*U. lazulina*

Utricularia graminifolia Vahl, *Enum. Pl. [Vahl] i.* 195 (1804); Gamble, *Fl. Madras* 981 (1924); Sasidh., *Fl. Parambikulam WLS* 220 (2002); *Utricularia caerulea* Clarke, Hook.f., *FBI* 4: 331 (1884);

Utricularia smithiana Wight, Gamble, *Fl. Madras* 982 (1924).

Habit : Herb
Ecosystem preference : Marshy rocky patches
Endemism : India and Sri Lanka
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Found along seasonal drainage channels in rocky outcrops
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : September - March
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala,10°49'44.76"N,76°40'30.72 "E, 14m, 31 July 2017, Aswani & Maya, 388 (GVCH); Olappalam, 10°49'52.20"N, 76°43'44.19"E, 181m, 25 November 2017, Aswani & Maya, 955 (GVCH); Anayappanchalla,10°48'24.82"N,76°48'30. 73"E, 176m, 18 September 2018, Aswani & Maya, 2844 (GVCH); Kongampadam, 10°48'39.80"N, 76°47'2.67"E, 163m, 06 September 2019, Aswani & Maya, 4600 (GVCH), Edamala, 16 October 2019, Aswani & Maya, 4845 (GVCH) **(Plate 79: Fig. c)**.

Utricularia lazulina P. Taylor, *Proc. Indian Acad. Sci. Pl. Sci.* 93(2): 101 (1984); M.K. Janarth. & Henry, *Bladderworts India* 67 (1992).

Habit : Herb
Ecosystem preference : Marshy rocky patches and other wet regions in rocky slopes
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Found along seasonal drainage channels in rocky outcrops
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : August - October
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kosavanidukku - Kaduvachal, 10°50'26.38"N, 76°40'30.88"E, 107m, 16 June 2017, Aswani & Maya, 228 (GVCH); Koomachimala,10°49'44.76"N,76°40'30.72 "E, 14m, 31 July 2017, Aswani & Maya, 387 (GVCH); Neelippara, 10°51'47.52"N, 76°37'37.38"E, 355m, 15 September 2017, Aswani & Maya, 592 (GVCH); Ollappallam,10°49'52.20"N,76°43'44.19"E, 180m, 25 November 2017, Aswani & Maya,954(GVCH);Anayappanchalla,10°48' 24.82"N,76°48'30.73"E, 177m, 18 September 2018, Aswani & Maya, 2845 (GVCH); Edamala, 10°50'28.32"N, 76° 38 '45.96"E, 196m, 16 October 2019, Aswani & Maya, 4844 (GVCH).

Verbenaceae

1. Prostrate herbs…..……..…..*Phyla*
- Erect shrubs……2
2. Stem armed; shrubs…….. *Lantana*
- Stems unarmed; herbs rarely subshrubs…...……..……...…3
3. Flowers in terminal spikes…..……..….*Stachytarpheta*
- Flowers in simple or panicled racemes, both axillary and terminal……..…….*Duranta*

Duranta L., *Sp. Pl. [Linnaeus]* 2: 637 (1753)

Duranta erecta L., *Sp. Pl*. 2: 637 (1753); *Duranta plumieri* Jacq., C.B. Clarke in Hook. f., *FBI* 4: 560 (1885); Gamble, *Fl. Madras* 1106 (1924).

Habit : Shrub
Ecosystem preference : Grown in homesteads and found as escape to wild

Distribution : South American
IUCN Category : Not Evaluated (NE)
Habitat : Introduced plant in forest tracks
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : July - March
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Malampuzha irrigation dept guest house hillock, 10°50'03.76"N, 76°40'56.19"E, 120m, 18 May 2018, Aswani & Maya, 2201 (GVCH) **(Plate 79: Fig. d)**.

Lantana L., *Sp. Pl. [Linnaeus]* 2: 626 (1753), nom. cons.

Lantana camara L., *Sp. Pl.* 2: 627 (1753); Sasidh., *Fl. Parambikulam WLS* 241 (2002); *Lantana aculeata* L., Gamble, *Fl. Madras* 1087 (1924); *Lantana camara* L. var. *aculeata* (L.) Hook. f., *FBI* 4: 562 (1885); Vajr., *Fl. Palghat Dist* 366 (1990).

Habit : Shrub
Ecosystem preference : All forest types and in plains and other wastelands
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Weed in open forests, deciduous, semi - evergreen and grasslands
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : April - June
Altitude preference : Found in all altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Pallippara, 10°49'48.36"N, 76°43'44.04"E, 120m, 29 October 2017, Aswani & Maya, 691 (GVCH); Kallanpuzha, 10°51'34.02"N, 76°42'40.16"E, 140m, 26 January 2018, Aswani & Maya, 1344 (GVCH); G. P. Nair Estate, 10°53'20.38"N, 76°39'41.73"E, 176m, 24 March 2018, Aswani & Maya, 1649 (GVCH); Koyamarakaadu, 10°47'44.88"N, 76°45'38.52"E, 111m, 06 September 2018, Aswani & Maya, 2693 (GVCH); Kottamutti waterfalls, 10°49'42.94"N, 76°46'47.87"E, 206m, 23 September 2018, Aswani & Maya, 2875 (GVCH); Parachaathy, 10°50'38.76"N, 76°43'51.96"E, 147m, 02 January 2019, Aswani & Maya, 3528 (GVCH).

Phyla Lour., *Fl. Cochinch*. 1: 63, 66 (1790)

Phyla nodiflora (L.) Greene, *Pittonia* 4(20): 46 (1899); Vajr., *Fl. Palghat Dist* 367 (1990); Sasidh., *Fl. Parambikulam WLS* 242 (2002); *Lippia nodiflora* (L.) A.Rich., Hook. f., *FBI* 4: 563 (1885); Gamble, *Fl. Madras* 1088 (1924).

Basionym : *Verbena nodiflora* L., *Sp. Pl.* 1: 20 (1753).

Habit : Herb
Ecosystem preference : Banks of streams
Distribution : Indo - Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Sandy soils near water sources
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : November - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thonikadavu,10°50'04.96"N,76°40'48.72"E , 116m, 04 June 2017, Aswani & Maya, 4 (GVCH); Kava, 10°49'25.18"N, 76°43'29.96"E, 115m, 06 April 2018, Aswani & Maya, 1844 (GVCH); Thekke Malampuzha, 10°50'01.23"N , 76° 40 '58.49"E, 127m, 08 July 2019, Aswani & Maya, 4179 (GVCH) **(Plate 79: Fig. e)**.

Stachytarpheta Vahl, *Enum. Pl. [Vahl]* 1: 205 (1804), nom. cons.

Stachytarpheta jamaicensis (L.) Vahl, *Enum. Pl. [Vahl]* 1: 206 (1804); Vajr., *Fl. Palghat Dist* 369 (1990); Sasidh., *Fl. Parambikulam WLS* 243 (2002); *Stachytarpheta indica* Clarke, Hook. f., *FBI* 4: 564 (1885); *Stachytarpheta indica* (L.) Vahl var. *jamaicensis* (L.) Moon, Gamble, *Fl. Madras* 1090 (1924).

Basionym : *Verbena jamaicensis* L., *Sp. Pl. [Linnaeus]* 1: 19 (1753).

Habit : Shrub
Ecosystem preference : Degraded forests and plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Open forest areas and in plains
Raunkiaer's Life form : Chamaephytes
Distribution Frequency : Common
Phenology : June- December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thonikadavu,10°50'12.34"N,76°40'41.15", 109m, 04 June 2017, Aswani & Maya, 8 (GVCH); Kosavanidukku - Kaduvachal, 10°50'26.38"N, 76°40'30.88"E, 105m, 16 July 2017, Aswani & Maya, 350 (GVCH); Malampuzha irrigation dept. guest house hillock, 10°50'03.76"N, 76°40'56.19"E, 120m, 08 September 2017, Aswani & Maya, 459 (GVCH); Way to Ayyappan Mala, 10°49'07.40"N, 76°45'32.38"E, 170m, 06 January 2018, Aswani & Maya, 1226 (GVCH); Chaavadippara, 10°52'42.20"N, 76°48'43.56"E, 243m, 28 January 2020, Aswani & Maya, 1226 (GVCH) **(Plate 79: Fig. f)**.

Lamiaceae

Key to genera

1. Fruits a drupe……..…….….2
- Fruits a nutlet…….…….….9
2. Leaves digitate…….……...*Vitex*
- Leaves simple……..…...3
3. Corolla regular…..……..…..…4
- Corolla bi - lipped…..……..…...…5
4. Fruits a drupe with inflated calyx……..…..……*Tectona*
- Fruits a drupe; calyx never inflated……..……..*Callicarpa*
5. Drupe with one pyrene……..…..…6
- Drupe with 4 pyrene……..….7
6. Flowers small……...…….....*Premna*
- Flowers large…..…..……..*Gmelina*
7. Panicles axillary…...….*Volkameria*
- Panicles terminal……..……..8
8. Calyx lobes short; leaves glabrous above, pubescent along nerves below…….....…*Rotheca*
- Calyx lobes deeply lobed; leaves tomentose above, villous beneath……...…..….*Clerodendrum*
9. Nutlets succulent....*Gomphostemma*
- Nutlets dry……..……..10
10. Lower lip of corolla hardly longer than upper lip……..…….…11
- Lower lip of corolla longer than the upper lip……...……...14
11. Calyx deflexed in fruit…….....…12
- Calyx never deflexed in fruit……..……13
12. Stigma 2 - fid……..…....*Ocimum*
- Stigma entire…….…..….*Orthosiphon*
13. Flowers in paniculate racemes……...…..*Basilicum*
- Flowers in ovoid or cylindrical heads……..…….…..….*Platostoma*
14. Stamens declinate……..……...15
- Stamens erect……...…….16
15. Upper lip of corolla flat…….....……..*Mesosphaerum*
- Upper lip of corolla 3 - 4 toothed…..……..……...…*Coleus*
16. Corolla lobes 5; stamens didynamous……..……17

- Corolla lobes 4; stamens equal or sub - equal……..…….....19
17. Stamens included…….……...18
- Stamens exerted…….……*Anisomeles*
18. Flowers scarlet or yellowish orange coloured…..……..,……*Leonotis*
- Flowers white coloured…..... *Leucas*
19. Filaments bearded…....*Pogostemon*
- Filaments naked……...*Colebrookea*

Anisomeles R.Br., *Prodr. Fl. Nov. Holland.* 503 (1810)

Anisomeles indica (L.) Kuntze, *Revis. Gen. Pl.* 2: 512 (1891); Gamble, *Fl. Madras* 1140 (1924); Vajr., *Fl. Palghat Dist* 373 (1990); Sasidh., *Fl. Parambikulam WLS* 245 (2002); *Anisomeles ovata* R. Br., Hook. f., *FBI* 4: 672 (1885); *Anisomeles heyneana* Benth. Hook. f., *FBI* 4: 672 (1885); Gamble, *Fl. Madras* 1140 (1924).

Basionym : *Nepeta indica* L., *Sp. Pl.* 2: 571 (1753).

Habit : Herb
Ecosystem preference : Moist deciduous forests and in plains
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : Banks of water sources
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Common
Phenology : January - April
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Ayyankulam, 10°48'10.29"N, 76°44'39.61"E, 116m, 06 January 2018, Aswani & Maya, 1191(GVCH); Walayar Dam, 10°50'24.58"N, 76°51'01.52"E, 199m, 09 May 2018, Aswani & Maya, 2049 (GVCH); Parachaathy – Ponthancheeni, 10°50'49.97" N, 76°43'56.67"E, 160m, 12 January 2019, Aswani & Maya, 3728 (GVCH) **(Plate 79: Fig. g)**.

Basilicum Moench, *Suppl. Meth. (Moench)* 143 (1802)

Basilicum polystachyon (L.) Moench, *Methodus Plantas Horti Botanici et Agri Marburgensis*, *Suppl.* (1802); Vajr., *Fl. Palghat Dist* 374 (1990); *Moschosma polystachyum* (L.) Benth., Hook. f., *FBI* 4: 612 (1885); Gamble, *Fl. Madras* 1117 (1921).

Basionym: *Ocimum polystachyon* L. in *Mant. Pl*. 2: 567 (1771).

Habit : Herb
Ecosystem preference : Degraded forests and in wastelands
Distribution : Indo Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Wastelands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : October - January
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Mayyappallam, 10°48'06.93"N , 76°46'25.09"E, 135m, 10 May 2018, Aswani & Maya, 2101 (GVCH) **(Plate 79: Fig. h)**.

Callicarpa L., *Sp. Pl.* 1: 111 (1753)

Callicarpa tomentosa (L.) L., *Syst. Veg., ed.* 13. 130 (1774); Vajr., *Fl. Palghat Dist* 364 (1990); Sasidh., *Fl. Parambikulam WLS* 240 (2002); *Callicarpa lanata* L., Gamble, *Fl. Madras* 1092 (1924); Hook. f., *FBI* 4: 567 (1885); *Callicarpa arborea* Miq. ex Clarke in Hook. f., *FBI* 4: 567 (1885).

Basionym : *Tomex tomentosa* L., *Sp. Pl.* 1: 118 (1753).

Habit : Shrub

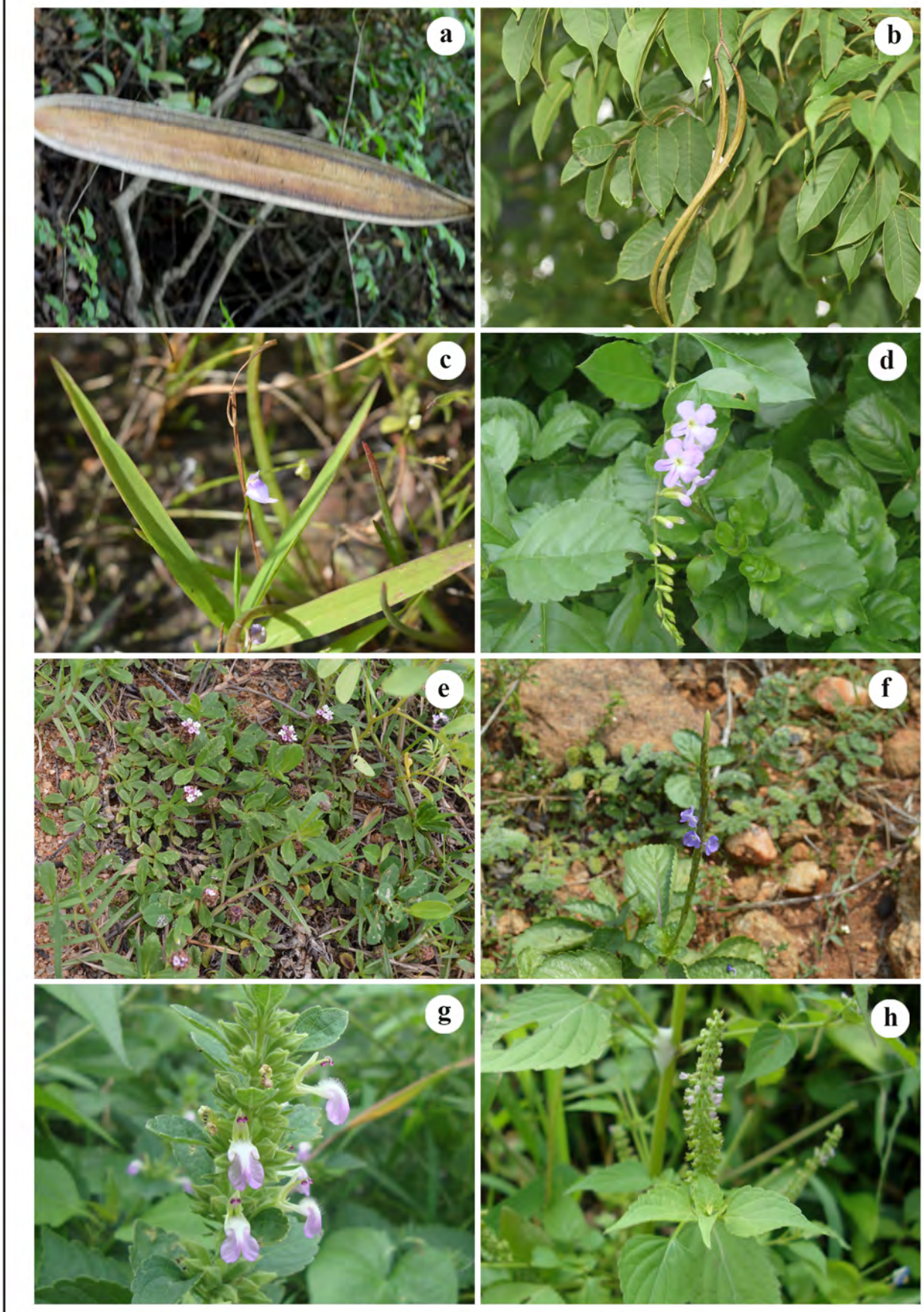

Plate 79: Fig. a. *Oroxylum indicum* (L.) Benth. ex Kurz **b.** *Stereospermum colais* (Buch. - Ham. ex Dillwyn **c.** *Utricularia graminifolia* Vahl **d.** *Duranta erecta* L. **e.** *Phyla nodiflora* (L.) Greene **f.** *Stachytarpheta jamaicensis* (L.) Vahl **g.** *Anisomeles indica* (L.) Kuntze **h.** *Basilicum polystachyon*

Ecosystem preference : Moist deciduous forests and semi evergreen forests
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Hill slopes
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : November - April
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, G. P. Nair Estate, 10°53'47.40"N, 76°39'47.16"E, 267m, 24 March 2018, Aswani & Maya, 1782 (GVCH); Neelippara, 10°51'47.52"N, 76°37'37.38"E, 312m, 27 April 2018, Aswani & Maya, 1950 (GVCH); Pazhampullikaadu, 10°50'20.14" N, 76°38'07.09"E, 91m, 16 October 2018, Aswani & Maya, 3188 (GVCH); Chacolas, 10°51'21.60"N, 76°44'52.08"E, 265m, 02 August 2019, Aswani & Maya, 4537 (GVCH); Aduppukootimala, 10°50'15.72"N, 76°44'28.68"E, 443m, 16 February 2021, Aswani & Maya, 6481 (GVCH) **(Plate 80: Fig. a)**.

Clerodendrum L., *Sp. Pl.* 2: 637 (1753)

Key to species

Flowers fragrant, calyx never inflated in fruits……..…… *C. chinense*
Flowers not fragrant; calyx inflated in fruits……....……..……*C. infortunatum*

Clerodendrum chinense (Osbeck) Mabb., *Pl.-Book* (corr. repr. 1989) 707 (1989); *Clerodendrum philippinum* Schauer, Vajr., *Fl. Palghat Dist* 365 (1990); Sasidh., *Fl. Parambikulam WLS* 240 (2002); *Clerodendrum fragrans* Hort. ex Vent, Gamble, *Fl. Madras* 1100 (1924).

Basionym: *Cryptanthus chinensis Osbeck* in Dagb. *Ostind. Resa:* 215 (1757).

Habit : Shrub
Ecosystem preference : Degraded forests
Distribution : Holarctic
IUCN Category : Least Concern (LC)
Habitat : Along dam side
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : February - May
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Cheranpara, 10°49'48.36"N, 76° 43 '44. 04" E, 120m, 23 November 2019, Aswani & Maya, 5010 (GVCH).

Clerodendrum infortunatum L., *Sp. Pl.* 2: 637 (1753); Hook. f., *FBI* 4: 594 (1885); Gamble, *Fl. Madras* 1100 (1924); *Clerodendrum viscosum auct. non.*Vent., Vajr., *Fl. Palghat Dist* 365 (1990); Sasidh., *Fl. Parambikulam WLS* 240 (2002).

Habit : Shrub
Ecosystem preference : Degraded forest areas
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Disturbed forest areas
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : December - February
Altitude preference : Found in all altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Cheranpara, 10°49'29.62"N, 76°40'38.63" E, 87m, 27 June 2017, Aswani & Maya, 207 (GVCH); G. P. Nair Estate, 10°53'26.52"N, 76°39'41.04"E, 181m, 24 March 2018, Aswani & Maya, 1705 (GVCH); Kottamutti waterfall, 10°49'46.20"N,76°46'47.28"E, 203m, 23 September 2018, Aswani & Maya, 2971 (GVCH); Ayyappan Mala, 10°49'07.19"N, 76°44'50.28"E, 130m, 07 March 2019, Aswani & Maya, 3801 (GVCH); Jamanthimala, 10°52'10.20"N,

76°47'15.00"E, 766m, 23 June 2019, Aswani & Maya, 4082 (GVCH).

Colebrookea Sm., *Exot. Bot.* 2: 111, t. 115 (1806)

Colebrookea oppositifolia Sm., *Exot. Bot.* ii. 111. t. 115; Hook. f., *FBI* 4: 642 (1885); Gamble, *Fl. Madras* 1138 (1924); Vajr., *Fl. Palghat Dist* 374 (1990); Sasidh., *Fl. Parambikulam WLS* 246 (2002).

Habit : Shrub
Ecosystem preference : Semi-evergreen
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Hill slopes in semi evergreen forests
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : January - May
Altitude preference : Found commonly in higher altitudes very rarely in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Chacolas, 10°51'21.60"N, 76°44'52.08"E, 265m, 02 August 2019, Aswani & Maya, 4508 (GVCH); Jamanthimala, 10°52'10.20"N, 76°47'15.00"E, 766m, 09 January 2020, Aswani & Maya 5615 (GVCH); Pothukunnu, 10°53'21.84"N, 76°46'33.24"E, 970m, 28 January 2020, Aswani & Maya 5984 (GVCH); Thanniplace,10°52'43.32"N,76°45'54.07"E, 972m, 28 January 2020, 972m, Aswani & Maya 6005 (GVCH); Kundanmala, 10°53'33.48"N, 76°41' 52.76"E, 943m, Aswani & Maya 6120 (GVCH) **(Plate 80: Fig. b)**.

Coleus Lour., *Fl. Cochinch.* 2: 372 (1790)

Key to species

1. Filaments of anther confluent ……..……..*C. strobilifer*
- Filaments free; anther cells confluent……...……..2
2. Herbs – tuberous.....*C. rotundifolius*
- Herbs non – tuberous…….. ……..…….*C. amboinicus*

Coleus amboinicus Lour., *Fl. Cochinch.* 2: 372 (1790); Gamble, *Fl. Madras* 1124 (1924); *Coleus aromaticus* Benth., Hook. f., FBI 4: 625 (1885).

Habit : Herb
Ecosystem preference : In plains
Distribution : Indo - Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Planted in homesteads
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Common
Phenology : January - March
Altitude preference : Found in lower altitudes
Specimen examined :INDIA, Kerala: Palakkad District, Walayar range, Akathethara, 10°49'3.06"N, 76°38'32.77"E, 116m, 10 April 2023, Aswani & Maya, 6591 (GVCH).

Coleus rotundifolius (Poir.) A.Chev. & Perrot, *Vég. Utiles Afrique Trop. Franç.* 1: 119 (1905); *Coleus parviflorus* Benth., Hook. f., *FBI* 4: 625 (1885); Gamble, *Fl. Madras* 1124 (1924).
Basionym: *Germanea rotundifolia* Poir. in J.B.A.M.de Lamarck, *Encycl., Suppl*. 2: 763 (1812).

Habit : Herb
Ecosystem preference : In plains
Distribution : African
IUCN Category : Not Evaluated (NE)

Habitat : Cultivated
Raunkiaer's Life form : Geophyte
Distribution Frequency : Common
Phenology : September - October
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kadukkamkunnam,10°48'48.76"N,76°39'48.98"E, 107m, 23 March 2023, Aswani & Maya, 6567 (GVCH).

Coleus strobilifer (Roxb.) A.J.Paton, *PhytoKeys* 129: 100 (2019); *Anisochilus carnosus* (L. f.) Wall. ex Benth., Hook. f., *FBI* 4: 627 (1885); Gamble, *Fl. Madras* 1126 (1924); Vajr., *Fl. Palghat Dist* 372 (1990); Sasidh., *Fl. Parambikulam WLS* 245 (2002).

Basionym : *Plectranthus strobiliferus Roxb*., *Hort. Bengal*. 45. 1814; *Fl. Ind*. 3: 23.

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Open rocky areas with scarce soil and other rocky crevices
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : September - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kosavanidukku - Kaduvachal, 10°50'26.38"N, 76°40'30.88"E, 105m, 16 July 2017, Aswani & Maya, 274 (GVCH); Karadikunnu,10°50'26.38"N,76°40'30.88", 202m, 30 December 2017, Aswani & Maya, 1092 (GVCH); Valiya Eri, 10°48'51.04"N, 76°45'01.67"E, 136m, 06 January 2018, Aswani & Maya, 1264 (GVCH); Kottamutti waterfalls, 10°49'46.20"N, 76°46'47.28"E, 203m, 23 September 2018, Aswani & Maya, 2923 (GVCH); Mayappallam, 10°48'09.35"N, 76°46'28.60"E, 137m, 30 November 2019, Aswani & Maya, 5392 (GVCH); Chaavadippara,10°52'42.20"N,76°48'43.56"E, 243m, 28 January 2020, Aswani & Maya, 5854 (GVCH) **(Plate 80: Fig. c)**.

Gmelina L., *Sp. Pl.* 2: 626 (1753)

Gmelina arborea Roxb. ex Sm., *Cycl. [A. Rees], (London ed.) 16: Gmelina n.* 4 (1810); Hook. f., *FBI* 4: 581 (1885); Gamble, *Fl. Madras* 1097 (1924); Vajr., *Fl. Palghat Dist* 365 (1990); Sasidh., *Fl. Parambikulam WLS* 241 (2002).

Habit : Tree
Ecosystem preference : Moist deciduous forests and also in the plains
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Degraded forests and in plains
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology: January - June
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Ahalya campus, 10°47'43.08"N, 76°50'5.43"E, 150m, 24 September 2020, Aswani & Maya, 6342 (GVCH).

Gomphostemma Wall. ex Benth., *Edwards's Bot. Reg.* 15: t. 1292 (1830)

Gomphostemma heyneanum Wall. ex Benth., *Pl. Asiat. Rar. (Wallich).* 2: 12 (1830); *Gomphostemma strobilinum* Wall. ex Benth. var. *heyneanum* (Benth.) Hook.f., *FBI* 4: 696 (1885); *Gomphostemma heyneanum* Benth. var. *heyneanum*; Gamble, *Fl. Madras* 1167 (1924); Vajr., *Fl. Palghat Dist* 375 (1990); Sasidh., *Fl. Parambikulam WLS* 246 (2002).

Habit : Herb
Ecosystem preference : Moist deciduous and semi - evergreen forests
Endemism : Southern Western Ghats
Distribution : Indo Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Understorey of the forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : October - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, G. P. Nair Estate, 10°53'47.40"N , 76°39'47.16"E, 267m, 24 March 2018, Aswani & Maya, 1761 (GVCH); Jamanthimala, 10°51'53.64"N, 76°47'16.80"E, 586m, 23 March 2019, Aswani & Maya, 4094; (GVCH); Moochikadavu - Pettikallu, 10°52'28.20"N, 76°42'38.52"E, 346m, 19 July 2019, Aswani & Maya, 4350 (GVCH);Chacolas,10°51'21.60"N,76°44'52.08 "E, 265m, 02 August 2019, Aswani & Maya, 4517 (GVCH); Kallappara, 10° 52' 54.66" N, 76° 45' 52.092" E, 1058m, 28 January 2020, Aswani & Maya, 6001 (GVCH) **(Plate 80: Fig. d)**.

Leonotis **(**Pers.) R.Br., *Hort. Kew., ed.* 2 [W.T. Aiton] 3: 409 (1811)

Leonotis nepetifolia (L.) R.Br., *Hort. Kew., ed.* 2 [W.T. Aiton] 3: 409 (1811); Hook. f., *FBI* 4: 691 (1885); Gamble, *Fl. Madras* 1155 (1924); Vajr., *Fl. Palghat Dist* 376 (1990); Sasidh., *Fl. Parambikulam WLS* 247 (2002).

Basionym: *Phlomis nepetifolia* L., *Sp. Pl.* 2: 586 (1753).

Habit : Shrub
Ecosystem preference : Deciduous forests and wastelands
Distribution : Indo Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : A weed in degraded forests, scrub jungles and open plains
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : November - March
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kava, 10°50'36.42"N, 76°43'31.74"E, 109m, 06 April 2018, Aswani & Maya, 1894 (GVCH); Pallippara, 10°49'49.08"N, 76°43'47.28"E, 120m, 23 November 2019, Aswani & Maya, 5031 (GVCH); Olappalam, 10°49'55.39"N, 76°43'39.76"E, 116m, 23 November 2019, Aswani & Maya, 5031 (GVCH); Anayappanchalla, 10°48'25.92"N, 76°48'35.19"E, 157m, Aswani & Maya, 5134 (GVCH).

Leucas R.Br., *Prodr. Fl. Nov. Holland.* 504 (1810)

Key to species

1. Scandent or sub - scandent herbs……...….*L. chinensis*
- Erect herbs……..……...2
2. Leaf margins distantly serrate; puberulous……..…..……*L. aspera*
- Leaf margins sub - entire; veins and leaf margins only hairy……...….*L. lavandulifolia*

Leucas aspera Link, *Enum. Hort. Berol. Alt.* 2: 113 (1822); Hook. f., *FBI* 4: 690 (1885); Gamble, *Fl. Madras* 1150 (1924); Vajr., *Fl. Palghat Dist* 377 (1990); Sasidh., *Fl. Parambikulam WLS* 247 (2002).

Basionym: *Phlomis aspera Willd*., *Enum. Pl. [Willdenow]* 2: 621 (1809).

Habit : Herb
Ecosystem preference : Deciduous forests and in plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)

Habitat : Found in hillocks, forest margins, hillock premises and in plains
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : September - January
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thonikadavu,10°50'04.96"N,76°40'48.72"E , 116m, 04 June 2017, Aswani & Maya, 23 (GVCH); Neelippara, 10°51'47.52"N, 76°37'37.38"E, 312m, 15 September 2017, Aswani & Maya, 578 (GVCH); Kongampaadam,10°48'36.72"N,76°46'51.96"E, 151m, 15 June 2018, Aswani & Maya, 2325 (GVCH); Ayyappan Mala, 10°49'06.39"N, 76°44'39.99"E, 218m, 26 June 2018, Aswani & Maya, 2554 (GVCH); Mannukunnu, 10°52'5.50"N, 76°38'30.27"E, 181m, 09 July 2019, Aswani & Maya, 4221 (GVCH).

Leucas chinensis (Retz.) Sm., *Cycl. [A. Rees], (London ed.)* 20(2): *Leucas no.* 8 (1812); Hook. f., *FBI* 4: 681 (1885); Gamble, *Fl. Madras* 1151 (1924); Sasidh., *Fl. Parambikulam WLS* 248 (2002).

Basionym: *Phlomis chinensis Retz*., *Observ. Bot. (Retzius)* ii. 19 (1781).

Habit : Herb
Ecosystem preference : Open regions in semi evergreen forests and grasslands
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : Open forest areas near water sources
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : December - February
Altitude preference : Found in all altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Akamalavaram- Muchikadavu, 10°52'10.56"N, 76°42'45.18"E, 226m, 30 November 2018, Aswani & Maya, 3247 (GVCH); Jamanthimala, 10°52'21.00"N, 76°47'00.24"E, 848m, 09 January 2020, Aswani & Maya, 5718 (GVCH); Jamanthimala, 10°52'18.19"N, 76°46'47.14"E, 921m, 09 January 2020, Aswani & Maya, 5777 (GVCH); Aduppukootimala, 10°50'15.72"N, 76°44'28.68"E, 443m, 16 February 2021, Aswani & Maya, 6510 (GVCH) **(Plate 80: Fig. e)**.

Leucas lavandulifolia Sm., Cycl. [A. Rees], *(London ed.)* 20: *Leucas sp. no.* 2 (1812); *Leucas linifolia* (Roth) Spreng., Hook. f., *FBI* 4:690 (1885); Gamble, *Fl. Madras* 1149 (1924); *Leucas linifolia* (Roth) Spreng. var. *decipiens* Hook. f., *FBI* 4: 691 (1885).; *Leucas indica* (L.) R. Br. ex Vatke, Vajr., *Fl. Palghat Dist* 378 (1990).
Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : Open sandy forest floors
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : July - October
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thekke Malampuzha - Edamala, 10°51'15.84"N, 76°39'40.32"E, 129m, 05 October 2017, Aswani & Maya, 683 (GVCH); Mathappumala,10°51'9.36"N,76°49'55.56"E, 230m, 07 January 2020, Aswani & Maya, 5611 (GVCH) **(Plate 80: Fig. f)**.

Mesosphaerum P. Browne, *Civ. Nat. Hist. Jamaica* 257 (1756)

Mesosphaerum suaveolens (L.) Kuntze, *Revis. Gen. Pl.* 2: 525 (1891); *Hyptis suaveolens* (L.) Poit., Hook. f., *FBI* 4: 630 (1885); Gamble, *Fl. Madras* 1129 (1924);

Vajr., *Fl. Palghat Dist* 376 (1990); Sasidh., *Fl. Parambikulam WLS* 246 (2002).

Basionym: *Ballota suaveolens* L., *Syst. Nat., ed.* 10. 2: 1100 (1759).

Habit : Shrub
Ecosystem preference : Degraded moist deciduous forests, plains and other wastelands
Distribution : Indo Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Found commonly in open forests in hillocks and main ghats
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : August - February
Altitude preference : Found in all forest types
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thonikadavu,10°50'04.96"N,76°40'48.72", 116m, 04 June 2017, Aswani & Maya, 17 (GVCH); Karadikunnu, 10°50'20.20"N, 76°49'48.92"E , 202m, 30 December 2017, Aswani & Maya, 1086 (GVCH); Valiya Eri, 10°48'53.76"N, 76°44'59.07"E, 124m, 06 January 2018, Aswani & Maya, 1266 (GVCH); Mayappallam, 10°48'01.78"N, 76°45'58.91"E, 1165m, 10 May 2018, Aswani & Maya, 2086 (GVCH); Chaavadippara, 10°52'42.20" N, 76°48'43.56"E, 243m, 28 January 2020, Aswani & Maya, 5847 (GVCH); Malampuzha Vanadurga temple hillock, 10°49'48.81"N, 76°39'58.80"E, 99m, 03 September 2020, Aswani & Maya, 6222 (GVCH).

Ocimum L., *Sp. Pl.* 2: 597 (1753)

Key to the species

1. Stem glandular - scabrid; leaves long petioled…...…*O. gratissimum*
- Stem hairy, e - glandular; leaves short petioled……..…..……..2
2. Fruiting calyx large.....*O. basilicum*
- Fruiting calyx small……..…….3
3. Nutlets sub - trigonous; fruiting calyx villous inside…….…….. ……..…*O. americanum*
- Nutlets ellipsoid; fruiting calyx glabrous inside……..*O. tenuiflorum*

Ocimum americanum L., *Cent. Pl. I*. 15 (1755); Vajr., *Fl. Palghat Dist* 380 (1990); Sasidh., *Fl. Parambikulam WLS* 249 (2002); *Ocimum canum* Sims, Hook. f., *FBI* 4: 607 (1885); Gamble, *Fl. Madras* 1111 (1924).

Habit : Herb
Ecosystem preference : Degraded moist deciduous forests in other wastelands
Distribution : Indo Pacific, African
IUCN Category : Not Evaluated (NE)
Habitat : Wastelands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala, 10°49'39.72"N, 76°40'28.20"E, 184m, 17 September 2017, Aswani & Maya, 616 (GVCH); Pallippara, 10°49'49.08"N, 76°43'47.28"E, 120m, 29 October 2017, Aswani & Maya, 746 (GVCH); Walayar Dam, 10°50'24.58"N, 76°51'01.52"E, 199m, 09 May 2018, Aswani & Maya, 1998 (GVCH); Ayyappan Mala, 10°49'07.19"N, 76°44'50.28"E, 130m, 26 June 2018, Aswani & Maya, 2485 (GVCH).

Ocimum basilicum L., *Sp. Pl.* 2: 597 (1753); Hook. f., *FBI* 4: 608 (1885); Gamble, *Fl. Madras* 1111 (1924); *Ocimum basilicum* var. *purpurascens* Benth., Gamble, *Fl. Madras* 1111 (1924).

Habit : Herb

Ecosystem preference : Homesteads and in temples
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Grown as a sacred plant
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Rare
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Anayappanchalla, 10°48'25.92"N, 76°48'35.19"E, 157m, 30 November 2019, Aswani & Maya, 5185 (GVCH).

Ocimum gratissimum L., *Sp. Pl.* 2: 1197 (1753); Hook. f., *FBI* 4: 608 (1885); Gamble, *Fl. Madras* 1111 (1924); Vajr., *Fl. Palghat Dist* 380 (1990); Sasidh., *Fl. Parambikulam WLS* 248 (2002).
Habit : Shrub
Ecosystem preference : Margins of deciduous forests and in plains
Distribution : Indo Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Found commonly in wastelands and plains
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : August - December
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Ahalya campus, 10°47'43.08"N, 76°50'5.43"E, 150m, 24 September 2020, Aswani & Maya, 6309 (GVCH).

Ocimum tenuiflorum L., *Sp. Pl.* 2: 597 (1753); Vajr., *Fl. Palghat Dist* 380 (1990); *Ocimum sanctum* L., Hook. f., *FBI* 4: 609 (1885); Gamble, *Fl. Madras* 1111 (1924).

Habit : Herb
Ecosystem preference : Homesteads and in temples
Distribution : Indo Pacific, African
IUCN Category : Not Evaluated (NE)
Habitat : Grown as a sacred plant
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Common
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Pallippara, 10°49'49.08"N, 76°43'47.28"E, 120m, 29 October 2017, Aswani & Maya, 719 (GVCH); Ahalia campus, 10°47'43.08"N, 76°50'5.43"E, 150m, 24 September 2020, Aswani & Maya, 6325 (GVCH).

Orthosiphon Benth., *Edwards's Bot. Reg.* 15. t. 1300 (1830)

Orthosiphon thymiflorus (Roth) Sleesen, *Reinwardtia* 5: 42 (1959); Vajr., *Fl. Palghat Dist*. 380 (1990); Sasidh., *Fl. Parambikulam WLS* 249 (2002); *Orthosiphon glabratus* Benth., Gamble, *Fl. Madras* 1114 (1924); *Orthosiphon viscosus* Benth. Gamble, *Fl. Madras* 1114 (1924).

Basionym: *Ocimum thymiflorum* Roth in *Nov. Pl. Sp.*: 269 (1821).

Habit : Herb
Ecosystem preference : Degraded deciduous forests and in plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Mud slopes in forest margins
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : October - May
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Poozhikunnu,10°51'20.44"N,76°43'38.28", 118m, 09 November 2017, Aswani &

Maya, 850 (GVCH); Ayyappan Mala, 10°49'07.19"N, 76°44'50.28"E, 130m, 26 June 2018, Aswani & Maya, 2468 (GVCH); Olappallam, 10°49'52.20"N, 76°43'44.19"E, 121m, 23 November 2019, Aswani & Maya, 5079 (GVCH) **(Plate 80: Fig. g)**.

Platostoma P. Beauv., *Fl. Oware* 2: 61, t. 95 (1818)

Platostoma hispidum (L.) A.J.Paton, *Kew Bull.* 52(2): 273 (1997); *Acrocephalus hispidus* (L.) Nicolson & Sivad., Vajr., *Fl. Palghat Dist* 372 (1990); Sasidh., *Fl. Parambikulam WLS* 245 (2002); *Acrocephalus indicus* (Burm.f.) O. Ktze., Gamble, *Fl. Madras* 1115 (1924).

Basionym: *Gomphrena hispida* L. in *Sp. Pl., ed*. 2.: 326 (1762).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Rocky grassy regions in moist deciduous forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : September - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kattadikunnu,10°50'19.32"N,76°39'13.63" E, 261m, 16 October 2019, Aswani & Maya, 4805 (GVCH); Koomachimala, 10°49'44.76"N, 76°40'34.59"E, 102m, 23 November 2019, Aswani & Maya, 4914 (GVCH) **(Plate 80: Fig. h)**.

Pogostemon Desf., *Mém. Mus. Hist. Nat.* 2: 154 (1815)

Key to species

Calyx teeth almost equal to the tube……..……..…….. *P. purpurascens*
Calyx teeth much shorter than the tube……..……..…….*P. pubescens*

Pogostemon pubescens Benth., *Prodr. [A. P. de Candolle]* 12: 152 (1848); Gamble, *Fl. Madras* 1133 (1924); Vajr., *Fl. Palghat Dist* 382 (1990); *Pogostemon parviflorus* Benth., Hook. f., *FBI* 4: 632 (1885).

Habit : Herb
Ecosystem preference : Semi evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Canopy rich forest floor
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : November - December
Altitude preference : Found in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala, 10°52'14.73"N, 76° 46 '46.15"E, 895m, 09 January 2020, Aswani & Maya, 5670 (GVCH).

Pogostemon purpurascens Dalzell, *Hooker's J. Bot. Kew Gard. Misc*. 2: 337 (1850); Hook. f., *FBI* 4: 632 (1885); Gamble, *Fl. Madras* 1133 (1924); Vajr., *Fl. Palghat Dist* 382 (1990).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated
Habitat : Open forest floor
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : January - April

Plate 80: Fig. a. *Callicarpa tomentosa* (L.) L. **b.** *Colebrookea oppositifolia* Sm. **c.** *Coleus strobilifer* (Roxb.) A.J.Paton **d.** *Gomphostemma heyneanum* Wall. ex Benth. **e.** *Leucas chinensis* (Retz.) Sm. **f.** *Leucas lavandulifolia* Sm. **g.** *Orthosiphon thymiflorus* (Roth) Sleesen **h.** *Platostoma hispidum* (L.) A.J.Paton.

Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Parachaathy flood site, 10°50'08.16"N, 76°44'33.36"E, 360m, 12 January 2019, Aswani & Maya, 3736 (GVCH); Akamalavaram – Pettikallu, 10°53'2.04"N, 76°42'13.92"E, 539m, 27 February 2020, Aswani & Maya, 6104 (GVCH); Aduppukootimala,10°50'01.68"N,76°44'33.00"E, 327m, 16 February 2021, Aswani & Maya, 6433 (GVCH) **(Plate 81: Fig. a)**.

Premna L., *Mant. Pl. Altera [Linnaeus]* 154, 252 (1771), nom. cons.

Key to species

Habit - Tree; flowers yellow……... ……..……...*P. tomentosa*
Habit - Climber; flowers pink or dull pink ……..…….*P. paucinervis*

Premna paucinervis Gamble, *Fl. Madras* 1095 (1924); Sasidh., *Fl. Periyar Tiger Reserve* 312 (1998); Rajendran & Daniel, *Indian Verbenaceae* 267 (2002); *Premna purpurascens* Thw. var. *paucinervis* Clarke in Hook. f., *FBI* 4: 574 (1885).

Habit : Climber
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific
Endemism : South India
IUCN Category : Not Evaluated (NE)
Habitat : Found in valleys of semi - evergreen forests and below grasslands
Raunkiaer's Life form : Liana (Euliana)
Distribution Frequency : Rare
Phenology : December - May
Altitude preference : Found in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kallappara, 10°53'16.44"N, 76°45'50.4"E, 1016m, 28 January 2020, Aswani & Maya, 6000 (GVCH) **(Plate 81: Fig. b)**.

Premna tomentosa Willd., *Sp. Pl.,* ed. 4 [Willdenow] 3(1): 314 (1800). ; Hook. f., *FBI* 4: 576 (1885); Gamble, *Fl. Madras* 1095 (1924); Vajr., *Fl. Palghat Dist* 368 (1990); Sasidh., *Fl. Parambikulam WLS* 242 (2002).

Habit : Tree
Ecosystem preference : Dry deciduous forests
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Margins of forests and outskirts of hillocks
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : February - April
Altitude preference : Found in lower and medium altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Malampuzha irrigation dept. guest house hillock, 10°50'04.20"N, 76°40'52.68"E, 120m, 08 September 2017, Aswani & Maya, 426 (GVCH) **(Plate 81: Fig. c)**.

Rotheca Raf., *Fl. Tellur.* 4: 69 (1838)

Key to species

Stem and branches grey; inflorescence axillary or terminal corymbose cyme; corolla white or yellowish white……..…….*R. microphylla*
Stem and branches purplish; inflorescence terminal panicles; corolla bluish……...……*R. serrata*

Rotheca microphylla (Blume) Callm. & Phillipson, *Candollea* 68(2): 317 (2013); *Clerodendrum incisum* Klotzsch., Rajendran & Daniel, *Indian Verbenaceae* 147 (2002).

Basionym: *Adelosa microphylla* Blume, *Mus. Bot.* 1(11): 176 (1850).

Habit : Shrub
Ecosystem preference : Moist deciduous forests and in plains
Distribution : African
IUCN Category : Least Concern (LC)
Habitat : Found as a escape to wild
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kottamutti waterfalls, 10°49'42.94"N, 76°46'47.87"E, 206m, 23 September 2018, Aswani & Maya, 2895 (GVCH) **(Plate 81: Fig. d)**.

Rotheca serrata (L.) Steane & Mabb., *Novon* 8(2): 206 (1998); *Clerodendrum serratum* (L.) Moon, *Cat. Pl. Ceylon* 46. n.382. 1824; Hook. f., *FBI* 4:592 (1885); Gamble, *Fl. Madras* 1100 (1924); Vajr., *Fl. Palghat Dist* 365 (1990); Sasidh., *Fl. Parambikulam WLS* 240 (2002).

Basionym: *Volkameria serrata* L., *Mant. Pl.* 90 (1767).

Habit : Shrub
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Open forest tracks
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : August - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Ayyappan Mala, 10°49'07.19"N , 76°44'50.28"E, 130m, 26 June 2018, Aswani & Maya, 2444 (GVCH); Kattadikunnu, 10°50'34.80"N, 76° 38 '54.60"E, 231m, 16 October 2019, Aswani & Maya, 4825 (GVCH) **(Plate 81: Fig. e)**.

***Tectona* L. f., *Suppl. Pl.* 20, 151 (1782)**

Tectona grandis L. f., Suppl.Pl.151(1782): Hook. f., *FBI* 4: 570 (1885); Gamble, *Fl. Madras* 1092 (1924); Vajr., *Fl. Palghat Dist* 369 (1990); Sasidh., *Fl. Parambikulam WLS* 243 (2002).

Habit : Tree
Ecosystem preference : Moist deciduous forests and also grown in plantations
Distribution : Indo - Pacific
IUCN Category : Endangered
Habitat : Commonly raised in plantations
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : May - January
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Ollappallam,10°49'53.04"N,76°43'41.52"E, 127m, 25 November 2017, Aswani & Maya, 1002 (GVCH); Walayar Dam, 10°50'24.58"N, 76°51'01.52"E, 199m, 09 May 2018, Aswani & Maya, 2034 (GVCH); Ayyappan Mala, 10°50'24.58"N, 76°51'01.52"E, 199m, 26 June 2018, Aswani & Maya, 2034 (GVCH); Parachaathy, 10° 50 '54.24"N, 76° 43' 55.92"E, 159m, 02 January 2019, Aswani & Maya, 3540 (GVCH).

***Vitex* L., *Sp. Pl.* 2: 638 (1753)**

Key to species

1. Leaf petiole winged…...*V. altissima*
- Leaf petiole wingless…….……...2
2. Leaflets sessile; calyx teeth very short……..……..…*V. trifolia*
- Leaflets petiolulate; calyx teeth triangular…....…..……*V. negundo*

Vitex altissima L. f., *Suppl. Pl.* 294 (1782); Hook. f., *FBI* 4: 584 (1885); Gamble, *Fl. Madras* 1102 (1924); Vajr., *Fl. Palghat Dist* 370 (1990); Sasidh., *Fl. Parambikulam WLS* 244 (2002); *Vitex alata* Willd., Hook. f., *FBI* 4: 584 (1885)

Habit : Tree
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : Hill slopes
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : March - July
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Ollappallam,10°49'53.04"N,76°43'41.52"E, 127m, 25 November 2017, Aswani & Maya, 992 (GVCH); Malampuzha irrigation dept guest house hillock, 10°50'03.76"N, 76°40'56.19"E , 120m, 18 May 2018, Aswani & Maya, 2167 (GVCH); Way to Ayyappan Mala, 10°49'07.40"N, 76°45'32.38"E, 170m, 26 June 2018, Aswani & Maya, 2451 (GVCH);Pazhampullikaadu,10°50'20.14", 76°38'07.09"E, 91m, 16 October 2018, Aswani & Maya, 3205 (GVCH); Parachaathy,10°50'38.76"N,76°43'51.96"E, 147m, 02 January 2019, Aswani & Maya, 3533 (GVCH); Jamanthimala, 10°51'59.76"N, 76°47'15.36"E, 641m, 23 March 2019, Aswani & Maya, 4111 (GVCH) **(Plate 81: Fig. f)**.

Vitex negundo L., *Sp. Pl.* 2: 638 (1753); Hook. f., *FBI* 4: 583 (1885); Gamble, *Fl. Madras* 1102 (1924); Vajr., *Fl. Palghat Dist* 370 (1990).

Basionym: *Vitex agnus-castus var. negundo* (L.) Kuntze, *Revis. Gen. Pl.* 2: 511 (1891).

Habit : Shrub
Ecosystem preference : Margins of deciduous forests and in hillocks, grown in biofences
Distribution : Indo - Pacific, Holarctic, African and South American
IUCN Category : Least Concern (LC)
Habitat : Grown as a biofencing plant
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : February - July
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala, 10°49'44.76"N, 76°40'34.59"E, 102m, 24 July 2017, Aswani & Maya, 371 (GVCH); Mucuroni, 10°48'37.19"N, 76°44'56.27"E, 118m, 06 January 2018, Aswani & Maya, 1169 (GVCH); Ayyappan Mala, 10°48'59.96"N, 76°45'22.61"E, 132m, 26 June 2018, Aswani & Maya, 2394 (GVCH); Anayappanchalla,10°48'24.82"N,76°48'30. 73"E, 147m, 30 November 2019, , Aswani & Maya, 5152 (GVCH); Mayappalam, 10°48'06.93"N, 76°46'25.09"E, 135m, 30 November 2019, Aswani & Maya, 5375 (GVCH).

Vitex trifolia L., *Sp. Pl.* 2: 638 (1753); Hook. f., *FBI* 4: 583 (1885); Gamble, *Fl. Madras* 1102 (1924).

Habit : Shrub
Ecosystem preference : Moist deciduous forests
Distribution : Indo Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Open forest tracts
Raunkiaer's Life form: Phanerophyte

Distribution Frequency : Rare
Phenology : May - July
Altitude preference : Found in lower altitudes

Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kavarakundu, 10°52'14.88"N, 76°42'38.88"E, 263m, 10 March 2018, Aswani & Maya, 1473 (GVCH); Kottamutti waterfalls, 10°49'42.94"N, 76°46'47.87"E, 206m, 23 September 2018, Aswani & Maya, 2926 (GVCH) **(Plate 81: Fig. g)**.

Volkameria L., *Sp. Pl.* 2: 637 (1753)

Key to species

Leaves elliptic - lanceolate; flowers in trichotomous many flowered cymes; staminal filaments white.….*V. heterophylla*
Leaves elliptic - ovate; flowers in few axillary trichotomous cymes; staminal filaments purple or pink…..……*V. inermis*

Volkameria heterophylla Poir., *Encycl. [J. Lamarck & al.]* 8: 687 (1808); *Clerodendrum heterophyllum* (Poir.) R. Br., Manilal & Sivar., *Fl. Calicut* 233 (1982); Sivar. & Manilal *J. Econ. Tax. Bot*. 3: 814 (1982); Rajendran & Daniel, *Indian Verbenaceae* 107 (2002).

Habit : Shrub
Ecosystem preference : Grown as a bio - fencing plant
Distribution : African
IUCN Category : Not Evaluated (NE)
Habitat : Found and raised in biofences
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : February - December
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kadukkamkunnam, 10°48'48.76"N, 76°39'48.98"E, 107m, 23 February 2023, Aswani & Maya, 6570 (GVCH) **(Plate 81: Fig. h)**.

Volkameria inermis L., *Sp. Pl.* 2: 637 (1753); *Clerodendrum inerme* (L.) Gaertn., Hook. f., *FBI* 4: 589 (1885); Gamble, *Fl. Madras* 1099 (1924); Vajr., *Fl. Palghat Dist* 364 (1990); *Clerodendrum neriifolium* Wall. ex Schauer, Hook. f., *FBI* 4: 589 (1885); Gamble, *Fl. Madras* 1100 (1924).

Habit : Shrub
Ecosystem preference : Degraded forests
Distribution : Indo - Pacific, Holarctic and Australian
IUCN Category : Not Evaluated (NE)
Habitat : Found in forest margins and raised in bio fences
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : November - December
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Valiya Eri, 10°48'53.76"N, 76°44'59.07"E, 124m, 06 January 2018, Aswani & Maya, 1265 (GVCH) **(Plate 82: Fig. a)**.

Orobanchaceae

Key to genera

1. Parasitic leafless herbs…..*Aeginetia*
- Parasitic or semi parasitic leaved herbs…….……..…...2
2. Leaves pinnatisect.....*Rhamphicarpa*
- Leaves simple……..…...…3
3. Stems angular…….….*Striga*
- Stems terete……..……..4
4. Leaves narrow; filiform ……..…...*Parasopubia*
- Leaves linear – oblong…….*Centranthera*

Aeginetia L., *Sp. Pl.* 2: 632 (1753)

Aeginetia indica L., *Sp. Pl.* 2: 632 (1753); Hook. f., *FBI* 4: 320 (1884); Gamble, *Fl. Madras* 974 (1924); Vajr., *Fl. Palghat Dist*

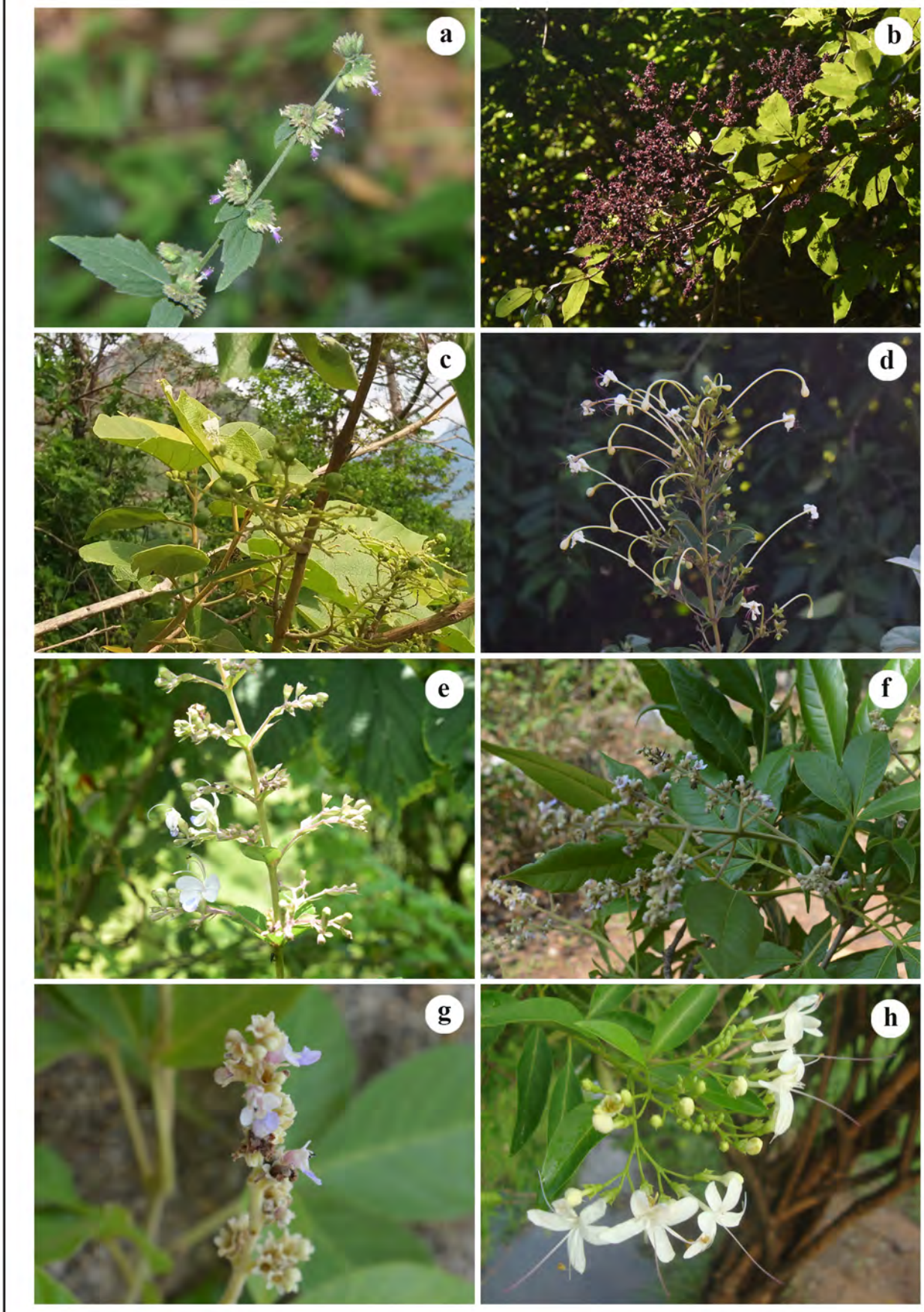

Plate 81: Fig. a. *Pogostemon purpurascens* Dalzell **b.** *Premna paucinervis* Gamble **c.** *Premna tomentosa* Willd. **d.** *Rotheca microphylla* (Blume) Callm. & Phillipson **e.** *Rotheca serrata* (L.) Steane & Mabb. **f.** *Vitex altissima* L.f. **g.** *Vitex trifolia* L. **h.** *Volkameria heterophylla* Poir.

328 (1990); Sasidh., *Fl. Parambikulam WLS* 218 (2002).

Habit : Herb
Ecosystem preference : Moist deciduous forests and in plains
Distribution : Indo -Pacific and Holarctic
IUCN Category : Least Concern (LC)
Habitat : Along banks and slopes of river channels
Raunkiaer's Life form : Parasite
Distribution Frequency : Rare
Phenology : August - September
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Near Malampuzha Vanadurga temple, 10°49'52.22"N, 76°39'58.46"E, 98m, 03 September 2020, Aswani & Maya, 6204 (GVCH) **(Plate 82: Fig. b)**.

Centranthera R.Br., *Prodr. Fl. Nov. Holland.* 438 (1810)

Centranthera indica Gamble, *Fl. Madras* 971 (1924); Sasidh., *Fl. Parambikulam WLS* 215 (2002); *Centranthera procumbens* Benth., Hook. f., *FBI* 4: 301 (1884).

Habit : Herb
Ecosystem preference : Moist deciduous forest and sandy plains
Distribution : Indo -Pacific, Holarctic and Australian
IUCN Category : Least Concern (LC)
Habitat : Catchment area of dams (Water refrained areas in dam)
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : September - January
Altitude preference : Found in lower altitudes
Specimen examined :INDIA, Kerala: Palakkad District, Walayar range, Kava, 10°50'36.42"N, 76° 43 '31.74"E, 109m, 06 April 2018, Aswani & Maya, 1855 (GVCH).

Parasopubia H.-P. Hofm. & Eb.Fisch., *Bot. Jahrb. Syst.* 125(3): 357 (2004)

Parasopubia delphiniifolia (L.) H.-P.Hofm. & Eb.Fisch., *Bot. Jahrb. Syst.* 125(3): 357 (2004); *Sopubia delphiniifolia* (L.) G. Don, Hook. f., *FBI* 4: 302 (1885); Gamble, *Fl. Madras* 970 (1924); Vajr., *Fl. Palghat Dist* 326 (1990); Sasidh., *Fl. Parambikulam WLS* 217 (2002).

Basionym : *Gerardia delphiniifolia* L., *Cent. Pl. II.* 21 (1756).

Habit : Herb
Ecosystem preference : Moist deciduous forests and rocky outcrops
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Exposed Rocks in hillocks and other exposed rocky patches
Raunkiaer's Life form : Semi parasite
Distribution Frequency : Occasional
Phenology : September - October
Altitude preference : Found in lower altitudes
Specimens examined :INDIA, Kerala: Palakkad District, Walayar range, Koomachimala, 10°49'39.72"N, 76°40'28.20"E, 184m, 17 September 2017, Aswani & Maya, 620 (GVCH); Pallakaadu, 10°51'30.96"N, 76°37'39.00"E, 151m, 09 October 2018, Aswani & Maya, 3080 (GVCH); Kongampaadam, 10°48'36.72"N, 76°46'51.96"E, 151m, 06 September 2019, Aswani & Maya, 4611 (GVCH); Mayappalam, 10°48'01.78"N, 76°45'58.91"E, 116m, 06 September 2019, Aswani & Maya, 4694 (GVCH); Kaatadikunnu, 10°50'17.16"N, 76°38'59.64"E, 139m, 16 October 2019, Aswani & Maya, 4795 (GVCH) **(Plate 82: Fig. c)**.

Rhamphicarpa Benth., *Companion Bot. Mag.* 1: 368 (1836)

Rhamphicarpa fistulosa Benth., *Prodr. [A. P. de Candolle]* 10: 504 (1846); *Rhamphicarpa longiflora* (Arn.) Benth., Hook. f., *FBI* 4: 300 (1884); Gamble, *Fl. Madras* 969 (1924); Vajr., *Fl. Palghat Dist* 325 (1990).

Habit : Herb
Ecosystem preference : Marshy areas in hillocks
Distribution : Indo - Pacific
Endemism : India
IUCN Category : Least Concern (LC)
Habitat : Ephemeral Flush Vegetation in hillocks
Raunkiaer's Life form : Semi parasite
Distribution Frequency : Occasional
Phenology : August - November
Altitude preference : Found in lower and medium altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kosavanidukku-Kaduvachal, 10°50'26.38"N, 76°40'30.88"E, 105m, 16 July 2017, Aswani & Maya, 245 (GVCH); Koomachimala,10°49'44.76"N,76°40'30.72 "E, 108m, 24 July 2017, Aswani & Maya, 357 (GVCH); Kongampadam, 10°48'36.72"N, 76°46'51.96" E, 151m, 06 September 2019, Aswani & Maya, 4603 (GVCH); Cheekuzhi, 10°50'8.57"N, 76°38'57.48"E, 104m, 16 October 2019, Aswani & Maya, 4741 (GVCH).

Striga Lour., *Fl. Cochinch.* 1: 22 (1790)

Striga angustifolia (D. Don) Saldanha, *Bull. Bot. Surv. India* 5: 70 (1963); Vajr., *Fl. Palghat Dist* 327 (1990); Sasidh., *Fl. Parambikulam WLS* 218 (2002); *Striga euphrasioides* Benth.; Hook. f., *FBI* 4: 299 (1884); Gamble, *Fl. Madras* 968 (1924).

Basionym: *Buchnera angustifolia* D.Don in *Prodr. Fl. Nepal*.: 91 (1825).

Habit : Herb
Ecosystem preference : Open grasslands in forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Grassy outcrops and in open grassy regions in forests
Raunkiaer's Life form : Semi parasite
Distribution Frequency : Occasional
Phenology : August - December
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koyamarakaadu,10°47'44.88"N,76°45'38.52"E, 111m, 06 September 2018, Aswani & Maya, 2726 (GVCH); Pallakaadu, 10°51'32.04"N, 76°37'25.68"E, 138m, 09 October 2018, Aswani & Maya, 3072 (GVCH);Anayappanchalla, 10°48'22.74"N, 76°48'19.16"E, 147m, 06 September 2019, Aswani & Maya, 4592 (GVCH); Mayappalam,10°48'08.64"N,76°46'34.68", 127m, 06 September 2019, Aswani & Maya, 4677 (GVCH); Koomachimala, 10°49'44.76"N, 76°40'30.72"E, 108m, 23 November 2019, Aswani & Maya, 4865 (GVCH) **(Plate 82: Fig. d)**.

IV.1.2.11.Campanulids (Euasterids II)

Asterales

Campanulaceae

Key to genera

1. Flowers zygomorphic…….*Lobelia*

- Flowers actinomorphic……....*Wahlenbergia*

Lobelia L., *Sp. Pl. [Linnaeus]* 2: 929 (1753)

Key to species

Small herbs with small flowers……...…….*L. alsinoides*
Large herbs with large flowers…..……..….*L. nicotianifolia*

Lobelia alsinoides Lam., *Encycl. [J. Lamarck & al.]* 3(2): 588 (1792); Vajr., *Fl. Palghat Dist* 260 (1990); Sasidh., *Fl. Parambikulam WLS* 174 (2002); *Lobelia trigona* Roxb., Hook. f., *FBI* 3: 423 (1881); Gamble, *Fl. Madras* 736 (1921).

Habit : Herb
Ecosystem preference : Wet and damp regions of forests and in plains
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Wet regions of forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : August - October
Altitude preference : Wet swampy regions in hillocks
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Pallippara, 10°49'48.36"N, 76°43'44.04"E, 120m, 29 October 2017, Aswani & Maya, 749 (GVCH); Ollappallam, 10°49'53.04"N, 76°43'41.52"E, 127m, 25 November 2017, Aswani & Maya, 963 (GVCH); Pazhampullikaadu, 10°50'09.55"N, 76°38'28.33"E, 89m, 16 October 2018, Aswani & Maya, 3199 (GVCH); Anayappanchalla, 10°48'20.42"N, 76°48'05.00"E, 146m, 30 November 2019, Aswani & Maya, 5207 (GVCH).

Lobelia nicotianifolia Roth, *Syst. Veg., ed.* 15 bis [Roemer & Schultes] 5: 47; Hook. f., *FBI* 3: 427 (1881); Gamble, *Fl. Madras* 736 (1921); Vajr., *Fl. Palghat Dist* 260 (1990); *Lobelia nicotianifolia* Roth ex Roem. & Schult. var. *trichandra* (Wight) Clarke, Hook.f., *FBI* 3: 427 (1881); Gamble, *Fl. Madras* 736 (1921); Vajr., *Fl. Palghat Dist* 260 (1990); Sasidh., *Fl. Parambikulam WLS* 175 (2002).

Habit : Shrub
Ecosystem preference : Grasslands
Distribution : Indo - Pacific
IUCN Category : Least Concern (LC)
Habitat : Found in open grasslands
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Rare
Phenology : October - March
Altitude preference : Grasslands
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Aatumala Thodu, 10°53'24"N, 76°41'24"E, 1080m, 28 February 2020, Aswani & Maya, 6144 (GVCH); Aduppukootimala, 10°50'43.08"N, 76° 44 '28.68"E, 819m, 16 February 2021, Aswani & Maya, 6509 (GVCH) **(Plate 82: Fig. e)**.

Wahlenbergia Schrad. ex Roth, *Nov. Pl. Sp.* 399 (1821)

Wahlenbergia erecta (Roth ex Roem. & Schult.) Tuyn, *Fl. Males., Ser.* 1, *Spermat*. 6: 113 (1960); Vajr., *Fl. Palghat Dist* 261 (1990); Sasidh., *Fl. Parambikulam WLS* 176 (2002); *Cephalostigma schimperi* Hochst. ex Rich., Hook. f., *FBI* 3: 428 (1881); Gamble, *Fl. Madras* 738 (1921).

Basionym: *Dentella erecta* Roth ex Schult. in J.J.Roemer & J.A.Schultes, *Syst. Veg., ed*. 15[bis]. 5: 25 (1819).

Habit : Herb
Ecosystem preference : Grasslands
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Low altitude grasslands in hillocks and main ghats
Raunkiaer's Life form : Therophyte

Distribution Frequency : Rare
Phenology : March - May
Altitude preference : Found in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala, 10°52'20.64"N, 76°46'57.00"E, 864m, 09 January 2020, Aswani & Maya, 5761 (GVCH) **(Plate 82: Fig. f)**.

Asteraceae

Key to genera

Asteraceae

1. Head homogamous……..……..2
- Head heterogamous…….……14
2. Anther sagittate at base……..…3
- Anther not sagittate at base…...…9
3. Florets yellow to red……..…..4
- Florets purple……..……..…..5
4. Colour of anthers black……...*Eleutheranthera*
- Colour of anther Purple…..…….....*Crassocephalum*
5. Involucral bracts uniseriate..*Emilia*
- Involucral bract more than two……..6
6. Heads in glomerules...*Elephantopus*
- Heads not in glomerules…...……..7
7. Outer involucral bracts leafy, pappus fugacious…*Phyllocephalum*
- Outer involucral bracts not leafy, pappus copious……..…….8
8. Habit tree……...*Strobocalyx*
- Habit herb or shrub…..……..……9
9. Stem reddish and tomentose……..….*Acilepsis*
- Stem green and smooth or puberulous…….. *Cyanthillium*
10. Single head ……..…..…*Lagascea*
- more than two head…….……11
11. Florets are equal to phyllaries (4)……..……..……..….*Mikania*
- Florets and phyllaries are not equal……...……..……12
12. Phyllaries distant with non-articulate base…….....*Adenostemma*
- Phyllaries imbricate, base always articulate……...…..……13
13. Inflorescence terminal corymbose panicle……..……...….*Ageratum*
- Inflorescence terminal corymbose cymes…..……..…..*Chromolaena*
14. Female floret Ligulate (ray floret, outer one)……15
- Female floret non-ligulate...……22
15. Inner floret male…...….*Parthenium*
- Inner floret bisexual (disc floret)…….…..... 16
16. Outer floret Ligulate (ray floret)…..……..…..17
- Outer floret not ligulate…..…….28
17. Leaves alternate…….…..….18
- leaves opposite……..……...21
18. Habit shrubs…..……..…*Tithonia*
- Habit herbs…….…...…..……..19
19. Pappus present, yellow……*Vicoa*
- Pappus absent, retrosely barbed awns present…..……...…….20
20. Achene apex beakes, anther filament pubescent.……..…*Cosmos*
- Achene apex narrow, not beaked, anther filament glabrous……*Bidens*
21. Only ray floret fertile, disc floret sterile…….…...*Acanthospermum*
- Disk floret fertile, ray floret present, fertile, sterile or absent……..……..……..…..22
22. Plumose setae type pappus……..……..*Tridax*
- Pappus absent or awned……..23
23. Achenes compressed..… *Synedrella*
- Achenes relatively plump and angled…….……..…..…..24
24. Inner bracts of involucre enclosing the achenes in female flowers…….…….….*Sigesbeckia*
- Inner bracts of involucre not enclosing the achenes in female flowers……..…..…..25

25. Palea narrow…..……..……*Eclipta*
- Palea concave or folded……..…..26
26. Achenes in disk ellipsoid, strongly compressed……..…..….*Acmella*
- Achenes in disk florets 4- or 5-angled, or compressed…..…..….27
27. Capitula small, Pappus elements 2-5, unequal, spinelike…...*Blainvillea*
- Capitula relatively large, Pappus absent, or scalelike….*Sphagneticola*
28. Herbs aromatic……..…….29
- Herbs non aromatic……..……31
29. Anther base tailed……..…...…30
- Anther base never tailed... *Laggera*
30. Head in globose spike…….*Sphaeranthus*
- Head in corymb panicles……..……..….*Blumea*
31. Achenes paired and enclosed in a 2-beaked utricle; pappus absent……...……...…. *Xanthium*
- Achenes hairy or villous, Pappus present…….....……..…….32
32. Prostate herb……..…….*Grangea*
- Erect herb……..….*Erigeron*

Acanthospermum Schrank, *Pl. Rar. Hort. Monac. t.* 53 (1820)

Acanthospermum hispidum DC., *Prodr. [A. P. de Candolle]* 5: 522 (1836); Gamble, *Fl. Madras* 704 (1921); Vajr., *Fl. Palghat Dist* 247 (1990); Sasidh., *Fl. Parambikulam WLS* 165 (2002).

Habit : Herb
Ecosystem preference : Degraded forest areas and other plains
Distribution : Indo Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Found as weed in wastelands and other plains
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : January - June
Altitude preference : Found in wastelands and roadsides
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Ahalya campus, 10°47'43.08"N, 76°50'5.43"E, 150m, 24 September 2020, Aswani & Maya, 6267 (GVCH).

Acilepis D. Don, *Prodr. Fl. Nepal.* 169 (1825)

Acilepis divergens (DC.) H.Rob. & Skvarla, *Proc. Biol. Soc. Washington* 122(2): 140 (2009); *Vernonia divergens* (Roxb.) Edgew., Hook. f., *FBI* 3: 234 (1881); Gamble, *Fl. Madras* 673 (1921); Vajr., *Fl. Palghat Dist* 258 (1990); Sasidh., *Fl. Parambikulam WLS* 173 (2002).

Basionym : *Decaneurum divergens DC*., *Contr. Bot. India [Wight]* 8 (1834).

Habit : Shrub
Ecosystem preference : Semi - evergreen forests and grasslands
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found in open grasslands
Raunkiaer's Life form : Chamaephyte
Distribution Frequency : Common
Phenology : November - March
Altitude preference : Found in high altitude grasslands
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thanniplace,10°52'43.32"N,76°45'54.07"E, 972m, 28 January 2020, Aswani & Maya, 6011 (GVCH); Aatumala Thodu, 10°53'52.08"N, 76°41'24"E, 1010m, 28 February 2020, Aswani & Maya, 6146 (GVCH);Aduppukootimala,10°50'43.08"N, 76°44'28.68"E, 819m, 16 February 2021, Aswani & Maya, 6512 (GVCH) **(Plate 82: Fig. g)**.

Acmella Rich., *Syn. Pl. [Persoon]* 2: 472 (1807)

Key to species

1. Heads greenish – white……..….*A. radicans*
- Heads yellow……..……2
2. Inflorescence sub - paniculate; ovoid or sub – globose……..*A. uliginosa*
- Inflorescence solitary; conical…. ……*A. calva*

Acmella calva (DC.) R.K.Jansen, *Syst. Bot. Monogr.* 8: 41 (1985); *Spilanthes calva* DC., Vajr., *Fl. Palghat Dist* 256 (1990); *Spilanthes acmella*, Hook. f., *FBI* 3: 307 (1881); Gamble, *Fl. Madras* 708 (1921).

Basionym: *Spilanthes calva* DC., in Wight, *Contrib. 19.*

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : Wet regions in forest floor
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : February - April
Altitude preference : Found In lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kanyarmuttu, 10°49'59.16"N , 76°44'31.56"E, 298m, 12 January 2019, Aswani & Maya, 3701 (GVCH); Vettumadavu,10°52'45.01"N, 76°48'8.60"E, 363m, 28 January 2020, Aswani & Maya, 5894 (GVCH).

Acmella radicans (Jacq.) R.K.Jansen, *Syst. Bot. Monogr*. 8: 69 (1985); Manilal, *Fl. Silent Valley* 158 (1988); Babu, *Fl. Malappuram Dist* 382 (1990); Sasidh. & Sivar., *Fl. Pl. Thrissur For* 254 (1996); Sasidh., *Fl. Periyar Tiger Reserve* 209 (1998); Anil Kumar *et al*., *Fl. Pathanamthitta* 288 (2005); Sunil & Sivadasan, *Fl. Alappuzha Dist* 390 (2009); Ratheesh Narayanan, F*l. Stud. Wayanad Dist* 480 (2009).

Basionym : *Spilanthes radicans* Jacq., *Collectanea [Jacquin]* 3: 229 (1791).

Habit : Herb
Ecosystem preference : Degraded moist deciduous forests, also in the plains
Distribution : South American
IUCN Category : Not Evaluated (NE)
Habitat : In shady waste place,along roadsides
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : October - March
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kallanpuzha,10°51'34.02"N,76°42'40.16"E, 140m, 26 January 2018, Aswani & Maya, 1377 (GVCH).

Acmella uliginosa (Sw.) Cass., *Dict. Sci. Nat., ed.* 2. [F. Cuvier] 24: 331 (1822); *Spilanthes uliginosa* Sw., H.J. Chowdhery in Hajra *et al*., *Fl. India* 12: 412 (1995); Sunil & Sivadasan, *Fl. Alappuzha Dist*. 391 (2009).

Basionym - *Spilanthes uliginosa* Sw., *Prodr. [O. P. Swartz]* 110 (1788).

Habit : Herb
Ecosystem preference : Wetlands and marshes in forests
Distribution : Indo Pacific, African and South American
IUCN Category : Least Count (LC)
Habitat : Wastelands, roadsides, margins of hill sides, wet regions in forests
Raunkiaer's Life form : Therophyte

Distribution Frequency : Rare
Phenology : November - February
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Ahalya campus, 10°47'37.00"N , 76° 49 '33.40"E, 156m, 24 September 2020, Aswani & Maya, 6268 (GVCH).

Adenostemma J. R. Forst. & G.Forst., *Char. Gen. Pl., ed.* 2. [89] (1776)

Adenostemma lavenia (L.) Kuntze, *Revis. Gen. Pl.* 1: 304 (1891); Gamble, *Fl. Madras* 677 (1921); Vajr., *Fl. Palghat Dist* 247 (1990); Sasidh., *Fl. Parambikulam WLS* 165 (2002); *Adenostemma viscosum* J.R. & G. Forst. var. *lavenia* Hook. f., *FBI* 3: 242 (1881).

Basionym: *Verbesina lavenia* L., *Sp. Pl.* 2: 902 (1753).

Habit : Herb
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Found in canopy rich forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : October - December
Altitude preference : Found in all altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala, 10°52'14.73"N , 76° 46 '46.15"E, 895m, 09 January 2020, Aswani & Maya, 5677 (GVCH) **(Plate 82: Fig. h)**.

Ageratum L., *Sp. Pl*. 2: 839 (1753)

Key to species

Corolla tubular, white…….....*A. conyzoides*

Corolla tubular, pale blue…….
……..….*A. houstonianum*

Ageratum conyzoides L., *Sp. Pl.* 2: 839 (1753); Hook. f., *FBI* 3: 243 (1881); Gamble, *Fl. Madras* 677 (1921); Vajr., *Fl. Palghat Dist* 248 (1990); Sasidh., *Fl. Parambikulam WLS* 165 (2002).

Habit : Herb
Ecosystem preference : Moist deciduous forests and in plains, found commonly in wastelands and along roadsides
Distribution : Indo Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : A common weed found everywhere
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : August - December
Altitude preference : Found In lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Neelippara, 10°51'47.52"N , 76°37'37.38"E, 312m, 15 September 2017, Aswani & Maya, 569 (GVCH); Valiya eri, 10°48'53.76"N, 76°44'59.07"E, 124m, 06 January 2018, Aswani & Maya, 1255 (GVCH); Anayappanchalla, 10°48'24.82"N, 76°48'30.73"E, 147m, 18 September 2018, Aswani & Maya, 2839 (GVCH); Aduppukootimala – Kanyarmuttu, 10°49'59.16"N, 76°44'31.56"E, 298m, 12 January 2019, Aswani & Maya, 3707 (GVCH); Jamanthimala, 10°51'53.64"N, 76° 47 '16.80"E, 586m, 09 January 2020, Aswani & Maya, 5635 (GVCH).

Ageratum houstonianum Mill., *Gard. Dict., ed.* 8. n. 2 (1768); Gamble, *Fl. Madras* 1881 (1936); Sasidh. & Sivar., *Fl. Pl. Thrissur For*. 245 (1996); Sasidh., *Fl. Chinnar WLS* 161 (1999); Sasidh., *Biodiv. Doc. Kerala- Fl. Pl.* 239 (2004); Anil

Kumar *et al*., *Fl. Pathanamthitta* 275 (2005); Sunil, *Fl. Pl. Diver. Ernakulam Dist* 214 (2016).

Habit : Herb
Ecosystem preference : Degraded forest tracks and in roadsides
Distribution : South American
IUCN Category : Not Evaluated (NE)
Habitat : A weed in forest floor
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : February - May
Altitude preference : Found in all altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala, 10°51'53.64"N , 76°47'16.80"E, 586m, 23 June 2019, Aswani & Maya, 4107 (GVCH); Chaavadippara, 10°52'32.05"N, 76°48'28.8"E, 294m, 28 January 2020, Aswani & Maya, 5872 (GVCH).

Bidens L., *Sp. Pl.* 2: 831 (1753)

Bidens pilosa L., Sp. Pl. 2: 832 (1753); var. *minor* (Blume) Sherff, Vajr., *Fl. Palghat Dist* 248 (1990); Sasidh., *Fl. Parambikulam WLS* 166 (2002); *Bidens pilosa* Hook. f., *FBI* 3: 309 (1881); Gamble, *Fl. Madras* 709 (1921).

Habit : Herb
Ecosystem preference : Grasslands
Distribution : Indo Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Found as a weed in grasslands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : March - October
Altitude preference : Fond in higher altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala,10°52'18.19"N,76°46'47.14" E, 921m, 09 January 2020, Aswani & Maya, 5763 (GVCH).

Blainvillea Cass., *Dict. Sci. Nat., ed.* 2. *[F. Cuvier]* 29: 493 (1823)

Blainvillea acmella (L.) Philipson, *Blumea* 6(2): 350 (1950); Sasidh., *Fl. Parambikulam WLS* 166 (2002); *Blainvillea latifolia* (L. f.) DC.. Hook. f., *FBI* 3: 305 (1880); *Blainvillea rhomboidea* Cass., Gamble, *Fl. Madras* 706 (1921).

Basionym: *Verbesina acmella* L., *Sp. Pl.* 2: 901 (1753).

Habit : Herb
Ecosystem preference : Dry deciduous forests, also in the plains
Distribution : Indo Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Invasive taxa in wastelands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : April - November
Altitude preference : Found In lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Mayappallam,10°48'0.36"N,76°45'58.68"E, 114m, 06 September 2019, Aswani & Maya, 4687 (GVCH).

Blumea DC., *Arch. Bot. (Paris)* 2: 514 (1833)

Key to species

1. Heads few……..…..*B. oxyodonta*
- Heads numerous……..……...…2
2. Flowers pink or purple....*B. axillaris*
- Flowers yellow……..…….3
3. Corolla lobes glabrous; achenes not ribbed, subtetragonous……..…… ……*B. lacera*

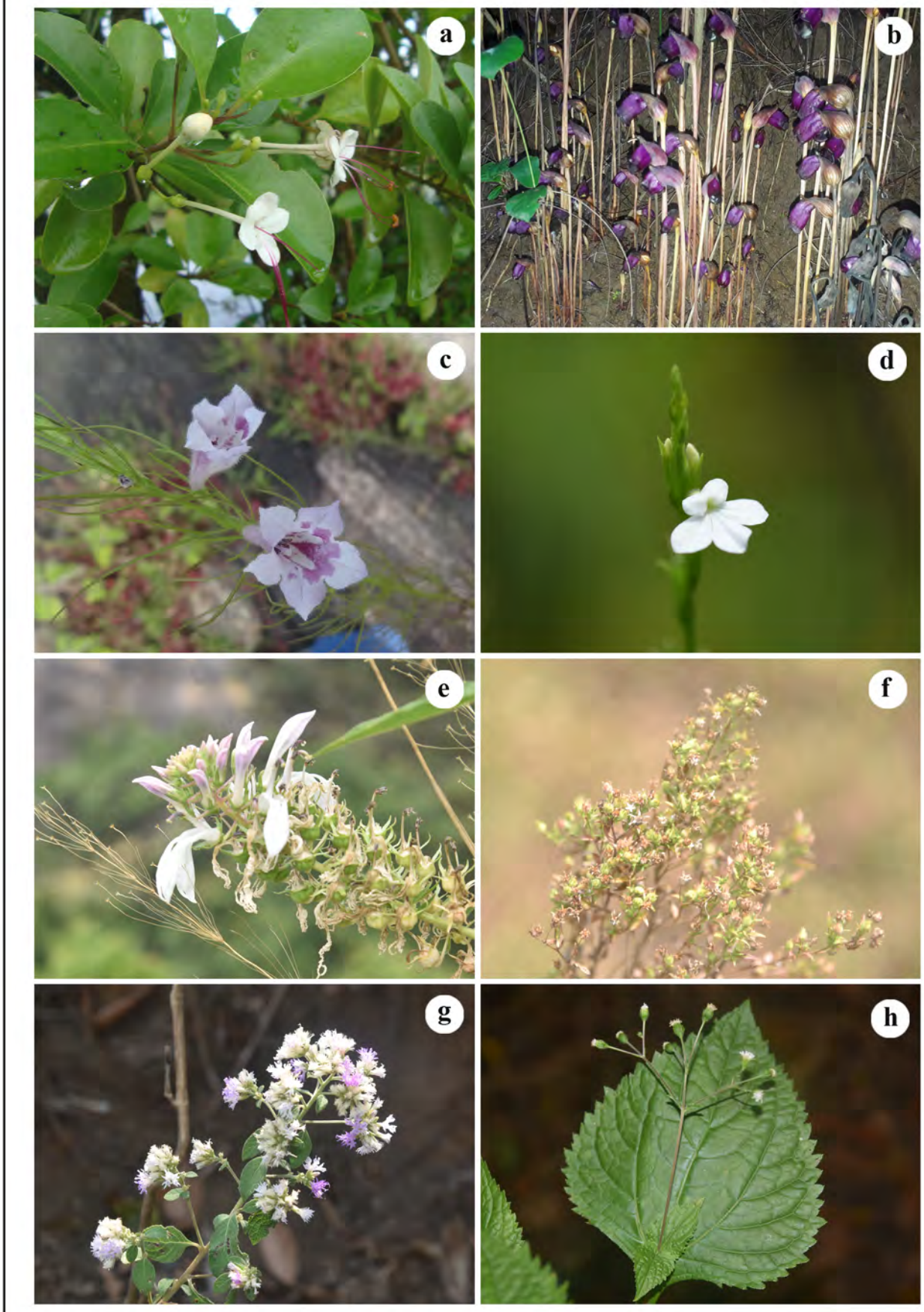

Plate 82: Fig. a. *Volkameria inermis* L. **b.** *Aeginetia indica* L. **c.** *Parasopubia delphiniifolia* (L.) H.-P.Hofm. & Eb.Fisch. **d.** *Striga angustifolia* (D.Don) Saldanha **e.** *Lobelia nicotianifolia* Roth **f.** *Wahlenbergia erecta* (Roth ex Roem. & Schult.) Tuyn **g.** *Acilepis divergens* (DC.) H.Rob. & Skvarla **h.** *Adenostemma lavenia* (L.) Kuntze.

- Corolla lobes glandular; achenes ribbed; oblong……....….*B. laevis*

Blumea axillaris DC., *Prodr. [A. P. de Candolle]* 5: 434 (1836); *Blumea wightiana* DC., Hook. f., *FBI* 3: 261 (1881); Gamble, *Fl. Madras* 686 (1921); *Blumea neilgherrensis* Hook. f., *FBI* 3: 261 (1881); Gamble, *Fl. Madras* 686 (1921); *Blumea mollis* (D. Don) Merr., Vajr., *Fl. Palghat Dist* 249 (1990).

Basionym: *Conyza axillaris Lam*., *Encycl. [J. Lamarck & al.]* 2(1): 84 (1786).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo-Malesia, African and Australian
IUCN Category : Not Evaluated (NE)
Habitat : Degraded forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : January - November
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kallanpuzha,10°51'34.02"N,76°42'40.16"E, 140m, 26 January 2018, Aswani & Maya, 1367 (GVCH); Pazhampullikaadu, 10°50'09.55"N, 76°38'28.33"E, 89m, 16 October 2018, Aswani & Maya, 3132 (GVCH).

Blumea lacera (Burm.f.) DC., *Contr. Bot. India [Wight]* 14 (1834); Hook. f., FBI 3: 263 (1881); Gamble, *Fl. Madras* 687 (1921); *Blumea lacera* (Burm. f.) DC. var. *cinerascens* Hook. f., FBI 3: 263 (1881); *Blumea lacera* (Burm. f.) DC. var. *glandulosa* (DC.) Hook. f., *FBI* 3: 263 (1881); Gamble, *Fl. Madras* 687 (1921).

Habit : Herb
Ecosystem preference :Degraded deciduous forests and plains
Distribution : Indo - Pacific and African
IUCN Category : Not Evaluated (NE)
Habitat : Open wastelands and other plains
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kallanpuzha,10°51'34.02"N,76°42'40.16"E, 140m, 26 January 2018, Aswani & Maya, 1367 (GVCH); Pazhampullikaadu, 10°50'09.55"N, 76°38'28.33"E, 89m, 16 October 2018, Aswani & Maya, 3132 (GVCH).

Blumea laevis **(**Lour.) Merr., *Trans. Amer. Philos. Soc. ser.* 2, 24(2): 386 (1935); *Blumea virens* Wall. ex DC., Hook. f., *FBI* 3: 264 (1881); Gamble, *Fl. Madras* 687 (1921).

Basionym: *Placus laevis* Lour. in *Fl. Cochinch.* 2: 497 (1790).

Habit : Herb
Ecosystem preference : Moist deciduous forests and plains
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Disturbed forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : December - June
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thaanikunnu,10°51'57.24"N, 76°42'0.00"E, 179m, 18 December 2018, Aswani & Maya, 3448 (GVCH); Parachaathy, 10°50'49.97"N, 76°43'56.67"E, 160m, 02 January 2019, Aswani & Maya, 3617 (GVCH); Malampuzha irrigation dept. guest house hillock, 10°50'04.20"N, 76°40'52.68"E, 120m, 23 November 2019, Aswani & Maya, 4956 (GVCH);

Aduppukootimala, 10°49'38.80"N, 76°44'16.08"E, 140m, 16 February 2021, Aswani & Maya, 6418 (GVCH).

Blumea oxyodonta DC., *Contr. Bot. India [Wight]* 15. (1834); Hook. f., *FBI* 3: 266 (1881); Gamble, *Fl. Madras* 686 (1921); Sasidh., *Fl. Parambikulam WLS* 167 (2002).

Basionym: *Conyza oxyodonta* (DC.) Wall. ex Miq., *Fl. Ned. Ind.* 2(1): 45 (1856).

Habit : Herb
Ecosystem preference : Along wet regions in forests
Distribution : Indo - Pacific and Holarctic
IUCN Category : Not Evaluated (NE)
Habitat : Open forests and dam sites
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : October - May
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Akamalavaram – Kalliyara, 10°53'14.64"N, 76°39'39.96"E, 180m, 24 March 2018, Aswani & Maya, 1582 (GVCH); G. P. Nair Estate, 10°53'17.51"N, 76°39'42.72"E, 177m, 24 March 2018, Aswani & Maya, 1602 (GVCH); Walayar Dam, 10°50'24.58"N, 76°51'01.52"E, 199m, 09 May 2018, Aswani & Maya, 2035 (GVCH); Akamalavaram – Kavarakundu, 10°52'10.56"N, 76°42'45.18"E, 226m, 30 November 2018, Aswani & Maya, 3242 (GVCH).

Chromolaena DC., *Prodr. [A. P. de Candolle]* 5: 133 (1836)

Chromolaena odorata (L.) R.M.King & H.Rob., *Phytologia* 20(3): 204 (1970); Vajr., *Fl. Palghat Dist* 250 (1990); Sasidh., *Fl. Parambikulam WLS* 167 (2002); *Eupatorium odoratum* L., Hook. f., *FBI* 3: 244 (1881).

Basionym: *Eupatorium odoratum* L. in *Syst. Nat., ed*. 10. 2: 1205 (1759).

Habit : Shrub
Ecosystem preference : A weed in forests, plains and other wastelands
Distribution : Indo - Pacific, Holarctic and South American
IUCN Category : Not Evaluated
Habitat : Found in all places as a weed
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : November - May
Altitude preference : Found in all altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kezhakootimala,10°51'53.30"N,76°37'36.39"E, 362m, 15 September 2017 Aswani & Maya, 486 (GVCH); Karadikunnu, 10°50'25.97"N, 76°49'42.92"E, 203m, 30 December 2017, Aswani & Maya, 1019 (GVCH); Poolakunnu, 10°51'33.12"N, 76°42'29.52"E, 142, 10 March 2018, Aswani & Maya, 1405 (GVCH); Kava, 10°50'36.42"N, 76°43'31.74"E, 109m, 06 April 2018, Aswani & Maya, 1816 (GVCH); Ahalya campus, 10°47'43.08"N, 76°50'5.43"E, 150m, 24 April 2020, Aswani & Maya, 6266 (GVCH).

Cosmos Cav., *Icon. [Cavanilles]* 1(1): 9, t. 14, 79 (1791)

Key to species

Achenes black……..….*C. sulphureus*
Achenes light brown……..…*C. caudatus*

Cosmos caudatus Kunth, *Nov. Gen. Sp. [H.B.K.]* 4(17): 188 (ed. fol.) (1818); Mohanan, *Fl. Quilon Dist* 228 (1984); Babu, *Fl. Malappuram Dist* 368 (1990) Sasidh., *Fl. Chinnar WLS* 164 (1999); Sunil & Sivadasan, *Fl. Alappuzha Dist* 381 (2009).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific and South American
IUCN Category : Not Evaluated (NE)
Habitat : Disturbed forest areas
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : August - February
Altitude preference : Found in all altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Neelippara, 10°51'47.52"N, 76° 37 '37. 38"E, 312m, 15 September 2017, Aswani & Maya, 547 (GVCH).

Cosmos sulphureus Cav., *Icon. [Cavanilles]* 1(3): 56, t. 79 (1791); Vajr., *Fl. Palghat Dist* 259 (1990).

Habit : Herb
Ecosystem preference : Cultivated in gardens, often runs wild
Distribution : South American and African
IUCN Category : Not Evaluated
Habitat : Degraded forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : February - November
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Mayappalam,10°48'0.36"N, 76°45'58.68"E, 114m, 06 September 2019, Aswani & Maya, 4693 (GVCH).

Crassocephalum Moench, *Methodus (Moench)* 516 (1794)

Crassocephalum crepidioides (Benth.) S. Moore, *J. Bot.* 50: 211 (1912); Vajr., *Fl. Palghat Dist* 251 (1990); Sasidh., *Fl. Parambikulam WLS* 168 (2002); *Erechtites valerianaefolia* C.E.C. Fisch. in Gamble, *Fl. Madras* 1882 (1936).

Basionym : *Gynura crepidioides Benth*., *Niger Fl. [W. J. Hooker]*. 438. (1849).

Habit : Herb
Ecosystem preference : Deciduous forests
Distribution : Indo - Pacific, Holarctic and African
IUCN Category : Not Evaluated (NE)
Habitat : Disturbed forest tracks and other plains
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : August - December
Altitude preference : Found in all altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Anakundu, 10°49'42.90"N, 76°46'13.00"E, 134m, 07 March 2019, Aswani & Maya, 3857 (GVCH); Jamanthimala, 10°52'21.00"N, 76°47'00.24"E, 848m, 09 January 2020, Aswani & Maya, 5684 (GVCH); Pothukunnu, 10°53'21.84"N, 76°46'33.24"E, 969m, 28 January 2020, Aswani & Maya, 5974 (GVCH).

Cyanthillium Blume, Bijdr. *Fl. Ned. Ind.* 15: 889 (1826)

Cyanthillium cinereum (L.) H.Rob., *Proc. Biol. Soc. Washington* 103(1): 252 (1990); Hook. f., *FBI* 3: 233 (1881); Gamble, *Fl. Madras* 676 (1921); Vajr., *Fl. Palghat Dist* 257 (1990); Sasidh., *Fl. Parambikulam WLS* 173 (2002).

Basionym: *Conyza cinerea* L., *Sp. Pl.* 2: 862 (1753).

Habit : Herb
Ecosystem preference : Deciduous forests, also in the plains
Distribution : Indo Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Margins of hillocks and other plains
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common

Phenology : Throughout the year
Altitude preference : Found in all altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Koomachimala, 76°40'36.16"E, 76°40'34.59"E, 122m, 20 June 2017, Aswani & Maya, 123 (GVCH); Kallanpuzha,10°51'34.02"N,76°42'40.16"E, 140m, 26 January 2018, Aswani & Maya, 1371 (GVCH); Kongampaadam, 10°48'39.80"N, 76°47'2.67"E, 130m, 06 September 2019, Aswani & Maya, 4649 (GVCH); Edasherikunnu, 10°52'42.6"N, 76°46'53.32"E, 645m, Aswani & Maya, 5961 (GVCH).

Eclipta L., *Mant. Pl. Altera* 157 (286) (1771)

Eclipta prostrata (L.) L., *Mant. Pl. Altera* 286 (1771); *Eclipta alba* (L.) Hassk., Hook. *FBI* 3: 304 (1881); Gamble, *Fl. Madras* 705 (1921); Vajr., *Fl. Palghat Dist* 252 (1990).

Basionym: *Eclipta prostrata (L.)* L., *Mant. Pl. Altera* 286 (1771).

Habit : Herb
Ecosystem preference : Moist deciduous forests and plains
Distribution : Indo Pacific, African and South American
IUCN Category : Least Concern (LC)
Habitat : Wet and moist regions such as paddy fields, dam sites
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Vedivachapara, 10°50'04.96"N , 76°40'48.72"E, 116m, 04 June 2017, Aswani & Maya, 78 (GVCH); Valiyaeri, 10°48'51.04"N, 76°45'01.67"E, 136m, 06 January 2018, Aswani & Maya, 1250 (GVCH); Mayappalam, 10°48'01.78"N, 76°45'58.91"E, 06 September 2019, Aswani & Maya, 4658 (GVCH).

Elephantopus L., *Sp. Pl.* 2: 814 (1753)

Elephantopus scaber L., *Sp. Pl.* 2: 814 (1753); Hook. f., *FBI* 3: 242 (1881); Gamble, *Fl. Madras* 676 (1921); Vajr., *Fl. Palghat Dist* 252 (1990); Sasidh., *Fl. Parambikulam WLS* 169 (2002).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo Pacific, African and South American
IUCN Category : Not Evaluated
Habitat : Degraded forests and other plains
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : October - January
Altitude preference : Found in all altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, G. P. Nair Estate, 10°53'40.83"N, 76°39'43.16"E, 230m, 24 March 2018, Aswani & Maya, 1754 (GVCH); Ayyappan Mala, 10°49'07.19"N, 76°44'50.28"E, 130m, 26 June 2018, Aswani & Maya, 2376 (GVCH); Pazhampullikaadu, 10°50'09.55" N, 76°38'28.33"E, 89m, 16 October 2018, Aswani & Maya, 3203 (GVCH); Pettikallu, 10°52'28.20"N, 76°42'38.52"E, 346m, 19 July 2019, Aswani & Maya, 4334 (GVCH); Chaatapara waterfalls, 10°53'11.76"N, 76°42'15.84"E, 600m, 10 December 2019, Aswani & Maya, 5437(GVCH) **(Plate 83: Fig. a)**.

Eleutheranthera Poit., *Bull. Sci. Soc. Philom. Paris* 3 (no. 66): 137 (1802)

Eleutheranthera ruderalis (Sw.) Sch.Bip., *Bot. Zeitung (Berlin)* 24: 239 (1866); Babu,

Fl. Malappuram Dist 371 (1990); Sasidh. & Sivar., *Fl. Pl. Thrissur For* 250 (1996); Sasidh., *Fl. Periyar Tiger Reserve* 200 (1998); Sunil & Sivadasan, *Fl. Alappuzha Dist* 383 (2009); Ratheesh Narayanan, *Fl. Stud. Wayanad Dist* 470 (2009).

Basionym : *Melampodium ruderale* Sw., *Fl. Ind. Occid.* iii. 1372 (1806).

Habit : Herb
Ecosystem preference : Moist deciduous forests and also in the plains
Distribution : Indo - Pacific, Holarctic and South American
IUCN Category : Not Evaluated (NE)
Habitat : Degraded forests and other plains
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : May - November
Altitude preference : Found in all altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, G. P. Nair Estate, 10°53'40.83"N, 76°39'43.16"E, 230m, 24 March 2018, Aswani & Maya, 1735 (GVCH); Koyamarakaadu, 10°47'44.88"N, 76°45'38.52"E, 111m, 06 September 2018, Aswani & Maya, 2661 (GVCH).

Emilia Cass., *Bull. Sci. Soc. Philom. Paris* 1817: 68

Emilia sonchifolia (L.) DC., *Contr. Bot. India [Wight]* 24 (1834) ; Hook. f., *FBI* 3: 336 (1881); Gamble, *Fl. Madras* 716 (1921); Vajr., *Fl. Palghat Dist* 252 (1990); Sasidh., *Fl. Parambikulam WLS* 170 (2002).

Basionym: *Cacalia sonchifolia* L., Sp. Pl 2: 835 (1753).

Habit : Herb
Ecosystem preference : Moist deciduous forests and also in the plains
Distribution : Indo - Pacific, Holarctic and African
IUCN Category : Not Evaluated (NE)
Habitat : Found in open forests and other plains
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : July - December
Altitude preference : Found in lower and middle altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Neelippara, 10°51'47.52"N, 76°37'37.38"E, 312m, 15 September 2017, Aswani & Maya, 549 (GVCH); Valiya eri, 10°49'04.44"N, 76°45'05.04"E, 129m, 06 January 2018, Aswani & Maya, 1310 (GVCH); Ayyappan Mala, 10°49'07.40"N, 76°45'32.38"E, 170m, 26 June 2018, Aswani & Maya, 2448 (GVCH); Anayappanchalla,10°48'25.92"N,76°48'35. 19"E, 157m, 30 November 2019, Aswani & Maya, 5187 (GVCH).

Erigeron L., *Sp. Pl.* 2: 863 (1753)

Erigeron bonariensis L., *Sp. Pl.* 2: 863 (1753); *Erigeron linifolius* Willd., Hook. f., *FBI* 3: 254 (1881); *Conyza ambigua* DC., Gamble, *Fl. Madras* 683 (1921); *Conyza bonariensis* (L.) Cronq., Vajr., *Fl. Palghat Dist* 251 (1990); Sasidh., *Fl. Parambikulam WLS* 168 (2002).

Habit : Herb
Ecosystem preference : Moist deciduous forests and Grasslands
Distribution : Indo Pacific, African and South American
IUCN Category : Not Evaluated
Habitat : Open forest tracks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : June - January
Altitude preference : Found in all altitudes

Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, G. P. Nair Estate, 10°53'17.51"N, 76°39'42.72"E, 176m, 24 March 2018, Aswani & Maya, 1615 (GVCH); Jamanthimala, 10°52'21.00"N, 76°47'00.24"E, 848m, 09 January 2020, Aswani & Maya, 5734 (GVCH). **(Plate 83: Fig. b)**.

Grangea Adans., *Fam. Pl. (Adanson)* 2: 121 (1763)

Grangea maderaspatana (L.) Poir., *Encycl. [J. Lamarck & al.] Suppl.* 2. 825 (1812); Hook. f., *FBI* 3: 247 (1881); Gamble, *Fl. Madras* 680 (1921); Sasidh., *Fl. Parambikulam WLS* 170 (2002).

Basionym : *Artemisia maderaspatana* L., *Sp. Pl*. 2: 849 (1753).

Habit : Herb
Ecosystem preference : Marshy areas
Distribution : Indo - Pacific and African
IUCN Category : Least Concern (LC)
Habitat : Wet marshy areas in dam site and other river banks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : March - July
Altitude preference : Found in all altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thonikadavu, 10°50'12.34"N, 76°40'41.15" E, 109m, 04 June 2017, Aswani & Maya, 39 (GVCH); Kava, 10°49'25.18"N, 76°43'29.96"E, 115m, 06 April 2018, Aswani & Maya, 1822 (GVCH).

Lagascea Cav., *Anales Ci. Nat.* 6: 331 (1803), nom. et orth. cons.

Lagascea mollis Cav., Anales Ci. Nat. 6: 332, t (1803); Hook. f., *FBI* 3: 302 (1881); Gamble, *Fl. Madras* 703 (1921); Vajr., *Fl. Palghat Dist* 254 (1990); Sasidh., *Fl. Parambikulam WLS* 170 (2002).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Open forests near water sources
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : April - November
Altitude preference : Found in all altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Chottuppara waterfalls, 10°52'37.92"N, 76°41'39.84"E, 346m, 14 May2019, Aswani & Maya, 3985 (GVCH); Kattadikunnu,10°50'17.16"N, 76°38'59.64" E, 139m, 16 October 2019, Aswani & Maya, 4813 (GVCH).

Laggera Sch.Bip. ex Benth., *Gen. Pl. [Bentham & Hooker f.]* 2(1): 290 (1873)

Laggera alata (DC.) Sch. Bip. ex Oliv., *Trans. Linn. Soc. London* 29: 94 (1873); Hook. f., *FBI* 3: 271 (1881); Gamble, *Fl. Madras* 689 (1921).

Basionym: *Blumea alata (D. Don)* DC., *Prodr. [A. P. de Candolle]* 5: 448 (1836).

Habit : Herb
Ecosystem preference : Grasslands
Distribution : Indo - Pacific, Holarctic and African
IUCN Category : Not Evaluated (NE)
Habitat : Grasslands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : December - March
Altitude preference : Found in all altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range,

Jamanthimala, 10°52'21.00"N, 76°47'00.24"E, 848m, 09 January 2020, Aswani & Maya, 5737 (GVCH); Edasherikunnu, 10°52'42.6"N, 76°46'53.32"E, 645m, 28 January 2020, Aswani & Maya, 5960 (GVCH); Aatumalathodu, 10°53'52.08" N, 76°41'24"E, 1010m, 28 February 2020, Aswani & Maya, 6150 (GVCH) **(Plate 83: Fig. c)**.

Mikania Willd., *Sp. Pl., ed.* 4 [Willdenow] 3(3): 1481, 1742 (1803)

Mikania micrantha Kunth, *Nov. Gen. Sp. [H.B.K.]* 4(fol.): 105 (1818); Sasidh., *Fl. Parambikulam WLS* 171 (2002); *Mikania scandens* Clarke, Hook. f., *FBI* 3: 144 (1881).

Habit : Herb
Ecosystem preference : Margins of forests, open forests, wastelands and other plains
Distribution : Indo Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Fast spreading weed in forest tracks and other plains
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : February - April
Altitude preference : Found in all altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kallanpuzha, 10°51'34.02"N, 76°42'40.16" E, 140m, 26 January 2018, Aswani & Maya, 1382 (GVCH); Aduppukootimala – Kanyarmuttu, 10°49'59.16"N, 76°44'31.56"E, 298m, 12 January 2019, Aswani & Maya, 3692(GVCH); Chottuppara, 10°52'37.92" N, 76°41'39.84"E, 346m, 14 May 2019, Aswani & Maya, 3924(GVCH); Koyyamarakaadu, 10°47'44.88"N, 76°45'38.52"E, 108m, 30 November 2019, Aswani & Maya, 5303(GVCH).

Parthenium L., *Sp. Pl.* 2: 988 (1753)

Parthenium hysterophorus L., *Sp. Pl*. 2: 988 (1753); Vajr., *Fl. Palghat Dist* 259 (1990); Sasidh., *Fl. Parambikulam WLS* 171 (2002).

Habit : Herb
Ecosystem preference : Dry deciduous forests, also along roadsides, railway tracks and wastelands
Distribution : Indo - Pacific, South American
IUCN Category : Not Evaluated (NE)
Habitat : Fast spreading weed along forest margins, dam sites and roadsides
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : May - March
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Walayar Dam, 10°50'24.58"N, 76°51'01.52"E, 199m, 09 May 2018, Aswani & Maya, 2043(GVCH); Ashramam, 10°51'23.40"N, 76°43'34.72"E, 116m, 02 August 2019, Aswani & Maya, 4413(GVCH); Mayappalam,10°48'06.93"N,76°46'25.09", 135m, 06 September 2019, Aswani & Maya, 4703 (GVCH).

Phyllocephalum Blume, *Bijdr. Fl. Ned. Ind.* 15: 888 (1826)

Key to species

Heads upto 2cm or more in diameter; leaves elliptic - ovate; peduncles stout and short……..…...*P. courtallense*

Heads upto 1.25cm diameter; leaves lanceolate; peduncles slender and long……..... *P. rangacharii*

Phyllocephalum courtallense (Wight) Narayana, *Curr. Sci.* 51(8): 438 (1982); *Centratherum courtallense* (Wight) Benth. ex Hook. f., *FBI* 3: 227 (1881); Gamble, *Fl. Madras* 666 (1921).

Basionym : *Decaneurum courtallense Wight*, *Icon. Pl. Ind. Orient. [Wight]* 3(4): 6, t. 1081 (1846).

Habit : Herb
Ecosystem preference : Grasslands and montane scrub jungles
Distribution : Indo - Pacific
Endemism : Yes (Southern Western Ghats)
IUCN Category : Not Evaluated (NE)
Habitat : Open grasslands
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : January - June
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kattadikunnu,10°50'17.16"N,76°38'59.64" E, 139m, 16 October 2019, Aswani & Maya, 4806(GVCH).

Phyllocephalum rangacharii (Gamble) Narayana, *Curr. Sci.* 51(8): 438 (1982); *Centratherum rangacharii* Gamble, Gamble, *Fl. Madras* 667 (1921).

Basionym : *Centratherum rangacharii Gamble*, *Bull. Misc. Inform. Kew* 1920(10): 338 (1920).

Habit : Herb
Ecosystem preference : Grasslands
Distribution : Indo- Pacific
Endemism : Yes (Southern Western ghats)
IUCN Category : Not Evaluated (NE)
Habitat : Exposed rocky regions
Raunkiaer's Life form : Therophyte
Distribution Frequency : Rare
Phenology : August - December
Altitude preference : Found in middle altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Chaatapara waterfalls, 10°53'11.76"N, 76°42'15.84"E, 600m, 10 December 2019, Aswani & Maya, 5560(GVCH).

Sigesbeckia L., *Sp. Pl*. 2: 900 (1753)

Sigesbeckia orientalis L., *Sp. Pl*. 2: 900 (1753); Hook. f., *FBI* 3: 304 (1881); Gamble, *Fl. Madras* 704 91921); Vajr., *Fl. Palghat Dist* 254 (1990).

Habit : Herb
Ecosystem preference : Moist deciduous forests and plains
Distribution : Indo Pacific, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : A common weed in plains and margins of hillocks
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : April - December
Altitude preference : Found in middle altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Edasherikunnu, 10°52'42.6"N, 76°46'53.32"E, 645m, 28 January 2020, Aswani & Maya, 5956 (GVCH) **(Plate 83: Fig. d)**.

Sphaeranthus L., *Sp. Pl.* 2: 927 (1753)

Sphaeranthus indicus L., *Sp. Pl.* 2: 927 (1753); Hook. f., *FBI* 3: 275 (1881) ; Gamble, *Fl. Madras* 692 (1921); Vajr., *Fl. Palghat Dist* 255 (1990)

Habit : Herb
Ecosystem preference : Wetlands
Distribution : Indo - Pacific, Australian and African

IUCN Category : Least Concerned (NE)
Habitat : In paddy fields, banks of ponds and other canals
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : January - April
Altitude preference : Found in all altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Valiya Eri, 10°49'04.44"N, 76°45'05.04"E, 129m, 06 January 2018, Aswani & Maya, 1307 (GVCH); Kava, 10°49'25.18"N, 76°43'29.96"E, 115m, 06 April 2018, Aswani & Maya, 1899 (GVCH); Aduppukootimala, 10°49'38.80"N, 76°44'16.08"E, 140m, 16 February 2021, Aswani & Maya, 6375 (GVCH).

Sphagneticola O. Hoffm., *Notizbl. Königl. Bot. Gart. Berlin* 3: 36 (1900)

Sphagneticola trilobata (L.) Pruski, *Mem. New York Bot. Gard.* 78: 114 (1996)

Basionym - *Silphium trilobatum* L., *Syst. Nat., ed*. 10. 2: 1233 (1759).

Habit : Herb
Ecosystem preference : In forest margins
Distribution : South American
IUCN Category : Not Evaluated (NE)
Habitat : Found to be a fast spreading weed in forest margins, roadsides etc
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : June - September
Altitude preference : Found in all altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, G. P. Nair Estate, 10°53'23.22"N, 76°39'42.80"E, 190m, 24 March 2018, Aswani & Maya, 1634 (GVCH); Ahalia campus, 10°47'43.08"N, 76°50'5.43"E, 150m, 24 September 2020, Aswani & Maya, 6263 (GVCH).

Strobocalyx (Blume ex DC.) Spach, *Hist. Nat. Vég. (Spach)* 10: 39 (1841)

Strobocalyx arboreus Sch.Bip., *Jahresber. Pollichia* 18-19: 171 (1861); *Vernonia arborea* Buch.-Ham., Hook. f., *FBI* 3: 239 (1881); Vajr., *Fl. Palghat Dist* 257 (1990); Sasidh., *Fl. Parambikulam WLS* 173 (2002); *Vernonia monosis* Benth. ex Clarke, Gamble, *Fl. Madras* 672 (1921); *Vernonia arborea* Buch.-Ham. var. *wightiana* (DC.) Hook. f., *FBI* 3: 239 (1881).

Habit : Tree
Ecosystem preference : Evergreen forests
Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Growing on the hillsides and slopes
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Occasional
Phenology : September - March
Altitude preference : Found in higher altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thanniplace,10°52'43.32"N, 76°45'54.07"E, 972m, 28 January 2020, Aswani & Maya, 6040 (GVCH); Aatumala, 10°53'24" N, 76°41'24"E, 1065m, 28 February 2020, Aswani & Maya, 6163 (GVCH) **(Plate 83: Fig. e)**.

Synedrella Gaertn., *Fruct. Sem. Pl.* 2: 456 (1791)

Synedrella nodiflora (L.) Gaertn., *Fruct. Sem. Pl.* 2(3): 456, t. 171 (1791); Hook. f.,*FBI* 3: 308 (1881); Gamble, *Fl. Madras* 708 (1921); Vajr., *Fl. Palghat Dist* 256 (1990); Sasidh., *Fl. Parambikulam WLS* 172 (2002).

Basionym: *Verbesina nodiflora* L., *Cent. Pl.* I. 28 (1755).

Habit : Herb
Ecosystem preference : Deciduous forests, plains and other wastelands
Distribution : Indo - Pacific, Holarctic, African and Australian
IUCN Category : Not Evaluated (NE)
Habitat : Found in all disturbed places
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kozhimala, 10°50'01.89"N, 76°42'58.61"E, 105m, 09 November 2017, Aswani & Maya, 775 (GVCH); Koyamarakaadu, 10°47'44.88"N, 76°45'38.52"E, 111m, 06 September 2018, Aswani & Maya, 2660 (GVCH); Kottamutti waterfall, 10°49'46.20"N, 76°46'47.28"E, 203m, 23 September 2018, Aswani & Maya, 2960 (GVCH); Chaatapara waterfalls, 10°53'11.76"N, 76°42'15.84"E, 600m, 10 December 2019, Aswani & Maya, 5424 (GVCH); Aduppukootimala, 10°49'38.80"N, 76°44'16.08"E, 140m, 16 February 2021, Aswani & Maya, 6397 (GVCH).

Tithonia Desf. ex Juss., *Gen. Pl. [Jussieu]* 189 (1789)

Key to species

Annual herbs upto 1.5m tall; involucral bracts 2 - 3 seriate…..……. *T. rotundifolia*
Perennial shrubs upto 2m tall; involucral bracts 4 - seriate…….....….. *T. diversifolia*

Tithonia diversifolia (Hemsl.) A.Gray, *Proc. Amer. Acad. Arts xix.* 5 (1883); Sasidh., *Fl. Parambikulam WLS* 172 (2002).

Basionym : *Mirasolia diversifolia Hemsl*., *Biol. Cent.-Amer., Bot.* 2: 168, t (1881).

Habit : Shrub
Ecosystem preference : Margins of forests and found as escape in grasslands
Distribution : Indo - Pacific, Holarctic, African, Australian and South American
IUCN Category : Not Evaluated (NE)
Habitat : Found as a common bio fencing plant in homesteads and other settlements
Raunkiaer's Life form : Phanerophyte
Distribution Frequency : Common
Phenology : September - May
Altitude preference : Found in lower and middle altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Thannikunnu, 10°52'44.47"N, 76°47'3.91" E, 605m, 28 January 2020, Aswani & Maya, 5946 (GVCH) **(Plate 83: Fig. f)**.

Tithonia *rotundifolia* S.F.Blake, Contr. Gray Herb. 52: 41 (1917); Subram., *Fl. Thenmala Div* 194 (1995); Chowdhery in Hajra *et al*., *Fl. India* 12: 416 (1995); Sasidh., *Biodiv. Doc. Kerala- Fl. Pl* 256 (2004); Sunil & Sivad., *Fl. Alappuzha Dist* 398 (2009).

Habit : Herb
Ecosystem preference : Ornamental plant and often found running wild
Distribution : South American
IUCN Category : Not Evaluated (NE)
Habitat : Grown in homesteads
Raunkiaer's Life form :Therophyte
Distribution Frequency : Occasional
Phenology : July - January
Altitude preference : Found in lower altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Kadukkamkunnam, 10°48'48.76"N, 76°39'48.98"E, 107m, 23 March 2023, Aswani & Maya, 6568 (GVCH).

Tridax L., *Sp. Pl*. 2: 900 (1753)

Tridax procumbens L., *Sp. Pl.* 2: 900 (1753).; Hook. f., *FBI* 3: 311 (1881); Gamble, *Fl. Madras* 711 (1921); Vajr., *Fl. Palghat Dist* 256 (1990); Sasidh., *Fl. Parambikulam WLS* 172 (2002).

Habit : Herb
Ecosystem preference : Deciduous forests, waste lands and also in plains
Distribution : Indo Pacific, Holarctic, African and South American
IUCN Category : Not Evaluated (NE)
Habitat : Along disturbed areas in forests and roadsides and other grounds
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : Throughout the year
Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thonikadavu,10°50'04.96"N, 76°40'48.72"E, 115m, 04 June 2017, Aswani & Maya, 13 (GVCH); Koomachimala, 10°49'44.76"N, 76°40'34.59"E, 102m, 20 June 2017, Aswani & Maya, 145 (GVCH); Karadikunnu, 10°50'25.97"N, 76°49'42.92"E, 203m, 30 December 2017, Aswani & Maya, 1124 (GVCH); Kongampadam, 10°48'40.59"N, 76°46'51.94"E, 128m, 06 September 2019, Aswani & Maya, 4586 (GVCH); Anayappanchalla, 10°48'25.92"N, 76°48'35.19"E, 156m, 30 November 2019, Aswani & Maya, 5106 (GVCH).

Vicoa Cass., *Ann. Sci. Nat. (Paris)* 17: 418 (1829)

Vicoa indica DC., *in Wight, Contrib.* 10; Gamble, *Fl. Madras* 701 (1921); Sasidh., *Fl. Parambikulam WLS* 174 (2002); *Vicoa auriculata* Cass., Hook. f., *FBI* 3: 297 (1881); *Pentanema indicum* (L.) Ling, Vajr., *Fl. Palghat Dist* 258 (1990).

Habit : Herb
Ecosystem preference : Moist deciduous forests
Distribution : Indo - Pacific, Holarctic and African
IUCN Category : Not Evaluated (NE)
Habitat : Found in open forests
Raunkiaer's Life form : Therophyte
Distribution Frequency : Common
Phenology : November - February
Altitude preference : Found in lower and middle altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Kosavanidukku - Kaduvachal, 10°50'26.38"N, 76°40'30.88"E, 105m, 16 July 2017, Aswani & Maya, 342 (GVCH); Ayyappan Mala, 10°49'10.38"N, 76°44'28.29"E, 310m, 26 June 2018, Aswani & Maya, 2605 (GVCH); Mathappumala, 10°51'0.15"N, 76°49'53.62"E, 240m, 07 January 2020, Aswani & Maya, 5882 (GVCH); Aduppukootimala, 10°49'59.16"N, 76°44'31.56"E, 16 February 2021, Aswani & Maya, 6495 (GVCH) **(Plate 83: Fig. g)**.

Xanthium L., *Sp. Pl*. 2: 987 (1753)

Xanthium strumarium L., *Sp. Pl.* 2: 987 (1753); Hook. f., *FBI* 3:303 (1881); Gamble, *Fl. Madras* 703 (1921); Vajr., *Fl. Palghat Dist* 259 (1990); *Xanthium indicum* Koenig, Sasidh., *Fl. Parambikulam WLS* 174 (2002).

Habit : Herb
Ecosystem preference : Deciduous forests, also in the plains
Distribution : Indo - Pacific.
IUCN Category : Not evaluated
Habitat : Found in dry area
Raunkiaer's Life form : Phanerophyte
MicroEcosystem preference : Soil rich areas
Distribution Frequency : Common
Phenology : March - December

Altitude preference : Found in lower altitudes
Specimens examined : INDIA, Kerala: Palakkad District, Walayar range, Thonikadavu, 10°50'04.96"N, 76°40'48.72"E, 116m, 04 June 2017, Aswani & Maya, 43 (GVCH); Way to Ayyappan Mala, 10°48'59.96"N, 76°45'22.61"E, 132m, 06 January 2018, Aswani & Maya, 1225 (GVCH); Kava, 10°49'25.18"N, 76°43'29.96"E, 115m, 06 April 2018, Aswani & Maya, 1829 (GVCH).

Apiales

Araliaceae

Hydrocotyle javanica Thunb., *Diss. Hydroc. n.* 17. t. 2; ed. Pers. ii. 415. t. 2; C.B. Clarke in Hook. f., *FBI* 2: 667 (1879); Gamble, *Fl. Madras* 556 (1919); Vajr., *Fl. Palghat Dist* 222. 1990; Sasidh., Fl. Parambikulam WLS 141. 2002.

Habit : Herb
Ecosystem preference : Semi - evergreen forests
Distribution : Indo - Pacific and Holarctic
IUCN Category : Least Count (LC)
Habitat : Moist wet soils
Raunkiaer's Life form : Hemi - Cryptophyte
Distribution Frequency : Rare
Phenology : October - May
Altitude preference : Found in all altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Jamanthimala, 10°52'21.00"N, 76°47'00.24"E, 848m, 23 March 2019, Aswani & Maya, 4140 (GVCH).

Apiaceae

Prostrate herbs; rooting at nodes……..……..…….…. *Centella*

Erect or decumbent herbs; not rooting at nodes……..……..…….. *Pimpinella*

Centella L., *Sp. Pl.*, ed. 2. 2: 1393 (1763)

Centella asiatica **(**L.) Urb., *Fl. Bras. (Martius)* 11(1): 287 (1879); Gamble, *Fl. Madras* 556 (1919); Vajr., *Fl. Palghat Dist* 222 (1990); Sasidh., *Fl. Parambikulam WLS* 141 (2002); *Hydrocotyle asiatica* L., Hook. f., *FBI* 2: 669 (1879).

Habit : Herb
Ecosystem preference : Deciduous forests, also in wet places in the plains
Distribution : Indo - Pacific, African and Holarctic
IUCN Category : Least Count (LC)
Habitat : Prefer damp soil condition
Raunkiaer's Life form : Hemi - Cryptophyte
Distribution Frequency : Rare
Phenology : Throughout the year
Altitude preference : Found in all altitudes
Specimen examined : INDIA, Kerala: Palakkad District, Walayar range, Pothukunnu - Pudussery North, 10°53'21.84"N, 76°46'33.24"E, 970m, 28 January 2020, Aswani & Maya, 5989 (GVCH).

Pimpinella L., *Sp. Pl.* 1: 263 (1753)

Pimpinella heyneana (DC.) Benth., *Gen. Pl. [Bentham & Hooker f.]* 1(3): 894 (1867); Gamble, *Fl. Madras* 560 (1919); Vajr., *Fl. Palghat Dist* 223 (1990); Sasidh., *Fl. Parambikulam WLS* 142 (2002).

Habit : Herb
Ecosystem preference : Moist deciduous and semi evergreen forests

Distribution : Indo - Pacific
IUCN Category : Not Evaluated (NE)
Habitat : Found in rocky hills
Raunkiaer's Life form : Therophyte
Distribution Frequency : Occasional
Phenology : October - February
Altitude preference : Found in all altitudes
Specimens examined :INDIA, Kerala: Palakkad District, Walayar range, Kottamutti waterfall, 10°49'46.20"N, 76°46'47.28"E, 203m, 23 September 2018, Aswani & Maya, 2967 (GVCH); Jamanthimala,10°52'18.19"N,76°46'47.13" E, 923m, 09 January 2020, Aswani & Maya, 5712 (GVCH); Ayyappan Koil, 10°52'43.68"N, 76°47'6"E, 439m, 28 January 2020, Aswani & Maya, 5925 (GVCH) **(Plate 83: Fig. h)**.

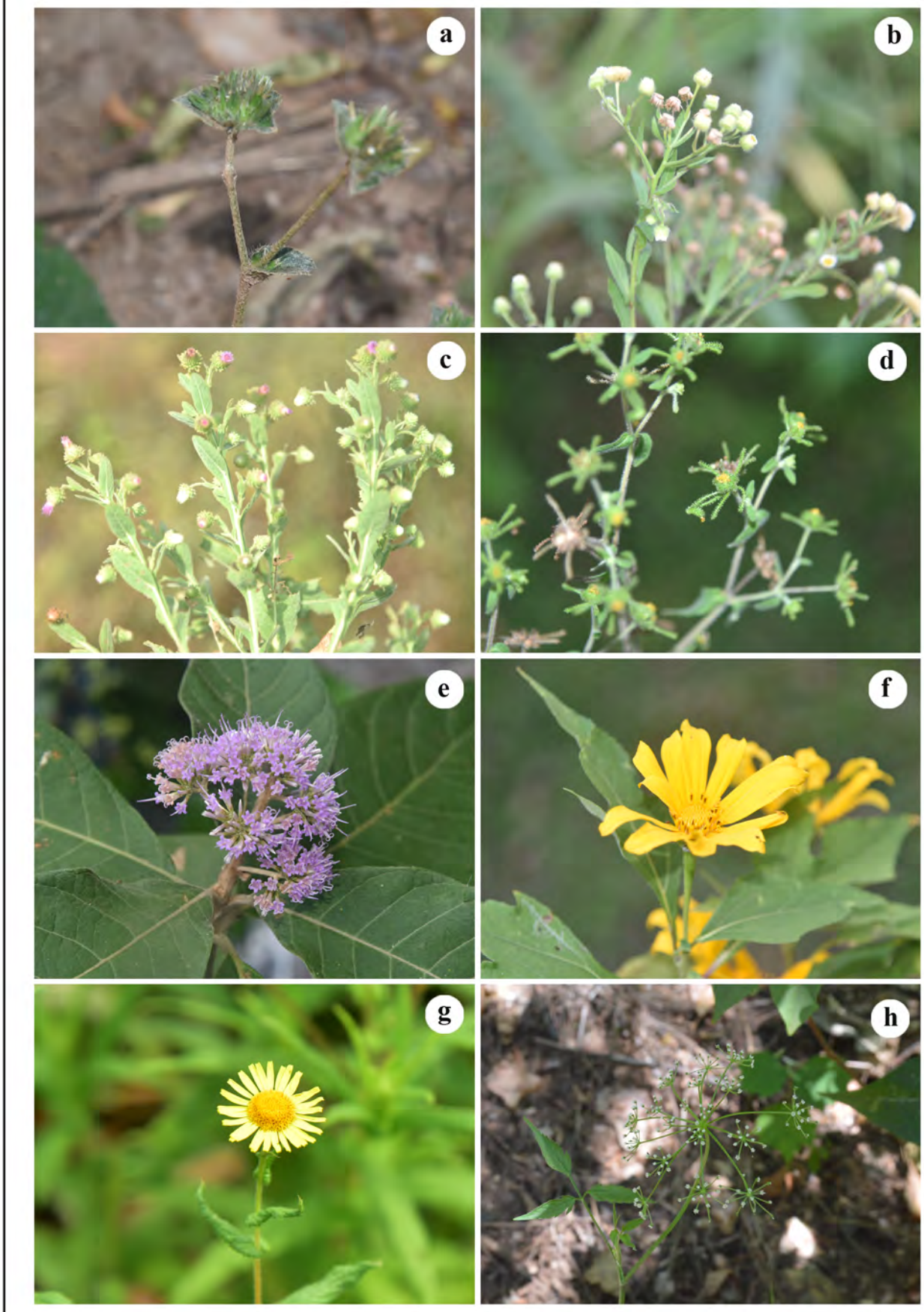

Plate 83: Fig. a. *Elephantopus scaber* L. **b.** *Erigeron bonariensis* L. **c.** *Laggera alata* (DC.) Sch.Bip. ex Oliv. **d.** *Sigesbeckia orientalis* L. **e.** *Strobocalyx arboreus* Sch.Bip. **f.** *Tithonia diversifolia* (Hemsl.) A.Gray **g.** *Vicoa indica* DC. **h.** *Pimpinella heyneana* (DC.) Benth.

RESULTS (IV.2 onwards)

IV.2. Habitat diversity and vegetation distribution in Walayar Range Forests

Objective addressed

- Analysis of diversity in macro and micro habitats and associated floristic elements in Walayar forest range

IV.2.1. Macro habitat diversity

Walayar forest range lying to the North of Palghat gap is unique by its geographical, climatic, physiological and edaphic features. The main hill tracts as well as granitic outcrops scattered throughout makes the forest range encompassed with different vegetation and unique biodiversity. Thorough and systematic observation on the floristic elements within this range revealed that the habitat diversity can be broadly classified as diversity on mountains and diversity in low altitude hillocks or outcrops.

Floristic survey conducted in main hill tracts of Walayar hill ranges could reveal vegetation types as West - coast semi- evergreen forests, Southern moist mixed deciduous forests, Southern montane wet grasslands and Southern tropical thorn forests (Scrub jungles). Other than these major forest types, some minor (edaphic forest types) types were also recognized viz., Bamboo brakes, Euphorbiaceous scrub jungles, wetlands and riparian vegetation.

IV.2.1.1. Low Altitude Hillocks

Due to distinct heterogeneity in its topography, elevation, climate and edaphic factors, Walayar range with its administrative boundary under Palakkad forest division of Palakkad district lying within Palghat gap region harbours diverse isolated low altitude hillocks existing as granitic rocky systems and support rich and unique floral wealth.

In this range, hillock systems are seen interspersed with agricultural lands or dwelling places of village people. The forest vegetation is of lesser extent and has specific habitat limitations like exposure to higher temperature and scarcity of soil.

The survey could reveal 19 low altitude hillocks, which are found scattered throughout, but more concentrated towards the northern lip of the range. The hillocks are more widely distributed towards the western side than the eastern side. The distribution of hillocks is restricted to Kottekad, Pudussery North, Akathethara and Walayar sections and no detached hill systems could be found in Akamalavaram and Pudussery South sections. Kottekkad section holds more hillocks in the western region, while Pudussery North and

Walayar sections encompass the rest of the hillocks. But while going to the North - eastern side, the hillocks are found to be much closer than to the Western region. The altitude of these hillocks range from 10m to upto 150m. Further, the shape of these rocky outcrops varies from typical mountainous dome shaped or appear to be flat tabletop rocky systems. Rarely, these hillocks seemed to be formed of just the assemblage of very large rocks together.

As the shape of the hillocks varies, the vegetation also showed a gradation, which further connected with the climatic and edaphic conditions to which the hillocks are exposed to. The precipitation level and the temperature regimes are favorable for vegetation in the western side. But the hillocks towards the Walayar end experience comparatively less precipitation, high temperature and the strong hot and dry winds blowing through the Gap. These extremities create a distinct vegetation difference in the hillocks toward the Walayar region or north - eastern end of the study area.

The vegetation in these hillocks constitute moist deciduous elements, even though there are no moist deciduous forests in the hillock systems. Since the hillocks in Kottekad and Akathethara sections are much steeper and altitudinally higher than rest of the outcrops, small seasonal water channels appear in the hillock systems during the monsoon season. Further, this favors the habitation of unique microhabitats with taxa having a very narrow ecological niche. Koomachimala, Kozhimala, Poozhikunnu, Malampuzha guest house hillocks are among such systems. But the hillocks towards the Walayar and Pudussery sections such as Kongampadam, Vattappara, Chemanamadu and Anayappanchalla lack such vegetation due to the table top nature of hillocks and comparatively low altitudes. These hillocks are characterized by the presence of unique Euphorbiacean scrub jungles which are absent towards the Western region. These scrub jungles with predominance of succulent taxa such as *Euphorbia tortilis* Rottler ex Ainslie, *Opuntia dillenii* Haw. and *Cereus pterogonus* Lem are characteristic of the hillocks in Walayar region. These hillocks are devoid of ephemeral flush vegetation and other slender herbaceous elements.

The hillocks represent small geographical systems, which are currently subjected to grazing and quarrying along with other anthropogenic disturbances. Though less heavily impacted than the mainstream hills and forest systems of the range, continuous disturbances and extremities in the environment will alter and degrade these small ecological niches beyond their restorability.

IV.2.1.2. The Ghats and vegetation distribution (Plate 84 - 88)

IV.2.1.2. 1. West Coast Semi - evergreen forests

This type of forest is a mixture of both evergreen and moist deciduous elements and is an intermediate formation with dominance of evergreen elements with few deciduous taxa. These forests are distributed in the hill tracts of Jamanthimala, Aatumala, Chinnattumala, Aduppukootimala, Parapetti, Ayyappan Mala etc. These are bordered by moist mixed deciduous elements and are seen in association with some riverine systems or any other forest waterfalls. Such formations will retain the moisture content even during the summer season and are found at an altitude above 500m above sea level.

These forests are characterized by the presence of trees, shrubs, herbs, lianas, climbers, stragglers and epiphytes. As in the evergreen forests, three tier canopy cover of vegetation with specific floristic assemblage can be seen in this semi - evergreen forest type with comparatively less foliage than evergreen formations. The upper storey mainly consists of evergreen trees and large lianas. The presence of epiphytic ferns and bryophytes is one of the striking features with boulders and large rocks near to water bodies colonized by bryophytes and ferns during favorable climate. The epiphytic orchids include *Aerides maculosa* Lindl., *Oberonia bicornis* Lindl. etc. and other epiphytes include *Remusatia vivipara* (Roxb.) Schott, *Taxillus tomentosus* (B.Heyne ex Roth) Tiegh. etc. The most common evergreen trees found include *Artocarpus heterophyllus* Lam., *Artocarpus hirsutus* Lam., *Ficus arnottiana* (Miq.) Miq., *Baccaurea courtallensis* (Wight) Müll.Arg., *Symplocos acuminata* Miq., *Ailanthus triphysa* (Dennst.) Alston, *Sapindus trifoliatus* L., *Dimocarpus longan* Lour., *Hymenodictyon obovatum* Wall., *Carallia brachiata* Merr., *Prunus ceylanica* Miq., *Drypetes oblongifolia* (Bedd.) Airy Shaw, *Drypetes confertiflora* Pax & K.Hoffm., *Hydnocarpus alpinus* Wight, *Hydnocarpus pentandrus* (Buch.-Ham.) Oken, *Holigarna arnottiana* Hook.f., *Monoon fragrans* (Dalzell) B.Xue & R.M.K.Saunders, *Hunteria zeylanica* Gardner ex Thwaites etc. This formation harbours few buttress trees like *Tetrameles nudiflora* R.Br. also. The middle storey is composed of comparatively smaller trees like *Crateva magna* DC., *Garcinia cowa* Roxb., *Garcinia gummi-gutta* (L.) N.Robson, *Diospyros trichophylla* Alston, *Mallotus resinosus* Merr., *Mallotus rhamnifolius* Müll.Arg., *Phoebe lanceolata* (Nees) Nees, *Beilschmiedia gemmiflora* (Blume) Kosterm., *Actinodaphne salicina* Meisn. etc. Apart from trees, there is the presence of large lianas and climbers represented by *Thunbergia mysorensis* (Wight) T.Anderson, *Ancistrocladus heyneanus* Wall. ex J. Graham, *Aganosma cymosa* (Roxb.) G. Don, *Pothos scandens* L., *Combretum albidum* G.Don, *Elaeagnus conferta* Roxb.,

Guilandina bonduc L., *Entada phaseoloides* Merr., *Phanera scandens* (L.) Lour. ex Raf. etc.

Since the trees, other shrubs and climbers occur in various tiers, light penetration in the lower storey favors the growth of ground vegetation . The lower storey is composed of herbs and shrubs such as *Mappia nimmoniana* (J.Graham) Byng & Stull, *Triumfetta pilosa* Roth, *Antidesma acidum* Retz., *Spodiopogon rhizophorus* (Steud.) Pilg., *Argostemma courtallense* Arn., *Geophila repens* (L.) I.M.Johnst., *Pavetta zeylanica* Gamble, *Atalantia monophylla* (L.) DC., *Elatostema heyneanum* (Wedd.) Hallier f.. etc. During the monsoon season, the forest floor get flourished with numerous Zingibers such as *Boesenbergia pulcherrima* Kuntze, *Globba marantina* L., *Globba sessiliflora* Sims, *Zingiber neesanum* (J.Graham) Ramamoorthy, *Zingiber nimmonii* Dalzell, *Zingiber sabuanum* K.M.P.Kumar & A.Joe , *Curcuma vamana* M.Sabu & Mangaly, *Curcuma aurantiaca* Zijp etc. This forest vegetation showed the presence of 282 taxa and are summarized in annexure I.

IV.2.1.2.2. Southern moist mixed deciduous forests

This forest type constitutes the major forest vegetation of Walayar range and occurs on the lower slopes and ridges towards the facing segment of Palghat Gap. The main hill tracts like Thekke Malampuzha, Edamala, Moochikadavu, Pettikallu, G. P. Nair estate, lower parts of Chacolas estate, Azhakumppara waterfalls, Neelippara, Kottamutti waterfalls, Ayyappan Mala, Kaatadikunnu, Mathappumala, Karadikunnu, Anakkal, the catchment region in Malampuzha dam and the rocky outcrops like Koomachimala, Poozhikunnu, Kozhimala, Olappalam, Pallippara, Karadikunnu, Cheranpara etc harbour this vegetation. These forests are usually found between the altitude range from 30m to 500m.

These forests are characterized by much less canopy cover compared to semi - evergreen forests. The stratification is two layered, with upper strata of trees and shrubs mostly of deciduous nature interspersed with a few evergreen ones. The most peculiar feature of this vegetation is the predominance of *Terminalia paniculata* Roth, *Alstonia scholaris* (L.) R.Br., *Wrightia tinctoria* R.Br., *Terminalia anogeissiana* Gere & Boatwr., *Dalbergia latifolia* Roxb., *Sterculia urens* Roxb., *Givotia moluccana* (L.) Sreem., *Cochlospermum religiosum* (L.) Alston, *Xylia xylocarpa* (Roxb.) W.Theob., *Bombax ceiba* L., *Ceiba pentandra* (L.) Gaertn, *Mallotus philippensis* (Lam.) Müll.Arg., *Butea monosperma* Kuntze, *Naringi crenulata* (Roxb.) Nicolson etc. The other important trees include *Dalbergia* sp, *Gmelina arborea* Roxb. ex Sm., *Tectona grandis* L.f., *Careya*

arborea Roxb., *Strychnos nux-vomica* L., *Grewia tiliifolia* Vahl, *Streblus asper* Lour., *Ficus* sp, *Bridelia retusa* A.Juss., *Cleistanthus collinus* Benth. & Hook.f., , *Chloroxylon swietenia* DC., *Schleichera oleosa* (Lour.) Oken., *Holoptelea integrifolia* (Roxb.) Planch. etc.

The most common shrubs include *Leea asiatica* (L.) Ridsdale, *Canthium coromandelicum* (Burm.f.) Alston, *Flueggea* sp, *Helicteres isora* L., *Ziziphus oenoplia* (L.) Mill. etc. *Combretum albidum* G.Don, *Spatholobus parviflorus* Kuntze, *Gloriosa superba* L., *Getonia floribunda* Roxb., *Asparagus* sp, *Ampelocissus latifolia* (Roxb.) Planch., *Cayratia pedata* Gagnep., *Cissus vitiginea* L., *Cardiospermum halicacabum* L., *Jasminum coarctatum* Roxb., *Tinospora cordifolia* (Willd.) Miers ex Hook.f. & Thomson, *Anamirta cocculus* (L.) Wight & Arn. etc are the most common climbers found in this vegetation.

The understory is also featured by the presence of small temporary water channels formed during the monsoon season and will be inhabited by very small herbaceous ephemeral taxa such as *Drosera indica* L., *Eriocaulon xeranthemum* Mart., *Impatiens minor* (DC.) Bennet, *Rhamphicarpa fistulosa* Benth., *Utricularia graminifolia* Vahl, *Utricularia lazulina* P.Taylor, *Xyris pauciflora* Willd., *Mitrasacme prolifera* R.Br., *Cyanotis* sp etc.

Further, the lower storey will be biodiverse by the presence of grass members such as *Alloteropsis cimicina* Stapf, *Arundinella mesophylla* Nees ex Steud., *Eragrostis unioloides* Nees ex Steud., *Tripogon bromoides* Roem. & Schult., *Chloris barbata* Sw., *Sporobolus indicus* (L.) R.Br., etc.

During the post monsoon period, the lower storey is colonized by invasive taxa such as *Chromolaena odorata* (L.) R.M.King & H.Rob., *Mikania micrantha* Kunth, *Mesosphaerum suaveolens* (L.) Kuntze, *Croton hirtus* L'Hér., and *Coleus strobilifer* (Roxb.) A.J.Paton that forms a thick understorey which on the onset of summer season will dry up and become vulnerable for forest fire. Another feature of these forests is that defoliation begins during December - January. The trees shed their leaves and start to bloom and set fruits in due course of time. The onset of summer season will make the lower hill tracts much drier than the rest of the mountains. The lower stretch of the forests then appears to be dry deciduous without any sign of green patch during the entire summer. All the grass members and other herbaceous plants will dry and turn yellowish - brown. But, it cannot be stated that the vegetation to be dry deciduous since the onset of monsoon will gradually turn the dry hill to green mat again with diverse microhabitats and ephemeral

vegetation. A total of 418 taxa were described from this region and are included in annexure II.

IV.2.1.2.3. Grasslands

The grasslands in Walayar forest range can be classified as low elevation grasslands and montane grasslands based on their distribution with respect to altitudes. Only few grasslands are found in Walayar hill ranges. Low elevation grasslands occur within the altitudinal range from 600m to 1000m. They are found in Jamanthimala, Mathappumala, Aduppukootimala and Azhakumpara waterfalls. Parapetti, Aatumala and Chinnattumala grasslands distributed above 1000m altitude can be considered as the montane grasslands, though not with typical representation of montane grassland elements. The low level grasslands are represented by *Hypoxis aurea* Lour., *Erigeron bonariensis* L., *Osbeckia gracilis* Bedd., *Wendlandia thyrsoidea* Steud., *Dendrobium ovatum* Kraenzl., *Kalanchoe olivacea* Dalzell, *Arundinella mesophylla* Nees ex Steud., *Cymbopogon citratus* Stapf, *Cymbopogon flexuosus* (Nees ex Steud.) Will. Watson, *Swertia corymbosa* (Griseb.) Wight ex C.B.Clarke etc.

The high altitude grasslands is floristically diverse with *Phoenix loureiroi* Kunth, *Polyspora obtusa* (Wall. ex Wight & Arn.) Niissalo & L.M.Choo, *Hypoxis aurea* Lour., *Erigeron bonariensis* L., *Cymbopogon citratus* Stapf, *Arundinella mesophylla* Nees ex Steud., *Arundinella ciliata* Nees ex Miq., *Swertia corymbosa* (Griseb.) Wight ex C.B.Clarke, *Flemingia macrophylla* (Willd.) Kuntze ex Merr., *Wendlandia thyrsoidea* Steud., *Dendrobium barbatulum* Lindl., *Osbeckia* spp., *Lepidagathis* spp., *Rostellaria* spp. etc. The study could record 114 taxa as grassland elements and is summarized in annexure III.

IV.2.1.2.4. Southern Tropical thorn forests (Scrub jungle)

The scrub jungles in Walayar forest range, are not represented by characteristic elements and growth forms, yet there is the presence of scrub jungle elements in plains near the political boundary of Palakkad district and the state of Tamilnadu near Walayar. The wastelands and other plains are inhabited by taxa like *Dichrostachys cinerea* (L.) Wight & Arn., *Prosopis juliflora* (Sw.) DC., *Senegalia chundra* (Roxb. ex Rottler) Maslin, *Bridelia retusa* A.Juss., *Achyranthes aspera* L., *Ziziphus oenoplia* (L.) Mill., *Butea monosperma* Kuntze, *Azadirachta indica* A.Juss. etc. Taxa like *Chromolaena odorata* (L.) R.M.King & H.Rob., *Mikania micrantha* Kunth, *Parthenium hysterophorus* L., *Ricinus communis* L., *Mesosphaerum suaveolens* (L.) Kuntze etc. were found to be invasive to the vegetation frequently. The presence of such scrub jungle elements as an adaptive representation in this

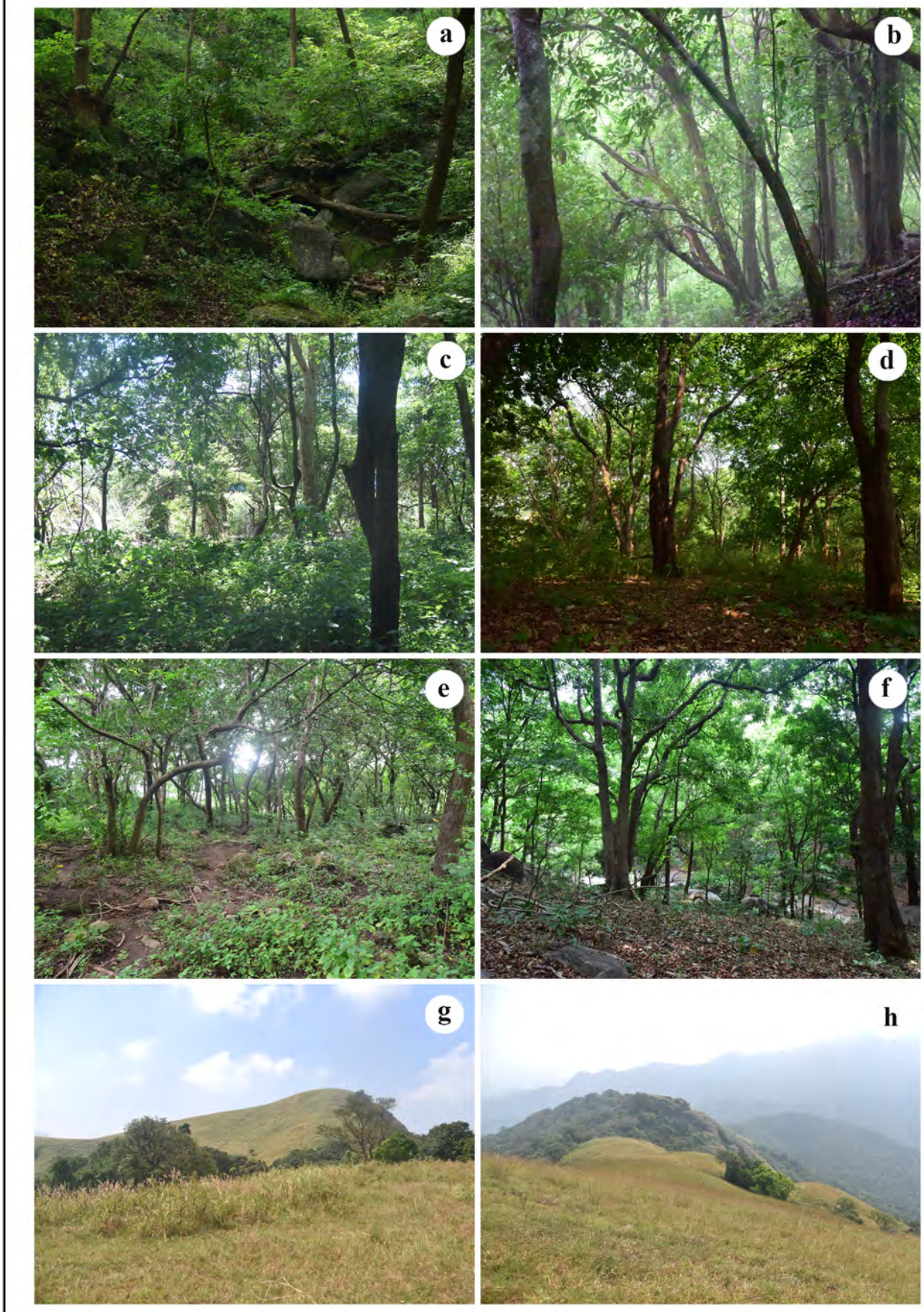

Plate 84: Habitat diversity in Walayar hills Fig. a – b. Semi – evergreen forests **d. – f.** Moist deciduous forests **g. – h**. Grasslands

forest range forms the differentiating vegetation trait from other ranges of Palakkad District. Table 7 summarizes the scrub jungle elements represented in Walayar forest range.

Table 7. Scrub jungle elements in Walayar forest range

Sl. No.	Binomial Name	Family
1	*Andrographis paniculata* (Burm.f.) Wall.	Acanthaceae
2	*Barleria prionitis* L.	Acanthaceae
3	*Blepharis integrifolia* E.Mey. & Drège	Acanthaceae
4	*Justicia glauca* Rottler	Acanthaceae
5	*Boucerosia umbellata* Wight & Arn.	Apocynaceae
6	*Cosmostigma cordatum* (Poir.) M.R.Almeida	Apocynaceae
7	*Cynanchum annularium* (Roxb.) Liede & Khanum	Apocynaceae
8	*Oxystelma esculentum* (L.f.) Decne.	Apocynaceae
9	*Pergularia daemia* (Forssk.) Chiov.	Apocynaceae
10	*Phyllocephalum courtallense* (Wight) Narayana	Asteraceae
11	*Impatiens minor* (DC.) Bennet	Balsaminaceae
12	*Ehretia microphylla* Lam.	Boraginaceae
13	*Euploca marifolia* var. *rottleri* (Lehm.) Ancy & P.Javad	Boraginaceae
14	*Opuntia dillenii* Haw.	Cactaceae
15	*Getonia floribunda* Roxb.	Combretaceae
16	*Ipomoea eriocarpa* R.Br.	Convolvulaceae
17	*Ipomoea sagittifoli*a Burm.f.	Convolvulaceae
18	*Crotalaria mysorensis* Roth	Fabaceae
19	*Indigofera astragalina* DC.	Fabaceae
20	*Indigofera colutea* (Burm.f.) Merr.	Fabaceae
21	*Tephrosia pumila* Pers.	Fabaceae
22	*Basilicum polystachyon* (L.) Moench	Lamiaceae
23	*Volkameria inermis* L.	Lamiaceae
24	*Abutilon indicum* (L.) Sweet	Malvaceae
25	*Pavonia zeylanica* (L.) Cav.	Malvaceae
26	*Tinospora cordifolia* (Willd.) Miers ex Hook.f. & Thomson	Menispermaceae
27	*Zanthoxylum asiaticum* (L.) Appelhans, Groppo & J.Wen	Rutaceae
28	*Cardiospermum halicacabum* L.	Sapindaceae
29	*Datura stramonium* L.	Solanaceae

These macrohabitats are located along the national highway passing through the Palghat gap region and are often prone to anthropogenic disturbances like construction purposes and agri practices. The area is often found modified for agricultural lands of maize, Sorghum, sugarcane and other vegetables like Amaranthus, Chilli and Tomato.

IV.2.1.2.5. Euphorbiaceous scrub jungles

This type of vegetation is a peculiar feature of rocky outcrops towards the Palghat gap region such as Anayappanchalla, Kongampadam, Koyyamarakadu, Mayappalam and Karadikunnu. These rocky outcrops experience less precipitation, heavy sunshine and more dryness than the rest of the hillocks in the range and warrants taxa which can thrive well with these adversities. Thus, the vegetation is characterized by the predominance of succulent Euphorbiacean member *Euphorbia tortilis* Rottler ex Ainslie. It is further associated with other succulents such as *Opuntia dillenii* Haw., *Cereus pterogonus* Lem, *Murdannia semiteres* (Dalzell) Santapau, *Cyanotis burmanniana* Wight., *Coleus strobilifer* (Roxb.) A.J.Paton, *Portulaca pilosa* L. etc. These taxa are found in the rocky surfaces with very limited or scarce soil and often serve as shelters for many small other herbaceous plants like *Theriophonum fischeri* Sivad., *Cyperus dubius Rottb., Amorphophallus paeoniifolius (Dennst.) Nicolson, Paramollugo nudicaulis* (Lam.) Thulin, *Ipomoea nil (*L.) Roth, *Phyllanthus urinaria* L., *Microstachys chamaelea* (L.) Müll.Arg. etc.

IV.2.1.2.6. Bamboo brakes

Bamboo brakes is one of the important edaphic forest types found in close connection with moist deciduous and semi - evergreen forests and are found in the range at S- medu, Parapetty, Nadupathy, Mines, Akamalavaram - Moochikadavu, Chacolas estate etc. *Bambusa bambos* (L.) Voss and *Dendrocalamus strictus* Nees are the most represented elements in bamboo brakes in the range. The forest department has further initiated the growing and maintenance of *Bambusa bambos* (L). Voss in the hill tracts of Pettikallu, Moochikadavu and Kavarakundu regions. Small colonies of *Calamus rotang* L. and *Calamus thwaitesii* Becc. are often found near waterfalls in Akamalavaram hills.

IV.2.1.2.7. Degraded forest elements

The outskirts of the hill systems have degraded forest elements and are often found near human settlements. Often the vegetation is a mixture of both wild taxa and the domesticated ones or gardenscapes. The taxa included in degraded forests (87 taxa) are summarized in annexure IV.

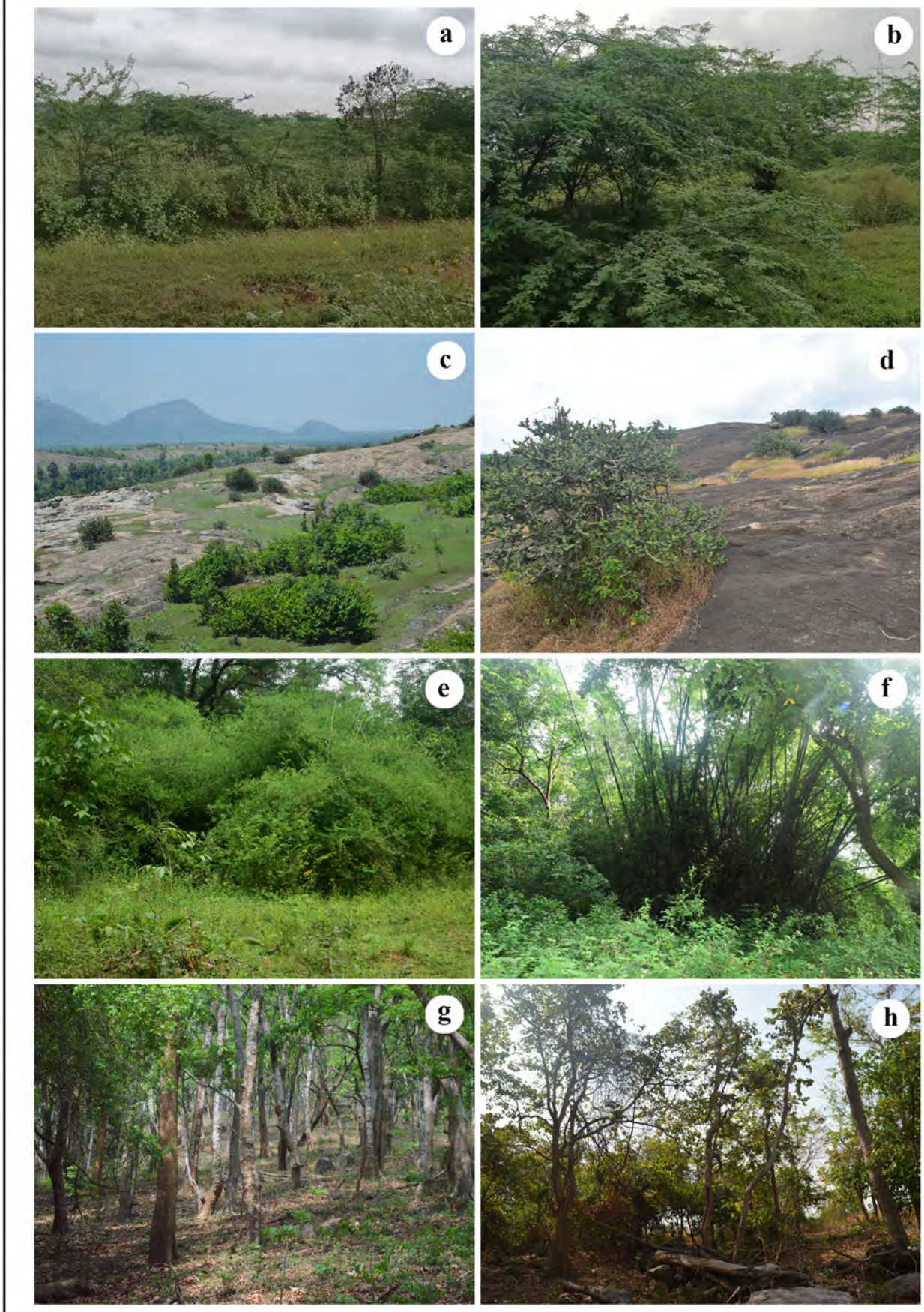

Plate 85: Habitat diversity in Walayar hills Fig. a –b. Scrub jungles **c. – d**. Euphorbaceous scrub jungles **e. – f.** Bamboo brakes **g. – h.** Degraded forests

IV.2.1.2.8. Wetlands and riparian elements

The Walayar hill ranges are gifted with many small to large waterfalls and resulted in small formations of riverine vegetation stretches near forest streams in the study area. Moochikadavu, Kavarakundu, Chaatappara, Kottamutti, Parachaathy and Parapetti are the important waterfalls in the range and the documentation could record 115 riparian or wetland elements and is summarized in annexure V.

IV.2.1.2.9. Perennial ponds and rock pools

Several perennial ponds are found within the forest range and the majority of them are created for irrigation purposes. Further many rock pools are found in association with the hillock systems which are created by the activities of quarries. These habitats harbor numerous hydrophytes such as *Nymphaea nouchali* Burm.f., *Nelumbo nucifera* Gaertn., *Ottelia alismoides* (L.) Pers., *Limnophila heterophylla* Benth., *Pistia stratiotes* L., *Pontederia crassipes* Mart. etc. Most of the perennial ponds are located near residential areas or agricultural lands. Rock pools in outcrops are formed by the activity of quarries and hence the depth of these pools will be upto 50m.

IV.2.1.2.10. Plantations

The study area has many plantations of rubber, pineapple, cashew and mango. These are often located in the catchment area of Malampuzha dam and are under private ownership. The Kerala Forest department has maintained several plantations including teak, *Eucalyptus sp*., Cane, *Bamboo*, cashew, *Dalbergia spp*., *Casuarina sp.* and *Acacia sp.* in several plots in the forest range. Since the forest range is much drier and hotter, it favors the growth of teak, and hence the major plantation becomes teak and a teak depot is established for the maintenance, thinning, harvesting and processing of the teak wood in the study area. The department has further initiated the rehabilitation of degraded forests in Palamara forest regions. The miscellaneous growing of trees (MISC) is carried out in Pullimanpathy, Vattappara, Malampuzha, Nellisseri and Chozhamkod regions. Tree species like *Azadirachta indica* A.Juss., *Xylia xylocarpa* (Roxb.) W.Theob., *Terminalia paniculata* Roth, *Grewia tiliifolia* Vahl, *Pongamia pinnata* (L.) Pierre, *Phyllanthus emblica* L., *Pterocarpus marsupium* Roxb., *Syzygium cumini* (L.) Skeels, *Gmelina arborea* Roxb. ex Sm. etc. are planted so as to revert that area back to natural forests. The details of the total plantations maintained by the Kerala Forest Department is summarized in annexure VI which includes the year, plantation name and location details.

IV.2.1.2.11. Reservoir vegetation

Malampuzha and Walayar dams are the two irrigation purpose dams within the Walayar forest range and are featured with diverse floristic elements in the catchment areas and on the dam banks. The water in the reservoir recedes during the post monsoon period and limited water is reserved during the summer season. The dam banks, where the water receded got inhabited by small herbaceous to small sized herbs and shrubs. These plants have very fast growth, absorbing the mineral rich soil in the dam and will start to flower during the months from January to March. A total of 160 taxa could be recorded from both reservoirs and is summarized in annexure VII.

Major taxa observed include Torenia *crustacea* (L.) Cham. & Schltdl., *Torenia lindernioides* C.J.Saldanha, *Sphenoclea zeylanica* Gaertn., *Bulbostylis barbata* (Rottb.) C.B.Clarke, *Fimbristylis aestivalis* var. *aestivalis* (Retz.) Vahl, *Bonnaya antipoda* Druce, *Chloris barbata* Sw., *Coldenia procumbens* L., *Cyperus maderaspatanus* Willd., *Cynodon dactylon* (L.) Pers., *Dentella repens* J.R.Forst. & G.Forst., *Dactyloctenium aegyptium* (L.) Willd., *Eragrostis gangetica* Steud., *Eragrostis unioloides* Nees ex Steud., *Lindernia rotundifolia* (L.) Alston, *Oxalis corniculata* L., *Perotis indica* (L.) Kuntze, *Phyla nodiflora* (L.) Greene, *Polycarpon prostratum* (Forssk.) Asch. & Schweinf., *Saccharum spontaneum* L. etc. The floristic diversity of the reservoirs follow a cyclic process that in the monsoon season reservoir plants get inundated by the water and later during the summer season, recolonization of the same taxa in both dams continues till the next inundation cycle.

The Malampuzha dam is characterized by the presence of numerous small to medium sized rocky islands which almost get submerged when water level of the dam rises during the monsoon season. These rocky islands are further colonized by a few shrubs, trees and small herbs. The most common taxa found are *Acacia auriculiformis* A.Cunn. ex Benth., *Calotropis gigantea* (L.) W.T. Aiton, *Cassia fistula* L., *Cochlospermum religiosum* (L.) Alston, *Holarrhena pubescens* Wall. & G.Don, *Ipomoea pes-tigridis* L., *Macaranga peltata* Müll.Arg., *Streblus asper* Lour., *Strychnos nux-vomica* L., *Terminalia* sp., *Wrightia tinctoria* R.Br., *Ziziphus oenoplia* (L.) Mill., *Morinda coreia* Buch.-Ham. etc.

The reservoir vegetations were found affected by alien invasive taxa viz., *Xanthium strumarium* L., *Martynia annua* L., *Saccharum spontaneum* L., *Ricinus communis* L., *Ouret lanata* (L.) Kuntze, *Mikania micrantha* Kunth, *Ipomoea pes-tigridis* L., *Ipomoea carnea* subsp. *fistulosa* (Mart. ex Choisy) D. F. Austin, *Cuscuta chinensis* Lam., *Croton hirtus* L'Hér., *Croton bonplandianus* Baill., *Chromolaena odorata* (L.) R.M.King & H.Rob., *Acacia auriculiformis* A.Cunn. ex Benth. etc. Among these taxa, *Xanthium strumarium* L.,

Plate 86: Waterfalls in Walayar forest range Fig. a. Chaatappara waterfalls **b.** Azhakumpara waterfalls **c.** Kavarakundu **d.** Moochikadavu **e.** Chaavadippara waterfalls **f.** Vettumadavu **Fig. g. – h**. Rivers in Walayar hills **g.** Korayaar river **h.** Walayar river

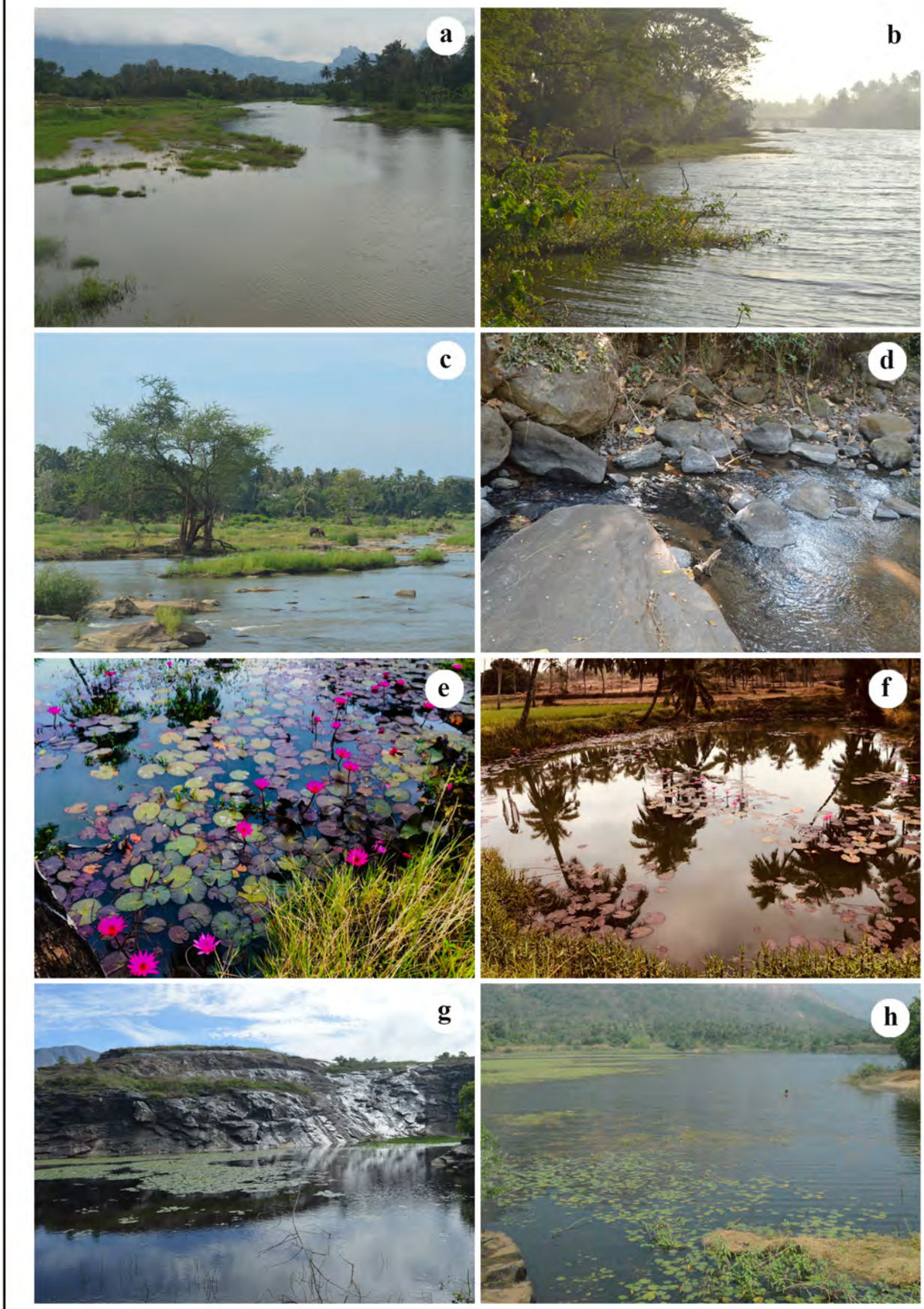

Plate 87: Waterbodies in Walayar forest range Fig. a. – d. Rivers in Walayar hills
a. Onnaampuzha **b.** Naregampillypuzha **c.** Mukkaipuzha **d.** Kallanpuzha **e. – f.** Perennial ponds
g. – h. Rock pools

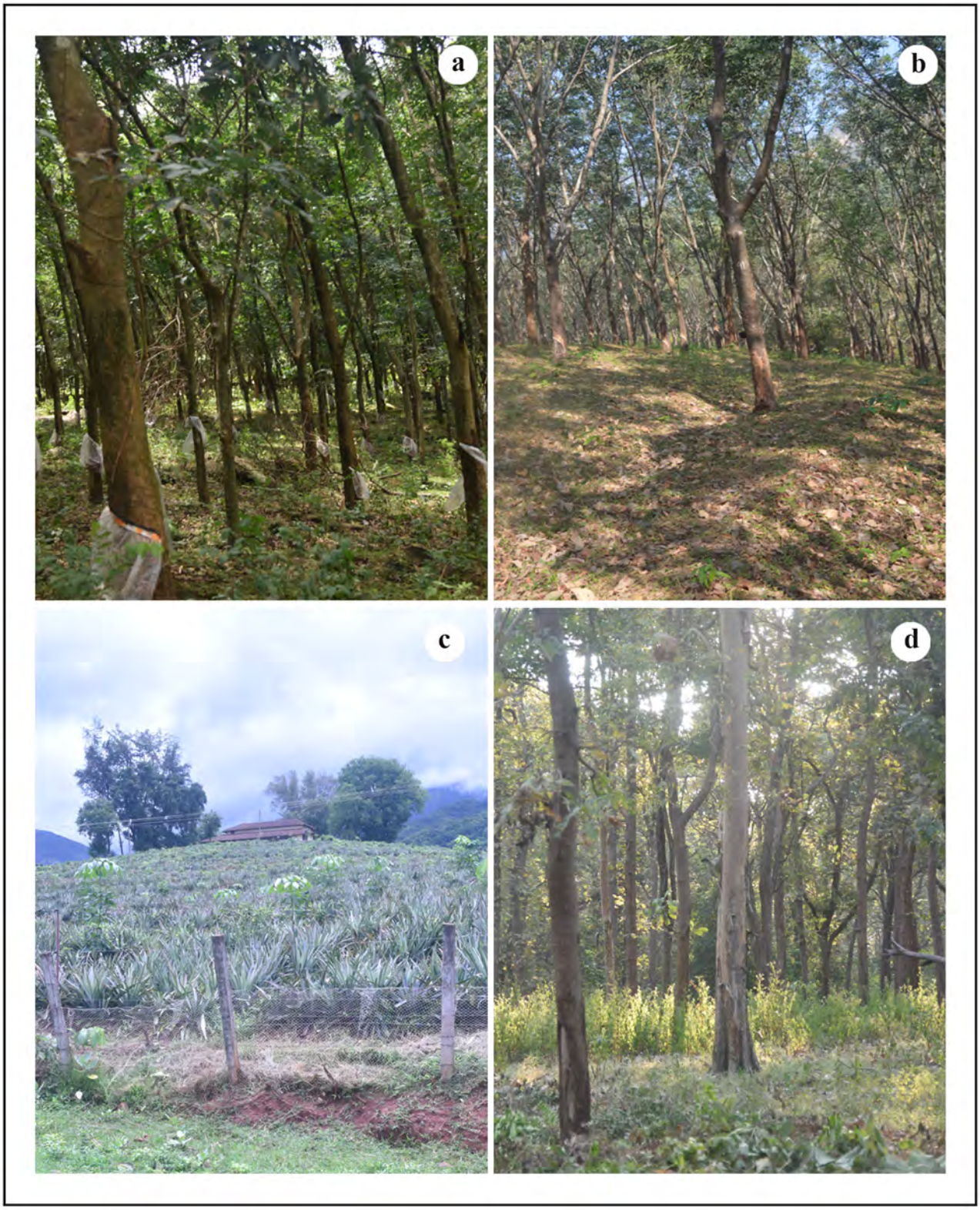

Plate 88. Plantations in Walayar forest range Fig. a – b. Rubber plantations c. Pineapple estates d. Miscellaneous tree plantations

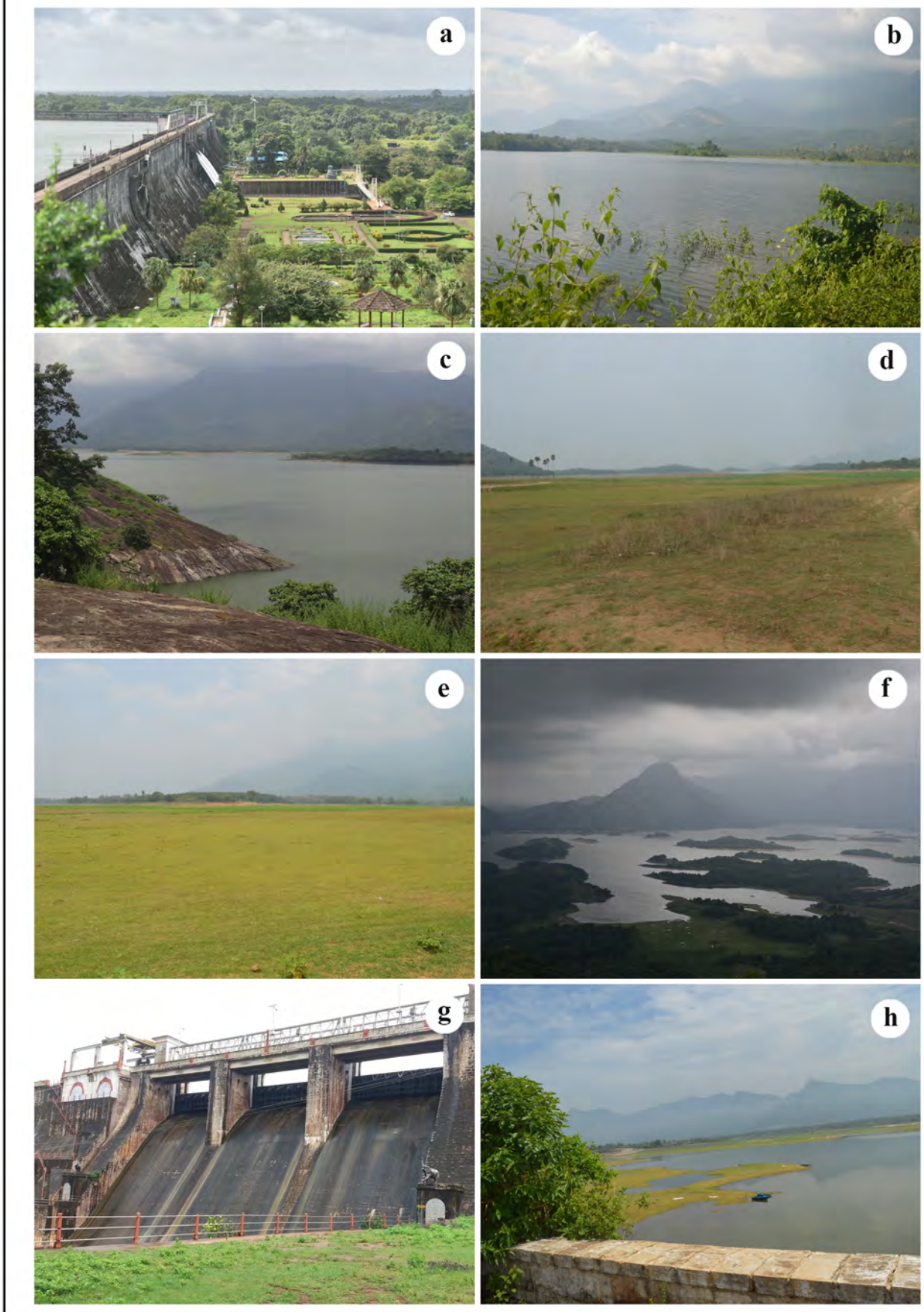

Plate 89: Reservoirs in Walayar hill ranges Fig. a. – d. Malampuzha dam **e.** The catchment area of Malampuzha dam during summer **f.** Rocky outcrops in Malampuzha dam **g. – h.** Walayar dam

Ipomoea carnea subsp. *fistulosa* (Mart. ex Choisy) D. F. Austin and *Acacia auriculiformis* A.Cunn. ex Benth. are very fast colonizing and invades the marshy regions of the dam and further widen its territory in the succeeding years which gradually removes the indigenous taxa surviving in the dam banks and catchment zones.

IV.2.1.2.12. Sacred grove elements

Though typical sacred groves are absent within the forest range, vegetation included a total of 41 sacred grove elements recorded from the Walayar hill ranges and are summarized in table 8.

IV.2.1.2.13 Chasmophytic elements

Chasmophytes are unique plants that survives on thrives on bare rocks and soil less microhabitats are capable to overcome harsh edaphic environments. The taxa includes therophytes, chamaephytes and hydrophytes. The occupancy of each taxon and demarcation of each taxon in the microhabitat is often difficult and found to be inhabiting in a very complex way. Walayar hills documented 92 chasmophytes from the open rocky areas in hillocks and main ghats. Table 9 summarizes the chasmophytic elements in Walayar hills.

IV.2.2. Micro Habitat diversity in main Ghats (Plate 90 & 91)

The macrohabitats of any vegetation zone are characterized by specific micro zones where typical floristic elements find their niche for survival. Such microhabitats were identified within the Walayar forests also and include mud cliffs, boulders, exposed rocky out crops, buttresses, tree trunks and branches, fallen logs, riparian slopes etc. The following summary on such microhabitats has a direct link for the existence of certain specific floral elements in this fragile ecosystem, which is prone to drastic environmental fluctuations.

IV. 2.2.1. Mud cliffs

They are the small vertical mud slopes seen in the semi evergreen forests in Akamalavaram, Parapetti, Neelippara, Chacolas estate and G. P. Nair estate of Walayar forest range. Taxa like *Rhynchoglossum notonianum* (Wall.) B.L.Burtt, *Argostemma courtallense* Arn., *Ariopsis peltata* Nimmo, *Scleria lithosperma* (L.) Sw., *Epithema carnosum* Benth. etc. are some of the most commonly recorded taxa from this microhabitat and this specific assemblage of plants is found during the monsoon season. With the advent

of the dry season, these microhabitats got dried and are found to be bare without any floral components.

IV. 2.2.2. Exposed Rocky surfaces

These are the exposed rocky regions found in the moist deciduous forests where the plants are found to be growing on rock surfaces where there is negligible soil and become water scarce soon after the end of monsoon season. Taxa such as *Coleus strobilifer* (Roxb.) A.J.Paton, *Impatiens minor* (DC.) Bennet, *Pouzolzia zeylanica* (L.) Benn., *Rhynchoglossum notonianum* (Wall.) B.L.Burtt, *Cajanus scarabaeoides* (L.) Thouars, *Arundinella mesophylla* Nees ex Steud., *Cenchrus pedicellatus* (Trin.) Morrone, *Heteropogon contortus* (L.) P.Beauv. ex Roem. & Schult., *Cyanotis burmanniana* Wight, *Cymbopogon flexuosus* (Nees ex Steud.) Will.Watson etc. are found to be in the exposed rocky regions during the favorable seasons.

IV. 2.2.3. Buttresses

Presence of the buttress root system is another important feature found rarely in the semi evergreen forests of Walayar hill ranges. This feature helps the tree members like *Tetrameles nudiflora* R.Br. to gather nutrients from poor soils and further help the tree from falling over. Further, the base of the buttresses are home for certain herbaceous plants such as *Arisaema tortuosum* (Wall.) Schott, *Arisaema barnesii* C.E.C.Fisch., *Disperis monophylla* Blatt. ex C.E.C.Fisch., *Piper longum* L. etc.

IV. 2.2.4. Tree trunks

Tree trunks are often inhabited by smaller herbs such as *Piper longum* L., *Peperomia pellucida* (L.) Kunth, *Piper argyrophyllum* Miq., *Piper nigrum* L., *Piper wightii* Miq., *Pothos scandens* L., *Asparagus gonocladus* Baker etc. Many epiphytic taxa such as *Acampe praemorsa* (Roxb.) Blatt. & McCann, *Aerides maculosa* Lindl., *Dendrobium ovatum* (L.) Kranz., *Dendrobium barbatulum* Lindl. and *Oberonia bicornis* Lindl. are also found inhabiting the tree trunks.

IV. 2.2.5. Fallen logs

The fallen tree logs become the microhabitat for small herbaceous plants like *Peperomia pellucida* (L.) Kunth, *Impatiens minor* (DC.) Bennet, *Cyanotis pilosa* Schult.f,

Biophytum reinwardtii (Zucc.) Klotzsch. etc. These tree logs during monsoon season were found inhabited by fungi like *Xylaria*, many other basidiomycetes and moss members.

IV. 2.2.6. Riparian slopes

The riparian slopes are characterized by the presence of high water content throughout the season. And these water slopes are microhabited by taxa such as many grass members like *Ischaemum* sp, *Dimeria* sp, *Arundinella* sp and other taxa such as *Ficus* sp, *Macaranga peltata* Müll.Arg., *Brachypterum scandens* (Roxb.) Miq., *Impatiens scapiflora* B.Heyne, *Thunbergia mysorensis* (Wight) T.Anderson, *Boesenbergia pulcherrima* Kuntze, *Homonoia riparia* Lour. etc.

IV. 2.2.7. Boulders

This is characterized by large rocks or patches of rocks found in the forest tracks with very few vegetation surviving in the shade of this formation. Usually, bryophytes and pteridophytes are found to be inhabiting such habitats. *Cyperus brevifolius* (Rottb.) Endl. ex Hassk., *Bulbostylis barbata* (Rottb.) C.B.Clarke and *Pouzolzia zeylanica* (L.) Benn. are some of the few angiosperms found during the wet periods of the forests.

IV. 2.2.8. Rock Crevices and fissures

The fissures of the rocky forest tracks are inhabited by unique plants such as *Polycarpaea corymbosa* (L.) Lam., *Indigofera uniflora* Buch.-Ham. ex Roxb., *Dimeria* spp, *Impatiens* spp, etc. These habitats are very rare and unique to the forest flora where there is enough moisture and adequate sunlight and other edaphic factors.

Table 8. Sacred grove elements in Walayar forest range

Sl. No.	Binomial name	Family
1	*Eranthemum capense* L.	Acanthaceae
2	*Alstonia scholaris* (L.) R.Br.	Apocynaceae
3	*Cosmostigma cordatum* (Poir.) M.R.Almeida	Apocynaceae
4	*Plumeria alba* L.	Apocynaceae
5	*Tabernaemontana alternifolia* L.	Apocynaceae
6	*Ariopsis peltata* Nimmo	Araceae
7	*Pothos scandens* L.	Araceae
8	*Hydrocotyle javanica* Thunb.	Araliaceae
9	*Calamus rotang* L.	Arecaceae
10	*Impatiens minor* (DC.) Bennet	Balsaminaceae
11	*Salacia chinensis* L.	Celastraceae
12	*Combretum latifolium* Blume	Combretaceae
13	*Dioscorea pentaphylla* L.	Dioscoreaceae
14	*Hopea parviflora* Bedd.	Dipterocarpaceae
15	*Brachypterum scandens* (Roxb.) Miq.	Fabaceae
16	*Spatholobus parviflorus* Kuntze	Fabaceae
17	*Guilandina bonduc* L.	Fabaceae
18	*Sarcostigma kleinii* Wight & Arn.	Icacinaceae
19	*Ocimum tenuiflorum* L.	Lamiaceae
20	*Vitex altissima* L.f.	Lamiaceae
21	*Litsea coriacea* (B.Heyne ex Nees) Hook.f.	Lauraceae
22	*Machilus glaucescens* (Nees) Wight	Lauraceae
23	*Hiptage benghalensis* (L.) Kurz	Malpighiaceae
24	*Cipadessa baccifera* Miq.	Meliaceae
25	*Anamirta cocculus* (L.) Wight & Arn.	Menispermaceae
26	*Tiliacora acuminata* (Lam.) Miers	Menispermaceae
27	*Myxopyrum smilacifolium* Blume	Oleaceae
28	*Nervilia concolor* Schltr.	Orchidaceae
29	*Antidesma acidum* Retz.	Phyllanthaceae
30	*Antidesma montanum* Blume	Phyllanthaceae
31	*Bridelia stipularis* Blume	Phyllanthaceae
32	*Panicum notatum* Retz.	Poaceae
33	*Xanthophyllum flavescens* Roxb.	Polygalaceae
34	*Putranjiva roxburghii* Wall.	Putranjivaceae
35	*Canthium coromandelicum* (Burm.f.) Alston	Rubiaceae
36	*Canthium rheedei* DC.	Rubiaceae
37	*Geophila repens* (L.) I.M.Johnst.	Rubiaceae
38	*Ixora brachiata* Roxb.	Rubiaceae
39	*Lepisanthes tetraphylla* Radlk.	Sapindaceae
40	*Cayratia pedata* Gagnep.	Vitaceae
41	*Cissus discolor* Blume	Vitaceae

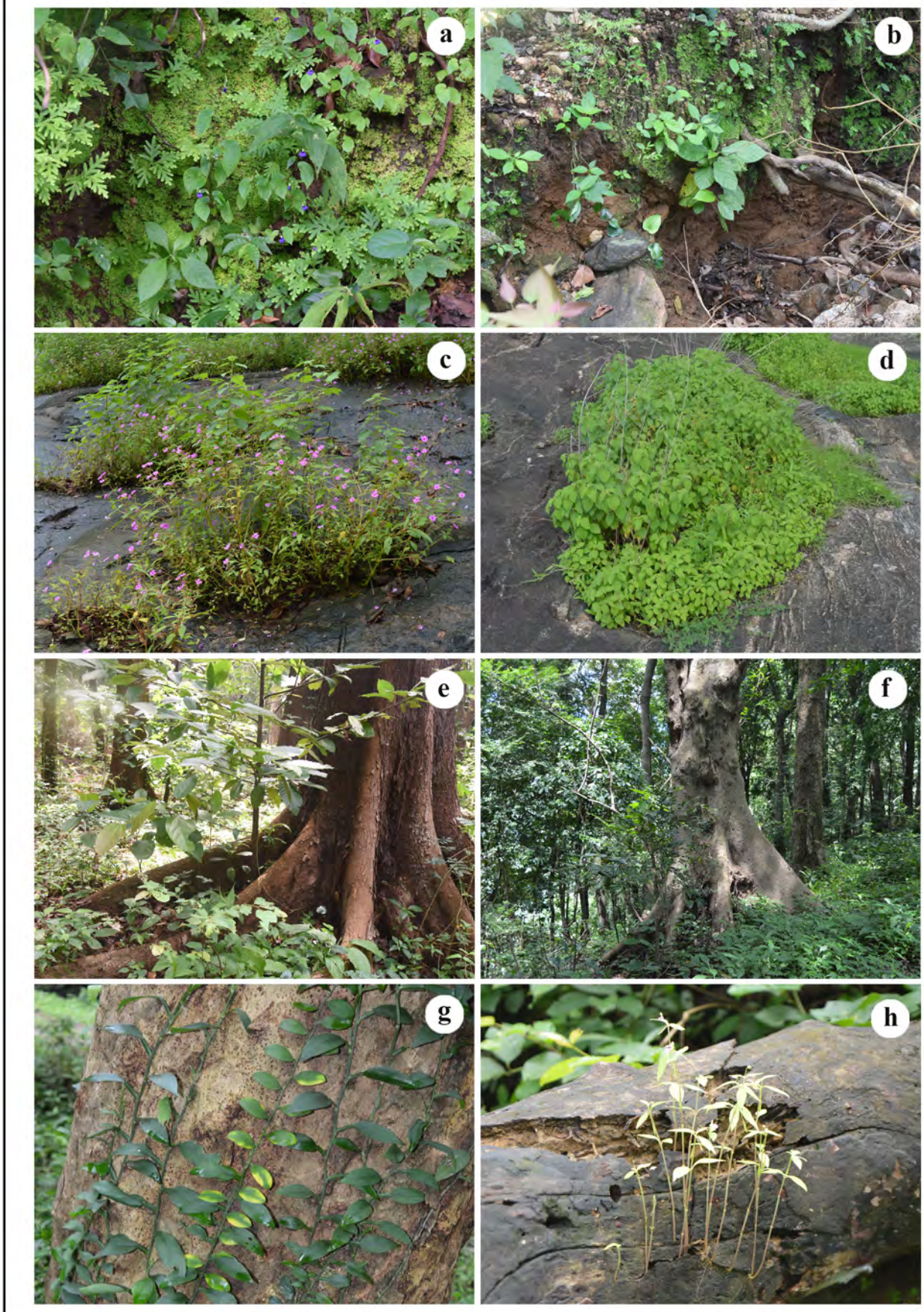

Plate 90: Microhabitats in Walayar hills Fig. a- b. Mud cliff **c.- d.** Exposed Rock Surfaces **e. – f.** Buttresses **g.** Tree trunks **h.** Fallen logs

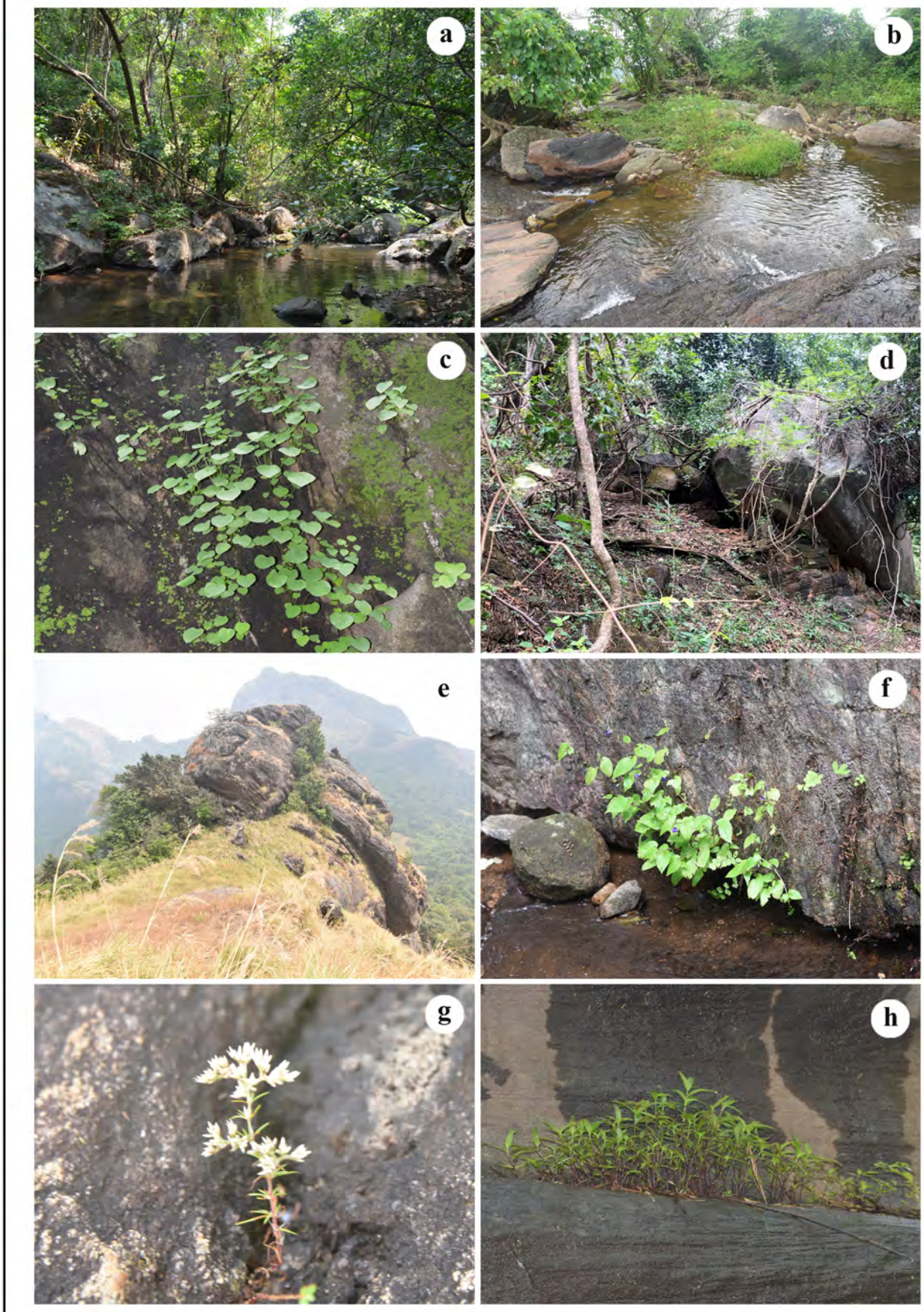

Plate 91: Microhabitats in Walayar hills Fig. a – b. Riparian slopes **c. – e.** Boulders **f. – h.** Rock Crevices and fissures

Table 9. Chasmophytic elements in Walayar hills

Sl. No	Binomial name	Family
1	*Phyllocephalum courtallense* (Wight) Narayana	Asteraceae
2	*Phyllocephalum rangacharii* (Gamble) Narayana	Asteraceae
3	*Impatiens dasysperma* Wight	Balsaminaceae
4	*Impatiens flaccida* Arn.	Balsaminaceae
5	*Impatiens gardneriana* Wight	Balsaminaceae
6	*Impatiens minor* (DC.) Bennet	Balsaminaceae
7	*Impatiens scapiflora* B.Heyne	Balsaminaceae
8	*Euploca marifolia* var. *rottleri* (Lehm.) Ancy & P.Javad	Boraginaceae
9	*Polycarpaea corymbosa* (L.) Lam.	Caryophyllaceae
10	*Cyanotis burmanniana* Wight	Commelinaceae
11	*Murdannia dimorpha* G.Brückn.	Commelinaceae
12	*Murdannia semiteres* (Dalzell) Santapau	Commelinaceae
13	*Bulbostylis barbata* subsp. *pulchella* (Thwaites) T.Koyama	Cyperaceae
14	*Bulbostylis barbata* (Rottb.) C.B.Clarke	Cyperaceae
15	*Bulbostylis thouarsii* (Roem. & Schult.) Lye ex Veldkamp & Verloove	Cyperaceae
16	*Cyperus pseudokyllingioides* Kük.	Cyperaceae
17	*Cyperus sesquiflorus* subspec. *cylindricus* (Nees) T.Koyama	Cyperaceae
18	*Drosera indica* L.	Droseraceae
19	*Eriocaulon palghatense* R.Ansari & N.P.Balakr.	Eriocaulaceae
20	*Eriocaulon quinquangulare* L.	Eriocaulaceae
21	*Eriocaulon sexangulare* L.	Eriocaulaceae
22	*Eriocaulon xeranthemum* Mart.	Eriocaulaceae
23	*Crotalaria evolvuloides* Wight	Fabaceae
24	*Crotalaria mysorensis* Roth	Fabaceae
25	*Crotalaria nana* Burm.f.	Fabaceae
26	*Geissaspis cristata* var. *tenella* (Benth.) M.R.Almeida	Fabaceae
27	*Geissaspis cristata* Wight & Arn.	Fabaceae
28	*Indigofera uniflora* Buch.-Ham. ex Roxb.	Fabaceae

29	*Smithia blanda* Wall. ex Wight & Arn.	Fabaceae
30	*Smithia conferta* Sm.	Fabaceae
31	*Smithia gracilis* Benth.	Fabaceae
32	*Zornia gibbosa* Span.	Fabaceae
33	*Canscora diffusa* (Vahl) R.Br. ex Roem. & Schult.	Gentianaceae
34	*Canscora pauciflora* Dalzell	Gentianaceae
35	*Canscora perfoliata* Lam.	Gentianaceae
36	*Hoppea fastigiata* (Griseb.) C.B.Clarke	Gentianaceae
37	*Henckelia fischeri* (Gamble) A.Weber & B.L.Burtt	Gesneriaceae
38	*Henckelia humboldtiana* (Gardner) A.Weber & B.L.Burtt	Gesneriaceae
39	*Henckelia incana* (Vahl) Spreng.	Gesneriaceae
40	*Rhynchoglossum notonianum* (Wall.) B.L.Burtt	Gesneriaceae
41	*Utricularia graminifolia* Vahl	Lentibulariaceae
42	*Utricularia lazulina* P.Taylor	Lentibulariaceae
43	*Bonnaya antipoda* Druce	Linderniaceae
44	*Bonnaya ciliata* Spreng.	Linderniaceae
45	*Mitrasacme prolifera* R.Br.	Loganiaceae
46	*Rotala malampuzhensis* R.V.Nair ex C.D.K.Cook	Lythraceae
47	*Habenaria rariflora* A.Rich.	Orchidaceae
48	*Parasopubia delphiniifolia* (L.) H.-P.Hofm. & Eb.Fisch.	Orobanchaceae
49	*Rhamphicarpa fistulosa* Benth.	Orobanchaceae
50	*Striga angustifolia* (D.Don) Saldanha	Orobanchaceae
51	*Sesamum prostratum* Retz.	Pedaliaceae
52	*Phyllanthus maderaspatensis* L.	Phyllanthaceae
53	*Phyllanthus reticulatus* Poir.	Phyllanthaceae
54	*Phyllanthus virgatus* G.Forst.	Phyllanthaceae
55	*Apocopis mangalorensis* (Hochst. ex Steud.) Henrard	Poaceae
56	*Arundinella ciliata* Nees ex Miq.	Poaceae
57	*Arundinella mesophylla* Nees ex Steud.	Poaceae
58	*Bothriochloa insculpta* (Hochst. ex A.Rich.) A.Camus	Poaceae
59	*Bothriochloa pertusa* (L.) A.Camus.	Poaceae
60	*Chrysopogon asper* B.Heyne ex Blatt. & McCann	Poaceae
61	*Chrysopogon hackelii* (Hook.f.) C.E.C.Fisch.	Poaceae

62	*Cymbopogon citratus* Stapf	Poaceae
63	*Cymbopogon flexuosus* (Nees ex Steud.) Will.Watson	Poaceae
64	*Cymbopogon martini* (Roxb.) Will.Watson	Poaceae
65	*Dichanthium annulatum* Stapf	Poaceae
66	*Digitaria ciliaris* (Retz.) Koeler	Poaceae
67	*Digitaria longiflora* Pers.	Poaceae
68	*Dimeria deccanensis* Bor	Poaceae
69	*Dimeria ornithopoda* Trin.	Poaceae
70	*Dimeria raizadae* V.J.Nair, Sreek. & N.C.Nair	Poaceae
71	*Enteropogon monostachyus* Schum.	Poaceae
72	*Heteropogon contortus* (L.) P.Beauv. ex Roem. & Schult.	Poaceae
73	*Isachne walkeri* Arn. ex Steud.	Poaceae
74	*Ischaemum rangacharianum* C.E.C.Fisch.	Poaceae
75	*Oryza rufipogon* Griff.	Poaceae
76	*Pogonatherum crinitum* Kunth	Poaceae
77	*Polytrias indica* (Houtt.) Veldkamp	Poaceae
78	*Pseudopogonatherum trispicatum* (Schult.) Ohwi	Poaceae
79	*Sporobolus pilifer* (Trin.) Kunth	Poaceae
80	*Sporobolus tenuissimus* (Mart. ex Schrank) Kuntze	Poaceae
81	*Sporobolus virginicus* (L.) Kunth	Poaceae
82	*Themeda triandra* Forssk.	Poaceae
83	*Tripogon bromoides* Roem. & Schult.	Poaceae
84	*Urochloa ramosa* (L.) T.Q.Nguyen	Poaceae
85	*Polygala bolbothrix* Dunn	Polygalaceae
86	*Polygala persicariifolia* DC.	Polygalaceae
87	*Oldenlandia hygrophila* Bremek.	Rubiaceae
88	*Spermacoce lasiocarpa* R.Br.	Rubiaceae
89	*Spermacoce latifolia* Aubl.	Rubiaceae
90	*Spermacoce ocymoides* Burm.f.	Rubiaceae
91	*Spermacoce pusilla* Wall.	Rubiaceae
92	*Curcuma decipiens* Dalzell	Zingiberaceae

IV. 3. Cross analysis of Angiosperm flora in Walayar forests and Life form spectrum analysis

Objectives addressed

- Analysis of angiosperm flora in Walayar range forests
- Analysis of distribution of various habit forms and life forms in the forest range
- Characterization of habitats and life form spectrum analysis in Walayar range forests

IV.3.1. Analysis of habit forms in Walayar hill ranges

On investigating the floristic diversity of Walayar hills, it results in the documentation of 1077 taxa, out of which herbs form the most represented habit form with 549 taxa followed by trees with 209 taxa. Shrubs and climbers are represented by 169 and 150 taxa respectively. Figure 2. summarizes the various habit forms in the range.

IV.3.2. Distribution of angiosperms in altitudinal gradients in Walayar range

The study area shows a range of altitudinal gradients from below 60m asl to 1700m asl. The hill tracks are diverse with various vegetation cover with degraded deciduous elements in the lower stretches of forests which gradually turns to moist deciduous forest elements intermixed with dry deciduous elements. As the elevation goes higher, there is a gradual transition of vegetation to semi evergreen forests with few deciduous elements growing along with it. The understory of forest tracks also show distinct transitions. There is the presence of thick understory in the lower elevations. But as the altitude increases and the canopy cover of forests turns thicker, the ground vegetation becomes lower. True semi – evergreen forests are observed towards the medium altitudes above 500m asl.

The Walayar forest tracks are further characterized by the grassland patches at higher elevations. But these types of grasslands cannot be rated as true open montane grasslands. These open grassy lands are observable even at low elevation areas. Normally montane grasslands occur at higher elevations above 900m with shola forests forming the valley. Shola vegetation is absent in these forest tracks. As the elevation gradient in Walayar hills reach upto 800m, there is the presence of grassland patches interspersed with large bare rocks. Cross analysis of vegetation conclude that maximum species diversity is observed in the medium elevations rather than in lower and higher altitudes. As the range is within the gap zone and is prone to higher wind velocity through the Gap, bare rock formations simulating inselbergs are more observed at higher elevations. The hill slopes is also found to be bear with least vegetation which is seen at altitude above 500m asl.

IV.3.3. Life form spectrum analysis of angiosperm flora

The life form of a plant refers to its nature and protection it possesses in order to thrive in critical or rigorous weather conditions. The system is manifested by adaptation of plants to various climates. Critical analysis of vegetation of plants in Walayar forest range results that 39.36% of plants are included under therophytes, forming the dominant life form represented by 424 taxa. These include annual herbs with a short life span. They complete their life cycle before the onset of the dry hot season. These plants produce numerous seeds soon after the flowering and are easily dispersed. The account of the total life forms is summarized in table 10 and figure 3.

These taxa can often be called drought escapers since they begin to disappear by the end of October. The taxa are found in hillock systems, lower exposed hill tracks, open forest floors and grasslands. Phanerophytes form the second dominant life form which includes 328 taxa and forms 30.45% of the total plants recorded. These plants are represented by perennials including trees and shrubs whose shoots do not die back periodically. The plants included in this group are mostly found in lower degraded forests, moist deciduous and semi - evergreen forests. Annexure VIII summarizes the major terminologies of Raunkiaer plant lifeforms.

Table 10. Raunkiaer life form spectrum analysis (Ellenberg and Dombois, 1967)

Sl. No	Life form	Number of taxa	Percentage of taxa
1	Therophyte	424	39.36%
2	Phanerophyte	328	30.45%
3	Liana	148	13.74%
4	Geophyte (Cryptophyte)	71	6.59%
5	Chamaephyte	62	5.75%
6	Hemicryptophyte	15	1.39%
7	Hydrophyte	13	1.20%
8	Semi parasite	8	0.74%
9	Epiphyte	7	0.64%
10	Parasite	1	0.09%

Liana forms the third predominant lifeform and include slender to woody climbers found in deciduous and semi - evergreen forests and reports 148 taxa (13.74%). Geophytes

(Cryptophyte) forms the next predominant life form and is represented by 71 taxa (6.59%). These plants are featured by periodic reduction of complete shoot system and are protected in the form of storage organs such as tuber, rhizome, bulbils, corm etc.

The members included in Araceae, Asparagaceae, Amaryllidaceae, Cyperaceae, Orchidaceae, Marantaceae, Zingiberaceae etc fall under this category. Other life forms with protected shoot buds include chamaephytes and hemicryptophyte with 62 taxa (5.75%) and 15 taxa (1.39%) respectively. Apart from these, hydrophytes, semi - parasites, epiphytes and parasites are represented by few members and constitutes 1.20%, 0.74%, 0.64% and 0.09% respectively of the vegetation.

IV. 4. Seasonal dynamics and diversity of low altitude hillocks - An appraisal

Objective addressed

- Analysis of floristic diversity in hillocks under Walayar forest range
- Detailed investigation on the microhabitats in hillock system
- Life form spectrum and vegetation analysis of plants in hillock systems

IV. 4.1. Hillocks in Walayar forest range

Presence of numerous small to medium sized hillocks in the Palghat gap region is one of the unique features in Southern Western Ghats. Often, these rocky outcrops are distributed between agricultural lands or within the villages where people live. They may have an altitudinal difference ranging from a few metres to about 150m above sea level. Often, these rocky patches are neglected as wastelands due to lack of awareness on the significance of these detached ecosystems and are found to be an area of waste disposal. In general, the hillocks may be composed of lateritic or granitic outcrops. Mostly, these granitic and lateritic hillocks are exploited for stone mining. It is in this background, the rocky outcrops in Walayar forest range were explored for its floristic diversity analysis. Due to the unique geographical location and prevailing climatic conditions along with other edaphic features, these rocky outcrops show unique floral diversity when compared to forest vegetation in the main hill tracks.

Most of the hillocks are located in human inhabited areas often surrounded by agricultural lands, industries and a few near to main Ghats. Anthropogenic disturbances such as industrial wastes and smoke are adversely affecting the unique and rare therophytic vegetation present over these ecosystems. Quarrying modifies the entire geographical and

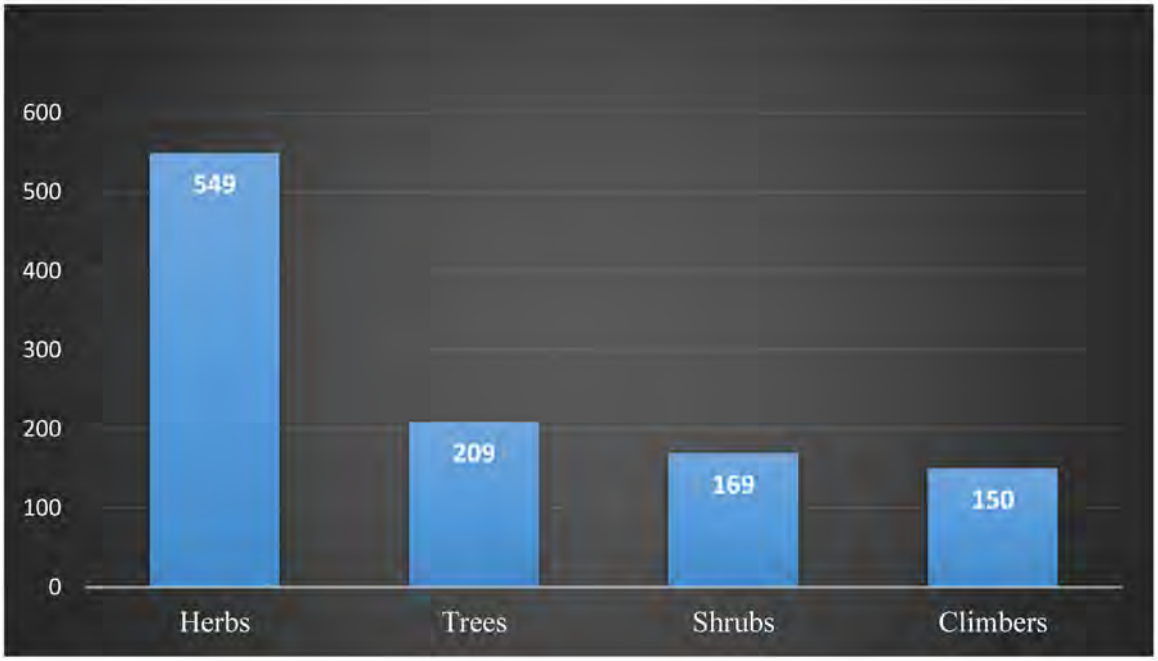

Figure 2. Diversity of habit forms

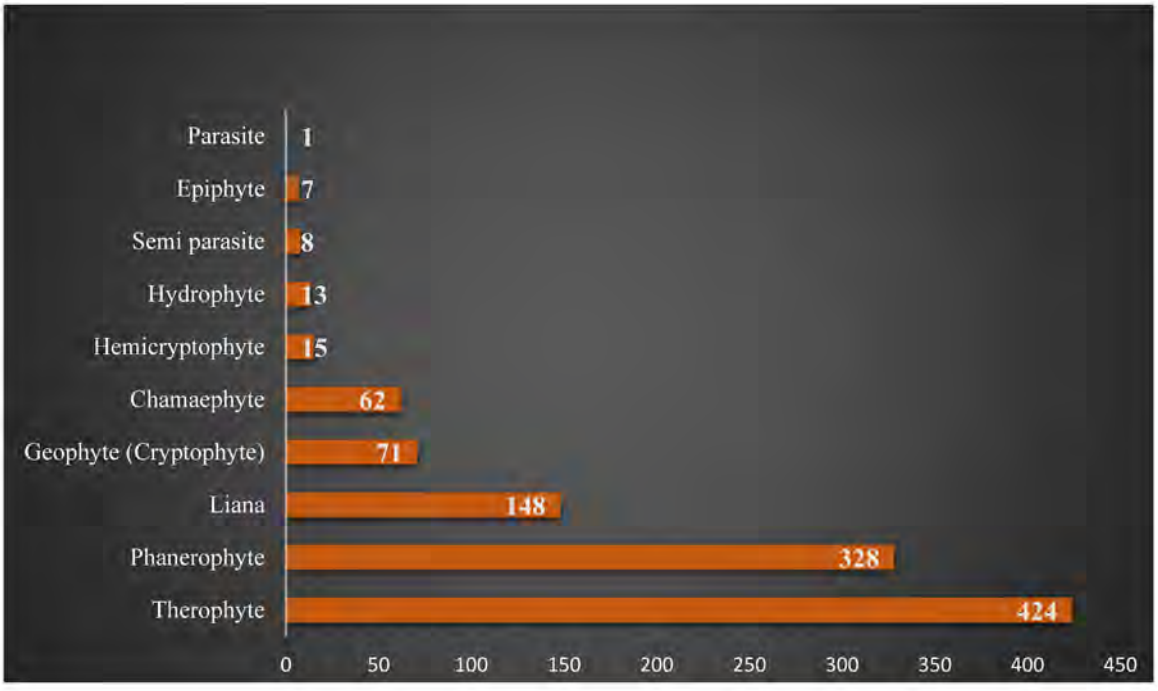

Figure 3. Analysis of Raunkiaer's life forms in vegetation

floristic features of the area permanently. Walayar forest range consists of 19 different small to medium sized hillocks and the geographical coordinates of the hillocks in the range is summarized in Figure 4 and table 11.

Table 11. Hillocks in Walayar forest range

Sl. No	Hillock Name	Latitude	Longitude
1	Koomachimala	10°49'44.76"N	76°40'30.72"E
2	Anayappanchalla	10°48'25.92"N	76°48'35.19"E
3	Cheranpara	10°49'29.62"N	76°40'38.63"E
4	Kongampaadam	10°48'40.59"N	76°46'51.94"E
5	Kozhimala	10°49'56.45"N	76°43'11.80"E
6	Poozhikunnu	10°51'19.42"N	76°43'42.59"E
7	Panampulli	10°49'08.43"N	76°48'56.51"E
8	Vattappara	10°49'29.47"N	76°49'05.26"E
9	Karadikunnu	10°50'23.64"N	76°49'47.64"E
10	Poolakunnu	10°51'33.12"N	76°42'29.52"E
11	Koyamarakaadu	10°47'41.24"N	76°45'35.17"E
12	Chemanamkadu	10°48'46.03"N	76°44'47.99"E
13	Malampuzha Guest house hillock	10°50'03.76"N	76°40'56.19"E
14	Mangalathumchalla	10°49'02.97"N	76°48'15.94"E
15	Mayappalam	10°48'08.64"N	76°46'34.68"E
16	Olappalam	10°49'52.20"N	76°43'44.19"E
17	Pallippara	10°49'49.08"N	76°43'47.28"E
18	Walayar hillock	10°48'42.95"N	76°48'14.01"E
19	Walayar toll plaza hillock	10°48'45.00"N	76°47'49.56"E

IV.4.2. Floristic diversity analysis in Hillocks

Floristic explorations in nineteen hillocks recorded the presence of 411 taxa including 7 infraspecific taxa under 296 genera distributed among 86 families. Herbs were found to be the predominant habit form represented by 229 taxa (55.71%) followed by trees with 79 taxa (19.22%) and shrubs and climbers with 60 (14.59%) and 43 (10.46%) taxa respectively. Fabaceae formed the most represented family in these rocky outcrops with 60

species followed by Poaceae (50 species), Malvaceae (22 species) and Cyperaceae (19 species). Further, 38 families recorded were represented by a single species. Highest generic diversity is found to be for Fabaceae (39 genera) followed by Poaceae (37 genera), Malvaceae (15 genera) and Lamiaceae (13 genera). The graphical representation of habit forms, species and generic diversity is depicted in figure 5, 6 and 7 respectively. The species composition and lifeforms in hillocks are summarized under Annexure IX.

IV. 4.3. Lifeform spectrum analysis

The lifeform of taxa was identified and classified based on revised Raunkiaer plant life form spectrum by Ellenberg and Mueller - Dombois (1967). It was found that Therophytes represented the dominant lifeform (202 taxa) followed by Phanerophytes (119 taxa) and Liana or Eulianas (44 taxa). Further, Chamaephytes are represented by 18 taxa and Geophytes or Cryptophytes with 14 taxa. Hemicryptophytes and semi parasites are represented by only 7 and 4 taxa respectively. *Hydrilla verticillata* (L.f.) Royle and *Nymphaea nouchali* Burm.f.are the two hydrophytes reported from these rocky outcrops. *Dendrophthoe falcata* (L.f.) Ettingsh. form the only epiphyte reported in the hillock system in the Walayar forest range (Figure 8).

IV. 4.4. Phenological study

Onset of monsoon transforms the dry rocky outcrops to green, due to the germination of seedlings. These small seedlings complete their vegetative phase and start flowering by the end of the monsoon season and by the onset of the post monsoon period. Almost all taxa show luxuriant flowering between August to December, and extends sometimes upto the month of February. Trees and shrubs flower mostly in the drier seasons. The grasses start flowering once they complete their juvenile phase. The graphical representation of the phenology of taxa recorded is depicted in figure 9.

IV. 4.5. Microhabitat studies (Plate 92 and 93)

Several unique microhabitats were observed in these biodiversity rich hillock systems. There is no distinct demarcation between these microhabitats, as each one is seen in transformation from one micro habitat to another. The species composition in these microhabitats is dependent on the intensity of precipitation, amount of soil in the surface, the depth of the soil, water holding capacity, amount of water in small depressions and rocky pools. A total of nine microhabitats could be recorded from these rocky outcrops and each microhabitat is characterized by specific plant composition along with other common

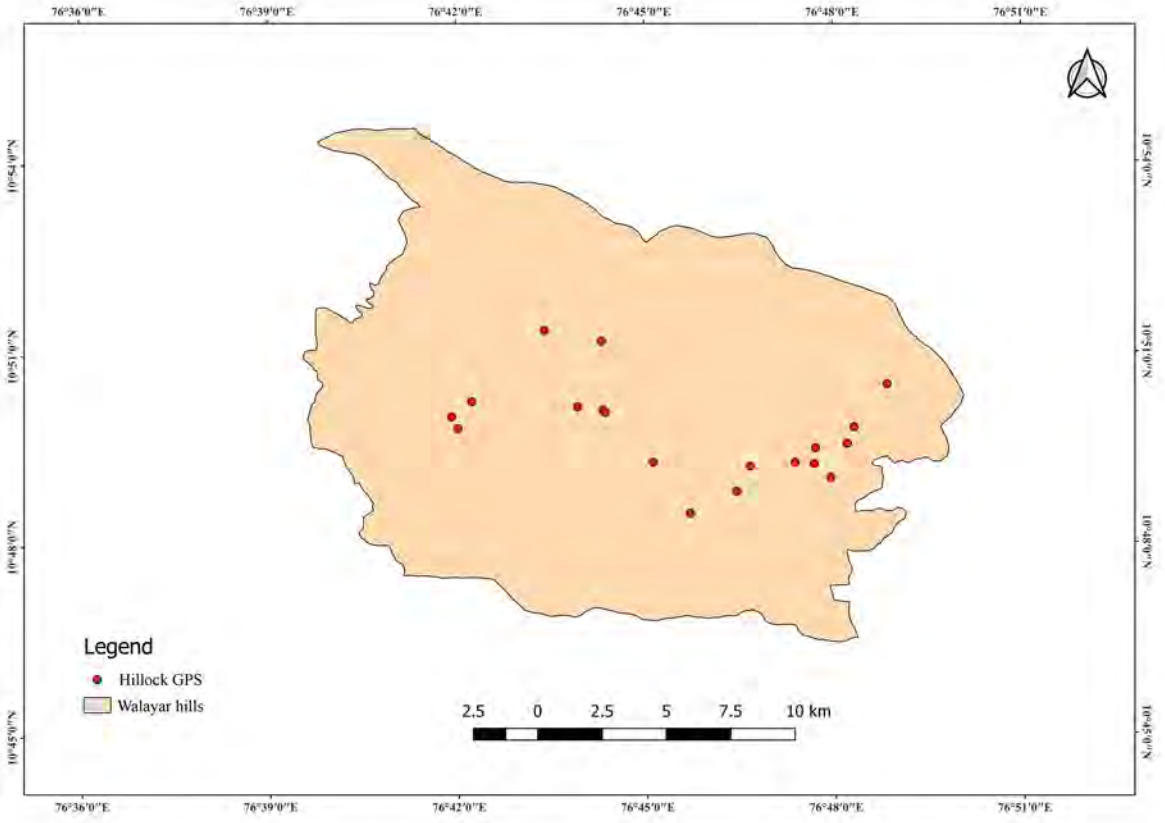

Figure 4. Hillocks in Walayar forest range

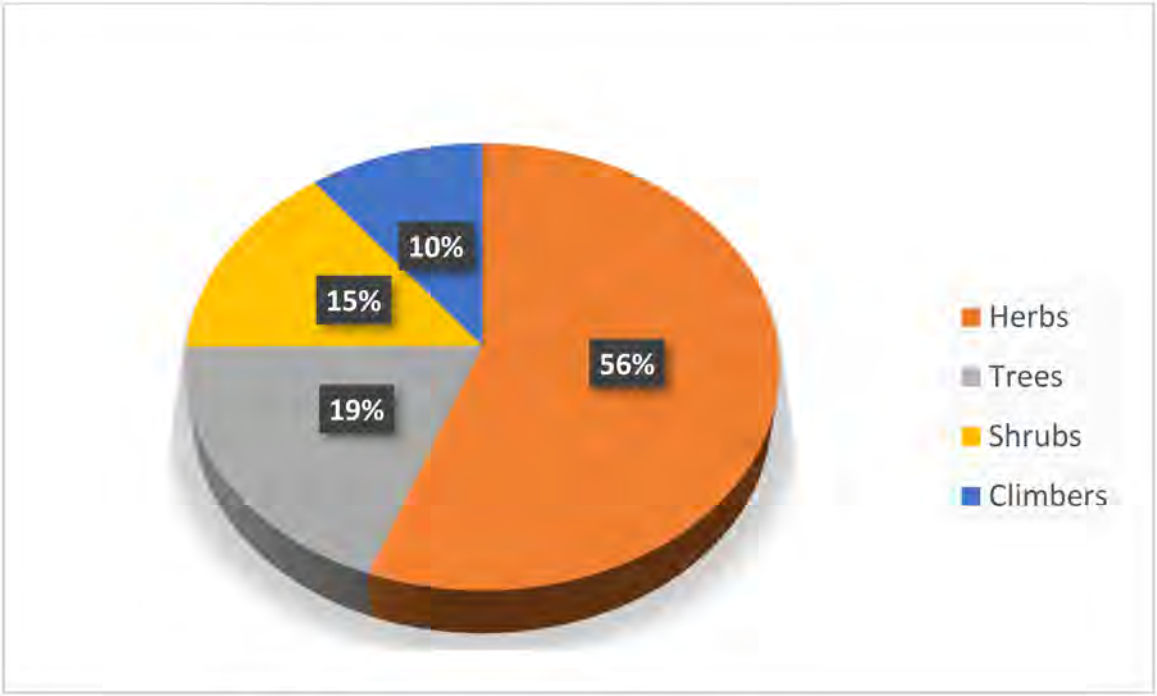

Figure 5. Growth habit analysis in hillocks

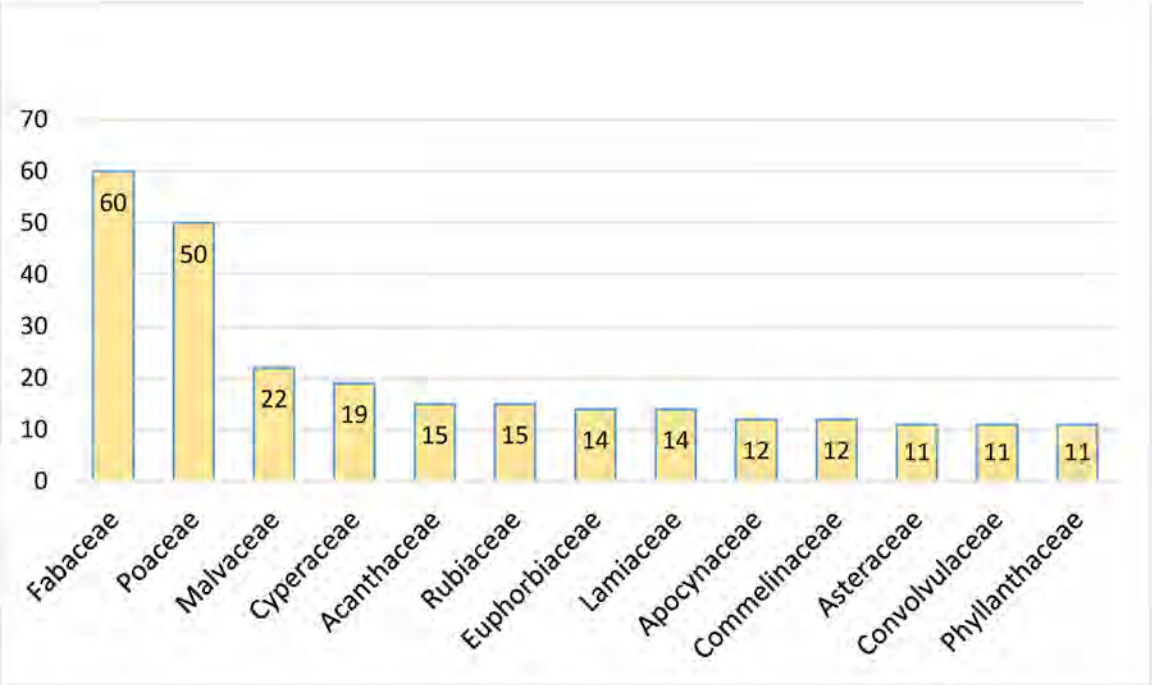

Figure 6. Species diversity in hillocks

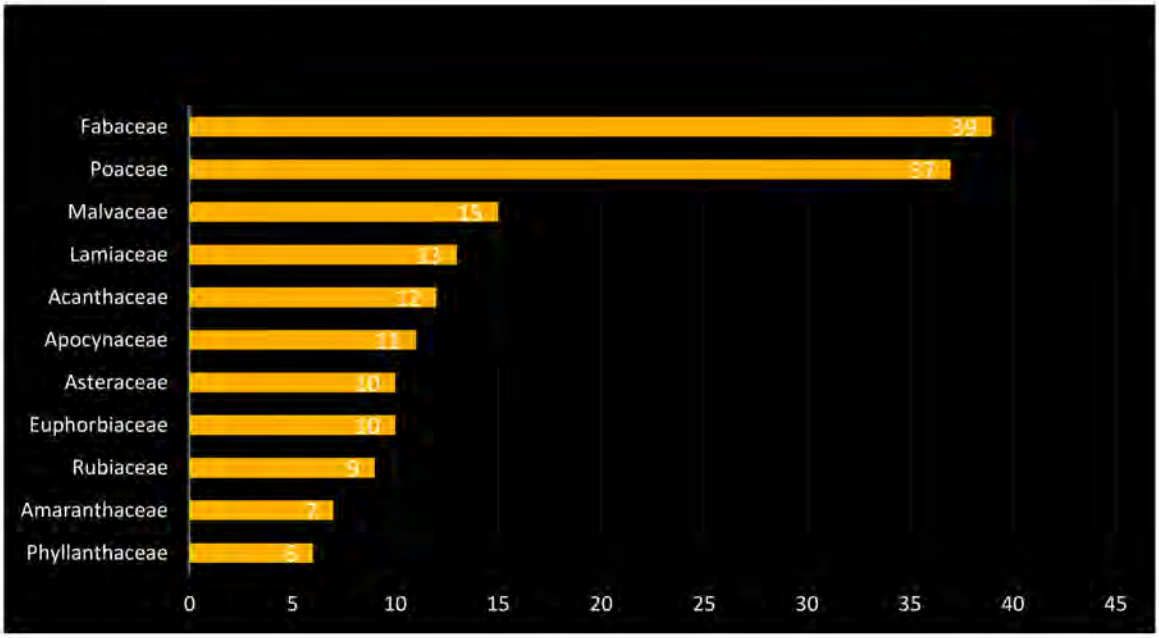

Figure 7. Generic diversity in hillocks

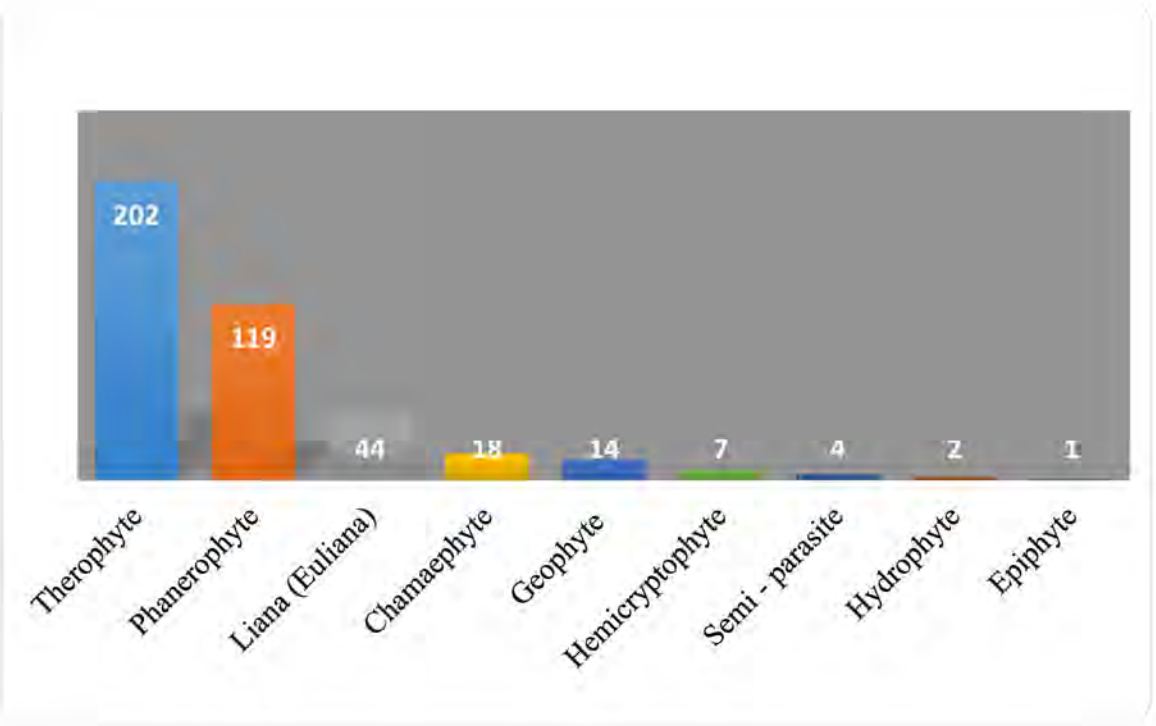

Figure 8. Raunkiaer life form spectrum analysis in hillocks

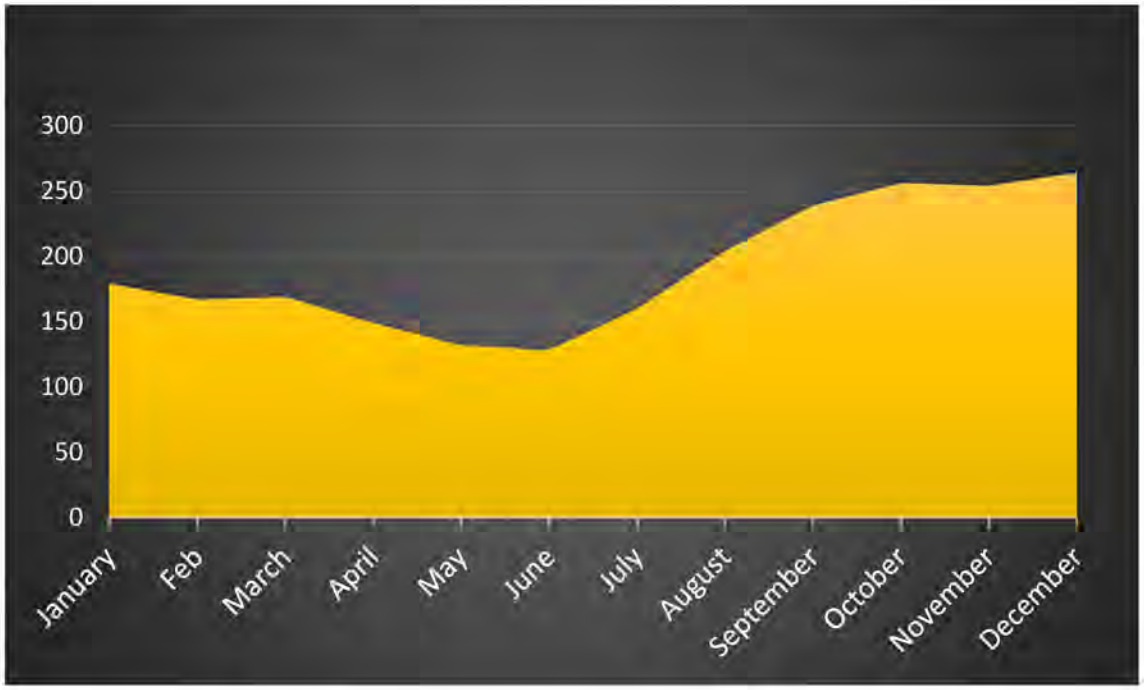

Figure 9. Phenology of taxa in hillocks

plants seen in other habitats. The nine microhabitats include Ephemeral Flush Vegetation (EFV), Exposed Rock Surface (ERS), Soil Filled Depressions (SFD), Soil Rich Areas (SRA), Rock Crevices and Fissures (RCF), Boulders (B), Small Ephemeral Pools (SEP), Rock pools (RP) and Tree cover Tree associates (TCTA). Details of these microhabitats are summarized below.

IV.4.5.1. Ephemeral flush vegetation (EFV): This microhabitat is predominant in monsoon season and formed when water drains slowly and continuously in hill slopes. Here the soil content will be negligible. The habitat will be predominated by herbaceous members like *Utricularia graminifolia* Vahl., *Utricularia lazulina* P.Taylor, *Rhamphicarpa fistulosa* Benth., *Mitrasacme prolifera* R.Br., *Drosera indica* L., *Eriocaulon xeranthemum* Mart. etc. About 26 taxa were found to be present in this unique habitat, of which 6 taxa were restricted to this microhabitat only. The plants seen in this habitat complete their life cycle by the end of monsoon season and this microhabitat slowly disappears as the water recedes down the slope of the hill.

IV.4.5.2. Exposed rock surfaces (ERS): This habitat is characterized by plants seen in exposed rocks that are exposed to direct sunlight. The plants here are adapted to thrive in harsh climatic conditions due to acute water shortage and poor soil quality. These habitats, in the course of time may slowly get converted to soil filled depressions due to the deposition of soil. Seventy seven taxa were documented in this microhabitat. *Cyanotis burmanniana* Wight, *Murdannia semiteres* (Dalzell) Santapau, *Cajanus scarabaeoides* (L.) Thouars, *Geissaspis cristata* var. *tenella* (Benth.) M.R.Almeida, *Sesamum prostratum* Retz. etc are some of the plants recorded from this habitat. During the post monsoon period, these herbaceous vegetation get replaced by grasses and other invasive taxa like *Mesosphaerum suaveolens* (L.) Kuntze.

IV.4.5.3. Rock crevices or fissures (RCF): These are the narrow openings or fissures seen on the rocks due to weathering of rocks. This unique system is seen inhabited by 13 taxa and few of them includes *Theriophonum fischeri* Sivad., *Polycarpaea corymbosa* (L.) Lam., *Cyanotis burmanniana* Wight, *Paramollugo nudicaulis* (Lam.) Thulin, *Portulaca oleracea* L. etc

IV.4.5.4. Small Ephemeral Pools (SEP): These are the small to medium sized depressions seen in the surface of rocky outcrops and these depressions get filled up by water during the monsoon season. The depth of water in these habitats range from few

centimeters to upto few meters. The soil deposition in this microhabitat is negligible and the predominant taxa include *Rotala malampuzhensis* R.V.Nair ex C.D.K.Cook, *Ludwigia hyssopifolia* (G.Don) Exell, *Echinochloa colona* (L.) Link, *Echinochloa crus-galli* (L.) P.Beauv., *Isachne globosa* (Thunb.) Kuntze etc. The water gets dried up soon after the monsoon season. A total of 28 taxa were recorded from this habitat.

IV.4.5.5. Soil -Filled Depressions (SFD): This microhabitat is characterized by accumulation of soil and water in small depressions in the hillock crust. A total of 124 taxa were reported from this microhabitat and some of the represented members include *Crotalaria nana* Burm.f., *Microstachys chamaelea* (L.) Müll.Arg., *Zornia gibbosa* Span., *Corchorus aestuans* L., *Parasopubia delphiniifolia* (L.) H.-P.Hofm. & Eb.Fisch., *Phyllanthus maderaspatensis* L., *Tribulus terrestris* L.,*Tripogon bromoides* Roth etc. .

IV.4.5.6. Soil-Rich Areas (SRA): This microhabitat is found in flat surfaces of rocky outcrops where the deposition of soil is very high and the depth of the soil may reach upto 20cm. This microhabitat is the most speciose microhabitat with 209 taxa. *Tripogon bromoides* Roth, *Oryza rufipogon* Griff., *Spermacoce ocymoides* Burm.f., *Catharanthus pusillus* G.Don, *Commelina benghalensis* L., *Cyperus iria* L., *Fimbristylis microcarya* F.Muell., *Euphorbia thymifolia* L., *Alysicarpus vaginalis* (L.) DC., *Torenia crustacea* (L.) Cham. & Schltdl., *Biophytum reinwardtii* (Zucc.) Klotzsch, *Heteropogon contortus* (L.) P.Beauv. ex Roem. & Schult. and *Tribulus terrestris* L. are some of the most common members represented in this microhabitat.

IV.4.5.7. Tree Cover and Tree Associated (TCTA): This microhabitat is similar to Soil rich areas (SRA) but differs by the presence of shrubs and tree forms colonized in the rocky outcrops. This habitat is also occupied by various climbers found along with shrubs and trees. Thus, this microhabitat forms the second speciose habitat represented by 179 taxa . *Alangium salviifolium* (L.f.) Wangerin, *Annona squamosa* L., *Holarrhena pubescens* Wall. & G.Don, *Wrightia tinctoria* R.Br., *Terminalia anogeissiana* Gere & Boatwr., *Terminalia paniculata* Roth, *Cassia fistula* L., *Bombax ceiba* L., *Ficus hispida* L.f., *Streblus asper* Lour., *Flueggea virosa* (Roxb. ex Willd.) Royle, *Ziziphus oenoplia* (L.) Mill., *Canthium coromandelicum* (Burm.f.) Alston, *Flacourtia indica* (Burm.f.) Merr., and *Schleichera oleosa* (Lour.) Oken. are some of the represented tree members. *Gymnema sylvestre* (Retz.) R.Br. ex Sm., *Ichnocarpus frutescens* (L.) W.T.Aiton, *Wattakaka volubilis Stapf, Celastrus paniculatus Willd., Ipomoea hederifolia L., Ipomoea pes-tigridis* L., *Xenostegia tridentata*

Plate 92: Microhabitats in hillocks Fig. a. – b. Ephemeral flush vegetation (EFV) **c. – d.** Exposed rock surfaces (ERS) **e. – f.** Rock crevices or fissures (RCF) **g. – h.** Small Ephemeral Pools (SEP)

(L.) D.F.Austin & Staples, D*ioscorea pentaphylla* L., *Cissus vitiginea* L. are some of the important climbers reported from this microhabitat.

IV.4.5.8. Boulders (B): This microhabitat is unique by the presence of medium to large sized rocks which are found as single or in groups, and are mostly covered by lichens, bryophytes and pteridophytes during the monsoon season. Plants like *Rostellaria hedyotidifolia* Nees, *Cyperus richardii* Steud., *Osbeckia muralis* Naudin, *Oxalis corniculata* L. and *Pigea enneasperma* (L.) P.I.Forst. (*Viola enneasperma* L.) are represented members from this microhabitat.

IV.4.5.9. Rock Pools (RP): Deep depressions found in the rocky outcrops created either naturally or by quarrying activities are filled by water during the monsoon season and this forms a unique ecosystem for aquatic and semi aquatic plants. These water filled areas may be a few meters to upto several meters depth and the water in these rock pools may remain there even after the monsoon season and lowers during the summer season. Forteen taxa are found to be colonized in this habitat. *Hygrophila ringens* (L.) R.Br. ex Spreng., *Ipomoea carnea* subsp. *fistulosa* (Mart. ex Choisy) D.F.Austin, *Cyperus brevifolius* (Rottb.) Endl. ex Hassk., *Fimbristylis schoenoides* Vahl, *Cyperus pumilus* L., *Cyperus haspan* L., *Chamaecrista mimosoides* (L.) Greene, *Hydrilla verticillata* (L.f.) Royle, *Nymphaea nouchali* Burm.f., *Limnophila repens* Benth., *Garnotia courtallensis* Thwaites, *Isachne globosa* (Thunb.) Kuntze, *Apocopis mangalorensis* (Hochst. ex Steud.) Henrard and *Echinochloa crus-galli* (L.) P.Beauv. are reported from this microhabitat.

IV.4.6. Special plant associations (Plate 94)

Unique plant associations are observed in the hillock systems of Walayar during monsoon season. *Drosera indica* L.- *Utricularia graminifolia* Vahl*, Drosera indica* L. - *Utricularia lazulina* P.Taylor, *Drosera indica* L.- *Eriocaulon xeranthemum* Mart.- *Drosera indica* L.- *Eriocaulon xeranthemum* Mart., *Hoppea fastigiata* (Griseb.) C.B.Clarke in Hook.f.- *Drosera indica* L. - *Utricularia spp.,* are some of the unique plant associations seen in the Ephemeral Flush Vegetation (EFV). In exposed rock surfaces (ERS), *Geissaspis cristata* var. *tenella* (Benth.) M.R.Almeida is found growing intermixed with *Indigofera uniflora* Buch.-Ham. ex Roxb. Further, another plant association observed was between *Theriophonum fischeri* Sivad and *Euphorbia tortilis* Rottler ex Ainslie, where the *Theriophonum fischeri* Sivad grow and survive under the protection of *Euphorbia tortilis* Rottler ex Ainslie. The roots of *Theriophonum* goes deep into the rock crevices and is therefore protected from harsh climates.

IV.4.7. Plant adaptations in Rocky Outcrops (Plate 95)

The plants present in the hillocks of the Gap region exhibit various adaptive features for their survival in harsh environmental conditions like low water availability, high wind velocity, high temperature, poor nutrient soils and other anthropogenic disturbances. Following are the adaptive traits recorded in the elements from the vegetation in low altitude hillocks.

IV.4.7.1. Pubescence

Hairiness is one of the features observed in the plants thriving in exposed rocks with poor soil conditions, less water availability and high temperature. The hairiness of the entire plant or its plant parts will help the plant to reduce the evapo - transpiration and assist it to survive until the life cycle is completed. *Andrographis echioides* Nees, *Anisochilus carnosus* (L.f.) Wall., *Cajanus scarabaeoides* (L.) Thouars, *Calopogonium mucunoides* Desv., *Crotalaria mysorensis* Roth, *Cyanotis burmanniana* Wight, *Gymnema sylvestre* (Retz.) R.Br. ex Sm., *Osbeckia muralis* Naudin, *Phyllocephalum courtallense* (Wight) Narayana, *Pouzolzia zeylanica* (L.) Benn., *Senna hirsuta* (L.) H.S.Irwin & Barneby, *Sesamum prostratum* Retz., *Sesamum radiatum* Schum. in Schum. & Thonn., *Sida cordifolia* L., *Strobilanthes crossandra* (Steud.) J.R.I.Wood are some of the plants found frequently thriving in these rocky patches with pubescence.

IV.4.7.2. Carnivory

Drosera indica L., *Utricularia graminifolia* Vahl and *Utricularia lazulina* P.Taylor are the carnivorous species observed in Ephemeral flush Vegetation (EFV). The presence of these plants is an indication of poor availability of mineral nutrients especially Nitrogen, Phosphorus and Sulphur.

IV.4.7.3. Semi - parasitism

Parasopubia delphiniifolia (L.) H.-P.Hofm. & Eb.Fisch., *Rhamphicarpa fistulosa* Benth, and *Striga angustifolia* (D.Don) Saldanha exhibits semi - parasitism. *Santalum album* L. is found to be a root parasite in the hillock system. This also indicates the scarcity of nutrients in the soil.

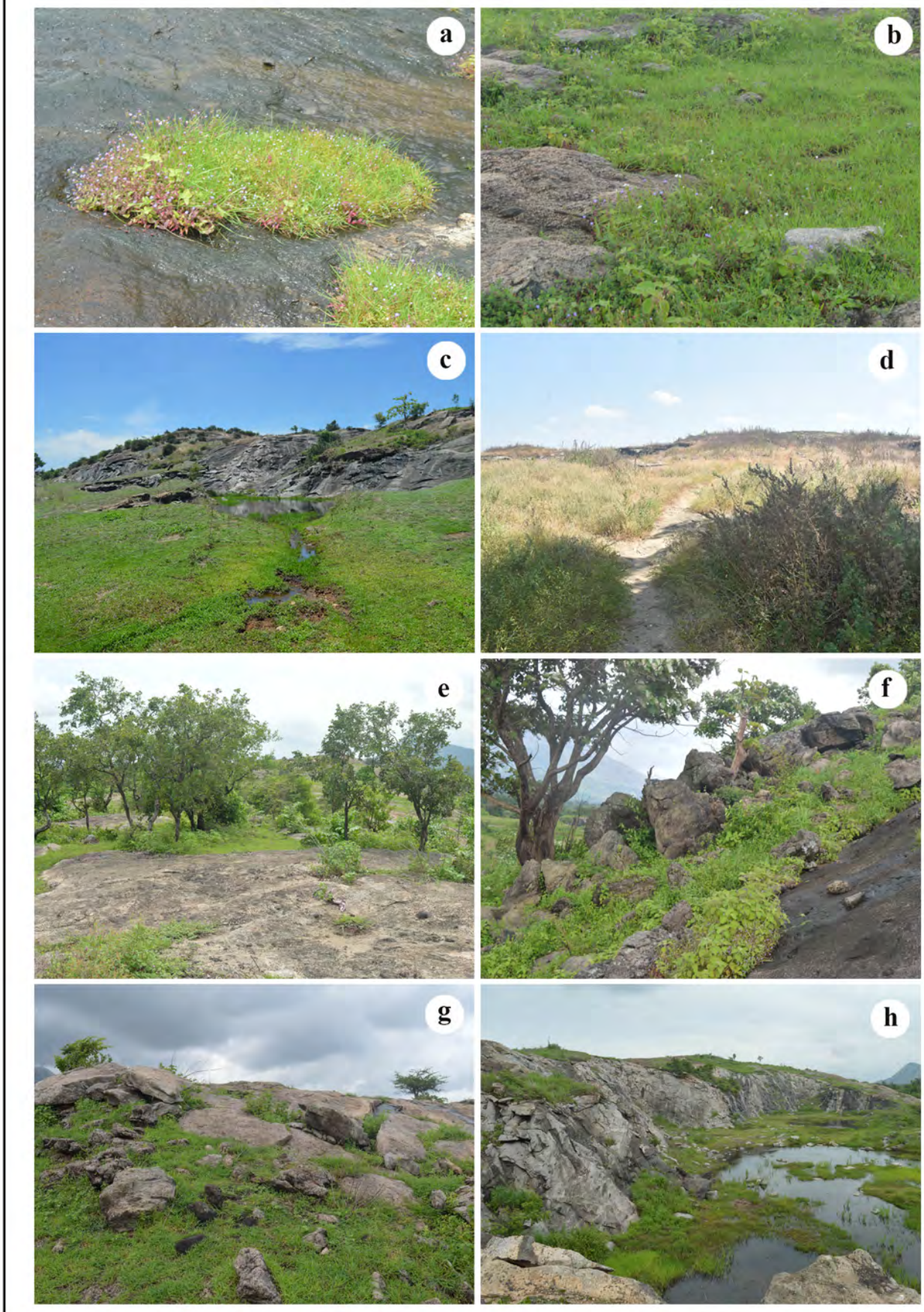

Plate 93: Microhabitats in hillocks Fig. a – b. Soil-Filled Depressions (SFD) **c. – d.** Soil-Rich Areas (SRA) **e.** Tree Cover and Tree Associated (TCTA) **f. – g.** Boulders (B) **h.** Rock Pools (RP)

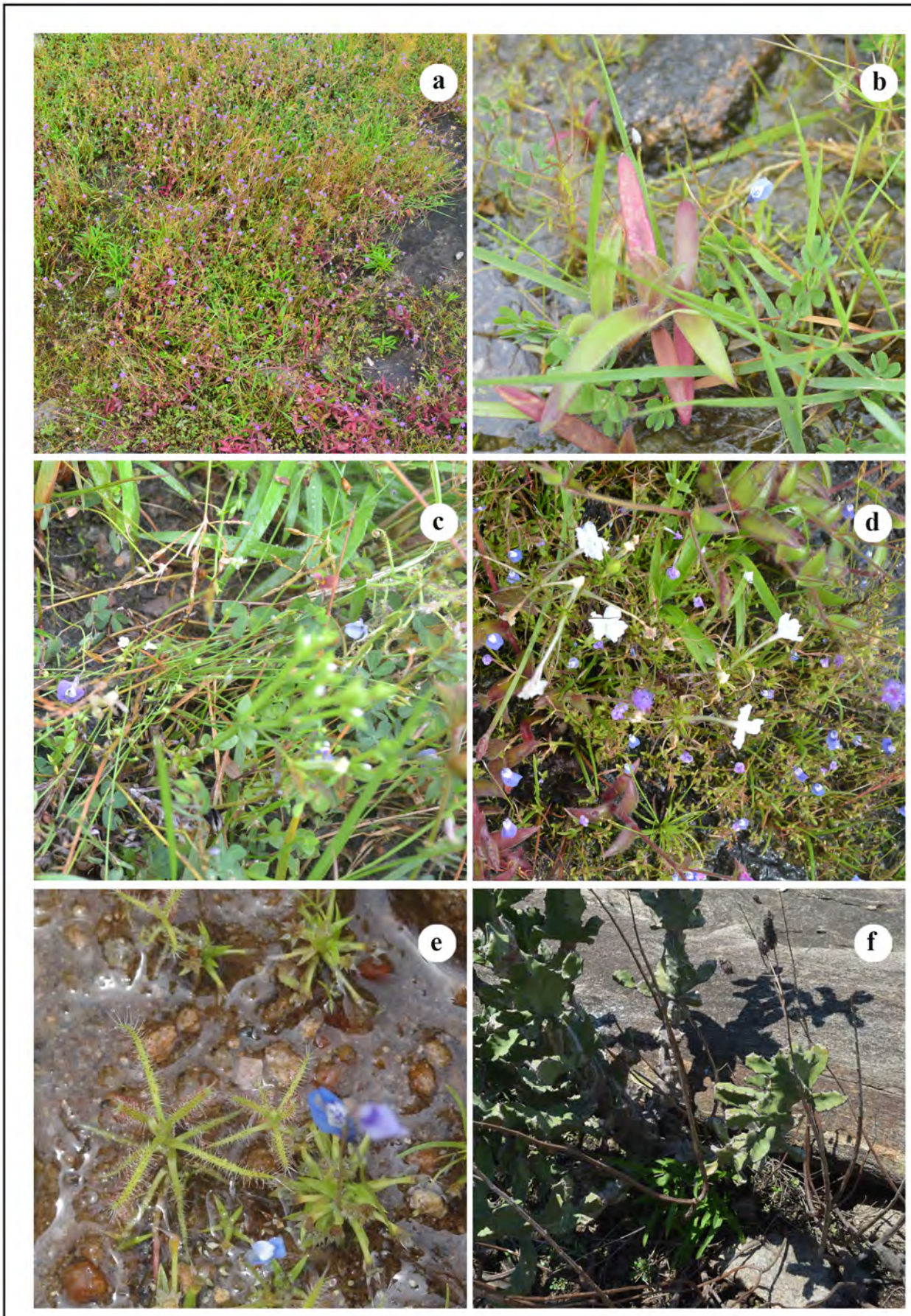

Plate 94: Special plant associations Fig. a. Microhabitats in hillocks- long view **b.** *Utricularia – Drosera – Eriocaulon* **b.** *Utricularia – Rhamphicarpa* **c.** *Utrcularia – Drosera – Mitrasacme – Hoppea – Geissaspes* **d.** *Euphorbia tortilis* Rottler ex Ainslie - *Theriophonum fischeri* Sivad. associations

IV.4.7.4. Subterranean organs

Presence of special subterranean organs such as corm in *Amorphophallus paeoniifolius* (Dennst.) Nicolson and *Theriophonum fischeri* Sivad., tubers in *Portulaca oleracea* L. and *Portulaca pilos*a L., rhizome in *Curcuma decipiens* Dalzell, *Nymphaea nouchali* Burm.f., *Eleocharis dulcis* (Burm.f.) Trin. ex Hensch. and *Cyperus* sp. (*Cyperus brevifolius* (Rottb.) Endl. ex Hassk., *Cyperus dubius* Rottb., *Cyperus haspan* L., *Cyperus mindorensis* (Steud.) Huygh, *Cyperus richardii* Steud., *Cyperus rotundus* L.) will help them to overcome the hot summer season and other adverse environmental conditions. On the arrival of monsoon season, these subterranean organs become active and sprout again to produce new plants.

IV.4.7.5. Succulence

Many scrub jungle elements characterized by succulent shoot system are distributed in rocky outcrops of Walayar. *Cereus pterogonus* Lem, *Euphorbia tortilis* Rottler ex Ainslie, *Murdannia semiteres* (Dalzell) Santapau, *Opuntia dillenii* Haw., *Peperomia pellucida* (L.) Kunth and *Pedalium murex* L. are some of the common succulent plants represented in the vegetation . The succulence is maintained for the water storage and they are desiccation tolerant. The very common *Coleus strobilifer* (Roxb.) A.J.Paton is a semi-succulent plant which grows very successfully in these rocky patches and colonizes in the form of a weed that replaces the native plants.

IV.4.7.6. Short life span

Onset of monsoon results in the sprouting and germination of herbaceous plants like *Sesamum prostratum* Retz., *Polycarpaea corymbosa* (L.) Lam., *Polygala persicariifolia* DC., *Murdannia* sp, *Hoppea fastigiata* (Griseb.) C.B.Clarke, *Commelina* sp, *Canscora diffusa* (Vahl) R.Br. ex Roem. & Schult., *Bonnaya sp.* etc. They complete their vegetative period within a short span of time and enter into the reproduction phase by the end of July or August. Mass flowering of these plants along with pollination and seed setting occurs by the end of August and September. This results in the successful completion of the life cycle before the soil and atmospheric conditions become hostile and harsh.

IV.4.7.7. Anemochory

Strong desiccating wind through the Palghat Gap region favours easy seed dispersal of plants like *Alstonia scholaris* (L.) R.Br., *Saccharum spontaneum* L., *Terminalia paniculata* Roth, *Wrightia tinctoria* R.Br., *Cenchrus pedicellatus* (Trin.) Morrone, *Arundinella mesophylla* Nees ex Steud., *Gymnema sylvestre* (Retz.) R.Br. ex Sm., *Terminalia anogeissiana* Gere & Boatwr., *Getonia floribunda* Roxb.etc. The dominance of anemochorous taxa within the range seems to be an adaptive feature to thrive well within the desiccating winds flowing through the Gap.

IV.4.7.8. Massive flowering

The massive flowering of *Bonnaya ciliata* Spreng., *Heliotropium rottleri* Lehm., *Hoppea fastigiata* (Griseb.) C.B.Clarke in Hook.f., *Sesamum prostratum* Retz., *Sesamum radiatum* Schum. in Schum. & Thonn., *Drosera indica* L., *Utricularia spp*., *Parasopubia delphiniifolia* (L.) H.-P.Hofm. & Eb.Fisch., *Commelina* sp, *Cyanotis* sp during the months of August and September in these rocky outcrops will attract the pollinators and help in the multiple pollination with minimal expense. This favors cross pollination rather than self pollination. Further, more research is needed for the evaluation of relation between mass flowering and pollination mechanisms.

IV.4.8. Unique features and shift in vegetation

The hillocks in Walayar hill ranges are not uniformly distributed and are found scattered throughout the range. The vegetation also seems to be slightly different when compared with the outcrops in the southern and Northern ends of the Gap. The hillocks seem to be more species rich towards the Southern ends when compared to the northern ends.The presence of unique microhabitats like Ephemeral Flush Vegetation is very significant in the hillocks towards the southern side and the hillocks towards the Walayar end lack this microhabitat. This may be due to the absence of small water channels flowing through the slopes of these hillocks which are commonly formed during monsoon season towards the southern end. The altitude of the hillocks towards the northern lip is much lower compared to those in the southern side. This results in the exposure of hillocks to more dry winds flowing through the Palghat gap. As a result, many dry deciduous members along with scrub jungle elements are found in abundance towards the northern tip.

Euphorbia tortilis Rottler ex Ainslie is one such unique taxa found in the hillocks towards the northern end but is absent towards the southern lip . Other unique members

Plate 95. **Plant adaptations in rocky outcrops: Fig. a. Pubescence** - *Cyanotis burmanniana* Wight **b. Carnivory** - *Drosera indica* L. **c. Semi – parasitism** - *Parasopubia delphiniifolia* (L.) H.-P.Hofm. & Eb.Fisch. **d. Subterranean organs** - *Curcuma decipiens* Dalzell **e. - f. Succulence** - *Cereus pterogonus* Lem & *Euphorbia tortilis* Rottler ex Ainslie **g. Anemochory** - *Combretum albidum* G.Don **h. Mass flowering** - *Euploca marifolia* var. *rottleri* (Lehm.) Ancy & P.Javad.

found towards the north include *Tribulus terrestris* L., *Cleome aspera* J.Koenig, *Theriophonum fischeri* Sivad., *Dodonaea viscosa* Jacq., *Gymnema sylvestre* (Retz.) R.Br. ex Sm., *Pedalium murex* L. etc. and are never found towards the southern end hillocks as they are adapted to thrive in harsh edaphic conditions. This is an indication that the northern end low altitude hillocks are exposed to acute water shortage, severe temperature regimes and dry winds through the Gap.

IV.4.9. Analysis of floristic composition in microhabitats of hillocks

Analysis of similarity in associated flora of each microhabitat using Sorensen's similarity index revealed that the index varies from 0 - 0.46 (Table no: 12) and forty five combinations were possible when nine microhabitats were compared between each other for their similarity in species composition. It is revealed that, only SFD and SRA exhibited more than 45% of similarity which highlights the unique floral compositions in these microhabitats. SRA and TCTA along with ERS and SFD showed 40% similarity in species composition. Further, the common floral composition between SEP and RP and EFV and ERS exhibited more than 30% similarity. Similarly, the floral composition between SEP and SFD, RCF and ERS and ERS and SRA expressed more than 15% and 10% similarity respectively.

Twelve combinations of microhabitats showed least common species composition in their microhabitats and they include EFV & SFD, EFV & RCF, EFV & SEP, ERS & B, ERS & SEP, ERS & TCTA, SFD & RP, SFD & RCF, SFD & B, SFD & TCTA, SRA & RCF and SRA & SEP. These microhabitats gave less than 10 percentage similarity among their species composition. Sixteen different combinations of microhabitat (EFV & SRA, EFV & RP, EFV & B, EFV & TCTA, ERS & RP, SRA & RP, SRA & B, RP & RCF, RP & B, RP & TCTA, RCF & B, RCF & SEP, RCF & TCTA, B & TCTA, B & SEP, SEP & TCTA) didn't share even a single common species in them and exhibited zero percent similarity.

Table 12. Analysis of floristic composition in microhabitats of hillocks (Sorensen's Similarity Index)

	EFV	ERS	SFD	SRA	RP	RCF	B	SEP	TCTA
EFV	1	0.361	0.065	0	0	0.0526	0	0.0363	0
ERS		1	0.4	0.1254	0	0.1555	0.025	0.0560	0.0077
SFD			1	0.4564	0.0144	0.0294	0.0317	0.1568	0.0328
SRA				1	0	0.0090	0	0.0756	0.421
RP					1	0	0	0.3255	0
RCF						1	0	0	0
B							1	0	0
SEP								1	0
TCTA									1

EFV - Ephemeral Flush Vegetation, ERS - Exposed Rock Surfaces, SFD - Soil Filled Depressions, SRA - Soil Rich Area, RP - Rock Pools, RCF - Rock Crevices or Fissures, B - Boulders, SEP - Small Ephemeral Pools, TCTA - Tree Cover Tree Associates

IV.4.10. Disturbances in vegetation

Hillock systems are often considered as wastelands and are often neglected as far as the conservation of biodiversity is concerned. Since most of the hillocks are found near to human inhabited areas, the disturbances are also high. Alien - invasive taxa, disposal of waste, active quarries, construction activities, forest fire, grazing and industries are the factors responsible for such disturbances to the vegetation. Following is a summary of threats operating in low altitude hillocks.

IV.4.10.1. Alien - invasive taxa

Alien - invasive species is one of the most important disturbances found in the hillock systems. About 65 taxa are found to be invasive to the study area which forms 15.82% of the total plants in the hillock systems. *Ageratum conyzoides* L., *Chromolaena odorata* (L.) R.M.King & H.Rob., *Mesosphaerum suaveolens* (L.) Kuntze, *Parthenium hysterophorus* L., *Cleome rutidosperma* var. *burmanni* (Wight & Arn.) M.O.Siddiqui & S.N.Dixit, *Croton hirtus* L'Hér., *Ipomoea pes-tigridis* L., *Ipomoea hederifolia* L., *Lantana*

camara L., *Martynia annua* L., *Mimosa diplotricha* C.Wright, *Ricinus communis* L., *Senna tora* Roxb., *Synedrella nodiflora* Gaertn., *Urena lobata* subsp. *sinuata* (L.) Borss.Waalk. etc are posing great threat to the native plants of these innate ecosystems. Often these plants even invade the unique microhabitats such as Ephemeral Flush Vegetation (EFV) and Exposed Rock Surfaces ERS) and becomes a great competitor for native plants like *Utricularia* sp, *Drosera indica* L., *Eriocaulon* sp, *Rhamphicarpa fistulosa* Benth., *Smithia gracilis* Benth. etc. Their fast growing nature, higher no of seeds and effective seed dispersal mechanisms are making them the nursing ground for these plants. They multiply very rapidly and complete many progeny in a year. These plants are often found in the forest margins and road sides, from where they gradually reach the rocky outcrops.

IV.4.10.2. Industries and Waste disposal

Most of the hillocks are located along the roadsides or near to human inhabited areas. Also, few hillocks are near to industries and these factors make the area the dumping grounds of waste and is often neglected even by authorities since these lands are considered as wastelands. Industrial waste is often found to be dumped in these grounds and the smoke from the industries are creating ashy dust on all aerial plant parts. This often gradually affects the photosynthetic efficiency and the growth of the resident taxa inhabiting such ecosystems.

IV.4.10.3. Quarrying

Active quarries are one of the important threats to the hillock systems in the Gap zone and the changes brought out by quarrying are irreversible to the entire ecosystem. Moreover the very existence of the low altitude rocky outcrops are even questioned in many areas. Quarrying will affect the unique microhabitats such as Ephemeral Flush Vegetation, Rock crevices and fissures, and will ultimately affect the survival of rare species such as *Drosera indica* L., *Oldenlandia hygrophila* Bremek., *Rhamphicarpa fistulosa* Benth., *Utricularia graminifolia* Vahl, *Utricularia lazulina* P.Taylor, O*sbeckia muralis* Naudin etc. Further, the disappearance of these microhabitats paves way for the invasion of certain other invasive taxa such as *Chromolaena odorata* (L.) R.M.King & H.Rob., *Mesosphaerum suaveolens* (L.) Kuntze, *Mimosa diplotricha* C.Wright, *Lantana camara* L. etc. and will completely disturb the other microhabitats too. The uncontrolled mining and quarrying adversely affect the groundwater levels in the nearby areas. In the range, at present, one large active quarry was found in operation at Kongampadam hillock and further, three hillocks were found to be active earlier and now abandoned. But, the

restoration of this permanently changed habitat is beyond restoration and adversely affected the native vegetation as well as the ground water resources in the surroundings.

IV.4.10.4. Grazing

Grazing by herbivores like cows, goats and buffaloes pose another important threat to the hillocks as they feed mostly on selected herbaceous plants. The population of many herbaceous taxa get affected by early grazing, before the plants attain the reproductive phase. Depleting populations of many taxa inhabiting such fragile ecosystems are serious, as many taxa are disappearing from low altitude hillocks. Moreover, as these grazing animals do not feed on the alien invasive elements, the population of such plants is also increasing tremendously.

IV.4.10.5. Construction

Road widening, construction of new roads and construction of buildings also affect the health of the hillock systems. Often for making roads, the hillocks are dug from the middle isolating both ends. Further, houses are also being constructed in these rocky outcrops as many of these low altitude lands are owned by private landlords .

IV.4.10.6. Forest fire

The occurrence of forest fires during the dry phase of these ecosystems due to anthropogenic activities were reported from Vattappara, Karadikunnu etc. Further, the fire is triggered by the presence of volatile oil containing dried plants of *Mesosphaerum suaveolens* (L.) Kuntze, *Ageratum conyzoides* L., *Chromolaena odorata* (L.) R.M.King & H.Rob., *Anisochilus carnosus* (L.f.) Wall. etc. The fire replaces the native ground dwelling members as well as the propagules which are waiting to get sprouted by the onset of monsoon. .

IV.5. Bio-monitoring of habitat dynamics and associated angiosperm diversity in Walayar Forest range

Objective addressed

- Seasonal analysis of floristic wealth in Walayar hills
- Biomonitoring of vegetation in Walayar hills

IV. 5.1. Seasonal analysis of floristic wealth

Walayar range being located in the Palghat Gap zone, the distribution of drier elements are more and the vegetation is being dominated by moist deciduous and deciduous elements. The moist deciduous trees of the study area shed their leaves in the extreme dry seasons of the year and with the onset of monsoon, new leaves start to appear. From the months of December, the forest floor becomes barren due to the penetration of heavy sunlight by opening up of canopy as a result of leaf shedding in the autumn season. The shed-off leaves help in humus accumulation by rain water in the forthcoming season (Plate 96).

With the onset of monsoon, the forest floor gets filled with shade-loving plants. Most of the semi-evergreen patches in the Walayar range could be easily delineated from the moist deciduous patches in these dry seasons.

Seasonal vegetational fluctuation is pronounced in the Walayar range due to harsh sunlight and increased temperature regimes in drier seasons. Most of the trees became barren and the forest floor will be without any green element. Such areas easily catch fire and affect the frequency of occurrence of many taxa in the forthcoming seasons. Similarly, the frequency of occurrence of epiphytic elements in these forest patches are very minimal and showed variations. The available epiphytes are predominant in the monsoon and immediate post-monsoon seasons.

There is a remarkable difference in the plant composition, as the elevation of the forest increases. In higher elevations also there is a clear distinction of plants in the pre - monsoon period and post monsoon period. The canopy cover of the forests opens up a little in the higher elevations where there are semi- evergreen forest patches as the intermittent deciduous trees shed their leaves during hot summer. The ground storey also gets dried up due to lack of moisture content. The onset of monsoon is the triggering element for the flowering of ground orchids such as *Nervilia* spp., *Habenaria digitata* Lindl., *Crepidium purpureum* (Lindl.) Szlach. etc. Further, the greening of the ground floor by various geophytes such as *Zingiber* spp., *Curcuma* spp., *Meistera* spp., *Globba* spp., *Chlorophytum*

sp, *Stachyphrynium spicatum* K.Schumm and *Theriophonum fischeri* Sivad. are found in the higher elevations.

Another peculiar feature observed in the Walayar hills is the presence of barren rocky hill slopes above 400m. These rocks are devoid of any vegetation and are often found in the hill slopes where the strong hot winds blows regularly.

There are no true evergreen and shola forest regions in Walayar forest range. Grasslands are represented as small geographical areas on the top of the hills and are found to be green with diverse floral elements during the monsoon and soon after the monsoon season. Small herbaceous plants flower and set seeds during this period. The species richness in the grasslands will be in its maximum during the post monsoon period from August to September.

By the end of December, the vegetation in the grasslands diminishes, the plants start to dry up and the green grasslands gradually turn to brown dry grasslands with very few traces of plant elements. Only the trees and a few shrubby forms will remain green and rest of the plant groups turn brown. During the summer season, these high elevation grasslands seems to be bare rocks devoid of vegetation.

IV. 5.2. Seasonally active microhabitats in low altitude hillocks

As granitic hillock systems harbor unique microhabitats and associated floristic components, seasonal shifts in vegetation were apparent. The ecosystem figures demarcating wet and dry phases based on the availability of moisture (Plate 97). The micro environment in these hillock systems varied between extremely hot and arid in the dry season from December to May to the water logged and slippery from June to November in the wet season. Microhabitat conditions present in these outcrops vary significantly from the adjoining areas and hence they can be referred to as terrestrial habitat islands.

IV. 5.2.1. Wet phase in granitic hillocks

Wet phase in rocky outcrops becomes evident soon after the Southwest monsoon. Several microhabitats are found during this period (June - November) and they will remain in these special habitats until the monsoon recedes. Several unique plant associations are also observed during this time. These habitats are hydro - geographically affected and therefore a distinct wet and dry phase can be observed in these rocky outcrops.

Wet phase is characterized by the presence of wetland taxa like *Utricularia* spp., *Eriocaulon* sp, *Drosera* sp, *Rotala* sp, *Bonnaya sp*, *Hoppea fastigiata* (Griseb.) C.B.Clarke, *Oldenlandia hygrophila* Bremek., *Rhamphicarpa fistulosa* Benth.etc. Ephemeral Flush

Vegetation, Small Ephemeral Pools and Exposed Rock Surfaces (ERS) are some of the microhabitats prominent during this phase. Further some unique plant associations are also prominent such as the combination of *Eriocaulon*, *Utricularia* spp, *Drosera indica* L., *Murdannia* sp, *Bonnaya* sp, *Hoppea fastigiata* (Griseb.) Clarke, *Rhamphicarpa fistulosa* Benth. etc. They grow as small populations and are found growing in close contact with other members. They appear along with the southwestern monsoon. Small water channels flowing or sweeping through the hillocks become the most suitable region for EFV. Small network of *Utricularia* sp. along with a green mat of *Eriocaulon xeranthemum* Mart. along with *Hoppea fastigiata* (Griseb.) Clarke begins to appear by the middle of June. These plants show fast growth rate and complete their vegetative phase by the end of July and set to flower. These taxa complete their life cycle simultaneously, as the southwest monsoon recedes by the end of September. As the monsoon season ends, the small water channels begin to dry out and this marks the period of disappearance of these wetland taxa and further, this microhabitat also diminishes and disappears. There are other microhabitats such as Small Ephemeral Pools (SEP) flourished with taxa like *Rotala malampuzhensis* R.V.Nair ex C.D.K.Cook, *Apocopis mangalorensis* (Hochst. ex Steud.) Henrard, *Commelina benghalensis* L., *Cyanotis cristata* (L.) D.Don, *Cyperus haspan* L., *Cyperus pumilus* L., *Eriocaulon quinquangulare* L., *Lindernia rotundifolia* (L.) Alston etc. These taxa complete their life cycle by the end of July and start flowering during August - September. The water in these temporary pools will soon dry up as the monsoon season ends and consequently plants dried up completing the life cycle.

Exposed Rock Surfaces (ERS) are characterized by the presence of *Indigofera uniflora* Buch.-Ham. ex Roxb., *Alysicarpus bupleurifolius* (L.) DC., *Arundinella mesophylla* Nees ex Steud., *Bonnaya ciliata* Spreng., *Sesamum prostratum* Retz., *Bulbostylis barbata* (Rottb.) C.B.Clarke, *Commelina wightii* Raizada, *Cyanotis burmanniana* Wight, *Cyperus compressus* L., *Dimeria raizadae* V.J.Nair, Sreek. & N.C.Nair, *Enteropogon dolichostachyus* (Lag.) Keng, E*riocaulon xeranthemum* Mart. and many more taxa. Of these, many show gregarious flowering during the months of August and September. The higher temperature and dry climate after the monsoon season cause these taxa to dry up after completing its life cycle. Later, these areas will be covered with invasive taxa like *Mesosphaerum suaveolens* (L.) Kuntze, *Coleus strobilifer* (Roxb.) A.J.Paton etc.

IV. 5.2.2. Dry Phase in hillocks

The Southwestern monsoon season recedes by the end of September. The wetness on the surface of rocky outcrops begins to retard and the Exposed Rock Surfaces (ERS) along with Soil Filled Depressions (SFD) becomes dry after a few days of rain. *Heliotropium rottleri* Lehm., *Commelina wightii* Raizada, *Cyperus* sp, *Bulbostylis barbata* (Rottb.) C.B.Clarke, *Zornia gibbosa* Span. etc. get colonized in the Exposed Rock Surfaces (ERS). *Cereus pterogonus* Lem, *Cyanotis burmanniana* Wight, *Cymbopogon flexuosus* (Nees ex Steud.) Will.Watson, *Geissaspis cristata* var. *tenella (*Benth.) M.R.Almeida, *Oxalis corniculata* L., *Paramollugo nudicaulis* (Lam.) Thulin, *Polycarpaea corymbosa* (L.) Lam. are some of the predominant taxa found in Rock Crevices and Fissures. The initially wet but later drier Soil Filled Depressions (SFD) are colonized by taxa like *Alysicarpu*s spp, *Biophytum reinwardtii* (Zucc.) Klotzsch, *Chamaecrista nictitans* subsp. *patellaria* (Collad.) H.S.Irwin & Barneby, *Aeschynomene indica* L., *Andrographis echioides* Nees, *Cajanus rugosus* (Wight & Arn.) Maesen, *Calopogonium mucunoides* Desv. etc. Later, during the post monsoon period, many grass members start to grow and colonize the rocky outcrops. *Arundinella mesophylla* Nees ex Steud., *Dimeria* sp, *Tripogon bromoides* Roth, *Digitaria* sp, *Heteropogon contortus* (L.) P.Beauv. ex Roem. & Schult. etc are some of the grass members predominating the rocky outcrops.

Many shrubs and tree forms are found in Soil Rich Areas and Tree Cover Tree Associates and such taxa will remain in the rocky outcrops. They will flower mostly during the post monsoon seasons. Since the plants in these habitats are deciduous, the taxa will remain dormant by shedding its leaves during the extreme summer season. Onset of monsoon initiates flushing in trees and lianas *Terminalia* spp, *Canthium* spp, *Ziziphus* spp, *Givotia moluccana* (L.) Sreem., *Grewia tiliifolia* Vahl, *Holarrhena pubescens* Wall. & G.Don, *Wattakaka volubili*s Stapf, *Wrightia tinctoria* R.Br., *Streblus asper* Lour., *Holoptelea integrifolia* (Roxb.) Planch., *Getonia floribunda* Roxb. etc are some such members found throughout the year in the hillock systems. These taxa are the only perennating members and represent the isolated green elements in the rocky out crops during the hot summer.

Minor variations in the weather conditions also affect the floristic diversity of these rocky outcrops. Delayed onset of monsoon adversely affects the germination of many taxa and sudden retrieval of monsoon puts the plants under pressure to complete its lifecycle before the expected time frame. This negatively affects the population of such taxa

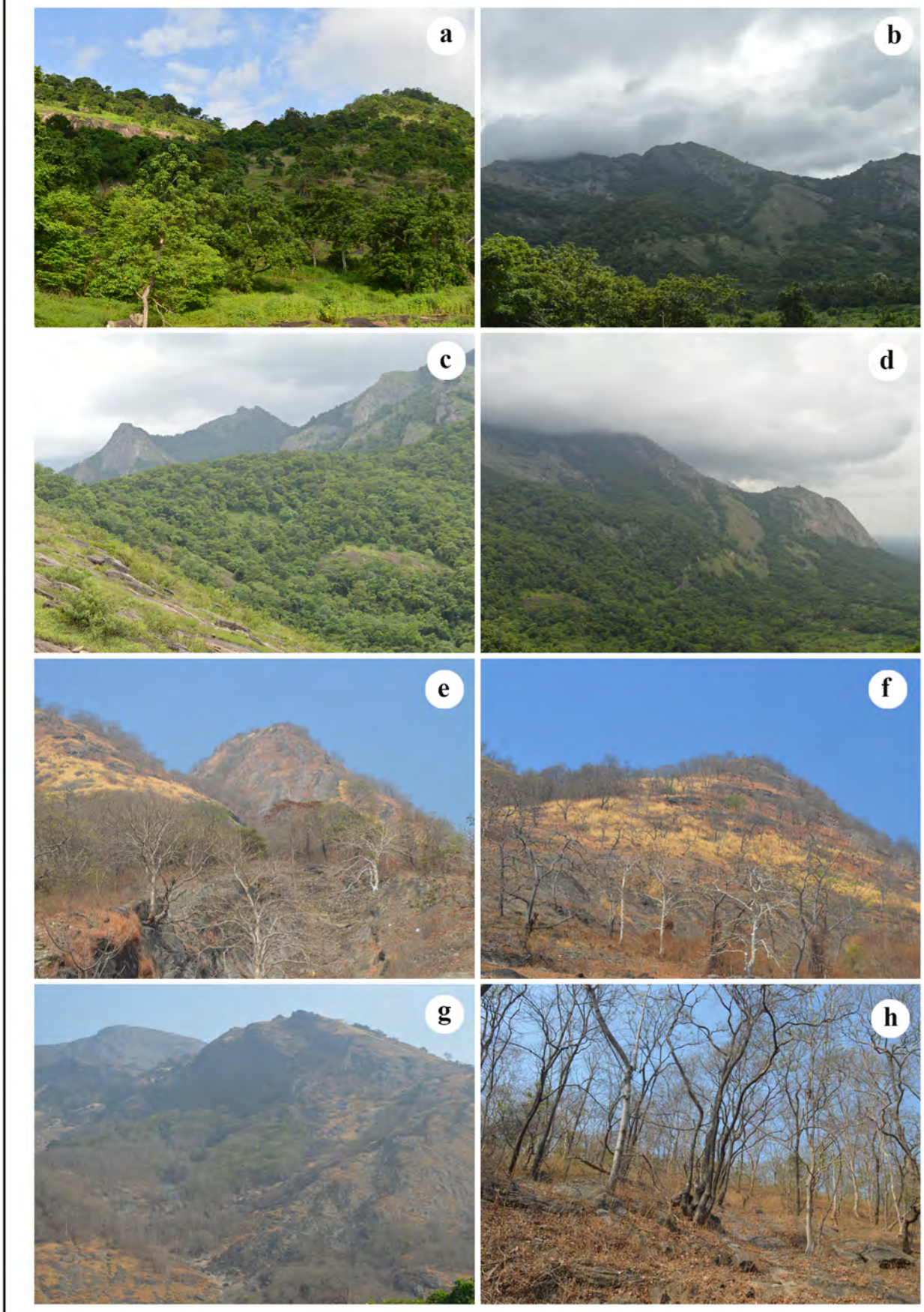

Plate 96: Biomonitoring in Walayar hill ranges Fig. a. – d. Wet phase in hill tracks **Fig. e. – h.** Dry phase in hill tracks

Plate 97: Biomonitoring in Walayar hill ranges Fig. a. – d. Wet phase in hillocks **Fig e. – h.** Dry phase in hillocks

in succeeding seasons. In conclusion it can be stated that the microhabitats in these ecosystems are so fragile that a very slight shift in the nutrient availability, changes in edaphic factors, weather conditions and other anthropogenic disturbances adversely affect the vegetation or even may result in the loss of such habitats.

IV. 5.3. Phenological analysis

The graphical representation of the phonological observations resulted in two major peaks between the months September to December and from January to March. This implies that one major peak is found in the post-monsoon and another much smaller peak before the onset of summer season. Very few taxa flowers during the summer period whose flowering is initiated by high temperature regimes and high humidity (Figure 10). Critical analysis of the phenological features of various habit forms revealed that the herbaceous taxa showed their luxuriant flowering in the mid of monsoon and post-monsoon periods, while the arborescent taxa show flowering and fruiting predominantly in the pre-monsoon periods (March - May). Climbers and the shrubby taxa have their flowering and fruiting almost constant in all the seasons, without any specificity (Figure 11).

IV.6. Endemic and threatened taxa with Phytogeographical allocation

Objectives addressed

- Analysis of percentage of endemism in Walayar forest range
- Estimation and mapping of threatened taxa using IUCN Red List 2022-2
- Elucidation of the phytogeographical affinities of taxa recorded in Walayar forest range

IV.6.1. Distribution of endemic taxa in the flora (Plate 98 - 110)

Endemism constitutes the restriction of a taxa to a particular geographical area and the percentage of endemism in a geographical area gives an insight for the need to protect that unique habitat. Analysis of taxa recorded from Walayar hill ranges accounted for 150 species (14%) as endemic. Among them, 51 species (34%) are endemic to Southern Western Ghats, out of which 11 species are strictly endemic to Kerala. Among these, *Oldenlandia hygrophila* Bremek., and *Zingiber sabuanum* K.M.P. Kumar & A. Joe are strictly endemic to the district of Palakkad and are found to be narrowly distributed within the range. *Glycosmis nelliyampathiensis* Jabeena & Maya is a recently described taxa from Nelliyampathy hills (Jabeena *et al*., 2021) and this was also collected from Walayar forest range. Further, 42 species (28%) as endemic to Western Ghats and 41 species (27.33%) endemic to Peninsular India. The vegetation has seven species as strict endemics to south India and nine species are Indian endemics (Figure 12).

Acanthaceae form the predominant family with the largest number of endemic taxa and are represented by 24 members followed by Poaceae and Rubiaceae with 10 taxa each. Fabaceae and Zingiberaceae are represented by eight endemics and other important endemic families represented include Araceae and Orchidaceae with six and five taxa respectively. Euphorbiaceae, Gesneriaceae, Lauraceae and Linderniaceae are represented by 4 taxa each (Figure 13).

When the habit forms are taken into consideration, herbs constitute 55% (84 taxa) of the predominant endemic taxa followed by trees, with 21% (32 taxa). Shrubs and climbers are represented by 16% (24 taxa) and 8% (13 taxa) respectively (Figure 14). *Barleria* L., *Curcuma* L. and *Impatiens* L. are the largest endemic genera represented by 4 species each. The genera *Torenia* L. and *Zingiber* Mill. are represented by three taxa each and form the second largest endemic genera in this range. Annexure X summarizes the number of taxa represented in different endemic zones.

IV.6.2. Estimation of threat category elements in Walayar range vegetation

Threat category elements in vegetation forms another index for assessing the significance of an ecosystem in terms of conservation. Presence of populations of threatened taxa in an area make the location a hotspot and any slight change in the biogeography may result in the irreplaceable loss of the taxa forever.

Walayar hill ranges harbour 27 threatened taxa listed under various IUCN Categories (Plate 111- 113). These include one species under Critically Endangered (CR), five taxa under Endangered (EN), fourteen under Vulnerable (VU) and seven under Near Threatened (NT) categories. Apart from these, the documented species includes 11 taxa under Data Deficient category (DD), 317 taxa under Least Concern (LC) and 733 taxa are yet to be evaluated by IUCN. *Tectona grandis* L.f. and *Coffea arabica* L. are considered as the endangered taxa under IUCN Redlist 2022 - 2. But both these taxa are found cultivated in the study area. Teak forms the major estate in the forest range. It is not found in the natural forest systems and Coffee is found as a intermixed crop in Areca and Cacao farms. Often, *Tectona grandis* L.f. and *Coffea arabica* L. are found in the forest tracks near these agricultural lands. Table 13 summarizes the list of threatened taxa recorded from the study area and Figure 15 shows the distribution of threatened taxa among various IUCN categories.

According to Barik *et al*., (2018), among the taxa collected, 168 taxa belong to the threatened categories and the list is summarized in annexure XI. Fabaceae is the family

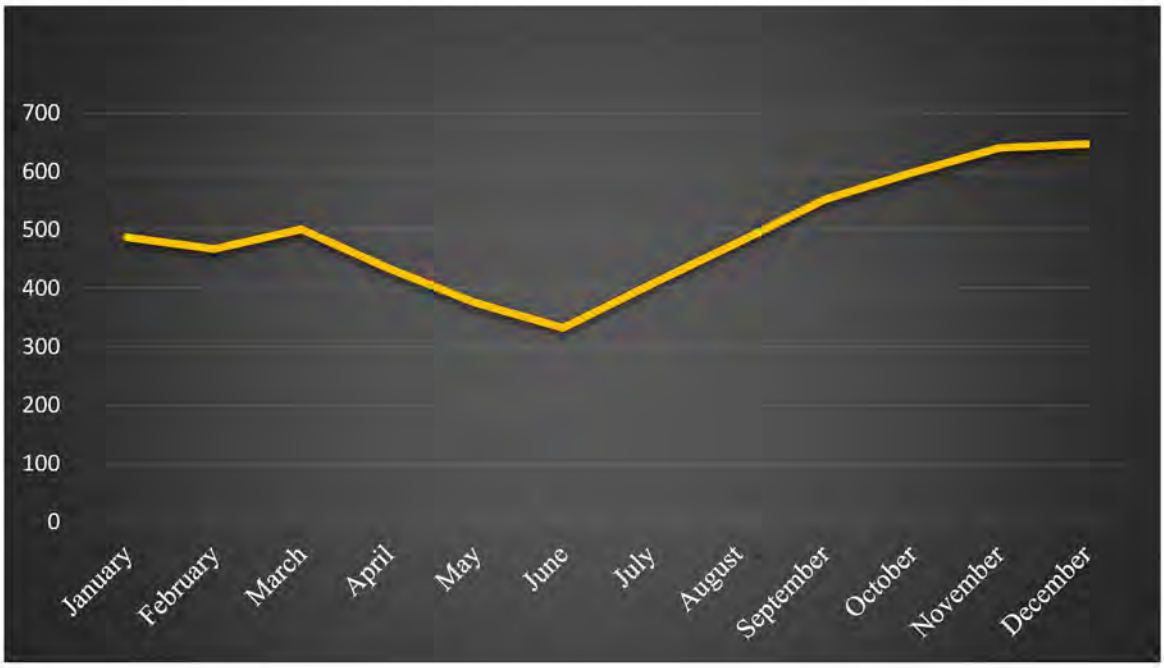

Figure 10. Phenology of plants in Walayar hills

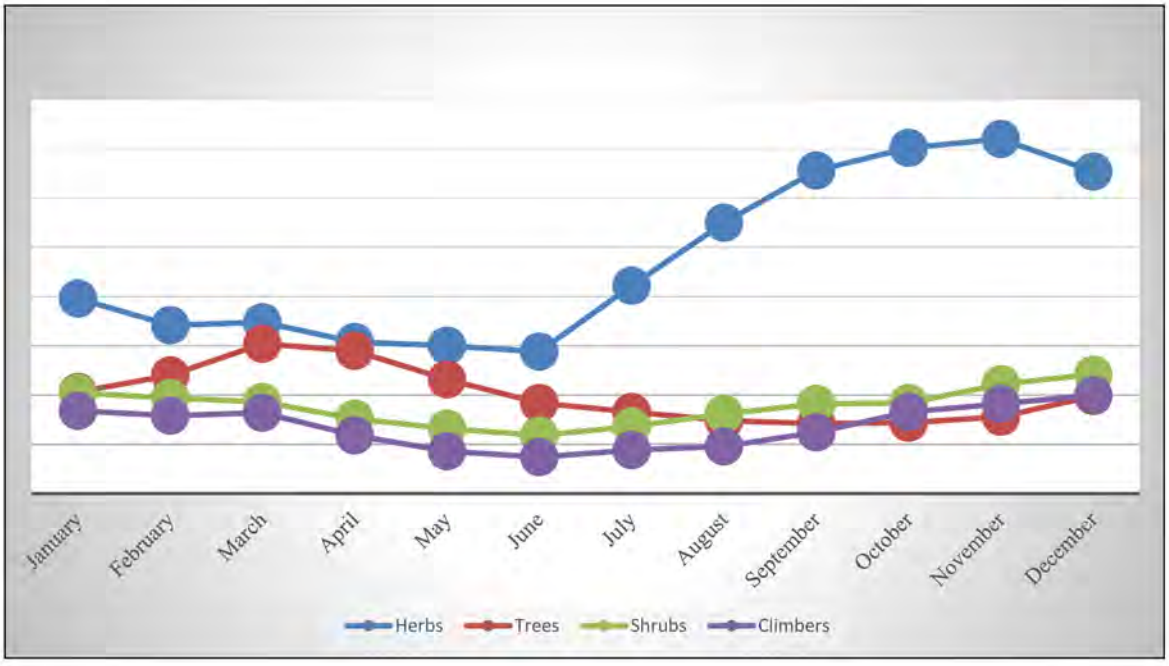

Figure 11. Habit - wise phenological analysis

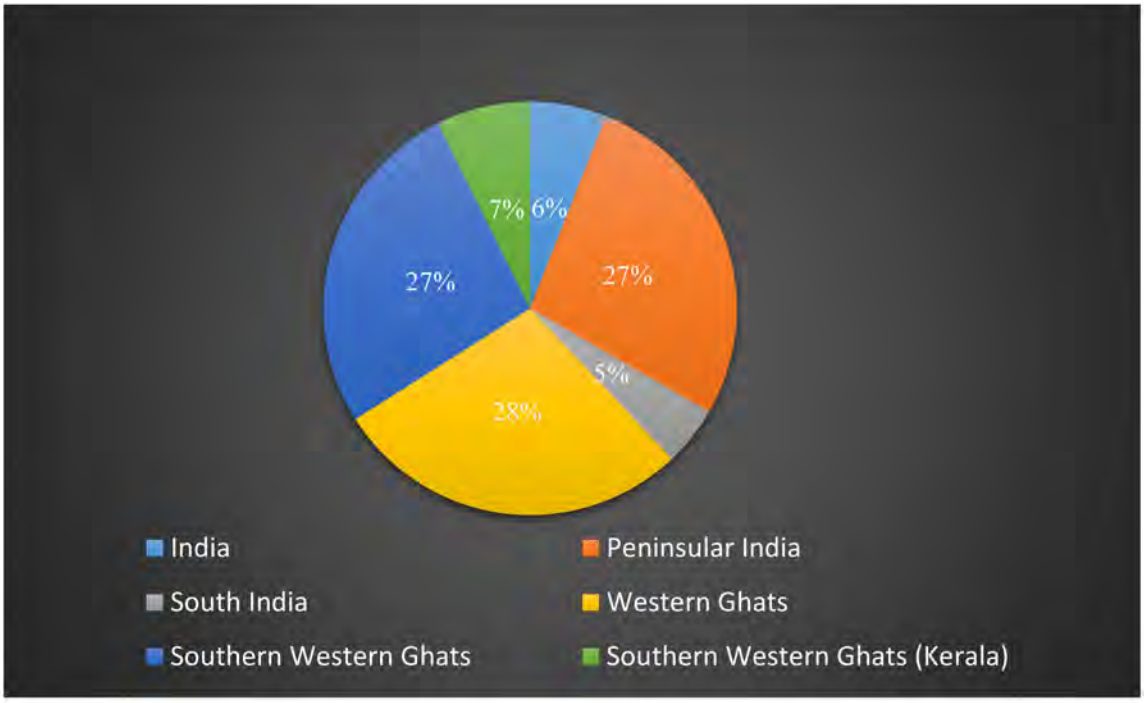

Figure 12. Endemism in Walayar hills

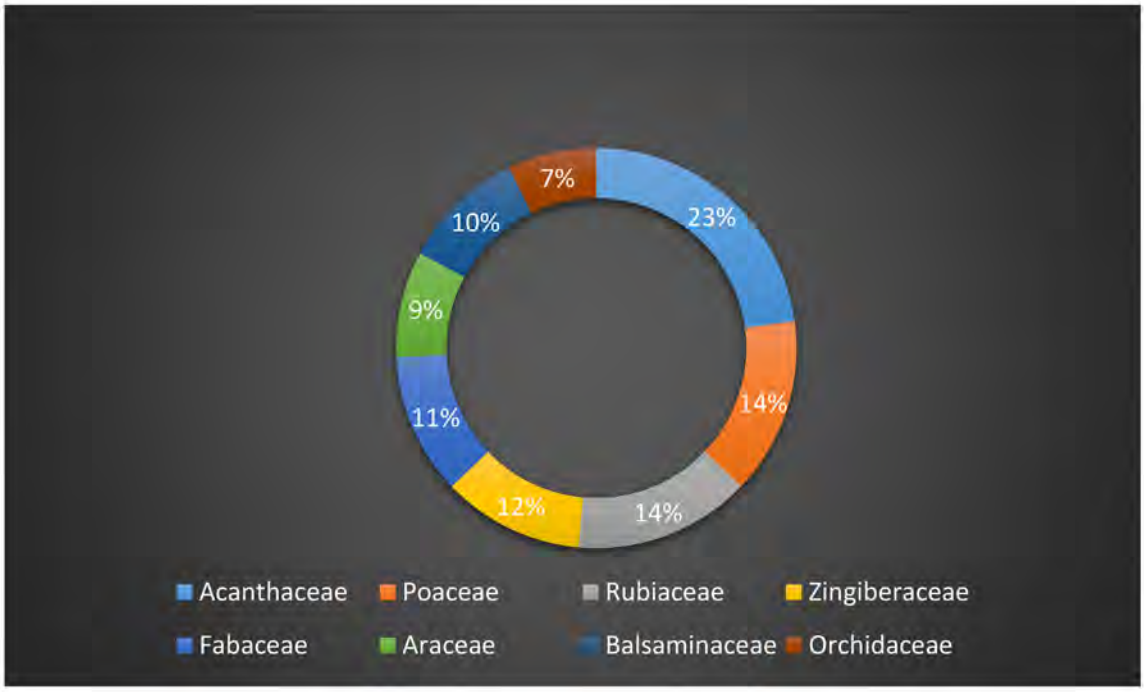

Figure 13. Distribution of endemic taxa among families

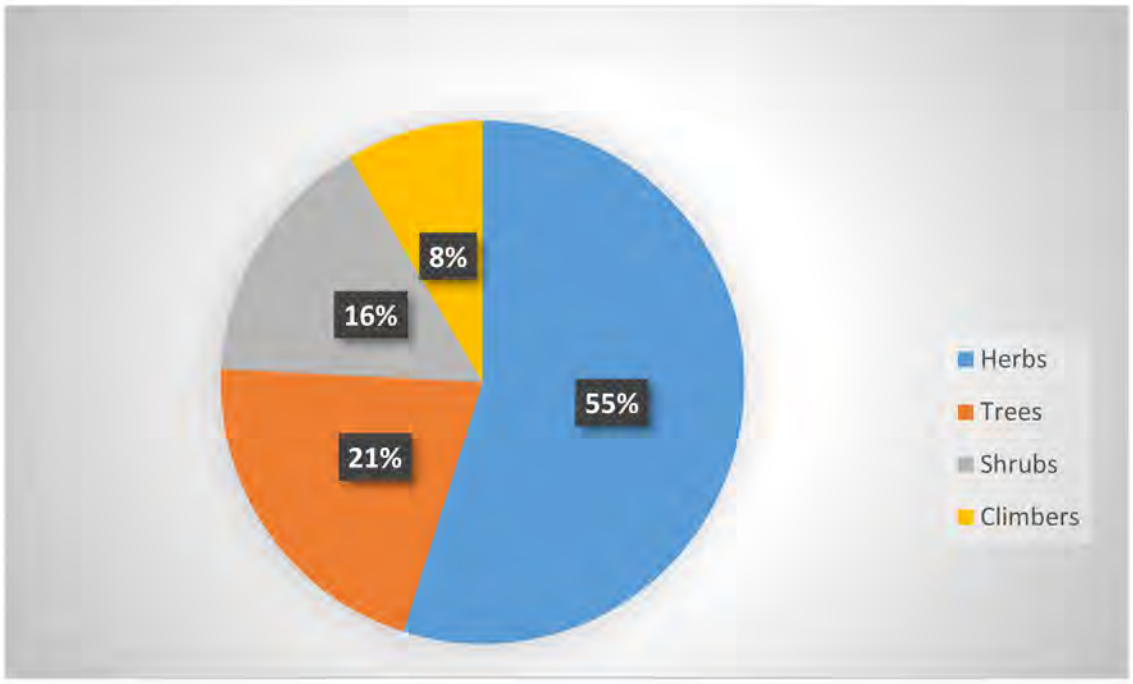

Figure 14. Distribution of endemic taxa among different habit forms

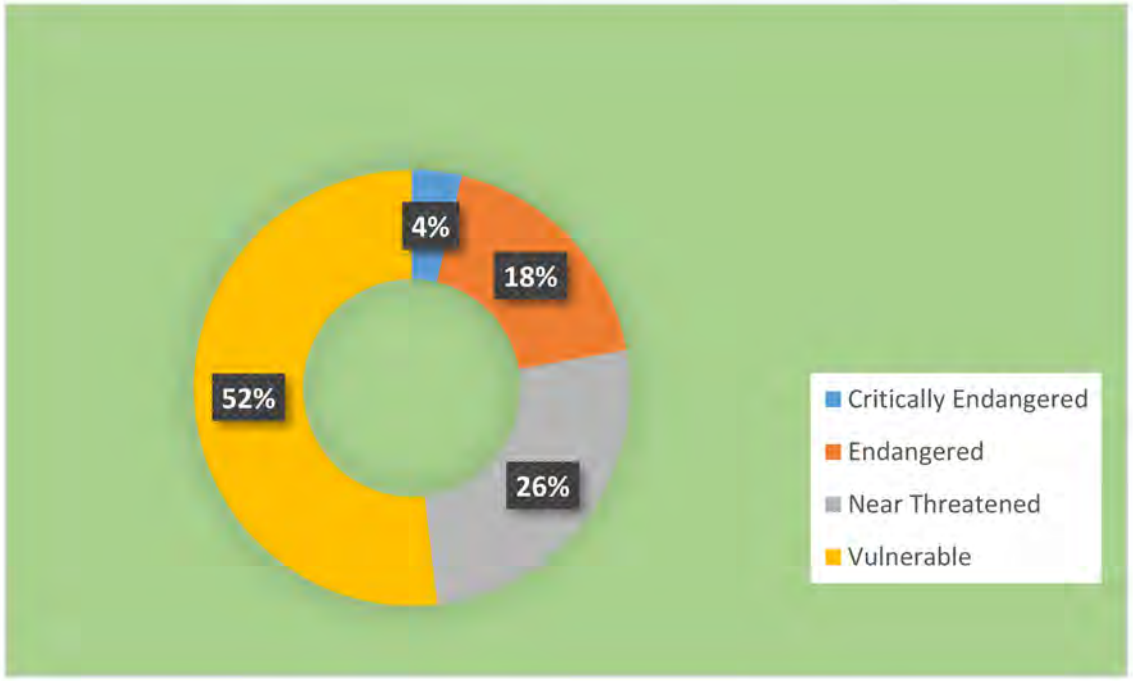

Figure 15. Distribution of threatened taxa in Walayar hills

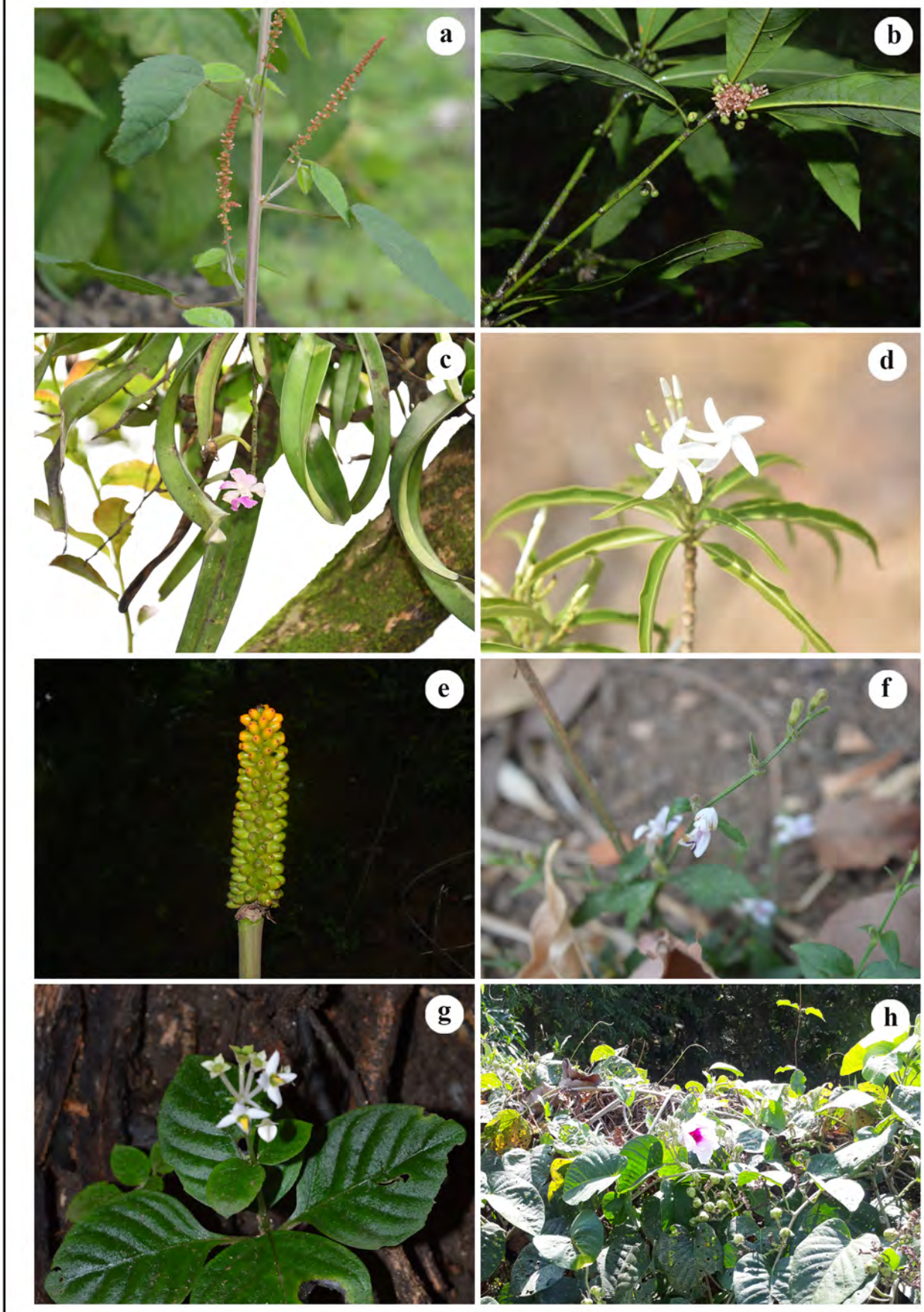

Plate 98: Diversity of endemic taxa Fig. a. *Acalypha capitata* Willd. **b**. *Actinodaphne salicina* Meisn. **c.** *Aerides maculosa* Lindl. **d.** *Alstonia venenata* R.Br. **e.** *Amorphophallus commutatus* (Schott) Engl. **f.** *Andrographis elongata* (Vahl) T.Anderson **g.** *Argostemma courtallense* Arn. **h.** *Argyreia pomacea* Choisy

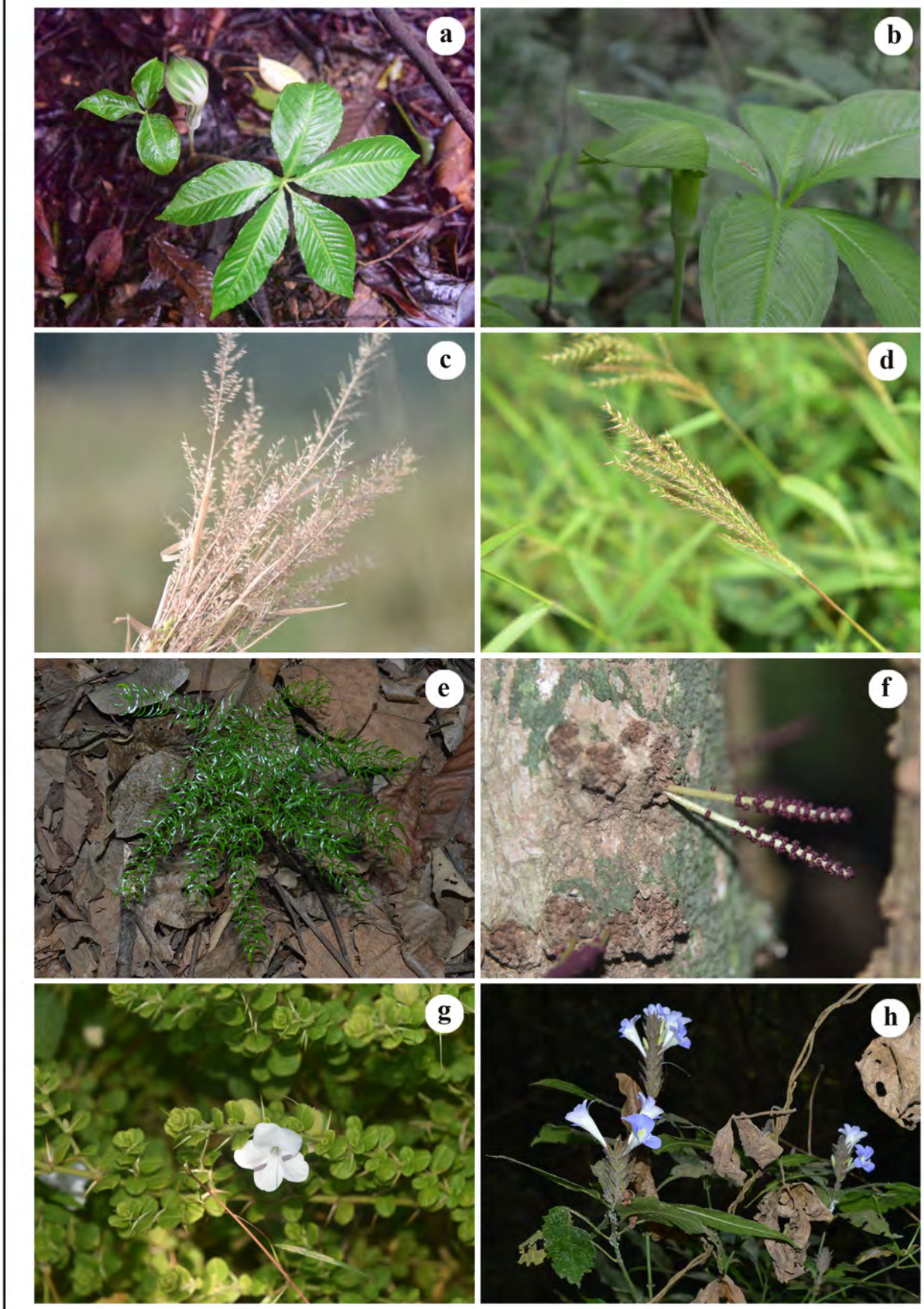

Plate 99: Diversity of endemic taxa Fig. a. *Arisaema barnesii* C.E.C.Fisch. **b.** *Arisaema tortuo*sum var. *neglectum* (Schott) Fisch. **c.** *Arundinella ciliata* Nees ex Miq. **d.** *Arundinella mesophylla* Nees ex Steud. **e.** *Asparagus gonocladus* Baker **f.** *Baccaurea courtallensis* (Wight) Müll.Arg. **g.** *Barleria buxifolia* L. **h.** *Barleria courtallica* Nees

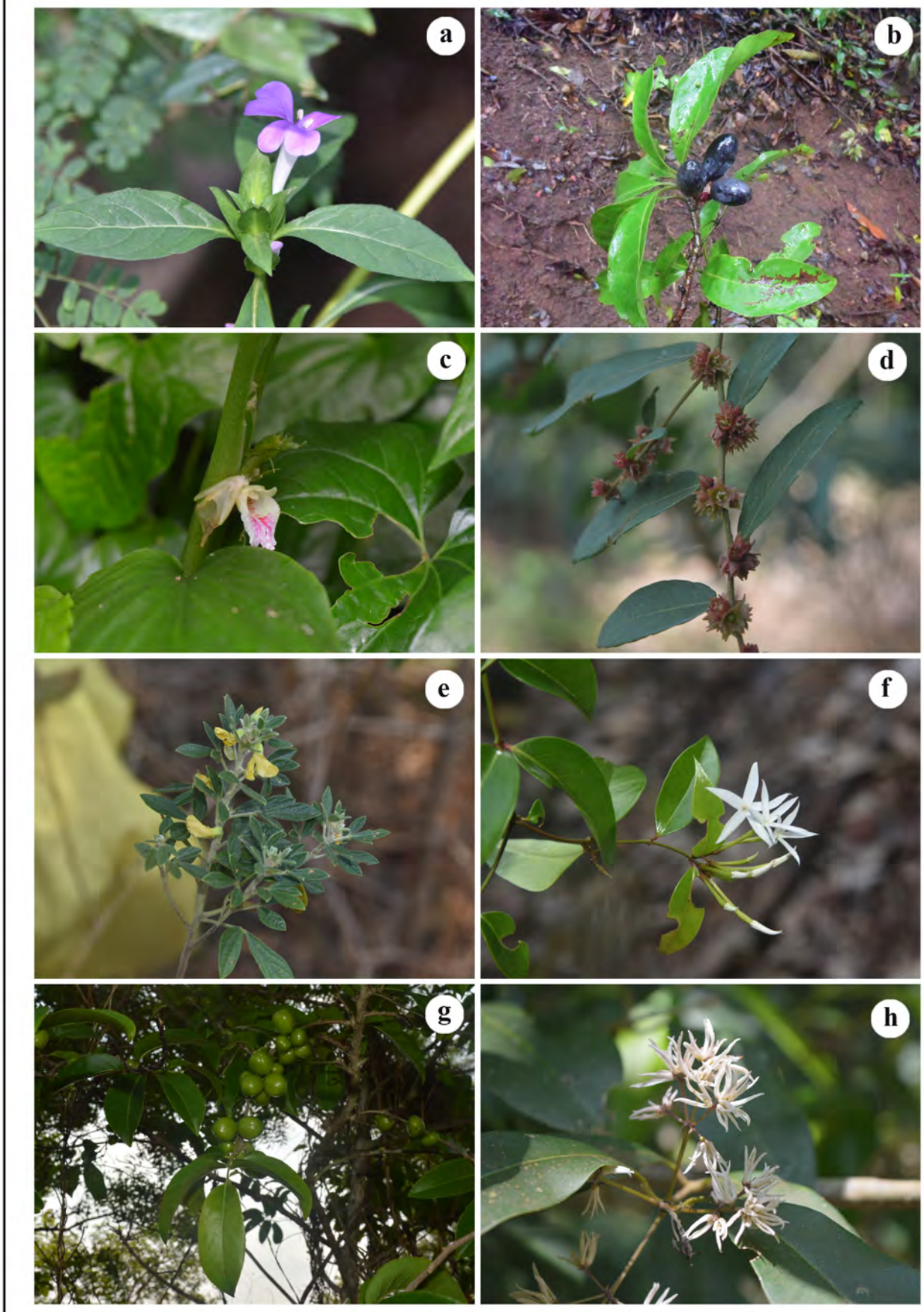

Plate 100: Diversity of endemic taxa Fig. a. *Barleria prattensis* Santapau **b.** *Beilschmiedia gemmi*flora (Blume) Kosterm. **c.** *Boesenbergia pulcherrima* Kuntze **d.** *Cajanus lineatus* (Wight & Arn.) Maesen **f.** *Carissa spinarum* L. **g.** *Casearia wynadensis* Bedd. **h.** *Chionanthus mala-elengi* (Dennst.) P.S.Green.

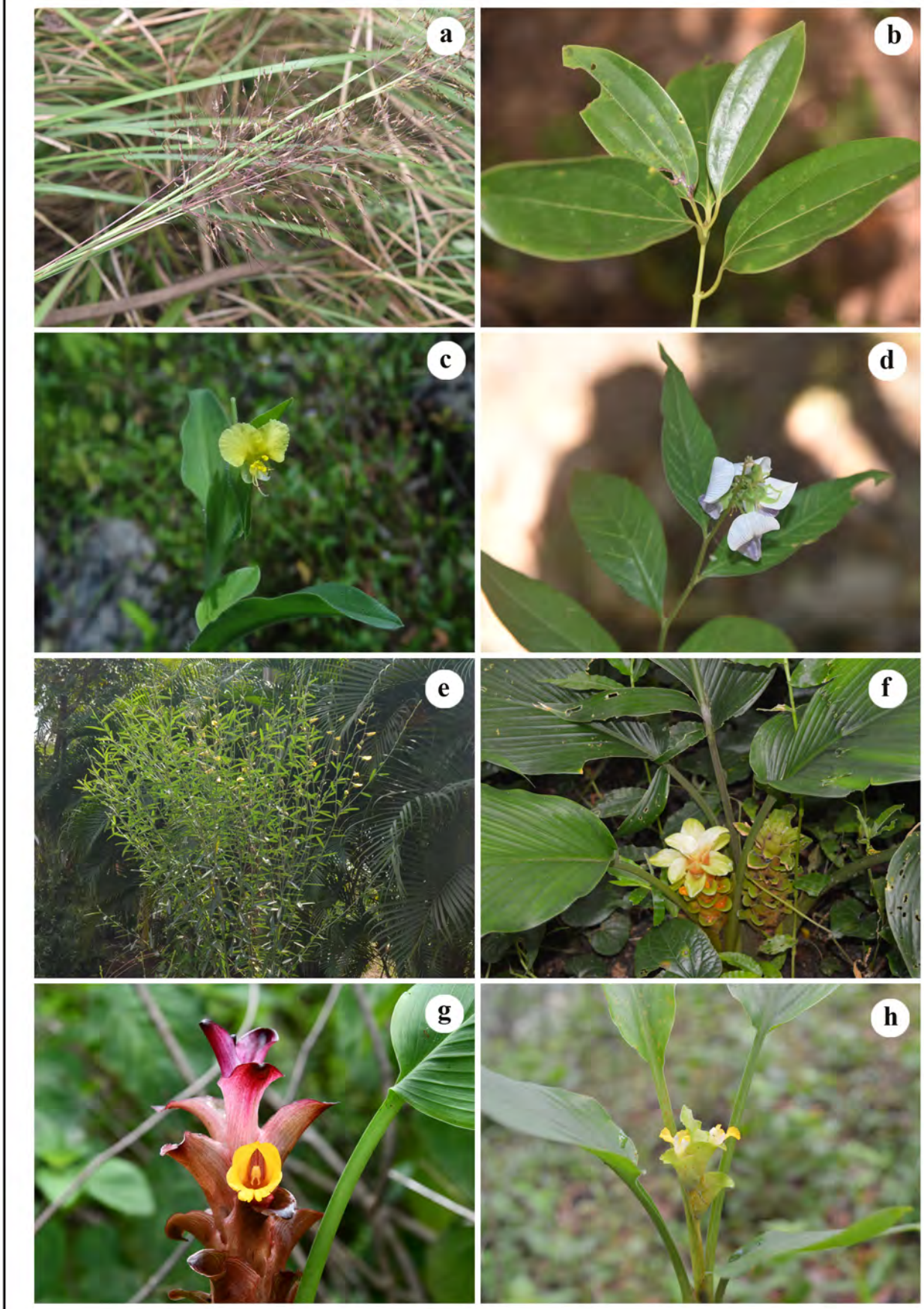

Plate 101: Diversity of endemic taxa Fig. a. *Chrysopogon hackelii* (Hook.f.) C.E.C.Fisch. **b.** *Cinnamomum malabathrum* (Burm.f.) Blume **c.** *Commelina wightii* Raizada **d.** *Crotalariaheyneana* Graham ex Wight & Arn. **e.** *Crotalaria leptostachya* Benth. **f.** *Curcuma aurantiaca* Zijp. **g.** *Curcuma decipiens* Dalzell. **h.** *Curcuma vamana* M.Sabu & Mangaly.

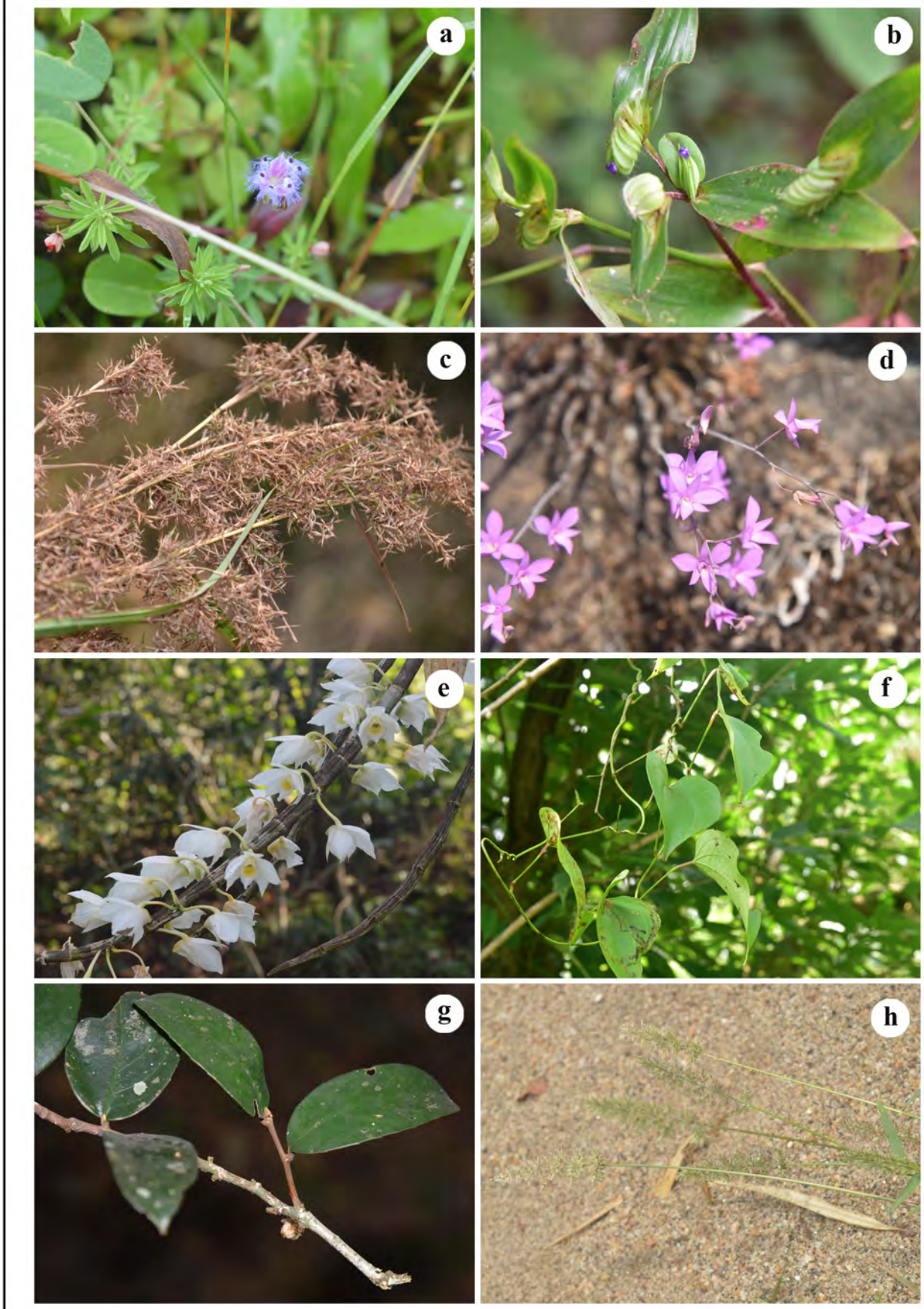

Plate 102: Diversity of endemic taxa Fig. a. *Cyanotis burmanniana* Wight **b.** *Cyanotis tuberosa* (Roxb.) Schult.f.. **c.** *Cymbopogon martini* (Roxb.) Will.Watson **d.** *Dendrobium barbatulum* Lindl. **e.** *Dendrobium ovatum* Kraenzl. **f.** *Dioscorea alata* L. **g.** *Drypetes confertiflora* Pax & K.Hoffm. **h.** *Eragrostis riparia* Nees.

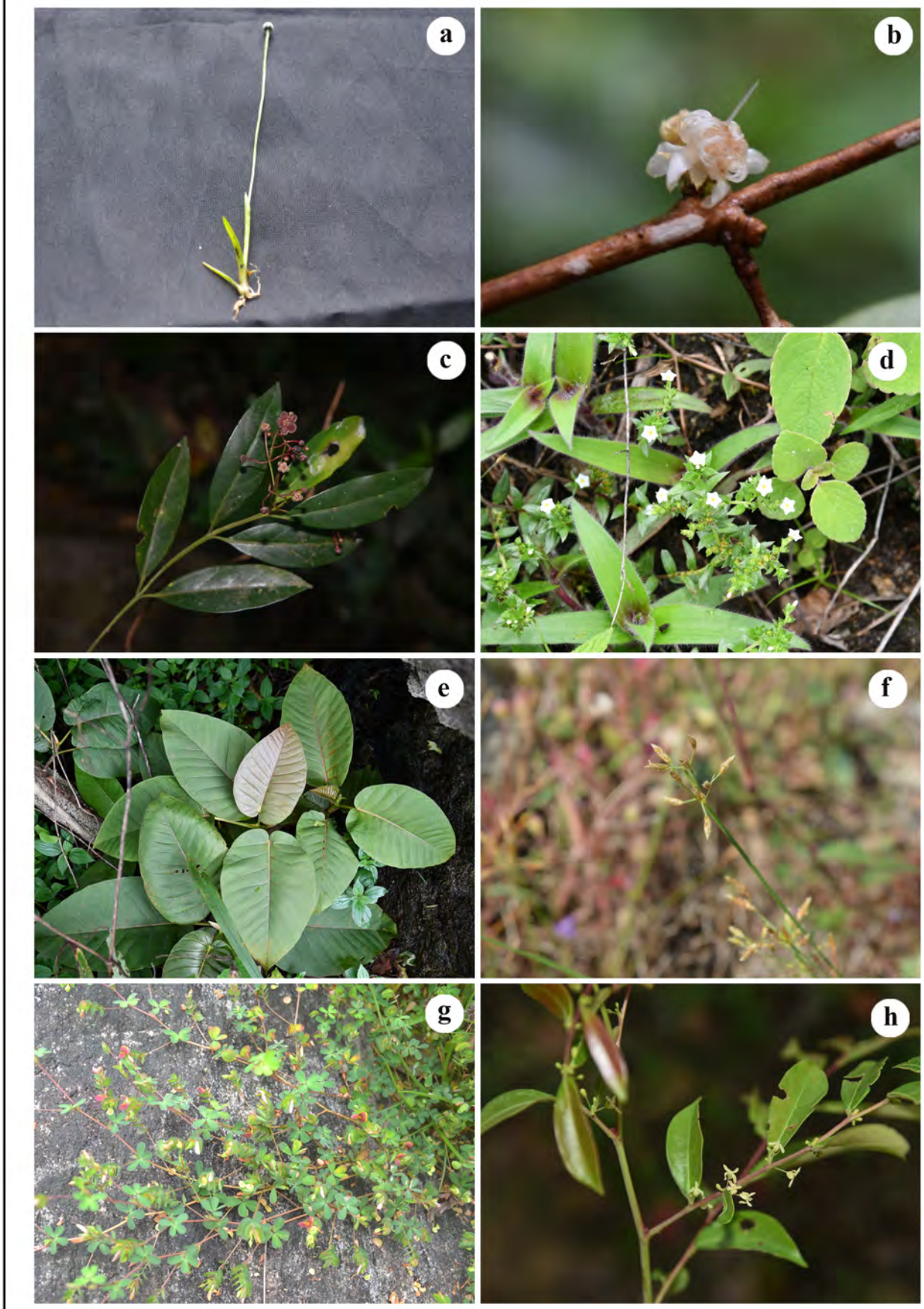

Plate 103: Diversity of endemic taxa fig. a. *Eriocaulon palghatense* R.Ansari & N.P.Balakr. **b.** *Eugnia wynadensis* Bedd. **c.** *Euonymus angulatus* Wight **d.** *Euploca marifolia* var. rottleri (Lehm.) Ancy & P.Javad **e.** *Ficus beddomei* King **f.** *Fimbristylis narayanii* C.E.C.Fisch. **g.** *Geissaspis cristata* var. *tenella* (Benth.) M.R.Almeida **h.** *Glochidion ellipticum* Wight.

Plate 104: Diversity of endemic taxa Fig. a. *Habenaria rariflora* A.Rich. **b.** *Haplanthodes tentaculata* var. *neilgherryensis* (Wight) J.R.I.Wood **c.** *Henckelia fischeri* (Gamble) A.Weber & B.L.Burtt **d.** *Henckelia incana* Spreng. **e.** *Holigarna arnottiana* Hook.f. **f.** *Hydnocarpus pentandrus* (Buch.-Ham.) Oken **g.** *Hymenodictyon obovatum* Wall. **h.** *Impatiens dasysperma* Wight.

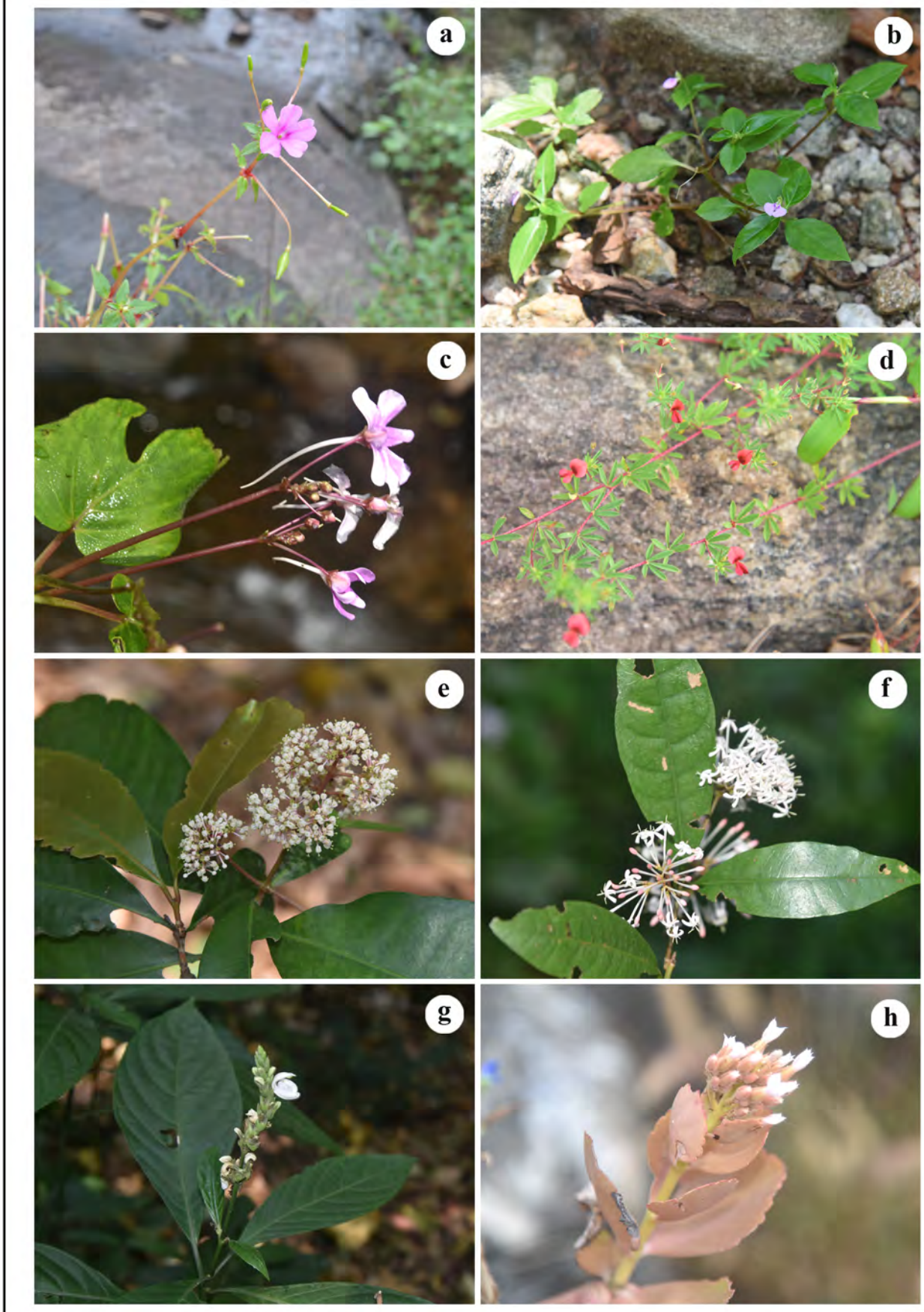

Plate 105: Diversity of endemic taxa Fig. a. *Impatiens gardneriana* Wight **b.** *Impatiens minor* (DC.) Bennet **c.** *Impatiens scapiflora* B.Heyne **d.** *Indigofera uniflora* Buch.-Ham. ex Roxb. **e.** *Ixora brachiata* Roxb. **f.** *Ixora ravikumarii* Kottaim. **g.** *Justicia wynaadensis* B.Heyne **h**. *Kalanchoe olivacea* Dalzell.

Plate 106: Diversity of endemic taxa Fig. a. *Lagerstroemia microcarpa* Wight **b.** *Lindernia tamilnadensis* M.G.Prasad & Sunojk. **c.** *Litsea coriacea* (B.Heyne ex Nees) Hook.f. **d.** *Mallotus resinosus* Merr. **e.** *Memecylon talbotianum* D.Brandis **f.** *Momordica sahyadrica* Kattuk. & V.T.Antony **g.** *Monoon fragrans*(Dalzell) B.Xue & R.M.K.Saunders **h.** *Murdannia semiteres* (Dalzell) Santapau.

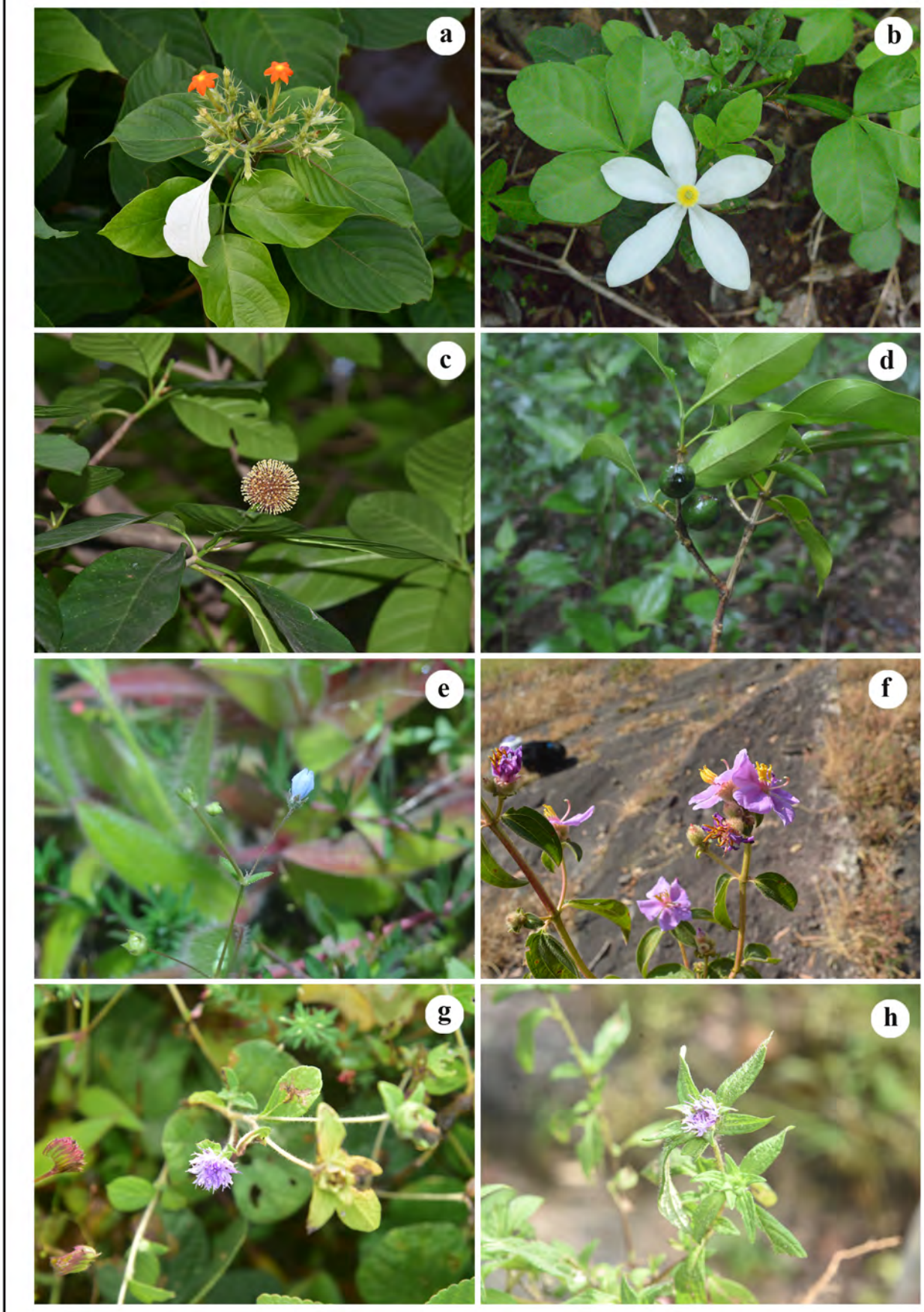

Plate 107: Diversity of endemic taxa Fig. a. *Mussaenda frondosa* L. **b.** *Naregamia alata* Wight & Arn. **c.** *Neonauclea purpurea* (Roxb.) Merr. **d.** *Nostolachma crassifolia* (Gamble) Deb J.Lahiri **e.** *Oldenlandia hygrophila* Bremek. **f.** *Osbeckia aspera* Blume **g.** *Phyllocephalum courtallense* (Wight) Narayana **h.** *Phyllocephalum rangacharii* (Gamble) Narayana.

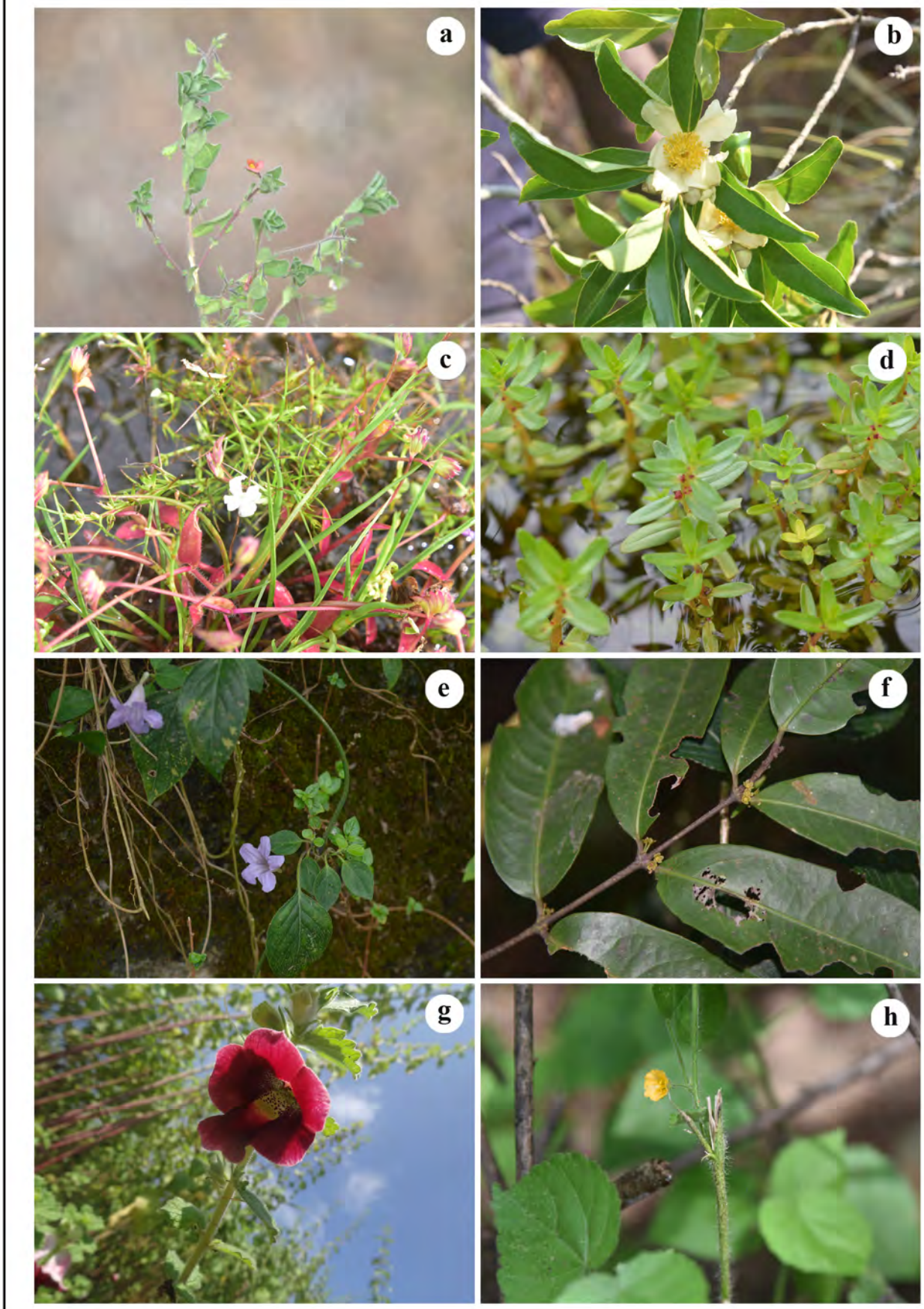

Plate 108: Diversity of endemic taxa Fig. a. *Polygala bolbothrix* Dunn **b.** *Polyspora obtusa* (Wall. ex Wight & Arn.) Niissalo & L.M.Choo **c.** *Rhamphicarpa fistulosa* Benth. **d.** *Rotala malampuzhensis* R.V.Nair ex C.D.K.Cook **e.** *Ruellia prostrata* Poir. **f.** *Salacia macrosperma* Wight **g.** *Sesamum prostratum* Retz. **h.** *Sida beddomei* Jacob.

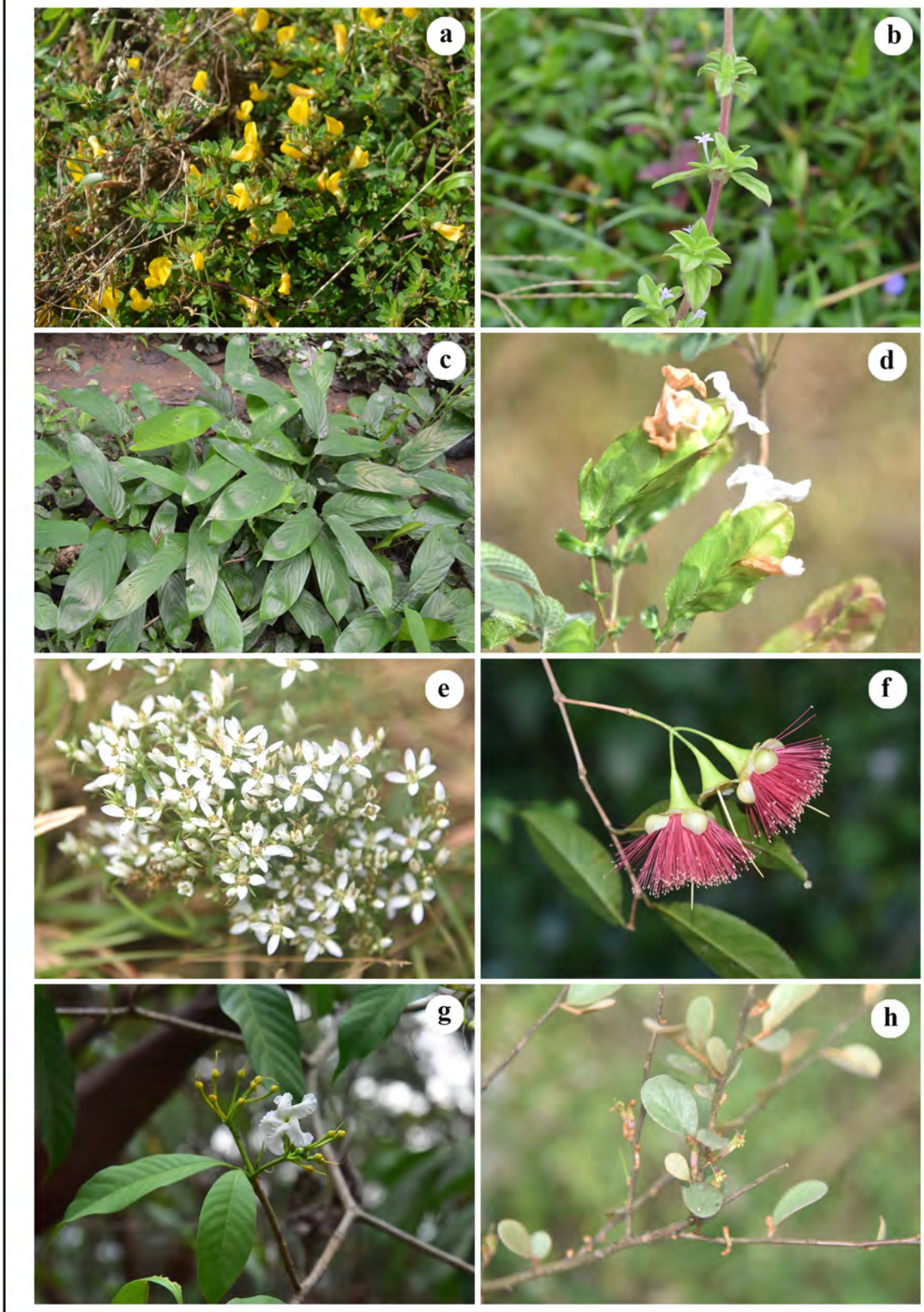

Plate 109: Diversity of endemic taxa Fig. a. *Smithia blanda* Wall. ex Wight & Arn. **b.** *Spermacoce hispida* L. **c.** *Stachyphrynium spicatum* K.Schum. **d.** *Strobilanthes dupeni* Bedd. ex C.B.Clarke **e.** *Swertia corymbosa* (Griseb.) Wight ex C.B.Clarke **f.** *Syzygium laetum* (Buch.-Ham.) Gandhi **g.** *Tabernaemontana alternifolia* L. **h.** *Taxillus recurvus* (Wall. ex DC.) Tiegh.

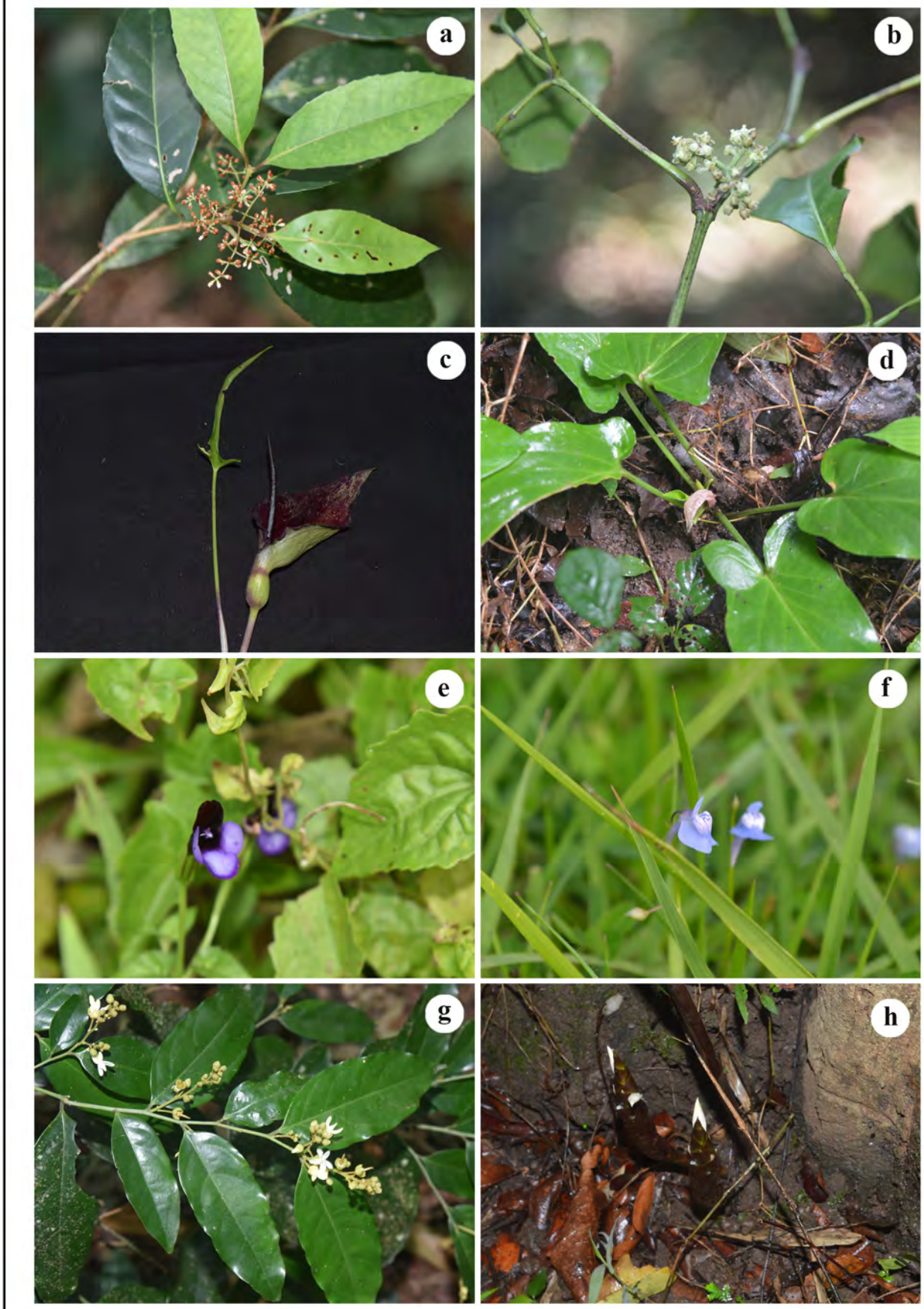

Plate 110: Diversity of endemic taxa Fig. a. *Tetrapilus dioicus* (Roxb.) L.A.S.Johnson **b.** *Tetrastigma sulcatum* Gamble **c.** *Theriophonum fischeri* Sivad. **d.** *Theriophonum infaustum* N.E.Br. **e.** *Torenia bicolor* Dalzell **f.** *Utricularia lazulina* P.Taylor **g.** *Xanthophyllum flavescens* Roxb. **h.** *Zingiber neesanum* (J.Graham) Ramamoorthy.

with highest number of threatened taxa (19 species) followed by Orchidaceae (13 taxa), Poaceae (12 taxa) and Commelinaceae, Cyperaceae, Euphorbiaceae and Malvaceae with 5 taxa each.

The mapping of the IUCN categorized taxa was carried out in order to find the distribution of these taxa in the study area and depicted in figure 16 to 18. The core areas with concentration of these taxa can be considered as the hotspots of the study area.

Table 13. Diversity of threatened taxa in Walayar hill ranges (IUCN 2022 – 2)

Sl. No	Binomial name	Family	IUCN 2022 -2
1	*Curcuma vamana* M.Sabu & Mangaly	Zingiberaceae	Critically Endangered
2	*Actinodaphne salicina* Meisn.	Lauraceae	Endangered
3	*Coffea arabica* L.	Rubiaceae	Endangered
4	*Nostolachma crassifolia* (Gamble) Deb & J.Lahiri	Rubiaceae	Endangered
5	*Prunus ceylanica* Miq.	Rosaceae	Endangered
6	*Tectona grandis* L.f.	Lamiaceae	Endangered
7	*Dimocarpus longan* Lour.	Sapindaceae	Near Threatened
8	*Impatiens gardneriana* Wight	Balsaminaceae	Near Threatened
9	*Litsea coriacea* (B.Heyne ex Nees) Hook.f.	Lauraceae	Near Threatened
10	*Meiogyne pannosa* (Dalzell) J.Sinclair	Annonaceae	Near Threatened
11	*Polyalthia malabarica* (Bedd.) I.M.Turner	Annonaceae	Near Threatened
12	*Pterocarpus marsupium* Roxb.	Fabaceae	Near Threatened
13	*Swietenia mahagoni* (L.) Jacq.	Meliaceae	Near Threatened
14	*Aporosa cardiosperma* (Gaertn.) Merr.	Phyllanthaceae	Vulnerable
15	*Casearia wynadensis* Bedd.	Salicaceae	Vulnerable
16	*Cayratia pedata* Gagnep.	Vitaceae	Vulnerable
17	*Chloroxylon swietenia* DC.	Rutaceae	Vulnerable
18	*Cleistanthus collinus* (Roxb.) Benth. ex Hook.f.	Phyllanthaceae	Vulnerable
19	*Dalbergia latifolia* Roxb.	Fabaceae	Vulnerable
20	*Dalbergia sissoides* Graham ex Wight & Arn.	Fabaceae	Vulnerable
21	*Diospyros trichophylla* Alston	Ebenaceae	Vulnerable
22	*Euonymus angulatus* Wight	Celastraceae	Vulnerable
23	*Hydnocarpus alpinus* Wight	Achariaceae	Vulnerable
24	*Hydnocarpus pentandrus* (Buch.-Ham.) Oken	Achariaceae	Vulnerable
25	*Santalum album* L.	Santalaceae	Vulnerable
26	*Saraca asoca* (Roxb.) W.J.de Wilde	Fabaceae	Vulnerable
27	*Strobilanthes ciliata* Nees	Acanthaceae	Vulnerable

IV.6.3. Phytogeographical affinity of the vegetation elements in Walayar range

While considering the species-specific conservation protocols, along with the concept of endemism and threat category taxa, the phytogeographical affinity of a species

provides an idea on the distribution of taxa across the globe and constitute an indicator for the significance to be given for a taxon.

Analysis of phytogeographical affinity of the floristic elements in the Walayar range revealed that 46.70% of the vegetation is confined to the Indo-Pacific zone (503 taxa). Only 14 taxa showed a cosmopolitan distribution in Indo-Pacific, African, Australian, Holarctic and South American zones and these 14 taxa include hedge plants, weeds, biofencing, aquatic plants in wetlands and marshes or representatives of degraded areas and other wastelands. Table 14 shows the number of taxa showing affinities towards various Phytogeographical zones

Table 14. Distribution of taxa among various phytogeographical zones

Sl. No.	Phytogeographical zone	No. of taxa
1	Indo-Pacific	503
2	Indo-Pacific and African	128
3	Indo-Pacific and Australian	26
4	Indo-Pacific and Holarctic	92
5	Indo-Pacific and South American	12
6	Indo-Pacific, African and Australian	5
7	Indo-Pacific, African and South American	157
8	Indo-Pacific, African, South American and Australian	1
9	Indo-Pacific, Holarctic, African and South American	16
10	Indo-Pacific, Holarctic, African and Australian	13
11	Indo-Pacific, Holarctic and South American	13
12	Indo-Pacific, Holarctic and Australian	22
13	Indo-Pacific, Holarctic and African	37
14	Indo-Pacific, Holarctic, African, South American and Australian	14
15	Indo-Pacific, South American and Australian	2
16	South American and African	1
17	African	8
18	Australian	1
19	Holarctic	2
20	South American	24

The zones with highest percentage affinities include Indo-Pacific, African and South American with 14.57% followed by Indo-Pacific and African (11.88%) and Indo-Pacific and Holarctic with 8.54%. Other than Indo-Pacific, the collected taxa shows highest affinity towards the South American (24 taxa) followed by African zone (8 taxa), Holarctic (2 taxa) and Australian (1 taxa). The collected taxa showed least affinity with the Australian zone.

The analysis showed that 3.43% of the collected taxa (36 taxa) have affinities to other zones except Indo - Pacific, i.e., they do not share any affinities with the Indo - Pacific zone. They are either restricted to a single zone such as African (8 taxa), Australian

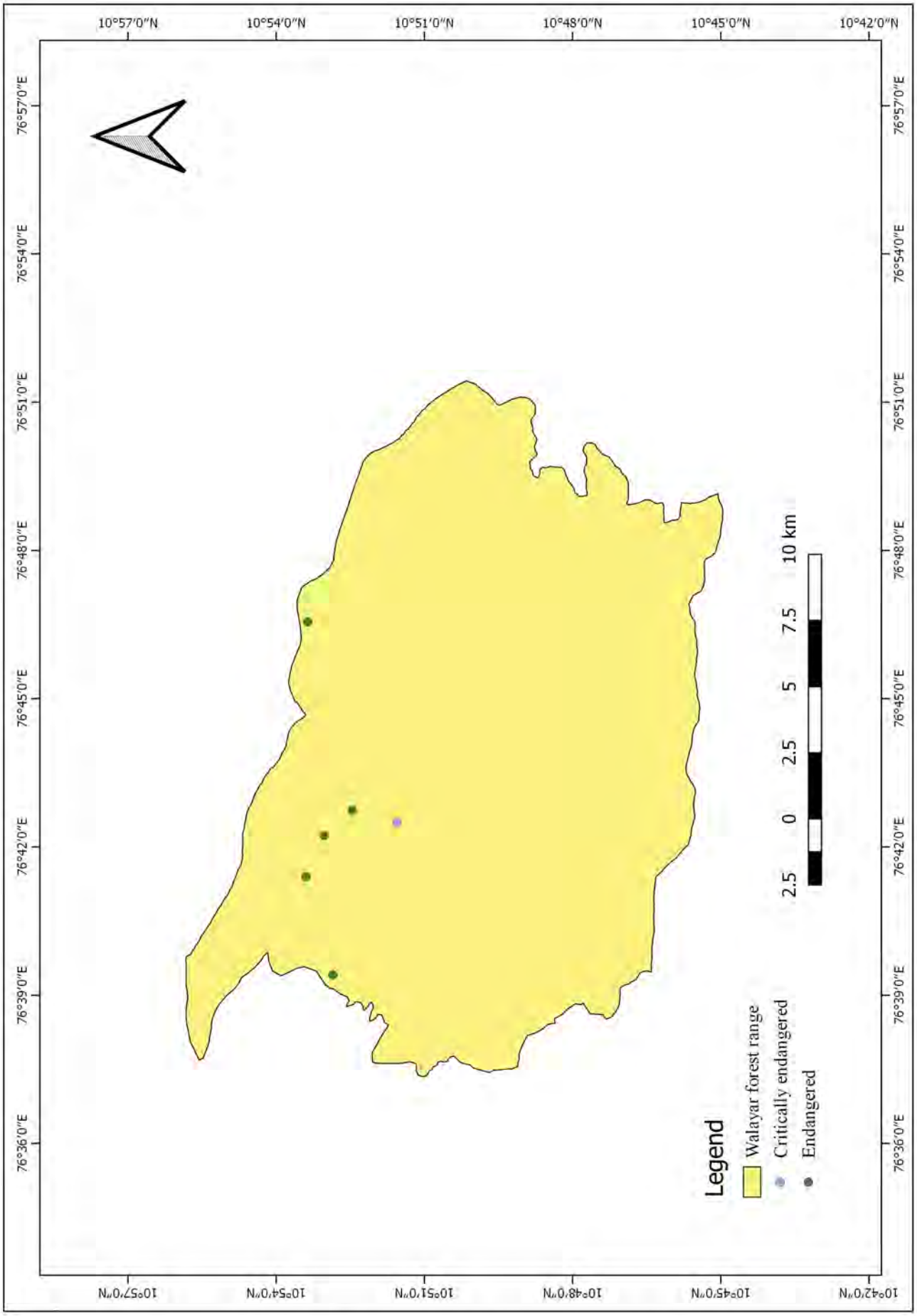

Figure 16. Distribution of Critically Endangered and Endangered taxa in Walayar forest range

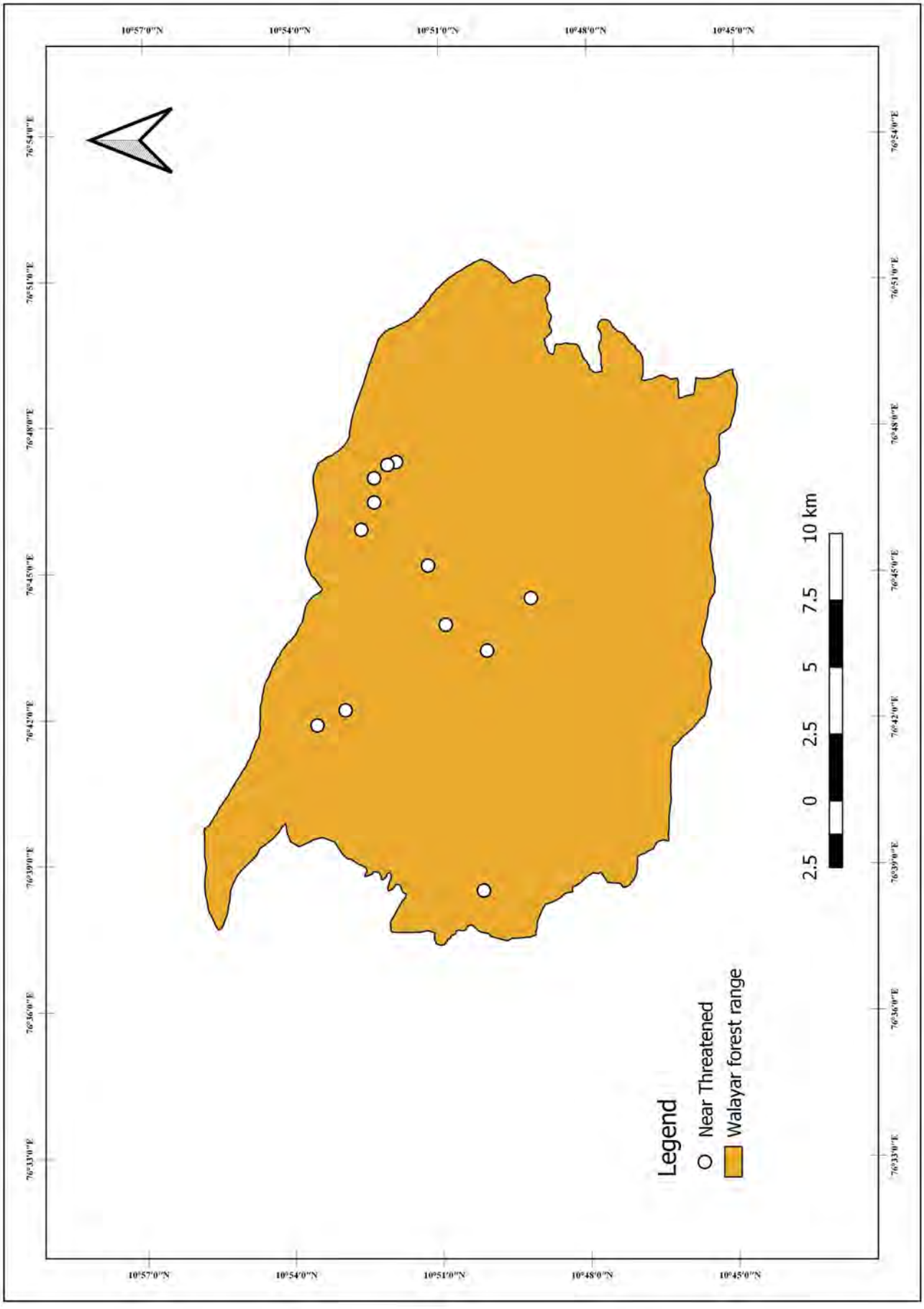

Figure 17. Distribution of Near Threatened taxa in Walayar forest range

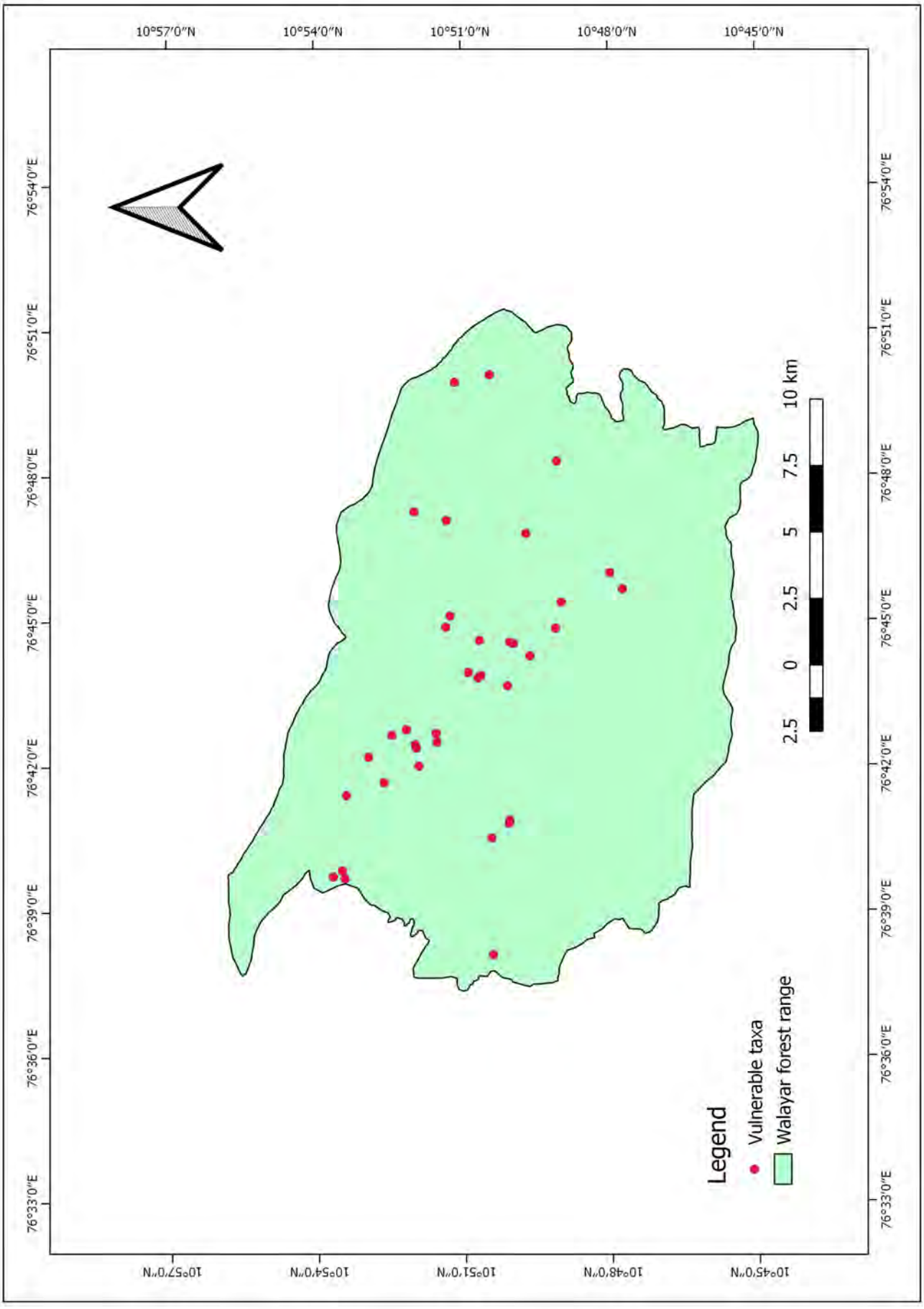

Figure 18. Distribution of Vulnerable taxa in Walayar forest range

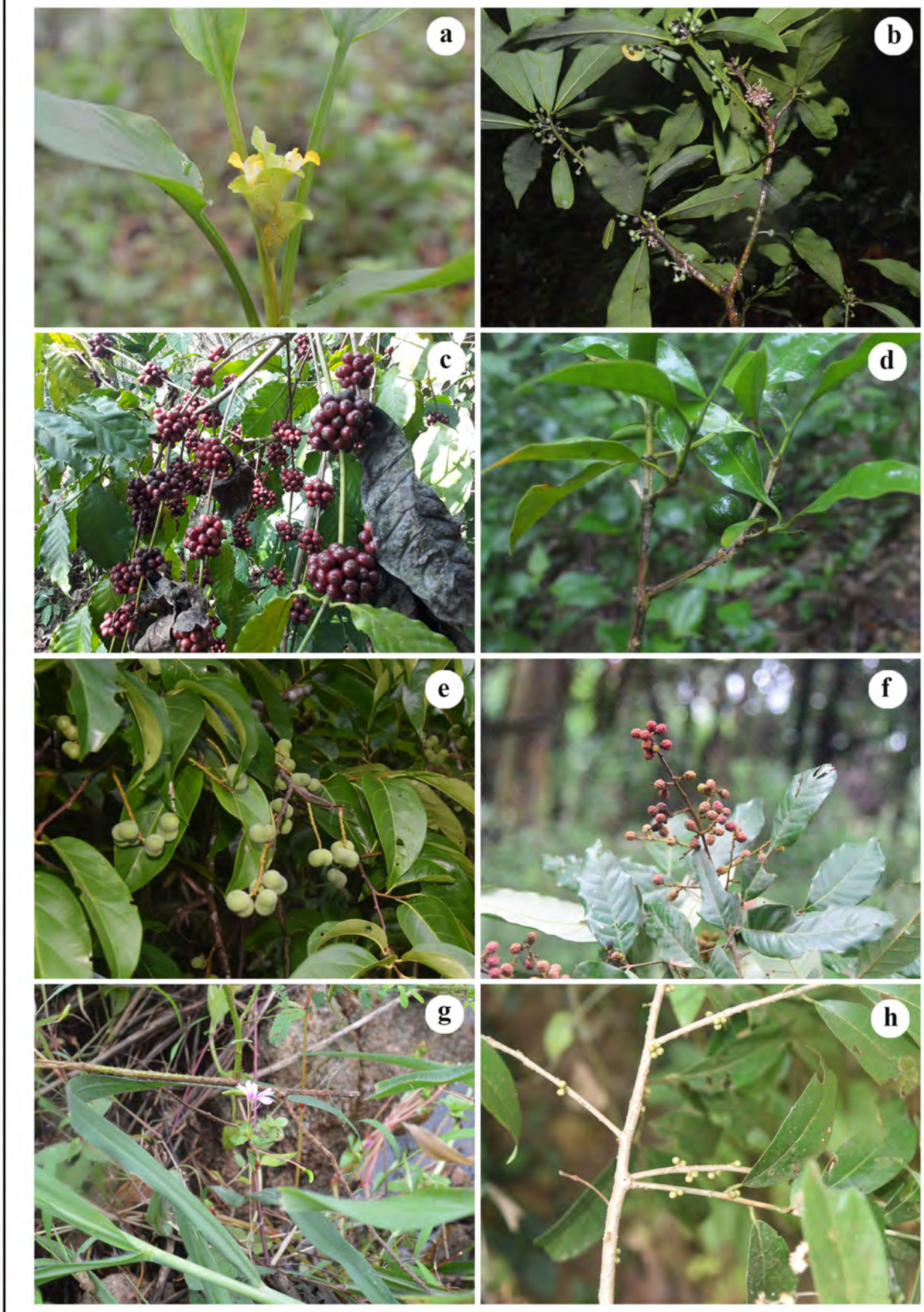

Plate 111: Incidence of threatened taxa Fig. a. Critically Endangered - *Curcuma vamana* M.Sabu & Mangaly. **b.– e. Endangered b.** *Actinodaphne salicina* Meisn. **c.** *Coffea arabica* L. **d.** *Nostolachma crassifolia* (Gamble) Deb & J.Lahiri **e.** *Prunus ceylanica* Miq. **f. –h. Near Threatened f**. *Dimocarpus longan* Lour. **g.** *Impatiens gardneriana* Wight. **h.** *Litsea coriacea* (B.Heyne ex Nees) Hook.f.

Plate 112: Incidence of threatened taxa Near Threatened a.–c. **Fig. a.** *Polyalthia malabarica* (Bedd.) I.M.Turner **b.** *Pterocarpus marsupium* Roxb. **c.** *Swietenia mahagoni* (L.) Jacq. **d. – h. Vulnerable - d.** *Casearia wynadensis* Bedd. **e.** *Cayratia pedata* Gagnep. **f.** *Chloroxylon swietenia* DC. **g.** *Cleistanthus collinus* (Roxb.) Benth. ex Hook.f. **h.** *Dalbergia latifolia* Roxb.

Plate 113: Incidence of endemic taxa : Vulnerable - a. – h. **Fig. a.** *Dalbergia sissoides* Graham ex Wight & Arn. **b.** *Diospyros trichophylla* Alston **c.** *Euonymus angulatus* Wight **d.** *Hydnocarpus alpinus* Wight **e.** *Hydnocarpus pentandrus* (Buch.-Ham.) Oken **f.** *Santalum album* L. **g.** *Saraca asoca* (Roxb.) W.J.de Wilde **h.** *Strobilanthes ciliata* Nees.

(1 taxa), Holarctic (2 taxa) and South American (24) or distributed in two different zones such as South American and African (1 taxa). All these taxa which do not have any affinity towards the Indo-Pacific zone are either cultivated ones or representatives of degraded areas.

IV.7. Floristic additions, extended distribution and taxonomic novelties from Walayar Forest range

Objectives addressed

- Inventory on plant species new to science
- Documentation of floristic elements as addition to Flora of Kerala
- Documentation of taxa with extended distribution

IV.7.1. Taxonomic novelties

The exploration of floral elements in Walayar range forests resulted in finding out three different taxa, which showed marked variations from already recorded taxa. Following is a summary of the morphological data recorded and all the taxa are under review.

IV.7.1.1. *Amorphophallus sp. nov.* (Plate 114)

Description:— Tuberous herbs. Tubers subglobose, 3–8 cm diam. and 3–7.5cm thick in vegetative phase; 4–8cm thick in reproductive phase with fusiform offsets c. 4 –5cm long, produced from the tubers, white outside and inside, upto 4 offsets observed in a single tuber. Cataphylls 3, 2–8cm long, ovate-lanceolate, characteristically brown mottling with parallel nerves, apex acuminate, later becoming scarious. Petiole smooth, 35–65cm long, 1.5–3cm diam. at base, slightly tapering towards the tip, 1–2cm diam., green- reddish to brownish mottles in olive green petiole. The mottling gradually disappears halfway and becomes greenish throughout towards the tip. Leaf lamina decompound dividing into three main leaflets with one branching slightly longer than the other two. Leaflets sessile, linear-lanceolate, large leaflets 18–24cm long and 2 –2.5cm wide, small leaflets 4 –8cm long and 1–1.5cm wide, base unequal and decurrent on the rachis, acute or slightly acuminate at apex, glabrous on both sides, darker green above and paler below. Inflorescence appears before the leaves. Peduncle slender, smooth, 50–56cm long, 3.5 –5cm diameter. The mottling at the base of peduncle identical with the mottling pattern at the petiole. Spathe convoluted throughout the length with an opening at the top, tip acute, apex characteristically twisted opposite to the position of spadix, 20 - 22cm long, 7 –17cm wide,

not differentiated into basal tube and upper limb, brownish-pale green with prominent longitudinal veins and creamy - green mottling outside, dark maroon to brown inside, verrucose patterns at the base, apex greenish inside. Spike slightly longer than the spathe, 24 –27 cm long with a small stipe, 5 –6mm long and 3 –3.5cm diam., female zone 3 – 3.5cm long and 1.2–1.5cm diam.; neutriferous zones, 4.2 –4.5cm long and 1.2 –1.3cm diam.; male zone 6–7cm long and 1.1 –1.2cm diam.; appendix 6.5 –7.0cm long, .8 –1.2cm diameter at base, tapering to the tip, creamy with irregular longitudinal furrows, but without any special structures and glabrous throughout. Staminodal zone or neutriferous zone with very loosely arranged rhomboid fleshy sterile flowers 15 - 18 in numbers, arranged in 3–4 spiral rows each with 0.6–1cm long and 3 –6mm diam, acute at apex, convex in appearance with a round purple coloured region above in the middle. Male flowers seen as single flowers arranged more or less compact throughout the length, golden yellow, 2–3mm high and 1.5–2mm broad. Anthers truncate, opening by two apical pores. Female flowers loosely arranged, ovary globose, 3x3mm, greenish-yellow, 2-locular, style very short or absent, stigma 2 -lobed, 1.3–1.5mm diam., yellow. Infrutescence not observed.

IV.7.1.2. *Impatiens sp. nov* (Plate 115)

Glabrous herb upto 70cm long. Stem basally terete, flowering region angular (quadrangular), glabrous, greenish throughout the length. Leaves uniform, opposite, subsessile, ovate- cordate, margins strongly serrate, 5- 6 nerved, commonly 6 nerved, 6 - 6.3cm long, 2.5 -2.9cm wide, glabrous on both sides, apex acute. Lateral nerves prominent beneath, serrations green, stipule absent. Petioles upto 2mm. Flowers axillary solitary or 2-flowered arising from leaf axils. 7 – 8mm long, white or pale pink in colour. Pedicels shorter than leaves, slender, glabrous, 2.0 -2.2cm. Sepals 3, lateral sepals linear – lanceolate, 5x5mm, glabrous, as long as the standard sepal). Standard sepal cymbiform or boat shaped, 5mm long, acuminate at tip, slightly pinkish or whitish and with faint pink stripes along the sepals, greenish towards apex. Apex slightly acuminate with a short curved spur, 2 – 2.2mm long, bent inwards, blunt at tip. Lateral sepals linear- lanceolate, 5-6mm x 2mm broad, acuminate at apex, glabrous. Standard petal orbicular, spurred and winged. Middle greenish with wings, whitish, apex acuminate (Spur like) brownish, 5mmx2mm. Lateral petals 2, wings two lobed, white or faint pinkish, glabrous , longer than standard, glabrous, 8x3mm. Lateral sides also with very narrow pink spots. Anther 5, united to form a ring, 2mm, partially fused, filament 3 mm. Ovary 2mm and above. 1mm wide, 2

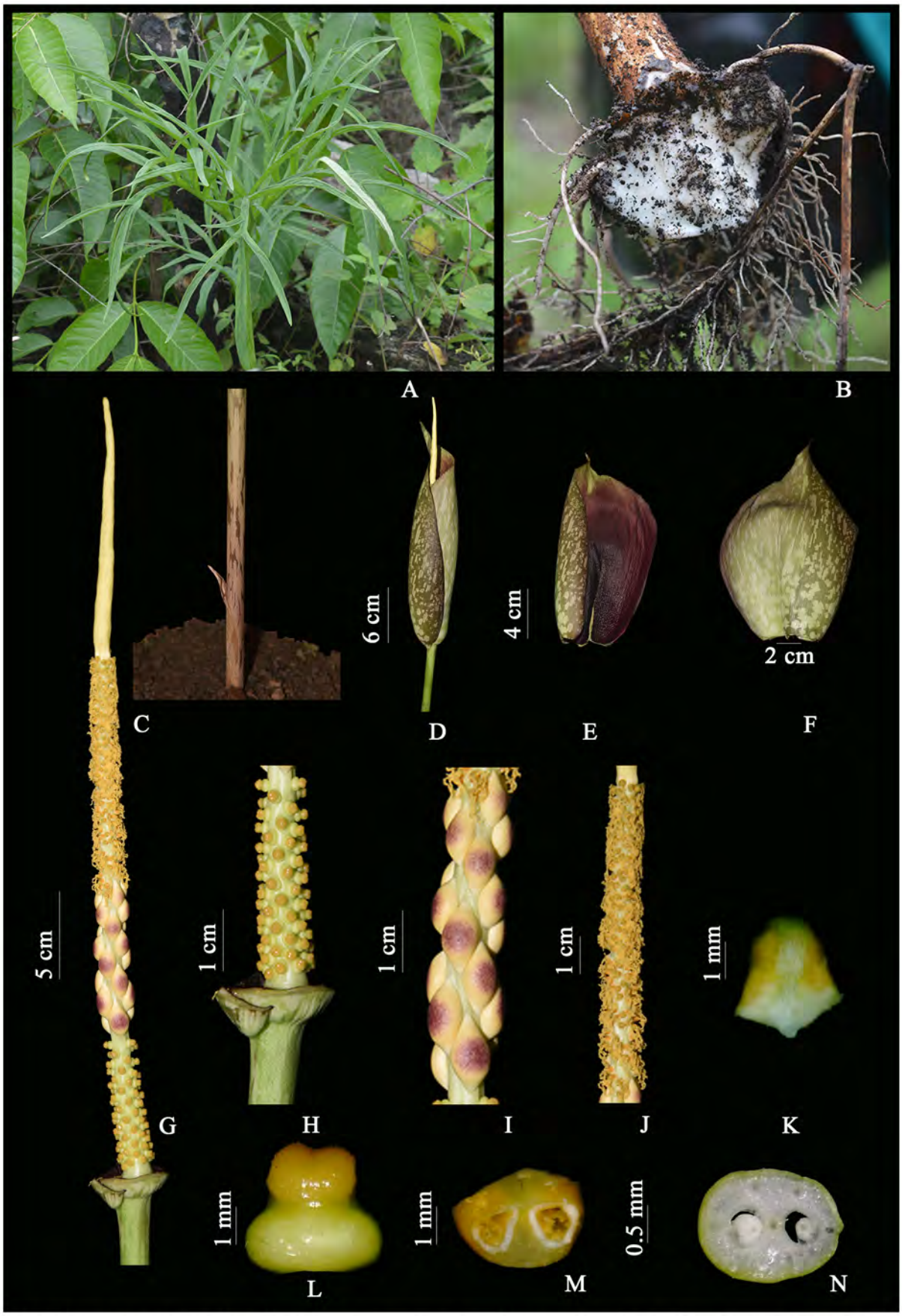

PLATE 114: ***Amorphophallus*** *sp. nova* **A.** Habit **B.** Corm **C.** Lower portion of peduncle with cataphyll and mosaic pattern **D.** Inflorescence **E.** – **F.** Open spathe adaxial and abaxial surfaces **G.** Spadix **H.** Female zone **I.** Neutriferous zone **J.** Male zone **K.** Male flower **L.** Female flower **M.** C. S. of male flower **N.** C. S. of ovary

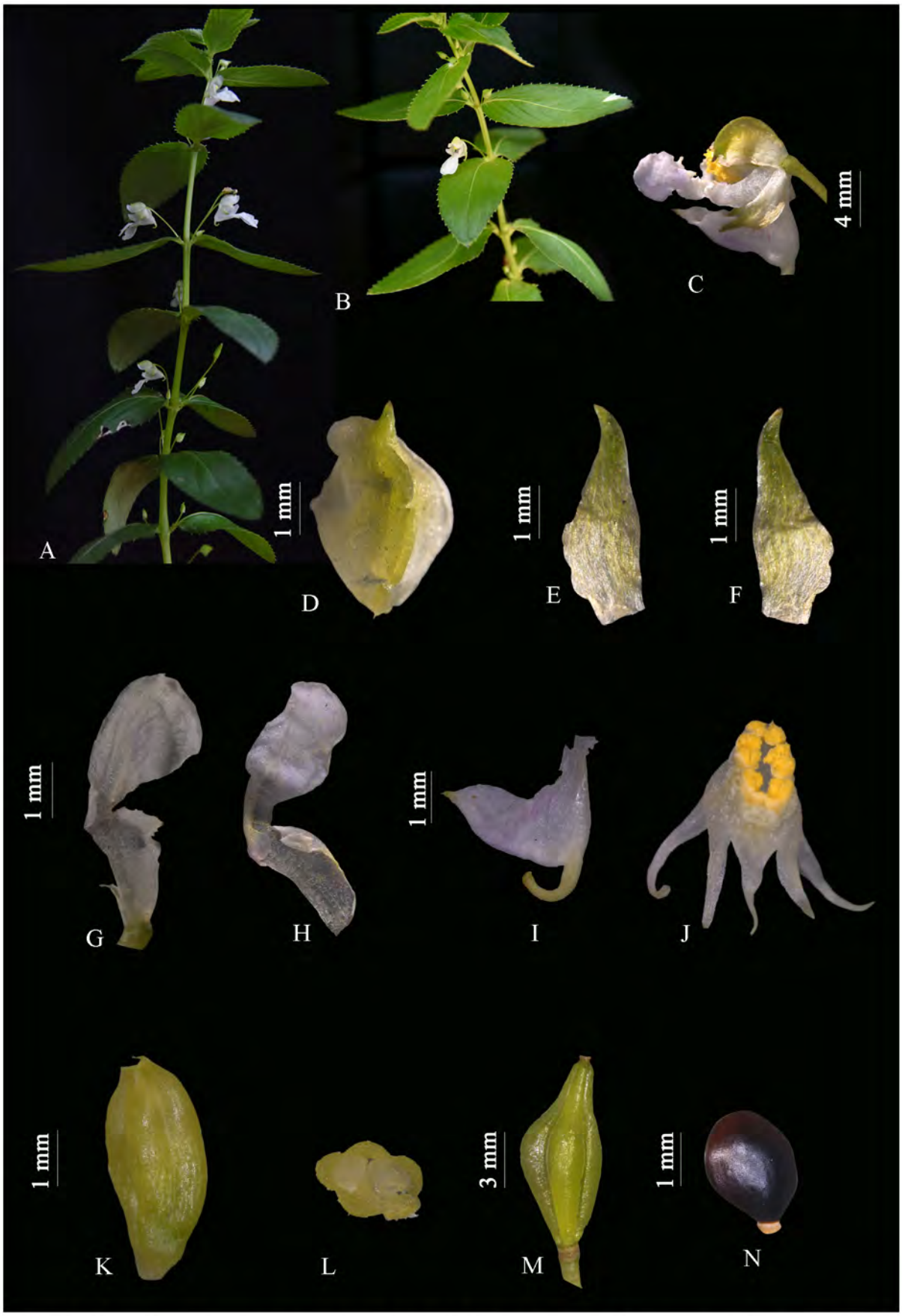

PLATE 115: ***Impatiens sp. nov.*** **Fig. A & B.** Twigs bearing flowers and fruits **C.** Single flower **D.** Standard petal **E. – F.** Lateral sepals **G. – H.** Wing petals **I. –** Standard sepals **J.** Anther **K.** Ovary **L.** C. S. of ovary **M.** Fruit **N.** Seed

seeded. On maturity, one black seeded, glabrous, shining. Fruit 5 partite, 9mm x 3mm, glabrous.

IV.7.1.3. *Ouret sp. nov.* (Plate 116)

Description:— Perennial robust densely wooly herbs to subshrubs upto 60cm to 2m above high. Stem erect or suberect, terete, often more branching seen towards the base. Stem densely covered with white wooly hairs. Leaves simple, alternate, much variable in shape and appearance. The lower leaves larger (5.5 -8 x 2.5 - 3.5cm) with longer internodal length of 2cm or above. The size of the leaves slightly reduced (6 - 2 x 0.4 -0.8cm) as it reaches upper nodes with internodes much shorter below 0.5cm; orbicular, 6 lateral nerved, apex obtuse, silky pubescent above, densely white wooly pubescent below, petioles upto 1cm long. Inflorescence in spikes, axillary solitary or 1 -3 arising from the leaf axils, densely white tomentose. Spikes much variable in length from 0.5 - 2.5cm long. The spikes in the lower nodes much longer than in the upper nodes. Floral bracts ovate, glabrous on both sides except for white hairs from the mid nerve, apex apiculate. Bracteoles 2, linear with densely long white hairs, apex apiculate. Perianth calycine, 5 lobed, ovate, united at the base, densely white wooly hairs outside, glabrous inside, apex mucronate. Stamens 5, 0.3mm long, 2 - celled, filaments united at the base interspersed with staminodes. Ovary one celled, one ovuled with basal placentation nearly 0.4mm long, stigma bifid; style very short. Seeds much variable in shape from reniform to subreniform, black, shining less than 1mm long.

IV.7.2. Notes on taxonomic status of new taxa reported from the range

IV.7.2.1. *Polycarpaea palakkadensis* V. S. A. Kumar, Sindhu Arya & V. Suresh (Plate:117)

In the study area, the genus *Polycarpaea* Lam. is represented by the species *Polycarpaea corymbosa* (L.) Lam. The species is inhabited in granitic rock crevices of hillocks in areas like Koomachimala, Kava and Thekke Malampuzha regions. Recently, a new species *Polycarpaea palakkadensis* V.S.A.Kumar, Sindhu Arya & V. Suresh (Type location:- Malampuzha; Holotype: V.S.A Kumar, S. Arya & Suresh 564 (UCBD)), has been reported from the study area during the year 2021.

Field explorations were conducted in the type locality mentioned and collected this reported taxon (Coll no: Aswani & Maya, 6225 (GVCH) and Aswani & Maya 6250 (GVCH)). Thorough examination of multiple samples from type location for morphological

features could not depict any distinguishing characters from the predominant species *Polycarpaea corymbosa* (L.) Lam..

As per the research article, the species *Polycarpaea palakkadensis* is distinguished by ovate bracts, capilliform bracteoles, linear stipules, ovate -cordate whitish red petals, short anthers and 4-valved capsule with 1-2 seeds (Arya *et al*.,2021). On examination, it was found that the shape and nature of bracts, bracteoles and stipules are similar to *Polycarpaea corymbosa* (L.) Lam. and showed a continuous variation within the population. Inflorescence is little lax in the case of *P. palakkadensis* but corymbose in the case of *P. corymbosa*, but within the population this character is not frequent and static. Sepals also show continuous variation in its shape from lanceolate, ovate - lanceolate and oblong, the colour of the sepals are silvery white at young stage gradually turning light brownish at maturity and they are not fused, but free in all species. Colour of the petal cannot be taken as a stable character, since it shows a gradient of colour change from young to old stage of the plant from dark red, purple to whitish red at mature stage. In the case of stamens, filaments are short at young stage and become as long as the anther at maturity. Three-valved capsule is an important character of the genus and the 4-valved capsules reported in *Polycarpaea palakkadensis* is rare and not observed as a frequent character in a population. Number of seeds at the young stage of capsules are 10-12 in *Polycarpaea corymbosa* but at mature stage, most of the seeds get dehisced and 2-3 seeds remain in the capsule. Hence seed number also varies depending upon the time of examination.

The diagnostic features mentioned to delimit the species (Arya *et al*., 2021) is observed to be a continuous variation and hence in this present study all the accessions of this taxon is identified and treated as *Polycarpaea corymbosa* (L.) Lam.

IV.7.2.2. *Allmania multiflora* V. S. A. Kumar, V. Suresh, Sindhu Arya & Iamonico

In the study area, the genus *Allmania* R.Br. ex Wight. is represented by the species *Allmania nodiflora* (L.) R.Br. ex Wight. The species is inhabited in the hillocks like Kongampaadam, Anayappanchalla and in the lower stretches of forests in Thekke Malampuzha, Kosavaniduku, Kasuvaachaal, Kezhakootimala and in the Akamalavaram hills. *Allmania nodiflora* (L.) R.Br. ex Wight. is the only species under this genus.

The taxa collected from these localities showed many variations in external morphology. Different accessions (Coll no: Aswani & Maya, 2305 (GVCH), Aswani & Maya 4201 (GVCH) and Aswani & Maya, 4512 (GVCH)) showed different stem colour

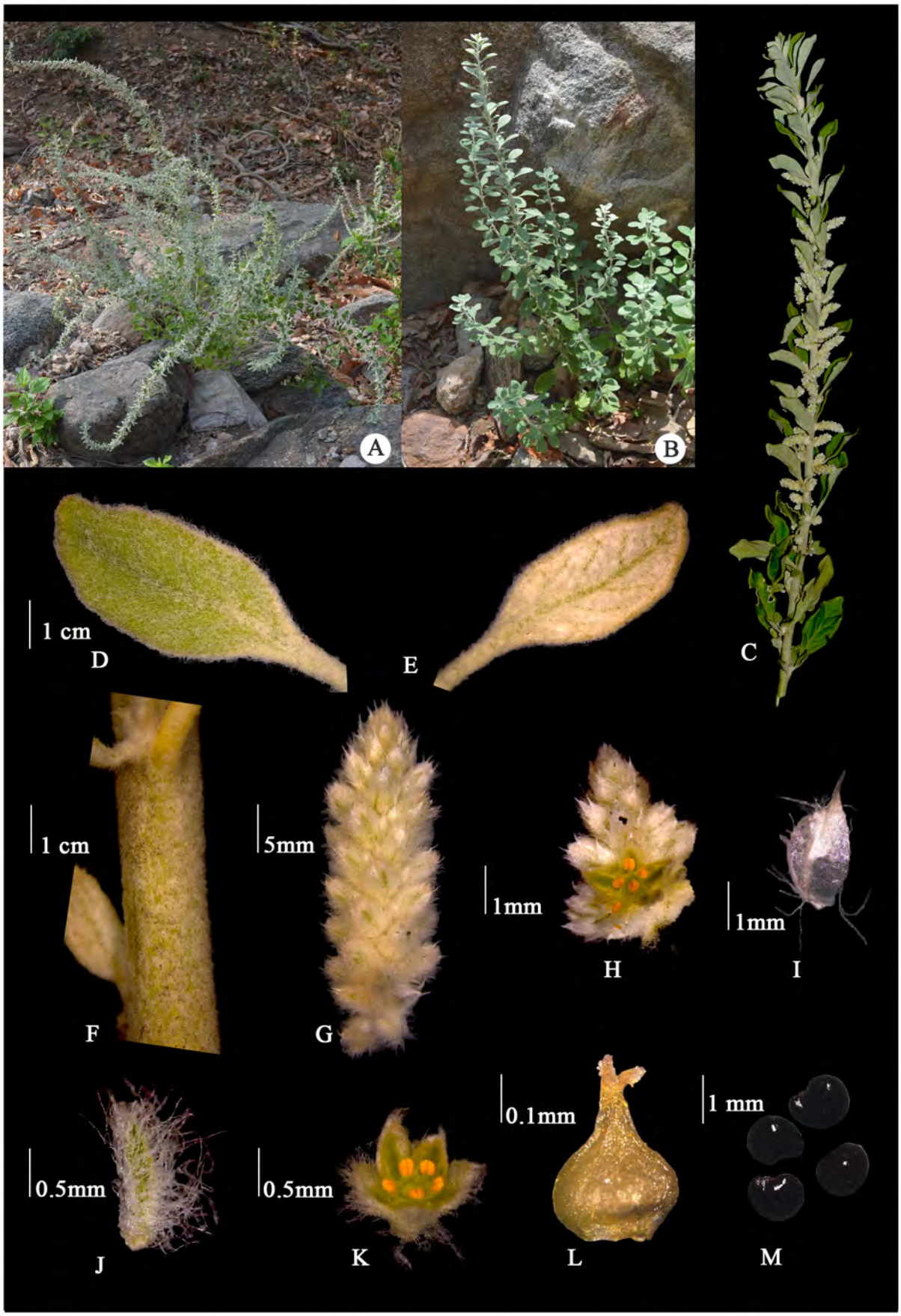

Plate 116: ***Ouret sp. nov.*** **A. – B.** Habit **C.** Closer view of a part of twig **D.** Leaf adaxial surface **E.** Leaf abaxial surface **F.** Closer view of stem **G. – H.** Inflorescence **I.** Bract **J.** Bracteole **K.** Single flower **L.** Gynoecium **M.** Mature seed

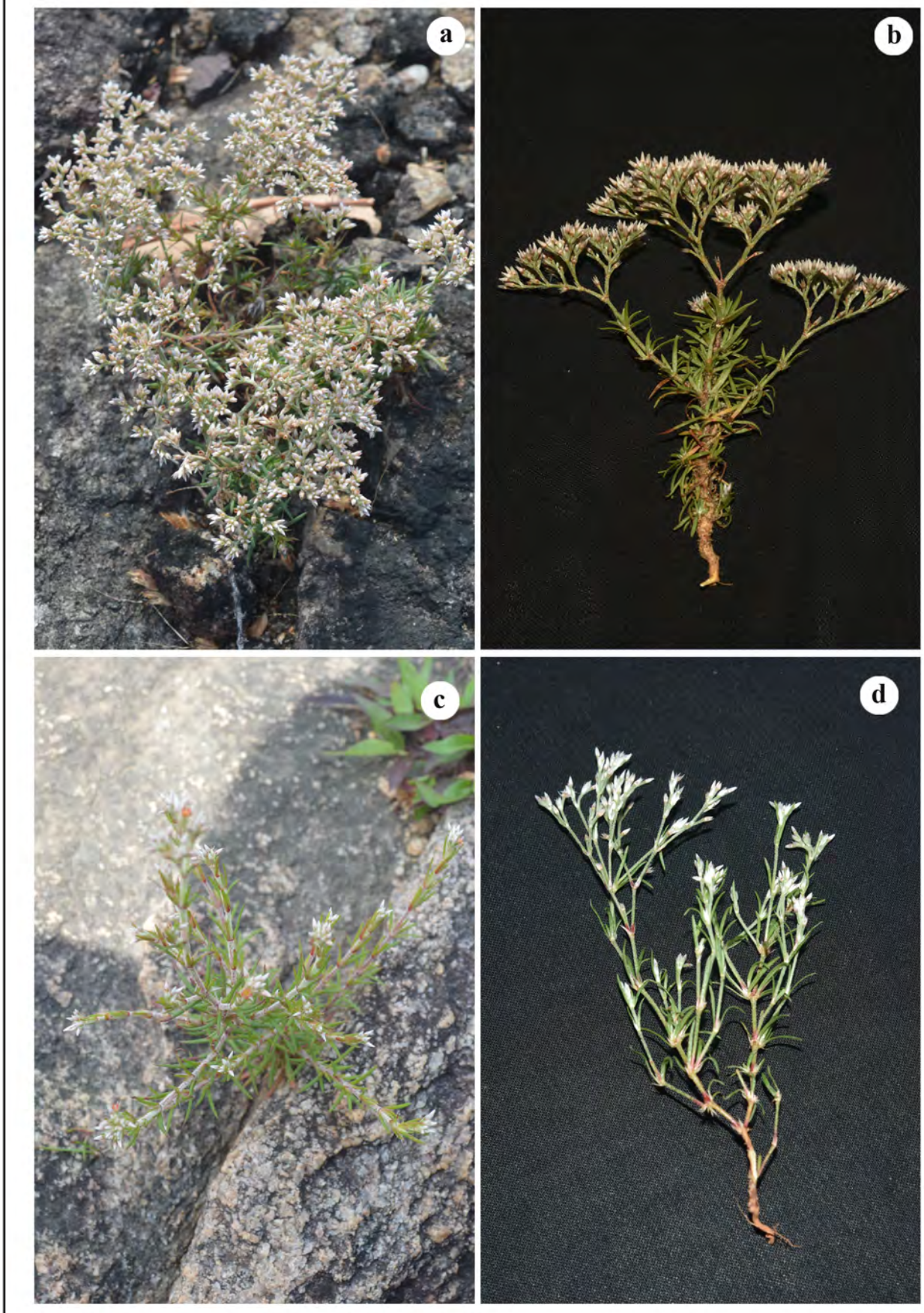

Plate 117: *Polycarpaea sp.* in Walayar hills Fig. a. – b. species *Polycarpaea corymbosa* (L.) Lam.. **c. – d.** *Polycarpaea palakkadensis* V. S. A. Kumar, Sindhu Arya & V. Suresh.

from green to reddish brown to brown (lower stem region reddish and upper greenish), variations in the degree of pubescence in stem and leaves, inflorescence appears in heads either sessile or sub - sessile or with small pedicel and heads green or reddish brown, either smaller or larger heads with variations in number of flowers in each head on the same plant. The length of the perianth is found to be correlated with the size of head, the stigma capitate reddish, greenish or pinkish. Ovary seems to be much varying in length from 2 - 3.5mm with short style. Seeds ovate, 1.5– 2mm in size, brownish-black or black with white membraneous or almost setaceous arils at the base and surface densely pubescent or glabrous. Owing to these morphological variations, many varieties were proposed for this taxon viz., *A. nodiflora* var. *aspera* (Roth) Hook.f. *A. nodiflora* var. *longipedunculata* Trimen, *A. nodiflora* var. *angustifolia* Hook.f. and *A nodiflora* var. *dichotoma* (Roth) Hook.f. After thorough morphological studies, no discrete stable characters could be proposed for these specimens to be explained as a separate species or varieties. So, now these varieties have been synonymized under *Allmania nodiflora* (L.) R.Br. ex Wight. The variation in morphological features in different accessions of this single taxon might have arisen due to the edaphic and climatic conditions along with geographical peculiarities of Palghat Gap.

Recently, the a new species *Allmania multiflora* V.S.A.Kumar, V.Suresh, Sindhu Arya & Iamonico (Type location:-Way to Kollengode; Holotype: Suresh & Anil Kumar, 2850 (UCBD)) is described from the gap regions with morphological characters distinct from the allied species *Allmania nodiflora* (L.) R.Br. ex Wight in having shorter tepals, wider gynoecium, shorter bract length, diameter of seeds, higher number of flowers per head, pubescence of peduncle, colour of stigma and hairiness of seed. On analysis with the protologue of *Allmania nodiflora* (L.) R.Br. ex Wight., these characters are very closer and matches with the newly described taxon. Since the type locality of newly described taxon is located in the Palghat Gap region, near to Walayar range, direct influence of extremities in environmental and edaphic factors might have played a role in the phenotypic plasticity of the taxon.. Hence, the new taxon described as *sp. nova* may be reconsidered as a morpho - ecotype and the diagnostic features mentioned to delimit the species (Arya *et al.*, 2022) is observed to be a continuous variation and hence in this present study all the accessions of this species are treated as *Allmania nodiflora* (L.) R.Br. exWight.

IV.7.3. Recollection of taxa

IV.7.3.1. *Oldenlandia hygrophila* Bremek. (Plate 118 -119)

During the floristic studies on the diversity of granitic hillocks in the study area, a taxon was found to be growing on the wet ephemeral flush vegetation in a rocky outcrop near the dam site of Malampuzha. The specimen was identified to be *Oldenlandia hygrophila* Bremek. collected by Prof. Vasudevan Nair in 1972 cited from Malampuzha dam vicinity of Palakkad District (Bremekamp 1974) and confirmed the taxa from the type specimens deposited at Kew Herbarium (*O. hygrophila*: bar code no: K000031277). Regional herbaria (MH, KFRI and CALI) were consulted to check the presence of earlier collections of the taxon and found that N. Sasidharan had collected the taxa from Thrissur district in 1987 (Acc. No. KFRI 6945, collection No: N.S. 4635). Later, the taxa was reported from Muthanga region of Wayanad District in Kerala by Ratheesh Narayanan (RNMK 2228) in 2009. The taxon was unable to relocate from its type locality after its first collection by Prof. R. Vasudevan Nair in 1972. So the collection of the taxon could be considered as a recollection from the type location. Table 15 summarizes the taxonomic delineation of O. hygrophila from allied species.

Description: —

Annual, erect, branched or unbranched herbs, 25–130 mm tall. Entire plant with sparsely distributed setiform cuticular protuberances. Stem quadrangular, minutely winged when old. Stipules connate, interpetiolar, 1.5–2 mm long, 1–1.2 mm wide, with three bristles, middle one longer than the other two. Leaves sessile, 5–12 mm × 2–5 mm, linear lanceolate, 1–nerved, lamina base attenuate, margins recurved. Flowers axillary solitary, 3–3.5 mm long, corolla lobes not spreading when open. Pedicel slender, 6–10 mm, hypanthium ovoid and both laden with setiform cuticular protuberances. Calyx lobes 4, 1.5–2 mm × 0.8–1 mm, reaching one fourth of the corolla tube, margins entire, apex acute. Corolla blue, tube 2–2.2 mm long, lobe 1mm long, oblong, apex acute, glabrous outside and with small hyaline hairs inside at the base. Stamens 4, inserted, adnate to sinus of corolla lobes, introrse. Filaments 0.25mm long, glabrous. Anthers linear 0.75mm. Style 1.5mm long, glabrous. Stigma bilobed, 1mm, densely papillose. Ovary 1×1mm, 2–celled, many ovuled in axile placentation. Capsule sub-globose, 2×2 mm, loculicidally dehiscent from apex, with slightly raised crown above. Seeds numerous, trigonal, reticulate 0.3×0.2 mm.

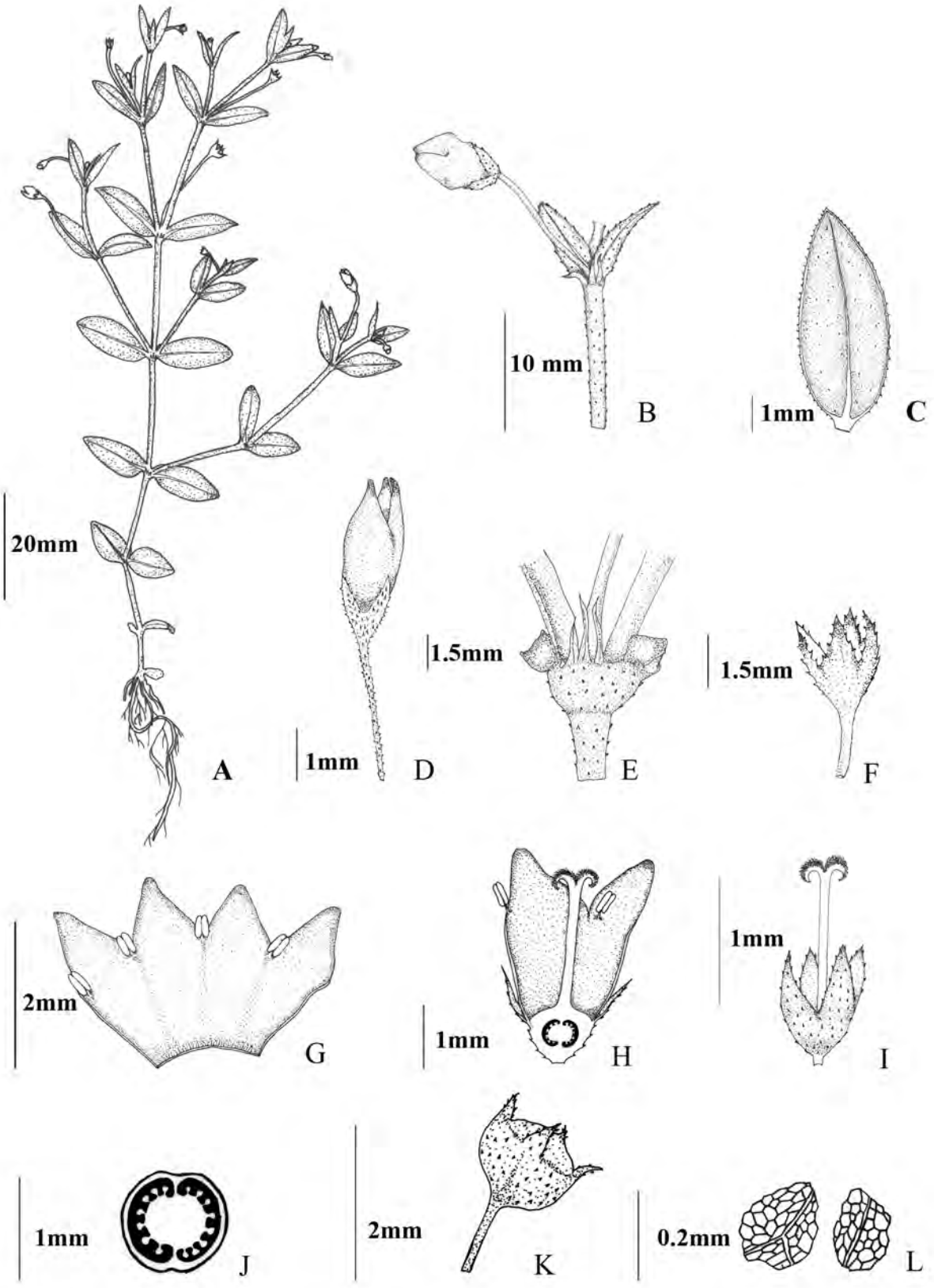

PLATE 118: *Oldenlandia hygrophila* Bremek. **A.** Habit **B.** Portion of a flowering twig **C.** Single leaf **D.** Single flower **E.** Part of node showing stipules **F.** Calyx **G.** Corolla tube opened showing stamens **H.** L.S. of flower **I.** Gynoecium **J.** C.S. of ovary **K.**Capsule **L.** Seeds

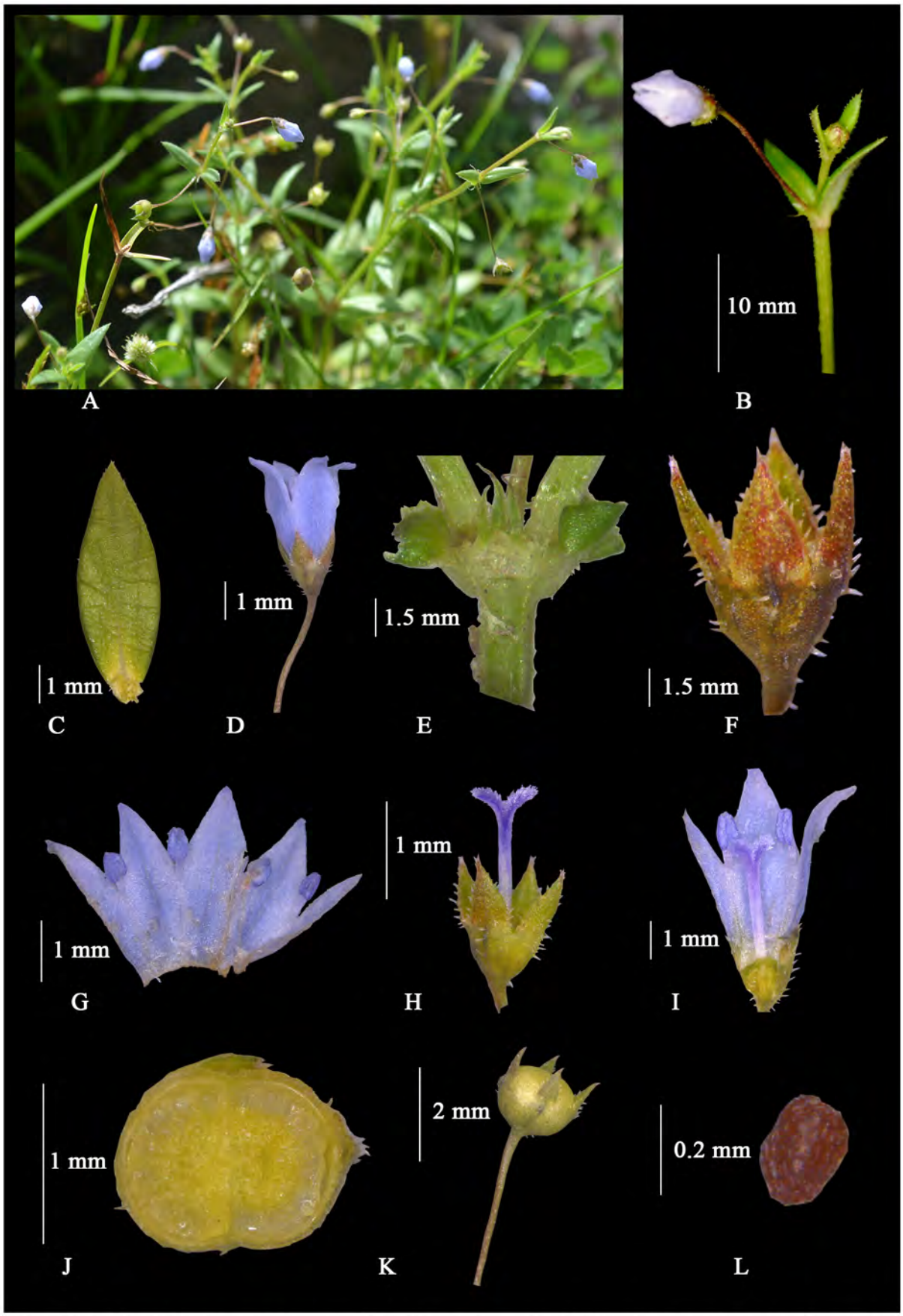

PLATE 119: ***Oldenlandia hygrophila*** **Bremek.** **A.** Habit. **B.** Portion of a flowering twig **C**. Single leaf **D.** Single flower **E.** Part of node showing stipules **F.** Calyx **G.** Corolla tube opened showing stamens **H.** Gynoecium **I.** L.S. of flower **J.** C.S. of ovary **K.** Capsule **L.** Seeds

Table 15. Taxonomic delineation of *Oldenlandia hygrophila* from *O. dineshii* and *O. pumila*

Taxonomic Trait	*Oldenlandia hygrophila*	*O. dineshii*	*O. pumila*
Habit	Erect herb, branched and unbranched, 25–130 mm tall	Erect herb, dichotomously branched 50–200 mm tall	Branched prostrate or diffuse herbs
Stem	4–angled, minutely winged with setiform cuticular protuberances	4–angled, minutely winged, glabrous	Acutely angular, minutely dentate on ribs
Leaf	Linear–lanceolate, setiform cuticular protuberances present, 5–12 ×2–5 mm	Linear–lanceolate, sparsely scabrid,10–20 ×5–8mm	Elliptic- lanceolate, 7–18 x 1–6mm
Leaf margin and leaf apex	Entire with regular setiform cuticular protuberances, recurved, apex acute, base attenuate	Apex acute, base attenuate	Scabrid above along margin and midrib below
Stipules	Bristles 3, 1.5–2mm long, base broad up to 1–1.2mm, middle one longer than other two	Bristles 2–3, 2–4mm long, base broad up to 5mm.	Bristles 2–5 , 2–3 mm long
Inflorescence	Axillary, solitary flowers alternating at nodes	Axillary, solitary or terminal 2–4 flowered cyme	Solitary or 2–flowered cyme
Flowers	3–3.5mm long, blue	5–7mm long, blue, campanulate	3–4 mm long, white
Pedicel	6–10mm	4–6mm long	10–15 mm long
Hypanthium	Ovoid with setiform cuticular protuberances	Ovoid, puberulous	Ovoid
Level of calyx lobes	One fourth of corolla tube	Much below the corolla tube	Below the level of corolla
Calyx	Margin entire with setiform cuticular protuberances, apex acute 1.5 – 2 × 0.8–1mm long	Margin setulose, apex acute, 0.7–1 ×0.5–0.7mm long	Margin dentate, Lobes 4, rarely 5, ovate–lanceolate or triangular, apex acute, 0.5-0.6 mm long
Corolla	Lobes not spreading, tube 2–2.2mm long, lobes 1mm long, oblong, acute at tip, glabrous outside and minute hyaline hairs at the base of corolla tube inside, apex slightly reflexed	Broadly campanulate, tube 2.5–4mm long, lobes 2.5–3.5 mm long, minutely pubescent outside glabrous inside, apex reflexed	2 mm long, tube 1.2–1.3 mm long, pubescent at throat; lobes 0.5–0.8 x 0.5–0.6 mm, ovate, acute, incurved at apex.
Stamens	Inserted, filaments 0.25 mm long, glabrous	Inserted, filaments 0.7–1 mm long, hairy	Included, filaments 0.2-0.3 mm long
Anther	0.75mm	1–1.2mm	3–4 Mm long
Stigma	Bilobed, papilose	Bifid, hispid	Bilobed, papillose fleshy, tufted hairy
Capsule	Sub–globose 2×2 mm	Ovoid, 2.5–3×1.5–2.5mm	Ellipsoid or oblong-ovoid
Seed	Many, angular, with minor grooves 0.2–0.3 x 0.2–0.3 mm	Many, angular 0.3–0.5x0.3–0.5mm	Many, 0.7 x 0.1 mm, angular

Specimens examined: INDIA: Kerala: Palakkad District, Walayar range, Koomachimala, 10°49'44.76"N, 76°40'36.16"E, 100m, 24 July 2017, Aswani & Maya, 177855 (MH); Koomachimala, 10°49'44.76"N, 76°40'36.16"E, 100m, 24 July 2017, Aswani & Maya, 7004 (CALI); Koomachimala, 10°49'44.76"N, 76°40'36.16"E, 100m, 24 July 2017, Aswani & Maya 399 (GVCH); Koomachimala, 10°50'2.4"N, 76°40'48"E, 140m, 12 August 2017, Aswani & Arabhi; 543 (GVCH), Neelippara, 10°51'47.52"N, 76°37'37.38"E, 312m, 15 September 2017, Aswani & Rekha, AVJ 4173 (GVCH); Thekke Malampuzha, 10°50'02.52"N, 76°40'58.49"E, 120m, 08 July 2019, Aswani & Maya, AVJ 4173 (GVCH) (GVCH– Government Victoria College Herbarium).

Phenology: Flowering: June–August; Fruiting: July– September.

Additional specimens examined: K000031277 (K), s.n. 1972, India, Kerala, Malampuzha near Palghat hardly 100m below, coll. R. Vasudevan Nair; 6945(KFRI), Collection no: N.S. 4635, 22.09.1987, Peechi, Thrissur, coll. N. Sasidharan.

IV.7.4. Floristic additions to Palakkad District (Plate 120 - 125)

Among the 1077 taxa collected, 387 taxa were found to be an addition to Flora of Palghat (Vajravelu, 1990). The taxa listed as addition to Palakkad District Flora (Vajravelu, 1990) from Walayar range forests are summarized in Annexure XII.

IV.7.5. Extended distribution to Palakkad district (Plate 126 - 128)

With reference to e- flora of Kerala (2023) and Kumar (2015), the explorations in Walayar range forests could identify 98 taxa having an extended distribution to Palakkad district, which were already showing distribution in other districts. List of taxa are given in Annexure XIII.

IV.7.6. Analysis of vegetation across and through the Palghat Gap

The species diversity of Walayar forest range was compared with that of Dhoni hills, Attappady, Kollengode, Parambikulam and Nelliyampathy hills using PAST software. The list of species from Parambikulam (Sasidharan, 2002) and Attappady (Anil Kumar, 2015), Kollengode hills (Soumya, 2018), Dhoni hills (Rekha, 2019) and Nelliyampathy hills (Jabeena, 2022) were taken and reconfirmed their status using POWO (2023). These taxa along with the species composition from Walayar hills were used for analysis using PAST. Analysis of vegetation across the Palghat Gap clearly depicts the effect of Palghat Gap in species distribution.

Plate 120: Additions to the flora of Palghat district Fig. a. *Acmella radicans* (Jacq.) R.K.Jansen **b.** *Acmella uliginosa* (Sw.) Cass. **c.** *Ailanthus excelsus* Roxb.**d.** *Alternanthera brasiliana* (L.) Kuntze **e.** *Alternanthera paronychioides* A.St.-Hil.**f.** *Alysicarpus heterophyllus* (Baker) Jafri & Ali **g.** *Amorphophallus paeoniifolius* (Dennst.) Nicolson **h.** *Andrographis elongata* (Vahl) T.Anderson.

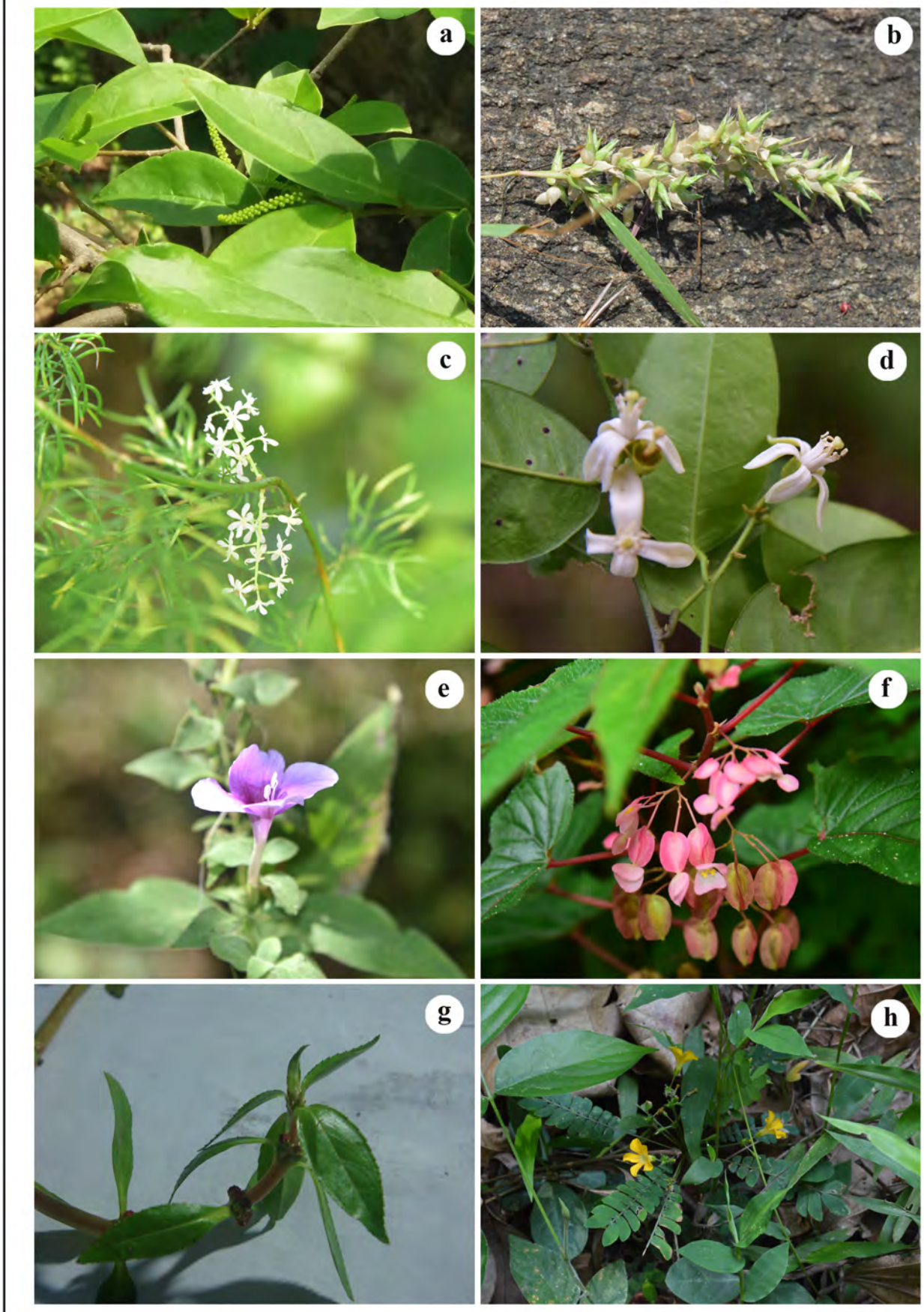

Plate 121: Addition to the flora of Palghat district Fig. a. *Antidesma alexiteria* L.**b.** *Apluda mutica* L. **c.** *Asparagus racemosus* Willd. **d.** *Atalantia monophylla* (L.) DC. **e.** *Barleria tomentosa* Roth **f.** *Begonia dipetala* Graham **g.** *Bergia capensis* L. **h.** *Biophytum sensitivum* (L.) DC.

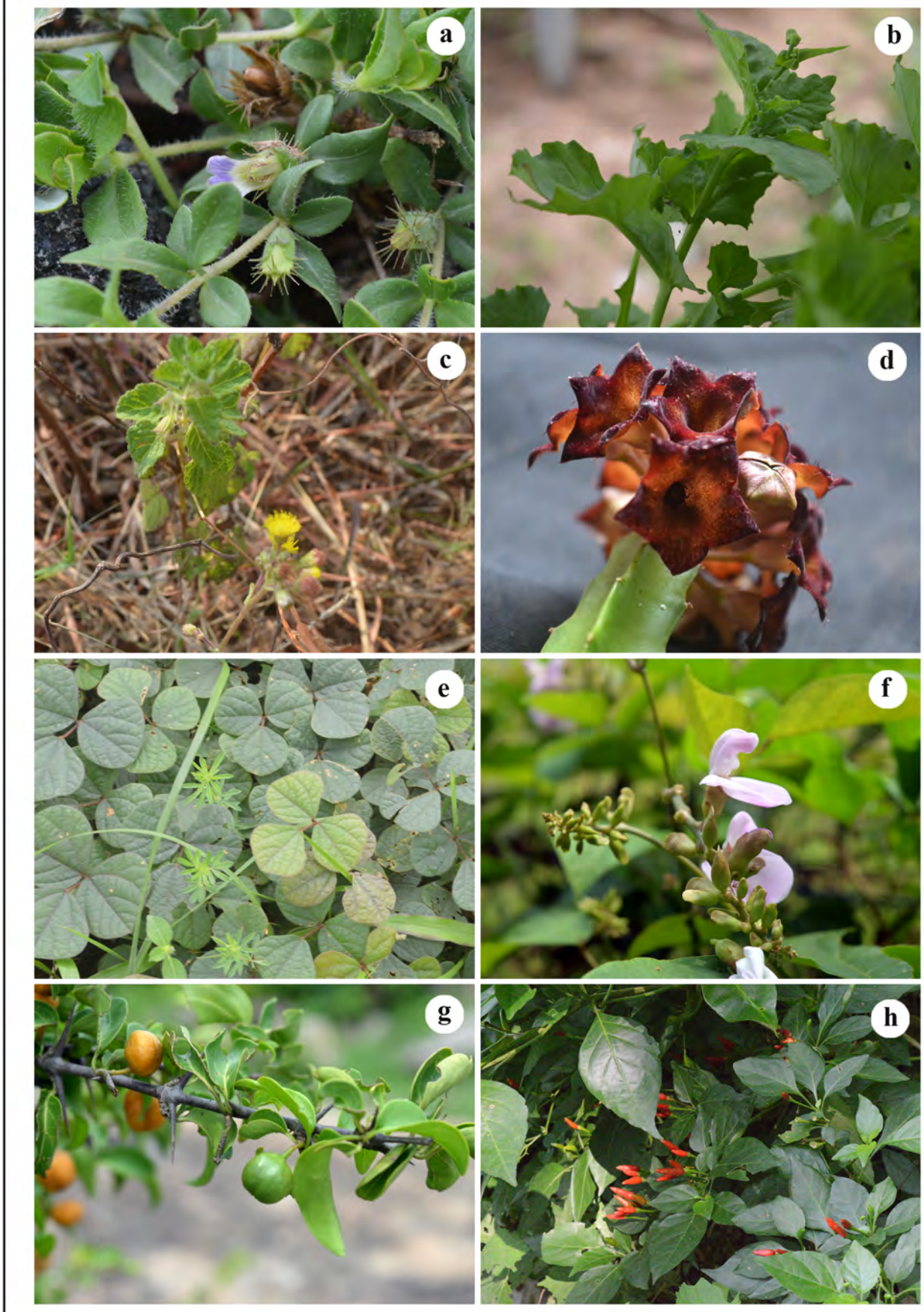

Plate 122: Addition to the flora of Palghat district Fig. a. *Blepharis integrifolia* E.Mey. & Drège **b.** *Blumea lacera* (Burm.f.) DC. **c.** *Blumea oxyodonta* DC. **d.** *Boucerosia umbellata* Wight & Arn. **e.** *Cajanus rugosus* (Wight & Arn.) Maesen. **f.** *Canavalia mollis* Wall. ex Wight & Arn. **g.** *Canthium coromandelicum* (Burm.f.) Alston **h.** *Capsicum frutescens* L.

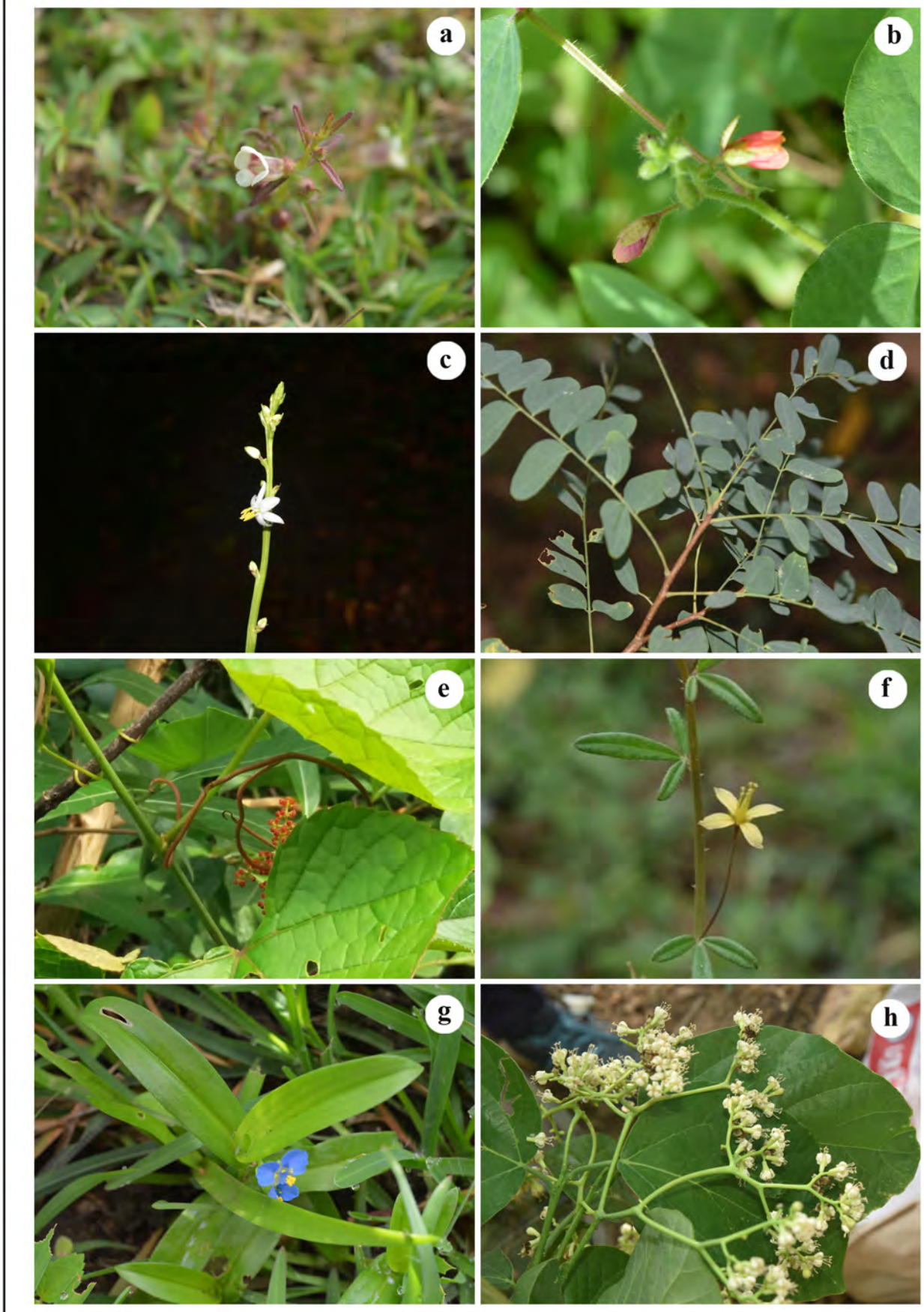

Plate 123: Addition to the flora of Palghat district Fig. a. *Centranthera indica* Gamble **b.** *Chamaecrista absus* (L.) H.S.Irwin & Barneby **c.** *Chlorophytum nimmonii* Dalzell **d.** *Chloroxylon swietenia* DC. **e.** *Cissus latifolia* Lam. **f.** *Cleome aspera* J.Koenig. **g.** *Commelina clavata* C.B.Clarke **h.** *Cordia dichotoma* G.Forst.

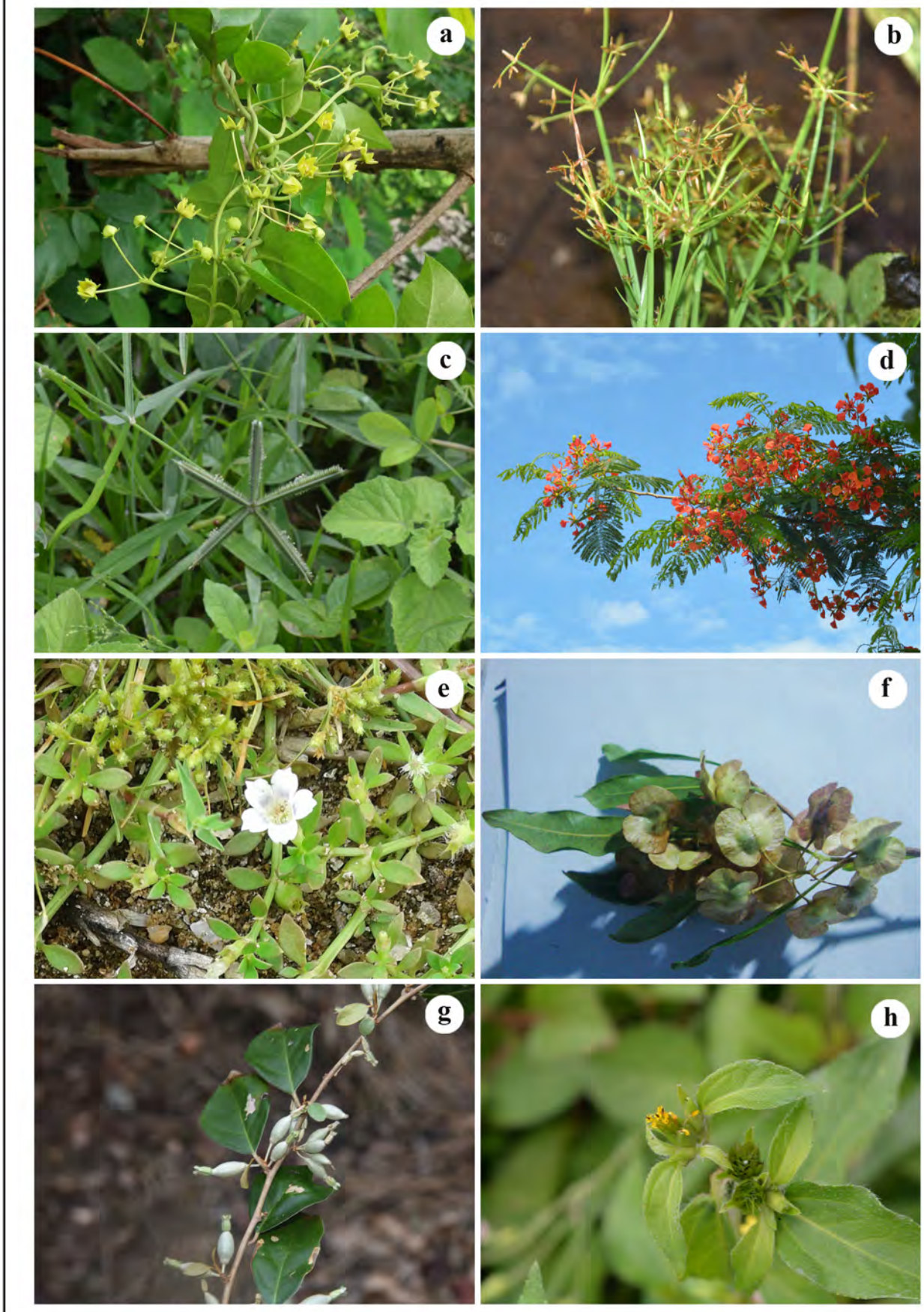

Plate 124: Addition to the flora of Palghat district Fig. a. *Cosmostigma cordatum* (Poir.) M.R.Almeida **b.** *Cyperus haspan* L. **c.** *Dactyloctenium aegyptium* (L.) Willd.**d.** *Delonix regia* (Bojer) Raf. **e.** *Dentella repens* var. *serpyllifolia* (Wall. ex Craib) Verdc.**f.** *Dodonaea viscosa* Jacq. **g.** *Elaeagnus indica* Serv. **h.** *Eleutheranthera ruderalis* (Sw.) Sch.Bip.

Plate 125: Addition to the flora of Palghat district Fig. a. *Grangea maderaspatana* (L.) Poir.**b.** *Heritiera papilio* Bedd. **c.** *Justicia tranquebariensis* L.f. **d.** *Leea asiatica* (L.) Ridsdale **e.** *Lindernia rotundifolia* (L.) Alston **f.** *Meistera aculeata* (Roxb.) Škorničk. & M.F.Newman **g.** *Melochia corchorifolia* L. **h.** *Oxystelma esculentum* (L.f.) Decne.

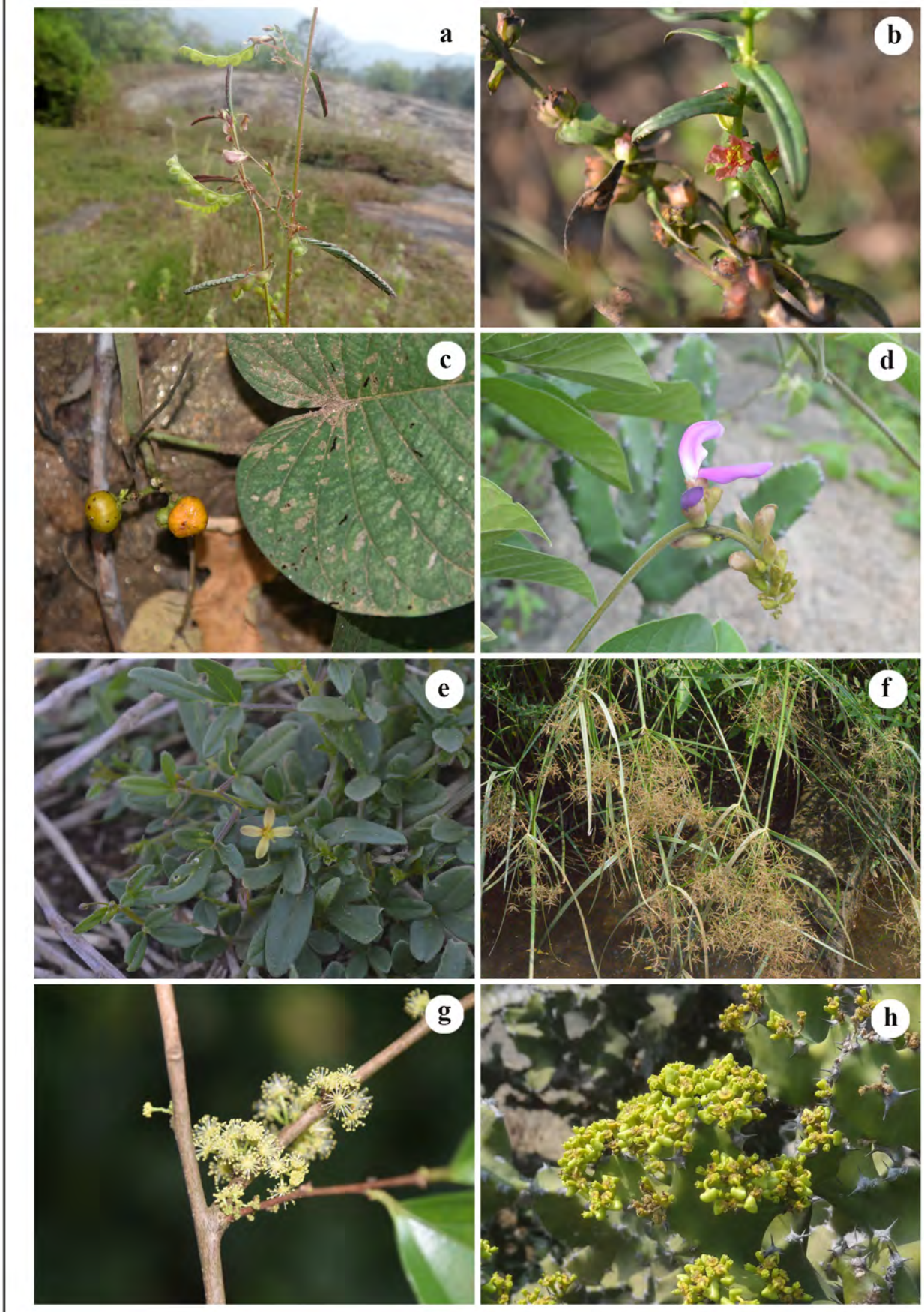

Plate 126: Taxa with extended distribution in Palakkad district Fig. a. *Aeschynomene americana* L. **b.** *Ammannia octandra* L.f. **c.** *Argyreia populifolia* Choisy **d.** *Canavalia africana* Dunn ex Hutch. **e.** *Cleome aspera* J.Koenig **f.** *Cyperus corymbosus* Rottb. **g.** *Drypetes confertiflora* Pax & K.Hoffm. **h.** *Euphorbia tortilis* Rottler ex Ainslie.

Plate 127: Taxa with extended distribution in Palakkad district Fig. a. *Indigofera tsiangiana* F.P.Metcalf **b.** *Limnophila heterophylla* Benth. **c.** *Mitreola petiolata* (J.F.Gmel.) Torr. & A.Gray **d.** *Murdannia dimorpha* G.Brückn. **e.** *Ophiorrhiza rugosa* var. *decumbens* (Gardner ex Thwaites) Deb & Mondal **f.** *Paramollugo nudicaulis* (Lam.) Thulin **g.** *Rostellularia procumbens* (L.) Nees **h.** *Salomonia ciliata* DC.

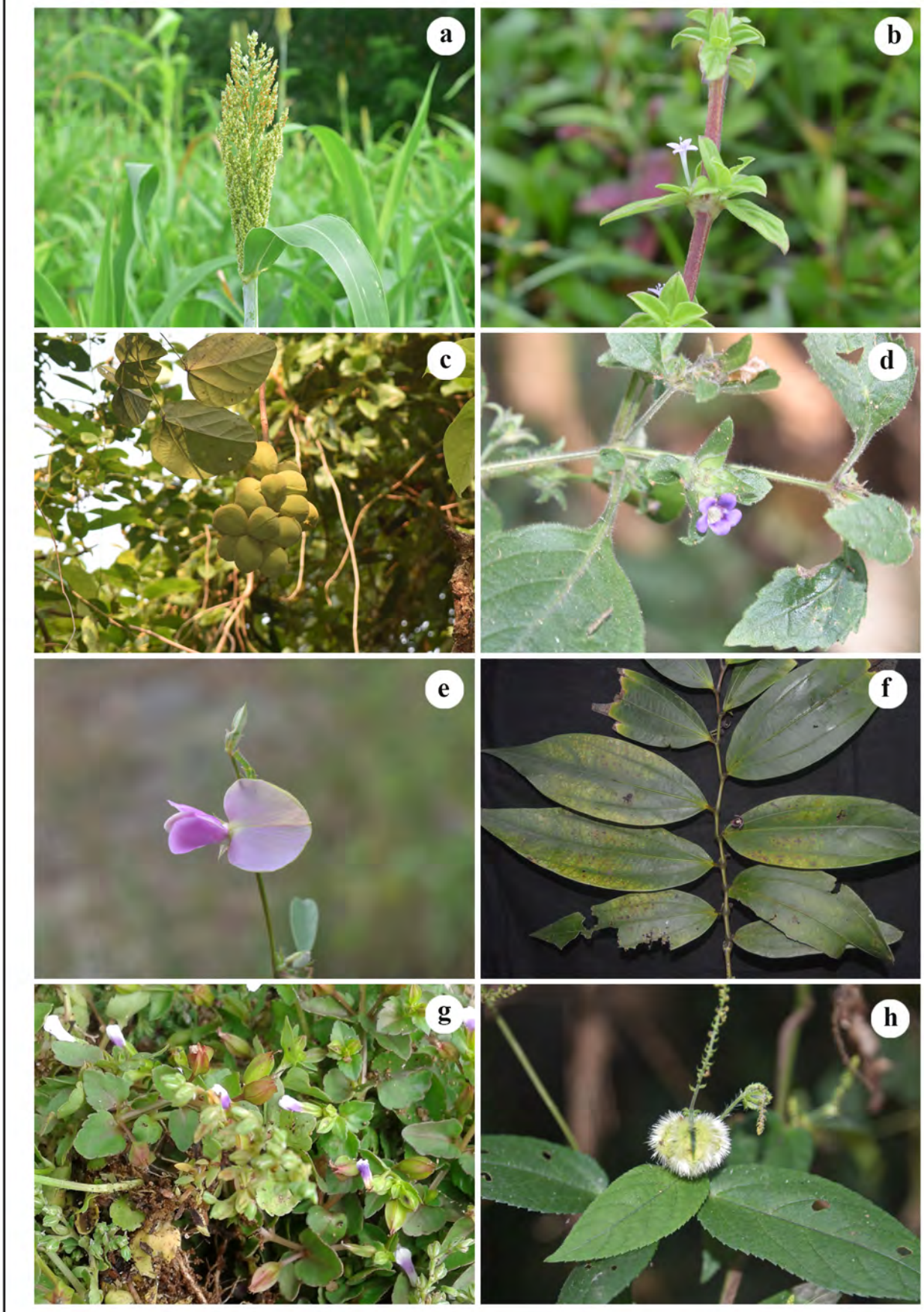

Plate 128: Taxa with extended distribution in Palakkad district Fig. a. *Sorghum bicolor* (L.) Moench.**b.** *Spermacoce hispida* L. **c.** *Sterculia foetida* L. **d.** *Strobilanthes crossandra* (Steud.) J.R.I.Wood **e.** *Tephrosia maxima* Pers. **f.** *Thottea sivarajanii* E.S.S.Kumar, A.E.S.Khan & Binu **g.** *Torenia lindernioides* C.J.Saldanha **h.** *Tragia bicolor* Miq.

Walayar and Dhoni hills region on the northern side of Palghat Gap branch out from a common node of the dendrogram while, Nelliyampathy, Kollengode and Parambikulam on the southern side of the Palghat gap shared a different node. The dissimilarity in overall floral composition in Attappady hills separate them from rest of the hill tracks and show a different lineage. Table 16 summarizes the similarity index calculated using PAST software.

Table 16. Similarity index of different forest zones across Palghat Gap

	Walayar	Kollengode	Nelliyampathy	Attappady	Dhoni	Parambikulam
Walayar	1	0.392	0.398	0.353	0.237	0.339
Kollengode	0.392	1	0.578	0.444	0.256	0.479
Nelliyampathy	0.398	0.578	1	0.543	0.252	0.564
Attappady	0.353	0.444	0.543	1	0.225	0.551
Dhoni	0.237	0.256	0.252	0.225	1	0.244
Parambikulam	0.339	0.479	0.564	0.551	0.244	1

The output dendrogram from the PAST software indicates a stronger similarity index between Walayar and Dhoni hills than other regions (Fig. 19). The high similarity index between these hills may be because of two reasons. First one is that both these regions are the continuous mountain stretches hence dispersal of seeds and distribution of pollinators will be similar in these two regions. Without a geographical barrier, species distribution will be more or less similar. Similar is the reason for the similarity between Kollengode, Nelliyampathy and Parambikulam which lies in the north - eastern side of the Palghat Gap. Therefore, the plant composition in these forest tracts will be similar. Further, the 32 Km wide Palghat Gap between these regions, would hinders the species dispersal across the Gap, which in turn leads to maintenance of unique species distribution on both sides of the Gap. Since Attappady hills lies far away from the gap region, the species distribution is least affected by harsh, extreme environments near gap area.

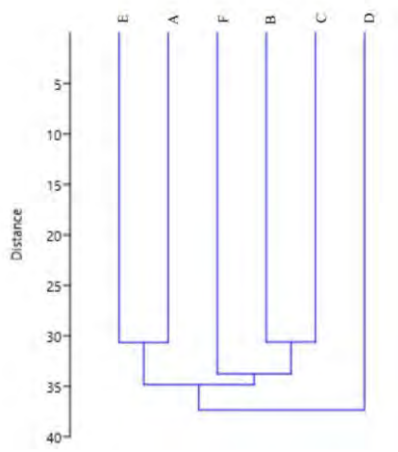

Figure 19. Dendrogram generated from PAST software

A - Walayar B – Kollengode C – Nelliyampathy D – Attappady E – Dhoni F - Parambikulam

IV. 8. Pollination and dispersal mechanisms Vs angiosperm profile in Walayar range forests

Objectives addressed

- Influence of Palghat Gap traits with incidence of anemophily and anemochory in angiosperm vegetation
- Distribution of taxa across families with reference to pollination and dispersal mechanisms

The ecosystem characteristics of a specific habitat is determined by the climatic conditions and abiotic parameters which influences the species survival in such environments with adaptive traits. The taxa surviving in such habitats show various kinds of adaptations. These adaptive traits gave them additional support for survival and the frequency of taxa with such special adaptations in Walayar range is in tune with Gap parameters like high wind velocity, extremities in temperature, low humidity and lesser water availability. Following is an assessment of special adaptations seen in the floristic elements of Walayar range.

IV.8.1. Pollination mechanisms - Anemophily

Anemophily is very common in plants with very small flowers that lack bright colours, sweet scented odour, inconspicuous sepals and petals and lacks nectar. Poaceae, Cyperaceae, Euphorbiaceae, Phyllanthaceae, Lauraceae, Combretaceae, Puthranjeevaceae and Typhaceae are some of the families which are featured by flowers with anemophilous adaptations. Often, the anemophilous flowers are found aggregated in inflorescences.

Even though critical evaluation of the pollination mechanisms is not carried out so far, certain taxa is found to have features which supports anemophily rather than other mechanisms. Strong dry winds flowing through Walayar hills are beneficial for such taxa. Annexure XIV summarizes those taxa which favours anemophily.

IV.8.2. Seed Dispersal mechanisms - Anemochory

Anemochory helps the plants for far dispersal of their seeds and range extension and is one of the most advanced traits shown by angiosperms. Since Walayar range hills lie within the Palghat Gap area, the velocity of the wind blowing through the Gap is high. Hence taxa growing in the region utilize this wind for seed dispersal and would help the plants to reach more distances. Annexure XV summarizes the list of anemochorous taxa inhabiting the range. Cyperaceae accounts for the highest number of anemochorous taxa with 41 species, followed by Asteraceae (31 taxa), Apocynaceae (20 taxa), Poaceae (19 taxa) and Fabaceae (9 taxa).

Strong desiccating wind through the Palghat gap region favours easy seed dispersal of plants like *Alstonia scholaris* (L.) R.Br., *Saccharum spontaneum* L., *Terminalia paniculata* Roth, *Wrightia tinctoria* R.Br., *Cenchrus pedicellatus* (Trin.) Morrone, *Holoptelea integrifolia (Roxb.) Planch.*, *Dioscorea bulbifera* L., *Hopea parviflora* Bedd., *Pterocarpus marsupium* Roxb., *Terminalia anogeissiana* Gere & Boatwr., *Getonia floribunda* Roxb.etc. The dominance of anemochorous taxa within the range seems to be an adaptive feature to thrive well within the desiccating winds flowing through the Gap. The light weight flattened samaroid fruits and pappus hairs in seeds are found to be an adaptation to fly in wind and move to other places. Detailed investigations on the pollination and seed dispersal of the plants in the Walayar forest range have to be carried out to demonstrate the influence of wind in distribution of taxa along the Palghat Gap zone and to elucidate the significance and geographical peculiarity of the Walayar hills compared to other mountainous tracks.

IV. 9. Wild Genetic Resources and Medicinal plant diversity in Walayar hills

Objectives addressed

- Investigation and documentation of wild edible plants in Walayar hills
- Documentation of medicinal plants and wild genetic resources in Walayar hills
- Documentation of the potential ornamental wild plants in hill tracts

IV.9.1. Medicinal plant diversity (Plate 129)

Forests are the primary sources of medicinal plants. A total of 389 medicinal plants were recorded from Walayar hill ranges and it accounts to 36.11% of the collected taxa. Annexure XVI summarizes the list of medicinal plants collected from the study area. Fabaceae accounts the highest number of medicinal plants with 45 taxa, followed by Apocynaceae (23 taxa), Malvaceae (18 taxa), Asteraceae (11 taxa), Acanthaceae, Cucurbitaceae and Solanaceae with 10 taxa each. Herbs are the most predominant medicinal plants with 127 taxa (32.64%) followed by trees with 103 taxa (26.47%). Shrubs and climbers are represented by 81 taxa (20.82%) and 78 taxa (20.05%) respectively.

IV.9.1.1. Rare and important medicinal plant resources

Pterocarpus marsupium Roxb. is a near threatened tree found in Walayar hills. The gum obtained from the incisions in bark is used to heal skin allergies in children. The leaf paste is used to treat boils, sores and other skin diseases. *Hydnocarpus alpinus* Wight and *Hydnocarpus pentandrus* (Buch.-Ham.) Oken are vulnerable ones and are used to treat skin diseases like leprosy. *Santalum album* L. is another vulnerable taxa used as a cooling agent during high fever in kids. It is further used to treat hepatic diseases. *Cayratia pedata* Gagnep. is used to treat skin burns, ulcer, diarrhoea etc.

The tubers obtained from *Asparagus gonocladus* Baker and *Asparagus racemosus* Willd. is used by the breastfeeding mothers to enhance lactation. *Gymnema sylvestre* (Retz.) R.Br. ex Sm. is one of the medicinal plants with potent anti diabetic properties. The leaves are used as Its leaves have been used in ayurveda to treat diabetes, malaria and snakebites. *Acampe praemorsa* (Roxb.) Blatt. & McCann is an orchid member whose watery juice obtained from flowers is used to treat ear aches. *Nervilia concolor* Schltr. and *Nervilia plicata* Schltr. are one of the rare terrestrial orchids in Walayar hills, whose tubers are used as a ‘single ingredient’ medicine to heal acute headache like migraine, sinusitis etc. *Baccaurea courtallensis* (Wight) Müll.Arg. is one of the rare forest tree species used to treat diarrhoea, dysentery and skin infections. Fruits obtained from *Anamirta cocculus* (L.) Wight & Arn. is used to heal ulcers, scabies, and menstrual diseases in women. *Sapindus*

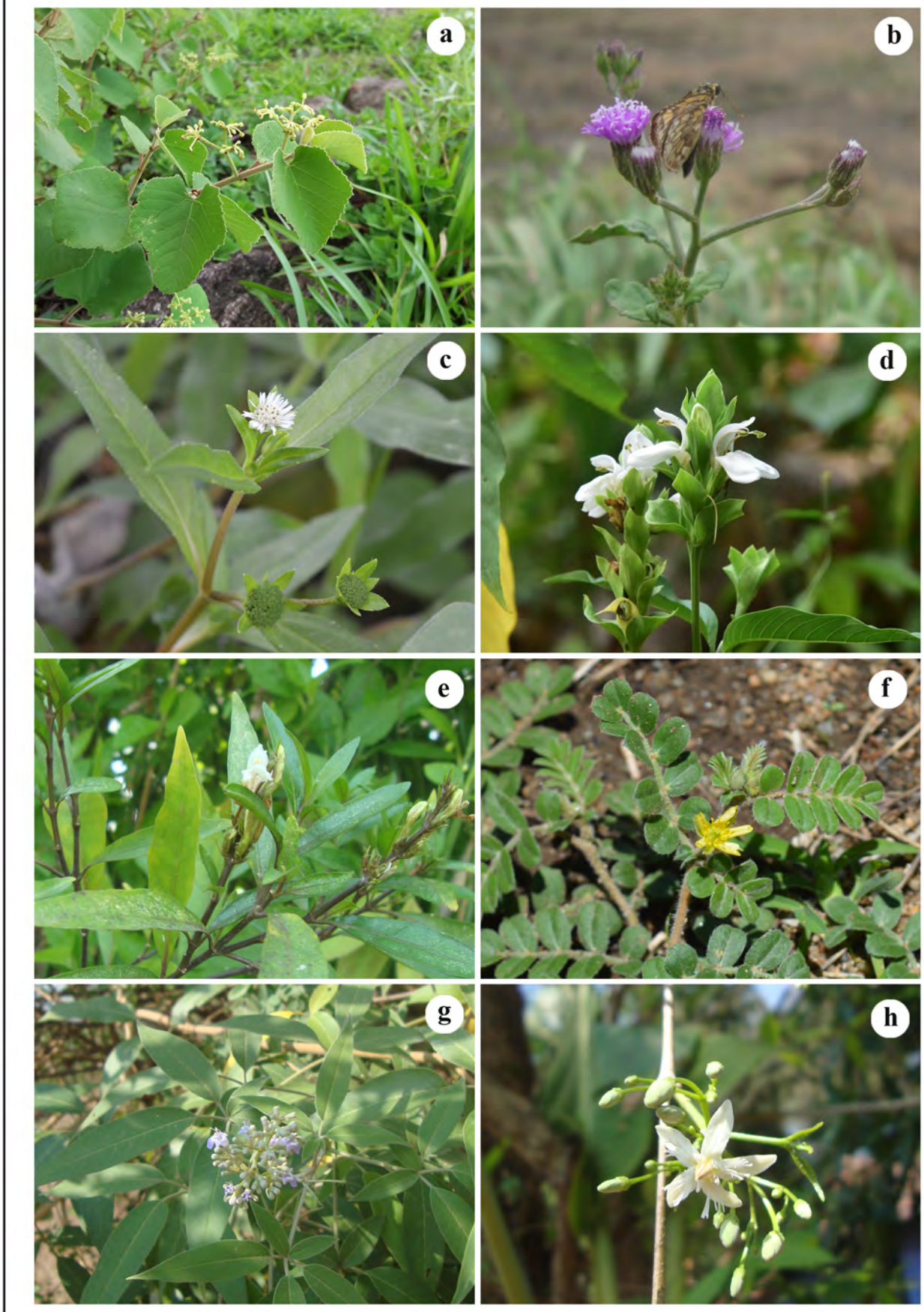

Plate 129: Medicinal plant diversity Fig. a. *Cissus vitiginea* L. **b.** *Cyanthillium cinereum* (L.) H.Rob. **c.** *Eclipta prostrata* (L.) L. **d.** *Justicia adhatoda* L. **e.** *Justicia gendarussa* Burm.f. **f.** *Tribulus terrestris* L. **g.** *Vitex negundo* L. **h.** *Wrightia tinctoria* R.Br.

trifoliatus L. is used as a skin cleansing agent for babies. *Mappia nimmoniana* (J.Graham) Byng & Stull is a rare plant in Walayar hills which is reported to have potent anti - cancerous, Camptothecin (CPT) and anti - HIV drug components. The oil obtained from *Sarcostigma kleinii* Wight & Arn. is used to heal rheumatism.

IV.9.1.2. Traditionally used medicinal plants

The plants used in 'Dasamoola' such as *Gmelina arborea* Roxb. (Kumizhu), *Oroxylum indicum* (L.) Benth. ex Kurz (Palakapayyani), *Pleurolobus gangeticus* J.St. Hil. (Orila), *Pseudarthria viscida* (L.) Wight & Arn. (Moovila), *Solanum violaceum* Ortega (Cheruchunda), *Stereospermum colais* (Buch.-Ham. ex Dillw.) Mabb. (Poopathiri) and *Tribulus terrestris* L. (Njerinjil) were recorded from Walayar hills. The members in 'Dasapushpam' such as *Ouret lanata* (L.) Kuntze (Cherula), *Biophytum reinwardtii* (Zucc.) Klotzsch (Mukkutti), *Cardiospermum halicacabum* L. (Uzhinja), *Curculigo orchioides* Gaertn. (Nilappana), *Cyanthillium cinereum* (L.) H.Rob. (Poovaamkurunnal), *Cynodon dactylon* (L.) Pers. (Karuka), *Eclipta prostrata* (L.) L. (Kanjunni), *Emilia sonchifolia* (L.) DC. (Muyyalcheviyan), *Evolvulus alsinoides* L. (Krishnakranti) and *Ipomoea obscura* (L.) Ker Gawl (Thiruthali) are found in the hill tracts and in the plains of Walayar hill ranges.

Along with this, *Ficus benghalensis* L. (Peraal), *Ficus microcarpa* L.f. (Ithi) , *Ficus racemosa* L.(Atthi) and *Ficus religiosa* L. (Arayal) commonly known as 'Nalpaamaram' is also very common in the hill tracts. 'Thrikadu' includes *Piper longum* L. (Thippalli), *Piper nigrum* L. (Kurumulaku) and *Zingiber officinale* Rosc. (Inchi) and 'Triphala' includes *Phyllanthus emblica* L. (Nelli), *Terminalia bellirica* (Gaertn.) Roxb. (Thanni) and *Terminalia chebula* Retz. (Kadukai) were also collected from the Walayar hills.

IV.9.2. Wild edible plants

Many plants in the forest areas are edible and form the main source of food for the animals and the human beings. They are either eaten raw or cooked which includes leaves, rhizome, roots, seeds or the entire plant. Walayar hills also offer many wild edibles. Annexure XVII summarizes 139 wild edible plants recorded from Walayar hills, out of which fruit yielding plants are more (80 taxa) followed by plants with useful as leaves (23 taxa).

IV.9.3. Wild relatives of cultivated plants

Walayar hills are found to harbour rich germplasm of the wild relatives of many cultivated species, that can be used in the hybridization programmes for crop improvements. A total of 115 taxa were recorded as wild genetic resources. The wild

relative of ragi namely *Eleusine indica* (L.) Gaertn., wild relative of paddy viz., *Oryza officinalis* Wall. and *Oryza rufipogon* Griff. are the important cereal resources. *Corchorus aestuans* L. is a wild member yielding fibre. *Saccharum spontaneum* L. is a wild relative of sugarcane, The wild relatives in spices and contiments include species of *Cinnamomum, Myristica, Curcuma, Zingiber* and *Piper* and were also collected from the Walayar hills. Table 17 summarizes the list of various wild genetic resources in Walayar hills.

Table 17. Wild relatives of cultivated plants

Sl. No	Category	Wild relatives
1	Cereals and millets	*Eleusine indica* (L.) Gaertn., *Oryza officinalis* Wall., *Oryza rufipogon* Griff.
2	Pulses and legumes	*Vigna* (5 spp.), *Cajanus* (4 spp.)
3	Fibre yielding plants	*Corchorus aestuans* L.
4	Spices and condiments	*Bergera koenigii* L., *Cinnamomum malabatrum* (Burm.f.) J.Presl, *Cinnamomum verum* J.Presl, *Curcuma* (6 spp.), *Myristica fragrans* Houtt., *Zingiber (5 sp.), Piper* (5 spp.)
5	Sugar yielding crops	*Saccharum spontaneum* L.
6	Timber yielding plants	*Ailanthus excelsus* Roxb)., *Ailanthus triphysus* (Dennst.) Alston, *Dalbergia lanceolaria* subsp. *paniculata* (Roxb.) Thoth., *Dalbergia latifolia* Roxb., *Dalbergia sissoides* Graham ex Wight & Arn., *Dalbergia sissoo* Roxb. ex DC.
7	Fruit crops	*Carissa carandas* L., *Carissa spinarum* L., *Flacourtia indica* (Burm.f.) Merr., *Flacourtia montana* J.Graham, *Ziziphus* (5 spp.), *Phyllanthus (8* spp.*), Artocarpus* (3 spp.), *Syzygium* (3 spp.)
8	Gums and Resins	*Senegalia caesia* (L.) Maslin, Seigler & Ebinger*, Senegalia catechu* (L.f.) P.J.H.Hurter & Mabb., *Senegalia chundra* (Roxb. ex Rottler) Maslin, *Senegalia pennata* (L.) Maslin, *Senegalia rugata* Britton & Rose
9	Seeds and oil yielding crops	*Sesamum indicum* L., *Sesamum prostratum* Retz., *Sesamum radiatum* Thonn. ex Hornem.
10	Vegetable crops	*Ipomoea* (14 spp.)*, Solanum* (6 spp.), *Dioscorea* (8 spp), (*Abelmoschus* (3 spp.), *Amaranthus spinosus* L., *Amorphophallus commutatus* (Schott) Engl., *Amorphophallus paeoniifolius* (Dennst.) Nicolson, *Coccinia grandis* (L.) Voigt, *Cucumis maderaspatanus* L.,*Cucumis sativus* L., *Cucurbita maxima* Duchesne, *Cucurbita pepo* L., *Manihot carthagenensis* subsp. *glaziovii* (Müll.Arg.) Allem, *Trichosanthes cucumerin*a L., *Trichosanthes tricuspidata* Lour., *Momordica charantia* L., *Momordica sahyadrica* Kattuk. & V.T.Antony

IV.9.4. Wild ornamentals (Plate 130 - 131)

Several wild plants are having beautiful, attractive flowers or leaves which gives them aesthetic beauty. These potential wild ornamental plants may be used in horticulture as introductions or as genetic resources for improvement of many ornamental plants. Annexure XVIII represents the potential ornamental wild plants collected from Walayar hills.

IV.10. Phenotypic plasticity in angiosperms of Walayar range forests

Objectives addressed

- Inter - specific diversity in taxa in Walayar forest range
- Identification of intraspecific variations in taxa with respect to geographic gradients
- Phenotypic plasticity and infra specific diversity in taxa as a prelude to speciation

IV.10.1. Inter - specific diversity (Plate 132 - 133)

Diversity of species within a genus represents the inter - specific diversity. Among the 610 genera collected, 209 genera are with more than a single species. The generic diversity of the study area is much higher and therefore the species diversity within the hill ranges needs to be studied. There are 401 genera represented from Walayar hills with only one species (Annexure XVIII). Table 18 represents the most speciose genera in Walayar hills.

Table 18. Interspecific diversity in Walayar hill ranges

Sl. No.	Genera	No. of species	Sl. No.	Genera	No. of species
1	*Cyperus*	29	17	*Curcuma*	6
2	*Ipomoea*	14	18	*Barleria*	5
3	*Ficus*	14	19	*Justicia*	5
4	*Crotalaria*	9	20	*Strobilanthes*	5
5	*Eragrostis*	9	21	*Alternanthera*	5
6	*Fimbristylis*	8	22	*Commelina*	5
7	*Dioscorea*	8	23	*Cyanotis*	5
8	*Phyllanthus*	8	24	*Acalypha*	5
9	*Impatiens*	7	25	*Euphorbia*	5
10	*Terminalia*	7	26	*Alysicarpus*	5
11	*Murdannia*	7	27	*Senegalia*	5
12	*Indigofera*	7	28	*Tephrosia*	5
13	*Hibiscus*	7	29	*Vigna*	5
14	*Solanum*	7	30	*Piper*	5
15	*Sida*	6	31	*Cissus*	5
16	*Spermacoce*	6	32	*Zingiber*	5

IV.10.1.1. *Cyperus* L.

Cyperus is the most speciose genus in Walayar hill ranges with 29 species (Plate 132: Fig. a. - f.). The genus is found to be inhabiting in wetlands and marshy places. They are often found along the river banks, paddy fields, along wet areas in forest tracks and in wastelands in lower altitudes. Among the 29 taxa reported, 25 taxa are grouped under Least Concern (LC) as per IUCN Redlist 2022.2. *Cyperus imbricatus* Retz., *Cyperus nutans* Vahl, *Cyperus pseudokyllingioides* Kük. and *Cyperus sesquiflorus* subspec. *cylindricus* (Nees) T.Koyama are found to have extended distribution to Palakkad district (www.eflorakerala.org).

IV.10.1.2. *Ipomoea* L.

Ipomoea is the second most speciose genus in Walayar, representing 14 species. All the plants under this genus are climbers and out of the 14 taxa recorded, 5 taxa are found to be alien - invasive. They include *Ipomoea eriocarpa* R.Br., *Ipomoea hederifolia* L. and *Ipomoea pes-tigridis* L. native to tropical America and *Ipomoea staphylina* Roem. & Schult and *Ipomoea obscura* (L.) Ker Gawl. with Tropical Africa as the place of origin. The genus is found growing luxuriently in the lower altitude hillocks and degraded forest tracts. *Ipomoea alba* L. and *Ipomoea wightii* Choisy are the rare climbers under this genus that are seen growing in the margins of grasslands.

IV.10.1.3. *Ficus* L.

The genus *Ficus* commonly known as ‘figs’ or ‘fig trees’ is also the second most speciose genus in Walayar hills representing 14 species (Plate 132: Fig. g. - h. and Plate 133: Fig. a. - d.). The members under this genera are the most common tree members found along the river banks, along waterfalls and in other marshy lands in the forests. The members are found commonly in the degraded and moist deciduous forests. *Ficus arnottiana* (Miq.) Miq., *Ficus beddomei* King and *Ficus dalhousieae* Miq. are the endemic taxa reported from the study area. These taxa are often found in the semi - evergreen forests and in the hill slopes near grasslands. The tree play a great ecological role in the Walayar hills since it forms the main source of food resource for a wide range of animals, birds and insects. Availability of food resources becomes limited or very low since the hill tracks encounter with extreme dry and hot summer season. The high frequency of occurrence of these taxa provides enough food resource during the scarcity period.

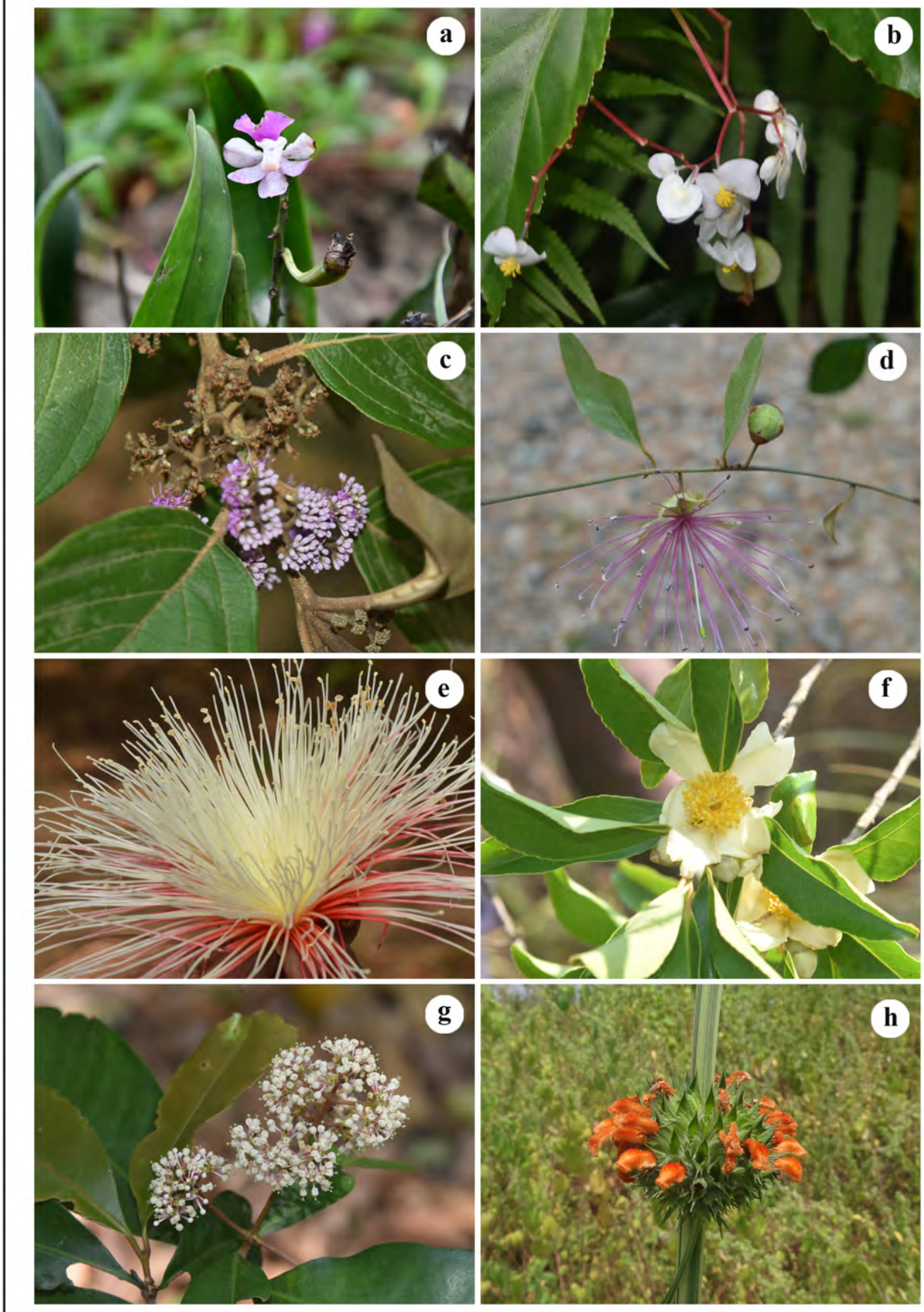

Plate 130: Incidence of wild ornamentals Fig. a. *Aerides maculosa* Lindl. **b.** *Begonia dipetala* Graham **c.** *Callicarpa tomentosa* (L.) L. **d.** *Capparis zeylanica* L. **e.** *Careya arborea* Roxb. **f.** *Polyspora obtusa* (Wall. ex Wight & Arn.) Niissalo & L.M.Choo **g.** Ixora brachiata Roxb. **h.** Leonotis nepetifolia (L.) R.Br.

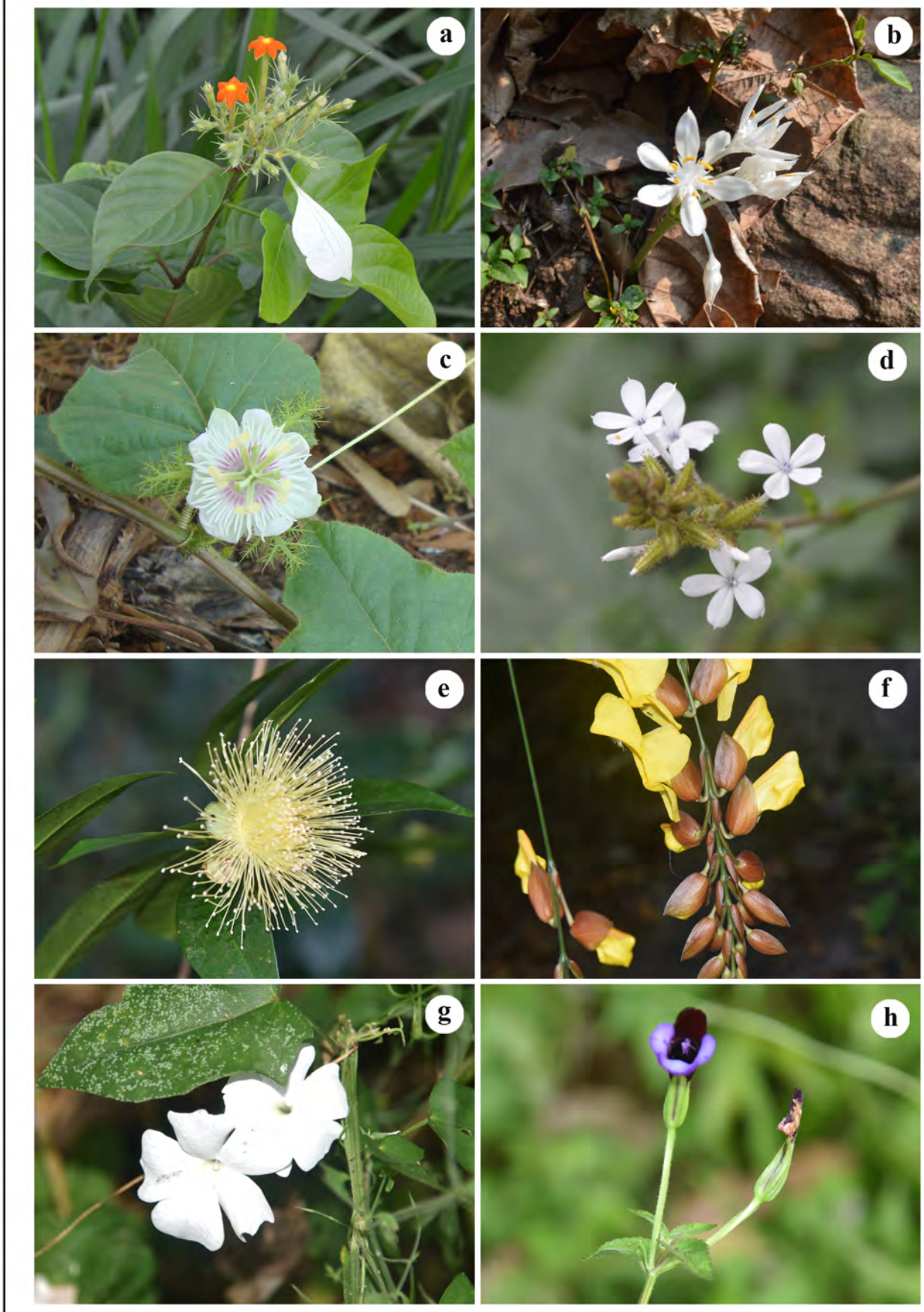

Plate 131: Incidence of wild ornamentals Fig. a. *Mussaenda frondosa* L. **b.** *Pancratium triflorum* Roxb. **c.** *Passiflora foetida* L. **d.** *Plumbago zeylanica* L. **e.** *Syzygium laetum* (Buch.-Ham.) Gandhi **f.** *Thunbergia mysorensis* (Wight) T.Anderson **g.** *Thunbergia tomentosa* Wall. ex Nees **h.** *Torenia hirsuta* Willd.

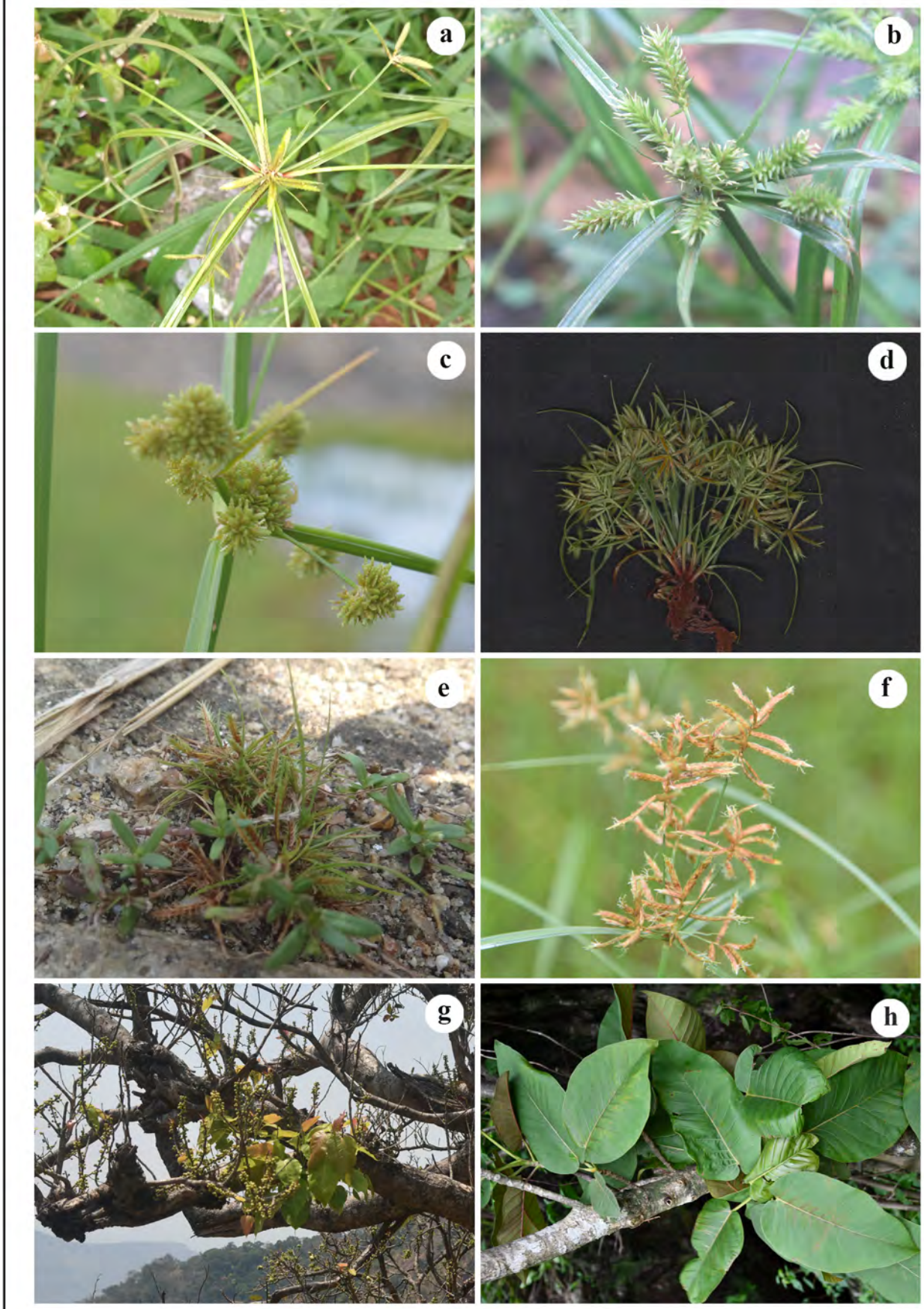

Plate 132: Inter - specific diversity Fig. a – f Fig a. *Cyperus compressus* L. **b.** *Cyperus cyperoides* (L.) Kuntze **c.** *Cyperus difformis* L. **d.** *Cyperus maderaspatanus* Willd. **e.** *Cyperus pumilus* L. **f.** *Cyperus rotundus* L. **g.** *Ficus arnottiana* (Miq.) Miq. **h.** *Ficus beddomei* King.

IV.10.1.4. *Crotalaria* L.

Crotalaria is the third speciose genus represented by 9 species in Walayar hills . The taxa included under this genus is found to be inhabiting in degraded deciduous forests, moist deciduous forests and in plains. *Crotalaria heyneana* Graham ex Wight & Arn. is an endemic species found in the lower altitude of Walayar hills. *Crotalaria mysorensis* Roth and *Crotalaria nana* Burm.f. are more frequently found in the rocky outcrops. *Crotalaria pallida* Aiton is the invasive species reported under this genus and is found to have faster spreading rate into the interior forests and gradually turns to be a weed in the forest tracts (USGS - Invasive Alien flora of India, 2008).

IV.10.1.5. *Eragrostis* Wolf

Eragrostis is represented by 9 species in Walayar hill ranges (Plate 133: Fig. e - h). The members under this genus is found to be growing in wet and marshy places. *Eragrostis nigra* Nees ex Steud. and *Eragrostis tef* (Zuccagni) Trotter are having extended distribution to Palakkad district. *Eragrostis riparia* Nees is endemic to Peninsular India. All the members are found in the lower altitudes.

IV.10.1.6. *Fimbristylis* Vahl

Fimbristylis is a herbaceous member included under the family Cyperaceae. It is represented by 8 species which prefer to inhabit on the wet and moist sandy soils in lower altitudes. They are found commonly in the catchment area of dam sites and in exposed rock surfaces in hillocks. *Fimbristylis narayanii* C.E.C. Fisch. is an endemic taxa, distributed in South Kerala.

IV.10.1. 7. *Dioscorea* L.

Dioscorea includes tuberous climbers represented by 8 species. They are the common liana in the degraded forests, moist deciduous and semi evergreen forests. They form the main understorey of forests. *Dioscorea alata* L. is the endemic taxa found in the Walayar hill tracks. Many members in this taxa are used as an edible tuber by the tribal groups residing in the study area.

IV.10.1.8. *Phyllanthus* L.

This genus is represented by 8 species. *Phyllanthus emblica* L. is the tree species in this range and all other members are either erect, subdecurrent or prostrate herbs. They are found in degraded forests, deciduous and semi - evergreen forests. *Phyllanthus maderaspatensis* L. is one of the common dry deciduous elements found in main hill tracts and in hillocks. *Phyllanthus reticulatus* Poir. is a common taxa found in the plains often planted in homesteads as a biofencing element.

IV.10.2. Intraspecific diversity (Plate 134 - 139)

Variations are one of the major driving forces for evolution of a species and morphological variations develop in a species due to its exposure to several factors. Walayar hills, located in the north- eastern side of Palghat Gap is directly influenced by the gap features. The dry hot winds seasonally passing through the gap, limited nutrient soils, the distribution of taxa in various unique microhabitats, heavy monsoon season followed by the hottest summer with highest recorded temperature regimes, water scarcity etc have greatly influenced the vegetation in Walayar hills. This is evident by the documentation of certain taxa as morpho variants who express characters differently from its own. Field explorations in various regions, both hillocks and main ghats resulted in the collection of taxa which showed morphological variations. Following is an account on the taxa which showed continuous variations among and within populations.

IV.10.2.1. *Allmania nodiflora* (L.) R.Br. ex Wight (Plate 134: Fig. a - b)

The accessions collected from the rock crevices in hillocks showed variations in morphological features. Certain specimens found growing in rocky outcrops (Kongampaadam, coll. no., 2305) exhibited reddish sessile inflorescence and the leaf appears much broader with reddish colouration along the leaf margins. The specimen collected along Ayyappan Mala (coll. no., 2547) were characterised by green pedicelled heads instead of sessile heads. Also, the number of flowers per head was fewer (7 - 15 flowers) as compared to other accessions with 15 - 30 flowers per head.

IV.10.2.2. *Andrographis echioides* Nees (Plate 134: Fig. c - d)

The specimens collected from different locations of the study area showed variations from the type specimen. The taxon is often characterised by whole plant densely villous hairy, stem greenish with reddish - brown colouration and corolla lip with violet blotches. The specimen collected from Mathappumala (coll. no. 5603) showed variations.

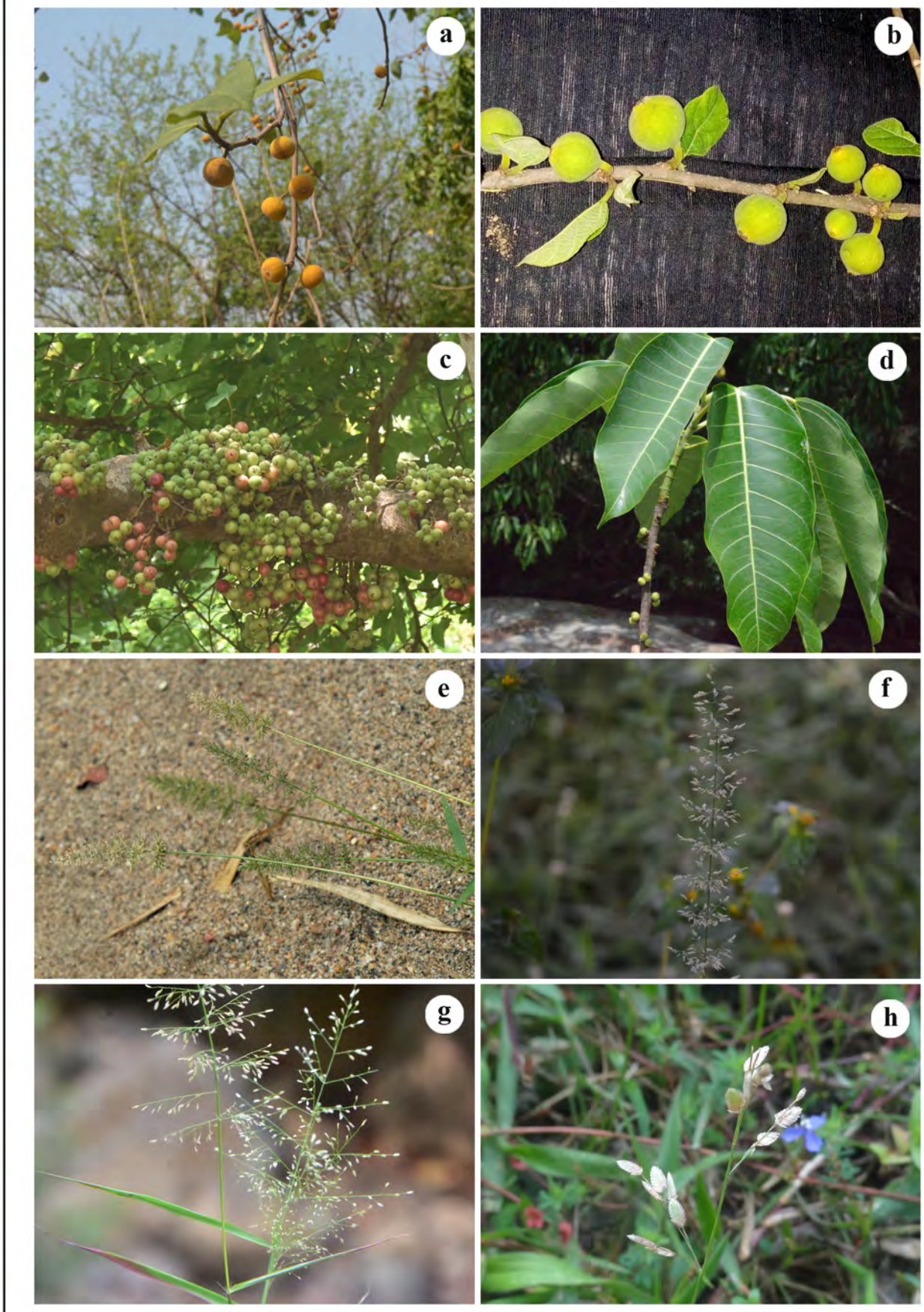

Plate 133: Interspecific diversity: Fig. a. *Ficus exasperata* Vahl **b.** *Ficus hispida* L.f **c.** *Ficus racemosa* L. **d.** *Ficus virens* Aiton **e.** *Eragrostis riparia* Nees **f.** *Eragrostis tenella* (L.) P. Beauv. **g.** *Eragrostis unioloides* (Retz.) Nees ex Steud. **h.** *Eragrostis viscosa* Mém.

The specimen showed variation by less villous nature of the plant, greenish stem without reddish - brown blotches, creamy white corolla lip without violet blotches.

IV.10.2.3. *Biophytum umbraculum* Welw. (Plate 134: Fig. e - f)

The specimens collected from Kaattadikunnu (coll. no., 4812) consists of calyx tube green, lobes brownish - red with less glandular hairs and petals cream or creamy yellow with red stripes in contrast to the type specimens characterised by calyx tube and lobes reddish brown with more glandular hairs and petals bright yellow with red stripes.

IV.10.2.4. *Bonnaya ciliata* Spreng. (Plate 134: Fig. g - h)

This taxon is found to occur in the rocky hillocks and open rocky patches in the study area. The populations show a wide range of variation in floral characters. Usually, leaves are found to be elliptic-oblong and margins aristate-dentate. The flowers of this taxon naturally have pink or bluish - pink corolla. As a variant, certain populations are featured by much narrowed elliptic leaves, margins with more deep serrations and pale pink petals (coll. no., 2506; 4787) . In certain populations (coll. no., 4570), the corolla lobes appears light blue or white coloured instead of bluish pink corolla.

IV.10.2.5. *Chamaecrista absus* (L.) H.S.Irwin & Barneby (Plate 135: Fig. a - b)

The taxon showed two morphotypes in the same geographical area. In general flowers appear reddish - yellow in the range. But the accessions collected from Kosavanidukku - Kaduvaachaal (coll. no., 242) and Thekke Malampuzha (coll. no., 667) exhibited yellow flower without any red colouration.

IV.10.2.6. *Chassalia curviflora* Thwaites (Plate 135: Fig. c- f)

The taxon collected from the study area showed many variations in the morphological features. The specimens collected from Chacolas (coll. no., 4534) have elliptic leaves with leaf apex acuminate, flowers pinkish - white and corolla throat yellow. But, the accessions from Chaatappara waterfalls (coll. no., 5548) had elliptic leaves with leaf apex obtuse and corolla throat white in pinkish - white flowers. Further, the accession collected from Jamanthimala (coll. no., 5622) had plants with narrowly elliptic leaves with apex acuminate and flowers white without pinkish colouration and corolla throat yellow. The number of flowers in the inflorescence are also found to vary in the same populations in the study area. The inflorescence appears many flowered (more than 50) in branched cymes while certain inflorescence consists of flowers less than 30 in simple cymes.

IV.10.2.7. *Commelina benghalensis* L. (Plate 135: Fig. g – h)

The specimen collected from various locations in the study area exhibited several morphological variations. Taxon collected from wet and moist areas are found to have

green stem, leaves oblong or suborbicular with leaf apex obtuse and dark green in colour. While, observing other accessions in the range, it was found that the stem appears red, leaves ovate and leaf petiole reddish and leaf blade with light green colour along with a red colouration in the leaf margins. The pubescence of the plant is found to be more in the specimens with reddish colouration. In specimen collected from Mannukunnu (coll. no., 4203), the colour of petals were found to be white, a variant from blue coloured flowers. The stem appeared to be green with leaves oblong with apex acute rather than obtuse and the hairiness of the plant is found to be less compared to other specimens collected from the study area.

IV.10.2.8. ***Curculigo orchioides*** **Gaertn.** (Plate 136: Fig. a- b)

The specimens collected from various location of the range show continuous variations in vegetative and floral characters such as leaf size, shape, hairiness and length and hairiness of perianth. The accessions obtained from Ayyappan Mala (coll. no., 2414) and Kottamutti waterfalls (coll. no., 2910) is characterised by plants with leaves linear - lanceolate, reaching upto 60 cm or above, either glabrous or with scarsely hairy below and with oblong glabrous perianth lobes. Further, the specimens collected from Jamanthimala (coll. no., 5640) showed dwarfism in plant parts. The total height of the plants was observed to be 15cm or less with small sessile leaves measuring about 5cm or above. The leaves are found to be lanceolate with breadth of leaf blade upto 2cm. The size of flower was only upto 2cm with densely hairy margins and apex of perianth lobes.

IV.10.2.9. ***Curcuma aurantiaca*** **Zijp** (Plate 136: Fig. c - d)

The specimens collected from Neelipara hills (coll. no., 580) exhibited reddish bracts while the specimens collected from Chacolas estate (coll. no., 4486) and Akamalavaram - Moochikadavu (coll. no., 4376) consists of greenish or pale greenish bracts.

IV.10.2.10. ***Cyanotis axillaris*** **(L.) D.Don ex Sweet** (Plate 136: Fig. e - h)

The specimens collected from different locations of the range showed variations from the type specimen. The taxon showed variation in stem colour, colour, length and succulence of leaf and colour of the flower. In the accessions collected from Cheranpara (coll. no., 182) and Mayyappalam (coll. no., 2105), the flowers were pink and leaves green with purple colouration in the margins. The flowers appeared violet in certain other specimens collected from Koomachimala but the stem appears green with reddish brown streaks and leaves more fleshy and wider with reddish brown lining along leaf margins. The length of the leaves was twice longer than the normal leaf length (more than 10cm to 15cm

Plate 134: Incidence of morphotypic variation Fig. a. – b. *Allmania nodiflora* (L.) R.Br. ex Wight **c. – d.** *Andrographis echioides* Nees **e. – f.** *Biophytum umbraculum* Welw. **g. – h.** *Bonnaya ciliata Spreng.*

Plate 135: Incidence of morphotypic variation Fig. a. – b. *Chamaecrista absus* (L.) H.S.Irwin & Barneby. **c. – f.** *Chassalia curviflora* Thwaites **g. – h.** *Commelina benghalensis* L.

long). The leaves further appears green without any reddish brown colouration along leaf margins.

IV.10.2.11. *Cyanotis burmanniana* Wight (Plate 137: Fig. a - b)

The study area harbours two morphotypes of *Cyanotis burmanniana* Wight. The specimen collected from rocky outcrops such as Koomachimala (coll.no., 377), Olappallam (coll. no., 982), Kongampaadam (coll.no, 4567) and from the open rocky patches in Kozhimala (coll. no., 798) is having fleshy succulent purple coloured leaves and red stem in contrast to fleshy green leaves and green stem collected from the main hill tracks from Kezhakootimala (coll. no., 514) and Ayyappan mala (coll. no., 2532). The leaves often seems to be less fleshy and thin in the wet forest tracks than in the dry hot rocky patches in hillocks.

IV.10.2.12. *Euphorbia hirta* L. (Plate 137: Fig. c- d)

The taxon observed in various habitats in study area show morphological variations. Plants growing in limited soils, near buildings and rocky regions in the forest area etc are found to have reddish brown stem and leaves, while in other regions the plant bears greenish stem and leaves which is quite similar with the type specimen.

IV.10.2.13. *Euphorbia thymifolia* L. (Plate 137: Fig. e - f)

The specimen collected from the catchment area of Malampuzha dam (coll. no., 2) and Walayar dam (coll. no., 2060) and the wet moist areas of Vedivachapara (coll. no., 69) and Thonikadavu- Thekke Malampuzha (coll. no., 32) are featured by greenish stem with pale green inflorescence. While the accessions from rocky outcrops such as Mayyappalam (coll. no., 2134) and Koomachimala (coll. no., 4181) are characterised by greenish stem and greenish inflorescence. More often, the seeds collected from these accessions were trigonous rather than quadrangular seen in the dam sites.

IV.10.2.14. *Geophila repens* (L.) I. M. Johnst. (Plate 137: Fig. g - h)

The type specimen of this taxon are usually characterized by white flowers with 5 corolla lobes. But, the specimens collected from Moochikadavu (coll. no., 4384) and Mannukunnu (coll. no., 4245) are examined for its corolla lobes to be four rather than 5 lobed corolla.

IV.10.2.15. *Haplanthodes tentaculata* var. *neilgherryensis* (Wight) J.R.I.Wood (Plate 138: Fig. a - c)

The taxon is characterized by axillary flowers in false whorls surrounded by numerous abortive branchlets reduced to cladodes and ending in spinous structures which are reduced leaves. The accessions collected from various locations in study area showed variations in

leaf shape, cladodes and floral characters. The specimens collected from Aduppukootimala (coll. no., 3690) is having glabrous stem, broadly elliptic leaves, numerous flowers arranged densely in branchlets with reduced cladodes. The corolla appears to be pale blue or whitish with bluish coloration in the throat. The specimen observed in Chaatappara waterfalls (coll. no., 5459) are featured by hairy stem in contrast to glabrous stem in type specimens. The leaves are further ovate, apex obtuse or widely acute. The length of the inflorescence spike measure above 4cm. In contrast to this morphological features, the plants in Pettikallu hills (coll. no., 6084) in Akamalavaram hills are characterised by sub erect herbs, stem softly pubescent, leaves ovate with long petiole and flowers few in a whorl of few cladodes ie. less than 2cm and corolla blue coloured without dark blue coloration in the corolla throat.

IV.10.2.16. *Hibiscus lobatus* (Murray) Kuntze (Plate 138: Fig. d - f)

The taxon showed a high degree of variation throughout the study area. The various accessions showed marked variation in lobing of leaves, aestivation of petals, length of staminal tube and size of the flower. Plants examined from Pallipara have entire leaves, corolla lobes with twisted aestivation and the presence of staminal tube reaching three - forth the length of petal lobes. The leaves were lobed, corolla with twisted aestivation and staminal tube reaching half the length of petal lobes in accessions collected from Thekke Malampuzha, Olappalam, and Kongampaadam. In plants collected from Edamala - Kaatadikunnu forests, the leaves were entire, petals with imbricate aestivation and the staminal tube three forth the length of petal lobes and the petals were wide open rather than the tubular nature. Very small flowers, entire leaf with leaf blade much broader and very short staminal tube were observed in the plants in hill tracks of Jamanthimala. The stability of these floral characters is much varying throughout the forest tracts.

IV.10.2.17. *Impatiens minor* (DC.) Bennet (Plate 138: Fig. g - h)

The specimens collected from various forest tracts showed continuous variations in floral characters like petal colour and length of flowers. Certain populations are characterised by flowers with pale pink or white petals rather than pink - violet petals in type specimen. Further, the flowers in certain populations are found to be shorter (5 - 6mm) than the the normal flowers (8mm) long.

IV.10.2.18. *Murdannia dimorpha* G.Brückn. (Plate 139: Fig. a - b)

The taxon collected from Thekke Malampuzha (coll. no., 666) showed variation in perianth lobes and stamens. The outer sepals appears white and membraneous different from the reddish brown sepals. The petals and stamens are pale -. white or faint blue

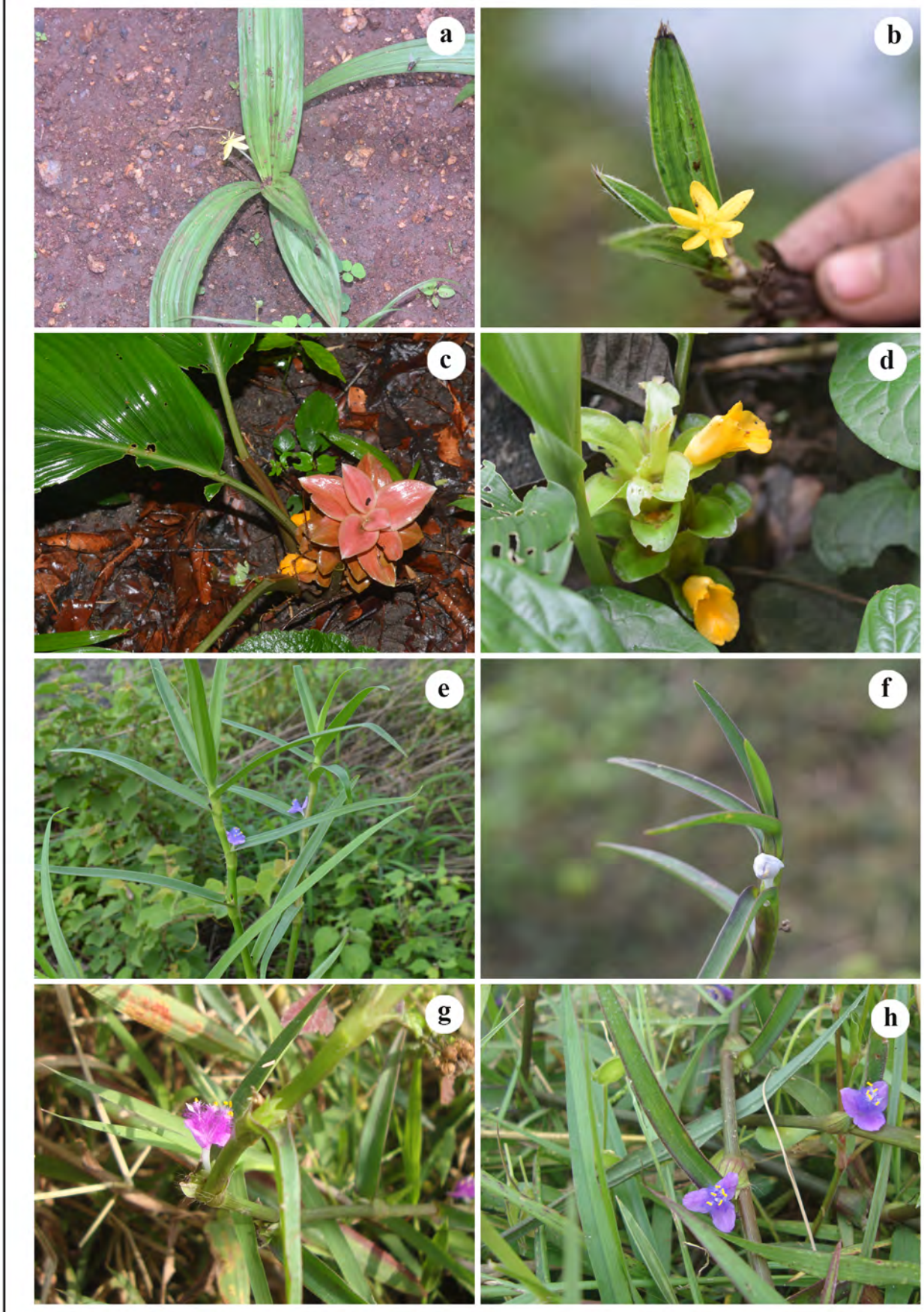

Plate 136: Incidence of morphotypic variation Fig. a. – b. *Curculigo orchioides* Gaertn. **c. - d.** *Curcuma aurantiaca* Zijp. **e. – h.** *Cyanotis axillaris* (L.) D.Don ex Sweet.

Plate 137: Incidence of morphotypic variation Fig. a. – b. *Cyanotis burmanniana Wight* **c. - d.** *Euphorbia hirta* L. **e. – f.** *Euphorbia thymifolia* L. **g. - h.** *Geophila repens* (L.)I.M.Johnst.

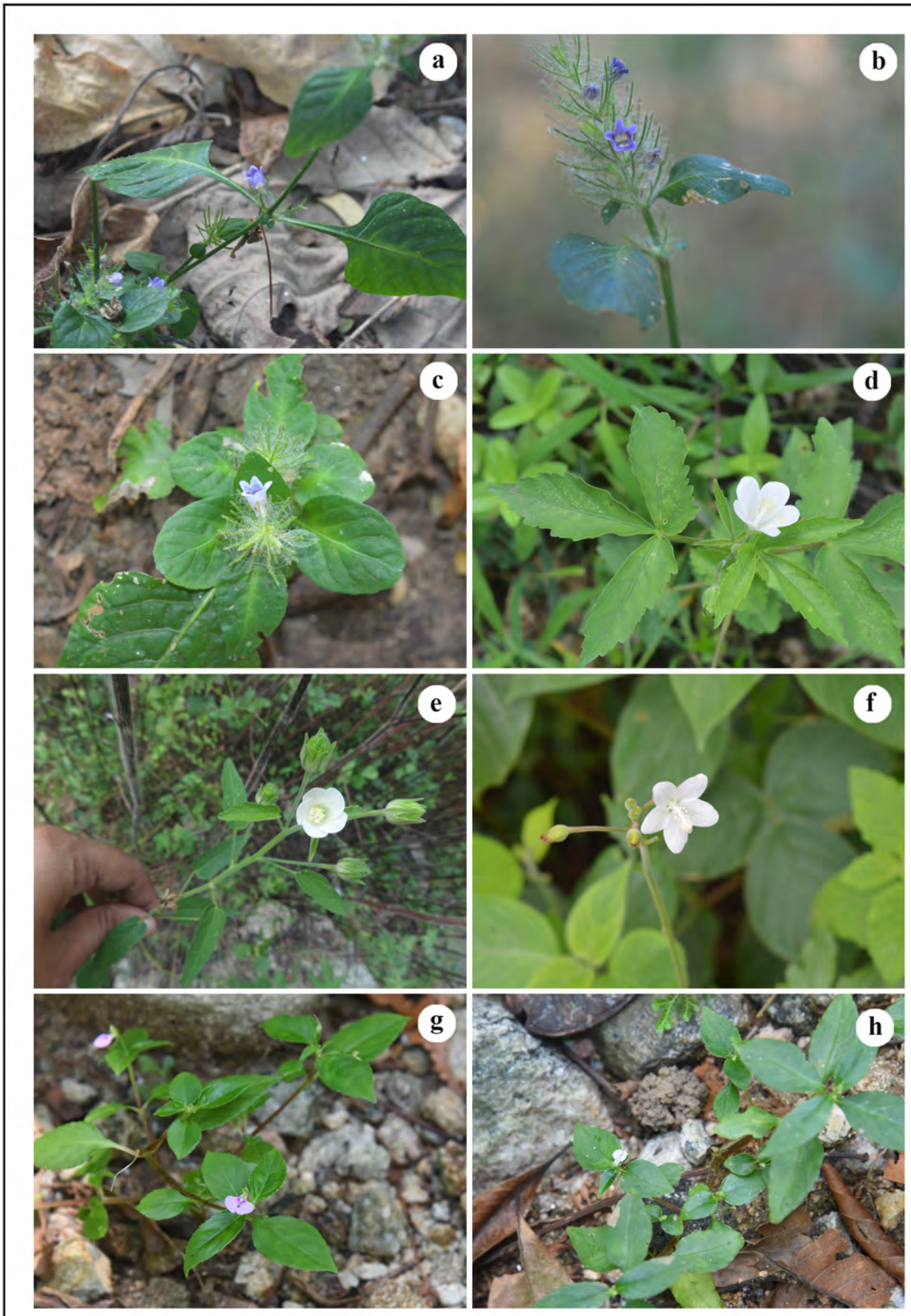

Plate 138: Incidence of morphotypic variation Fig. a. – c. *Haplanthodes tentaculata var. neilgherryensis*(Wight)J.R.I.Wood . **d. – f.** *Hibiscus lobatus* (Murray) Kuntze **g.- h.** *Impatiens minor* (DC.) Bennet.

coloured rather than the purple coloured petals and stamens (coll. no., 236; 522; 932). The taxa appears to be short statured less than 15cm and the stem appears green in comparison with tall plants more than 20cm and reddish-brown stem with nodes having a reddish coloration.

IV.10.2.19. ***Pouzolzia zeylanica*** **(L.) Benn.** (Plate 139: Fig. c- d)

This taxon is a much variable plant found growing in a variety of habitats such as degraded forests to semi - evergreen forests, rocky crevices in hillocks, near waterfalls, river banks, sandy soils, near canals, paddy fields, in plains and in other wastelands with wider adaptability. The taxon appears in two morphoforms. The stem and leaf petiole appears red or green with leaves variable from linear - lanceolate to elliptic to ovate lanceolate with varying leaf length from 1.5cm to 4cm or more. The seeds are found to bear 2 to 4 wings or seeds wingless.

IV.10.2.20. ***Xenostegia tridentata*** **(L.) D.F.Austin & Staples** (Plate 139: Fig.e - f)

The taxon was found growing in forest tracts, dry hillocks and in plains. The specimen exhibits different morphological features based on the habitat in which it is surviving. The accessions obtained from rocky hillocks such as Olappalam (coll. no., 928), Valiya eri (coll. no., 1271), Kongampaadam (coll. no., 4576) and Mayyappalam (coll. no., 5390) are found to be a slender climber with smaller leaves (0.5 - 1.5cm long), leaf base auricled and few toothed. Inflorescence is axillary solitary with flower length upto 1cm long. But, the specimens collected from Ayyappan Mala (coll. no., 2517) and Edamala (coll. no., 4969) are characterised by longer leaves (2 - 4cm or more), linear - hastate with base auricles having many teeth and flowers 1 - 3 together in axillary peduncles.

IV.11. Taxonomic singularity and monotypism in angiosperm vegetation of Walayar forests

Objectives addressed

- Analysis of taxonomic singularity to assess biodiversity richness
- Identification of monotypic taxa and its distribution
- Evaluation of taxonomic divergence at familial and generic level

IV.11.1. Taxonomic singularity

Taxonomic rarity is an important criterion used to evaluate the biodiversity of a specific region. In a specific area, the taxonomic singularity at the family level is calculated as the inverse of the number of genera in a particular family. Taxonomic singularity at the level of genus is calculated as the inverse the number of species in a genus. Out of the 610 genera recorded, 401 genera were found to have a single species (Annexure XIX.) and of the 133 families, 63 families contain a single genus (Table 19). The taxonomic singularity of vegetation at Walayar at genus level is 0.83 and at family level is 0.61. At the genus level, the taxonomic singularity is comparatively high since 66% of the collected genera contains a single species. But at the family level, taxonomic divergence is high, since 53% of the families are represented by more than a single genus.

IV.11.2. Identification of monotypic taxa

A monotypic genus is the one which contains only a single species globally. In Walayar forest range could record 33 monotypic species. Among these species recorded, and from Walayar range, They contain more than one species described by different authors. Later, all these taxa got synonymized under a single species (Table 20).

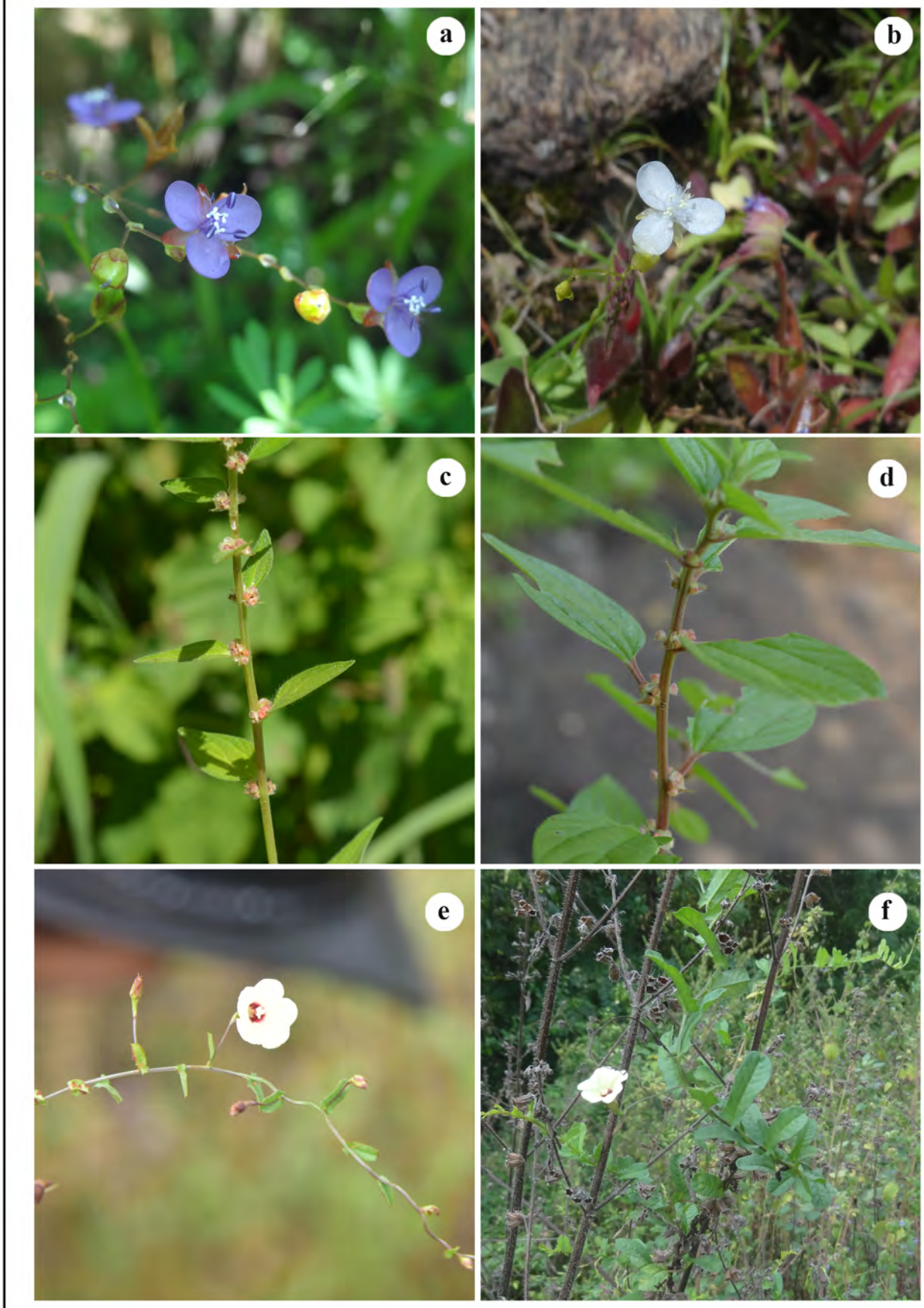

Plate 139: Incidence of morphotypic variation Fig. a. - b. *Murdannia dimorpha* G.Brückn. **c. - d.** *Pouzolzia zeylanica* (L.) Benn. **e. - f .** *Xenostegia tridentata* (L.) D. F. Austin & Staples

Table 19. List of families represented by single species in the Walayar hill range

Sl. No	Family	Genera name	Sl. No	Family	Genera name
1	Achariaceae	*Hydnocarpus*	19	Cornaceae	*Alangium*
2	Aizoaceae	*Trianthema*	20	Costaceae	*Hellenia*
3	Amaryllidaceae	*Pancratium*	21	Crassulaceae	*Kalanchoe*
4	Ancistrocladaceae	*Ancistrocladus*	22	Dilleniaceae	*Dillenia*
5	Araliaceae	*Hydrocotyle*	23	Dioscoreaceae	*Dioscorea*
6	Balsaminaceae	*Impatiens*	24	Dipterocarpaceae	*Hopea*
7	Basellaceae	*Basella*	25	Droseraceae	*Drosera*
8	Begoniaceae	*Begonia*	26	Ebenaceae	*Diospyros*
9	Bixaceae	*Cochlospermum*	27	Elaeagnaceae	*Elaeagnus*
10	Brassicaceae	*Brassica*	28	Elaeocarpaceae	*Elaeocarpus*
11	Bromeliaceae	*Ananas*	29	Elatinaceae	*Bergia*
12	Calophyllaceae	*Mesua*	30	Eriocaulaceae	*Eriocaulon*
13	Cannabaceae	*Trema*	31	Hydroleaceae	*Hydrolea*
14	Caricaceae	*Carica*	32	Lecythidaceae	*Careya*
15	Casuarinaceae	*Casuarina*	33	Lentibulariaceae	*Utricularia*
16	Cleomaceae	*Cleome*	34	Malpighiaceae	*Hiptage*
17	Clusiaceae	*Garcinia*	35	Marantaceae	*Stachyphrynium*
18	Colchicaceae	*Gloriosa*	36	Martyniaceae	*Martynia*
37	Moringaceae	*Moringa*	51	Rhizophoraceae	*Carallia*
38	Muntingiaceae	*Muntingia*	52	Rosaceae	*Prunus*
39	Musaceae	*Musa*	53	Santalaceae	*Santalum*
40	Myristicaceae	*Myristica*	54	Smilacaceae	*Smilax*
41	Nelumbonaceae	*Nelumbo*	55	Sphenocleaceae	*Sphenoclea*
42	Nyctaginaceae	*Boerhavia*	56	Symplocaceae	*Symplocos*
43	Nymphaeaceae	*Nymphaea*	57	Tetramelaceae	*Tetrameles*
44	Olacaceae	*Erythropalum*	58	Theaceae	*Polyspora*
45	Onagraceae	*Ludwigia*	59	Typhaceae	*Typha*
46	Pandanaceae	*Pandanus*	60	Ulmaceae	*Holoptelea*
47	Passifloraceae	*Passiflora*	61	Violaceae	*Pigea*
48	Plumbaginaceae	*Plumbago*	62	Xyridaceae	*Xyris*
49	Pontederiaceae	*Pontederia*	63	Zygophyllaceae	*Tribulus*
50	Ranunculaceae	*Clematis*			

Table 20. Monotypic taxa recorded from Walayar range

Sl. No	Binomial name	Family
1	*Anamirta cocculus* (L.) Wight & Arn.	Menispermaceae
2	*Apluda mutica* L.	Poaceae
3	*Basilicum polystachyon* (L.) Moench	Lamiaceae
4	*Chloroxylon swietenia* DC.	Rutaceae
5	*Cipadessa baccifera* Miq.	Meliaceae
6	*Cocos nucifera* L.	Arecaceae
7	*Coldenia procumbens* L.	Boraginaceae
8	*Colebrookea oppositifolia* Sm.	Lamiaceae
9	*Erythropalum scandens* Blume	Olacaceae
10	*Hemidesmus indicus* (L.) R.Br.	Apocynaceae
11	*Hewittia malabarica* (L.) Suresh	Convolvulaceae
12	*Hultholia mimosoides* (Lam.) Gagnon & G.P.Lewis	Fabaceae
13	*Hydrilla verticillata* (L.f.) Royle	Hydrocharitaceae
14	*Lawsonia inermis* L.	Lythraceae
15	*Millingtonia hortensis* L.f.	Bignoniaceae
16	*Muntingia calabura* L.	Muntingiaceae
17	*Naregamia alata* Wight & Arn.	Meliaceae
18	*Naringi crenulata* (Roxb.) Nicolson	Rutaceae
19	*Nerium oleander* L.	Apocynaceae
20	*Neustanthus phaseoloides* Benth.	Fabaceae
21	*Oroxylum indicum* (L.) Benth. ex Kurz	Bignoniaceae
22	*Pedalium murex* L.	Pedaliaceae
23	*Pistia stratiotes* L.	Araceae
24	*Polhillides velutina* (Willd.) H.Ohashi & K.Ohashi	Fabaceae
25	*Polytrias indica* (Houtt.) Veldkamp	Poaceae
26	*Pongamia pinnata* (L.) Pierre, Fl. Forest	Fabaceae
27	*Pycnospora lutescens* Schindl.	Fabaceae
28	*Ricinus communis* L.	Euphorbiaceae
29	*Schleichera oleos*a (Lour.) Oken	Sapindaceae
30	*Spathodea campanulata* P.Beauv.	Bignoniaceae
31	*Tamarindus indica* L.	Fabaceae
32	*Tetrameles nudiflora* R.Br.	Tetramelaceae
33	*Tribulus terrestris* L.	Zygophyllaceae

IV.12. Alien - Invasive flora of Walayar hills

Objectives addressed

- Documentation of biological invasion in Walayar hill ranges
- Floristic analysis of invasive taxa

IV.12.1. Record of alien - invasive taxa

Invasion of alien taxa is considered to be one of the primary reasons for the biological loss. This biological loss due to these invasive taxa is much higher compared to that of the damage caused by habitat fragmentation and destruction. Further, this is considered to be one of the major human created threats which has drastically changed the ecosystems all around the biosphere. Population explosion has further triggered the disturbances in ecosystems and made them prone to alien invasions. The accidental introduction of certain alien plant species such as *Pontederia crassipes* Mart., *Pontederia vaginalis* Burm.f. and *Lantana camara* L. for their beautiful flowers have made an irreplaceable mistake man have ever made. In this context, an attempt is made to document the alien invasive plants that pose a threat to the native plants of Walayar hills.

A total of 93 alien invasive taxa could be recorded from the Walayar hill ranges (ENVIS 2020 and Reddy *et al*., 2008) belonging to 76 genera under 30 families (Annexure XX). Among them, most invasiveness is expressed by members of family Asteraceae with 17 taxa followed by Fabaceae (14 taxa) and Convolvulaceae (9 taxa). Apart from these families, Malvaceae (6 taxa), Poaceae, Amaranthaceae and Solanaceae with 4 taxa each also pose great threat to the forest tracts of the range (Figure 20). The genus *Ipomoea* represents the highest number of invasive species (6 taxa) followed by *Senna* and *Cleome* with 3 taxa each.

It is evident from the analysis that the invasiveness is expressed predominantly by herbs (56 taxa) followed by shrubs (21 taxa), climbers (12 taxa) and trees (4 taxa). The phenological studies revealed that most of these invasive plants flowers without any season specificity. The adaptation of these plants to withstand hot and cooler climate and the effective seed dispersal mechanisms through strong winds and through animals have favored their long distance seed dispersal. Further, their high seed germination efficiency, extensive root systems, short vegetative phase, long flowering and fruiting periods are some other reasons for the fast spreading of such taxa to more and more forest areas.

Among the invasive taxa reported from the hill ranges, 58 taxa are native to tropical America, 11 taxa to Tropical South America, 8 taxa to Tropical Africa, two taxa each to Brazil, Tropical Central America, Tropical North America and West Indies and one species each to Tropical West Asia, Tropical East Africa, Temperate South America, South West Asia, Mexico, Mediterranean and Europe (Table 21 and figure 21). From these observations, it is evident that the majority of the taxa have American nativity.

It is found that 55 taxa are found to have invasive nature according to The Kerala State Biodiversity Board (KSBB) assessment on invasive taxa (Table 22). According to this, Fabaceae represents the most invasive family with 13 species followed by Asteraceae with 8 species and Amaranthaceae, Convolvulaceae and Euphorbiaceae with 5 species each.

It is also found that 9 taxa are considered as the 100's World's Worst Invasive Alien Species published by The Invasive Species Specialist Group (Lowe *et al.*, 2004; ISSG, 2004) which include *Spathodea campanulata* P.Beauv., *Opuntia dillenii* Haw., *Arundo donax* L., *Hiptage benghalensis* (L.) Kurz, *Lantana camara* L., *Leucaena leucocephala* (Lam.) de Wit, *Mikania micrantha* Kunth, *Chromolaena odorata* (L.) R.M.King & H.Rob. and *Sphagneticola trilobata* (L.) Pruski. But, many of these species do not show invasive nature in the study area at present.

Table 21. Nativity of invasive taxa in Walayar hill ranges

Sl. No	Native Range	No. of taxa
1	Tropical America	58
2	Tropical South America	11
3	Tropical Africa	8
4	Tropical Central America	2
5	Tropical North America	2
6	West Indies	2
7	Brazil	2
8	Australian	1
9	Temperate South America	1
10	Tropical West Asia	1
11	Tropical East Africa	1
12	Europe	1
13	Mediterranean	1
14	Mexico	1
15	South West Asia	1

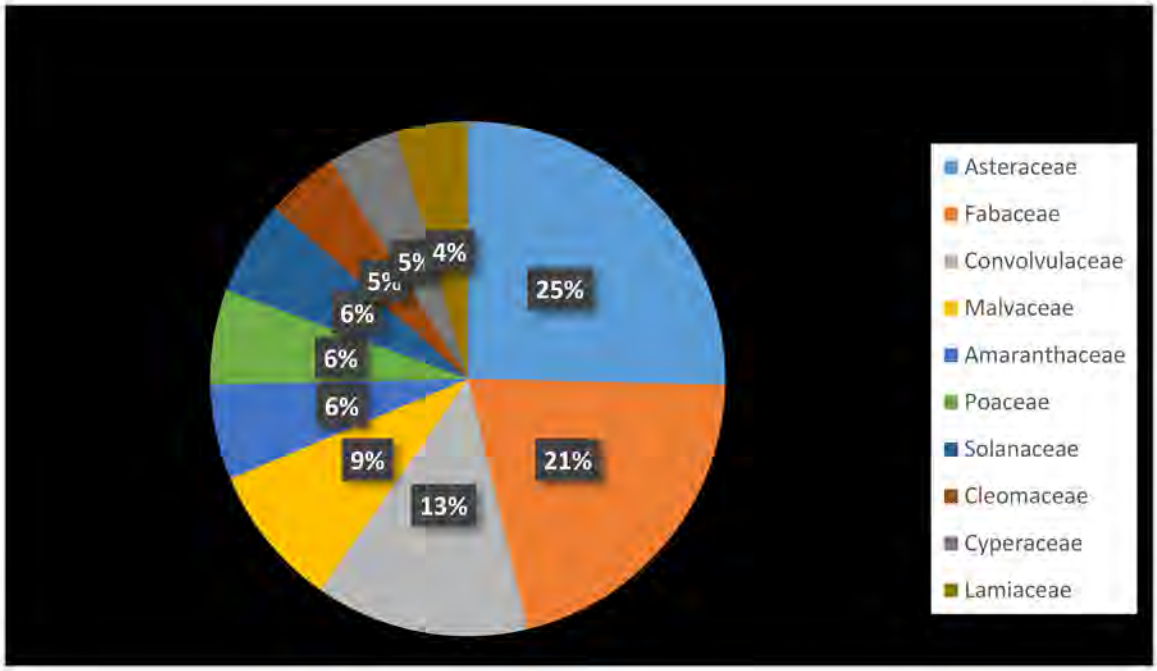

Figure 20. Distribution of invasive taxa among families

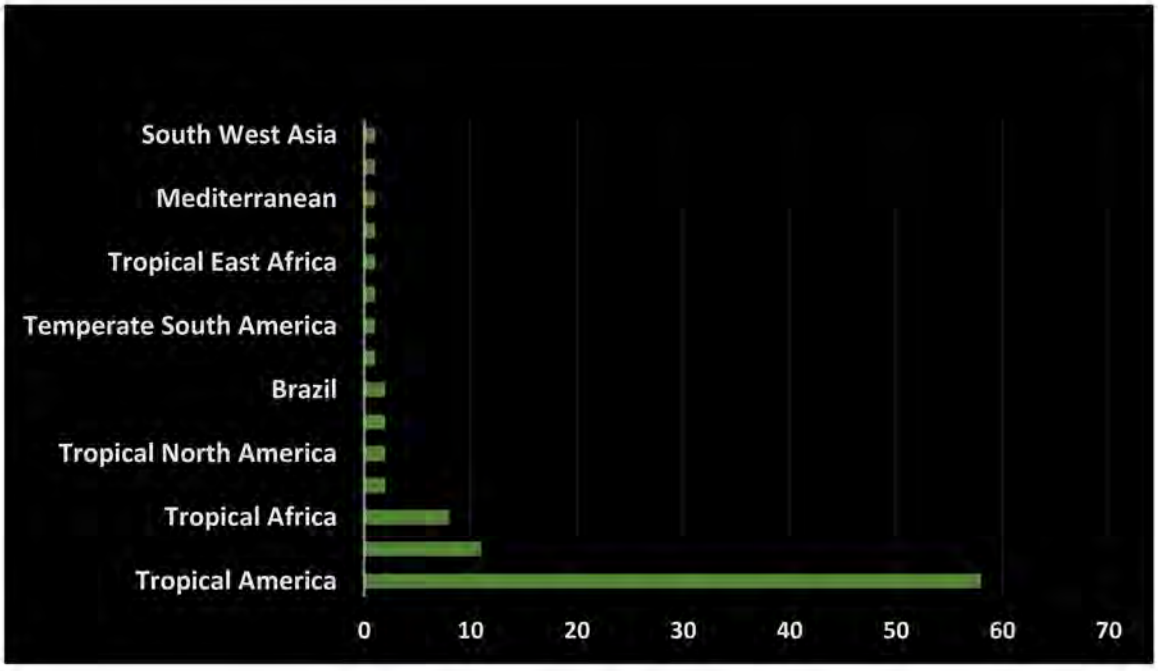

Figure 21. Nativity of invasive taxa in Walayar hills

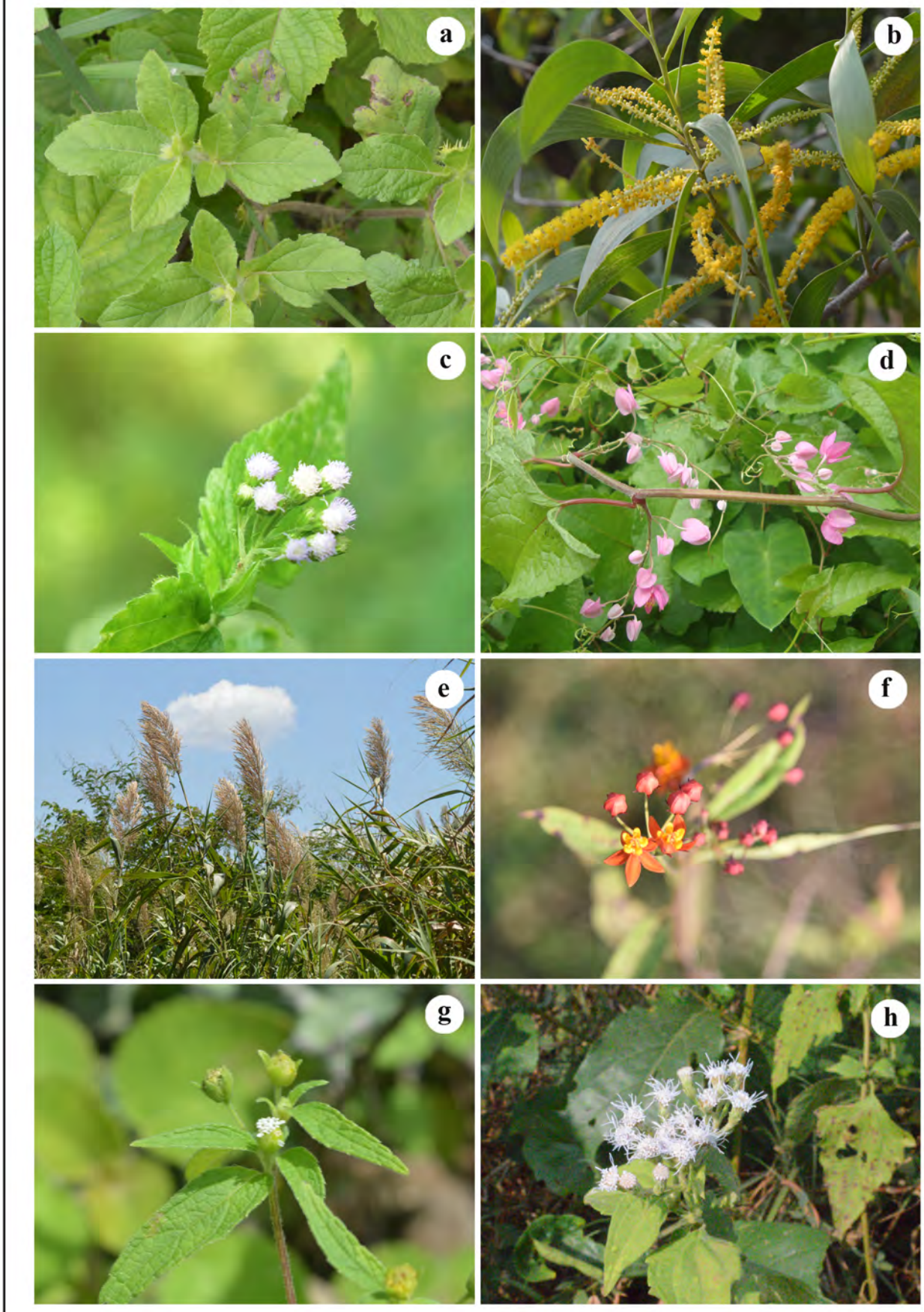

Plate 140: Incidence of invasive taxa Fig. a. *Acanthospermum hispidum* DC. **b.** *Acacia auriculiformis* A.Cunn. ex Benth. **c.** *Ageratum conyzoides* L. **d.** *Antigonon leptopus* Hook. & Arn. **e.** *Arundo donax* L. **f.** *Asclepias curassavica* L. **g.** *Blainvillea acmella* (L.) Philipson **h.** *Chromolaena odorata* (L.) R.M.King & H.Rob.

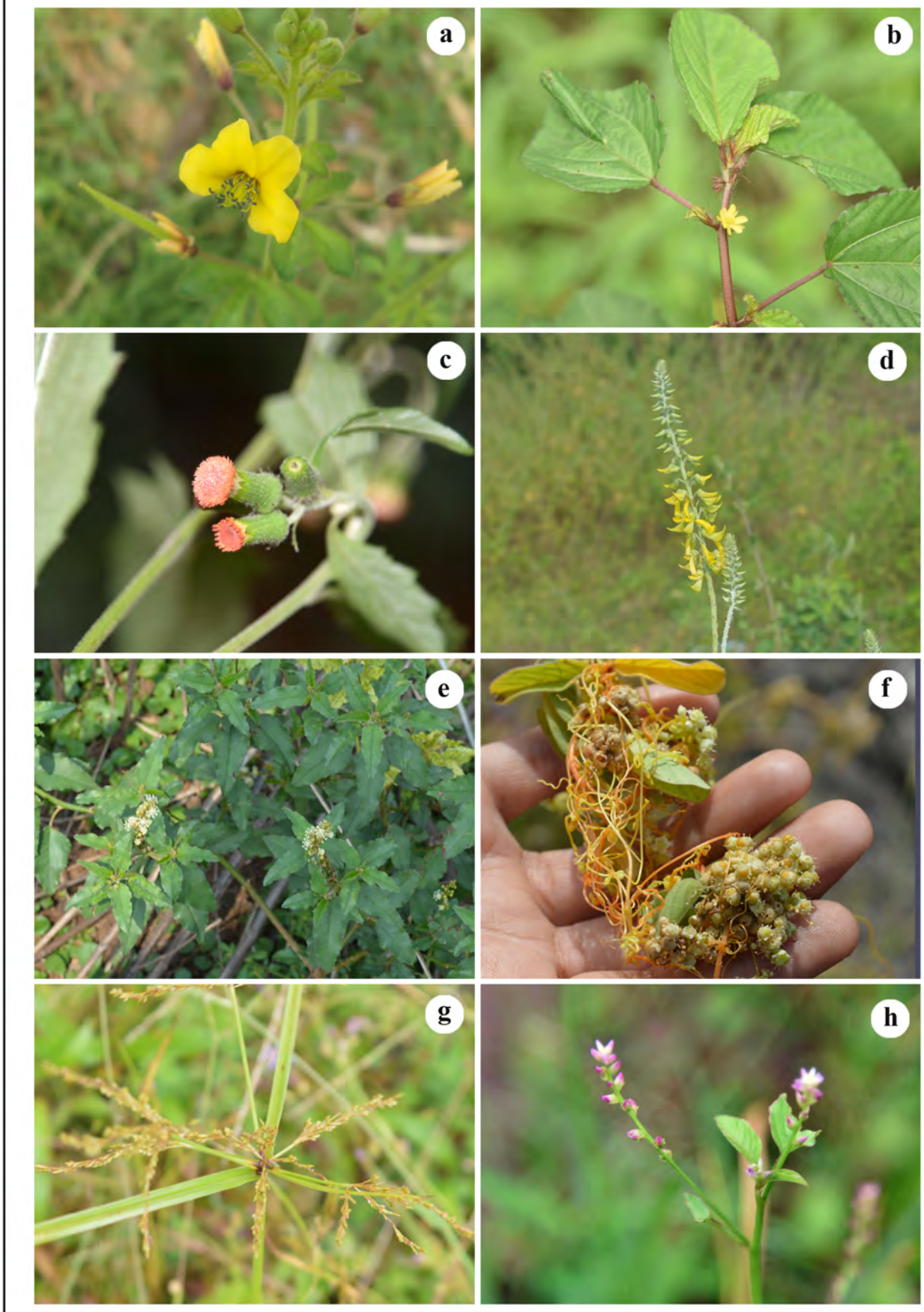

Plate 141: Incidence of invasive taxa Fig. a. *Cleome viscosa* L. **b.** *Corchorus aestuans* L. **c.** *Crassocephalum crepidioides* S.Moore **d.** *Crotalaria pallida* Aiton **e.** *Croton bonplandianus* Baill. **f.** *Cuscuta chinensis* Lam. **g.** *Cyperus iria* L. **h.** *Digera muricata* Mart.

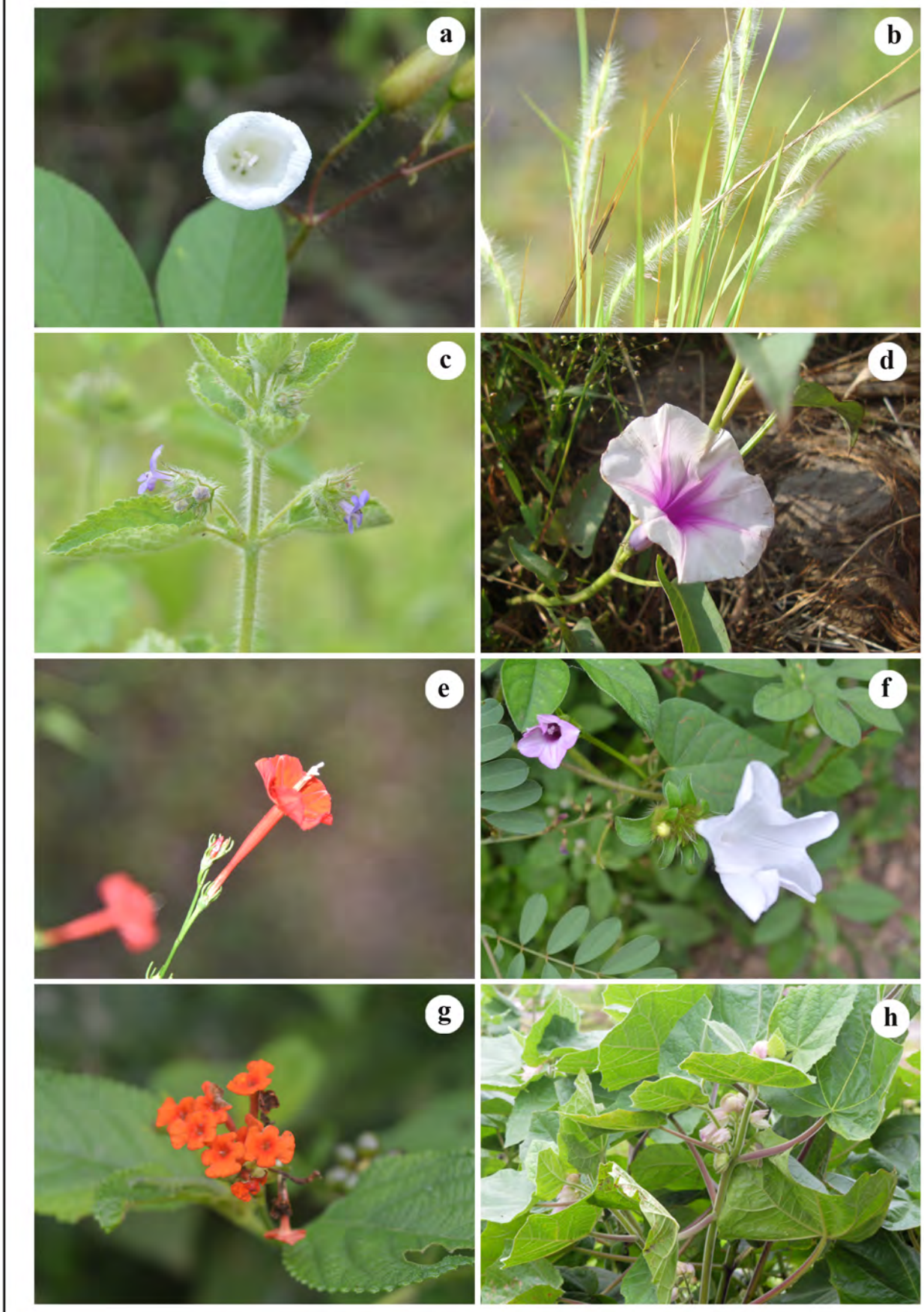

Plate 142: Incidence of invasive taxa Fig. a. *Distimake aegyptius* (L.) A.R.Simões & Staples **b.** *Heteropogon contortus* (L.) P.Beauv. ex Roem. & Schult. **c.** *Mesosphaerum suaveolens* (L.) Kuntze **d.** *Ipomoea carnea* subsp. *fistulosa* (Mart. ex Choisy) D.F.Austin **e.** *Ipomoea hederifolia* L. **f.** *Ipomoea pes-tigridis* L. **g.** *Lantana camara* L. **h.** *Martynia annua* L.

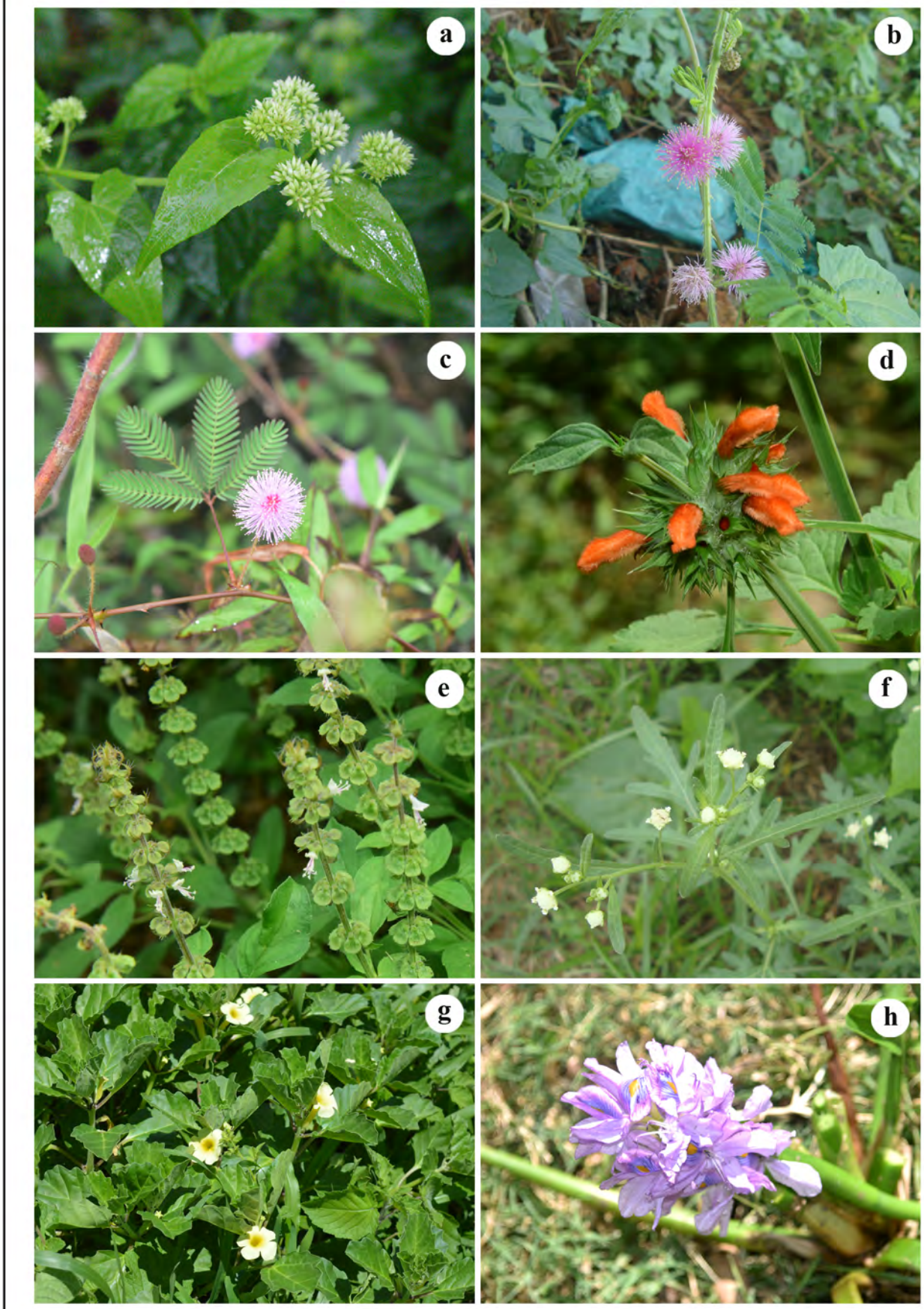

Plate 143: Incidence of invasive taxa Fig. a. *Mikania micrantha* Kunth **b.** *Mimosa diplotricha* C.Wright **c.** *Mimosa pudica* L. **d.** *Leonotis nepetifolia* (L.) R.Br. **e.** *Ocimum americanum* L. **f.** *Parthenium hysterophorus* L. **g.** *Pedalium murex* L. **h.** *Pontederia crassipes* Mart.

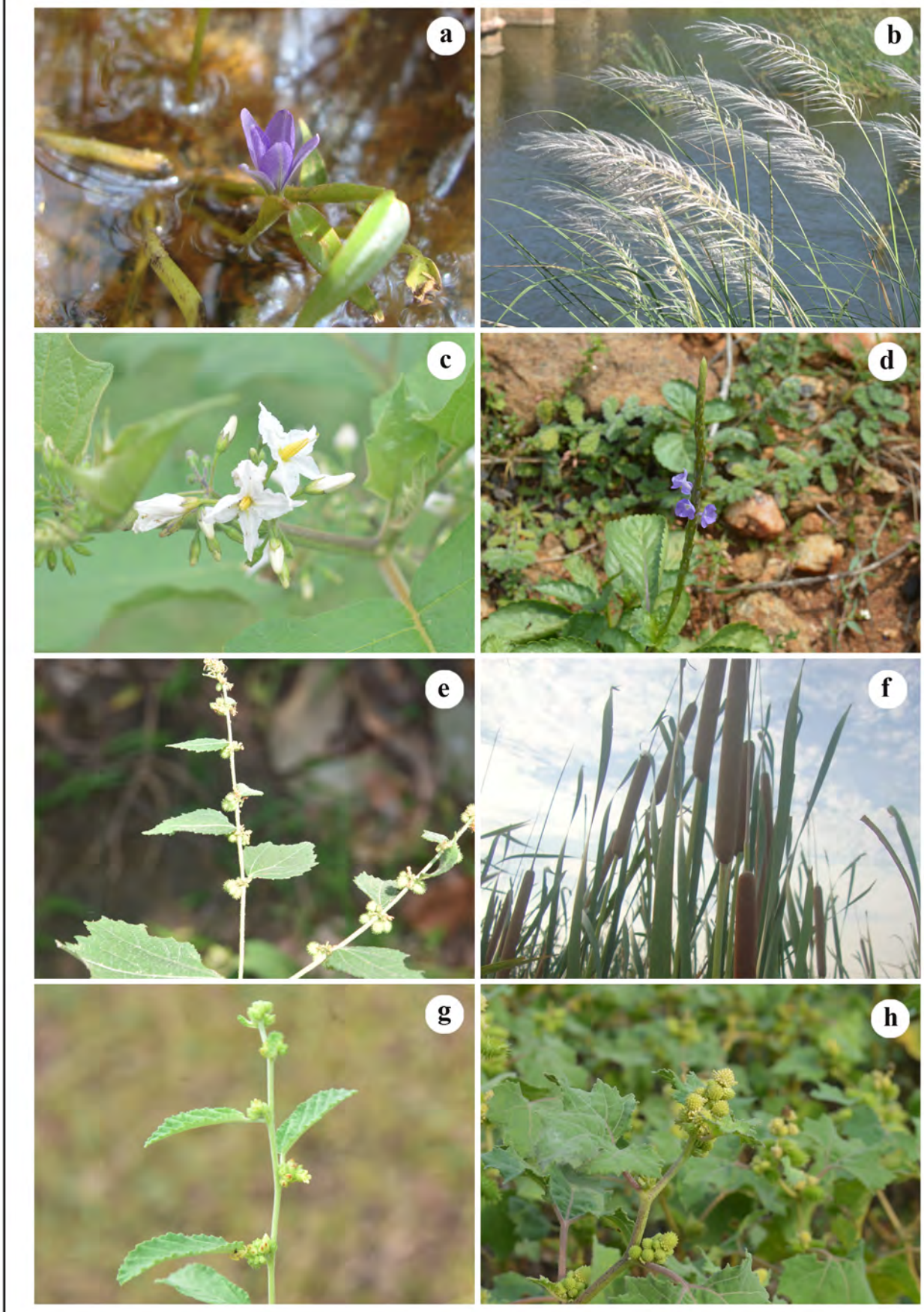

Plate 144: Incidence of invasive taxa Fig. a. *Pontederia vaginalis* Burm.f. **b.** *Saccharum spontaneum* L. **c.** *Solanum torvum* Sw. **d.** *Stachytarpheta jamaicensis* (L.) Vahl **e.** *Triumfetta rhomboidea* Jacq. **f.** *Typha angustifolia* L. **g.** *Waltheria indica* L. **h.** *Xanthium strumarium* L.

Table 22. Invasive taxa in Kerala according to KSBB

Sl. No	Binomial name	Family
1	*Acacia auriculiformis* A.Cunn. ex Benth.	Fabaceae
2	*Ageratum conyzoides* L.	Asteraceae
3	*Alternanthera bettzickiana* (Regel) G.Nicholson	Amaranthaceae
4	*Alternanthera brasiliana* (L.) Kuntze	Amaranthaceae
5	*Alternanthera philoxeroides* (Mart.) Griseb.	Amaranthaceae
6	*Amaranthus spinosus L.*	Amaranthaceae
7	*Antigonon leptopus* Hook. & Arn.	Polygonaceae
8	*Arundo donax* L.	Poaceae
9	*Asclepias curassavica* L.	Apocynaceae
10	*Calopogonium mucunoides* Desv.	Fabaceae
11	*Cascabela thevetia* (L.) Lippold	Apocynaceae
12	*Catharanthus roseus* (L.) G.Don	Apocynaceae
13	*Cenchrus pedicellatus* (Trin.) Morrone	Poaceae
14	*Cenchrus setosus* Sw.	Poaceae
15	*Centrosema molle* Mart. ex Benth.	Fabaceae
16	*Chromolaena odorat*a (L.) R.M.King & H.Rob.	Asteraceae
17	*Combretum indicum* (L.) DeFilipps	Combretaceae
18	*Croton bonplandianus* Baill.	Euphorbiaceae
19	*Croton hirtus* L'Hér.	Euphorbiaceae
20	*Datura stramonium* L.	Solanaceae
21	*Duranta erecta* L.	Verbenaceae
22	*Entada phaseoloides* Merr.	Fabaceae
23	*Euphorbia heterophylla* L.	Euphorbiaceae
24	*Gomphrena celosioides* Mart.	Amaranthaceae
25	*Ipomoea aquatica* Forssk.	Convolvulaceae
26	*Ipomoea cairica* (L.) Sweet	Convolvulaceae
27	*Ipomoea carnea* subsp. *fistulosa* (Mart. ex Choisy) D.F.Austin	Convolvulaceae
28	*Ipomoea hederifolia* L.	Convolvulaceae
29	*Ipomoea purpurea* (L.) Roth	Convolvulaceae
30	*Jatropha gossypifolia* L.	Euphorbiaceae
31	*Lantana camara* L.	Verbenaceae
32	*Leonotis nepetifolia* (L.) R.Br.	Lamiaceae
33	*Leucaena leucocephala* (Lam.) de Wit	Fabaceae
34	*Ludwigia peruviana* (L.) H.Hara	Onagraceae
35	*Mesosphaerum suaveolens* (L.) Kuntze	Lamiaceae
36	*Mikania micrantha* Kunth	Asteraceae
37	*Mimosa diplotricha* C.Wright	Fabaceae
38	*Mimosa pudica* L.	Fabaceae
39	*Mucuna bracteata* DC. ex Kurz	Fabaceae
40	*Muntingia calabura* L.	Muntingiaceae

41	*Parthenium hysterophorus* L.	Asteraceae
42	*Passiflora foetida* L.	Passifloraceae
43	*Physalis angulata* L.	Solanaceae
44	*Prosopis juliflora* (Sw.) DC.	Fabaceae
45	*Ricinus communis* L.	Euphorbiaceae
46	*Senna hirsuta* (L.) H.S.Irwin & Barneby	Fabaceae
47	*Senna occidentalis* (L.) Link	Fabaceae
48	*Senna tora* Roxb.	Fabaceae
49	*Sesamum radiatum* Thonn. ex Hornem.	Pedaliaceae
50	*Sesbania bispinosa* (Jacq.) W.Wight	Fabaceae
51	*Sphagneticola trilobata* (L.) Pruski	Asteraceae
52	*Swertia corymbosa* (Griseb.) Wight ex C.B.Clarke	Gentianaceae
53	*Synedrella nodiflora* Gaertn.	Asteraceae
54	*Tithonia diversifolia* (Hemsl.) A.Gray	Asteraceae
55	*Tridax procumbens* L.	Asteraceae

Mostly, alien - invasive taxa are dealt with negative impacts, but, some alien species are found to be useful to local people. Some of the examples include *Borassus flabellifer* L., which is an economically useful tree member. The mature leaf is used for thatching roof, mature fruits are used as edible ones, the cut flower is yielding sugar and toddy. *Leucaena leucocephala* (Lam.) de Wit is used commonly as a biofencing tree, a common firewood, fodder crop and green manure and controls soil erosion. *Mimosa pudica* L., *Calotropis gigantea* (L.) W.T.Aiton, *Catharanthus pusillus* G.Don, *Datura metel* L, *Eclipta prostrata* (L.) L., *Evolvulus nummularius* (L.) L., *Scoparia dulcis* L, *Tribulus terrestris* L. etc are used as traditional medicine from ancient times. *Peperomia pellucida* (L.) Kunth, *Portulaca oleracea* L. and *Senna tora* Roxb. are used as a nutritious leafy vegetable. So, the study suggests that even though there are many alien - invasive taxa reported, many taxa are found to have several benefits to mankind and a thorough ecological study has to be conducted to see the degree of negative impacts caused by these individual alien species in an ecosystem. Hence location based assessments on alien - invasive taxa is necessary to rate one taxon as invasive in a specific ecosystem.

IV.13. Ethnobotanical knowledge base of the tribal inhabitants of Walayar forest Range

Objectives addressed

- Enquiry on ethnobotanical knowledgebase of tribal inhabitants of Walayar range
- Survey on the non-wood forest materials collected by the ethnic groups of the range

IV.13.1. Ethnic inhabitants of Walayar Forest Range

The tribal inhabitants of Walayar forest belong to 3 major groups *viz*. Irulars, Mudugars and Paniyars. Of these, Irulars form the largest tribal group followed by Paniyars and a few families representing Mudugars. Irulars are traditionally honey collectors and hunters and Mudugars are proficient in the collection and trading of non - wood forest products such as honey, spices, herbs, medicines and other wild edible foods. They used to be the traditional experts in curing various diseases and often are involved in snake bite treatments. Paniyars are traditionally involved in agricultural practices and are hunters. Of late, traditional medical practices of these tribal communities are getting replaced with modern medical treatments at hospitals. Further, at present, most of the tribal people are either daily labourers at various farms and other agricultural lands. They are also involved in rearing livestock such as hen, duck, goat, buffalo, cow and sheep. Some are even involved in fish farming in the dam. Some tribal people find their daily livelihood by catching fishes from forest rivulets and rivers and selling them to the public. Some people work for the forest department as forest guards and watchers. Education to the new generation has created tremendous changes in the tribal group and many of the younger generation got employed in govt. and other private sector firms.

IV.13.2. Tribal Settlements in Walayar Forest Range

Survey for tribal settlements in the range could locate 22 tribal colonies under Akamalavaram, Kottekkad, Pudussery North and Walayar sections. Eleven colonies are present in Akamalavaram section followed by six and four colonies in Kottekkad and Pudussery North sections. The Walayar section represents only a single tribal group. viz; Varalippadi. The tribal families in the Parapetty tribal colony were retrieved from there since this colony was located in deep interior forests is one of the most important and is the most affected areas with wild animal attacks.

IV.13.2.1. Ethnobotanical knowledge base

The documentation on taxa with ethnobotanical relevance among the tribal community of the range revealed that, a total of 124 angiosperm taxa belonging to 110 genera under 56 families were found to be used by them for various purposes (Plate 145 - 147). Fabaceae are the most represented family among them with 13 species, followed by Apocynaceae (10 species), and Acanthaceae, Cucurbitaceae, Euphorbiaceae and Malvaceae (5 species each). The survey showed the dependence of the tribal population on all available plants (Herbs - 35, Trees - 37, Shrubs - 28 and Climbers - 24) for various products. These ethnic group collects wild honey and use it as a common solvent for the plant extracts to be ingested as medicine. As the range dominates with moist deciduous and drier elements, the continuous supply of the commodities throughout the year is a challenge and they need additional livelihood support for the rest of the year. The list of ethnobotanically significant taxa recorded along with their local names and their utility is given in Annexure XXI.

Out of the collected taxa, 65 species were found to be used for different ailments. The flower buds of *Acampe praemorsa* (Roxb.) Blatt. & McCann is used for ear pain, latex and seeds of *Alstonia scholaris* (L.) R.Br. is used to treat skin diseases and used in other ayurvedic medicines, stem of *Aristolochia indica* L. to treat snake bite, milky latex of *Calotropis gigantea* (L.) R. Br. in Ait.f. to treat skin diseases and eye problems, stem juice of *Cissus quadrangularis* L. to treat cattle diseases, *Curculigo orchioides* Gaertn for jaundice and cough, leaf and roots of *Cyclea peltata* (Lam.) Hook. f. & Thoms. for blood purification and as brain enhancer, leaves of *Gymnema sylvestre* (Retz.) R.Br. ex Sm. for Diabetes, snake bite and malaria, leaves of *Strobilanthes ciliatus* Nees of fever, cough, bronchitis and as anti inflammatory medicine to reduce pain. The plant parts such as whole plant, bark of trees, seeds or nuts, fruits, spikes, root, leaves, rhizome, tuber etc. of other species are used to treat other disorders like rheumatism, body pain, wound healing, fever, other skin ailments etc.

Apart from medical ailments, 39 species are found to be commonly used by them as food. Fruits of *Abelmoschus moschatus* Medik., *Anacardium occidentale* L., *Borassus flabellifer* L., *Dioscorea* alata L., *Dioscorea oppositifolia* L., *Manilkara zapota* (L.) P.Royen, *Momordica charantia* L., *Solanum torvum* Sw., *Trichosanthes cucumerina* L. etc, leaves of *Trianthema portulacastrum* L., *Senna tora* (L.) Roxb., *Colocasia esculenta* (L.) Schott in Schott & Endl., *Boerhavia diffusa* L., *Amaranthus hybridus* L. etc and rhizome of *Colocasia esculenta* (L.) Schott in Schott & Endl., *Amorphophallus paeoniifolius* (Dennst.)

Plate 145: Fig. a – e. Tribal settlements in Walayar forest range Fig. **f.** Along with tribal people during their ethnobotanical collections

Nicolson, *Curcuma aromatica* Salisb., *Curcuma longa* L. and *Zingiber officinale* Rosc. are found to be used as edible foods.

It was also found that 16 taxa were found to be used in beautification of skin (cosmetics) and hair care which includes *Eclipta prostrata* (L.) L., *Helicteres isora* L., *Mussaenda frondosa* L., *Bergera koenigii* L., *Ricinus communis* L., *Sida acuta* Burm. f. etc. Apart from this, 21 taxa were used for miscellaneous purposes such as basket making, house construction, bathing, as insect repellents, ornament making etc. Some of the examples include *Ailanthus excelsus* Roxb., *Dalbergia latifolia* Roxb., *Pterocarpus marsupium* Roxb., *Simarouba glauca* DC., *Tectona grandis* L. f. and *Tamarindus indica* L. used widely in furniture making, *Phoenix loureiroi* Kunth for broom making, *Luffa aegyptiaca* Mill. is used as a bathing brush, *Manihot carthagenensis* subsp. *glaziovii* (Müll.Arg.) Allem and *Gliricidia sepium* (Jacq.) Kunth ex Walp. are found to to be commonly used as biofencing plants, *Bambusa bambos* (L.) Voss in Vilmorin and *Calamus rotang* L. are found to be used in basket making and *Coix lacryma-jobi* L. is used to make ornaments.

Piper nigrum L., *Curcuma longa* L., *Cinnamomum malabatrum* (Burm.f.) J.Presl and *Zingiber officinale* Rosc. are used by the tribal group as spices in preparation of traditional food. *Azadirachta indica* A.Juss. and *Alstonia scholaris* (L.) R.Br. are found to be considered as sacred trees, the residential place of God, is a site of purity and is believed to have the power of destroying evil spirits. Therefore, these plants are protected and found commonly in tribal temples in the forest range.

Among the 124 taxa documented, 13 taxa were found to be endemic and 60 taxa are found to have a phytogeographical affinity towards the Indo-Pacific realm only. This is an indication that the traditional use of plants by the tribal community is primarily targeted on those plants which have restricted local distribution (endemic species) and are native with Indo – Pacific affinity. The rest of the plants is found to be have another phytogeographical affinity, but naturalized in the wild by decades. *Borassus flabellifer* L., *Annona squamosa* L., *Capsicum frutescens* L., *Bambusa bambos* (L.) Voss., *Senna tora* (L.) Roxb., *Tamarindus indica* L. etc are found to be alien taxa but is used by tribal groups for many generations.

Cleistanthus collinus (Roxb.) Benth. ex Hook.f., *Dalbergia latifolia* Roxb., *Hydnocarpus pentandrus* (Buch.-Ham.) Oken and *Strobilanthes ciliatus* Nees are the vulnerable taxa and *Pterocarpus marsupium* Roxb. (Near Threatened) and *Tectona grandis* L. f. (Endangered) are used by the ethnic group in the study area.

IV.13.3. Non-Wood Forest Products

The tribal community of Walayar hills utilize about 49 taxa for their daily livelihood. The forests yield various NWFP (Non- wood Forest Products) and table 23 summarizes the taxa from which the tribes collect plant parts for various purposes.

Table 23. Non-Wood Forest Products from Walayar hills

Sl. No	Botanical Name	Family	Local Name
1	*Alstonia scholaris* (L.) R.Br.	Apocynaceae	Ezhilamppala, Yekshippala
2	*Anamirta cocculus* (L.) Wight & Arn.	Menispermaceae	Pollakai
3	*Aristolochia indica* L.	Aristolochiaceae	Garudakodi
4	*Asparagus gonoclados* Baker	Asparagaceae	Sathavari
5	*Baccaurea courtallensis* (Wight) Müll.Arg.	Phyllanthaceae	Mootilpazham
6	*Canarium strictu*m Roxb.	Burseraceae	Kunthirikkam, Kungiliyium
7	*Capsicum frutescens* L.	Solanaceae	Kantharimulaku
8	*Cinnamomum malabatrum* (Burm.f.) J.Presl	Lauraceae	Patta
9	*Curculigo orchioides* Gaertn	Hypoxidaceae	Nelpana, Nilappana
10	*Curcuma aromatica* Salisb.	Zingiberaceae	Kasthurimanjal, Kattumanjal
11	*Curcuma longa* L.	Zingiberaceae	Manjal
12	*Cyclea peltata* (Lam.) Hook. f. & Thoms.	Menispermaceae	Padakizhangu, Padathali, Padavalli
13	*Cynanchum annularium* (Roxb.) Liede & Khanum	Apocynaceae	Thinnampala
14	*Dioscorea alata* L.	Dioscoreaceae	Kaachil
15	*Dioscorea oppositifolia* L.	Dioscoreaceae	Kaachil
16	*Eclipta prostrata* (L.) L.	Asteraceae	Kanjunni
17	*Embelia tsjeriam-cottam* (Roem. & Schult.) A.DC.	Primulaceae	Ammimuriyan
18	*Emilia sonchifolia* (L.) DC.	Asteraceae	Muyalcheviyan
19	*Gymnema sylvestre* (Retz.) R.Br. ex Sm.	Apocynaceae	Chakkarakolli
20	*Helicteres isora* L.	Malvaceae	Edampiri-Valampiri
21	*Hemidesmus indicus* (L.) R. Br. in Ait.f.,	Apocynaceae	Nannari, Narunandi, Naruneendi
22	*Hydnocarpus pentandrus* (Buch.-Ham.) Oken	Achariaceae	Marotti
23	*Ichnocarpus frutescens* (L.) R. Br. in Ait.f.	Apocynaceae	Palvalli
24	*Justicia adhatoda* L.	Acanthaceae	Aadalodakam
25	*Justicia gendarussa* Burm. f.	Acanthaceae	Vathakodi, Vathamkolli
26	*Momordica charantia* L.	Cucurbitaceae	Kaipa

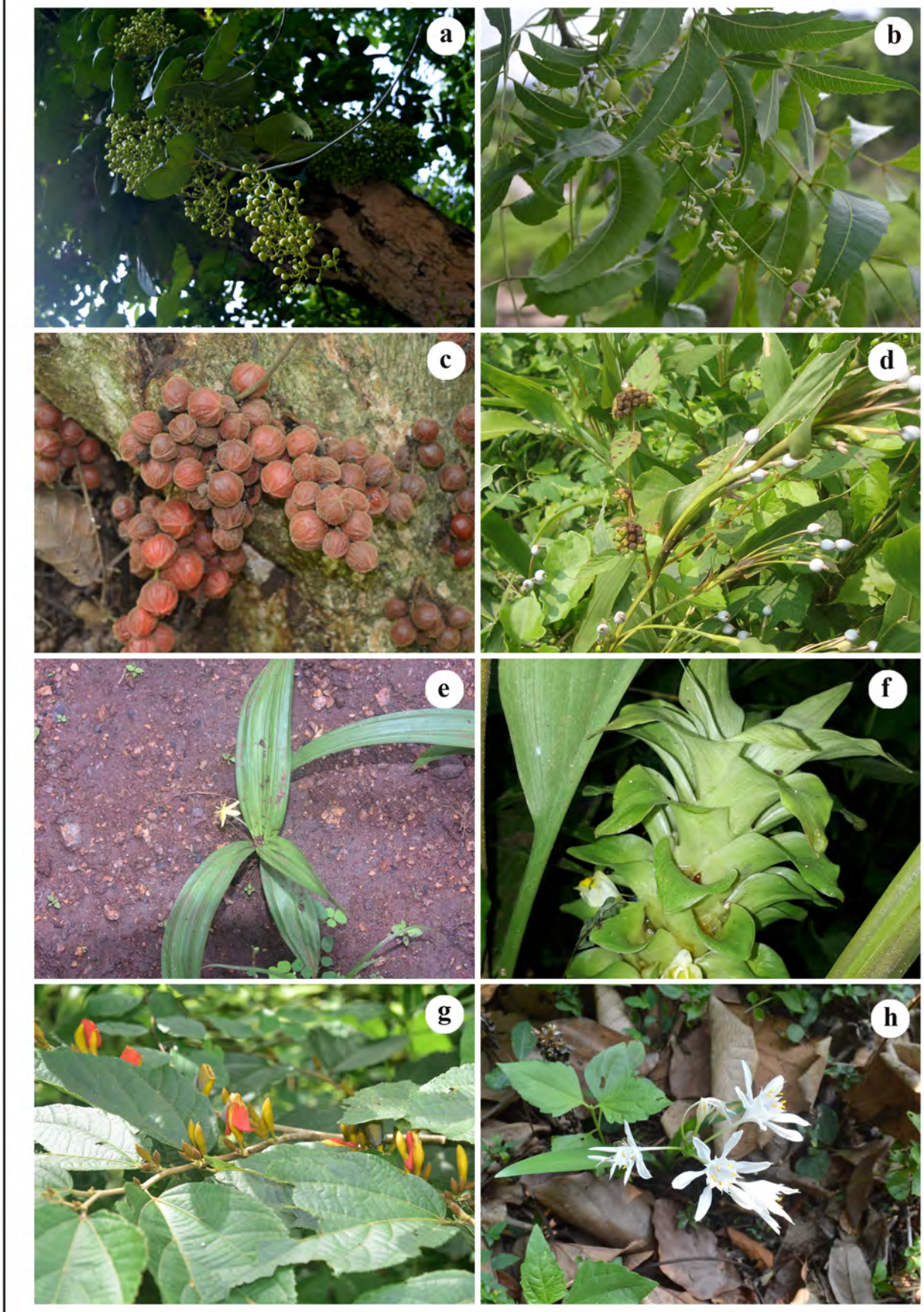

Plate 146: Taxa with ethnobotanical significance Fig. a. *Anamirta cocculus* (L.) Wight & Arn. **b.** *Azadirachta indica* A.Juss. **c.** *Baccaurea courtallensis* (Wight) Müll.Arg. **d.** *Coix lacryma-jobi* L. **e.** *Curculigo orchioides* Gaertn. **f.** *Curcuma longa* L. **g.** *Helicteres isora* L. **h.** *Pancratium triflorum* Roxb.

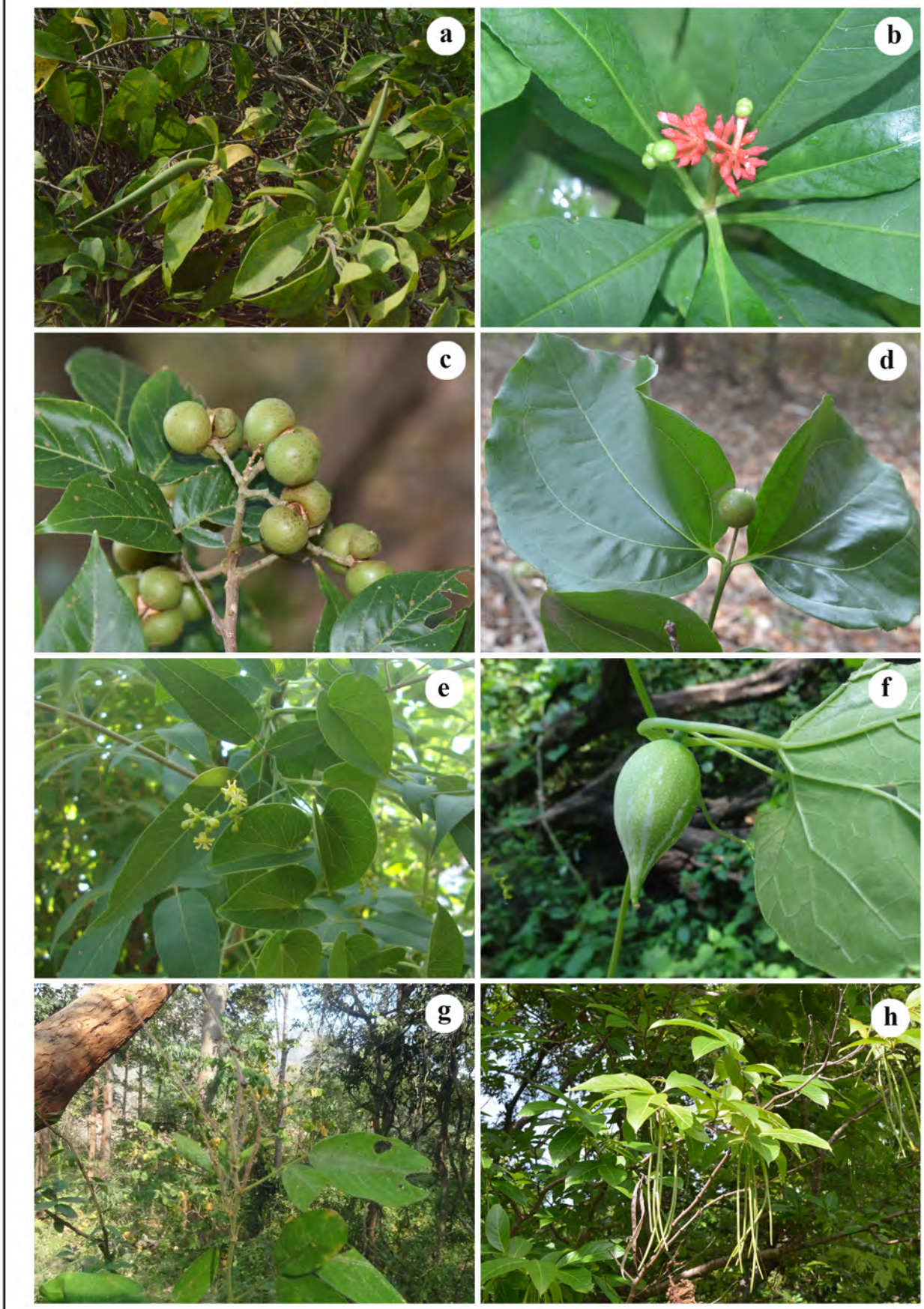

Plate 147: Taxa with ethnobotanical significance Fig. a. *Gymnema sylvestre* (Retz.) R.Br. ex Sm. **b.** *Rauvolfia serpentina* Benth. ex Kurz **c.** *Sapindus trifoliatus* L. **d.** *Strychnos nux-vomica* L. **e.** *Tinospora cordifolia* (Willd.) Miers ex Hook.f. & Thomson **f.** *Trichosanthes cucumerina* L. **g.** *Uraria rufescens* Schindl. **h.** *Wrightia tinctoria* R.Br.

27	*Momordica sahyadrica* Kattuk. & V.T.Antony	Cucurbitaceae	Kattuppavel
28	*Mussaenda frondosa* L.	Rubiaceae	Vellila thali
29	*Nervilia concolor* Schltr.	Orchidaceae	Nilathamara, Orilathamara
30	*Ouret lanata* (L.) Kuntze	Amaranthaceae	Cherula, Pongalpoovu
31	*Phyllanthus emblica* L.	Phyllanthaceae	Nelli
32	*Phyllanthus urinaria* L.	Phyllanthaceae	Chuvannakizhanelli
33	*Piper longum* L.	Piperaceae	Pippali, Thippali
34	*Pleurolobus gangeticus* (L.) J.St.-Hil. ex H.Ohashi & K.Ohashi	Fabaceae	Orila
35	*Plumbago zeylanica* L.	Plumbaginaceae	Vellakoduveli
36	*Pseudarthria viscida* (L.) Wight & Arn.	Fabaceae	Moovila
37	*Rauvolfia serpentina* (L.) Benth. ex Kurz	Apocynaceae	Amalpori, Sarpagandhi
38	*Ricinus communis* L.	Euphorbiaceae	Aavannakku
39	*Sapindus trifoliatus* L.	Sapindaceae	Soapinkaimaram, Uravanjikkaya
40	*Senegalia catechu* (L.f.) P.J.H.Hurter & Mabb.	Fabaceae	Karingali
41	*Senegalia rugata* Britton & Rose	Fabaceae	Cheenikka, Cheevikka
42	*Sida acuta* Burm. f.	Malvaceae	Malamkurunthotti
43	*Sida rhombifolia* L.	Malvaceae	Kurumthotti
44	*Strobilanthes ciliatus* Nees	Acanthaceae	Karimkurinji
45	*Tinospora cordifolia* (Willd.) Miers.	Menispermaceae	Chitamruthu
46	*Uraria rufescens* Schindl.	Fabaceae	Moovila
47	*Vitex trifolia* L.	Verbenaceae	Nochi, Vellanochi
48	*Wrightia tinctoria* (Roxb.) R. Br.	Apocynaceae	Dhanthappala, Thinnamppala
49	*Zingiber officinale* Rosc.	Zingiberaceae	Inchi

These taxa were found to be collected in large quantities and are sold in Malampuzha Pattika Varga Sevana Sahakarana Sangham as well as in markets. Some of the important plant species collected include the root of Orila (*Pleurolobus gangeticus* (L.) J.St.-Hil. ex H.Ohashi & K.Ohashi), root of Moovila (*Pseudarthria viscida* (L.) Wight & Arn.), root of Kurumthotti (*Sida rhombifolia* L.), plant exudate of *Canarium strictum* Roxb., fruits of Maroti (*Hydnocarpus pentandrus* (Buch.-Ham.) Oken), Uringikaya (*Sapindus trifoliatus* L.),Tippali (*Piper longum* L.), Cheenika (*Senegalia rugata* Britton & Rose), Thanika (*Terminalia bellirica* (Gaertn.) Roxb.), tubers of Adapathiyan (*Cynanchum*

annularium (Roxb.) Liede & Khanum), Amalpori (*Rauvolfia serpentina* (L.) Benth. ex Kurz) Nannari (*Hemidesmus indicus* (L.) R. Br. in Ait.f.) and Nellikka (*Phyllanthus emblica* L.) are collected in large quantities by the ethnic groups here. Apart from the plant species, they also collect large quantities of honey and bee - wax in specific seasons and are also marketed.

IV.14. Geo - Spatial characterization and vegetation mapping in Walayar forests

Objectives addressed

- Preparation of study area map of Walayar hill ranges
- Land Use Land Cover (LULC) classification of Walayar forests and vegetation profile
- Analysis of vegetation cover and change within two decades
- Normalized Difference Vegetation Index (NDVI) analysis
- Analysis of Forest cover across altitudinal gradients
- Mapping of IUCN Redlisted taxa in Walayar hill ranges
- Mapping of flood and landslide affected areas in Walayar hill ranges

IV.14.1. Location map and study area map of Walayar range forests

The study area Walayar forest range lies at the north western side of Palghat Gap and is included in Palakkad forest division. The range shares its boundaries between Olavakkode range under Palakkad division and Kollengode under Nemmara forest division. Most of the area of the range is within the Palghat Gap and it extends upto Dhoni Hills at the North and Kollengode range forests in the south. This entire study area lies between 10°45' - 10°55'N latitude and 76°37' - 76°49'E longitudes and various maps were prepared using Q - GIS software

IV.14.2. Land Use Land Cover (LULC) map of Walayar range Forests

LULC classification of the range was performed for two different decades viz., 2000 and 2020. The general picture of changes in the land use as well as the land cover between these two decades could be elucidated from this analysis. Eleven land cover classes were obtained such as Evergreen forests, Deciduous forests, Grasslands, Plantations, croplands, Water bodies, barren lands, settlements, rocky outcrops, mixed crop and quarries/ mines. The LU/LC maps are given in Figure 22 and 23 and the details are given in Table 24.

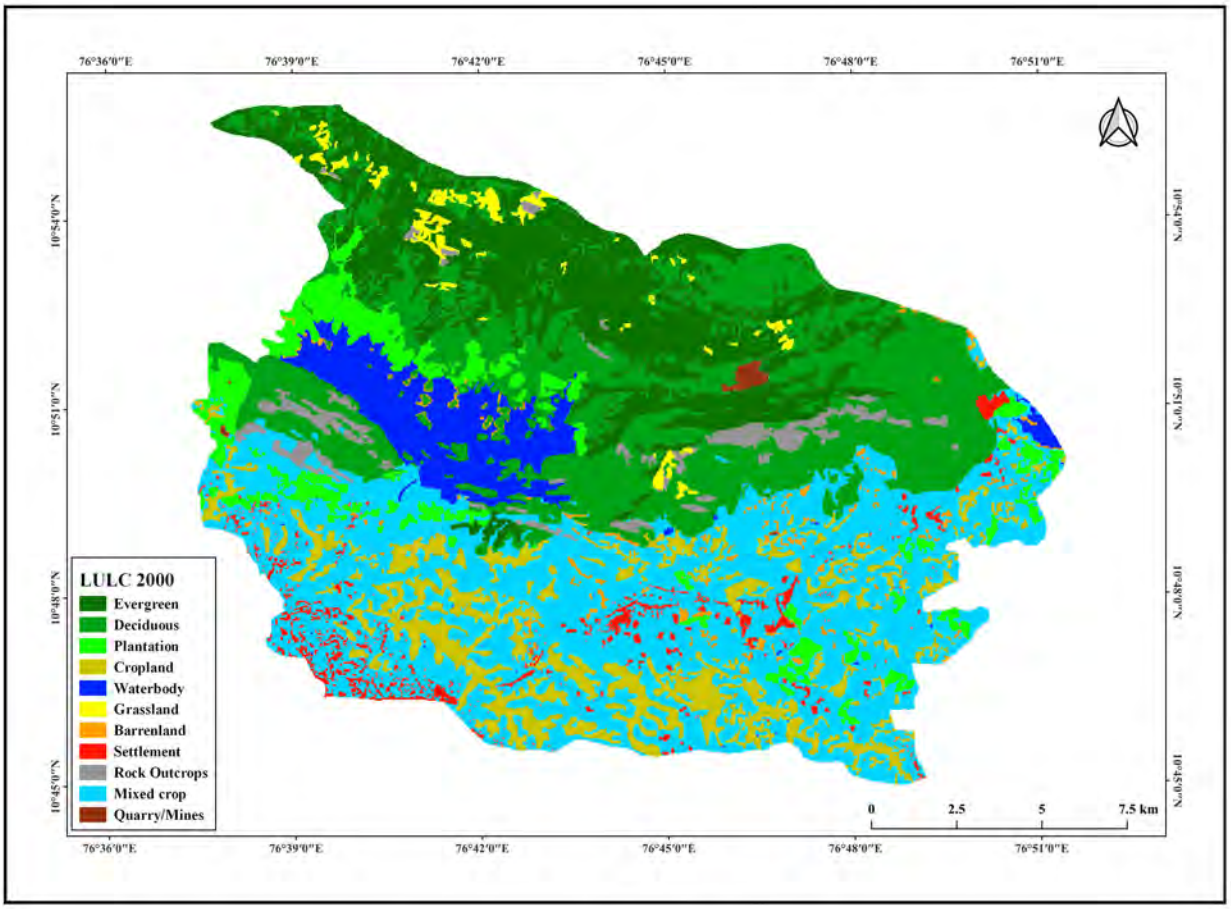

Figure 22. Land Use – Land Cover classification of Walayar hills in 2000

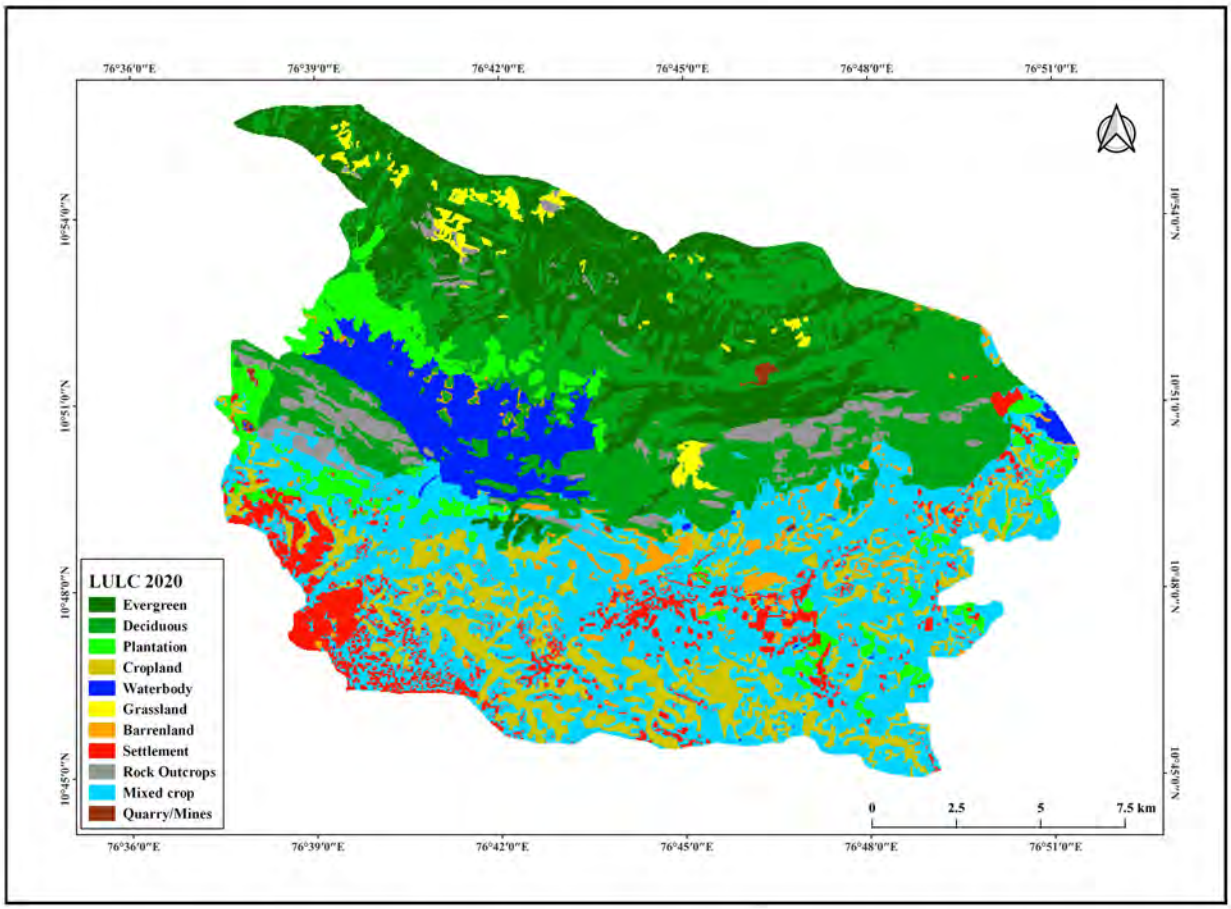

Figure 23. Land Use – Land Cover classification of Walayar hills in 2020

Table 24. LU/LC classification of Walayar forests in two different decades

Sl. No.	LULC class	2000	2020
1	Evergreen forests	5330.16 ha	5122.62 ha
2	Deciduous forests	7743.87 ha	7629.48 ha
3	Plantations	1898.46 ha	1799.19 ha
4	Grasslands	401.31 ha	428.76 ha
5	Waterbodies	1837.26 ha	1839.78 ha
6	Barren lands	342.09 ha	723.87 ha
7	Settlements	752.13 ha	1834.29 ha
8	Rock outcrops	768.33 ha	1128.78 ha
9	Mixed crops	10273.5 ha	8905.86 ha
10	Croplands	3029.94 ha	2983.32 ha
11	Quarries/ Mines	74.07 ha	55.17 ha

IV.14.3. Analysis of Forest cover change within two decades

The major forest types in Walayar include deciduous forests, evergreen forests and grasslands. Since a strict demarcation between evergreen and semi-evergreen forests is difficult in the range, these two forest covers are included in the same class. Similarly, grasslands are represented by short patches in the higher altitudes and no shola vegetation could be classified from the satellite imagery.

Among the various forest cover classes, the deciduous type forms the dominant vegetation in the hill tracts of Walayar with about 23.51 percent of total land area. This is followed by evergreen forest type (15.78%) and grasslands (1.32%). Apart from the forest covers in the area, there are many scattered rocky outcrops (3.47%) and barren lands (2.23%). Other than these, the geographical area is characterized by mixed crops (27.44%) which take over major land area followed by croplands (9.19%) and plantations (5.54%). Plantations include both forest plantations as well as private owned ones. Since these plantations are seen in close vicinity, a clear demarcation is not possible between both and are represented as one. These Plantations are mostly located along the banks of the reservoir and few in between the forest lands. Many of the forest owned plantations are now under the forest department since the lease period is over and now these plantations are left undisturbed for the natural regeneration and restoration of the forest. Croplands are located at the margins of the forest. Mixed crops are located in between the human settlement area and the foothills of the forest.

The analysis on the forest cover change computed for time periods of 2000 and 2020 depicts the change in each forest cover class between the two decades. It is observed that there is a slight decrease in the evergreen (0.64%) and deciduous forests (0.35%).

Similar is the case of plantations where there is a decrease by 0.31%. This decrease in the area of occupancy of plantations might be due to the procurement of many private plantations by the forest department and is left for regeneration of forest naturally. While the observations regarding the occupancy of agricultural lands, there is a sharp decrease in mixed crops by 4.21% and a minor decrease in croplands by 0.24%. On the other hand, a percentage increase of 3.29% was observed for settlements and 1.18% for barren lands.This must be due to the encroachment of human inhabitants on the croplands, mixed crop areas and margins of forests for shelter and other infrastructural developments. Since the earlier active quarries are now inactive due to the expiry of the lease period are left undisturbed for the natural restoration. This made the natural colonization of plants on that areas which might be the reason for the slight decrease in the quarries by 0.05%. The deterioration of natural ground vegetation have resulted in the increase of exposed rocky outcrops by 1.11%. The percentage of forest covers in two different decades is summarized in table 25 and they are graphically represented in Figure 24 and 25 respectively. Further, figure 26 - 33 shows separate maps of major vegetation types prepared for easy understanding of the vegetational change occurred in Walayar hills.

Table 25. Percentage analysis of forest cover change in two decades

Sl. No.	LULC class	2000	2020
1	Evergreen forests	16.42%	15.78 %
2	Deciduous forests	23.86 %	23.51%
3	Plantations	5.85 %	5.54 %
4	Grasslands	1.23 %	1.32 %
5	Waterbodies	5.66 %	5.66 %
6	Barren lands	1.05 %	2.23 %
7	Settlements	2.31 %	5.65 %
8	Rock outcrops	2.36 %	3.47%
9	Mixed crops	31.65 %	27.44 %
10	Croplands	9.33 %	9.19 %
11	Quarries/ Mines	0.22 %	0.17 %

These results indicate signs of the diminishing natural vegetation in the area. There is no observable change in the area of occupancy of water bodies in the Walayar forest range. Further geological and related research should be carried out in the Palghat Gap region especially in the Walayar forest range to elucidate the influence of Gap features and how restoration of a healthy forest ecosystem can be affected.

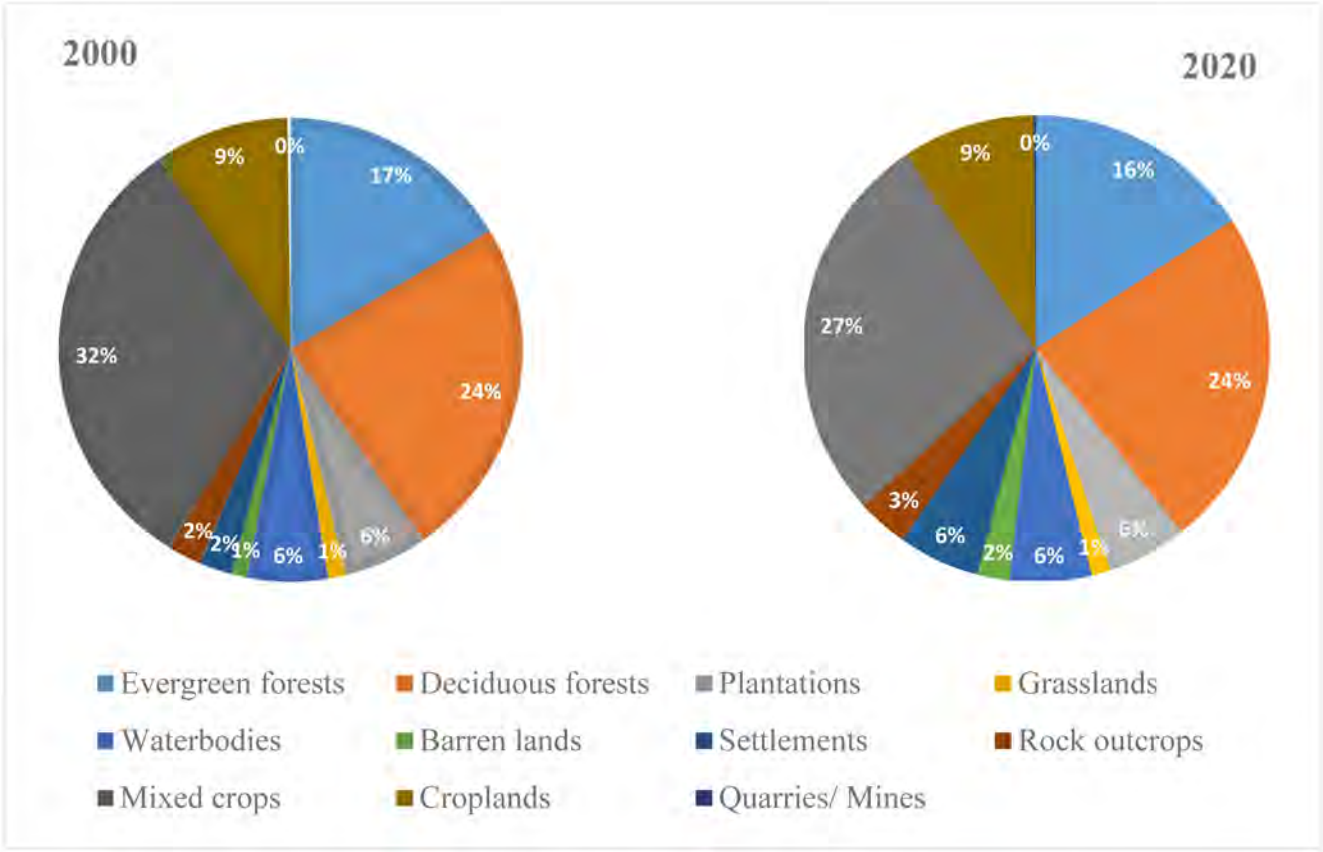

Figure 24. LU/LC classification of Walayar hills in 2000 and 2020

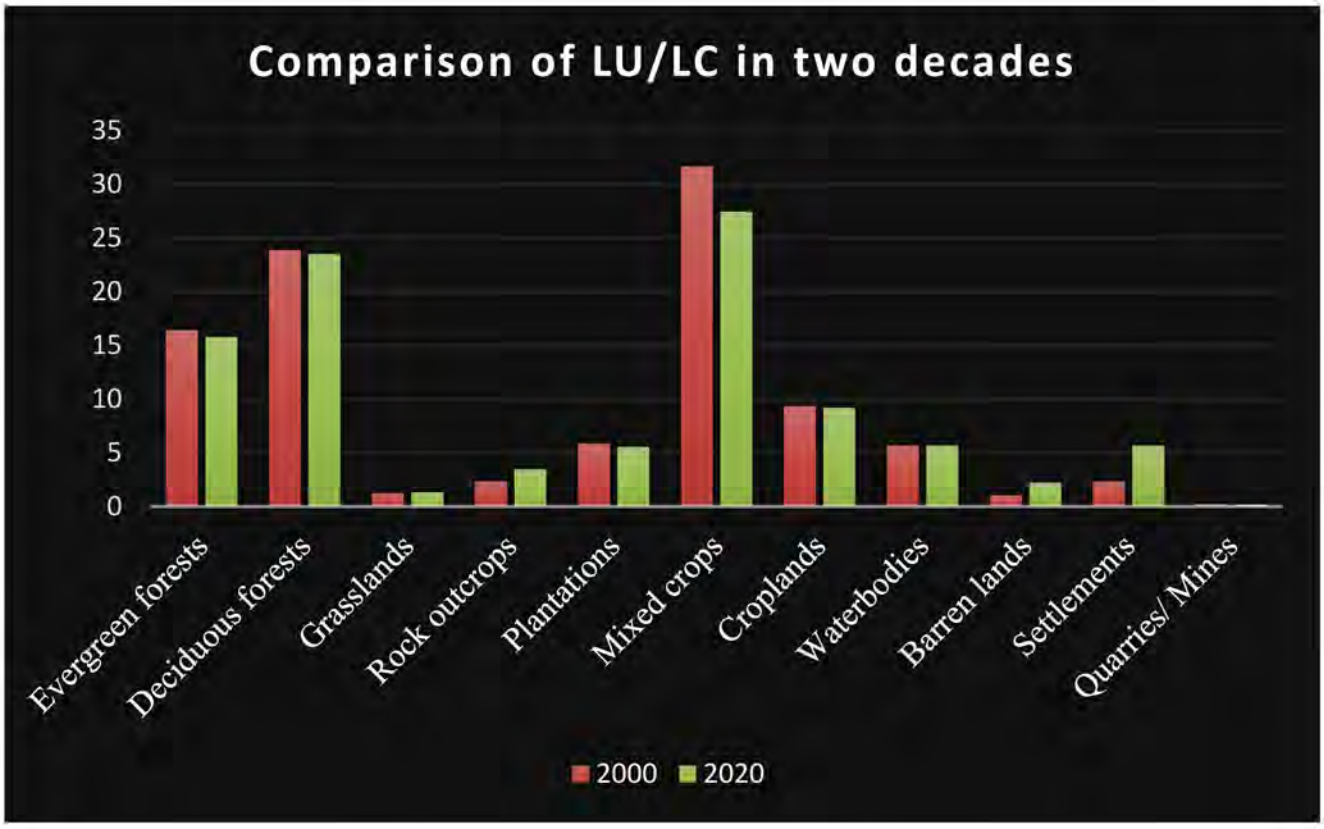

Figure 25. LU/LC patterns from 2000 - 2020

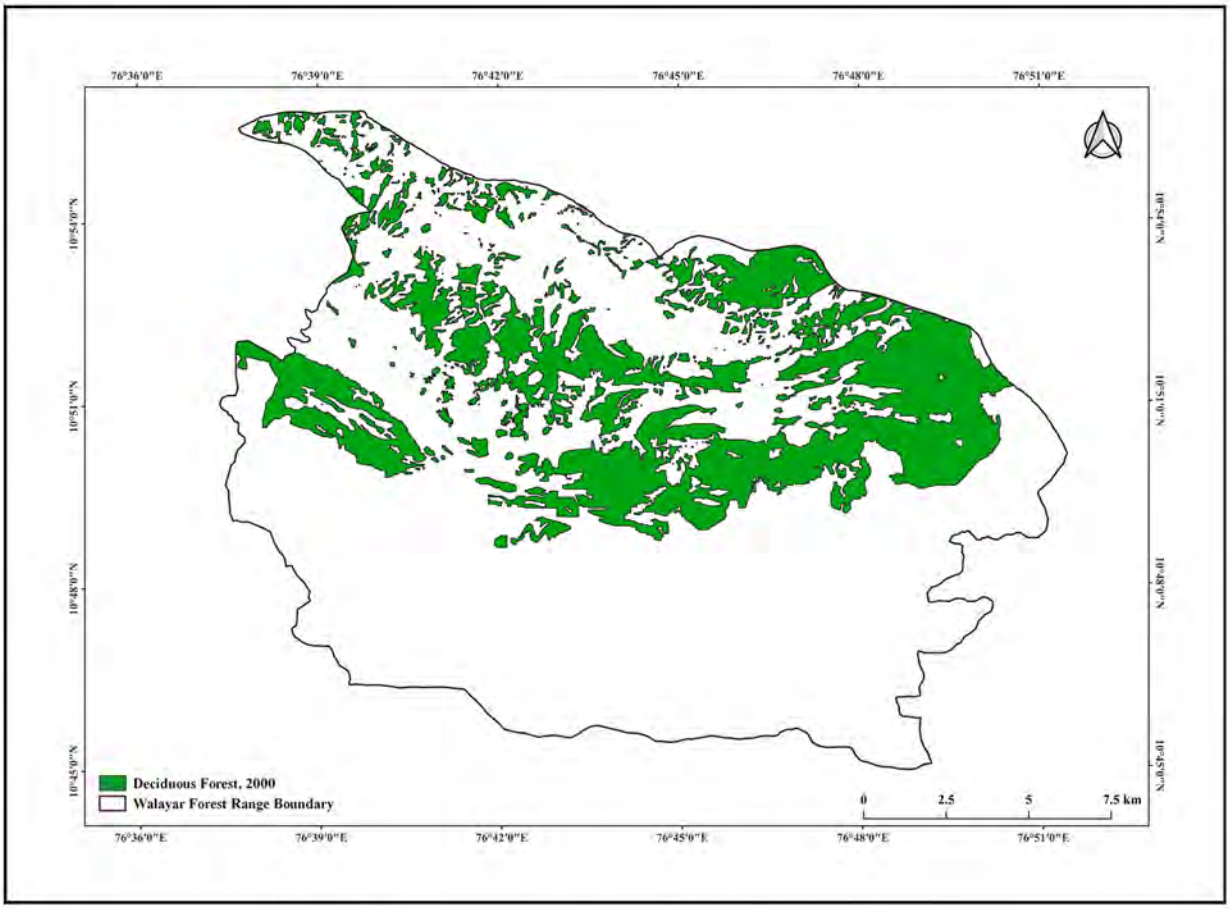

Figure 26. Distribution of deciduous forests in 2000

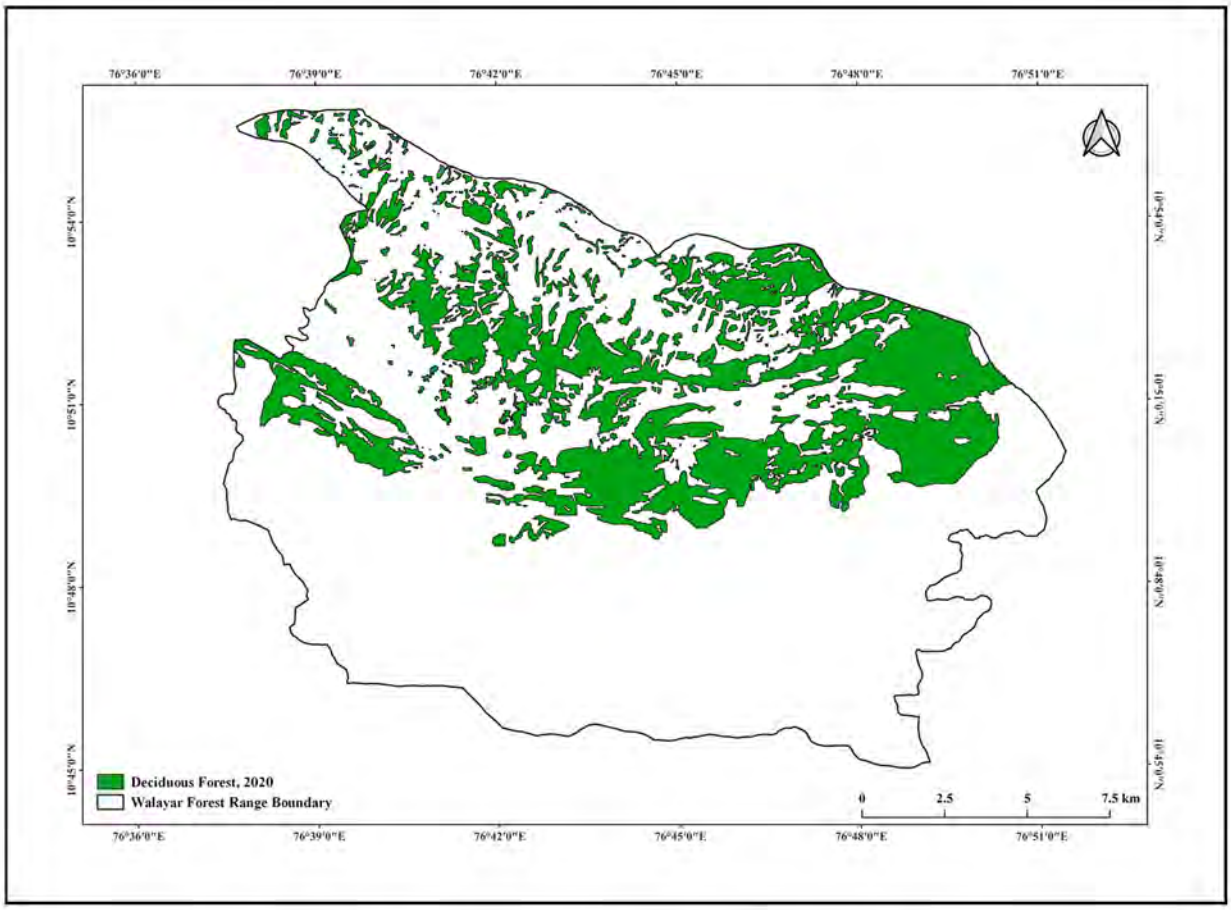

Figure 27. Distribution of deciduous forests in 2020

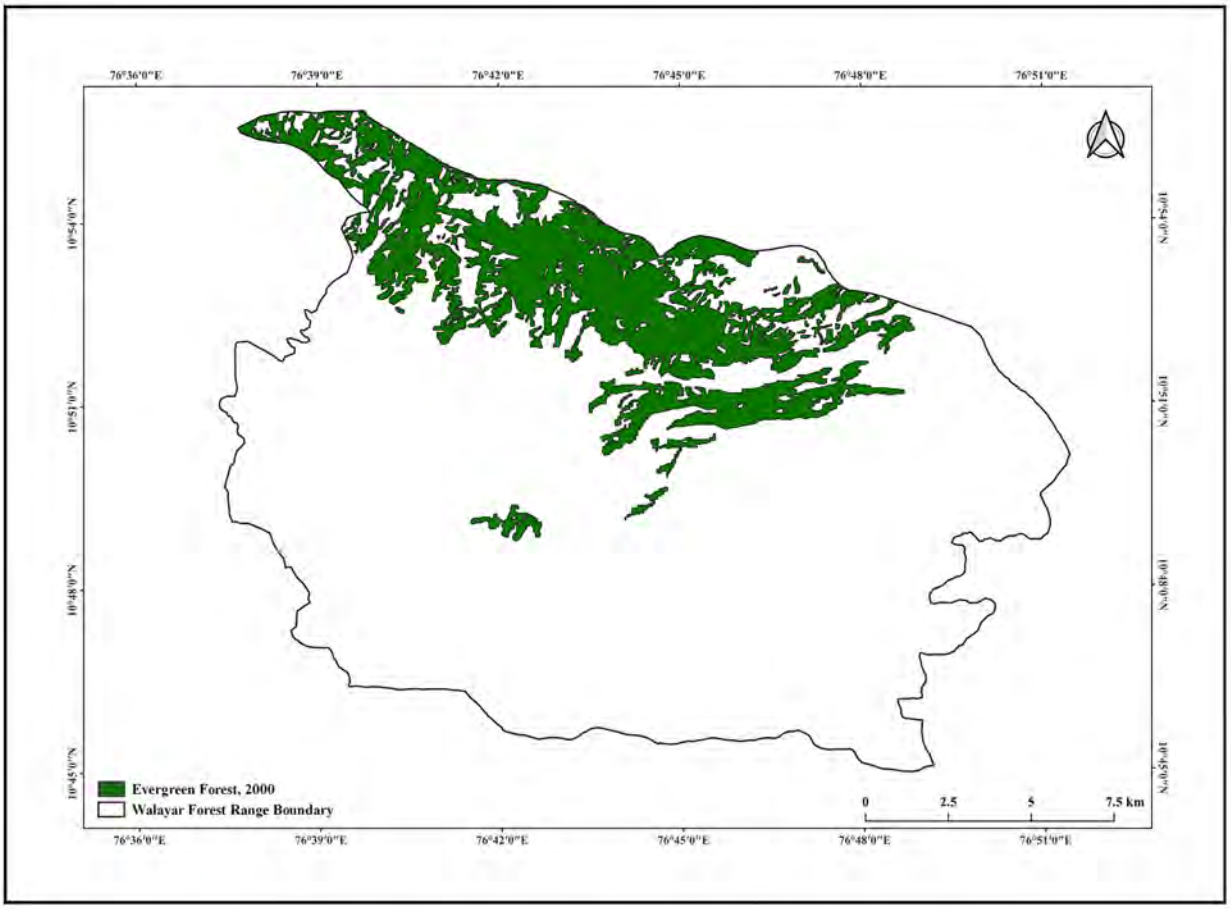

Figure 28. Distribution of evergreen forests in 2000

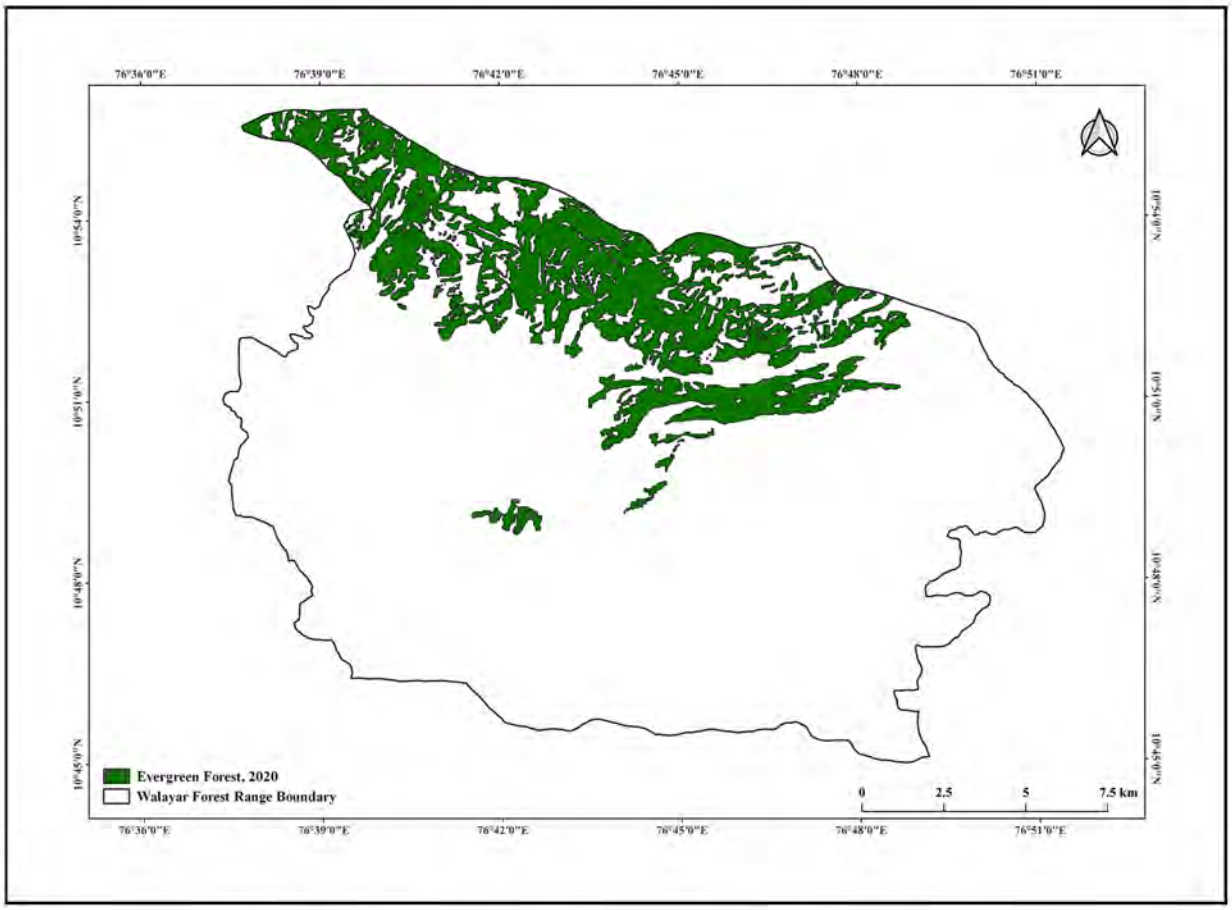

Figure 29. Distribution of evergreen forests in 2020

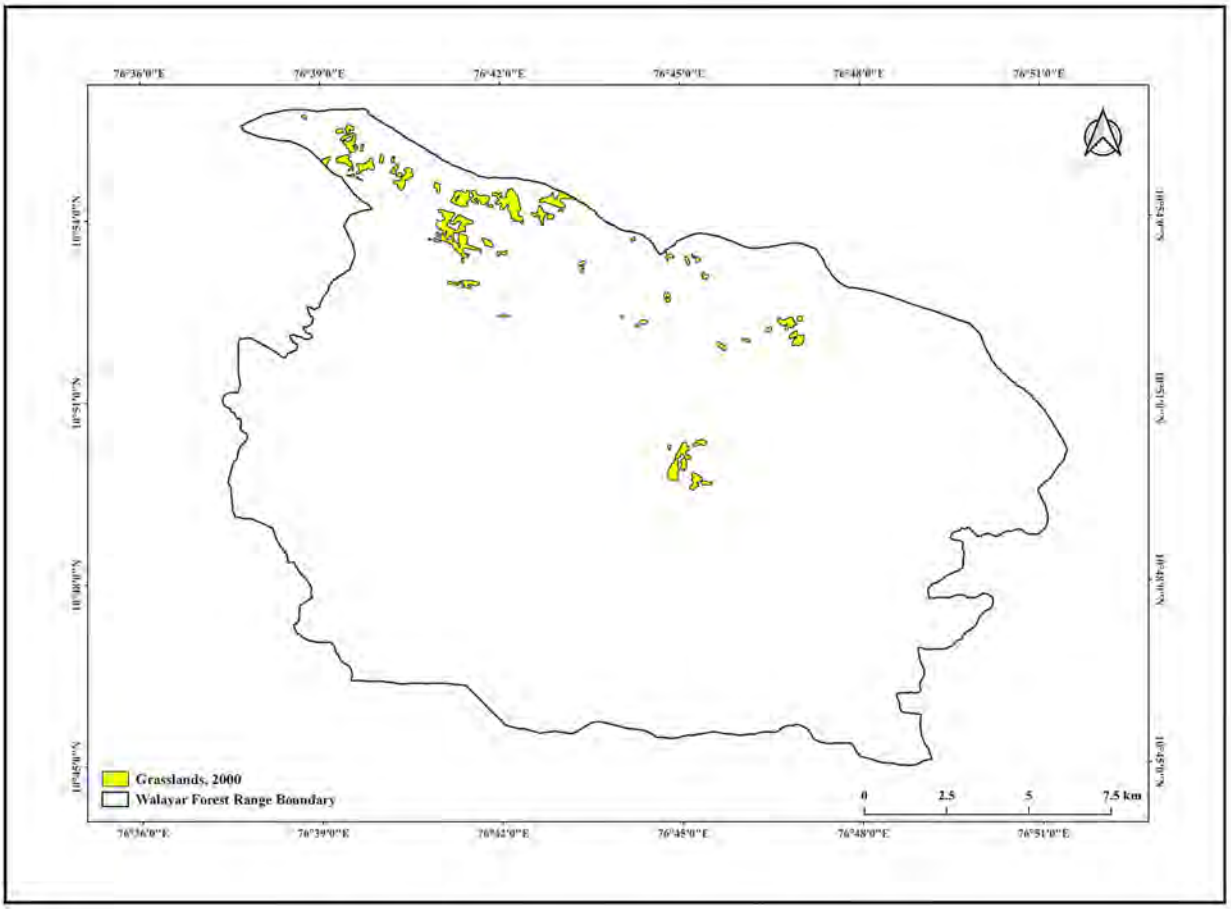

Figure 30. Distribution of grasslands in 2000

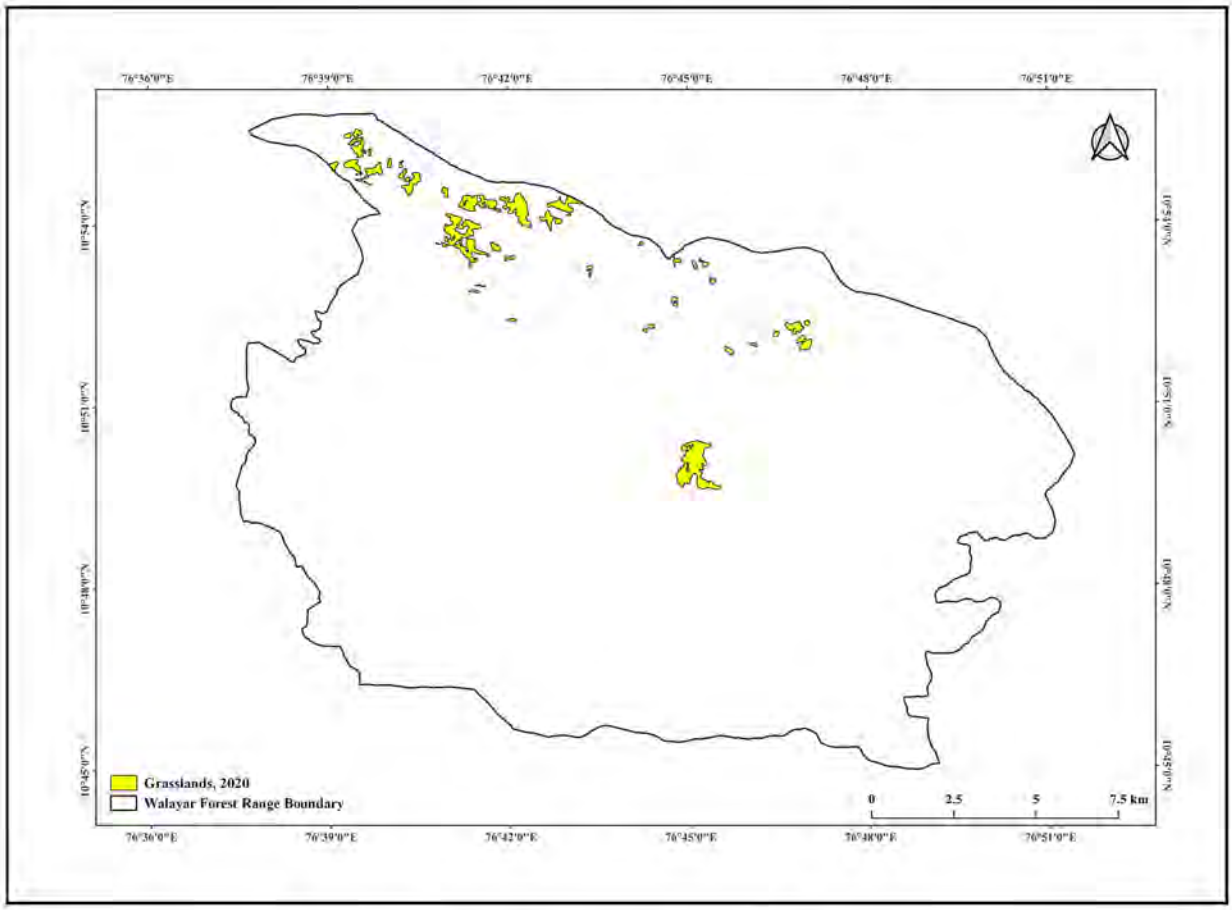

Figure 31. Distribution of grasslands in 2020

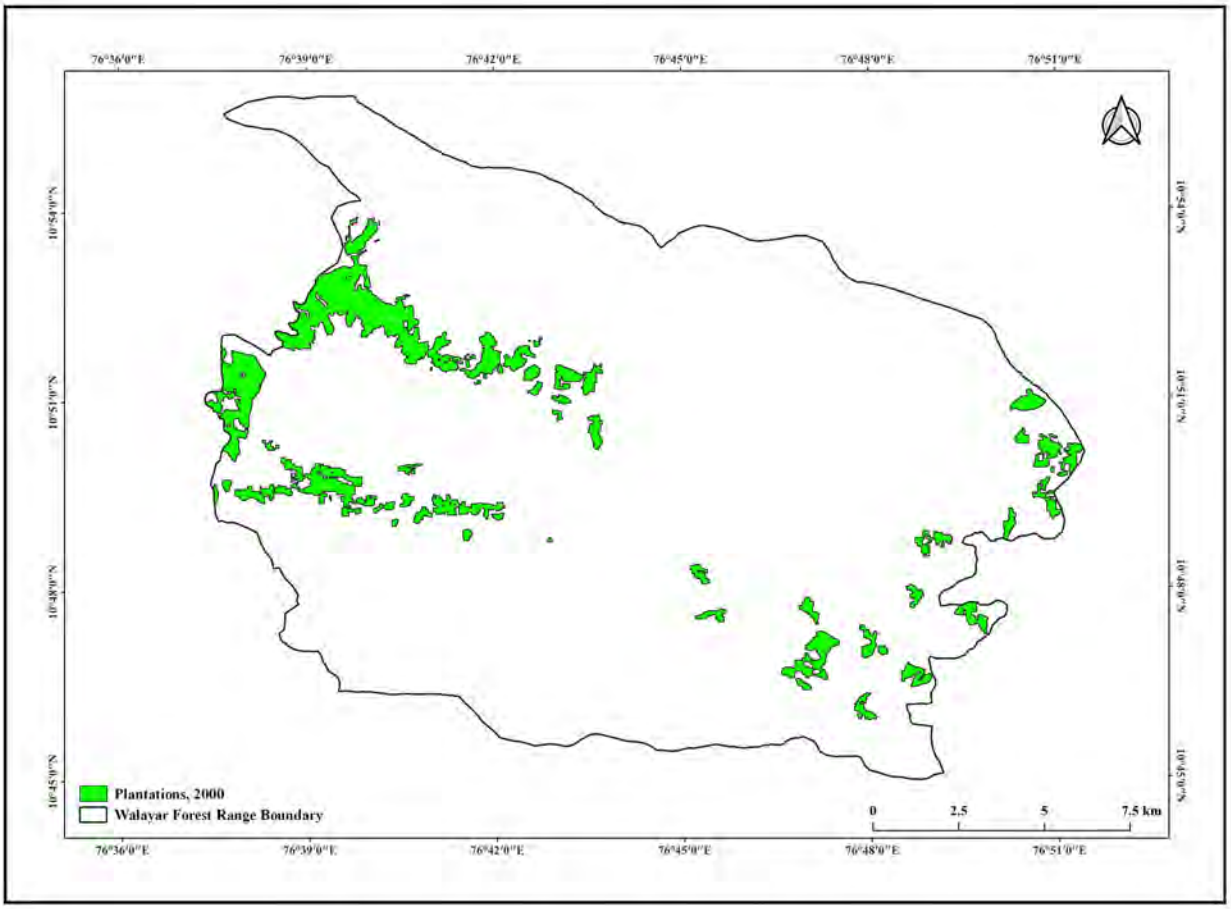

Figure 32. Distribution of plantations in 2000

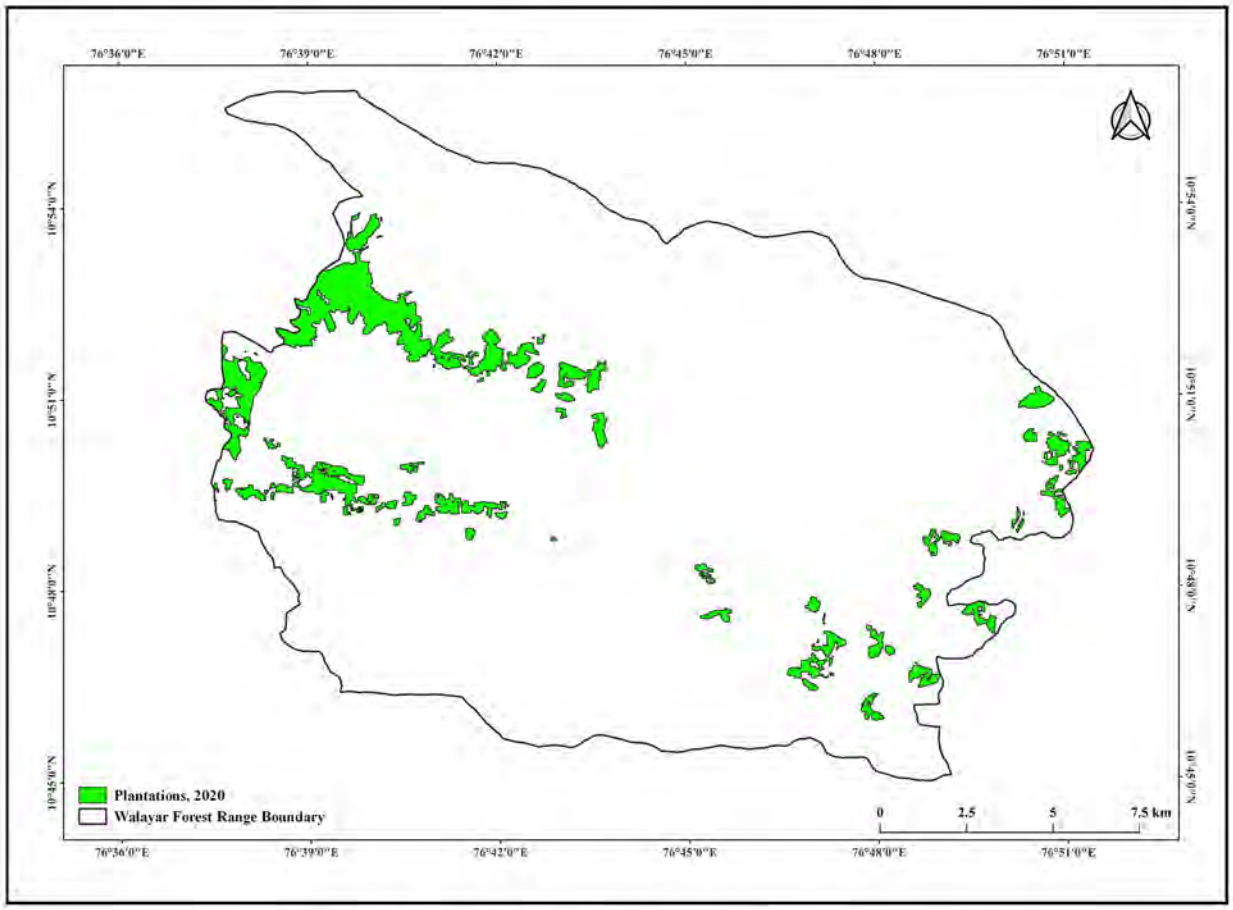

Figure 33. Distribution of plantations in 2020

IV. 14.4. Forest cover across altitudinal gradients

An elevation map of the study area was prepared considering five different elevation classes such as 0 - 400m, 400-700m, 700-1000m, 1000 -1300m and 1300m above. About 75.89% of the study area falls in the 1st zone while 9.75% falls in the 2nd zone, 7.47% in the 3rd zone and 4.4% in 4th and 2.49% in the 5th zone. The lower zone is primarily composed of deciduous forests while the next two zones are high canopy rich forests composed predominantly by semi - evergreen forests intermixed with deciduous elements. The upper two zones are composed of open grasslands and large bare rocks. Table 26 indicates the distribution of various forest cover in different altitudinal zones and Figure 34 and 35 provides the altitudinal zonation and Digital Elevation Model of the study area respectively.

Table 26. Forest cover and altitudinal zones

Forest type	Ist Zone (0 - 400m)	IInd Zone (400-700m)	IIIrd Zone (700-1000m)	IVth Zone (1000-1300m)	Vth Zone (Above 1300m)
Evergreen forests	3.43%	46.88%	56.45%	66.35%	58.71%
Deciduous forests	20.59%	41.73%	32.11%	20.5%	21.34%
Grasslands	3.18%	8.31%	12.65%	14.93%	39.70%
Rock outcrops	2.45%	9.29%	6.99%	3.2%	2.2%
Plantations	0.02%	7.29%	-	-	-
Barren lands	2.94%	-	-	-	-

IV. 14.5. Slope wise zonation of forest cover

A slope wise zonation map of the study area (Figure 36) was created and obtained three classes, such as gentle slope areas (0°-15°), medium slope areas (15°-30°) and steep slope areas (＞30°). The analysis revealed that about 71.43% of the study area falls under the gentle slope areas while 19.09% falls in the moderate slope category and 9.48% in steep slope zone. The majority of grasslands of the area fall under the steep slope category. moist deciduous forests, semi - evergreen forests, plantations and rocky outcrops are common in moderate slope and gentle slope areas.

IV.14.6. Normalized Difference Vegetation Index (NDVI)

Normalized Difference Vegetation Index showed three types of forest areas with respect to forest cover density, viz. non-forest areas with an NDVI value less than 0.2 (＜0.2) moderately dense vegetation areas with a value of 0.2 to 0.3 and dense forest areas with a value greater than 0.3 (＞0.3). The non-forest area occupies 23.25% of the study area

in 2020, while it was 41.65% in 2000. Moderately dense forest area seems to be 22.51% of the study area in 2020 while it was 43.1% in 2000. Dense forest areas occupied 35.84% in 2020 while it was 33.65% in 2000. Figure 37 and figure 38 provides the NDVI classification of the study area in the year 2000 and 2020 respectively.

The high percentage of moderately dense forests in Walayar hills showed the health condition of the vegetation. The decrease in dense vegetation may be due to the formation of bare rocks in the grasslands. But, there is a remarkable decrease in the non - forest areas in the range which might be due to the conversion of barren lands to scrub jungles and the undergrowth of degraded forest elements. Another reason for the increase may be due to the restoration and regeneration of the earlier plantations and estates into forest lands.

IV.14.7. Mapping of major flood affected regions in the study areas

The flood in 2018 had seriously affected the study area and these specific locations were plotted in the study area map to assess the possibilities that lead to such a disaster (Figure 39). From the generated maps it became evident that most of the flood affected regions are on the forest tracks and the margins of forests. Few landslides are reported from those areas which are closer to active quarries and near the railway track B passing through the forests. This caused mud slips in the railway tracks and caused temporary stoppage of rail transport for few days.. No human life loss has been reported and mostly affected the agricultural lands and the rivulets in the forest range.

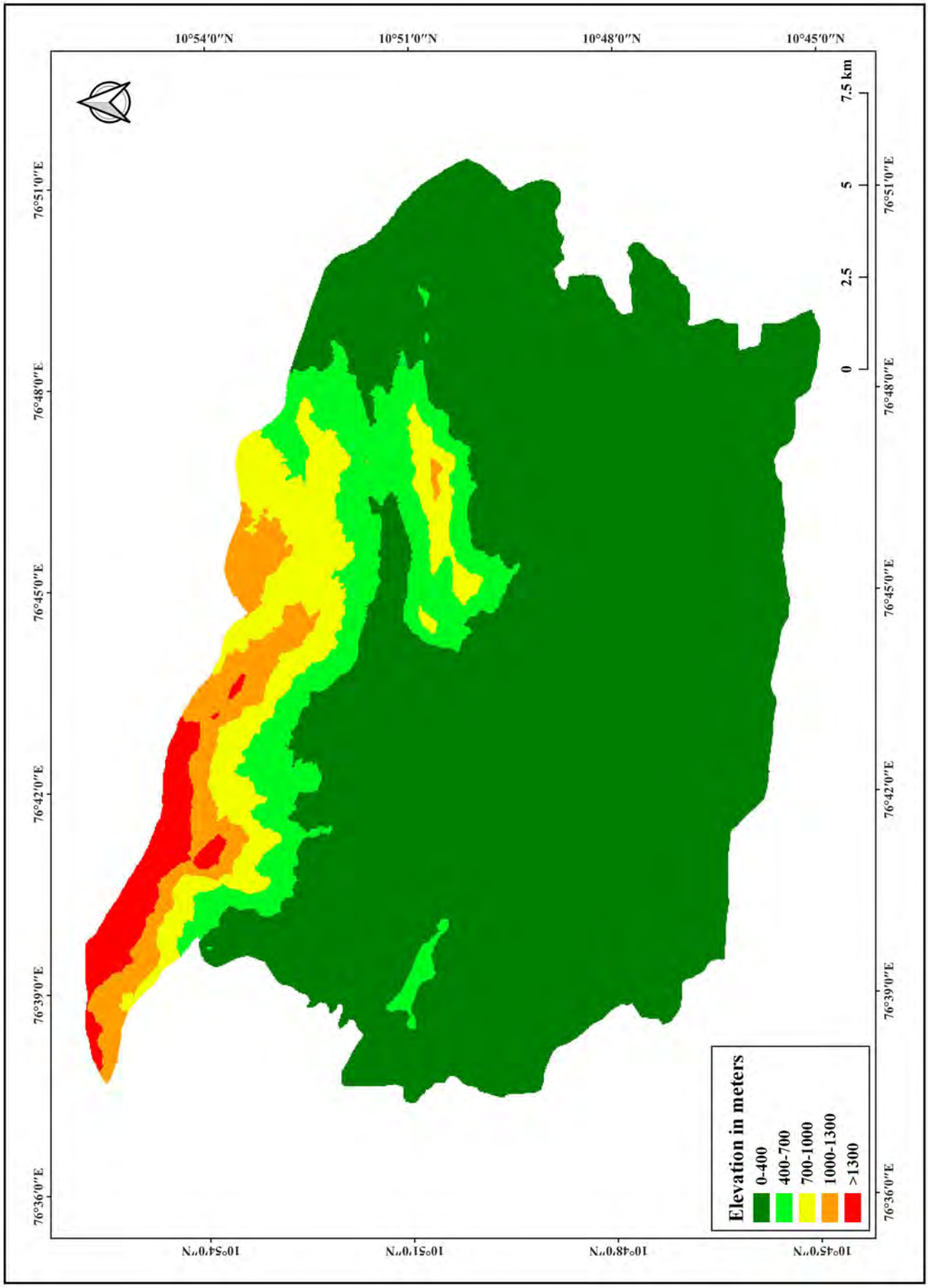

Figure 34. Altitudinal zonation in Walayar hills

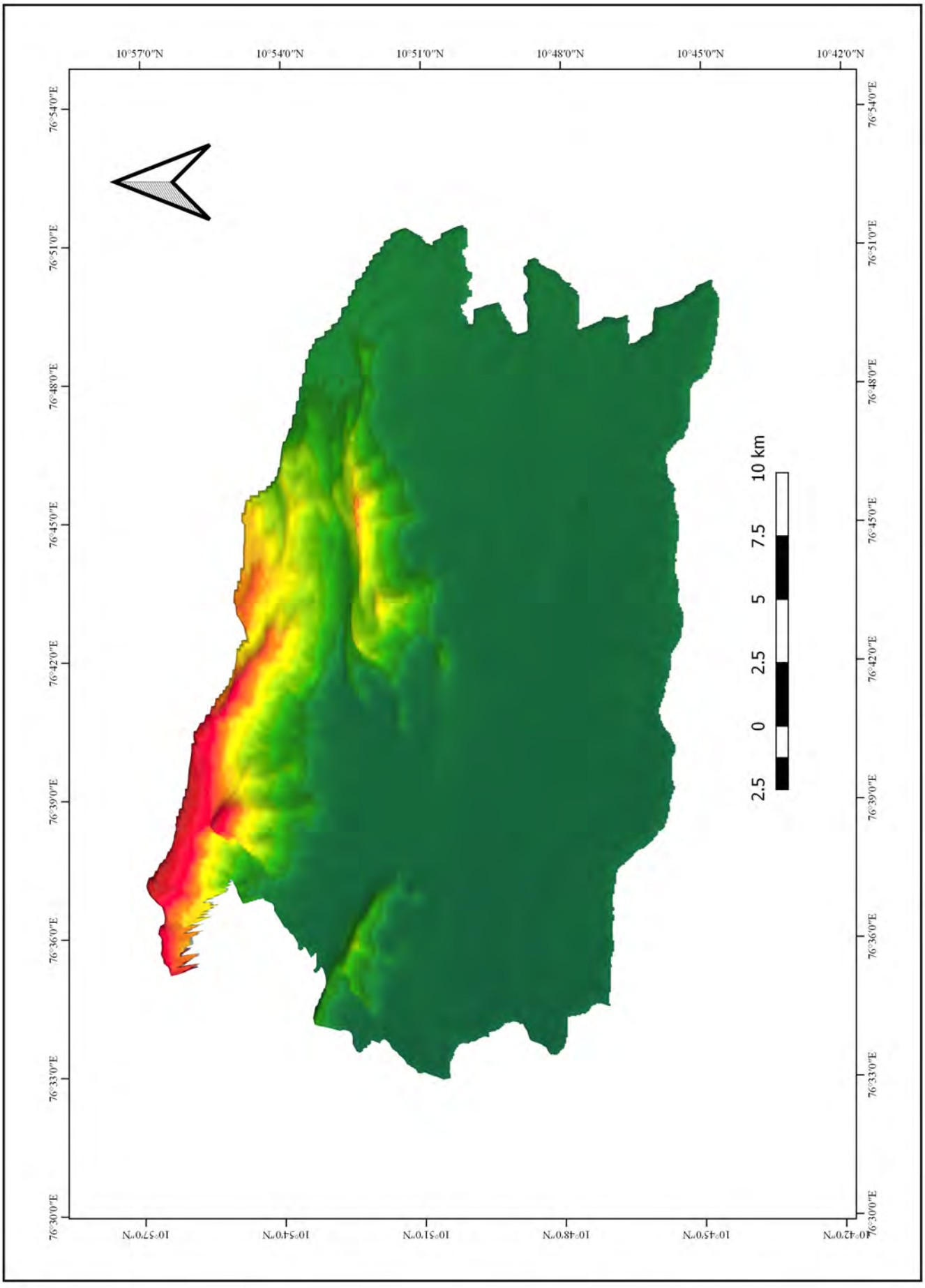

Figure 35. Digital Elevation Model of Walayar hills

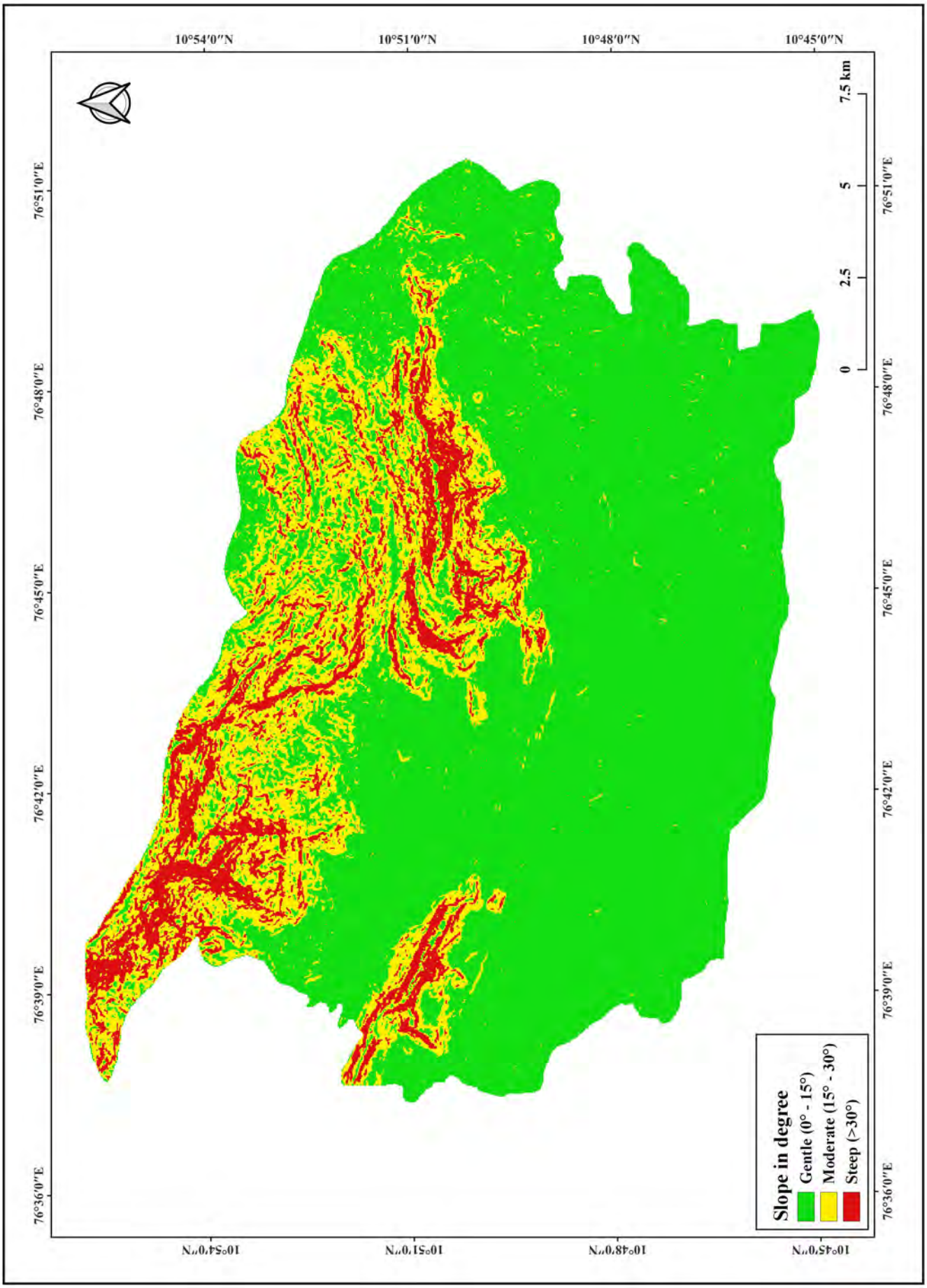

Figure 36. Slope map of Walayar hills

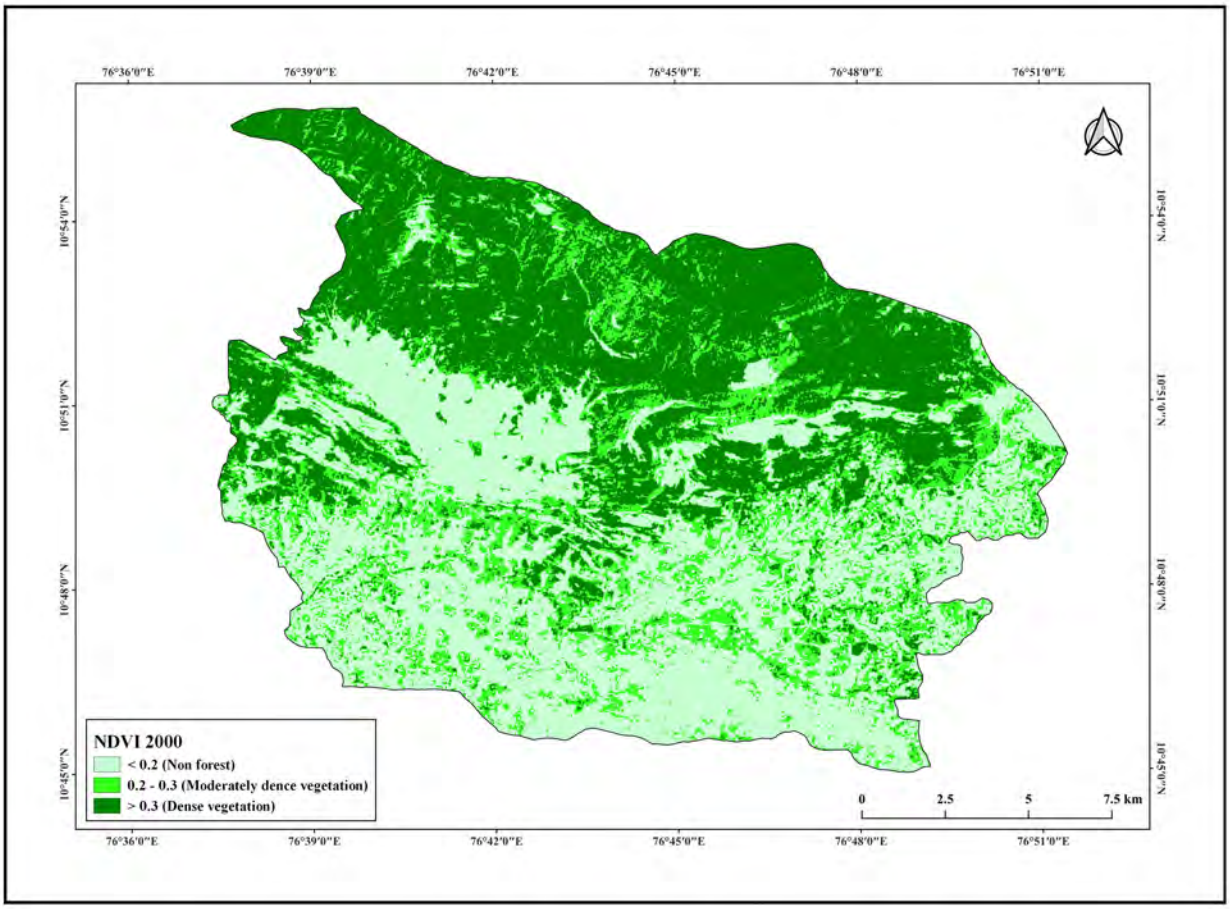

Figure 37. NDVI classification map of Walayar hills (Year – 2000)

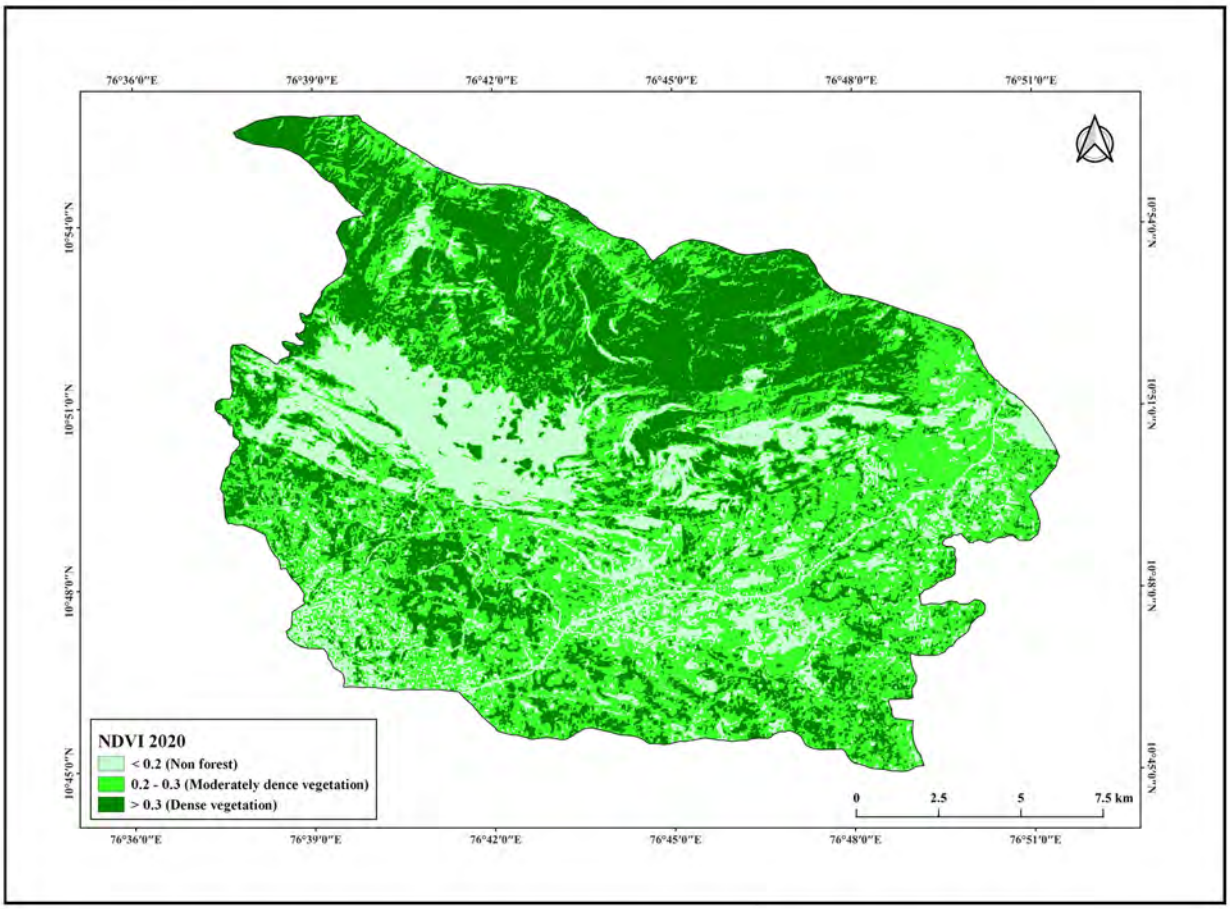

Figure 38. NDVI classification map of Walayar hills (Year – 2020)

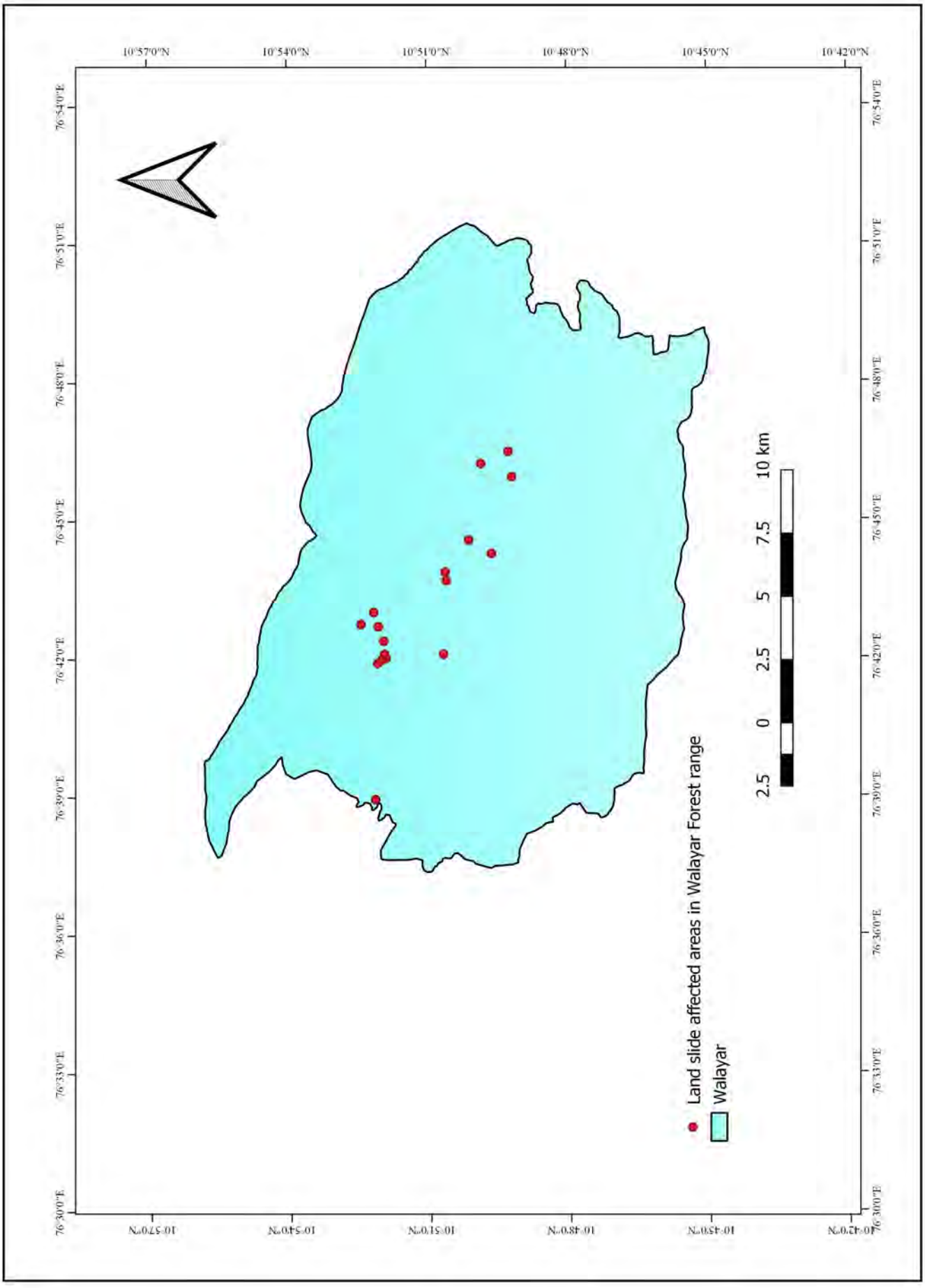

Figure 39. Landslide affected areas in Walayar hill ranges

IV.15. Post flood modifications and bio restoration in Walayar hills

Objective addressed

- Analysis of post flood habitat modification by landslides in Walayar range
- Impact of post flood drought in angiosperm vegetation
- Assessment of biodiversity loss in landslides of August 2018
- Analysis of habitat loss and threats to biodiversity
- Analysis of bio-resilience of angiosperm vegetation and monitoring of natural bio restoration

During the documentation of angiosperm vegetation in Walayar forest range, heavy rainfall and flood hit the study area in August 2018. This created heavy habitat modification and species loss in many parts of the range. Habitat modification and loss of habitats are serious environmental threats to vegetation, which in turn cause serious threats to natural animal shelters and movement tracks of larger animals.

The excessive torrential rains during the month of August 2018 in hill tracts of Palakkad district flooded rivers, several streams and created new rivulets and streams in forest ranges. The heavy onslaught of rains and the powerful gushing waters uprooted several large trees and other smaller vegetation, and carried them downstream. At several regions mudslides happened, changing the topography in isolated sites. The canopy has opened up in hitherto shaded regions and the lower sciophytic vegetation got threatened with exposure to sunlight. Though the media highlighted the loss of habituation of humans in heavy floods, no attempt has been made to highlight the loss of habitats within forests, effects on species survival and life of wildlife.

Based on the preliminary reports on landslide hit areas, the study documented data on landslide hit areas within the range and the loss due to heavy mud slips and flood. Data was taken on habitat loss, loss of species by way of uprooting, washing off the soil in heavy rain, habitat modification by silt deposition and sand filling.

IV.15.1. Landslides in Walayar Forest range

Walayar Forest Range is having the Kerala's largest irrigation dam Malampuzha reservoir and further many small to medium sized streams flow through the forest, which finally drains to this dam. During the flood in August 2018, heavy landslides hit the Akamalavaram, Pudussery South and Kottekkad sections of Walayar range (Plate 148 - 150). This in turn caused heavy water and soil inflow into the dam which resulted in the emergency opening of the shutters which caused flood in Kalpathy river and hit the riverine

beds in and around this river. The landslides occurred in areas of Parachaathi, Kottamutti, Velampotta and Anakundu etc. Moreover, there are many rivulets in the range which also experienced mini landslides, like those in Kottamutti and Ayyappan Mala. Table 27 summarizes the flood and landslide affected locations in Walayar forest range.

Table 27. Flood and landslide affected regions in Walayar forest range

Sl. No	Forest Section	Flood affected sites	Latitude	Longitude
1	Akamalavaram section	Muchikadavu	10°52' 05.16"N	76°42'41.22"E
2		Kavarakundu	10°52'11.02"N	76°42'59.76"E
3		Thakaramada	10°52'27.55"N	76°42'44.31"E
4		Thaanikunnu	10°51'55.44"N	76°42'00.10"E
			10°51'57.24"N	76°42'05.04"E
			10°52'01.20"N	76°41'57.48"E
5		Kochuthodu	10°50'41.28"N	76°42'05.04"E
			10°51' 58.32"N	76°42'22.32"E
6		Attippara	10°52'06.24"N	76°41'53.16"E
7		Nakkamalakunnu	10°52' 09.84"N	76°38'56.04"E
8	Kottekad section	Parachaathi	10°50'37.32"N	76°43'40.80"E
			10°50'38.76"N	76°43'51.96"E
9		Aduppukootimala	10°49'39"N	76°44'16.08"E
			10°50'08.16"N	76°44' 3.36"E
10	Pudussery South Section	Ayyappan Mala	10°49'16.89" N	76°46'28.89"E
11		Velanchery	10°49'12.37"N	76°45'55.81"E
12		Anakundu	10°49'52.32" N	76°46'13.08"E

IV.15.1.1. Akamalavaram Section

Akamalavaram section is the largest section under Walayar forest range which covers a total area of about 62.59 Sq. Km. No forest area in this section is reserve forest but is vested. Much of the forest area in this section was badly affected by the heavy rain during the month of August 2018. Certain areas in this section experienced flood-caused

landslides and mud slides which includes Muchikadavu, Kavarakundu, Thakaramada, Thaanikunnu, Attippara, Nakkamalakunnu and Kochuthodu

IV.15.1.1.1. Muchikadavu

Muchikadavu of Akamalavaram is located very near to Akamalavaram forest section office where forests are seen intermixed with private estates. The altitude of this area is around 79m. The area experienced a small landslide washing away the surface soil along with the ground vegetation. The area showed uprooting of a few trees along with mud and rocks reaching down the lane.

IV.15.1.1.2. Kavarakundu

This location is one of the beautiful areas in the Akamalavaram section where there is a waterfall area which is rich in vegetation. Soil content in this area is low and hence with a therophytic habitat, and hence heavy rain resulted in washing away of vegetation on the rock surface. The average altitude of this place is 266m.

IV.15.1.1.3. Thakaramada

Near to Kavarakundu where average altitude comes near 270m is rich in vegetation consisting of moist deciduous and dry deciduous elements. Heavy downpour has resulted in the heavy outflow of rain water through the forest floor which resulted in minor landslides in this spot uprooting several small trees and other herbaceous forms.

IV.15.1.1.4. Thaanikunnu

This place is located near to Vettiyil estate, a Govt. owned Rubber – Arecanut-Sandalwood - *Xylia xylocarpa* (Roxb.) W.Theob. plantation. The average altitude of this site is 167m. The heavy rain during monsoon resulted in mudslides on the margins of this estate uprooting some rubber trees and other few forest trees. Kochuthodu, a river through the forest is flowing near to this location.

IV.15.1.1.5. Kochuthodu

This is a small stream flowing through the Akamalavaram section along with other Rivers Mylaadumpuzha and Kallanpuzha. Mudslides near Vettiyil estate have caused the deposition of mud and silt in the Kochuthodu resulting in the reduction of waterflow through this river. It is also found that large rocks dumped during the flood blocked the water flow through this stream.

IV.15.1.1.6. Attippara

Attippara is located near to Thannikunnu with an average altitude of 252m which experienced a major landslide with washing off of top soil and uprooting of several trees. The severity of the damage caused by flood was more prevalent in this location causing great damage to the ground vegetation.

IV.15.1.1.7. Nakkamalakunnu

Located near to Akamalavaram is a biodiversity rich area which experienced a major landslide during heavy monsoon leaving back only few survivors and a few invasive taxa. The altitude of this region is 225m.

IV.15.1.2. Kottekkad Section

IV.15.1.2.1. Parachaathi

The Kottekkad forest section of the range was severely affected by the flood and subsequent landslides. Parachathi and Aduppoottimala witnessed the loss of topsoil along with the destruction of natural vegetation. Parachathi is located between Malampuzha and Kava in the catchment site of Malampuzha Dam. Landslides originating from top of the hill created blockade in the transport via road. Water level increased unusually, submerging households. There were five locations beginning from 10°50'37.32"N and 76°43'40.8"E up to 10°50'38.76"N and 76°43'51.96"E hit by the landslides in Parachathi hills. These locations had an elevation of 30 m, 147m, 155m, 164m and 144m respectively from the sea level. Plantations of *Cocos nucifera* L.*, Musa* × *paradisiaca* L. and *Hevea brasiliensis* (Willd. ex A.Juss.) Müll.Arg. at the lower stretches had severe loss. *Wrightia tinctoria* R.Br. is one of the prominent species uprooted alongside others. Other major tree species uprooted in this area are *Ficus racemosa L.,Grewia tiliifolia Vahl, Hevea braziliensis (Willd. ex A. Juss.) Muell.-Arg., Ficus hispida L. f.,* and *Schleichera oleosa (Lour.) Oken.* The lower agricultural lands were destroyed by the heavy deposition of sand and one of the streams which fed Malampuzha Dam disappeared by sand filling.

Later, after three to four months, this area started regaining health by replenishment of the pioneer species like *Yamazakia viscosa* (Hornem.) W.R.Barker*, Glinus oppositifolius* (L.) Aug. DC.*, Amaranthus viridis* L.*, Eragrostis tenella* (L.) P. Beauv. ex Roem. & Schult.*, Coleus strobilifer* (Roxb.) A.J.Paton etc.

IV.15.1.2.2. Aduppukoottimala

Another location hit by the flood in the Kottekkad section is Aduppukoottimala. This place also had four different locations affected by the landslides from 10°49'39"N and 76°44'16.08"E to 10°50'8.16"N and 76°44' 33.36"E. The elevations of these places ranges from 154m to 343m from sea level. The area witnessed tree fall in higher magnitude. The uprooted plants include *Bauhinia racemosa* Lam., *Holoptelea integrifolia* (Roxb.) Planch., *Grewia tiliifolia* Vahl, *Bombax ceiba* L., *Syzygium cumini* (L.) Skeels etc. The range was having plenty of survivor species including *Terminalia paniculata* Roth, *Miliusa tomentosa* (Roxb.) Finet & Gagnep., *Terminalia chebula* Retz., *Holarrhena pubescens* (Buch.-Ham.) Wall. ex G. Don, *Harpullia arborea* (Blanco) Radlk., *Tabernaemontana alternifolia* L., *Ixora brachiata* Roxb. ex DC. etc. The rapid spread of pioneer species helped the region from severe loss of vegetation. These plants include *Arundinella mesophylla* Nees ex Steud., *Dicliptera paniculata* (Forssk.) I. Darbysh., *Dicliptera foetida* (Forssk.) Blatt., *Haplanthodes neilgherryensis* (Wight) Majumdar, *Eranthemum capense* L., *Phaulopsis imbricata* (Forssk.) Sweet., *Argyreia elliptica* (Roth) Choisy etc. In addition to these, several invaders like *Mikania micrantha Kunth, Mesosphaerum suaveolens* (L.) Kuntze, *Chromolaena odorata* (L.) King & Robins., *Lantana camara* L. *and Ageratum conyzoides* L. were also spread in this area.

IV.15.1.3. Pudussery South Section

Pudussery South section under Walayar forest range covers a total area of about 5.90 Sq. Km and no forest area in this section is reserve forest, but is vested. Certain areas in this section experienced minor flood-caused landslides and mud slides which includes Ayyappan Mala (10°49'16.89" N and 76°46'28.89"E), Velancherry (10°49'37.56" N and 76°45'55.8"E) and Anakundu (10°49'52.32"N and 76°46'13.08"E).

IV.15.1.3.1. Ayyappan Mala

`Ayyappan Mala of Pudussery South section is located near to Aduppukootimala. The altitude of this area is above 500 m. The hill got this name due to the small temple of lord Ayyappa at the top and yearly ritual and worship occurs during the month of December. The area experienced a severe landslide, washing away the ground vegetation and few trees, forming a channel of mud and rocks reaching down.

IV.15.1.3.2. Velanchery

Velanchery is located 2km away from Ayyappan Mala. Here B tract railway line passes through and is one of the major elephant corridors in the Walayar Forest range.

IV.15.1.3.3. Anakundu

Anakundu is located near to Velanchery. The place gets this name by the old construction of "Ana" or check dam using rocks. This formed the main source of water to Korayar river and nearby ponds like Valiyaeri which is the life saving source of water for wild animals and humans. Heavy rain resulted in the heavy outflow of rain water through the forest floor and resulted in land slides totally destructing this "Ana".

IV.15.2. Post landslide effects

IV.15.2.1. Akamalavaram section

The destruction of the one large patch of vegetation happened with surface vegetation of average 80 x 40 sq.m area being washed away, uprooting several tall trees like *Xylia xylocarpa* (Roxb.) Taub., *Grewia tiliifolia* Vahl, *Ficus racemosa* L., *Schleichera oleosa* (Lour.) Oken, *Holoptelea integrifolia* (Roxb.) Planch, and some smaller trees like *Chionanthus mala-elengi* (Dennst.) P. S. Green ssp. *mala-elengi*, Bull., *Helicteres isora* L., *Artocarpus hirsutus* Lam., *Dalbergia latifolia* Roxb., *Ixora brachiata* Roxb. ex DC, and climbers like *Anamirta cocculus* (L.) Wight & Arn. and *Spatholobus parviflorus* (Roxb. ex DC.) O. Ktze.

Some minor mudslides occurred near Vettiyil estate, a govt. owned Rubber-Sandalwood – teak – *Xylia xylocarpa* plantation where heavy rain resulted in the uprooting of several rubber trees (*Hevea braziliensis* (Willd. ex A. Juss.) Muell.-Arg.) at the margins of the plantation. Along with that several other taxa got uprooted including *Grewia tiliifolia* Vahl, *Macaranga peltata* (Roxb.) Muell.-Arg *Ficus racemosa* L., *Schleichera oleosa* (Lour.) Oken and *Holoptelea integrifolia* (Roxb.) Planch. Heavy flow of water destroyed mostly the small herbaceous surface dwelling species which can be identified by comparing with the nearby vegetation. Herbaceous taxa such as *Baliospermum solanifolium*,(Burm.) Suresh, *Biophytum reinwardtii* (Zucc.) Klotzsch, *Acalypha paniculata* Miq., *Rostellularia procumbens* (L.) Nees, *Clerodendrum infortunatum* L., *Ruellia prostrata* Poir, *Eranthemum capense* L.; *Eragrostis viscosa* Trin., *Strobilanthes crossandra* (Steud.) J.R.I.Wood, *Urochloa distachyos* (L.) T.Q.Nguyen, *Hemidesmus indicus* (L.) R.Br. etc are found washed off in the heavy rains of August 2018.

Plate 148 : Landslide affected areas in Walayar hills Fig. a. Aatumala **b.** Chottuppara **c.** Moochikadavu **d. – f.** Parachaathy **g. – h.** Velanchery hills

Plate 149: Mud slips in Walayar hills Fig. a. Moochikadavu **b.** Anakallu **c.** Akamalavaram **d.** Chottuppara Sand depositions in forests after landslides **Fig e. – f.** Parachaathy **g. – h.** Velanchery

Plate 150: Landslides and flood effects reported in Walayar hills

IV.15.2.2. Effects in Kochuthodu

Kochuthodu is the small stream flowing through Muchikadavu and Kavarakundu which got affected by the landslide at both these location. Here the water flowing capacity got reduced due to the deposition of silt, mud and large boulders (rocks) during heavy rain. The riverine system is badly affected by the uprooting of *Homonoia riparia* Lour., and *Ficus hispida* L. There is also evidence of total uprooting of other riparian elements such as Poaceae and Cyperaceae members. After the flood, lower river drainage in this riverine system has reduced the inflow of water into Malampuzha Dam.

IV.15.2.3. Effects in Pudussery South section

The large patch of surface vegetation of average 60 x 30 sq.m area got washed away, uprooting several tall trees like *Bombax ceiba* L, *Careya arborea* Roxb., *Xylia xylocarpa* (Roxb.) Taub, *Terminalia paniculata* Roth, *Grewia tiliifolia* Vahl, *Erythrina variegata* L. *Ficus racemosa* L., *Schleichera oleosa* (Lour.) Oken and *Alangium salviifolium* (L.f.) Wangerin. Heavy rain caused massive landslides which completely washed out the ground flora, especially the herbs such as *Leucas chinensis* (Retz.) R. Br, *Andrographis elongata* (Vahl) Anders., *Baliospermum solanifolium* (Burm.) Suresh, *Clerodendrum infortunatum* L., *Ruellia prostrata* Poir., *Eranthemum capense* L., *Eragrostis viscosa* (Retz.) Trin., *Urochloa distachyos* (L.) T.Q.Nguyen, *Hemidesmus indicus* (L.) R.Br. etc

IV.15.2.4. Effects in Ayyappan Mala

Ayyappan Mala landslide caused heavy destruction which resulted in washing off of the forest soil along with large rocks. Sand and silt from the forest got deposited on the stream down the hill. Excess soil and sand got spread on the nearby private land making it unsuitable for agriculture.

Sand and silt deposition favoured survival and fast spreading of certain taxa such as *Arundo donax* L., *Vitex negundo* L., *Chromolaena odorata* (L.) King & Robins. and *Lantana camara* L. Deep tuberous root system of *Arundo donax* L. prevented further soil erosion in the area. Primary colonizers of the affected area include *Mollugo oppositifolia* L., *Eragrostis riparia* (Willd.) Nees, *Torenia hirsuta* Willd, *Leucas chinensis* (Retz.) R. Br., *Solanum torvum* Sw., *Crotalaria spectabilis* Roth, *Trianthema portulacastrum* L. etc.

Falling of large trees have opened up the canopy resulting in the fast drying of the forest floor. There was a hike in the atmospheric temperature which resulted in the wilting off of these primary colonizers too. Landslide created a new channel for the flow of rain water through the hill.

IV.15.3. Reasons for the Uprooting and survival of taxa

All the taxa which fell in the landslide grew in little soil supported by large rocks. Heavy rain resulted in the erosion of ground soil exposing the trees on rocks. Poor root system has paved the way for their uprooting. Lack of buttress root system is also one of the reasons for uprooting.

Some climber taxa such as *Spatholobus parviflorus* (Ro xb. ex DC.) O. Ktze, and other trees such as *Syzygium cumini* (L.) Skeels, *Dalbergia latifolia* Roxb. etc are some of the survival taxa and their strong root system and higher soil content in those forest floors might have been the cause for their survival.

Most of the uprooted taxa grew on the Forest floor with little soil cover and hence their root system will be spread on the rocky floor without going deep. Heavy rain resulted in the erosion of ground soil exposing the trees. This has increased the rate of uprooting and total run off of trees and shrubs. Since taxa with a buttress root system is rare in this forest floor, erosion rate increased further. Table 28 summarizes the uprooted taxa recorded from the study area.

Deep root system, buttress roots, strong barks, the ability of taxa to grow in clumps like that in *Bambusa* and the liana nature of some taxa like *Spatholobus parviflorus* (Roxb. ex DC.) O. Ktze etc may be some of the reasons for their survival inspite of the heavy soil erosion following the heavy rain.

IV.15.4. Resilient taxa

Thorough field explorations in the flood affected sites documented a list of surviving taxa which includes *Ailanthus excelsus* Roxb., *Bambusa bambos* (L.) Voss , *Dillenia pentagyna* Roxb., *Ficus hispida* L. f., *Ficus microcarpa* L., *Getonia floribunda* Roxb., *Mallotus philippensis* (Lam.) Muell.-Arg., *Spatholobus parviflorus* (Roxb. ex DC.) O. Ktze., *Streblus asper* Lour., *Tectona grandis* L., *Syzygium cumini* (L.) Skeels, (L.) Skeels, *Dalbergia latifolia* Roxb., *Terminalia paniculata* Roth, *Ficus racemosa* L.,

Terminalia anogeissiana Gere & Boatwr., *Xylia xylocarpa* (Roxb.) Taub., *Sapindus trifoliatus* L. and *Dalbergia sissoo* Roxb. Table 29 and 30 summarizes the the survivor taxa and primary colonizers of the land slide affected sites respectively.

Table 28. Uprooted taxa in flood - affected regions

Sl. No	Binomial name	Family
1	*Alangium salviifolium* (L. f.) Wang.	Alanginaceae
2	*Bauhinia racemosa Lam.*	Fabaceae
3	*Bombax ceiba* L	Malvaceae
4	*Careya arborea* Roxb.	Lecythidaceae
5	*Chionanthus mala-elengi* (Dennst.) P.S.Green	Oleaceae
6	*Dalbergia latifolia* Roxb.	Fabaceae
7	*Erythrina variegata* L.	Fabaceae
8	*Ficus hispida* L.	Moraceae
9	*Ficus racemosa* L.	Moraceae
10	*Ficus racemosa* L.	Moraceae
11	*Getonia floribunda* Roxb.	Combretaceae
12	*Grewia tiliifolia* Vahl	Malvaceae
13	*Hevea braziliensis* (Willd. ex A. Juss.	Euphorbiaceae
14	*Holoptelea integrifolia* (Roxb.) Planch.	Ulmaceae
15	*Homonoia riparia* Lour.	Euphorbiaceae
16	*Macaranga peltata* (Roxb.) Muell.-Arg	Euphorbiaceae
17	*Schleichera oleosa* (Lour.) Oken	Sapindaceae
18	*Spatholobus parviflorus* (Roxb. ex DC.) O. Ktze.	Fabaceae
19	*Strychnos potatorum* L.	Loganiaceae
20	Syzygium cumini (L.) Skeels	Myrtaceae
21	*Terminalia paniculata* Roth	Combretaceae
22	*Xylia xylocarpa* (Roxb.) Taub	Fabaceae

Table 29. Survived taxa in flood affected sites

Sl. No	Binomial Name	Family
1	*Acalypha paniculata* Miq.,	Euphorbiaceae
2	*Ailanthus excelsus* Roxb.	Simaroubaceae
3	*Alangium salviifolium* (L. f.) Wang.	Alangiaceae
4	*Anamirta cocculus* (L.) Wight & Arn.	Menispermaceae
5	*Artocarpus hirsutus* Lam.	Moraceae
6	*Bambusa bambos* (L.) Voss	Poaceae
7	*Briedelia retusa* (L.) A. Juss.	Euphorbiaceae
8	*Getonia floribunda* Roxb.	Combretaceae
9	*Chionanthus mala-elengi* (Dennst.) P.S.Green	Oleaceae
10	*Dalbergia latifolia* Roxb.,	Fabaceae
11	*Dalbergia sissoo* Roxb.,	Fabaceae
12	*Dillenia pentagyna* Roxb.,	Dilleniaceae
13	*Ficus hispida* L. f.,	Moraceae
14	*Ficus microcarpa* L.	Moraceae
15	*Ficus racemosa* L.,	Moraceae
16	*Grewia tiliifolia* Vahl,	Malvaceae
17	*Ixora brachiata* Roxb. ex DC.	Rubiaceae
18	*Mallotus philippensis* (Lam.) Muell.-Arg.	Euphorbiaceae
19	*Sapindus trifoliatus* L.,	Sapindaceae
20	*Senegalia catechu* (L.f.) P.J.H.Hurter & Mabb.	Fabaceae
21	*Spatholobus parviflorus* (Roxb. ex DC.) O. Ktze.	Fabaceae
22	*Streblus asper* Lour.,	Moraceae
23	*Syzygium cumini* (L.) Skeels, (L.) Skeels	Myrtaceae
24	*Tectona grandis* L.	Lamiaceae
25	*Terminalia anogeissiana* Gere & Boatwr.,	Combretaceae
26	*Terminalia bellirica* (Gaertn.) Roxb.,	Combretaceae
27	*Terminalia paniculata* Roth,	Combretaceae
28	*Vitex altissima* L.	Lamiaceae
29	*Xylia xylocarpa* (Roxb.) Taub.	Fabaceae
30	*Zingiber nimmonii* Dalz.	Zingiberaceae

Table 30. Primary colonizers in flood affected sites

Sl. No	Binomial Name	Family
1	*Acalypha paniculata* Miq.,	Euphorbiaceae
2	*Achyranthes aspera* L.,	Amaranthaceae
3	*Acmella radicans* (Jacq.) R.K.Jansen	Asteraceae
4	*Ageratum conyzoides* L.	Asteraceae
5	*Alternanthera bettzickiana* (Regel) Voss	Amaranthaceae
6	*Arundinella mesophylla* Nees ex Steud.	Poaceae
7	*Arundo donax* L.	Poaceae
8	*Baliospermum solanifolium*(Burm.) Suresh	Euphorbiaceae
9	*Getonia floribunda Roxb.*	Combretaceae
10	*Clerodendrum infortunatum* L.	Lamiaceae
11	*Digitaria ciliaris* (Retz.) Koeler	Poaceae
12	*Eragrostis unioloides* (Retz.) Nees ex Steud.	Poaceae
13	*Eranthemum capense* L.	Acanthaceae
14	*Grona triflora* (L.) H.Ohashi & K.Ohashi (L.) DC.	Fabaceae
15	*Leucas aspera* (Willd.)	Lamiaceae
16	*Lindernia antipoda* (L.) Alston in Trimen	Linderniaceae
17	*Mitracarpus hirtus* (L.) DC.	Rubiaceae
18	*Glinus oppositifolius (L.) Aug.DC.*	Molluginaceae
19	*Clematis zeylanica Poir.*	Ranunculaceae
20	*Oplismenus burmannii* (Retz.) P. Beauv.	Poaceae
21	*Orthosiphon thymiflorus* (Roth) Sleesen.	Poaceae
22	*Vicoa indica DC.*	Asteraceae
23	*Phyllodium pulchellum* Desv.	Fabaceae
24	*Pseudarthria viscida* (L.) Wight & Arn.	Fabaceae
25	*Rhinacanthus nasutus* (L.) Kurz	Asteraceae
26	*Rungia pectinata* (L.) Nees	Acanthaceae
27	*Senegalia catechu* (L.f.) P.J.H.Hurter & Mabb.	Fabaceae
28	*Vitex negundo* L.	Lamiaceae

IV.15.5. Post Landslide modifications

Sand and silt were dumped to the agricultural land and nearby water bodies in Ayyappan Mala which further reduced the soil fertility and water holding capacity. In Velanchery, soil deposition and fallen trees reached even the B track of the railway line which partially blocked the rail service for a day. The soil was then removed with the help of machines and manpower. In Anakundu, the destruction of “Ana” resulted in the dumping

of sand and silt to the nearby lowlands and agricultural lands which totally destroyed the whole agriculture sector in this area.

Further, the opening of canopy lead to the invasion of many invasive alien species in the land slide struck sites and nearby areas. The agricultural areas became unproductive due to the faster infestation of these invasive taxa. Table 31 summarizes the alien invasive taxa in flood effected sites in the study area. The water flow in the rivers was blocked and the main water sources in the forest tracks such as 'Valiyaeri' got filled up by mud and slit and the waterlevel in the 'eri' got tremendously reduced affecting the water resource to wild animals. It is also observed that fast evaporation of the ground water leads to the accelerated drying of the forest floor than their normal drying rate. This will lead to the total dryness of the forest which will lead to increased forest temperature that badly affects the survival of both flora and fauna.

Table 31. Alien - invasive taxa in landslide affected areas

Sl. No	Binomial Name	Family
1	*Ageratum conyzoides* L.	Asteraceae
2	*Chromolaena odorata* (L.) King & Robins.	Asteraceae
3	*Mesosphaerum suaveolens (L.) Kuntze*	Lamiaceae
4	*Lantana camara* L.	Verbenaceae
5	*Mikania micrantha* Kunth	Asteraceae
6	*Mimosa pudica* L.	Fabaceae
7	*Acmella radicans* (Jacq.) R.K.Jansen	Asteraceae
8	*Chloris barbata* Sw.	Poaceae
9	*Oxalis corniculata* L.	Oxalidaceae
10	*Corchorus aestuans* L.	Malvaceae
11	*Mimosa diplotricha* C.Wright	Fabaceae
12	*Triumfetta rhomboidea* Jacq.	Malvaceae
13	*Ipomoea hederifolia* L.	Convolvulaceae
14	*Synedrella nodiflora* Gaertn.	Asteraceae
15	*Scoparia dulcis* L.	Plantaginaceae

IV.15.6. Bio-restoration and status of landslide hit areas

Biomonitoring of the landslide affected forest tracts were carried out between 2019 to 2023 and the following observations could be recorded.

The landslide hit areas were monitored annually for documenting the natural restoration. The restoration of the natural forest in the range is a very slow process and only a few forest elements were found to be colonized in the area. The young plants of

Cipadessa baccifera Miq., *Macaranga peltat*a Müll.Arg., *Mallotus philippensis* (Lam.) Müll.Arg., *Cissampelos pareira* L., *Hemidesmus indicus* (L.) R.Br., *Holarrhena pubescens* Wall. & G.Don, *Ailanthus excelsus* Roxb., *Xylia xylocarpa* (Roxb.) W.Theob. and *Ficus racemosa* L. could be recorded in the sites of landslides where small to medium sized rocks are scattered and the ground soil is found to be sandy with little humus content.

The herbaceous taxa in the landslide affected sites include *Pogostemon purpurascens Dalzell, Azanza lampas Alef., Crotalaria pallida Aiton, Oplismenus compositus* P.Beauv., *Cyrtococcum oxyphyllum* Stapf, *Glinus oppositifolius* (L.) Aug.DC, *Arundinella mesophylla* Nees ex Steud. etc. The restoration of the forest floor is very little due to the invasion of alien plant taxa especially *Mikania micrantha* Kunth and *Chromolaena odorata* (L.) R.M.King & H.Rob. which covered the entire forest floor within three months of the occurrence of landslide. The invasion got triggered by the open canopy due to the falling of trees and the other factors include new fertile sandy soil and the absence of other competitive native taxa.

The lower stretches of the forest where the agricultural lands and catchment area of Malampuzha dam got filled with flooded sand and debris made the soil infertile and changed the entire topography of the region. In Parachaathy, Anakundu and Velanchery regions, the entire agricultural land got ruined and made further agriculture impossible due to the filling of flood sand to several feets. As a result, the flooded agriculture site is no longer in cultivation. Only a few taxa were found to be colonized in these areas and includes *Blumea oxyodonta* DC., *Lindernia hyssopioides* Haines, *Lindernia rotundifolia* (L.) Alston, *Torenia crustacea* (L.) Cham. & Schltdl.,*Yamazakia pusilla* (Willd.) W.R.Barker, *Glinus oppositifolius* (L.) Aug.DC., *Eragrostis unioloides* Nees ex Steud., *Eragrostis viscosa* Trin., *Distimake aegyptius* (L.) A.R.Simões & Staple etc.

Further, one of the important threat happened in Velanchery and Anakundu region is the invasion of foreign taxa such as *Arundo donax* L., *Cuscuta chinensis* Lam., *Chromolaena odorata* (L.) R.*M.King & H.Rob., Mikania micrantha Kunth, Trema orientale Blume* and *Lantana camara* L. The massive invasion of these taxa inside the forest tracts were also observed since the railway track passes through the forest belt .

Detailed analysis of the effects of landslides in Walayar forest range revealed that the loss of vegetation in the landslide affected site depends on the topography of soil and the composition of herbaceous plants dwelling in the rocky patches. Most of the survival taxa found is having a deep root system and the uprooted taxa is found to be in the hill

slopes with less soil support or either dwelling in the rocky patches. The opening of the canopy led to the invasion of alien - invasive plant taxa which flourished due to the presence of new nutritious soil and lack of competitive native species.

IV.15.6.1. Natural Bio restoration

Revisit to all the landslide hit areas in 2022-23 period showed that the natural restoration process has already been initiated by Nature itself, by the introduction of taxa, colonization and natural green coverage for the washed-out locations. The introduction process showed that most of them are alien, cosmopolitan taxa that possess higher ecological amplitude (Plate 151).

IV.16. Threats to habitats and biodiversity loss

Objective addressed

- Threats operating in habitats of Walayar forest range

Walayar range forests are located within the Gap with extensions of hill tract to both southern and northern lips. As the Gap connects the state of Kerala with Tamil Nadu by road and rail connections, human interventions at the Gap zone are intensive. The biodiversity elements of this range are being subjected to harsh environmental fluctuations and both man made as well as natural factors contribute to the depletion of biodiversity (Plate 152 - 156).

IV.16.1. Natural causes

IV.16.1.1. Natural calamities

Walayar forests faced serious calamities of floods, landslides and mudslides in 2018 Kerala floods and it seriously affected the biodiversity of this region. Since the upper ranges of the hills form inselbergs and sharp slope of hills is a major factor, the landslides caused serious erosion and resulted in the uprooting of major trees, shrubs and lianas. The massive erosions further made the roots of many larger survivor trees to get exposed and these trees are easily prone to fall off even if a minor landslide or mudslide occurs in future monsoons.

After, the water channels from the mountainous tract got filled up by the sand and silt which flew down during heavy rain and got its destiny in the main riverine systems like Onaampuzha, Mylaadumpuzha, Mukaipuzha, Korayaarpuzha etc. This further affected the natural flow of water to the reservoirs. The dumped sand and mud is several feet high making the flow of the river a tedious procedure. This resulted in the invasion of riverine

Plate 151: Biomonitoring of landslide affected areas Fig. a- d. Landslide affected sites after 5 years **Fig. e – h.** Forest margins and agricultural lands after 5 years

vegetation by many invasive taxa such as *Mikania micrantha* Kunth, *Cuscuta chinensis* Lam., *Pontederia crassipes* Mart., *Pistia stratiotes* L., *Salvinia molesta* D.Mitch. etc.

IV.16.1.2. Forest Fire

As this range experiences serious drought in the months of February to May, forest fire is a serious threat which destroys the biodiversity of a specific area within no time. The deciduous patches of the hill tracts and open rocky grassy hillocks are the most susceptible areas for the forest fire. The forest department used to create fire lines in order to reduce the risk of forest fires and their spread in forest margins such as Thekke Malampuzha, Kava, Poozhikunnu, Karadikunnu, Kaatadikunnu etc. and in the forest tracts of Parachaathy, Kozhimala, Kavarakundu, Kanyaarmuttu, Velanchery hills, Chacolas estate and Aamalavaram hills. Since, the range is a tourist spot,the forest department also clears the dry ground vegetation near the roadsides and the railway lines in order to reduce the accidental catch of fire due to human activities.

IV.16.1.3. Alien - Invasive taxa

The growth of many native taxa got affected by the invasion of introduced alien taxa. The wellbeing of natural flora gets seriously affected by the over dominance of invasive elements like *Chromolaena odorata* (L.) R.M.King & H.Rob., *Mikania micrantha* Kunth, *Parthenium hysterophorus* L., *Croton bonplandianus* Baill., *Mesosphaerum suaveolens* (L.) Kuntze, *Lantana camara* L. etc. These taxa are fast growing and are great competitors to the native taxa in the forest tracts. *Pontederia crassipes* Mart., *Pontederia vaginalis* Burm.f., *Typha angustifolia* L. and *Saccharum spontaneum* L., *Xanthium strumarium* L. and a pteridophyte viz., *Salvinia molesta* D.S.Mitch. are creating great threats to the riverine and wetland systems in the forest range. These plants adversely affects the natural flow of the water through the river and the rapid growth and multiplication of these prevents the growth of native elements in riverine systems. The landslide and flood hit areas of the forest floor opened up the canopy and such areas were pioneered by the invasive elements like M*ikania micrantha* Kunth, *Mesosphaerum suaveolens* (L.) Kuntze, and *Chromolaena odorata* (L.) R.M.King.

IV.16.1.4. Wildlife corridors through the Gap

The Palghat Gap, though a natural pass, has been used by wildlife for migration to the south of the Gap from earlier periods. As humans also started using this for connectivity through roads and rails, man-animal conflict became a routine and is a serious issue within this range. The elephant corridors within the gap poses serious threats to human life along with transportation through the gap.

IV.16.2. Anthropogenic disturbances

IV.16.2.1. Urbanization and Industrialization

Walayar region connects the two states through Palakkad Pass and the area is getting populated by industries. Many of the major industries of the state are being concentrated within this range like Malabar Cements Ltd., ITI (Industrial Training Institute), BHEL (Bharat Heavy Electricals Limited) and many more public and private sector firms. The infrastructure development for industries and settlements are being undertaken in the range by land acquisition and this depletes the natural habitats for the existence of biodiversity elements.

IV.16.2.2. Mines and quarries

One of the major mines of the state, "Chulliyar - Pandarathu mines" lies in the contiguous block of forests in Walayar range on the basis of which Malabar Cements Ltd. is getting its material resources. These mines have consumed much of the serene habitats within the Pudussery section of the range, where the vegetation is highly diverse. Quarry operations in the range are also high and there are three active quarries in the range along with four abandoned quarries. Around 55 hectares of land has been procured for the activity of the mines and quarries. These quarries pose great threat to the natural vegetation since the soil and rocks become very fragile due to the mining activities for the extraction of rocks. Therefore the forest tracts near the quarries are prone to landslides and mudslides when there is heavy rain downpours. The activity of the mines have created a soothy atmosphere in the forests near and the plants are covered with grey dust. This inturn adversely affects the growth pattern of the plants and the health of the plants in turn are further compromised.

IV.16.2.3. Pollution

With increased industrialization in Kanjikode- Walayar sector along with active mines at Pudussery section, the pollution rate increased manifold and the quality of air and water showed drastic decline throughout the year. Industrial effluents pollute the Walayar and Korayar rivers which ultimately joins with Kalpathi river and drains to Bharathapuzha and some part reaches the Malampuzha reservoir. Functioning of IMAGE - biomedical waste management Unit, operating at the catchment area of Malampuzha reservoir is a serious threat to the range as the leachates from the unit during rains reaches the reservoir, which is being used for drinking purposes. The waste dumping into rivulets is a serious threat to the aquatic fauna which ultimately affects the fish fauna of the reservoir.

Industrial pollution further causes the vegetation of the area to turn to ashy green with the deposition of fine dust and smoke on the aerial plant parts. Further, most of the industries have their liquid waste outlet to the Walayar and Korayar rivers which compromises the water quality of these sources. The water has now turned not to be used for drinking and other household purposes.

IV.16.2.4. Dumping of wastes

The human settlements and the tourism activities cause a serious threat to the habitat through waste dumping, especially plastic wastes. Fertility of soil gets depleted by the uncontrolled waste dumping on the tourism spots and urbanized areas. Faunal population directly consumes many of them along with their food and thus causes serious damages to the health of the population. The railway tracks (Track B) passing through the interior forest form one of the unintentional waste dumping grounds by the passengers of the trains. Since the rail travelers threw waste very carelessly along with spill over food and the incidences of consumption of such waste by wild animals in this sector.

IV.16.2.5. Grazing

As the range includes villages and tribal settlements, cattle rearing is being done as part of their daily livelihood. The uncontrolled grazing of these domestic animals in the hills and low altitude hillocks in the range make small herbaceous taxa susceptible and in the long run, their population gets diminished and they may vanish out from the natural vegetation.

IV.16.2.6. Over exploitation of resources

The tribal inhabitants of the range collect non-wood forest products like medicinal resources like *Asparagus, Piper,* honey, wild edible fruits like *Phyllanthus*, *Momordica* etc. for their daily livelihood. They catch fish from the rivulets and sell them in the market. But uncontrolled and unsustainable harvest technologies adopted by the young generation is a serious threat to the regeneration of these bioresources and are also getting depleted.

IV.16.2.7. Man - animal conflicts

Encroachment of human beings into the wild for agricultural practices have created disturbances to the natural habitat and fragmentation of the animal territory. Further, lack of food materials and water in the interior forests and the availability of enough food and water in the lower stretches of forests have also made the wild animals to move out of their natural abode and the incidence of occurrence of wild elephant, deer, pig, peafowl, Jackal , tiger etc. in the human inhabited regions have now become a very common sight. Among

these wild animals, elephant, wild pig and peafowl create great threat to the agricultural fields and farms in the range. Further, the electric fences to control these wild attacks have adversely affected life of many wild animals also. The occurrence of animal corridors near the farms is another reason for the frequent human - animal conflicts.

IV.16.2.8. Unscientific agricultural practices

As the catchment area harbors human settlements, agricultural practices for growing paddy, banana, cashew, coconut, arecanut and pepper were initiated by the people. With the arrival of new agricultural practices, Rubber (*Hevea braziliensis* (Willd. ex A. Juss.) Muell.-Arg.) Cocco (*Theobroma cacao* L.) and Pineapple (*Ananas comosus* (L.) Merr.) took over the forest margins and valleys of Walayar forests. Numerous teak, mango and mahagony plantations also occur in private lands in this range. The fertilizers and chemical pesticides in plantations reach the reservoir of Malampuzha, which is the major irrigation project in Palakkad district. The people of Palakkad taluk rely on this project for drinking water purposes.

IV.16.2.9. Tourism

The tourism activities within this range is being focused on two reservoirs, the Malampuzha Dam, the largest Dam in Kerala and Walayar, the irrigation Dam at the boundary of the state. Much of the area near the reservoirs have been developed into a garden and the 32 km catchment also attracts tourists. Thousands of tourists visit the dam on a daily basis, and this results in dumping of wastes, plastic pollution and also imparts pressure on the vegetation and wildlife along 32 km ring road area in the catchment zone. Deer Park and Snake park are other tourist spots in the range with poor maintenance. The animals in the deer park are not having enough resources to feed, since the park is constructed in the teak plantation.

IV.16.2.10. Plantations

The human settlements in the catchment area of Malampuzha reservoir made the conversion of forest land in the earlier period to plantation purposes. Plantations of Rubber (*Hevea braziliensis* (Willd. ex A. Juss.) Muell.-Arg.) Cocco (*Theobroma cacao* L.) and Pineapple (*Ananas comosus* (L.) Merr.) took over the forest margins and valleys of Walayar forests and many of them completed the lease period and are now under the custody of forest department. The permissions for plantations in interior forest areas affected the health of the forest vegetation and many like G P Nair Estate, Chakkolas estate,

Emoor Bhagavathy plantations are under natural regeneration. Several areas in the range is still maintained for several plantations of Teak, *Eucalyptus*, *Acacia*, Cashew, Rubber, Sandalwood, *Ailanthus, Casuarina* and other miscellaneous trees. About 2166.54 hectares of forest land was converted to various plantations till 2008. The conversion of forest land to such plantations have made drastic changes in the forest ecosystem.

IV.16.2.11. Threats to low altitude hillocks in Palghat Gap region

National highway expansion resulted in the vanishing of small rocky outcrops and many of them face serious disturbances. Indiscriminate quarrying in these low altitude hillocks negatively affects the unique microflora and fauna. These hillock systems are often considered as wastelands and are now used as main waste dumping sites which adversely affects the soil fertility and the vegetation. Grazing and other anthropogenic intervention are other factors which diminishes the vegetation in faster rates. Industries surrounding the hillock systems further affects the vegetation there. Invasive taxa such as *Mesosphaerum suaveolens* (L.) Kuntze, *Chromolaena odorata* (L.) R.M.King & H.Rob., *Mikania micrantha* Kunth, *Lantana camara* L., *Croton hirtus* L'Hér. etc.have colonised over native plants in the hillocks and is found to be a major threat replacing the native vegetation. Further, during the drier seasons, the taxa such as *Mesosphaerum suaveolens* (L.) Kuntze, *Chromolaena odorata* (L.) R.M.King & H.Rob., *Lantana camara* L., *Apluda mutica* L. etc are easily prone to catch fire due to the presence of volatile oils and the chances of forest fire increases manyfold. The rocky outcrops are further surrounded by monocultures such as Teak, Mango, cashew and *Acacia* plantations. Mitigation measures are urgently required to reduce the pressure on the vegetation, otherwise, the remaining vegetation in the Gap zone will vanish within no time.

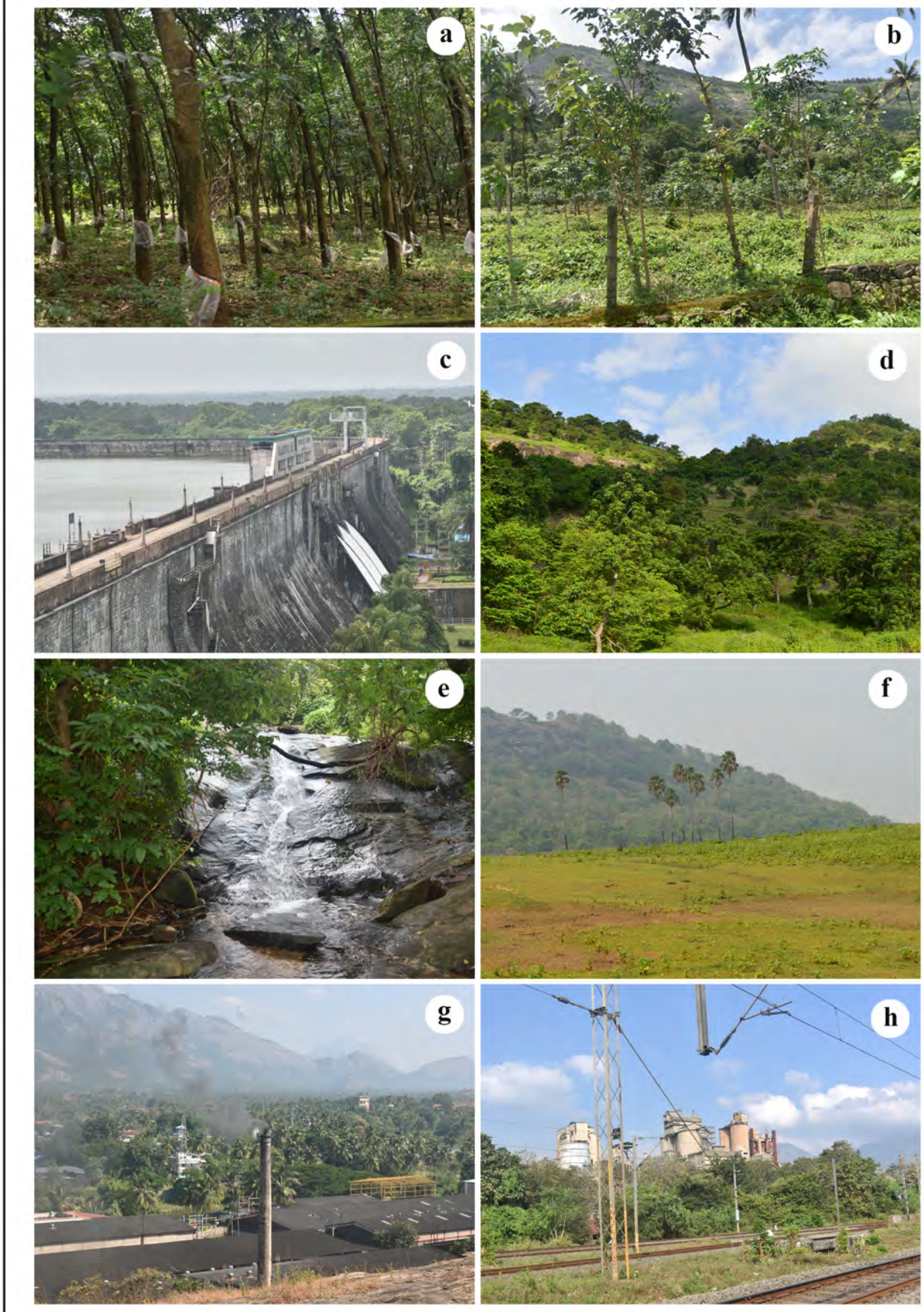

Plate 152: Threats to biodiversity Fig. a. – b. Estates and plantations **Fig. c. – f.** Tourist places in study area **c.** Malampuzha dam **d. – e.** Thekke Malampuzha **f.** Kava **Fig. g. – h. Industries in Walayar forest range g.** Kanjikode industrial area near hillocks **h.** Malabar Cements in the forest areas

Plate 153: Threats to biodiversity Fig. a. – c. Alien – invasive taxa a. – b. Fast growing and spreading of *Acacia* trees in the forest tracks and in the catchment area of dam **c.** *Mikania micrantha* Kunth infestation the forest tracks **d.** Grazing **e.** Waste disposal in the forest areas **f.** Highways passing near rocky outcrops Fig. **g. – h. Quarries and mines g.** Quarries in rocky outcrops **h.** Mines of Malabar cements

Plate 154: Threats to biodiversity: Man – animal conflicts in Walayar hills

Plate 155: Threats to biodiversity – Forest fire in Walayar hill tracts

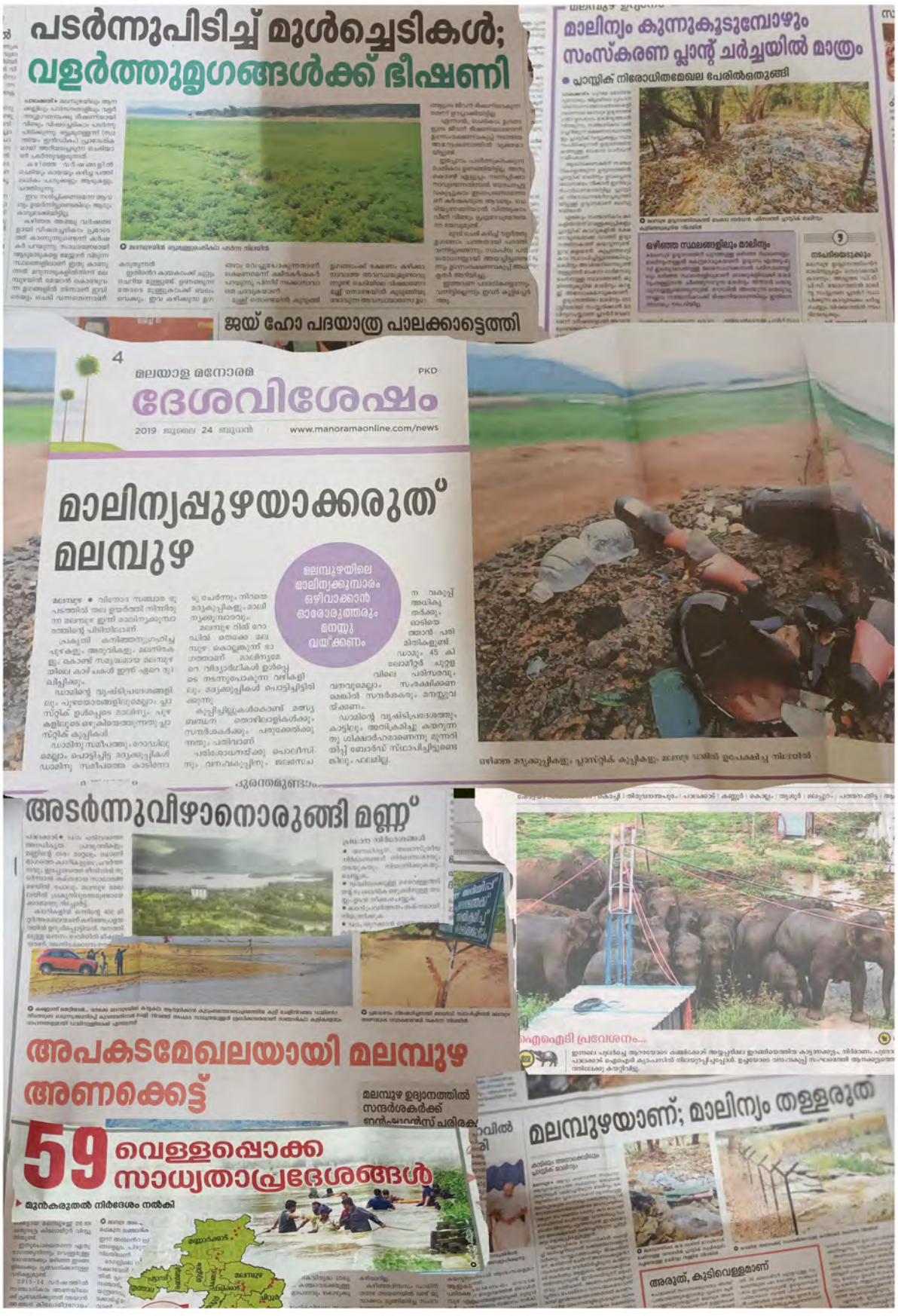

Plate 156: Various threats of Walayar hills reported in newspapers

V. Discussion and Conclusions

V.1. Contextual basis of the research problem

Western Ghats, being one of the hottest hotspots, is rich in floral and faunal biodiversity with high degree of endemism and the threat level of the elements are also found to be high. These long stretches of hill tracts are broken by a 32 km Palghat Gap, which sets apart the Nilgiri Hills to the north and the Anaimalai Hills to the south. The Gap located near to the state boundary separates Palakkad district of Kerala and Coimbatore district of Tamil Nadu, thus acting as a main corridor for transport by means of rail lines and highways and further influences the southwest monsoons due to its geographical features (Subramanian & Muraleedharan, 1985) and Cruz *et al*., (2000).

Since the loss of biodiversity has become a major concern in the present century, the need for proper conservation of this floristic wealth has become inevitable. Unpredicted climatic changes such as heavy rain or least precipitation, extremely hot or extremely cold seasons, cyclones, tsunami's, earthquakes and forest fires have triggered the pace in loss of biodiversity. Global biodiversity assessments are being done based on location based microlevel documentations and hence the assessment of the floristic wealth of a region with frequent fluctuations in climatic and edaphic factors turns out to be significant. The assessment of biodiverse elements of flora and fauna through extensive seasonal field visits, documentations and interpretations in the light of climate change becomes the pioneer step towards any conservation and protection initiatives. It is in this context, the floral documentation of Walayar forests located within the Palghat Gap, a geographical corridor, has been undertaken in this research. Walayar forest range lies at the north western side of Palghat Gap is included under Palakkad Forest division. The forest range is featured by the dominance of inselberg formations in the main hill tracts and many low altitude granitic rocky outcrops. The range forms one of the most disturbed areas in southern Western Ghats with high incidence of human - animal conflicts especially the elephants, major transport routes between two states along with tourist locations. In addition, due to geographical location, the range experiences extreme climates with torrential winds blowing through the Gap with hot currents during summer and less rain due to the proximity to the rain shadow region of the Ghats. Though, geographically the area is unique, no thorough floristic explorations have been conducted in this hill range. Several unique elements collected from Walayar hills were cited in literature many decades back. The floristic documentation in comparison with the previous knowledge base will depict the present status of this

geographically unique ecosystem and will assist in the planning of any conservation initiatives in this range along with sustainable development. The data may be useful in the mitigation measures to reduce the frequent man-animal conflicts in this region. Further, the floristic exploration and documentation will help to understand the influence of Palghat Gap features in the distribution of vegetation in and across the Gap.

V.2. Review of the vegetation

The floristic explorations in Walayar hill ranges could document 1077 taxa under 610 genera which belong to 133 families. Critical evaluation of the present results with the earlier floristic literature published from Kerala showed that the species diversity is high with unique elements within a small geographical area (Table 32). The Flora of Palghat District (Vajravelu,1990) is the exhaustive floristic document published for the entire district of Palakkad covering about 4400 sq km and this document could record only 1355 species under 732 genera belonging to 146 families. This elemental comparison in numbers alone projects the significance of location based floristic assessments, especially in fragile ecosystems.

Among the eleven clades recorded, Rosids were the most speciose clade with 398 taxa followed by Asterids (288 taxa), Commelinids (203 taxa) and monocots (52 taxa). While analyzing the generic diversity also, Rosids records the highest number with 221 genera followed by Asterids (170 genera), Commelinids (88 genera) and Campanulids (37 genera). The distribution of species and genera among different clades is summarized in figure 40.

The analysis of the orders at species level revealed that, Poales is the most speciose order with 155 taxa followed by Lamiales (133 taxa), Fabales (129 taxa), Gentianales (83 taxa) and Malpighiales (70 taxa). The distribution of taxa among various orders is summarized in figure 41. When generic diversity among orders were assessed, lamiales accounted for the highest number with 77 genera followed by Fabales (68 genera), Poales (67 genera), Gentianales (57 genera) and Malpighiales (36 genera). Fabaceae are found to be the most speciose family with 125 taxa followed by Poaceae (102 taxa), Cyperaceae (46 taxa), Acanthaceae (44 taxa), Asteraceae and Rubiaceae with 41 taxa each (Figure 42). This statistical data matches with *the flora of Palghat district* (Vajravelu, 1990) and *Flora of Attappady hills* (Anilkumar, 2015) where Fabaceae forms the speciose family with 132 and 164 species respectively. Poaceae follows the richness next with 81 and 102 taxa in Palakkad district as a whole and Attappady hills.

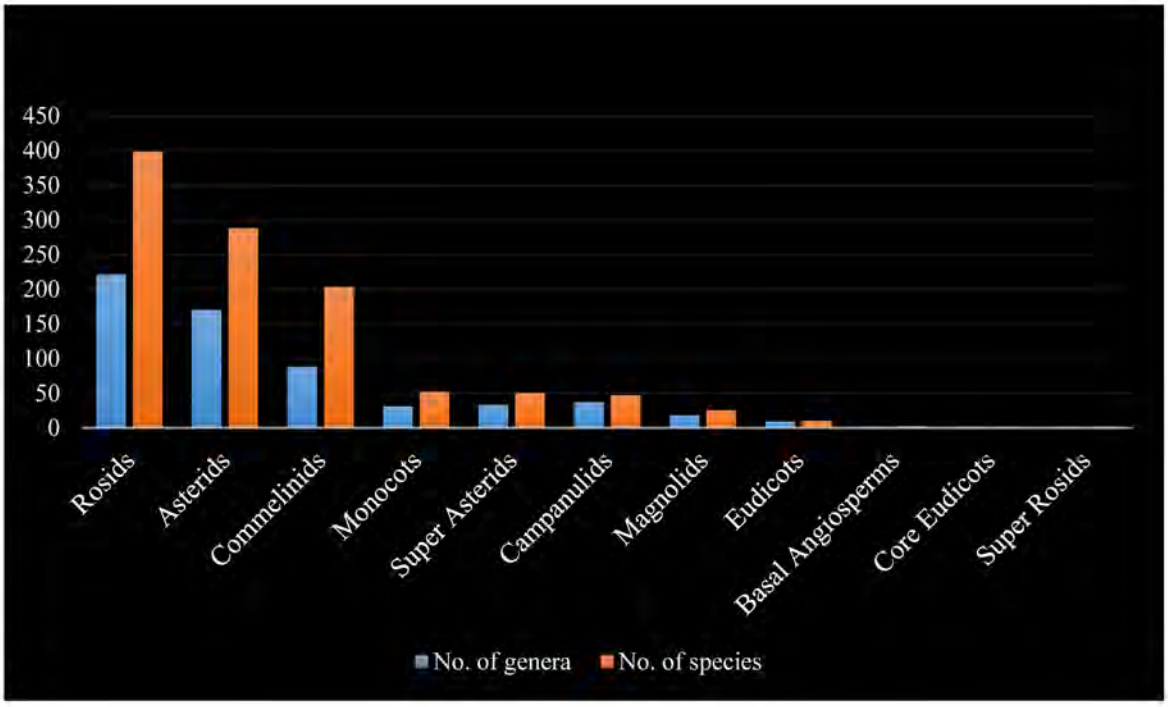

Figure 40. Distribution of taxa among clades

Figure 41. Distribution of taxa among orders

Table 32. Comparative analysis of species diversity recorded across Kerala

Sl. No	Flora	Number of taxa	Area (km^2)
1	**Flora of Walayar hill ranges (Present study 2023)**	**1077**	**126**
2	*Flora of Nelliyampathy hills* (Jabeena, 2021)	1529	206
3	*Flora of Dhoni hills* (Rekha, 2019)	668	33
4	*Flora of Kollengode range* (Soumya, 2018)	955	68
5	*Flora of Aralam Wildlife Sanctuary* (Dantas, 2017)	1018	55
6	Flora of Attappady Hills (Anilkumar, 2015)	1670	746
7	*Flora of Achankovil forest range* (Jose, 2015)	1040	269
8	*Flora of Pathanamthitta* (Anilkumar and Sivadasan, 2005)	1249	2697
9	Floristic study of Wayanad District (Narayanan, 2009)	2034	2136
10	*Flora of Parambikulam Wildlife Sanctuary* (Sasidharan, 2002)	1432	274
11	*Flora of Alappuzha district* (Sunil and Sivadasan, 2009)	1111	1414
12	*Flora of Periyar Tiger Reserve* (Sasidharan, 1998)	1978	777
13	*Flora of Shenduruny Wildlife Sanctuary* (Sasidharan, 1999)	951	100
14	*Flora of Nilambur* (Sivarajan & Mathew, 1997)	1132	150
15	*Flowering plants of Thrissur forests* (Sasidharan and Sivarajan, 1996)	1225	1041
16	*Flora of Thiruvananthapuram* (Mohanan & Henry, 1994)	1270	2191
17	*Flora of Malappuram district* (Babu, 1990)	813	3548
18	*Flora of Palghat district* (Vajravelu,1990)	1355	4400
19	*Flora of Cannanore* (Ramachandran & Nair, 1988)	1132	3670
20	*Flora of Silent Valley National park* (Manilal, 1988)	966	90
21	*Flora of Calicut* (Manilal & Sivarajan, 1982)	983	600

Recent updates on the plant diversity in India prepared from the ENVIS centre (Arisdason & Lakshminarasimhan, 2023) reports Fabaceae to be the largest family followed by Orchidaceae. The families Fabaceae, Asteraceae, Rubiaceae, Cyperaceae, Euphorbiaceae, Acanthaceae, Rosaceae and Lamiaceae follow the most speciose families according to the statistics. The reason for the dominance of Fabaceae over Poaceae in Walayar hills might be due to the drier habitat prevailing in the hills and the lack of large montane high-altitude grasslands. Even though grassland bits have been observed in

altitudes above 800m asl, they are exposed to higher temperature regimes and dry hot winds blowing through the Gap throughout the post monsoon period. This reduces the chances of colonization of those taxa that prefer adequate moisture and cooler temperature. The grasses recorded from Walayar hills are found to have more adaptability to higher temperature regimes and have the capacity to thrive water scarcity during drier periods. Effective wind pollination and seed dispersal in the gap region further helps the survival of such taxa in this region. Fabaceae members are found to have wider habitat adaptability, effective self or cross pollination, successful seed setting and germination regimes, and these might have been the reasons for their easy survival in the hill tracts of Walayar. The overall diversity profile in Walayar hill ranges are summarized in table 33.

Further, the checklist of taxa belonging to family Euphorbiaceae following Bentham and Hooker's system showed the presence of 55 species. The members in this family are featured by plants with milky or watery sap and are very well adapted to deciduous forests. Since, the study area is predominating with deciduous vegetation, the survival and flourishing of members of this family become more frequent. The members included under genera *Acalypha* viz., *Acalypha fruticosa* Forssk. is a common bio fencing shrub found in the outskirts of hillock systems and *Acalypha indica* L. is found in the lower stretches of hillocks, in the degraded forest tracts, roadsides, plains and other wastelands. The large populations of this taxon and fast spreading into the natural forests indicates the invasive potential of this taxon in the future. *Acalypha paniculata* Miq. forms the most common members in the understory of all forest tracts in the study area. Apart from this, *Mallotus philippensis* (Lam.) Müll. Arg. is a common tree member found in the hill tracts of Walayar.

The hillock systems are also diverse by the presence of herbaceous members like *Microstachys chamaelea* (L.) Müll. Arg., *Phyllanthus maderaspatensis* L. and *Phyllanthus virgatus* G. Forst. One of the distinguishing features of the hillock vegetation is the presence of *Euphorbia tortilis* Rottler ex Ainslie and *Givotia moluccana* (L.) Sreem. towards the northern end of the study area, very close to the state border of Kerala. These taxa form the dominant members in the Euphorbiaceous scrub jungles found towards the northern ends of Palghat Gap and are never found towards the southern lip of Walayar range. These unique elements found in these hillock systems clearly depict the vegetation shift happening in the gap area due to the prevalent geographical and edaphic features.

Table 33. Diversity profile of Walayar hill ranges

Sl. No	Orders with higher number of genera	Order with higher number of species	Families with higher number of genera	Families with higher number of species	Genera with higher number of species
1	Lamiales (77)	Poales (155)	Fabaceae (65)	Fabaceae (125)	*Cyperus* (29)
2	Fabales (68)	Lamiales (133)	Poaceae (55)	Poaceae (102)	*Ipomoea* (14)
3	Poales (67)	Fabales (129)	Asteraceae (32)	Cyperaceae (46)	*Ficus* (14)
4	Gentianales (57)	Gentianales (83)	Apocynaceae (26)	Acanthaceae (44)	*Crotalaria* (9)
5	Malpighiales (36)	Malpighiales (70)	Rubiaceae (25)	Asteraceae (41)	*Eragrostis* (9)
6	Asterales (34)	Asterales (44)	Acanthaceae (20)	Rubiaceae (41)	*Fimbristylis* (8)
7	Sapindales (33)	Caryophyllales (44)	Lamiaceae (20)	Malvaceae (38)	*Dioscorea* (8)
8	Caryophyllales (28)	Malvales (41)	Malvaceae (19)	Lamiaceae (34)	*Phyllanthus* (8)
9	Malvales (22)	Solanales (40)	Euphorbiaceae (15)	Apocynaceae (32)	*Impatiens* (7)
10	Solanales (16)	Rosales (38)	Amaranthaceae (11)	Euphorbiaceae (31)	*Terminalia* (7)

Critical evaluation of the diversity existing within the genera with interspecific variations showed that the area is species rich with members of Cyperaceae (46 taxa) with predominance of genus *Cyperus* and *Fimbristylis* represented by 29 and 8 taxa each. This is followed by Acanthaceae and Asteraceae with 44 and 41 taxa respectively (Figure 43). The attractive floral features makes the members of Asteraceae pollinated by both insects and by wind. The members in Cyperaceae are having flowers with exposed anthers and therefore the chances of pollination by means of strong winds would be high and seed setting rate of the members of both the families are also found to be very high. The light weight of mature seeds in Cyperaceae and light seeds with pappus hairs in members of Asteraceae further favors seed dispersal through wind.

Further, the diversity of *Cyperus* in the study area highlights the favorable and suitable ecosystems viz., wet and marshy places such as catchment areas of dams, margins of waterfalls, wet areas in forest tracks, paddy fields, canals etc. The diversity of Acanthaceae in Walayar hills might be due to the suitable floral pattern of members under this group. The flowers are often protected by foliaceous or spathaceous bracts. The members under this family except few are characterized by fruits with layers of testa which

are hygroscopic in nature. The study area experiences varied climatic conditions such as heavy rain followed by hot dry seasons. This results in the explosive splitting of mature fruit walls in the presence of water droplets and thus helps in the wide dispersal of seeds in the forest tracts.

Floristic explorations have led to the documentation of certain unique taxa with special ecological features. The second most speciose genera in Walayar hills is *Ficus* and are represented by 14 species. The members in this genera are mostly found to be associated with the riparian systems of the study area. Among the species, *Ficus benghalensis* L. and *Ficus religiosa* L. are found in the plains and other wastelands, rest of the members are found near the waterfalls on the rocky patches of the forest or on the forest floor near to water sources. Often these trees act as keystone species in providing food to all the animal groups in the forests during the dry season. The diversity of the genus *Ficus* is found to be proportionally high in the gap area since the hill tracts are having many rivulets flowing through the gap such as the Bharathapuzha, Walayar river etc.

Nervilia is a terrestrial tuberous one-leaved herb represented by four species in Kerala viz., *Nervilia concolor* Schltr., *Nervilia infundibulifolia* Blatt. & McCann, *Nervilia plicata* Schltr. and *Nervilia simplex* (Spreng.) Schltr. and all the four species of this taxon are found to occur in the hill tracts of Walayar. The representation of this taxon in nearby floras are meager viz., *N. plicata* only in *Flora of Palghat* (Vajravelu, 1990), *N. simplex* and *N. concolor* from Dhoni hills (Rekha, 2019), three species in *Parambikulam flora* (Sasidharan, 2002) viz., *N. concolor, N. simplex* and *N. plicata,* while *N. simplex* is the only species reported from Silent Valley hills (Manilal, 1988). The taxon could not be traced from Kollengode hills (Soumya, 2018) and Nelliyampathy hills (Jabeena, 2021). This reveals that the taxon finds suitable habitats for coexistence with a narrow distribution range at the Palghat Gap region. This taxon was found to be inhabiting in very small populations in the Moochikadavu and Akamalavaram hills of Walayar and further, this taxon is being collected for its tuber and used as a rare ethnobotanical medicine for treatment of migraine and sinusitis. This continuous exploitation might be one of the reasons for the narrow distribution with few populations.

Walayar forest range is within the Gap zone and is prone to higher wind velocity through the Gap and higher temperature ranging upto 42 degrees or more in drier seasons. Owing to these extremities, the vegetation elements in the Gap and near the Gap are showing more representation of dry deciduous and anemophilous taxa along with anemochorous ones like *Cochlospermum, Pterocarpus*, *Terminalia, Combretum,*

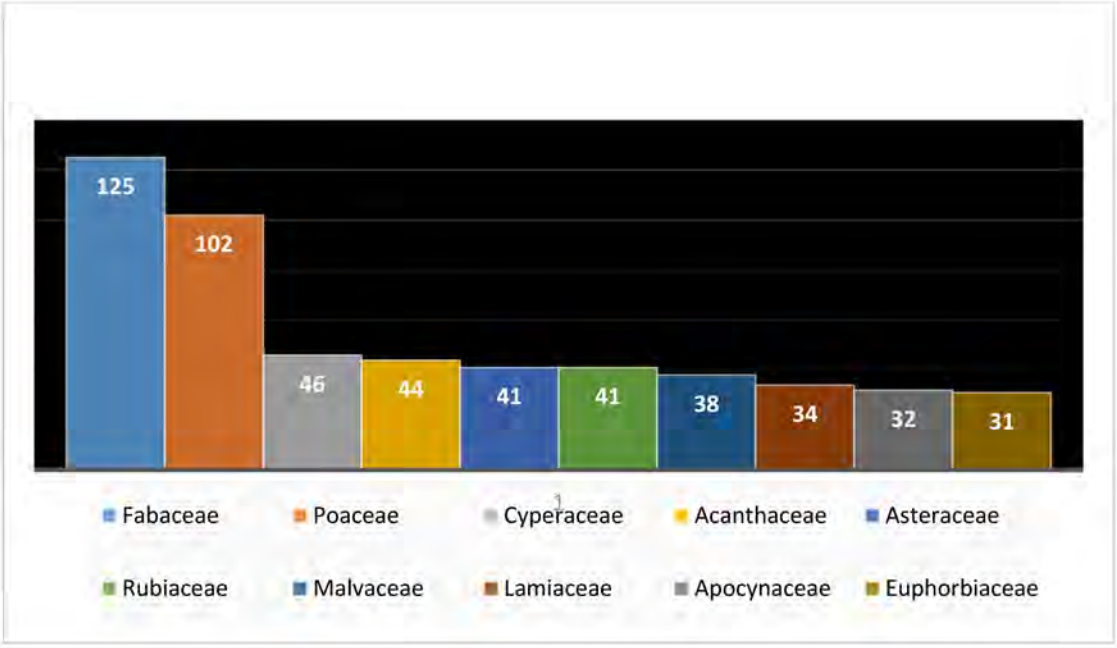

Figure 42. Distribution of species among families in Walayar hills

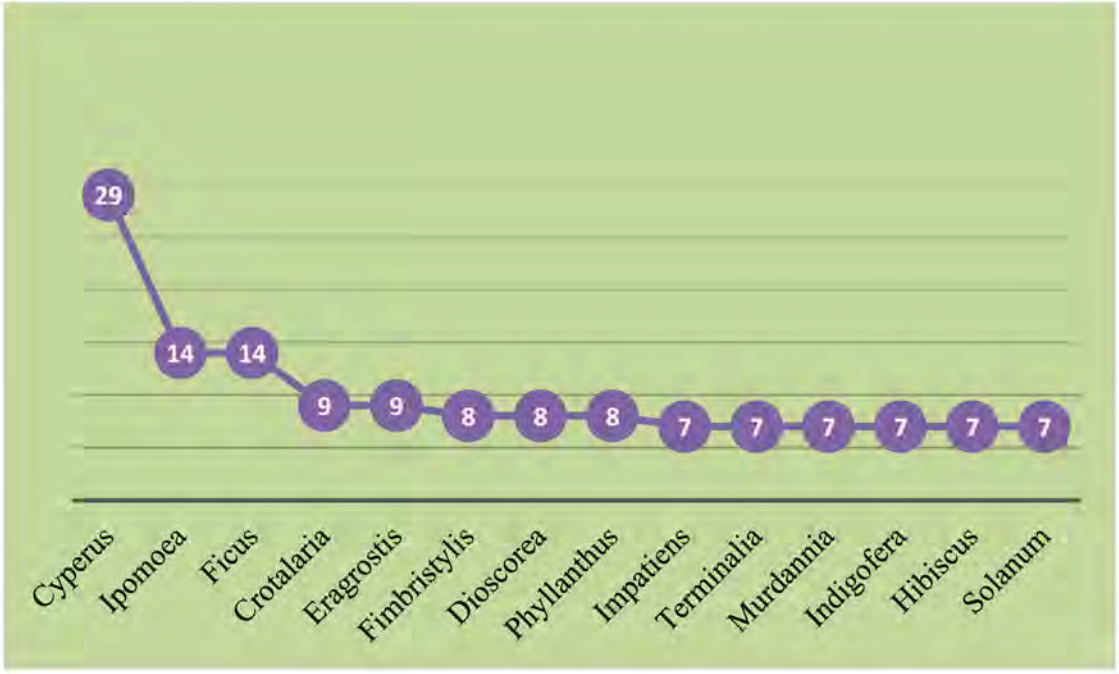

Figure 43. Most speciose genera in Walayar hills

Holoptelia etc. As the zone is with acute water shortage, the distribution of cactoid habit elements like *Euphorbia tortilis* Rottler ex Ainslie, *Boucerosia umbellata* Wight & Arn., *Cereus pterogonus* Lem and members of Apocynaceae and Euphorbiaceae are more frequent in the vegetation. Observations on such floristic elements from the Gap across the range towards Dhoni forests showed that, the distribution of these dry elements are diminishing with a downward trend, decreasing its frequency with more representation of semi-evergreen elements and ground vegetation.

The lower ranges show abundance of *Getonia floribunda* Roxb., an element with water storing capacity, which is an indication of water as a limiting factor in the vegetation. Distribution of succulents and elements with more latex is also characteristic of this vegetation. The lower ranges are further characterized by the presence of deciduous taxa such as *Strychnos nux-vomica* L., *Strychnos potatorum* L.f., *Strychnos wallichiana* Steud. ex A.DC., *Dichrostachys cinerea* (L.) Wight & Arn. etc. These taxa also represent the degree of dryness experienced in the study area.

Biswas and Karanth (2021) suggested that Palghat Gap acts as a major barrier for a range of taxonomic groups. This suggestion is found to be true when we analyze the representation of certain families on either side of the Palghat Gap. Certain families such as Adoxaceae, Burmanniaceae, Chloranthaceae, Centroplacaceae, Haloragaceae, Hypericaceae, Pittosporaceae, Proteaceae etc. are represented in the forest tracts of Nelliyampathy hills (Jabeena, 2021), but members of these families are never found to occur in the hill tracts of Walayar hills. This may be due to the absence of true evergreen, grassland and shola forests in Walayar hill ranges. Further, the low altitude hill tracts are influenced by the dry hot winds passing through the gap. The families such as Cactaceae, Zygophyllaceae, Xyridaceae, Elatinaceae and Rhizophoraceae are found to occur in the Walayar hills, but could not be located in the Nelliyampathy hills. Moreover, the frequency of distribution of drier elements is more in this range, compared to other hill tracts of the district and it may be due the proximity of the hill range to the Palghat Gap.

The frequency of occurrence of *Impatiens* in the Northeastern side of the Palghat Gap is more than the Northwestern side. The Parambikulam hills reports 18 taxa in *Impatiens* (Sasidharan, 2002), 15 taxa in Nelliyampathy hills by Jabeena (2021) and 10 taxa in Kollengode hills by Soumya (2018). While the present study reports only 7 taxa from Walayar hills. High temperature might be the limiting factor for the diversification of such narrowly adapted taxa. In Spite of these high degrees of temperature and dryness, the field explorations could find a new species under *Impatiens* which adds to the floral uniqueness

of the area. This species is found to thrive in the crevices of barren rocks with limited vegetation around. This indicates the adaptability and uniqueness of *Impatiens sp. nov.* in the hills of Walayar. Similar is the occurrence of trees such as *Cullenia exarillata* A. Robyns and *Palaquium ellipticum* (Dalzell) Baill. in the northeastern side of gap (Sasidharan, 2002; Soumya, 2018 & Jabeena, 2021) and are absent in the northeastern side of Walayar hill ranges.

The representation of endemic and threatened taxa are found to be low when compared with flora of Nelliyampathy hills (Jabeena, 2021) and Aralam wildlife sanctuary (Dantas, 2017) which reported 379 and 299 taxa respectively as endemics. Usually, such taxa are found more in the evergreen, shola and grassland ecosystems with narrow ecological niches. Further, the altitude and temperature regimes also restrict the distribution of such taxa. Walayar hill ranges are characterized by the absence of true evergreen forests and grasslands. Only a few hill tracts cross the altitude of 1000m asl and high altitudes are with large rocky boulders and patches of few grassy areas. Typical shola forest representations are absent in the study area. The dry climatic conditions in the area make the majority of forest vegetation to be deciduous in nature. Most parts of the hill tracts are disturbed due to human interventions and hence the incidence of degraded forest elements (87 taxa) and alien invasive elements (93 taxa) were found to be very high. Similar is the case of threatened taxa in Walayar hills and out of the 1077 taxa recorded, only 27 are coming under the IUCN Red Listed taxa and nine hundred and forty-two taxa collected from Walayar hills are not yet evaluated for its IUCN status. But as per Barik *et al*., 2018, 168 taxa are assessed as threatened. Among these threatened taxa, majority are found to have restricted geographical distribution with a thick forest having least disturbances. The mapping of such IUCN red listed taxa showed that the Critically Endangered and Endangered taxa were found to be more in the higher elevations and, Near Threatened as well as Vulnerable taxa are distributed throughout the hill tracts irrespective of altitude classes.

The critical analysis of the vegetation in Walayar hills showed that therophytic lifeforms is the most dominant lifeform with 424 taxa (39.36%) followed by Phanerophytes with 328 taxa (30.45%) and lianas with 148 taxa (13.74%). The high incidence of therophytes in the range points to the harsh environmental conditions and therophytes being the drought escapers are characterized by shorter life span will complete its vegetative and generative phase in very short period of time and develop mature seeds ready for germination with the advent of favorable environmental conditions. Similar observations

were proposed by Porembski (2007) and Porembski and Barthlott (2000). Lifeform spectrum analysis was observed in taxonomic studies by Soumya (2018) and Arabhi (2019) where in the predominant vegetation is deciduous forests with high proportion of degraded forest elements and detached granitic rocky hillocks with predominance of herbs. But, Phanerophytes form the predominant lifeform in Nelliyampathy hills (Jabeena, 2021) where, the major forest type is evergreen and semi - evergreen. Another interesting observation is the high incidence of geophytes (Cryptophytes) throughout the range. They form 6.59% of the reported taxa and is featured by dormant perennating parts embedded in the soil. This adaptive feature make sure the survival of many taxa during adverse dry season and water scarcity is acute. The distribution of such taxa show constant distribution below 1000m and later on decreases. Chamaephytes are mostly found in the lower and medium altitudes and hemicryptophytes with shoot apices perennating on the surface of ground mostly in the lower altitudes. In addition, *Aeginetia indica* L. is the only obligate parasite recorded from the hill tracts. This low representation of such taxa in hills indicates the unsuitability of ecosystem prevalent here. Similar is the case of epiphytes (7 taxa) representing only 0.64% of the taxa reported. The lack of true evergreen and shola forest may be the reason for such a reduced representation. The dominance of therophytes and phanerophytes in Walayar hills can be correlated with the degree of protection plants possess in a tropical ecosystem (Raunkiaer, 1934; Ellenberg & Dombois, 1967).

Seasonal variations cause rapid changes in the microhabitats in main Ghats and hillocks. The microhabitats viz. Mud cliffs, Exposed Rock Surfaces, Rock Crevices, Fissures and boulders are biodiverse and are prominent during the monsoon and post monsoon periods only. These microhabitats will soon vanish with the opening of the forest canopy by shedding of leaves by trees and as soon as the rocks experience water as a limiting resource.

Similar situation prevails in the microhabitats of hillocks too. The bioactive period of microhabitats such as Ephemeral Flush Vegetation (EFV), Small Ephemeral Pools (SEP), Exposed Rock Surfaces (ERS), Rock Crevices and Fissures (RCF) gradually disappear as the hillocks become more and more drier. The plants in such microhabitats would complete their life cycle by this period. Those plants with perennating organs will remain dormant until the next monsoon season. The flowering and fruiting of the taxa in hillocks are found to be dependent on the temperature regimes and precipitation rates. The flowering and fruiting of the majority of tree members are found to be in the summer and this observation is exactly in accordance with the microhabitat diversity studies conducted

in lateritic hillocks in northern Kerala (Sreejith *et al*., 2016). Further, Arabhi and Maya (2019) reported similar results on the various microhabitat diversity, special plant associations and seasonal vegetation shift in the granitic hillocks in the Palghat Gap region.

Massive flowering in hillocks can be considered as an adaptive mechanism to ensure maximum pollination and seed setting. The complex plant associations seen in nutrient deficient soils of hillocks may be due to their mechanism of co- existence and may have something to do with co - evolution. A preliminary survey on the physiology of plants revealed that the plants with C_4 and CAM metabolism are more frequent in the hillocks near gap regions. A similar outcome was recorded in recent times on the various adaptive traits observed in rock outcrops of India (Kulkarni *et al*., 2022; Kulkarni *et al*., 2022; Smrithy *et al*., 2023).

The Walayar range forests in the near vicinity of Palghat Gap showed the dominance of therophytes (39.36%) and phanerophytes (30.5%) and they show a steady decrease from the lower to the upper altitudinal zones. As therophytes are drought escapers, the frequency of such elements during favorable seasons are more in lower elevations and steadily increases with the increase in altitude. Though in higher altitudes, the temperature is low and wind velocity is high, the distribution of high-altitude elements are less frequent owing to the habitat modifications to large boulders. The epiphytic vegetation in the range is also too low, due to the severe temperature and lower humidity, and is represented only by a few orchids like *Acampe praemorsa* (Roxb.) Blatt. & McCann, *Aerides maculosa* Lindl, *Oberonia bicornis* Lindl, *Vanda testacea* Rchb.f and *Dendrophthoe falcata* (L.f.) Ettingsh., *Scurrula cordifolia* G. Don, *Taxillus recurvus* (Wall. ex DC.) Tiegh. and *Taxillus tomentosus* (B. Heyne *ex* Roth) Tiegh. of Loranthaceae. Further, the absence of true evergreen and shola forests further lowers the incidence of epiphytes in Walayar hills when compared with the nearby floras of Kollengode (Soumya, 2018) and Nelliyampathy (Jabeena, 2021). Saprophytic, semi-parasitic and parasitic life forms did not show any general trend in any of the altitudinal zones as the habitat is not conducive for such vegetation elements. In addition, the frequency of occurrence of geophytes (cryptophytes) in Walayar hills is proportionally high. This adaptation is found among the plants to thrive in adverse climatic conditions. These plants are characterized by the presence of protected organs and these taxa are found to be distributed in all the altitudes. Such propagules were given heavy protection during unfavorable situations especially during the months of February to May.

The geomorphological features of the Palghat gap influences the pollination and seed dispersal mechanisms of the taxa in the range. The gap and the nearby area experience high frequency winds. This in turn favors the survival of anemophilous and anemochorous taxa. The families Poaceae, Cyperaceae, Euphorbiaceae and many more families are well adapted to anemophilous pollination mechanisms. Similar is the case of the occurrence of anemochorous taxa. About 179 taxa were found to be well adapted for anemochory in this range, which is the highest when compared with the other regions of the district. The predominance of members of Combretaceae such as *Terminalia paniculata* Roth, *Terminalia anogeissiana* Gere & Boatwr., *Combretum albidum* G. Don, *Combretum indicum* (L.) DeFilipps and *Getonia floribunda* Roxb. and members of Apocynaceae such as *Alstonia scholaris* (L.) R.Br., *Wattakaka volubilis* Stapf and *Wrightia tinctoria* R.Br. in the hill tracts of Walayar could not be found predominant in the north - eastern side viz., Nelliyampathy, Kollengode and Parambikulam hill ranges.

The biodiversity of a region can be assessed by finding out the taxonomic singularity and this at genus level is found to be comparatively high since 66% of the genera were found to have single species. When family level is considered, it is comparatively low since 53% of the families are having more than one genus. These results in turn show the importance of the diversity to be protected without further damage.

Among the 34 monotypic taxa recorded from Walayar hills, Fabaceae forms the highest number followed by Bignoniaceae and Rutaceae. Documentation of monotypic genera in India (Rana and Ranade, 2009) reported Poaceae to be the family with highest number of monotypic taxa followed by Fabaceae. Further, the study reports herbs being the dominant habit forms among monotypic taxa. But the study area shows trees to be the most dominant ones to be monotypic followed by herbs. In addition, predominance of monotypic trees is often considered as a relic of past vegetation and can be used in the evolutionary studies to find out the lineage and speciation in certain families. Among the monotypic taxa, *Naregamia alata* Wight & Arn. is the only endemic taxa recorded. On the other hand, *Nerium oleander* L., *Millingtonia hortensis* L.f., *Oroxylum indicum* (L.) Benth. ex Kurz, *Spathodea campanulata* P.Beauv. and *Muntingia calabura* L. are introduced plants often grown as ornamental ones. These taxa remained isolated as monotypic by geographical or any other barriers which prevented them to diversify and undergo further speciation.

The flora of Palghat district (Vajravelu, 1990) is a comprehensive account of floristic composition of angiosperms in Palakkad district which documented 1355 species from a total of 4400 sq. km. The present study documented 1077 taxa from a total area of

125.65 sq. km. The number of taxa documented from a small area is found to be proportionally high with reference to the present documentation. The possible reason for this might be due to the lack of thorough field explorations in all regions of Walayar hills in different seasons. Among the plants mentioned in Palghat flora, 193 taxa were collected from Malampuzha dam, Thekke Malampuzha hill slopes, Malampuzha canal banks, roadsides, Walayar dam and nearby forests. Later Sasidharan (2014) reported 2936 taxa from Palakkad. The database is further updated to 3407 plants in Palakkad district in 2023 (www.eflorakerala.org).

A total of 387 taxa were found as an addition to the existing Palghat flora (Vajravelu, 1990) and among these taxa, 98 were not reported from Palakkad district with reference to e-flora of Kerala (Accessed in May 2023) and thus documented as extended distribution to the district. These reports point to the lack of thorough explorations and examinations in this small geographical area.

Most of the plants reported then by Vajravelu (1990) could be collected from the study location except for few which could not be collected from Walayar hills even by intensive field explorations in different locations mentioned in the literature. Some such taxa include such as *Elaeocarpus munroi* (Wight) Mast., *Crotalaria pusilla* Roxb. ex Roth, *Adenia wightiana* (Wall. ex Wight & Arn.) Engl., *Isonandra lanceolata* Wight., *Helixanthera intermedia* Danser, *Ledebouria revoluta* (L.f.) Jessop, *Iseilema anthephoroides* Hack. etc. Since the study area is located in an anthropogenically disturbed region and the previous collections were made 33 years back, intensive habitat modification might have caused the disappearance of those rare plants. This study helped in the documentation of lost floral elements from Walayar hills which highlight the need for the immediate protection and conservation of the present vegetation.

The study area reports many morphological variations among taxa owing to the varying temperature regimes, precipitation, scarcity for water and nutrient deficiency prevalent in the hill tracts and nearby areas of the Palghat Gap. These Morphological variations gain attention to the taxonomists since such variations attained through generations may lead to genetic variation paving way to the origin of a new species and evolutionary process happening within the populations. Many researchers (Soumya, 2018; Rekha, 2019; Jisha, 2019 and Jabeena, 2021) have also listed many taxa with variations from different forest tracts near to the Gap region. Taxa such as *Chassalia curviflora* Thwaites, *Cyanotis burmanniana* Wight, *Andrographis echioides* Nees and *Allmania nodiflora* (L.) R.Br. ex Wight are some of the common plant species reported to have

similar morphological variations throughout the Palghat Gap region. Biswas and Karanth (2021) gives evidence on the role of such geographical gaps in shaping intra and interspecific genetic diversity and can be interpreted and correlated with the range of variations recorded in many taxa in the Gap region.

Many new taxa and many new records of occurrence have been reported from Kerala in the last several years (Plant discoveries, 2015 - 2022). Morphotypic variations are found to be very high in many taxa in these hill ranges and a new taxon is formed by speciation which is the sum total of variations in the populations. In the present study, it was found that three taxa showed distinctive characters from the allied members of the genus which make them a novel one viz., *Amorphophallus sp. nov*., *Impatiens sp. nov.* and *Ouret sp. nov*. All these taxa are found in the grassy hill slopes in semi evergreen forests of Walayar hills. These findings open discussion on the need for the protection of these ecologically fragile sites and demand thorough explorations for finding out more members to the existing flora.

The analysis of vegetation in and across the Palghat Gap using PAST Software helped to predict the effect of Palghat Gap in species distribution. The dendrogram obtained after PAST analysis showed close similarity of vegetation between Walayar range with Dhoni hills in North - Western side of Gap region. While Nelliyampathy and Parambikulam hills showed close similarity in plant composition. The percentage dissimilarity between Nelliyampathy hills on south of Palghat Gap and Walayar hills on north of the Gap is a clear evidence of gap effects on the distribution of species on either side of the Gap. The flora of Nelliyampathy and Kollengode shows closer similarity with the plants on the Attappady hills, that lie further north of Dhoni forests. This must be due to the change in the temperature regimes and the less effects of dry and hot winds passing through the gap. The topology of Attappadi is similar to that of Nelliyampathy, and Parambikulam hills, and this may be the reason for the similarity in the plant composition in these hills.

Walayar hill ranges are inhabited by 3 tribal groups viz., Irulars, Mudugars and Paniyars. Among these people, Irulars are the most populated in the study area and Mudugars and Paniyars with very less numbers also got settled in the range. Often, these tribal groups depend on the forest produce for their daily livelihood, food, shelter and other miscellaneous purposes. They collect the non-wood forest products often seasonally and the information gathered from these groups is found to be similar with the findings of Remesh (2007) who conducted ethnobotanical studies on the various tribal groups in Palakkad district. The present study could find the use of all categories of plants by the tribal

community, irrespective of the habit of the plant. Since the major part of the collections include fruits, tubers or seeds and honey, the collections by the tribal community are often found to be focused during post monsoon period, especially from September to February. It was also found that, though the range harbor elements with alien affinity, majority of the ethnobotanically significant taxa was found to be having Indo - Pacific affinity, with localized distribution. This is an indication that the traditional knowledge was always associated with indigenous elements in the vegetation and the knowledgebase is age old and was prevalent even before introduced elements intruded the native populations. The utilization of species of *Nervilea, Hydnocarpus pentandrus* (Buch.-Ham.) Oken, *Momordica sahyadrica* Kattuk. & V. T. Antony and *Dioscorea alat*a L by the tribal inhabitants of the range is an indication of this age-old knowledge base transmitted between generations.

The range lies within a geographic zone that is being exposed to extremities in climate factors, though the altitudinal gradations are less. With seasonal climate change, there is distinct change in the vegetation of forest in the hill tracts and hillocks. With the advent of drier periods, the forest tracts dry up and there is a gradual shift of green vegetation to yellowish brown dry vegetation. The shedding of leaves to minimize the transpiration can be considered as an adaptive feature and this shedding makes the ground vegetation exposed. By this time, the plants would have reached their final reproductive stage. Mature plants with their ripe fruits and seeds get effectively dispersed during this period. The geophytes and hemicryptophytes will perennate in the soil waiting for the next monsoon for resprouting. Increased temperature regimes mark the onset of flowering of deciduous trees. The flowering of this kind can be considered as an adaptive feature for better floral display, which maximizes the chances of pollination and fruit setting. Similar is the case of the semi - evergreen trees that show a gradation in leaf shedding in order to reduce the energy and water loss. These trees are also characterized by flowering during the hotter periods of the season. Arabhi and Maya (2019) reported similar biomonitoring analysis in the rocky outcrops in the Palghat gap area a few years back that showed unique active microhabitats with special plant associations in the wet seasons and the dry season with trace of green elements represented by few trees and shrubs.

Analysis of the phytogeographical affinity showed that 46.70% of the vegetation of Walayar hills are confined to the Indo - Pacific zone. Following this, it showed more affinity towards the African zone (35.28%) and least affinity towards the Australian zone. This higher affinity towards African kingdom may be correlated to the continental drift

hypothesis and the concept of land mass movement. Further, the affinity towards the African kingdom provides evidence to the theory that the Indian sub - continent got separated from the African plate and collided with the Asian plate. The taxa showed least affinities towards the Australian kingdom as the Australian plate got detached from huge landmass 3 million years ago even before other plates get separated. Majority of the alien - invasive taxa of the range showed phytogeographical affinity towards South American kingdoms.

V.3. Geo - spatial analysis

The Land Use Land Cover analysis of Walayar hills revealed that the frequency of occurrence of deciduous forests is more when compared to other forest types. The change in the forest cover over decades showed an observable decrease in the evergreen forest and decrease in the deciduous forests in trace values. The area of occupancy of open grasslands shows the exposed rocky patches in higher altitudes. Increase in the barren lands is an indication of the degradation of natural vegetation and tendency for desertification in the study area. So, the health of the vegetation is gradually diminishing and needs immediate attention. The present laws and regulations on the activities have resulted in the restoration of forests to certain extent and there is a slight decrease in the area of occupancy of mines and quarries in the range. This decrease is not because of the decrease in mining happening in the range, but might be due to restoration activities happening in already mined areas. So the mining related activities within the range must be regulated, otherwise, the existing greenery in the Gap zone will be lost beyond repair.

There is an increase in the human settlements in the study area with inhabitations happening near the plantations and catchment areas of reservoirs other than in the plains. There is a narrow decrease in the occurrence of the plantations since certain plantations are now under the custody of the forest department since the lease period is over. Now these plantations are left undisturbed for natural regeneration and restoration. Since the natural vegetation is depleted, there is scarcity of resources in the forest. GIS mapping results of Walayar hill ranges are found to have some similarity with the LU/LC cover mapping and cover change detection studies of Watersheds in Walayar region by Balakrishnan and Ilanthirayan (2017). This geographical data analysis provides insight for the present geographical and climatic features prevalent in the Gap region. Increased temperature regimes and acute groundwater depletion, in spite of two reservoirs, are reported from the study area in the past few years. This might be due to the depletion of forest vegetation,

increase in the barren rocky patches, increased desertification and urbanization without measures for conservation of the rare vegetation in the Walayar hill tracks.

Ajin *et al*., (2015, 2016, 2017 & 2018) and Malik et al., (2013) came up with the mapping of forest fire risk zones in various forests of Kerala in order to have an early prediction of forest fire catching sites. This was helpful in making enough precautions as part of forest management practices to avoid natural destruction. Since the incidence of forest fire is common in the hill ranges, such mapping data could be utilized in minimizing the loss of biodiversity due to unpredictable events like forest fire. GIS maps prepared may be used in the prediction of hill tracts with high risk of forest fire, and action plans may be chalked out to reduce or avoid the incidence of forest fire.

V.4. Post flood studies and bio restoration in Walayar hills

The post flood studies and biomonitoring in the landslide struck sites in the range documented habitat modifications along with species loss and new species invasions. The landslide caused uprooting of various tree species and the entire ground vegetation got washed away along with rocks, mud and silts to the low-lying plains which were either agricultural lands or plantations. The uprooting of trees was found to be irregular since the uprooted taxa in one landslide affected area is a surviving taxon in another site. Further, a general reason for uprooting of trees was found to be their growth in a rocky forest system with their shallow roots without much penetration. This made the easy uprooting of large trees along with the ground vegetation. This further caused the opening up of canopy making the sciophytic taxa in the risk of drying. The loss of fertile top soil thus resulted in the loss of geophytes or cryptophytes and other taxa with any perennating organs to a greater extent.

There was a remarkable change in the phenology of plants in the landslide affected areas. The herbaceous taxa was the most affected with delayed germination followed by delayed flowering and fruiting. It was also observed that certain tree members were in flower in unusual periods with fluctuating phenology. This might be due to the extreme dryness experienced in the landslide affected areas along with increased temperature regimes. The herbaceous taxa were found to have a shorter life span with short vegetative phase and earlier flowering period.

V.5. Threats and biodiversity loss

Preliminary analysis on the causes of biodiversity loss and the degradation of health of the ecosystem points to anthropogenic disturbances within the range. The hill tracts are exposed to human activities such as agriculture, industries, human settlements and tourism. Moreover, the rail and road transport across state boundaries passes through this forest path. In addition, the presence of granite gneiss and limestone rocks makes the area vulnerable to uncontrolled mining and quarrying activities. This in turn threatens the very existence and survival of many rare and narrowly distributed floral elements. The hillocks, found detached from the main Ghats are often considered as waste lands and are neglected and little attention is being paid for the protection of the rare habitats present over there. They are often used as waste disposal sites and few are used even for quarrying. The farmers utilize the lower stretches of forests and hillocks as the feeding grounds for cattle and this uncontrolled grazing of herbaceous ground floor elements gradually lead to the depletion of vegetation.

Acute human interventions and non-scientific agricultural practices have resulted in high incidence of alien - invasive taxa in the forest floor. *Acacia* trees (*Acacia auriculiformis* A. Cunn. ex Benth.) planted as a plantation crop in Palamara (Year - 1968) and Akamalavaram and Thekke Malampuzha regions (year - 1987) by the forest department of Kerala became a threat to the native flora in the lower stretches of forest floor and the plants on the rocky outcrops in Malampuzha, as the population of this *Acacia* trees showed tremendous increase beyond the boundary of plantations. The seeds of these trees rapidly dispersed to wider distances and the biodiverse rocky outcrops in Malampuzha reservoir have now turned into *Acacia* tree group islands. The ground vegetation of this area has fully vanished. Further, the incidence of certain taxa such as *Mesosphaerum suaveolens* (L.) Kuntze, *Coleus strobilifer* (Roxb.) A. J. Paton in the margins of forests and in the forest tracts are often found to be the triggering force for the incidence of forest fire due to the presence of volatile oils in them. Asteraceae represents the most speciose family having high incidence of invasive taxa. This might be due to their ability of effective seed dispersal through anemochory and their greater germination potential. These taxa are not even fed by any animals as their food so that they remain unharmed and complete their life cycle without any disturbances. These further favors extension of their area of occupancy to interior forests disturbing the survival of native vegetation.

Several earlier studies on the invasiveness of plants in Indian sub-continent (Britto *et al*., 2001; Dobhal *et al*., 2011; Barik and Adhikari, 2012, Batish *et al*., 2012; Kaur *et al*.,

2012; Sharma & Raghubanshi, 2012; Tripathi *et al.*, 2012) justifies the same opinion and observations. According to them, floral features for effective pollination, shorter vegetative phase, presence of volatile oils and other phytochemicals which prevents pest attack, wider adaptability to survive in a range of habitats, higher rate of production of mature seeds, their effective seed dispersal mechanisms, extensive root system and absence of natural enemies are the main reasons for the establishment of such alien taxa in an area. Various studies have shown that the economic loss caused by the invasion of such taxa in agricultural lands and estates negatively affects the productivity of native plants. Results of several GIS based mapping studies of invasive taxa (Padalia *et al*., 2014; Adhikari *et al*., 2015) carried out to find out the extent of invasion in forest tracts of India can be of help in taking immediate steps to minimize the effects of such invasions.

After analysis and observations, *Mesosphaerum suaveolens* (L.) Kuntze and *Mikania micrantha* Kunth are found to be the most infested taxa in forest tracts. When hillocks and degraded forests are considered, *Mesosphaerum suaveolens* (L.) Kuntze takes the primary position followed by *Coleus strobilifer* (Roxb.) A. J. Paton. The catchment area of Malampuzha and Walayar reservoirs are heavily infested by *Xanthium strumarium* L. which negatively affect the natural vegetation. *Chromolaena odorata* (L.) R. M. King & H. Rob. and *Parthenium hysterophorus* L. show a general trend by invading the wastelands, plains and margins of agricultural lands. *Chromolaena odorata* (L.) R. M. King & H. Rob. are recently found to invade the inner forest tracts due to its easy dispersal and adding to this, the winds passing through the Gap region favors the wind dispersed alien - invasive taxa to get spread faster than any other plant species.

In spite of the invasive nature of taxa, several plants are found to be beneficial for human beings. Pappan and Thomas (2017) studied the contribution of invasive plants in herbal medicinal practices in Kerala and the data included, *Cleome burmannii* Wight & Arn., *Crassocephalum crepidioides* (Benth.) S. Moore., *Eclipta prostrata* L., *Emilia sonchifolia* (L.) DC., *Synedrella nodiflora* (L.) Gaertn., *Tridax procumbens* L. and *Stachytarpheta jamaicensis* (L.) Vahl. This highlights the need for finding out more alternative economic and medicinal uses for these alien - invasive elements, as complete eradication of these taxa are far from reality.

V.6. Conclusions and major findings

The floristic analysis of angiosperms in Walayar forest range near Palghat Gap zone and the associated biomonitoring studies revealed conclusions that have practical implications in making the Gap zone a green belt to mitigate the effects of climate change and extremities in temperature regimes experienced in this region. Major finding of the study are summarized below:

- The explorations conducted for floristic documentation of angiosperms in Walayar hills accounted for 1077 taxa including 1056 species, 11 subspecies and 10 varieties falling under 11 clades, 42 orders, 133 families and 610 genera.
- Rosids is the most speciose clade with 398 taxa followed by Asterids (288 taxa) and Commelinids (203 taxa).
- Poales forms the largest order with 155 taxa followed by Lamiales (133 taxa) and Fabales (129 taxa).
- Fabaceae is the largest family with 125 taxa followed by Poaceae (102 taxa) and Cyperaceae (46 taxa)
- Herbaceous taxa predominate with 549 taxa followed by 209 trees, 169 shrubs and 150 climbers.
- Raunkiaer plant life form spectrum analysis showed the dominance of therophytes with 424 taxa followed by phanerophytes (328 taxa) and liana or euliana (148 taxa).
- Habitat diversity ranges between West coast semi - evergreen forests, Southern moist mixed deciduous forests, low altitude Grasslands, Southern Tropical thorn forests, Euphorbiaceous scrub jungles, Bamboo brakes, Degraded forests, Wetlands and riparian stretches, hillock systems, Perennial ponds and rock pools, Reservoir vegetation and Plantations.
- Moist deciduous elements predominate the forests of Walayar hills with 418 taxa followed by evergreen elements (282 taxa) and grasslands (114 taxa).
- Ninety- two chasmophytic taxa could be documented from open rocky hill tracts.
- The microhabitats in the main forest tracts include Mud cliffs, Exposed Rocky surfaces, Buttresses, Tree trunks, Fallen logs, Riparian slopes, Boulders, Rock Crevices and fissures
- The field explorations in granitic hillocks in the range recorded 411 taxa including 7 infraspecific elements under 296 genera distributed among 86 families. Herbs were found to be the predominant habit form represented by 229 taxa followed by trees (79 taxa) shrubs (60) and climbers (43). Fabaceae formed the most represented family in

these rocky outcrops with 60 members followed by Poaceae (50 taxa), Malvaceae (22 taxa) and Cyperaceae (19 taxa).

- The Raunkiaer plant life form spectrum in hillocks revealed therophytes to be the dominant lifeform (202 taxa) followed by Phanerophytes (119 taxa) and Liana or Euliana (44 taxa).
- Nine unique microhabitats were observed in the granitic hillock systems which include Ephemeral Flush Vegetation (EFV), Exposed Rock Surface (ERS), Soil Filled Depressions (SFD), Soil Rich Areas (SRA), Rock Crevices and Fissures (RCF), Boulders (B), Small Ephemeral Pools (SEP), Rock pools (RP) and Tree cover Tree associates (TCTA).
- Pubescence, carnivory, semi - parasitism, subterranean organs and succulence are some of the adaptive features observed among the vegetation in hill ranges.
- Biomonitoring of vegetation in the Walayar hill tracts could distinguish two vegetation shifts in accordance with the monsoon, a wet phase with actively flourishing green vegetation with unique microhabitats and an extremely dry phase during the post monsoon period.
- Phenological studies reveal two peak periods of flowering, one between the months September to December (post monsoon season) and from January to March (before the onset of summer season).
- Out of the 150 endemic taxa recorded, 51 are endemic to Southern Western Ghats, 42 to Western Ghats, 41 to Peninsular India, 7 to South India and 9 are found to be endemic to India.
- According to IUCN, 27 taxa fall under various threat categories, one under Critically Endangered (CR), five under Endangered (EN), fourteen under Vulnerable (VU) and seven taxa under Near Threatened (NT) categories. According to the list of threatened plants in India prepared by Barik *et al*., 2018, Walayar hills have 168 threatened plants distributed throughout the range.
- Phytogeographical studies revealed that 46.70% of the vegetation is of Indo - Pacific affinity. This is followed by affinity towards the South American, African, Holarctic and Australian kingdoms.
- *Glycosmis nelliyampathiensis* Jabeena & Maya, recently reported new taxa from Nelliyampathy hills (Jabeena *et al*., 2021) could be located from Walayar hills.
- Three new species, *Amorphophallus sp. nov., Impatiens sp. nova* and *Ouret sp. nov.* could be recorded from hill tracts of Walayar and are under review.

- *Oldenlandia hygrophila* Bremek. could be documented as a recollection from its type locality after 40 years.
- A total of 387 taxa were found to be an addition to Flora of Palghat (Vajravelu, 1990). Among these, 98 taxa were found to have an extended distribution to Palakkad district (https://www.eflorakerala.com, accessed in May 2023).
- Analysis of vegetation across and through the Palghat Gap region through PAST software revealed Walayar and Dhoni hills to have similar plant composition in the North western side and Nelliyampathy, Kollengode and Parambikulam are closely related in the North eastern side of the Palghat gap region. This indicates the distinctiveness in the species composition between two sides of Palghat Gap.
- Two hundred and eleven anemophilous and 179 anemochorous taxa were recorded which utilizes high velocity wind passing through Palghat Gap region for pollination and dispersal
- Three hundred and eighty-nine medicinal plants, 139 wild edibles, 115 wild ornamentals and 116 wild relatives of medicinal plants could be documented from the range
- *Cyperus* is the most speciose genera with 29 species followed by *Ipomoea* and *Ficus* with 14 species each. *Crotalaria* and *Eragrostis* are represented by 9 species each.
- Morphotypic variations could be observed among twenty taxa recorded both from hillocks and main ghat regions.
- Occurrence of thirty-four monotypic genera in Walayar hills was reported. Further, the taxonomic singularity of vegetation at genus level is 0.83 and at family level is 0.61.
- Ninety-three alien invasive elements along with 87 degraded forest elements were recorded from Walayar hill ranges which indicates the depletion of forest health in the study area.
- Asteraceae reported the greatest number of alien - invasive elements with 17 taxa followed by Fabaceae (14 taxa) and Convolvulaceae (9 taxa) with South American phytogeographical affinity.
- A checklist prepared based on The Kerala State Biodiversity Board (KSBB) invasive plant database showed 55 taxa with Fabaceae as the most invasive family with a high number of invasive elements (13 species).
- The ethnobotanical studies among Irulars, Mudugars and Paniyars inhabiting twenty tribal colonies in Walayar hills could document 124 taxa belonging to 110 genera and 56 families as having ethnobotanical significance.

- The Land Use/ Land Cover (LU/LC) analysis could identify eleven land cover classes viz., evergreen forests, deciduous forests, grasslands, plantations, croplands, water bodies, barren lands, settlements, rocky outcrops, mixed crop and quarries/ mines.
- Out of the total forest cover, deciduous forests dominate with 23.51% of the total area followed by evergreen forests (15.78%), grasslands (1.32%), rocky outcrops (3.47%) and barren lands (2.23%). Majority of the study area is characterized by agricultural lands with mixed crops (27.44%), crop lands (9.19%) and plantations (5.54%).
- Forest cover change analysis over two decades between 2000 and 2020 revealed slight decrease in the evergreen and deciduous forests by a percentage of 0.64 and 0.35 respectively. There is a decrease in the area cover of plantations by 0.31%.
- The percentage of settlements and barren lands in and around the Walayar hills have increased by 3.29% and 1.18% respectively. Further, the percentage of mixed crops and croplands decreased by 4.21% and 0.24% respectively.
- The deterioration of the health of forest cover is clearly evident by the increase of exposed rocky outcrops (1.11%) in the main forest tracts
- Altitude wise zonation reported that 75.89% of the study area lies between 0 - 400m, 9.75% between 400 - 700m, 7.47% between 700 - 1000m, 4.4% in 1000 - 1300 m and 2.49% in 1300m and above.
- The lower zone is characterized by deciduous forests, the altitude between 400 - 1000m is predominantly having semi - evergreen forests intermixed with deciduous elements. The higher altitudes above 1000m are characterized by grassland patches along with large bare rocks.
- Slope wise zonation of the study area estimates that 71.43% falls under gentle slope areas (0°-15°), 19.09% falls under moderate slope category and 9.48% in the steep zone areas.
- Normalized Difference Vegetation Index (NDVI) analysis of forest cover shows a marked deterioration of health of moderately dense forest over decades. The percentage of occupancy of non-forest areas has been reduced in the past ten years which is a positive sign indicating greening of the area to a certain extent.
- The landslide affected areas along with the occurrence of the threatened taxa in the study area were mapped for future plans for conservation initiatives in the area
- The landslides and mudslides in the hill tracts resulted in uprooting of several taxa along with opening up of canopy cover. This resulted in the exposure of ground

vegetation to direct sunlight which negatively affected the growth and survival of many sciophytic vegetation

- Phenological shifting of plants along with invasion of alien - invasive taxa and loss of fertile topsoil caused marked loss to the biodiversity and the restoration in its native form could happen only over a long period of time.
- Natural calamities like forest fire, alien - invasives and landslides along with anthropogenic effects caused due to urbanization and industrialization, mines and quarries, agricultural practices and construction, waste disposal, grazing, tourism, human encroachments to the forest areas and frequent man - animal conflicts pose a great threat to the biodiversity of the hill tracts of Walayar.

V. 7. Recommendations

Assessment and evaluation of floral and faunal elements of a specific region provides an insight on the biodiversity elements occurring in the area and this knowledgebase is the primary requirement for planning of any protection and conservation initiatives. The floristic explorations conducted in different sections of Walayar hills made it clear that the hill ranges are unique both geographically as well as in the composition of floral elements. This is made possible by the occurrence of small to large ecosystems supporting many organisms. Walayar hill ranges located in the North - western side of Palghat gap is one of the most disturbed forest tracts in Kerala.

The B - rail track passing through the reserve forest and outskirts of forests poses a serious threat to the life of wild animals, especially the elephants, as the track passes exactly through the elephant corridors. These corridors in the Gap region are utilized by these animals for their free movements within the forests. These natural animal corridors are blocked by track construction and often many accidents due to train hit incidents happen, even after precaution measures are taken by railway authorities. Immediate actions should be taken to avoid or reduce the animal accidents due to rail hits by implementation of sensors and alarms through latest computational technologies to sense the presence of animals in the track and give proper instruction for the safe drive of trains without hitting. Further, periodical clearing of the understory of unwanted invasive plants on either side of the rail track will reduce the occurrence of these wild animals near the rail tracks thereby increasing the chances of saving their lives. Another recommendation is controlling the rail transport through b - track during night.

The man - animal conflicts in the agricultural lands near the forest margins is another frequent issue of the area. The occurrence of the wild animals such as wild pig, peacocks and monkeys, seeking food from the human produce gives an insight to the food scarcity faced by these animal groups in the forests. Abnormally increased population of such wild animals due to the lack of their predators is one of the reasons for such food scarcity in the forests. Adequate measurements should be taken for ensuring enough food resource availability by initiating afforestation programmes in various parts of the degraded forests. This can be done by cooperative initiatives between Kerala Forest department along with other recognized research centers like Kerala Forest Research Institute (KFRI), Kerala State Biodiversity Board (KSBB) etc. The proper maintenance of the floral elements suitable for the edaphic and climatic conditions in the Walayar hills may gradually improve the health of the vegetation, thereby satisfying the food supply requirements of the faunal groups. Moreover, creation and maintenance of water holding areas like large trenches and ponds within the forest areas will reduce the movement of wild animals for water in human inhabited areas and can reduce the conflict between man and other animals.

“Green Ahalia " is another project initiated by the major business group namely Ahalia foundation which works by promoting ex- situ conservation of several threatened and rare plants in their campus which comes under the jurisdiction of the Walayar range. An MOU with such an institution will help the maintenance of rare germplasm of plants in Walayar forests and thereby initiate a step to avoid rapidly increasing desertification of the Walayar hill tracts. Further, scientific studies conducted to understand the geographical features along with the knowledge base on the plants that thrive in the hill tracts may be utilized for the afforestation programme in the barren areas of the range.

Proper pollution checks and control measures should be implemented by the authorities to monitor and regulate the working of industries located in close vicinity to the forest areas and hillocks. The water quality of the rivers in the study area should be monitored periodically with proper implementation of existing rules and regulations as the effluents from the industries functioning in the range is causing serious threats to the floral and faunal population of the range. As the range has two prominent reservoirs and are important tourist centers in the district, implementation of safe and responsible tourism is required to reduce the dumping of wastes in the margins of forests and roadsides. Proper waste management systems should be planned and implemented in the tourist spots, rail tracks, roadsides and margins of forests in order to keep the wildlife safer and for a cleaner environment.

As the range merges with plantations and agricultural lands, unscientific practices should be regulated along with strict checks against excessive pesticide application in the farming fields, plantations and estates in order to maintain a healthy environment. Further, human encroachments to the forest lands for dwelling and other purposes must be regulated, otherwise the incidences of man - animal conflicts will increase manyfold.

The recovery of leased forest areas after the expiry of lease period should be continued by the department of forests and such areas should be demarcated as the Ecologically Fragile Lands (EFL) and afforestation programmes can be initiated in such areas for the restoration of the forests. Further, afforestation programmes should be planned and executed in the Govt. owned miscellaneous plantations after examination and selection of suitable plants that can successfully survive in the forests of Walayar. The restoration of EFL lands to natural forests will increase the forest cover and will aid in regaining the lost health of the vegetation. The present study could reveal data on location-based diversity and survival data of specific floral elements and recommend the following taxa in restoration programmes. The barren regions of lower elevations where dry deciduous elements survive can also hold taxa such as *Ficus sp.*, *Streblus asper* Lour., *Holarrhena pubescens* Wall. & G. Don, *Wrightia tinctoria* R.Br., *Cochlospermum religiosum* (L.) Alston, *Oroxylum indicum* (L.) Benth. ex Kurz, *Sterculia urens* Roxb, *Givotia moluccana* (L.) Sreem., *Xylia xylocarpa* (Roxb.) W. Theob., *Cordia dichotoma* G. Forst., *Syzygium cumini* (L.) Skeels, *Azadirachta indica* A. Juss., *Flacourtia indica* (Burm.f.) Merr., *Schleichera oleosa* (Lour.) Oken, *Terminalia* sp etc.

Similarly, at elevations of 400m to 800m, taxa such as *Dalbergia* sp, *Hydnocarpus alpinus* Wight, *Hydnocarpus pentandrus* (Buch.-Ham.) Oken, *Heritiera papilio* Bedd., *Artocarpus hirsutus* Lam., *Baccaurea courtallensis* (Wight) Müll.Arg., *Pterocarpus marsupium* Roxb., *Mallotus philippensis* (Lam.) Müll.Arg., *Syzygium sp., Bauhinia racemosa* Lam., *Sapindus trifoliatus* L., *Terminalia bellirica* (Gaertn.) Roxb., *Terminalia elliptica* Willd. etc. can be utilized in restoration programmes. At higher elevations, the regenerated seedlings of surviving taxa alone need to be protected for increasing the forest cover.

Afforestation programmes in rocky hillocks may be carried out by planting taxa such as *Ficus exasperata* Vahl, *Ficus hispida* L.f., *Streblus asper* Lour., *Alangium salviifolium* (L.f.) Wangerin, *Holarrhena pubescens* Wall. & G.Don, *Wrightia tinctoria* R.Br., *Cochlospermum religiosum* (L.) Alston, *Azadirachta indica* A.Juss., *Ziziphus* sp, *Sterculia urens* Roxb.etc.

The heavy infestation of forest tracts by alien invasive taxa needs to be checked and effective methods are required to reduce such infestation which adversely affect the floral wealth of the range. Periodical clearing of invasive taxa before the taxa reaches reproductive phases seems to be effective and must be included in the annual forest management schedule along with setting up of fire lines. As most of the infested areas are near to human habitations, reservoirs, roadsides etc., periodical removal could be effectively implemented by integrating the work with Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) of local self-governments. Along with this, afforestation programmes in the landslide struck sites will slowly recover the fertility of topsoil and the recolonization of the sciophytic ground vegetation will happen in near future. This will slowly restore the health of the forest vegetation and will reduce the fragmentation of forest ecosystems to a great extent. The removal of sand and slit accumulated during flood and dumped in the rivulets and water channels needs to be initiated for the restoration of the normal flow of water in the rivers and to increase the water storage in the reservoirs. With the expertise from geologists on the reasons for landslides happening in the range, many preventive measures such as gully plugging can be done in the landslide affected sites and nearby areas to reduce the chances of further landslides. Bamboo planting also seems to be an effective method to reduce the mudslides which in turn reduces the removal of topsoil. Strict laws and regulations must be made and implemented to regulate the working of quarries and mines in the range and the authorities should recover those quarries and mines whose lease period is over. A critical review of the geography of hill tracts along with floral and faunal wealth and associated ecosystems they are thriving must be made by the authority before permissions for any infrastructural development such as new settlements, industries or roads are given. Permissions granted for mining and quarrying in forest areas cannot be justified by any means, as it has long term implications on the existence of organisms. Infrastructural development should be carried out with least effect on co - existence of organisms in any ecosystems. The proposed ring road of Malampuzha connecting Thekke Malampuzha and Elival needs to be constructed without hampering the natural vegetation and forest fauna. The government permits and sanctions for the construction of human settlements needs to be evaluated with a biodiversity committee to confirm whether the site is suitable for human inhabitation and whether there is any chances of animal conflicts. Introduction of exotic ornamental plants for the beautification of gardens in homesteads, resorts and other buildings should be regulated so that there is no chance of escape into the wild habitats.

GIS mapping of Walayar hill tracts on a regular basis with information on landslide struck sites, forest fire prone areas, and regular travel path of animals such as elephants will aid the officials to effectively carry out any protection measures and conservation initiatives planned for the range. With this information, predictions can be made on the locations where the landslides can happen and chances of occurrence of forest fire along with understanding the animal corridors. Maintenance of fire lines and controlled firing of the understory of forests in the drier season will reduce the incidence of forest fire. Ecologically Fragile Lands (EFL) should be regularly monitored and the health of the ecosystem can be regularly checked. This may be done with mutual cooperation of Dept. of forests along with consultation with research centers, scientists, researchers, forest professionals, teachers etc. Pollution in the tourist locations in Malampuzha can be regulated by proper surveillance and through restricting the people entering and trekking the forest tracts.

The floristic explorations in the Walayar range revealed rich diversity within a small geographical area with unique floral elements that can survive in acute environmental regimes. Proper awareness and understanding of this floral wealth must reach at grassroot level so that the measures taken up for greening the Gap region can be made successful. This can be done through the implementation of several programmes in association with Department of Forests, respective Panchayats along with other governmental and non-governmental organizations working for the conservation and protection of nature. Recognized governmental organizations should responsibly function for the procurement of the forest products collected by the tribals and they must be made aware of the judicious collection and sustainable utilization of natural resources. More floristic, faunal and ecological studies need to be carried out for understanding the complex forest ecosystems and the services provided by them. Critical evaluation of ecosystem services and the economic values inherent in each local biodiversity element will aid in location-based conservation initiatives by the native inhabitants themselves. This will in turn create an awareness on the importance and the need for conservation and protection of natural resources in young minds.

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Annexure I

Semi-evergreen Forest elements in Walayar forest range

Sl. No	Binomial Name	Family
1	*Asystasia dalzelliana* Santapau	Acanthaceae
2	*Barleria courtallica* Nees	Acanthaceae
3	*Dicliptera foetida* Blatt.	Acanthaceae
4	*Eranthemum capense* L.	Acanthaceae
5	*Gymnostachyum pubescens* (Lam.) M.R.Almeida	Acanthaceae
6	*Justicia wynaadensis* B.Heyne	Acanthaceae
7	*Phaulopsis imbricata* Sweet	Acanthaceae
8	*Rostellularia diffusa* (Nees) Nees	Acanthaceae
9	*Rungia pectinata* Nees	Acanthaceae
10	*Rungia wightiana* Nees	Acanthaceae
11	*Strobilanthes aurita* J.R.I.Wood	Acanthaceae
12	*Strobilanthes ciliata* Nees	Acanthaceae
13	*Strobilanthes crossandra* (Steud.) J.R.I.Wood	Acanthaceae
14	*Strobilanthes dupeni* Bedd. ex C.B.Clarke	Acanthaceae
15	*Thunbergia mysorensis* (Wight) T.Anderson	Acanthaceae
16	*Hydnocarpus alpinus* Wight	Achariaceae
17	*Hydnocarpus pentandrus* (Buch.-Ham.) Oken	Achariaceae
18	*Cyathula prostrata* (L.) Blume	Amaranthaceae
19	*Holigarna arnottiana* Hook.f.	Anacardiaceae
20	*Mangifera indica* L.	Anacardiaceae
21	*Spondias pinnata* (L.f.) Kurz	Anacardiaceae
22	*Ancistrocladus heyneanus* Wall. ex J.Graham	Ancistrocladaceae
23	*Meiogyne pannosa* (Dalzell) J.Sinclair	Annonaceae
24	*Monoon fragrans* (Dalzell) B.Xue & R.M.K.Saunders	Annonaceae
25	*Orophea zeylanica* Hook.f. & Thomson	Annonaceae
26	*Polyalthia malabarica* (Bedd.) I.M.Turner	Annonaceae
27	*Pimpinella heyneana* (DC.) Benth.	Apiaceae
28	*Aganosma cymosa* (Roxb.) G.Don	Apocynaceae
29	*Anodendron parviflorum* (Roxb.) I.M.Turner	Apocynaceae
30	*Carissa spinarum* L.	Apocynaceae
31	*Gymnema inodorum* (Lour.) Decne.	Apocynaceae
32	*Hunteria zeylanica* Gardner ex Thwaites	Apocynaceae
33	*Amorphophallus commutatus* (Schott) Engl.	Araceae
34	*Ariopsis peltata* Nimmo	Araceae
35	*Arisaema barnesii* C.E.C.Fisch.	Araceae
36	*Arisaema tortuosum* (Wall.) Schott	Araceae
37	*Arisaema tortuosum* var. *neglectum* (Schott) Fisch.	Araceae
38	*Pothos scandens* L.	Araceae
39	*Remusatia vivipara* (Roxb.) Schott	Araceae
40	*Theriophonum fischeri* Sivad.	Araceae

41	*Hydrocotyle javanica* Thunb.	Araliaceae
42	*Calamus thwaitesii* Becc.	Arecaceae
43	*Caryota urens* L.	Arecaceae
44	*Thottea siliquosa* (Lam.) Ding Hou	Aristolochiaceae
45	*Thottea sivarajanii* E.S.S.Kumar, A.E.S.Khan & Binu	Aristolochiaceae
46	*Asparagus gonocladus* Baker	Asparagaceae
47	*Asparagus racemosus* Willd.	Asparagaceae
48	*Chlorophytum nimmonii* Dalzell	Asparagaceae
49	*Acmella calva* (DC.) R.K.Jansen	Asteraceae
50	*Adenostemma lavenia* (L.) Kuntze	Asteraceae
51	*Blumea laevis* (Lour.) Merr.	Asteraceae
52	*Strobocalyx arboreus* Sch.Bip.	Asteraceae
53	*Impatiens dasysperma* Wight	Balsaminaceae
54	*Impatiens gardneriana* Wight	Balsaminaceae
55	*Impatiens minor* (DC.) Bennet	Balsaminaceae
56	*Impatiens scapiflora* B.Heyne	Balsaminaceae
57	*Begonia dipetala* Graham	Begoniaceae
58	*Stereospermum colais* (Buch.-Ham. ex Dillwyn) Mabb.	Bignoniaceae
59	*Canarium strictum* Roxb.	Burseraceae
60	*Mesua ferrea* L.	Calophyllaceae
61	*Crateva magn*a DC.	Capparaceae
62	*Celastrus paniculatus* Willd.	Celastraceae
63	*Euonymus angulatus* Wight	Celastraceae
64	*Salacia macrosperma* Wight	Celastraceae
65	*Garcinia cowa* Roxb.	Clusiaceae
66	*Garcinia gummi-gutta* (L.) N.Robson	Clusiaceae
67	*Gloriosa superba* L.	Colchicaceae
68	*Combretum albidum* G.Don	Combretaceae
69	*Combretum latifolium* Blume	Combretaceae
70	*Terminalia bellirica* (Gaertn.) Roxb.	Combretaceae
71	*Commelina paludosa* Blume	Commelinaceae
72	*Cyanotis pilosa* Schult.f.	Commelinaceae
73	*Murdannia japonica* (Thunb.) Faden	Commelinaceae
74	*Rhopalephora scaberrima* (Blume) Faden	Commelinaceae
75	*Camonea umbellata* (L.) A.R.Simões & Staples	Convolvulaceae
76	*Hellenia speciosa* (J.Koenig) S.R.Dutta	Costaceae
77	*Cucumis sativu*s L.	Cucurbitaceae
78	*Momordica dioica* Roxb. ex Willd.	Cucurbitaceae
79	*Momordica sahyadrica* Kattuk. & V.T.Antony	Cucurbitaceae
80	*Trichosanthes cucumerina* L.	Cucurbitaceae
81	*Carex phacota* Spreng.	Cyperaceae
82	*Dioscorea hamiltonii* Hook.f.	Dioscoreaceae
83	*Dioscorea oppositifolia* L.	Dioscoreaceae

84	*Dioscorea spicata* Roth	Dioscoreaceae
85	*Dioscorea wallichii* Hook.f.	Dioscoreaceae
86	*Hopea parviflora* Bedd.	Dipterocarpaceae
87	*Diospyros buxifolia* Hiern	Ebenaceae
88	*Diospyros trichophylla* Alston	Ebenaceae
89	*Elaeagnus indica* Serv.	Elaeagnaceae
90	*Elaeocarpus serratus* L.	Elaeocarpaceae
91	*Acalypha paniculata* Miq.	Euphorbiaceae
92	*Mallotus philippensis* (Lam.) Müll.Arg.	Euphorbiaceae
93	*Mallotus resinosus* Merr.	Euphorbiaceae
94	*Mallotus rhamnifolius* Müll.Arg.	Euphorbiaceae
95	*Mallotus tetracoccus* Kurz	Euphorbiaceae
96	*Tragia bicolor* Miq.	Euphorbiaceae
97	*Albizia chinensis* (Osbeck.) Merr.	Fabaceae
98	*Crotalaria heyneana* Graham ex Wight & Arn.	Fabaceae
99	*Dysolobium pilosum* (Willd.) Maréchal	Fabaceae
100	*Entada phaseoloides* Merr.	Fabaceae
101	*Flemingia macrophylla* (Willd.) Kuntze ex Merr.	Fabaceae
102	*Flemingia strobilifera* (L.) W.T.Aiton	Fabaceae
103	*Flemingia wallichii* Wight & Arn.	Fabaceae
104	*Grona heterocarpos* (L.) H.Ohashi & K.Ohashi	Fabaceae
105	*Mucuna monosperma* DC. ex Wight	Fabaceae
106	*Phanera scandens* (L.) Lour. ex Raf.	Fabaceae
107	*Saraca asoca* (Roxb.) W.J.de Wilde	Fabaceae
108	*Senegalia caesia* (L.) Maslin, Seigler & Ebinger	Fabaceae
109	*Spatholobus parviflorus* Kuntze	Fabaceae
110	*Vigna umbellata* (Thunb.) Ohwi & H.Ohashi	Fabaceae
111	*Guilandina bonduc* L.	Fabceae
112	*Canscora pauciflora* Dalzell	Gentianaceae
113	*Epithema carnosum* Benth.	Gesneriaceae
114	*Henckelia fischeri* (Gamble) A.Weber & B.L.Burtt	Gesneriaceae
115	*Rhynchoglossum notonianum* (Wall.) B.L.Burtt	Gesneriaceae
116	*Rhynchoglossum scabrum* Dalzell	Gesneriaceae
117	*Hypoxis aurea* Lour.	Hypoxidaceae
118	*Mappia nimmoniana* (J.Graham) Byng & Stull	Icacinaceae
119	*Sarcostigma kleinii* Wight & Arn.	Icacinaceae
120	*Callicarpa tomentosa* (L.) L.	Lamiaceae
121	*Colebrookea oppositifolia* Sm.	Lamiaceae
122	*Gomphostemma heyneanum* Wall. ex Benth.	Lamiaceae
123	*Pogostemon purpurascens* Dalzell	Lamiaceae
124	*Premna paucinervis* Gamble	Lamiaceae
125	*Vitex altissima* L.f.	Lamiaceae
126	*Actinodaphne salicina* Meisn.	Lauraceae

127	*Beilschmiedia gemmiflora* (Blume) Kosterm.	Lauraceae
128	*Cinnamomum malabatrum* (Burm.f.) J.Presl	Lauraceae
129	*Cinnamomum verum* J.Presl	Lauraceae
130	*Litsea coriacea* (B.Heyne ex Nees) Hook.f.	Lauraceae
131	*Machilus glaucescens* (Nees) Wight	Lauraceae
132	*Phoebe lanceolata* (Nees) Nees	Lauraceae
133	*Strychnos wallichiana* Steud. ex A.DC.	Loganiaceae
134	*Scurrula cordifolia* G.Don	Loranthaceae
135	*Taxillus tomentosus* (B.Heyne ex Roth) Tiegh.	Loranthaceae
136	*Lagerstroemia speciosa* Pers.	Lythraceae
137	*Hiptage benghalensis* (L.) Kurz	Malpighiaceae
138	*Abelmoschus angulosus* Wight & Arn.	Malvaceae
139	*Abutilon persicum* (Burm.f.) Merr.	Malvaceae
140	*Bombax ceiba* L.	Malvaceae
141	*Bombax insigne* Wall.	Malvaceae
142	*Heritiera papilio* Bedd.	Malvaceae
143	*Sida beddomei* Jacob	Malvaceae
144	*Sterculia guttata* Roxb.	Malvaceae
145	*Triumfetta pilosa* Roth	Malvaceae
146	*Stachyphrynium spicatum* K.Schum.	Marantaceae
147	*Memecylon talbotianum* D.Brandis	Melastomataceae
148	*Memecylon umbellatum* Burm.f.	Melastomataceae
149	*Osbeckia aspera* Blume	Melastomataceae
150	*Aglaia lawii* (Wight) C.J.Saldanha	Meliaceae
151	*Cipadessa baccifera* Miq.	Meliaceae
152	*Anamirta cocculus* (L.) Wight & Arn.	Menispermaceae
153	*Cyclea peltata* (Lam.) Hook.f. & Thomson	Menispermaceae
154	*Diploclisia glaucescens* (Blume) Diels	Menispermaceae
155	*Stephania japonica* (Thunb.) Miers	Menispermaceae
156	*Stephania wightii* (Arn. ex Wight) Dunn	Menispermaceae
157	*Artocarpus heterophyllus* Lam.	Moraceae
158	*Artocarpus hirsutus* Lam.	Moraceae
159	*Ficus arnottiana* (Miq.) Miq.	Moraceae
160	*Ficus beddomei* King	Moraceae
161	*Ficus callosa* Willd.	Moraceae
162	*Ficus costata* Aiton	Moraceae
163	*Ficus hispida* L.f.	Moraceae
164	*Ficus microcarp*a L.f.	Moraceae
165	*Ficus racemosa* L.	Moraceae
166	*Ficus tinctoria* G.Forst.	Moraceae
167	*Ficus virens* Aiton	Moraceae
168	*Eugenia wynadensis* Bedd.	Myrtaceae
169	*Syzygium cumini* (L.) Skeels	Myrtaceae

170	*Syzygium gardneri* Thwaites	Myrtaceae
171	*Syzygium laetum* (Buch.-Ham.) Gandhi	Myrtaceae
172	*Erythropalum scandens* Blume	Olacaceae
173	*Chionanthus mala-elengi* (Dennst.) P.S.Green	Oleaceae
174	*Jasminum coarctatum* Roxb.	Oleaceae
175	*Jasminum flexile Vahl*	Oleaceae
176	*Myxopyrum smilacifolium* Blume	Oleaceae
177	*Tetrapilus dioicus* (Roxb.) L.A.S.Johnson	Oleaceae
178	*Aerides maculosa* Lindl.	Orchidaceae
179	*Disperis monophylla* Blatt. ex C.E.C.Fisch.	Orchidaceae
180	*Habenaria digitata* Lindl.	Orchidaceae
181	*Habenaria furcifera* Lindl.	Orchidaceae
182	*Oberonia bicornis* Lindl.	Orchidaceae
183	*Aeginetia indica* L.	Orobanchaceae
184	*Antidesma acidum* Retz.	Phyllanthaceae
185	*Antidesma alexiteria* L.	Phyllanthaceae
186	*Antidesma montanum* Blume	Phyllanthaceae
187	*Aporosa cardiosperma* (Gaertn.) Merr.	Phyllanthaceae
188	*Baccaurea courtallensis* (Wight) Müll.Arg.	Phyllanthaceae
189	*Breynia quadrangularis* (J.G.Klein ex Willd.) Chakrab. & N.P.Balakr.	Phyllanthaceae
190	*Breynia retusa* (Dennst.) Alston	Phyllanthaceae
191	*Bridelia retusa* A.Juss.	Phyllanthaceae
192	*Bridelia stipularis* Blume	Phyllanthaceae
193	*Glochidion ellipticum* Wight	Phyllanthaceae
194	*Glochidion zeylanicum* (Gaertn.) A.Juss.	Phyllanthaceae
195	*Phyllanthus rheedei* Wight	Phyllanthaceae
196	*Piper argyrophyllum* Miq.	Piperaceae
197	*Piper longum* L.	Piperaceae
198	*Piper nigrum* L.	Piperaceae
199	*Piper umbellatum* L.	Piperaceae
200	*Piper wightii* Miq.	Piperaceae
201	*Centotheca lappacea* Desv.	Poaceae
202	*Cyrtococcum deccanense* Bor	Poaceae
203	*Cyrtococcum oxyphyllum* Stapf	Poaceae
204	*Enteropogon dolichostachyus* (Lag.) Keng	Poaceae
205	*Oplismenus burmanni* (Retz.) P.Beauv.	Poaceae
206	*Oryza meyeriana* Baill.	Poaceae
207	*Oryza officinalis* Wall.	Poaceae
208	*Spodiopogon rhizophorus* (Steud.) Pilg.	Poaceae
209	*Xanthophyllum flavescens* Roxb.	Polygalaceae
210	*Persicaria chinensis* (L.) H.Gross	Polygonaceae
211	*Ardisia solanacea* Roxb.	Primulaceae
212	*Maesa indica* (Roxb.) Sweet	Primulaceae

213	*Drypetes confertiflor*a Pax & K.Hoffm.	Putranjivaceae
214	*Drypetes oblongifolia* (Bedd.) Airy Shaw	Putranjivaceae
215	*Gouania microcarpa* DC.	Rhamnaceae
216	*Carallia brachiata* Merr.	Rhizophoraceae
217	*Prunus ceylanica* Miq.	Rosaceae
218	*Argostemma courtallense* Arn.	Rubiaceae
219	*Canthium rheedei* DC.	Rubiaceae
220	*Discospermum sphaerocarpum* Dalzell	Rubiaceae
221	*Geophila repens* (L.) I.M.Johnst.	Rubiaceae
222	*Hymenodictyon obovatum* Wall.	Rubiaceae
223	*Ixora brachiata* Roxb.	Rubiaceae
224	*Ixora cuneifolia* Roxb.	Rubiaceae
225	*Ixora ravikumarii* Kottaim.	Rubiaceae
226	*Knoxia sumatrensis* (Retz.) DC.	Rubiaceae
227	*Mussaenda frondosa* L.	Rubiaceae
228	*Neonauclea purpurea* (Roxb.) Merr.	Rubiaceae
229	*Nostolachma crassifolia* (Gamble) Deb & J.Lahiri	Rubiaceae
230	*Ophiorrhiza mungos* L.	Rubiaceae
231	*Ophiorrhiza rugosa* var. *decumbens* (Gardner ex Thwaites) Deb & Mondal	Rubiaceae
232	*Oxyceros rugulosus* (Thwaites) Tirveng.	Rubiaceae
233	*Pavetta hispidula* Wight & Arn.	Rubiaceae
234	*Pavetta zeylanica* Gamble	Rubiaceae
235	*Atalantia racemosa* Wight & Arn.	Rutaceae
236	*Clausena indica* Oliv.	Rutaceae
237	*Glycosmis nelliyampathiensis* Jabeena & Maya	Rutaceae
238	*Glycosmis pentaphylla* (Retz.) DC.	Rutaceae
239	*Naringi crenulata* (Roxb.) Nicolson	Rutaceae
240	*Paramignya monophylla* Wight	Rutaceae
241	*Zanthoxylum asiaticum* (L.) Appelhans, Groppo & J.Wen	Rutaceae
242	*Casearia graveolens* Dalzell	Salicaceae
243	*Casearia wynadensis* Bedd.	Salicaceae
244	*Flacourtia montana* J.Graham	Salicaceae
245	*Allophylus serratus* Kurz	Sapindaceae
246	*Dimocarpus longan* Lour.	Sapindaceae
247	*Harpullia arborea* (Blanco) Radlk.	Sapindaceae
248	*Lepisanthes tetraphylla* Radlk.	Sapindaceae
249	*Sapindus trifoliatus* L.	Sapindaceae
250	*Schleichera oleos*a (Lour.) Oken	Sapindaceae
251	*Mimusops elengi* L.	Sapotaceae
252	*Ailanthus triphysus* (Dennst.) Alston	Simaroubaceae
253	*Smilax zeylanica* L.	Smilacaceae
254	*Solanum multiflorum* Roth	Solanaceae
255	*Solanum violaceum* Ortega	Solanaceae

256	*Symplocos acuminata* Miq.	Symplocaceae
257	*Tetrameles nudiflora* R.Br.	Tetramelaceae
258	*Polyspora obtusa* (Wall. ex Wight & Arn.) Niissalo & L.M.Choo	Theaceae
259	*Holoptelea integrifolia* (Roxb.) Planch.	Ulmaceae
260	*Elatostema acuminatum* (Poir.) Brongn., Bot. Voy. Coquille 211 (1834).	Urticaceae
261	*Elatostema heyneanum* (Wedd.) Hallier f.	Urticaceae
262	*Elatostema lineolatum* Wight	Urticaceae
263	*Girardinia diversifolia* (Link) Friis	Urticaceae
264	*Laportea bulbifer*a (Siebold & Zucc.) Wedd.	Urticaceae
265	*Ampelocissus latifolia* (Roxb.) Planch.	Vitaceae
266	*Causonis trifolia* (L.) Mabb. & J.Wen	Vitaceae
267	*Cayratia pedata* Gagnep.	Vitaceae
268	*Cissus discolor* Blume	Vitaceae
269	*Cissus heyneana* Steud.	Vitaceae
270	*Cissus latifolia* Lam.	Vitaceae
271	*Leea asiatica* (L.) Ridsdale	Vitaceae
272	*Leea macrophylla* Roxb. ex Hornem.	Vitaceae
273	*Tetrastigma sulcatum* Gamble	Vitaceae
274	*Boesenbergia pulcherrima* Kuntze	Zingiberaceae
275	*Curcuma aurantiaca* Zijp	Zingiberaceae
276	*Curcuma mutabili*s Škorničk., M.Sabu & Prasanthk.	Zingiberaceae
277	*Curcuma vamana* M.Sabu & Mangaly	Zingiberaceae
278	*Globba sessiliflora* Sims	Zingiberaceae
279	*Meistera aculeata* (Roxb.) Škorničk. & M.F.Newman	Zingiberaceae
280	*Zingiber neesanum* (J.Graham) Ramamoorthy	Zingiberaceae
281	*Zingiber sabuanum* K.M.P.Kumar & A.Joe	Zingiberaceae
282	*Zingiber zerumbet* (L.) Sm.	Zingiberaceae

Annexure II

Deciduous forest elements in Walayar forest range

Sl. No	Binomial Name	Family
1	*Andrographis elongata* (Vahl) T.Anderson	Acanthaceae
2	*Barleria prattensis* Santapau	Acanthaceae
3	*Barleria prionitis* L.	Acanthaceae
4	*Barleria tomentosa* Roth	Acanthaceae
5	*Blepharis integrifolia* E.Mey. & Drège	Acanthaceae
6	*Blepharis maderaspatensis* (L.) B.Heyne	Acanthaceae
7	*Dicliptera paniculata* (Forssk.) I.Darbysh.	Acanthaceae
8	*Ecbolium viride* (Forssk.) Alston	Acanthaceae
9	*Eranthemum capense* L.	Acanthaceae
10	*Haplanthodes tentaculata* var. *neilgherryensis* (Wight) J.R.I.Wood	Acanthaceae
11	*Justicia gendarussa* Burm.f.	Acanthaceae
12	*Justicia tranquebariensis* L.f.	Acanthaceae
13	*Justicia wynaadensis* B.Heyne	Acanthaceae
14	*Lepidagathis incurva* Buch.-Ham. ex D.Don	Acanthaceae
15	*Lepidagathis spinosa* Wight ex Nees	Acanthaceae
16	*Nicoteba betonica* Lindau	Acanthaceae
17	*Phaulopsis imbricata* Sweet	Acanthaceae
18	*Rhinacanthus nasutus* (L.) Kurz	Acanthaceae
19	*Strobilanthes crossandra* (Steud.) J.R.I.Wood	Acanthaceae
20	*Hydnocarpus pentandrus* (Buch.-Ham.) Oken	Achariaceae
21	*Achyranthes aspera* L.	Amaranthaceae
22	*Achyranthes aspera* var. *porphyristachya* (Wall. ex Moq.) Hook.f.	Amaranthaceae
23	*Allmania nodiflora* (L.) R.Br. ex Wight	Amaranthaceae
24	*Cyathula prostrata* (L.) Blume	Amaranthaceae
25	*Digera muricata* Mart.	Amaranthaceae
26	*Gomphrena celosioides* Mart.	Amaranthaceae
27	*Ouret lanata* (L.) Kuntze	Amaranthaceae
28	*Ouret* sp. Nova	Amaranthaceae
29	*Psilotrichum elliottii* Baker	Amaranthaceae
30	*Pupalia lappacea* (L.) Juss.	Amaranthaceae
31	*Pancratium triflorum* Roxb.	Amaryllidaceae
32	*Lannea coromandelica* (Houtt.) Merr.	Anacardiaceae
33	*Spondias pinnata* (L.f.) Kurz	Anacardiaceae
34	*Huberantha cerasoides* (Roxb.) Chaowasku	Annonaceae
35	*Miliusa tomentosa* (Roxb.) Finet & Gagnep.	Annonaceae
36	*Centella asiatica* (L.) Urb.	Apiaceae
37	*Pimpinella heyneana* (DC.) Benth.	Apiaceae
38	*Alstonia scholaris* (L.) R.Br.	Apocynaceae

39	*Alstonia venenata* R.Br.	Apocynaceae
40	*Anodendron parviflorum* (Roxb.) I.M.Turner	Apocynaceae
41	*Boucerosia umbellata* Wight & Arn.	Apocynaceae
42	*Cosmostigma cordatum* (Poir.) M.R.Almeida	Apocynaceae
43	*Cryptolepis buchananii* Roem. & Schult.	Apocynaceae
44	*Cynanchum annularium* (Roxb.) Liede & Khanum	Apocynaceae
45	*Gymnema sylvestre* (Retz.) R.Br. ex Sm.	Apocynaceae
46	*Hemidesmus indicus* (L.) R.Br.	Apocynaceae
47	*Holarrhena pubescens* Wall. & G.Don	Apocynaceae
48	*Ichnocarpus frutescens* (L.) W.T.Aiton	Apocynaceae
49	*Pergularia daemia* (Forssk.) Chiov.	Apocynaceae
50	*Rauvolfia serpentina* Benth. ex Kurz	Apocynaceae
51	*Tabernaemontana alternifolia* L.	Apocynaceae
52	*Wattakaka volubilis* Stapf	Apocynaceae
53	*Wrightia tinctoria* R.Br.	Apocynaceae
54	*Amorphophallus paeoniifolius* (Dennst.) Nicolson	Araceae
55	*Amorphophallus* sp. Nova Aswani, Prabhuumar and Maya	Araceae
56	*Remusatia vivipara* (Roxb.) Schott	Araceae
57	*Theriophonum infaustum* N.E.Br.	Araceae
58	*Asparagus gonocladus Baker*	Asparagaceae
59	*Chlorophytum nimmonii* Dalzell	Asparagaceae
60	*Acilepis divergens* (DC.) H.Rob. & Skvarla	Asteraceae
61	*Blainvillea acmella* (L.) Philipson	Asteraceae
62	*Blumea lacera* (Burm.f.) DC.	Asteraceae
63	*Blumea laevis* (Lour.) Merr.	Asteraceae
64	*Cosmos caudatus* Kunth	Asteraceae
65	*Crassocephalum crepidioides* S.Moore	Asteraceae
66	*Cyanthillium cinereum* (L.) H.Rob.	Asteraceae
67	*Elephantopus scabe*r L.	Asteraceae
68	*Emilia sonchifolia* (L.) DC.	Asteraceae
69	*Parthenium hysterophorus* L.	Asteraceae
70	*Sigesbeckia orientalis* L.	Asteraceae
71	*Synedrella nodiflora* Gaertn.	Asteraceae
72	*Tridax procumbens* L.	Asteraceae
73	*Vicoa indica* DC.	Asteraceae
74	*Xanthium strumarium* L.	Asteraceae
75	*Impatiens flaccida* Arn.	Balsaminaceae
76	*Impatiens minor* (DC.) Bennet	Balsaminaceae
77	*Basella alba* L.	Basellaceae
78	*Oroxylum indicum* (L.) Benth. ex Kurz	Bignoniaceae
79	*Radermachera xylocarpa* K.Schum.	Bignoniaceae
80	*Stereospermum colais* (Buch.-Ham. ex Dillwyn) Mabb.	Bignoniaceae
81	*Cochlospermum religiosum* (L.) Alston	Bixaceae

82	*Cordia dichotoma* G.Forst.	Boraginaceae
83	*Ehretia microphylla* Lam.	Boraginaceae
84	*Euploca marifolia* (J.Koenig ex Retz.) Ancy & P.Javad	Boraginaceae
85	*Euploca marifolia* var. *rottleri* (Lehm.) Ancy & P.Javad	Boraginaceae
86	*Trichodesma indicum* (L.) Sm.	Boraginaceae
87	*Garuga pinnata* Roxb.	Burseraceae
88	*Opuntia dillenii* Haw.	Cactaceae
89	*Opuntia ficus-indica* (L.) Mill.	Cactaceae
90	*Trema orientale* Blume	Cannabaceae
91	*Capparis brevispina* DC.	Capparaceae
92	*Capparis zeylanica* L.	Capparaceae
93	*Polycarpaea corymbosa* (L.) Lam.	Caryophyllaceae
94	*Celastrus paniculatus* Willd.	Celastraceae
95	*Pristimera arnottiana* (Wight) R.H.Archer	Celastraceae
96	*Salacia chinensis* L.	Celastraceae
97	*Cleome aspera* J.Koenig	Cleomaceae
98	*Cleome gynandra* L.	Cleomaceae
99	*Gloriosa superba* L.	Colchicaceae
100	*Getonia floribunda* Roxb.	Combretaceae
101	*Terminalia anogeissiana* Gere & Boatwr.	Combretaceae
102	*Terminalia arjuna* (Roxb. ex DC.) Wight & Arn.	Combretaceae
103	*Terminalia bellirica* (Gaertn.) Roxb.	Combretaceae
104	*Terminalia chebula* Retz.	Combretaceae
105	*Terminalia elliptica* Willd.	Combretaceae
106	*Terminalia paniculata* Roth	Combretaceae
107	*Commelina benghalensi*s L.	Commelinaceae
108	*Commelina clavata* C.B.Clarke	Commelinaceae
109	*Murdannia japonica* (Thunb.) Faden	Commelinaceae
110	*Murdannia spirata* G.Brückn.	Commelinaceae
111	*Argyreia pomacea* Choisy	Convolvulaceae
112	*Cuscuta chinensis* Lam.	Convolvulaceae
113	*Evolvulus alsinoides* L.	Convolvulaceae
114	*Evolvulus nummularius* (L.) L.	Convolvulaceae
115	*Hewittia malabarica* (L.) Suresh	Convolvulaceae
116	*Ipomoea alba* L.	Convolvulaceae
117	*Ipomoea cairica* (L.) Sweet	Convolvulaceae
118	*Ipomoea eriocarpa* R.Br.	Convolvulaceae
119	*Ipomoea nil* (L.) Roth	Convolvulaceae
120	*Ipomoea pes-tigridis* L.	Convolvulaceae
121	*Ipomoea staphylina* Roem. & Schult.	Convolvulaceae
122	*Ipomoea wightii* Choisy	Convolvulaceae
123	*Xenostegia tridentata* (L.) D.F.Austin & Staples	Convolvulaceae
124	*Alangium salviifolium* (L.f.) Wangerin	Cornaceae

125	*Hellenia speciosa* (J.Koenig) S.R.Dutta	Costaceae
126	*Kalanchoe olivacea* Dalzell	Crassulaceae
127	*Coccinia grandis* (L.) Voigt	Cucurbitaceae
128	*Cucumis maderaspatanus* L.	Cucurbitaceae
129	*Diplocyclos palmatus* (L.) C.Jeffrey	Cucurbitaceae
130	*Momordica dioica* Roxb. ex Willd.	Cucurbitaceae
131	*Momordica sahyadrica* Kattuk. & V.T.Antony	Cucurbitaceae
132	*Trichosanthes tricuspidata* Lour.	Cucurbitaceae
133	*Cyperus dubius* Rottb.	Cyperaceae
134	*Dillenia pentagyna* Roxb.	Dilleniaceae
135	*Dioscorea belophylla* (Prain) Voigt ex Haines	Dioscoreaceae
136	*Dioscorea bulbifera* L.	Dioscoreaceae
137	*Dioscorea hamiltonii* Hook.f.	Dioscoreaceae
138	*Dioscorea oppositifolia* L.	Dioscoreaceae
139	*Dioscorea wallichii* Hook.f.	Dioscoreaceae
140	*Drosera burmanni* Vahl	Droseraceae
141	*Drosera indica* L.	Droseraceae
142	*Diospyros ebenum* J.Koenig	Ebenaceae
143	*Diospyros melanoxylon* Roxb.	Ebenaceae
144	*Elaeagnus conferta* Roxb.	Elaeagnaceae
145	*Acalypha capitata* Willd.	Euphorbiaceae
146	*Acalypha fruticosa* Forssk.	Euphorbiaceae
147	*Acalypha indica* L.	Euphorbiaceae
148	*Acalypha paniculata* Miq.	Euphorbiaceae
149	*Baliospermum solanifolium* (Burm.) Suresh	Euphorbiaceae
150	*Euphorbia thymifolia* L.	Euphorbiaceae
151	*Euphorbia tortilis* Rottler ex Ainslie	Euphorbiaceae
152	*Givotia moluccana* (L.) Sreem.	Euphorbiaceae
153	*Macaranga peltata* Müll.Arg.	Euphorbiaceae
154	*Mallotus philippensis* (Lam.) Müll.Arg.	Euphorbiaceae
155	*Microstachys chamaelea* (L.) Müll.Arg.	Euphorbiaceae
156	*Abrus precatorius* L.	Fabaceae
157	*Aeschynomene indica* L.	Fabaceae
158	*Albizia amara* (Roxb.) Boivin	Fabaceae
159	*Albizia chinensis* (Osbeck.) Merr.	Fabaceae
160	*Albizia lebbeck* (L.) Benth.	Fabaceae
161	*Albizia odoratissima* (L.f.) Benth.	Fabaceae
162	*Alysicarpus glumaceus* (Vahl) DC.	Fabaceae
163	*Alysicarpus monilifer* (L.) DC.	Fabaceae
164	*Bauhinia racemosa* Lam.	Fabaceae
165	*Brachypterum scandens* (Roxb.) Miq.	Fabaceae
166	*Butea monosperma* Kuntze	Fabaceae
167	*Cajanus scarabaeoides* (L.) Thouars	Fabaceae

168	*Canavalia mollis* Wall. ex Wight & Arn.	Fabaceae
169	*Cassia fistula* L.	Fabaceae
170	*Centrosema molle* Mart. ex Benth.	Fabaceae
171	*Chamaecrista mimosoides* (L.) Greene	Fabaceae
172	*Crotalaria evolvuloides* Wight	Fabaceae
173	*Crotalaria heyneana* Graham ex Wight & Arn.	Fabaceae
174	*Crotalaria leptostachya* Benth.	Fabaceae
175	*Crotalaria mysorensis* Roth	Fabaceae
176	*Crotalaria spectabilis* Roth	Fabaceae
177	*Crotalaria verrucosa* L.	Fabaceae
178	*Dalbergia lanceolaria* subsp. *paniculata* (Roxb.) Thoth.	Fabaceae
179	*Dalbergia latifolia* Roxb.	Fabaceae
180	*Dalbergia sissoides* Graham ex Wight & Arn.	Fabaceae
181	*Dendrolobium triangulare* Schindl.	Fabaceae
182	*Dichrostachys cinerea* (L.) Wight & Arn.	Fabaceae
183	*Erythrina stricta* Roxb.	Fabaceae
184	*Erythrina suberosa* Roxb.	Fabaceae
185	*Erythrina variegata* L.	Fabaceae
186	*Flemingia macrophylla* (Willd.) Kuntze ex Merr.	Fabaceae
187	*Flemingia strobilifera* (L.) W.T.Aiton	Fabaceae
188	*Grona heterocarpos* (L.) H.Ohashi & K.Ohashi	Fabaceae
189	*Grona triflora* (L.) H.Ohashi & K.Ohashi	Fabaceae
190	*Hultholia mimosoides* (Lam.) Gagnon & G.P.Lewis	Fabaceae
191	*Indigofera astragalina* DC.	Fabaceae
192	*Indigofera colutea* (Burm.f.) Merr.	Fabaceae
193	*Indigofera uniflora* Buch.-Ham. ex Roxb.	Fabaceae
194	*Phyllodium pulchellum* Desv.	Fabaceae
195	*Pleurolobus gangeticus* (L.) J.St.-Hil. ex H.Ohashi & K.Ohashi	Fabaceae
196	*Polhillides velutina* (Willd.) H.Ohashi & K.Ohashi	Fabaceae
197	*Pongamia pinnata* (L.) Pierre, Fl. Forest	Fabaceae
198	*Pseudarthria viscida* Wight & Arn.	Fabaceae
199	*Pterocarpus marsupium* Roxb.	Fabaceae
200	*Pycnospora lutescens* Schindl.	Fabaceae
201	*Rothia indica* Druce	Fabaceae
202	*Senegalia catechu* (L.f.) P.J.H.Hurter & Mabb.	Fabaceae
203	*Senegalia chundra* (Roxb. ex Rottler) Maslin	Fabaceae
204	*Senegalia pennata* (L.) Maslin	Fabaceae
205	*Senegalia rugata* Britton & Rose	Fabaceae
206	*Senna auriculata* Roxb.	Fabaceae
207	*Senna tora* Roxb.	Fabaceae
208	*Spatholobus parviflorus* Kuntze	Fabaceae
209	*Tephrosia canarensis* J.R.Drumm.	Fabaceae
210	*Tephrosia purpurea* Pers.	Fabaceae

211	*Teramnus labialis* Spreng.	Fabaceae
212	*Uraria rufescens* Schindl.	Fabaceae
213	*Vigna umbellata* (Thunb.) Ohwi & H.Ohashi	Fabaceae
214	*Xylia xylocarpa* (Roxb.) W.Theob.	Fabaceae
215	*Guilandina bonduc* L.	Fabceae
216	*Canscora perfoliata* Lam.	Gentianaceae
217	*Hoppea fastigiata* (Griseb.) C.B.Clarke	Gentianaceae
218	*Curculigo orchioides* Gaertn.	Hypoxidaceae
219	*Mappia nimmoniana* (J.Graham) Byng & Stull	Icacinaceae
220	*Anisomeles indica* (L.) Kuntze	Lamiaceae
221	*Callicarpa tomentosa* (L.) L.	Lamiaceae
222	*Gmelina arborea* Roxb. ex Sm.	Lamiaceae
223	*Leonotis nepetifolia* (L.) R.Br.	Lamiaceae
224	*Leucas aspera* Link	Lamiaceae
225	*Leucas lavandulifolia* Sm., Cycl. [A. Rees]	Lamiaceae
226	*Mesosphaerum suaveolens* (L.) Kuntze	Lamiaceae
227	*Ocimum gratissimum* L.	Lamiaceae
228	*Orthosiphon thymiflorus* (Roth) Sleesen	Lamiaceae
229	*Platostoma hispidum* (L.) A.J.Paton	Lamiaceae
230	*Pogostemon purpurascens* Dalzell	Lamiaceae
231	*Premna tomentosa* Willd.	Lamiaceae
232	*Rotheca serrata* (L.) Steane & Mabb.	Lamiaceae
233	*Tectona grandis* L.f.	Lamiaceae
234	*Vitex altissima* L.f.	Lamiaceae
235	*Machilus glaucescens* (Nees) Wight	Lauraceae
236	*Careya arborea* Roxb.	Lecythidaceae
237	*Bonnaya ciliata* Spreng.	Linderniaceae
238	*Torenia crustacea* (L.) Cham. & Schltdl.	Linderniaceae
239	*Yamazakia pusilla* (Willd.) W.R.Barker, Y.S.Liang & Wannan	Linderniaceae
240	*Yamazakia viscosa* (Hornem.) W.R.Barker, Y.S.Liang & Wannan	Linderniaceae
241	*Mitreola petiolata* (J.F.Gmel.) Torr. & A.Gray	Loganiaceae
242	*Strychnos nux-vomica* L.	Loganiaceae
243	*Strychnos potatorum* L.f.	Loganiaceae
244	*Dendrophthoe falcat*a (L.f.) Ettingsh.	Loranthaceae
245	*Lagerstroemia microcarpa* Wight	Lythraceae
246	*Abelmoschus angulosus* Wight & Arn.	Malvaceae
247	*Abelmoschus moschatus* Medik.	Malvaceae
248	*Abutilon persicum* (Burm.f.) Merr.	Malvaceae
249	*Azanza lampas* Alef.	Malvaceae
250	*Bombax ceiba* L.	Malvaceae
251	*Bombax insigne* Wall.	Malvaceae
252	*Grewia tiliifolia* Vahl	Malvaceae

253	*Helicteres isora* L.	Malvaceae
254	*Hibiscus hispidissimus* Griff.	Malvaceae
255	*Hibiscus lobatus* (Murray) Kuntze	Malvaceae
256	*Hibiscus surattensis* L.	Malvaceae
257	*Hibiscus vitifolius* L.	Malvaceae
258	*Sida acuta* Burm.f.	Malvaceae
259	*Sida beddomei* Jacob	Malvaceae
260	*Sida rhombifolia* subsp. *alnifolia* (L.) Ugbor.	Malvaceae
261	*Sterculia foetida* L.	Malvaceae
262	*Sterculia guttata* Roxb.	Malvaceae
263	*Sterculia urens* Roxb.	Malvaceae
264	*Triumfetta pilosa* Roth	Malvaceae
265	*Urena lobata* subsp. *sinuata* (L.) Borss.Waalk.	Malvaceae
266	*Stachyphrynium spicatum* K.Schum.	Marantaceae
267	*Memecylon umbellatum* Burm.f.	Melastomataceae
268	*Osbeckia aspera* Blume	Melastomataceae
269	*Osbeckia gracilis* Bedd.	Melastomataceae
270	*Osbeckia muralis* Naudin	Melastomataceae
271	*Azadirachta indic*a A.Juss.	Meliaceae
272	*Cipadessa baccifera* Miq.	Meliaceae
273	*Naregamia alata* Wight & Arn.	Meliaceae
274	*Anamirta cocculus* (L.) Wight & Arn.	Menispermaceae
275	*Cissampelos pareira* L.	Menispermaceae
276	*Diploclisia glaucescens* (Blume) Diels	Menispermaceae
277	*Stephania japonica* (Thunb.) Miers	Menispermaceae
278	*Tiliacora acuminata* (Lam.) Miers	Menispermaceae
279	*Tinospora cordifolia* (Willd.) Miers ex Hook.f. & Thomson	Menispermaceae
280	*Paramollugo nudicaulis* (Lam.) Thulin	Molluginaceae
281	*Artocarpus hirsutus* Lam.	Moraceae
282	*Ficus arnottiana* (Miq.) Miq.	Moraceae
283	*Ficus benghalensis* L.	Moraceae
284	*Ficus callosa* Willd.	Moraceae
285	*Ficus dalhousieae* Miq.	Moraceae
286	*Ficus exasperata* Vahl	Moraceae
287	*Ficus hispida* L.f.	Moraceae
288	*Ficus racemosa* L.	Moraceae
289	*Ficus tinctoria* G.Forst.	Moraceae
290	*Ficus tsjakel*a Burm.f.	Moraceae
291	*Streblus asper* Lour.	Moraceae
292	*Boerhavia diffusa* L.	Nyctaginaceae
293	*Boerhavia erecta* L.	Nyctaginaceae
294	*Chionanthus mala-elengi* (Dennst.) P.S.Green	Oleaceae
295	*Jasminum auriculatum* Vahl	Oleaceae

296	*Jasminum coarctatum* Roxb.	Oleaceae
297	*Tetrapilus dioicus* (Roxb.) L.A.S.Johnson	Oleaceae
298	*Acampe praemorsa* (Roxb.) Blatt. & McCann	Orchidaceae
299	*Dendrobium ovatum* Kraenzl.	Orchidaceae
300	*Habenaria furcifera* Lindl.	Orchidaceae
301	*Nervilia concolor* Schltr.	Orchidaceae
302	*Nervilia infundibulifolia* Blatt. & McCann	Orchidaceae
303	*Nervilia plicata* Schltr.	Orchidaceae
304	*Nervilia simplex* (Spreng.) Schltr.	Orchidaceae
305	*Vanda testacea* Rchb.f.	Orchidaceae
306	*Aeginetia indica* L.	Orobanchaceae
307	*Centranthera indica* Gamble	Orobanchaceae
308	*Striga angustifolia* (D.Don) Saldanha	Orobanchaceae
309	*Biophytum reinwardtii* (Zucc.) Klotzsch	Oxalidaceae
310	*Antidesma acidum* Retz.	Phyllanthaceae
311	*Breynia quadrangularis* (J.G.Klein ex Willd.) Chakrab. & N.P.Balakr.	Phyllanthaceae
312	*Breynia retusa* (Dennst.) Alston	Phyllanthaceae
313	*Bridelia retusa* A.Juss.	Phyllanthaceae
314	*Bridelia stipularis* Blume	Phyllanthaceae
315	*Cleistanthus collinus* (Roxb.) Benth. ex Hook.f.	Phyllanthaceae
316	*Flueggea leucopyrus* Willd.	Phyllanthaceae
317	*Flueggea virosa* (Roxb. ex Willd.) Royle	Phyllanthaceae
318	*Phyllanthus emblica* L.	Phyllanthaceae
319	*Phyllanthus maderaspatensis* L.	Phyllanthaceae
320	*Phyllanthus rheedei* Wight	Phyllanthaceae
321	*Phyllanthus virgatus* G.Forst.	Phyllanthaceae
322	*Plumbago zeylanica* L.	Plumbaginaceae
323	*Alloteropsis cimicina* Stapf	Poaceae
324	*Apluda mutica* L.	Poaceae
325	*Apocopis cochinchinensis* A.Camus	Poaceae
326	*Apocopis mangalorensis* (Hochst. ex Steud.) Henrard	Poaceae
327	*Aristida adscensionis* L.	Poaceae
328	*Aristida setacea* Retz.	Poaceae
329	*Arthraxon hispidus* (Thunb.) Makino	Poaceae
330	*Arundinella setosa* Trin.	Poaceae
331	*Axonopus compressus* (Sw.) P.Beauv.	Poaceae
332	*Bambusa bambos* (L.) Voss	Poaceae
333	*Capillipedium assimile* (Steud.) A.Camus	Poaceae
334	*Centotheca lappacea* Desv.	Poaceae
335	*Chrysopogon aciculatus* Trin.	Poaceae
336	*Cymbopogon flexuosus* (Nees ex Steud.) Will.Watson	Poaceae
337	*Cyrtococcum deccanense* Bor	Poaceae
338	*Cyrtococcum longipes* A.Camus	Poaceae

339	*Cyrtococcum oxyphyllum* Stapf	Poaceae
340	*Cyrtococcum patens* (L.) A.Camus	Poaceae
341	*Dendrocalamus strictus* Nees	Poaceae
342	*Digitaria bicornis* (Lam.) Roem. & Schult.	Poaceae
343	*Digitaria ciliaris* (Retz.) Koeler	Poaceae
344	*Enteropogon dolichostachyus* (Lag.) Keng	Poaceae
345	*Enteropogon monostachyus* Schum.	Poaceae
346	*Oplismenus burmanni* (Retz.) P.Beauv.	Poaceae
347	*Oryza meyeriana* Baill.	Poaceae
348	*Oryza officinalis* Wall.	Poaceae
349	*Panicum notatum* Retz.	Poaceae
350	*Sporobolus indicus* (L.) R.Br.	Poaceae
351	*Sporobolus tenuissimus* (Mart. ex Schrank) Kuntze	Poaceae
352	*Themeda triandra* Forssk.	Poaceae
353	*Urochloa distachyos* (L.) T.Q.Nguyen	Poaceae
354	*Urochloa ramosa* (L.) T.Q.Nguyen	Poaceae
355	*Salomonia ciliata* DC.	Polygalaceae
356	*Persicaria chinensis* (L.) H.Gross	Polygonaceae
357	*Portulaca pilosa* L.	Portulacaceae
358	*Embelia tsjeriam-cottam* (Roem. & Schult.) A.DC.	Primulaceae
359	*Putranjiva roxburghii* Wall.	Putranjivaceae
360	*Clematis zeylanica* Poir.	Ranunculaceae
361	*Ziziphus mauritiana* Lam.	Rhamnaceae
362	*Ziziphus oenoplia* (L.) Mill.	Rhamnaceae
363	*Ziziphus xylopyrus* (Retz.) Willd.	Rhamnaceae
364	*Prunus ceylanica* Miq.	Rosaceae
365	*Adina cordifolia* (Roxb.) Hook.f. & Benth.	Rubiaceae
366	*Canthium coromandelicum* (Burm.f.) Alston	Rubiaceae
367	*Catunaregam spinosa* (Thunb.) Tirveng.	Rubiaceae
368	*Geophila repens* (L.) I.M.Johnst.	Rubiaceae
369	*Hymenodictyon obovatum* Wall.	Rubiaceae
370	*Hymenodictyon orixense* (Roxb.) Mabb.	Rubiaceae
371	*Mitragyna parvifolia* Korth.	Rubiaceae
372	*Morinda coreia* Buch.-Ham.	Rubiaceae
373	*Mussaenda frondosa* L.	Rubiaceae
374	*Oldenlandia herbacea* (L.) Roxb.	Rubiaceae
375	*Oldenlandia umbellata* L.	Rubiaceae
376	*Pavetta hispidula* Wight & Arn.	Rubiaceae
377	*Pavetta zeylanica* Gamble	Rubiaceae
378	*Spermacoce latifolia* Aubl.	Rubiaceae
379	*Spermacoce pusilla* Wall.	Rubiaceae
380	*Atalantia monophylla* (L.) DC.	Rutaceae
381	*Atalantia racemosa* Wight & Arn.	Rutaceae

382	*Chloroxylon swietenia* DC.	Rutaceae
383	*Glycosmis pentaphylla* (Retz.) DC.	Rutaceae
384	*Naringi crenulata* (Roxb.) Nicolson	Rutaceae
385	*Flacourtia indica* (Burm.f.) Merr.	Salicaceae
386	*Santalum album* L.	Santalaceae
387	*Allophylus serratus* Kurz	Sapindaceae
388	*Cardiospermum halicacabum* L.	Sapindaceae
389	*Dodonaea viscosa* Jacq.	Sapindaceae
390	*Sapindus emarginatus* Vahl	Sapindaceae
391	*Sapindus trifoliatus* L.	Sapindaceae
392	*Schleichera oleos*a (Lour.) Oken	Sapindaceae
393	*Smilax wightii* A.DC.	Smilacaceae
394	*Smilax zeylanica* L.	Smilacaceae
395	*Datura metel* L.	Solanaceae
396	*Solanum violaceum* Ortega	Solanaceae
397	*Tetrameles nudiflora* R.Br.	Tetramelaceae
398	*Girardinia diversifolia* (Link) Friis	Urticaceae
399	*Stachytarpheta jamaicensis* (L.) Vahl	Verbenaceae
400	*Pigea enneasperma* (L.) P.I.Forst.	Violaceae
401	*Cayratia pedata* Gagnep.	Vitaceae
402	*Cissus discolor* Blume	Vitaceae
403	*Cissus heyneana* Steud.	Vitaceae
404	*Cissus latifolia* Lam.	Vitaceae
405	*Cissus quadrangularis* L.	Vitaceae
406	*Cissus vitiginea* L.	Vitaceae
407	*Leea asiatica* (L.) Ridsdale	Vitaceae
408	*Leea macrophylla* Roxb. ex Hornem.	Vitaceae
409	*Tetrastigma sulcatum* Gamble	Vitaceae
410	*Xyris pauciflora* Willd.	Xyridaceae
411	*Curcuma aurantiaca* Zijp	Zingiberaceae
412	*Curcuma vamana* M.Sabu & Mangaly	Zingiberaceae
413	*Globba marantina* L.	Zingiberaceae
414	*Hedychium coronarium* J.Koenig	Zingiberaceae
415	*Hedychium flavescens* Carey ex Rosc.	Zingiberaceae
416	*Zingiber neesanum* (J.Graham) Ramamoorthy	Zingiberaceae
417	*Zingiber nimmonii* Dalzell	Zingiberaceae
418	*Tribulus terrestris* L.	Zygophyllaceae

Annexure III

Grassland elements in Walayar forest range

Sl. No	Binomial name	Family
1	*Rostellaria hedyotidifolia* Nees	Acanthaceae
2	*Rostellularia procumbens* (L.) Nees	Acanthaceae
3	*Strobilanthes heyneana* Nees	Acanthaceae
4	*Phoenix loureiroi* Kunth	Arecaceae
5	*Blumea axillaris* DC.	Asteraceae
6	*Blumea oxyodonta* DC.	Asteraceae
7	*Erigeron bonariensis* L.	Asteraceae
8	*Laggera alata* (DC.) Sch.Bip. ex Oliv.	Asteraceae
9	*Phyllocephalum courtallense* (Wight) Narayana	Asteraceae
10	*Phyllocephalum rangacharii* (Gamble) Narayana	Asteraceae
11	*Impatiens balsamina* L.	Balsaminaceae
12	*Impatiens dasysperma* Wight	Balsaminaceae
13	*Impatiens sp nova Aswani, Maya and Prabhukumar*	Balsaminaceae
14	*Lobelia nicotianifolia* Roth	Campanulaceae
15	*Wahlenbergia erecta* (Roth ex Roem. & Schult.) Tuyn	Campanulaceae
16	*Cyanotis cristata* (L.) D.Don	Commelinaceae
17	*Cyanotis tuberosa* (Roxb.) Schult.f.	Commelinaceae
18	*Murdannia dimorpha* G.Brückn.	Commelinaceae
19	*Murdannia nudiflora* (L.) Brenan	Commelinaceae
20	*Murdannia spirata* G.Brückn.	Commelinaceae
21	*Ipomoea wightii* Choisy	Convolvulaceae
22	*Zehneria maysurensis* Arn.	Cucurbitaceae
23	*Bulbostylis barbata* subsp. *pulchella* (Thwaites) T.Koyama	Cyperaceae
24	*Cyperus flavidus* Retz.	Cyperaceae
25	*Cyperus neochinensis* (Tang & F.T.Wang) Bauters	Cyperaceae
26	*Cyperus pangorei* Rottb.	Cyperaceae
27	*Cyperus pilosus* Vahl	Cyperaceae
28	*Cyperus polystachyos* Rottb.	Cyperaceae
29	*Cyperus pseudokyllingioides* Kük.	Cyperaceae
30	*Fuirena ciliaris* (L.) Roxb.	Cyperaceae
31	*Schoenoplectiella articulat*a (L.) Lye	Cyperaceae
32	*Drosera burmanni* Vahl	Droseraceae
33	*Bergia capensis* L.	Elatinaceae
34	*Eriocaulon palghatense* R.Ansari & N.P.Balakr.	Eriocaulaceae
35	*Croton aromaticus* L.	Euphorbiaceae
36	*Microstachys chamaelea* (L.) Müll.Arg.	Euphorbiaceae
37	*Alysicarpus bupleurifolius* (L.) DC.	Fabaceae
38	*Alysicarpus heterophyllus* (Baker) Jafri & Ali	Fabaceae
39	*Cajanus lineatus* (Wight & Arn.) Maesen	Fabaceae

40	*Cajanus rugosus* (Wight & Arn.) Maesen	Fabaceae
41	*Chamaecrista nictitans* subsp. *patellaria* (Collad.) H.S.Irwin & Barneby	Fabaceae
42	*Crotalaria calycina* Schrank	Fabaceae
43	*Crotalaria nana* Burm.f.	Fabaceae
44	*Dolichos trilobus* L.	Fabaceae
45	*Grona triflora* (L.) H.Ohashi & K.Ohashi	Fabaceae
46	*Indigofera tsiangiana* F.P.Metcalf	Fabaceae
47	*Smithia blanda* Wall. ex Wight & Arn.	Fabaceae
48	*Smithia conferta* Sm.	Fabaceae
49	*Smithia gracilis* Benth.	Fabaceae
50	*Tephrosia purpurea* Pers.	Fabaceae
51	*Canscora diffusa* (Vahl) R.Br. ex Roem. & Schult.	Gentianaceae
52	*Hoppea fastigiata* (Griseb.) C.B.Clarke	Gentianaceae
53	*Swertia corymbosa* (Griseb.) Wight ex C.B.Clarke	Gentianaceae
54	*Henckelia humboldtiana* (Gardner) A.Weber & B.L.Burtt	Gesneriaceae
55	*Henckelia incana* Spreng.	Gesneriaceae
56	*Curculigo orchioides* Gaertn.	Hypoxidaceae
57	*Hypoxis aurea* Lour.	Hypoxidaceae
58	*Leucas chinensis* (Retz.) Sm.	Lamiaceae
59	*Osbeckia aspera* Blume	Melastomataceae
60	*Jasminum auriculatum* Vahl	Oleaceae
61	*Crepidium purpureum* (Lindl.) Szlach.	Orchidaceae
62	*Dendrobium barbatulum* Lindl.	Orchidaceae
63	*Disperis monophylla* Blatt. ex C.E.C.Fisch.	Orchidaceae
64	*Habenaria digitata* Lindl.	Orchidaceae
65	*Habenaria furcifera* Lindl.	Orchidaceae
66	*Habenaria rariflora* A.Rich.	Orchidaceae
67	*Peristylus spiralis* A.Rich.	Orchidaceae
68	*Centranthera indica* Gamble	Orobanchaceae
69	*Parasopubia delphiniifolia* (L.) H.-P.Hofm. & Eb.Fisch.	Orobanchaceae
70	*Phyllanthus virgatus* G.Forst.	Phyllanthaceae
71	*Mecardonia procumbens* (Mill.) Small	Plantaginaceae
72	*Apocopis mangalorensis* (Hochst. ex Steud.) Henrard	Poaceae
73	*Aristida setacea* Retz.	Poaceae
74	*Arthraxon hispidus* (Thunb.) Makino	Poaceae
75	*Arundinella ciliata* Nees ex Miq.	Poaceae
76	*Arundinella mesophylla* Nees ex Steud.	Poaceae
77	*Arundinella setosa* Trin.	Poaceae
78	*Bothriochloa insculpta* (Hochst. ex A.Rich.) A.Camus	Poaceae
79	*Bothriochloa pertusa* (L.) A.Camus.	Poaceae
80	*Chrysopogon asper* B.Heyne ex Blatt. & McCann	Poaceae
81	*Chrysopogon hackelii* (Hook.f.) C.E.C.Fisch.	Poaceae
82	*Cymbopogon citratus* Stapf	Poaceae

83	*Cymbopogon flexuosus* (Nees ex Steud.) Will.Watson	Poaceae
84	*Cymbopogon martini* (Roxb.) Will.Watson	Poaceae
85	*Dichanthium annulatum* Stapf	Poaceae
86	*Digitaria ciliaris* (Retz.) Koeler	Poaceae
87	*Digitaria longiflora* Pers.	Poaceae
88	*Dimeria deccanensis* Bor	Poaceae
89	*Dimeria ornithopoda* Trin.	Poaceae
90	*Eragrostis gangetica* Steud.	Poaceae
91	*Eragrostis nigra* Nees ex Steud.	Poaceae
92	*Eragrostis tenella* (L.) P.Beauv. ex Roem. & Schult.	Poaceae
93	*Heteropogon contortus* (L.) P.Beauv. ex Roem. & Schult.	Poaceae
94	*Isachne walkeri* Arn. ex Steud.	Poaceae
95	*Pogonatherum crinitum* Kunth	Poaceae
96	*Pseudopogonatherum trispicatum* (Schult.) Ohwi	Poaceae
97	*Setaria pumila* Roem. & Schult.	Poaceae
98	*Sporobolus pilifer* (Trin.) Kunth	Poaceae
99	*Sporobolus tenuissimus* (Mart. ex Schrank) Kuntze	Poaceae
100	*Sporobolus virginicus* (L.) Kunth	Poaceae
101	*Themeda triandra* Forssk.	Poaceae
102	*Tripogon bromoides* Roem. & Schult.	Poaceae
103	*Urochloa ramosa* (L.) T.Q.Nguyen	Poaceae
104	*Polygala bolbothrix* Dunn	Polygalaceae
105	*Polygala persicariifolia* DC.	Polygalaceae
106	*Maesa indica* (Roxb.) Sweet	Primulaceae
107	*Ziziphus rugosa* Lam.	Rhamnaceae
108	*Oldenlandia herbacea* (L.) Roxb.	Rubiaceae
109	*Oldenlandia hygrophila* Bremek.	Rubiaceae
110	*Spermacoce articularis* L.f.	Rubiaceae
111	*Spermacoce lasiocarpa* R.Br.	Rubiaceae
112	*Spermacoce pusilla* Wall.	Rubiaceae
113	*Wendlandia thyrsoidea* Steud.	Rubiaceae
114	*Sapindus emarginatus* Vahl	Sapindaceae

Annexure IV

Degraded forest elements in Walayar forest range

Sl. No	Binomial name	Family
1	*Asystasia gangetica* (L.) T.Anderson	Acanthaceae
2	*Ruellia prostrata* Poir.	Acanthaceae
3	*Thunbergia tomentosa* Wall. ex Nees	Acanthaceae
4	*Alternanthera bettzickiana* (Regel) G.Nicholson	Amaranthaceae
5	*Amaranthus viridis* L.	Amaranthaceae
6	*Asclepias curassavica* L.	Apocynaceae
7	*Catharanthus pusillus* G.Don	Apocynaceae
8	*Aristolochia indica* L.	Aristolochiaceae
9	*Acanthospermum hispidum* DC.	Asteraceae
10	*Acmella radicans* (Jacq.) R.K.Jansen	Asteraceae
11	*Ageratum houstonianum* Mill.	Asteraceae
12	*Blumea axillaris* DC.	Asteraceae
13	*Eleutheranthera ruderali*s (Sw.) Sch.Bip.	Asteraceae
14	*Trichodesma zeylanicum* (Burm.f.) R.Br.	Boraginaceae
15	*Cleome rutidosperma* var. *burmanni* (Wight & Arn.) M.O.Siddiqui & S.N.Dixit	Cleomaceae
16	*Cyanotis axillaris* (L.) D.Don ex Sweet	Commelinaceae
17	*Cyanotis cristata* (L.) D.Don	Commelinaceae
18	*Argyreia populifoli*a Choisy	Convolvulaceae
19	*Evolvulus nummularius* (L.) L.	Convolvulaceae
20	*Ipomoea obscur*a (L.) Ker Gawl.	Convolvulaceae
21	*Ipomoea triloba* L.	Convolvulaceae
22	*Merremia hederacea* (Burm.f.) Hallier f.	Convolvulaceae
23	*Operculina turpethum* (L.) Silva Manso	Convolvulaceae
24	*Zehneria maysurensis* Arn.	Cucurbitaceae
25	*Cyperus cyperinus* (Retz.) Valck.Sur.	Cyperaceae
26	*Cyperus iria* L.	Cyperaceae
27	*Cyperus maderaspatanus* Willd.	Cyperaceae
28	*Cyperus mindorensis* (Steud.) Huygh	Cyperaceae
29	*Cyperus nutans* Vahl	Cyperaceae
30	*Cyperus squarrosus* L.	Cyperaceae
31	*Fimbristylis aestivalis* var. *aestival*is (Retz.) Vahl	Cyperaceae
32	*Fimbristylis dichotoma* subsp. *dichotom*a (L.) Vahl	Cyperaceae
33	*Scleria lithosperma* (L.) Sw.	Cyperaceae
34	*Scleria oblata* S.T.Blake ex J.Kern	Cyperaceae
35	*Dioscorea pentaphylla* L.	Dioscoreaceae
36	*Croton bonplandianus* Baill.	Euphorbiaceae
37	*Euphorbia heterophylla* L.	Euphorbiaceae
38	*Euphorbia hirta* L.	Euphorbiaceae
39	*Micrococca mercurial*is Benth.	Euphorbiaceae

40	*Chamaecrista absus* (L.) H.S.Irwin & Barneby	Fabaceae
41	*Crotalaria pallid*a Aiton	Fabaceae
42	*Grona heterophylla* (Willd.) H.Ohashi & K.Ohashi	Fabaceae
43	*Hultholia mimosoides* (Lam.) Gagnon & G.P.Lewis	Fabaceae
44	*Indigofera hendecaphylla* Jacq.	Fabaceae
45	*Indigofera hirsuta* L.	Fabaceae
46	*Mimosa diplotricha* C.Wright	Fabaceae
47	*Senna hirsuta* (L.) H.S.Irwin & Barneby	Fabaceae
48	*Tephrosia villosa* (L.) Pers.	Fabaceae
49	*Zornia gibbosa* Span.	Fabaceae
50	*Clerodendrum infortunatum* L.	Lamiaceae
51	*Mesosphaerum suaveolens* (L.) Kuntze	Lamiaceae
52	*Ocimum americanum* L.	Lamiaceae
53	*Orthosiphon thymiflorus* (Roth) Sleesen	Lamiaceae
54	*Mitrasacme prolifera* R.Br.	Loganiaceae
55	*Corchorus aestuans* L.	Malvaceae
56	*Melochia corchorifolia* L.	Malvaceae
57	*Triumfetta rhomboidea* Jacq.	Malvaceae
58	*Urena lobata* L.	Malvaceae
59	*Waltheria indica* L.	Malvaceae
60	*Oxalis corniculata* L.	Oxalidaceae
61	*Passiflora foetida* L.	Passifloraceae
62	*Phyllanthus airy-shawii* Jean F.Brunel & Jacq.Roux	Phyllanthaceae
63	*Phyllanthus amarus* Schumach. & Thonn.	Phyllanthaceae
64	*Phyllanthus urinaria* L.	Phyllanthaceae
65	*Peperomia pellucida* (L.) Kunth	Piperaceae
66	*Mecardonia procumbens* (Mill.) Small	Plantaginaceae
67	*Cenchrus setosus* Sw.	Poaceae
68	*Chloris barbata* Sw.	Poaceae
69	*Chrysopogon aciculatu*s Trin.	Poaceae
70	*Eragrostis nigra* Nees ex Steud.	Poaceae
71	*Eragrostis tenella* (L.) P.Beauv. ex Roem. & Schult.	Poaceae
72	*Oplismenus compositus* P.Beauv.	Poaceae
73	*Setaria pumila* Roem. & Schult.	Poaceae
74	*Urochloa distachyos* (L.) T.Q.Nguyen	Poaceae
75	*Urochloa panicoides* P.Beauv.	Poaceae
76	*Polygala bolbothrix* Dunn	Polygalaceae
77	*Portulaca oleracea* L.	Portulacaceae
78	*Mitracarpus hirtu*s DC.	Rubiaceae
79	*Oldenlandia corymbosa* L.	Rubiaceae
80	*Scleromitrion diffusum* (Willd.) R.J.Wang	Rubiaceae
81	*Datura metel* L.	Solanaceae
82	*Physalis angulata* L.	Solanaceae

83	*Solanum americanum* Mill.	Solanaceae
84	*Solanum torvum* Sw.	Solanaceae
85	*Laportea interrupta* (L.) Chew	Urticaceae
86	*Leea indica* (Burm.f.) Merr.	Vitaceae
87	*Curcuma aromatica* Salisb.	Zingiberaceae

Annexure V

Wetland and riparian elements in Walayar forest range

Sl. No	Binomial name	Family
1	*Hygrophila auriculata* (Schumach.) Heine	Acanthaceae
2	*Trianthema portulacastrum* L.	Aizoaceae
3	*Alternanthera paronychioides* A.St.-Hil.	Amaranthaceae
4	*Alternanthera sessilis* (L.) DC.	Amaranthaceae
5	*Colocasia esculent*a (L.) Schott	Araceae
6	*Lemna gibba* L.	Araceae
7	*Lemna perpusilla* Torr.	Araceae
8	*Pistia stratiotes* L.	Araceae
9	*Spirodela polyrhiza* (L.) Schleid.	Araceae
10	*Theriophonum infaustum* N.E.Br.	Araceae
11	*Acmella uliginosa* (Sw.) Cass.	Asteraceae
12	*Eclipta prostrata* (L.) L.	Asteraceae
13	*Grangea maderaspatana* (L.) Poir.	Asteraceae
14	*Sphaeranthus indicus* L.	Asteraceae
15	*Coldenia procumbens* L.	Boraginaceae
16	*Heliotropium indicum* L.	Boraginaceae
17	*Crateva magn*a DC.	Capparaceae
18	*Polycarpon prostratum* (Forssk.) Asch. & Schweinf.	Caryophyllaceae
19	*Floscopa scandens* Lour.	Commelinaceae
20	*Murdannia esculenta* (Wall. ex C.B.Clarke) Abeyw.	Commelinaceae
21	*Ipomoea aquatica* Forssk.	Convolvulaceae
22	*Bulbostylis barbata* (Rottb.) C.B.Clarke	Cyperaceae
23	*Carex phacota* Spreng.	Cyperaceae
24	*Cyperus brevifolius* (Rottb.) Endl. ex Hassk.	Cyperaceae
25	*Cyperus compressus* L.	Cyperaceae
26	*Cyperus difformis* L.	Cyperaceae
27	*Cyperus diffusus* Vahl	Cyperaceae
28	*Cyperus distans* L.f.	Cyperaceae
29	*Cyperus flavidus* Retz.	Cyperaceae
30	*Cyperus haspan* L.	Cyperaceae
31	*Cyperus neochinensis* (Tang & F.T.Wang) Bauters	Cyperaceae
32	*Cyperus pangorei* Rottb.	Cyperaceae
33	*Cyperus polystachyos* Rottb.	Cyperaceae
34	*Cyperus pseudokyllingioides* Kük.	Cyperaceae
35	*Cyperus pumilus* L.	Cyperaceae
36	*Cyperus richardii* Steud.	Cyperaceae
37	*Cyperus sesquiflorus* subspec. *cylindricus* (Nees) T.Koyama	Cyperaceae
38	*Cyperus substramineus* Kük.	Cyperaceae

39	*Cyperus tenuispica* Steud.	Cyperaceae
40	*Eleocharis dulcis* (Burm.f.) Trin. ex Hensch.	Cyperaceae
41	*Fimbristylis microcarya* F.Muell.	Cyperaceae
42	*Fimbristylis narayanii* C.E.C.Fisch.	Cyperaceae
43	*Fuirena ciliaris* (L.) Roxb.	Cyperaceae
44	*Schoenoplectiella articulata* (L.) Lye	Cyperaceae
45	*Drosera burmanni* Vahl	Droseraceae
46	*Eriocaulon quinquangulare* L.	Eriocaulaceae
47	*Eriocaulon sexangulare* L.	Eriocaulaceae
48	*Eriocaulon xeranthemum* Mart.	Eriocaulaceae
49	*Euphorbia thymifolia* L.	Euphorbiaceae
50	*Homonoia riparia* Lour.	Euphorbiaceae
51	*Ohwia caudata* (Thunb.) H.Ohashi	Fabaceae
52	*Sesbania bispinosa* (Jacq.) W.Wight	Fabaceae
53	*Smithia blanda* Wall. ex Wight & Arn.	Fabaceae
54	*Smithia conferta* Sm.	Fabaceae
55	*Stylosanthes fruticosa* (Retz.) Alston	Fabaceae
56	*Hydrilla verticillata* (L.f.) Royle	Hydrocharitaceae
57	*Ottelia alismoides* (L.) Pers.	Hydrocharitaceae
58	*Vitex trifolia* L.	Lamiaceae
59	*Utricularia graminifolia* Vahl	Lentibulariaceae
60	*Bonnaya antipoda* Druce	Linderniaceae
61	*Lindernia hyssopioides* Haines	Linderniaceae
62	*Lindernia rotundifolia* (L.) Alston	Linderniaceae
63	*Lindernia tamilnadensis* M.G.Prasad & Sunojk.	Linderniaceae
64	*Yamazakia pusilla* (Willd.) W.R.Barker, Y.S.Liang & Wannan	Linderniaceae
65	*Torenia bicolor* Dalzell.	Linderniaceae
66	*Torenia hirsuta* Willd.	Linderniaceae
67	*Torenia lindernioides* C.J.Saldanha	Linderniaceae
68	*Ammannia baccifera* L.	Lythraceae
69	*Ammannia octandra* L.f.	Lythraceae
70	*Rotala malampuzhensis* R.V.Nair ex C.D.K.Cook	Lythraceae
71	*Trapa natans* L.	Lythraceae
72	*Hiptage benghalensis* (L.) Kurz	Malpighiaceae
73	*Glinus oppositifolius* (L.) Aug.DC.	Molluginaceae
74	*Trigastrotheca pentaphylla* (L.) Thulin	Molluginaceae
75	*Nymphaea nouchali* Burm.f.	Nymphaeaceae
76	*Nymphaea rubra* Roxb. ex Salisb.	Nymphaeaceae
77	*Ludwigia hyssopifolia* (G.Don) Exell	Onagraceae
78	*Ludwigia peruviana* (L.) H.Hara	Onagraceae
79	*Rhamphicarpa fistulosa* Benth.	Orobanchaceae
80	*Pandanus canaranus* Warb.	Pandanaceae
81	*Phyllanthus reticulatus* Poir.	Phyllanthaceae

82	*Dopatrium junceum* (Roxb.) Benth.	Plantaginaceae
83	*Limnophila indica* (L.) Druce	Plantaginaceae
84	*Stemodia verticillata* (Mill.) Hassl.	Plantaginaceae
85	*Arundo donax* L.	Poaceae
86	*Coix lacryma-jobi* L.	Poaceae
87	*Cynodon dactylon* (L.) Pers.	Poaceae
88	*Dactyloctenium aegyptium* (L.) Willd.	Poaceae
89	*Echinochloa colonum* (L.) Link	Poaceae
90	*Echinochloa crus-galli* (L.) P.Beauv.	Poaceae
91	*Eragrostis gangetica* Steud.	Poaceae
92	*Eragrostis japonic*a Trin.	Poaceae
93	*Eragrostis riparia* Nees	Poaceae
94	*Eragrostis tef* (Zuccagni) Trotter	Poaceae
95	*Eragrostis unioloide*s Nees ex Steud.	Poaceae
96	*Isachne globosa* (Thunb.) Kuntze	Poaceae
97	*Ischaemum rugosum* Salisb.	Poaceae
98	*Ischaemum timorense* Kunth	Poaceae
99	*Oryza rufipogon* Griff.	Poaceae
100	*Ottochloa nodosa* (Kunth) Dandy	Poaceae
101	*Panicum paludosum* Roxb.	Poaceae
102	*Paspalum conjugatum* P.J.Bergius	Poaceae
103	*Paspalum scrobiculatum* L.	Poaceae
104	*Setaria flavida* (Retz.) Veldkamp	Poaceae
105	*Trigonochloa uniflora* (Hochst. ex A.Rich.) P.M.Peterson & N.Snow	Poaceae
106	*Salomonia ciliata* DC.	Polygalaceae
107	*Pontederia crassipes* Mart.	Pontederiaceae
108	*Pontederia vaginalis* Burm.f.	Pontederiaceae
109	*Dentella repens* J.R.Forst. & G.Forst.	Rubiaceae
110	*Neonauclea purpurea* (Roxb.) Merr.	Rubiaceae
111	*Typha angustifolia* L.	Typhaceae
112	*Elatostema acuminatum* (Poir.) Brongn., Bot. Voy. Coquille 211 (1834).	Urticaceae
113	*Pilea victoriae* V.Suresh & Sojan	Urticaceae
114	*Phyla nodiflora* (L.) Greene	Verbenaceae
115	*Ampelocissus latifolia* (Roxb.) Planch.	Vitaceae

Annexure VI

List of plantations in Walayar forest range

Sl. No	Year	Species	Location
1	1939	Teak	Poolampara
2	1940	Teak	Poolampara (Depot)
3	1945	Teak	Varalipadi
4	1946	Teak	Varalipadi
5	1947	Teak	Pullimanpathy
6	1957	Teak	Poolampara
7	1958	Teak	Poolampara
8	1959	Teak	Poolampara
9	1960	Teak	Poolampara
10	1963	Teak	Poolampara
11	1964	Teak	Poolampara
12	1967	Teak	Poolampara
13	1967	Teak	Pullimanpathy
14	1974	Teak	Poolampara
15	1975	Teak	Poolampara
16	1976	Teak	Poolampara
17	1976	Teak	Vattappara
18	1977	Teak	Varalipadi
19	1978	Teak	Vadyarchalla
20	1978	Teak	Kallanakode
21	1978	Teak	Vadyarchalla
22	1978	Teak	Panampully
23	1979	Teak	Varalipadi
24	1979	Teak	Poolampara
25	1979	Teak	Nadupathy
26	1979	*Cashew, Eucalyptus*	Panampully
27	1979	*Cashew, Eucalyptus*	Panampully
28	1980	Teak	Poolampara
29	1981	Teak	Poolampara
30	1981	*Dalbergia*	Panampully
31	1982	Mixed	Pullimanpathy
32	1982	Teak	Pullimanpathy
33	1983	Teak	Verli
34	1983	Mixed	Pullimanpathy
35	1983	*Casuarina*	Elichiram

36	1983	*Casuarina*	Panampully
37	1984	Teak	Varalipadi
38	1984	Teak	Arangottu kulambu
39	1985	Miscellaneous	Vattappara
40	1986	Miscellaneous	Malampuzha
41	1986	Teak	Verli
42	1986	*Acacia*	Palamara
43	1987	Cashew	Velancherry
44	1987	Acacia	T. Malavaram
45	1988	Miscellaneous	KFS
46	1989	Miscellaneous	Nellisseri
47	1990	Miscellaneous	Chozhamkod
48	1992	*Eucalyptus*	Panampully
49	1992	Miscellaneous	Nellisseri
50	1995	Miscellaneous	Edamala
51	1996	Eucalyptus	Edupukulam
52	1999	RDF2	Palamara
53	2000	Misc Bit I	Kava
53	2000	Misc Bit I	Kava
54	2000	Misc Bit II	Kava
55	2000	Miscellaneous	Elichiram
56	2001	RDF II	Sasthanagar
57	2001	Hardwood	Kottekkad
58	2003	RDF II	Chembana
59	2004	Cane	Pandara
60	2004	Medicinal	Vadhyarchalla (VSS)
61	2004	Medicinal	Velanchery (VSS)
62	2005	Teak	Poolampara
63	2005	Mixed	Nadupathy (VSS)
64	2005	Bamboo	Vadhyarchalla (VSS)
65	2006	Cane	Moochikadavu
66	2006	Bamboo	Nadupathy (VSS)
67	2006	Mixed	Vadhyarchalla (VSS)
68	2007	Cane	Nadupathy (VSS)
69	2007	Bamboo	Vadhyarchalla (VSS)
70	2008	Medicinal	Nadupathy (VSS)
71	2008	Bamboo	Anakkal (VSS)
72	2008	Bamboo	Chembana (VSS)
73	2008	Bamboo	Kottekkad (VSS)

Annexure VII

Diversity of plants in the catchment area of reservoirs

Sl. No	**Botanical Name**	**Family**
1	*Abrus precatorius* L.	Fabaceae
2	*Acacia auriculiformis* A.Cunn. ex Benth.	Fabaceae
3	*Acalypha indica* L.	Euphorbiaceae
4	*Achyranthes aspera* L.	Euphorbiaceae
5	*Adina cordifolia* (Roxb.) Hook.f. & Benth.	Rubiaceae
6	*Aeschynomene indica* L.	Fabaceae
7	*Allmania nodiflora* (L.) R.Br. ex Wight	Amaranthaceae
8	*Alternanthera paronychioides* A.St.-Hil.	Amaranthaceae
9	*Alternanthera philoxeroides* (Mart.) Griseb.	Amaranthaceae
10	*Alysicarpus heterophyllus* (Baker) Jafri & Ali	Fabaceae
11	*Alysicarpus monilifer* (L.) DC.	Fabaceae
12	*Alysicarpus vaginalis* (L.) DC.	Fabaceae
13	*Ammannia baccifera* L.	Lythraceae
14	*Ampelocissus latifolia* (Roxb.) Planch.	Vitaceae
15	*Annona squamosa* L.	Annonaceae
16	*Arundinella mesophylla* Nees ex Steud.	Poaceae
17	*Azadirachta indica* A.Juss.	Meliaceae
18	*Biophytum reinwardtii* (Zucc.) Klotzsch	Oxalidaceae
19	*Boerhavia diffusa* L.	Nyctaginaceae
20	*Boerhavia erecta* L.	Nyctaginaceae
21	*Bombax ceiba* L.	Malvaceae
22	*Bonnaya antipoda* Druce	Linderniaceae
23	*Bonnaya ciliata* Spreng.	Linderniaceae
24	*Borassus flabellifer* L.	Arecaceae
25	*Breynia retusa* (Dennst.) Alston	Phyllanthaceae
26	*Bulbostylis barbata* (Rottb.) C.B.Clarke	Cyperaceae
27	*Bulbostylis thouarsii* (Roem. & Schult.) Lye ex Veldkamp & Verloove	Cyperaceae
28	*Butea monosperma* Kuntze	Fabaceae
29	*Calotropis gigantea* (L.) W.T.Aiton	Apocynaceae
30	*Canthium coromandelicum* (Burm.f.) Alston	Rubiaceae
31	*Cardiospermum halicacabum* L.	Sapindaceae
32	*Careya arborea* Roxb.	Lecythidaceae
33	*Cassia fistula* L.	Fabaceae
34	*Catharanthus pusillus* G.Don	Apocynaceae
35	*Ceiba pentandra* (L.) Gaertn.	Malvaceae
36	*Celosia argentea* L.	Amaranthaceae
37	*Cenchrus pedicellatus* (Trin.) Morrone	Poaceae

38	*Chamaecrista absus* (L.) H.S.Irwin & Barneby	Fabaceae
39	*Chloris barbata* Sw.	Poaceae
40	*Chromolaena odorata* (L.) R.M.King & H.Rob.	Asteraceae
41	*Cleistanthus collinus* (Roxb.) Benth. ex Hook.f.	Phyllanthaceae
42	*Cleome rutidosperma* var. *burmanni* (Wight & Arn.) M.O.Siddiqui & S.N.Dixit	Cleomaceae
43	*Cleome viscosa* L.	Cleomaceae
44	*Cochlospermum religiosum* (L.) Alston	Bixaceae
45	*Coldenia procumbens* L.	Boraginaceae
46	*Coleus strobilifer* (Roxb.) A.J.Paton	Lamiaceae
47	*Commelina clavata* C.B.Clarke	Commelinaceae
48	*Corchorus aestuans* L.	Malvaceae
49	*Crotalaria pallida* Aiton	Fabaceae
50	*Croton bonplandianus* Baill.	Euphorbiaceae
51	*Croton hirtus* L'Hér.	Euphorbiaceae
52	*Cuscuta chinensis* Lam.	Convolvulaceae
53	*Cyanotis axillaris* (L.) D.Don ex Sweet	Commelinaceae
54	*Cyanthillium cinereum* (L.) H.Rob.	Asteraceae
55	*Cynodon dactylon* (L.) Pers.	Poaceae
56	*Cyperus iria* L.	Cyperaceae
57	*Cyperus maderaspatanus* Willd.	Cyperaceae
58	*Cyperus rotundus* L.	Cyperaceae
59	*Dactyloctenium aegyptium* (L.) Willd.	Poaceae
60	*Dentella repens* J.R.Forst. & G.Forst.	Rubiaceae
61	*Dentella repens* var. *serpyllifolia* (Wall. ex Craib) Verdc.	Rubiaceae
62	*Digitaria ciliaris* (Retz.) Koeler	Poaceae
63	*Drosera burmanni* Vahl	Droseraceae
64	*Echinochloa colonum* (L.) Link	Poaceae
65	*Eragrostis gangetica* Steud.	Poaceae
66	*Eragrostis japonica* Trin.	Poaceae
67	*Eragrostis riparia* Nees	Poaceae
68	*Eragrostis tef* (Zuccagni) Trotter	Poaceae
69	*Eragrostis tenella* (L.) P.Beauv. ex Roem. & Schult.	Poaceae
70	*Eragrostis unioloides* Nees ex Steud.	Poaceae
71	*Euphorbia hirta* L.	Euphorbiaceae
72	*Fimbristylis aestivalis var. aestivalis* (Retz.) Vahl	Cyperaceae
73	*Fimbristylis argentea* Vahl	Cyperaceae
74	*Fimbristylis microcarya* F.Muell.	Cyperaceae
75	*Gomphrena celosioides* Mart.	Amaranthaceae
76	*Heliotropium indicum* L.	Boraginaceae
77	*Heliotropium keralense* Sivar. & Manilal	Boraginaceae
78	*Hellenia speciosa* (J.Koenig) S.R.Dutta	Costaceae
79	*Heteropogon contortus* (L.) P.Beauv. ex Roem. & Schult.	Poaceae
80	*Holarrhena pubescens* Wall. & G.Don	Apocynaceae

81	*Hygrophila auriculata* (Schumach.) Heine	Acanthaceae
82	*Ipomoea carnea* subsp. *fistulosa* (Mart. ex Choisy) D.F.Austin	Convolvulaceae
83	*Ipomoea obscura* (L.) Ker Gawl.	Convolvulaceae
84	*Ipomoea pes-tigridis* L.	Convolvulaceae
85	*Ischaemum rangacharianum* C.E.C.Fisch.	Poaceae
86	*Ischaemum rugosum* Salisb.	Poaceae
86	*Jatropha gossypifolia* L.	Euphorbiaceae
87	*Justicia tranquebariensis* L.f.	Acanthaceae
88	*Leucas aspera* Link	Lamiaceae
89	*Lindernia hyssopioides* Haines	Linderniaceae
90	*Lindernia rotundifolia* (L.) Alston	Linderniaceae
91	*Lobelia alsinoides* Lam.	Campanulaceae
92	*Ludwigia hyssopifolia* (G.Don) Exell	Onagraceae
93	*Luffa aegyptiaca* Mill.	Cucurbitaceae
94	*Macaranga peltata* Müll.Arg.	Euphorbiaceae
95	*Martynia annua* L.	Martyniaceae
96	*Megathyrsus maximus* (Jacq.) B.K.Simon & S.W.L.Jacobs	Poaceae
97	*Mikania micrantha* Kunth	Asteraceae
98	*Mimosa diplotricha* C.Wright	Fabaceae
99	*Mimosa pudica* L.	Fabaceae
100	*Morinda coreia* Buch.-Ham.	Rubiaceae
101	*Muntingia calabura* L.	Muntingiaceae
102	*Ocimum americanum* L.	Lamiaceae
103	*Oldenlandia corymbosa* L.	Rubiaceae
104	*Ottelia alismoides* (L.) Pers.	Hydrocharitaceae
105	*Ouret lanata* (L.) Kuntze	Amaranthaceae
106	*Oxalis corniculata* L.	Oxalidaceae
107	*Oxystelma esculentum* (L.f.) Decne.	Apocynaceae
108	*Paramollugo nudicaulis* (Lam.) Thulin	Molluginaceae
109	*Paspalum conjugatum* P.J.Bergius	Poaceae
110	*Passiflora foetida* L.	Passifloraceae
111	*Perotis indica* (L.) Kuntze	Poaceae
112	*Phyla nodiflora* (L.) Greene	Verbenaceae
113	*Phyllanthus urinaria* L.	Phyllanthaceae
114	*Phyllanthus virgatus* G.Forst.	Phyllanthaceae
115	*Physalis angulata* L.	Solanaceae
116	*Pilea microphylla* (L.) Liebm.	Urticaceae
117	*Polycarpon prostratum* (Forssk.) Asch. & Schweinf.	Caryophyllaceae
118	*Pouzolzia zeylanica* (L.) Benn.	Urticaceae
119	*Psilotrichum elliottii* Baker	Poaceae
120	*Pupalia lappacea* (L.) Juss.	Amaranthaceae
121	*Ricinus communis* L.	Euphorbiaceae
122	*Ruellia prostrata* Poir.	Acanthaceae

123	*Saccharum spontaneum* L.	Poaceae
124	*Sacciolepis indica* (L.) Chase	Poaceae
125	*Schleichera oleosa* (Lour.) Oken	Sapindaceae
126	*Scoparia dulcis* L.	Plantaginaceae
127	*Senegalia pennata* (L.) Maslin	Fabaceae
128	*Senna occidentalis* (L.) Link	Fabaceae
129	*Senna tora* Roxb.	Fabaceae
130	*Sesamum prostratum* Retz.	Pedaliaceae
131	*Sesamum radiatum* Thonn. ex Hornem.	Pedaliaceae
132	*Sida acuta* Burm.f.	Malvaceae
133	*Sida cordata* (Burm.f.) Borss.Waalk.	Malvaceae
134	*Sida cordifolia* L.	Malvaceae
135	*Solanum torvum* Sw.	Solanaceae
136	*Spathodea campanulata* P.Beauv.	Bignoniaceae
137	*Sphaeranthus indicus* L.	Asteraceae
138	*Sphagneticola trilobata* (L.) Pruski	Asteraceae
139	*Sphenoclea zeylanica* Gaertn.	Sphenocleaceae
140	*Stachytarpheta jamaicensis* (L.) Vahl	Verbenaceae
141	*Sterculia urens* Roxb.	Malvaceae
142	*Streblus asper* Lour.	Moraceae
143	*Strychnos nux-vomica* L.	Loganiaceae
144	*Strychnos potatorum* L.f.	Loganiaceae
145	*Synedrella nodiflora* Gaertn.	Asteraceae
146	*Tephrosia purpurea* Pers.	Fabaceae
147	*Terminalia bellirica* (Gaertn.) Roxb.	Combretaceae
148	*Terminalia catappa* L.	Combretaceae
149	*Terminalia paniculata* Roth	Combretaceae
150	*Torenia crustacea* (L.) Cham. & Schltdl.	Linderniaceae
158	*Torenia lindernioides* C.J.Saldanha	Linderniaceae
151	*Trema orientale* Blume	Cannabaceae
152	*Trianthema portulacastrum* L.	Aizoaceae
153	*Tribulus terrestris* L.	Zygophyllaceae
154	*Wattakaka volubilis* Stapf	Apocynaceae
155	*Wrightia tinctoria* R.Br.	Apocynaceae
156	*Xanthium strumarium* L.	Asteraceae
157	*Xenostegia tridentata* (L.) D.F.Austin & Staples	Convolvulaceae
158	*Xylia xylocarpa* (Roxb.) W.Theob.	Fabaceae
159	*Ziziphus mauritiana* Lam.	Rhamnaceae
160	*Ziziphus oenoplia* (L.) Mill.	Rhamnaceae

Annexure VIII

Major groups of Raunkiaer Plant lifeforms (Ellenberg and Dombois, 1967)

Sl. No.	Plant Lifeform	Definition
1	**Phanerophyte**	Plants that grow taller than 25-50 cm, or whose shoots do not die back periodically to that height limit
2	**Chamaephyte**	Plants whose mature branch or shoot system remains perennially within 25 – 50cm above ground surface, or plants that grow taller than 25 – 50cm, but shoot die back periodically to that height limit
3	**Hemi – Cryptophyte**	Perennial (including biennial) herbaceous plants with periodic shoot reduction to a remnant shoot system that lies relatively flat on the ground surface
4	**Geophyte(Cryptophyte)**	Perennial plants with periodic reduction of the complete shoot system to storage organs that are embedded in the soil
5	**Therophyte**	Annual plants whose shoot and root system dies after seed production and which complete their whole life cycle within one year
6	**Liana (Eu-liana)**	Plants that grow by supporting themselves on others and these plants germinate on the ground and maintain their contact with the soil
7	**Hemi-epiphyte (Pseudo-liana)**	Plants that germinate on other plants and then establish their roots in the ground, or plants that germinate on the ground, grow up the tree and disconnect their soil contact
8	**Epiphyte**	Plants that germinate and root on other plants (these include dead standing plants, telegraph poles and wires, stumps and such like)
9	**Hydrophyte**	Free-moving water plants
10	**Semi-parasite**	Semi – autotrophic green plants growing attached to other living autotrophic plants
11	**Parasites**	Heterotrophic plants found growing on living plants
12	**Saprophytes**	Heterotrophic plants found growing on dead organic matter

Annexure IX

Diversity of taxa in hillock systems

Sl.No	Binomial name	Family	Microhabitat
1	*Abelmoschus moschatus* Medik.	Malvaceae	TCTA
2	*Abrus precatorius* L.	Fabaceae	TCTA
3	*Abutilon indicum* (L.) Sweet	Malvaceae	SRA,TCTA
4	*Acacia auriculiformis* A.Cunn. ex Benth.	Fabaceae	TCTA
5	*Acalypha capitata* Willd.	Euphorbiaceae	TCTA
6	*Acalypha paniculata* Miq.	Euphorbiaceae	SRA
7	*Achyranthes aspera* L.	Amaranthaceae	TCTA, SRA
8	*Adina cordifolia* (Roxb.) Hook.f. & Benth.	Rubiaceae	TCTA, SRA
9	*Aeschynomene indica* L.	Fabaceae	SFD, SRA
10	*Pigea enneasperma* (L.) P.I.Forst	Violaceae	SRA, B
11	*Ageratum conyzoides* L.	Asteraceae	SRA, SFD
12	*Ailanthus excelsus* Roxb.	Simaroubaceae	TCTA
13	*Alangium salviifolium* (L.f.) Wangerin	Cornaceae	TCTA, SRA
14	*Albizia odoratissima* (L.f.) Benth.	Fabaceae	TCTA, SRA
15	*Allmania nodiflora* (L.) R.Br. ex Wight	Amaranthaceae	SRA, ERS
16	*Alstonia scholaris* (L.) R.Br.	Apocynaceae	TCTA, SRA
17	*Alternanthera bettzickiana* (Regel) G.Nicholson	Amaranthaceae	SRA
18	*Alternanthera sessilis* (L.) DC.	Amaranthaceae	SRA
19	*Alysicarpus bupleurifolius* (L.) DC.	Fabaceae	SFD, ERS
20	*Alysicarpus heterophyllus* (Baker) Jafri & Ali	Fabaceae	SFD, SRA
21	*Alysicarpus monilifer* (L.) DC.	Fabaceae	SFD
22	*Alysicarpus vaginalis* (L.) DC.	Fabaceae	SFD, SRA
23	*Amorphophallus paeoniifolius* (Dennst.) Nicolson	Araceae	SRA, RCF
24	*Ampelocissus latifolia* (Roxb.) Planch.	Vitaceae	TCTA
25	*Anacardium occidentale* L.	Anacardiaceae	TCTA
26	*Andrographis echioides* Nees	Acanthaceae	ERS, SFD
27	*Andrographis elongata* (Vahl) T.Anderson	Acanthaceae	SFD, SRA
28	*Coleus strobilifer* (Roxb.) A.J.Paton	Lamiaceae	ERS, SFD
29	*Anisomeles indica* (L.) Kuntze	Lamiaceae	SEP,SRA, SFD
30	*Annona squamosa* L.	Annonaceae	TCTA, SRA
31	*Antidesma acidum* Retz.	Phyllanthaceae	TCTA
32	*Apluda mutica* L.	Poaceae	ERS
33	*Apocopis mangalorensis* (Hochst. ex Steud.) Henrard	Poaceae	SEP, RP
34	*Aristolochia indica* L.	Aristolochiaceae	TCTA
35	*Arundinella mesophylla* Nees ex Steud.	Poaceae	ERS,SFD, SRA
36	*Asparagus gonocladus* Baker	Asparagaceae	TCTA

37	*Azadirachta indica* A.Juss.	Meliaceae	TCTA
38	*Azanza lampas* Alef.	Malvaceae	TCTA
39	*Bambusa bambos* (L.) Voss	Poaceae	TCTA
40	*Basilicum polystachyon* (L.) Moench	Lamiaceae	SRA, SFD
41	*Biophytum reinwardtii* (Zucc.) Klotzsch	Oxalidaceae	SFD, SRA
42	*Blumea axillaris* DC.	Asteraceae	SRA
43	*Blumea laevis* (Lour.) Merr.	Asteraceae	SRA, SFD
44	*Boerhavia diffusa* L.	Nyctaginaceae	SRA
45	*Boerhavia erecta* L.	Nyctaginaceae	SRA, ERS
46	*Bombax ceiba* L.	Malvaceae	TCTA
47	*Bonnaya antipoda* Druce	Linderniaceae	EFV, ERS
48	*Bonnaya ciliata* Spreng.	Linderniaceae	EFV, ERS
49	*Borassus flabellifer* L.	Arecaceae	TCTA, SRA
50	*Bothriochloa insculpta* (Hochst. ex A.Rich.) A.Camus	Poaceae	SRA, SFD
51	*Breynia retusa* (Dennst.) Alston	Phyllanthaceae	TCTA
52	*Bridelia retusa* A.Juss.	Phyllanthaceae	TCTA, SRA
53	*Bulbostylis barbata* (Rottb.) C.B.Clarke	Cyperaceae	EFV,ERS, SFD
54	*Bulbostylis thouarsii* (Roem. & Schult.) Lye ex Veldkamp & Verloove	Cyperaceae	SFD, SRA
55	*Butea monosperma* Kuntze	Fabaceae	TCTA
56	*Cajanus rugosus* (Wight & Arn.) Maesen	Fabaceae	ERS, SFD
57	*Cajanus scarabaeoides* (L.) Thouars	Fabaceae	ERS
58	*Callicarpa tomentosa* (L.) L.	Lamiaceae	SRA, TCTA
59	*Calopogonium mucunoides* Desv.	Fabaceae	SRA, TCTA
60	*Calotropis gigantea* (L.) W.T.Aiton	Apocynaceae	TCTA
61	*Canavalia mollis* Wall. ex Wight & Arn.	Fabaceae	TCTA
62	*Canscora diffusa* (Vahl) R.Br. ex Roem. & Schult.	Gentianaceae	EFV,SFD, ERS
63	*Canthium coromandelicum* (Burm.f.) Alston	Rubiaceae	TCTA
64	*Canthium rheedei* DC.	Rubiaceae	SRA, TCTA
65	*Cardiospermum halicacabum* L.	Sapindaceae	TCTA
66	*Careya arborea* Roxb.	Lecythidaceae	TCTA, SRA
67	*Carica papaya* L.	Caricaceae	SRA
68	*Cascabela thevetia* (L.) Lippold	Apocynaceae	TCTA, SRA
69	*Casearia wynadensis* Bedd.	Salicaceae	TCTA
70	*Cassia fistula* L.	Fabaceae	TCTA, SRA
71	*Catharanthus pusillus* G.Don	Apocynaceae	ERS, SRA
72	*Catharanthus roseus* (L.) G.Don	Apocynaceae	SRA
73	*Catunaregam spinosa* (Thunb.) Tirveng.	Rubiaceae	SRA, TCTA
74	*Cayratia pedata* Gagnep.	Vitaceae	SRA, TCTA
75	*Ceiba pentandra* (L.) Gaertn.	Malvaceae	TCTA, SRA
76	*Celastrus paniculatus* Willd.	Celastraceae	TCTA

77	*Cenchrus pedicellatus* (Trin.) Morrone	Poaceae	ERS
78	*Centrosema molle* Mart. ex Benth.	Fabaceae	TCTA
79	*Cereus pterogonus* Lem	Cactaceae	ERS, RCF
80	*Chamaecrista absus* (L.) H.S.Irwin & Barneby	Fabaceae	ERS, SRA
81	*Chamaecrista mimosoides* (L.) Greene	Fabaceae	RP
82	*Chamaecrista nictitans* subsp. *patellaria* (Collad.) H.S.Irwin & Barneby	Fabaceae	SFD, SRA
83	*Chloris barbata* Sw.	Poaceae	SRA
84	*Chromolaena odorata* (L.) R.M.King & H.Rob.	Asteraceae	SRA, TCTA
85	*Chrysopogon hackelii* (Hook.f.) C.E.C.Fisch.	Poaceae	TCTA
86	*Cipadessa baccifera* Miq.	Meliaceae	TCTA
87	*Cissampelos pareira* L.	Menispermaceae	TCTA
88	*Cissus vitiginea* L.	Vitaceae	SRA, TCTA
89	*Citrus hystrix* DC.	Rutaceae	TCTA
90	*Cleistanthus collinus* Benth. & Hook.f.	Phyllanthaceae	TCTA, SRA
91	*Clematis zeylanica* Poir.	Ranunculaceae	TCTA
92	*Cleome aspera* J.Koenig	Cleomaceae	SFD, ERS
93	*Cleome rutidosperma* var. *burmanni* (Wight & Arn.) M.O.Siddiqui & S.N.Dixit	Cleomaceae	SFD, SRA
94	*Cleome viscosa* L.	Cleomaceae	SFD, SRA
95	*Clerodendrum infortunatum* L.	Lamiaceae	TCTA, SRA
96	*Clitoria ternatea* L.	Fabaceae	TCTA
97	*Commelina benghalensis* L.	Commelinaceae	SFD,SEP, SRA
98	*Commelina clavata* C.B.Clarke	Commelinaceae	SFD, SRA
99	*Commelina paludosa* Blume	Commelinaceae	SFD, ERS
100	*Commelina wightii* Raizada	Commelinaceae	ERS, SFD, SRA
101	*Commelina diffusa* Burm.f.	Commelinaceae	SFD, SRA
102	*Corchorus aestuans* L.	Malvaceae	SRA,TCTA, SFD
103	*Cordia dichotoma* G.Forst.	Boraginaceae	TCTA
104	*Crotalaria mysorensis* Roth	Fabaceae	ERS, SFD
105	*Crotalaria nana* Burm.f.	Fabaceae	SFD
106	*Crotalaria pallida* Aiton	Fabaceae	SRA
107	*Croton bonplandianus* Baill.	Euphorbiaceae	SRA
108	*Croton hirtus* L'Hér.	Euphorbiaceae	SRA
109	*Cucumis maderaspatanus* L.	Cucurbitaceae	TCTA
110	*Curcuma decipiens* Dalzell	Zingiberaceae	RCF
111	*Cyanotis axillaris* (L.) D.Don ex Sweet	Commelinaceae	ERS,SEP
112	*Cyanotis burmanniana* Wight	Commelinaceae	ERS,RCF, EFV
113	*Cyanotis cristata* (L.) D.Don	Commelinaceae	SEP, SFD

114	*Cyanthillium cinereum* (L.) H.Rob.	Asteraceae	SRA, TCTA
115	*Cymbopogon flexuosus* (Nees ex Steud.) Will.Watson	Poaceae	RCF, ERS
116	*Cynodon dactylon* (L.) Pers.	Poaceae	SRA
117	*Cyperus brevifolius* (Rottb.) Endl. ex Hassk.	Cyperaceae	SFD, SEP, RP
118	*Cyperus compressus* L.	Cyperaceae	EFV, ERS
119	*Cyperus dubius* Rottb.	Cyperaceae	SFD, SRA
120	*Cyperus haspan* L.	Cyperaceae	SEP, RP
121	*Cyperus iria* L.	Cyperaceae	SFD, SRA
122	*Cyperus maderaspatanus* Willd.	Cyperaceae	SFD, SRA
123	*Cyperus mindorensis* (Steud.) Huygh	Cyperaceae	SEP
124	*Cyperus distans* L.f.	Cyperaceae	SRA
125	*Cyperus pumilus* L.	Cyperaceae	SEP, RP
126	*Cyperus richardii* Steud.	Cyperaceae	SFD, B
127	*Cyperus rotundus* L.	Cyperaceae	SEP
128	*Cyperus substramineus* Kük.	Cyperaceae	SEP
129	*Cyrtococcum oxyphyllum* Stapf	Poaceae	SRA, SFD
130	*Dactyloctenium aegyptium* (L.) Willd.	Poaceae	SRA
131	*Dalbergia lanceolaria* subsp. *paniculata* (Roxb.) Thoth.	Fabaceae	TCTA
132	*Dalbergia latifolia* Roxb.	Fabaceae	TCTA
133	*Datura metel* L.	Solanaceae	SRA
134	*Delonix regia* (Bojer) Raf.	Fabaceae	TCTA
135	*Dendrophthoe falcata* (L.f.) Ettingsh.	Loranthaceae	TCTA
136	*Brachypterum scandens* (Roxb) Miq.	Fabaceae	TCTA
137	*Desmodium scorpiurus* (Sw.) Desv. ex DC.	Fabaceae	SRA,SFD, ERS
138	*Dichanthium annulatum* Stapf	Poaceae	SRA
139	*Dichrostachys cinerea* (L.) Wight & Arn.	Fabaceae	TCTA
140	*Dicliptera paniculata* (Forssk.) I.Darbysh.	Acanthaceae	TCTA, SRA
141	*Digitaria bicornis* (Lam.) Roem. & Schult.	Poaceae	SRA
142	*Digitaria ciliaris* (Retz.) Koeler	Poaceae	SRA, SEP
143	*Digitaria longiflora* Pers.	Poaceae	SRA, SEP
144	*Dillenia pentagyna* Roxb.	Dilleniaceae	TCTA
145	*Dimeria deccanensis* Bor	Poaceae	ERS
146	*Dimeria raizadae* V.J.Nair, Sreek. & N.C.Nair	Poaceae	ERS, RCF
147	*Dioscorea bulbifera* L.	Dioscoreaceae	TCTA
148	*Dioscorea pentaphylla* L.	Dioscoreaceae	TCTA
149	*Diospyros melanoxylon* Roxb.	Ebenaceae	TCTA
150	*Diplocyclos palmatus* (L.) C.Jeffrey	Cucurbitaceae	TCTA, SRA
151	*Dodonaea viscosa* Jacq.	Sapindaceae	TCTA
152	*Drosera indica* L.	Droseraceae	EFV
153	*Duranta erecta* L.	Verbenaceae	SRA
154	*Echinochloa colonum* (L.) Link	Poaceae	SEP,SFD

155	*Echinochloa crus-galli* (L.) P.Beauv.	Poaceae	SEP, RP
156	*Eleocharis dulcis* (Burm.f.) Trin. ex Hensch.	Cyperaceae	SRA
157	*Eleusine indica* (L.) Gaertn.	Poaceae	SEP, SRA
158	*Emilia sonchifolia* (L.) DC.	Asteraceae	SFD, SRA
159	*Enteropogon dolichostachyus* (Lag.) Keng	Poaceae	SFD, ERS
160	*Eragrostis tef* (Zuccagni) Trotter	Poaceae	SEP, SFD, ERS
161	*Eragrostis unioloides* Nees ex Steud.	Poaceae	SRA, SFD
162	*Eragrostis viscosa* Trin.	Poaceae	SEP, SRA
163	*Eranthemum capense* L.	Acanthaceae	SRA
164	*Eriocaulon palghatense* R.Ansari & N.P.Balakr.	Eriocaulaceae	EFV
165	*Eriocaulon quinquangulare* L.	Eriocaulaceae	SEP, EFV
166	*Eriocaulon xeranthemum* Mart.	Eriocaulaceae	EFV, ERS
167	*Euphorbia hirta* L.	Euphorbiaceae	SRA, SFD
168	*Euphorbia thymifolia* L.	Euphorbiaceae	SRA, SFD
169	*Euphorbia tortilis* Rottler ex Ainslie	Euphorbiaceae	ERS
170	*Evolvulus alsinoides* L.	Convolvulaceae	SFD
171	*Evolvulus nummularius* (L.) L.	Convolvulaceae	SFD, SRA
172	*Ficus exasperata* Vahl	Moraceae	TCTA
173	*Ficus hispida* L.f.	Moraceae	TCTA, SRA
174	*Ficus microcarpa* L.f.	Moraceae	TCTA
175	*Ficus religiosa* L.	Moraceae	TCTA, SRA
176	*Ficus tinctoria* G.Forst.	Moraceae	TCTA
177	*Fimbristylis aestivalis* var. *aestivalis* (Retz.) Vahl	Cyperaceae	SEP, SFD, SRA
178	*Fimbristylis argentea* Vahl	Cyperaceae	SFD, SRA
179	*Fimbristylis microcarya* F.Muell.	Cyperaceae	SRA,ERS, SFD
180	*Fimbristylis schoenoides* Vahl	Cyperaceae	RP
181	*Fimbristylis tetragona* R. Br.	Cyperaceae	ERS, EFV
182	*Flacourtia indica* (Burm.f.) Merr.	Salicaceae	TCTA
183	*Flueggea virosa* (Roxb. ex Willd.) Royle	Phyllanthaceae	TCTA, SRA
184	*Garcinia gummi-gutta* (L.) N.Robson	Clusiaceae	TCTA
185	*Garnotia courtallensis* Thwaites	Poaceae	SEP, RP
186	*Garnotia tenella* Janowski	Poaceae	ERS, SRA
187	*Garuga pinnata* Roxb.	Burseraceae	TCTA
188	*Geissaspis cristata* var. *tenella* (Benth.) M.R.Almeida	Fabaceae	ERS, RCF
189	*Getonia floribunda* Roxb.	Combretaceae	TCTA
190	*Givotia moluccana* (L.) Sreem.	Euphorbiaceae	TCTA, SRA
191	*Glinus oppositifolius* Aug.DC.	Molluginaceae	SFD, SRA
192	*Gliricidia sepium* (Jacq.) Kunth	Fabaceae	TCTA, SRA
193	*Glycosmis pentaphylla* (Retz.) DC.	Rutaceae	TCTA, SRA
194	*Gomphrena celosioides* Mart.	Amaranthaceae	SRA

195	*Grewia tiliifolia* Vahl	Malvaceae	TCTA
196	*Grona triflora* (L.) H.Ohashi & K.Ohashi	Fabaceae	ERS, SRA
197	*Gymnema sylvestre* (Retz.) R.Br. ex Sm.	Apocynaceae	TCTA
198	*Helicteres isora* L.	Malvaceae	TCTA, SRA
199	*Heliotropium indicum* L.	Boraginaceae	SFD, SRA
200	*Euploca marifolia* var. *rottleri* (Lehm.) Ancy & P.Javad	Boraginaceae	ERS, SFD
201	*Hemidesmus indicus* (L.) R.Br.	Apocynaceae	SFD,SRA, TCTA
202	*Heteropogon contortus* (L.) P.Beauv. ex Roem. & Schult.	Poaceae	SRA, SFD
203	*Hibiscus lobatus* (Murray) Kuntze	Malvaceae	SRA, TCTA
204	*Hibiscus surattensis* L.	Malvaceae	TCTA
205	*Hibiscus vitifolius* L.	Malvaceae	TCTA, SRA
206	*Holarrhena pubescens* Wall. & G.Don	Apocynaceae	TCTA, SRA
207	*Holigarna arnottiana* Hook.f.	Anacardiaceae	TCTA
208	*Holoptelea integrifolia* (Roxb.) Planch.	Ulmaceae	TCTA, SRA
209	*Hoppea fastigiata* (Griseb.) C.B.Clarke in Hook.f.	Gentianaceae	EFV, ERS
210	*Huberantha cerasoides* (Roxb.) Chaowasku	Annonaceae	TCTA
211	*Hydrilla verticillata* (L.f.) Royle	Hydrocharitacea e	RP
212	*Hygrophila ringens* (L.) R.Br. ex Spreng.	Acanthaceae	RP
213	*Hymenodictyon orixense* (Roxb.) Mabb.	Rubiaceae	TCTA
214	*Ichnocarpus frutescens* (L.) W.T.Aiton	Apocynaceae	TCTA, SRA
215	*Impatiens minor* (DC.) Bennet	Balsaminaceae	ERS, EFV
216	*Indigofera astragalina* DC.	Fabaceae	SFD
217	*Indigofera colutea* (Burm.f.) Merr.	Fabaceae	SFD, SRA
218	*Indigofera tsiangiana* F.P.Metcalf Ali	Fabaceae	SFD, SRA
219	*Indigofera uniflora* Buch.-Ham. ex Roxb.	Fabaceae	ERS, SFD
220	*Ipomoea carnea* subsp. *fistulosa* (Mart. ex Choisy) D.F.Austin	Convolvulaceae	RP
221	*Ipomoea eriocarpa* R.Br.	Convolvulaceae	TCTA
222	*Ipomoea hederifolia* L.	Convolvulaceae	TCTA, SRA
223	*Ipomoea obscura* (L.) Ker Gawl.	Convolvulaceae	TCTA, SRA
224	*Ipomoea pes-tigridis* L.	Convolvulaceae	TCTA, SRA
225	*Ipomoea sagittifolia* Burm.f.	Convolvulaceae	TCTA
226	*Ipomoea staphylina* Roem. & Schult.	Convolvulaceae	TCTA
227	*Ipomoea triloba* L.	Convolvulaceae	TCTA, SRA
228	*Isachne globosa* (Thunb.) Kuntze	Poaceae	SEP, RP
229	*Isachne walkeri* Arn. ex Steud.	Poaceae	SFD, SRA
230	*Ischaemum rangacharianum* C.E.C.Fisch.	Poaceae	ERS, SFD
231	*Ischaemum rugosum* Salisb.	Poaceae	ERS, SEP, SFD
232	*Jatropha curcas* L.	Euphorbiaceae	TCTA, SRA

233	*Justicia adhatoda* L.	Acanthaceae	TCTA, SRA
234	*Justicia glauca* Rottler	Acanthaceae	SRA, SFD
235	*Lagerstroemia microcarpa* Wight	Lythraceae	TCTA
236	*Lantana camara* L.	Verbenaceae	TCTA, SRA
237	*Laportea interrupta* (L.) Chew	Urticaceae	SRA, TCTA
238	*Lawsonia inermis* L.	Lythraceae	SRA, TCTA
239	*Leea indica* (Burm.f.) Merr.	Vitaceae	TCTA
240	*Leucaena leucocephala* (Lam.) de Wit	Fabaceae	TCTA, SRA
241	*Leucas aspera* Link	Lamiaceae	SRA, SFD
242	*Limnophila repens* Benth.	Plantaginaceae	RP
243	*Lindernia rotundifolia* (L.) Alston	Linderniaceae	SEP
244	*Lobelia alsinoides* Lam.	Campanulaceae	SFD
245	*Ludwigia hyssopifolia* (G.Don) Exell	Onagraceae	SEP, SFD
246	*Mallotus philippensis* (Lam.) Müll.Arg.	Euphorbiaceae	TCTA
247	*Manihot carthagenensis* subsp. *glaziovii* (Müll.Arg.) Allem	Euphorbiaceae	TCTA, SRA
248	*Martynia annua* L.	Martyniaceae	SRA
249	*Megathyrsus maximus* (Jacq.) B.K.Simon & S.W.L.Jacobs	Poaceae	SRA
250	*Melia azedarach* L.	Meliaceae	TCTA
251	*Melochia corchorifolia* L.	Malvaceae	TCTA
252	*Mesosphaerum suaveolens* (L.) Kuntze	Lamiaceae	ERS,SFD, SRA, TCTA
253	*Microstachys chamaelea* (L.) Müll.Arg.	Euphorbiaceae	ERS, SFD
254	*Millingtonia hortensis* L.f.	Bignoniaceae	TCTA, SRA
255	*Mimosa diplotricha* C.Wright	Fabaceae	SRA, TCTA
256	*Mimosa pudica* L.	Fabaceae	SRA, TCTA
257	*Mitracarpus hirtus* DC.	Rubiaceae	SRA
258	*Mitrasacme prolifera* R.Br.	Loganiaceae	ERS, EFV
259	*Mitreola petiolata* (J.F.Gmel.) Torr. & A.Gray	Loganiaceae	EFV, SFD
260	*Momordica charantia* L., Sp. Pl. [Linnaeus] 2: 1009 (1753).	Cucurbitaceae	TCTA
261	*Monoon longifolium* (Sonn.) B.Xue & R.M.K.Saunders	Annonaceae	TCTA
262	*Morinda coreia* Buch.-Ham.	Rubiaceae	TCTA, SRA
263	*Mucuna bracteata* DC. ex Kurz	Fabaceae	TCTA
264	*Mucuna pruriens* (L.) DC.	Fabaceae	TCTA
265	*Muntingia calabura* L.	Muntingiaceae	TCTA, SRA
266	*Murdannia dimorpha* G.Brückn.	Commelinaceae	ERS,EFV, SFD
267	*Murdannia semiteres* (Dalzell) Santapau	Commelinaceae	ERS
268	*Murdannia spirata* G.Brückn.	Commelinaceae	SFD, SRA
269	*Murdannia vaginata* G.Brückn.	Commelinaceae	ERS, SFD
270	*Naregamia alata* Wight & Arn.	Meliaceae	SRA

271	*Naringi crenulata* (Roxb.) Nicolson	Rutaceae	TCTA
272	*Nicoteba betonica* Lindau	Acanthaceae	TCTA, SRA
273	*Nymphaea nouchali* Burm.f.	Nymphaeaceae	RP
274	*Ocimum americanum* L.	Lamiaceae	SRA
275	*Oldenlandia corymbosa* L.	Rubiaceae	SRA,SEP, SFD
276	*Oldenlandia herbacea* (L.) Roxb.	Rubiaceae	SRA, SFD
277	*Oldenlandia hygrophila* Bremek.	Rubiaceae	EFV
278	*Oplismenus compositus* P.Beauv.	Poaceae	SRA, SFD
279	*Opuntia dillenii* Haw., Suppl. Pl. Succ. 79 (1819).	Cactaceae	ERS
280	*Orthosiphon thymiflorus* (Roth) Sleesen	Lamiaceae	SRA
281	*Oryza rufipogon* Griff.	Poaceae	SRA
282	*Osbeckia muralis* Naudin	Melastomataceae	ERS, EFV, B
283	*Ouret lanata* (L.) Kuntze	Amaranthaceae	SRA
284	*Oxalis corniculata* L.	Oxalidaceae	RCF, B
285	*Pandanus canaranus* Warb.	Pandanaceae	SRA
286	*Panicum paludosum* Roxb.	Poaceae	SRA
287	*Paramollugo nudicaulis* (Lam.) Thulin	Molluginaceae	ERS,RCF, SFD
288	*Parasopubia delphiniifolia* (L.) H.-P.Hofm. & Eb.Fisch.	Orobanchaceae	EFV,SFD, ERS
289	*Parthenium hysterophorus* L.	Asteraceae	SRA
290	*Passiflora foetida* L.	Passifloraceae	TCTA, SRA
291	*Pedalium murex* L.	Pedaliaceae	ERS, SFD
292	*Peperomia pellucida* (L.) Kunth	Piperaceae	SRA,SFD, ERS
293	*Pergularia daemia* (Forssk.) Chiov.	Fabaceae	TCTA
294	*Perotis indica* (L.) Kuntze	Poaceae	ERS, SRA
295	*Phaulopsis imbricata* Sweet	Acanthaceae	SRA
296	*Phyllanthus amarus* Schumach. & Thonn.	Phyllanthaceae	SRA, SFD
297	*Phyllanthus emblica* L.	Phyllanthaceae	TCTA
298	*Phyllanthus maderaspatensis* L.	Phyllanthaceae	SFD, SRA
299	*Phyllanthus reticulatus* Poir.	Phyllanthaceae	TCTA
300	*Phyllanthus urinaria* L.	Phyllanthaceae	SFD, SRA
301	*Phyllanthus virgatus* G.Forst.	Phyllanthaceae	ERS, SFD
302	*Phyllocephalum courtallense* (Wight) Narayana	Asteraceae	ERS, SFD
303	*Pithecellobium dulce* (Roxb.) Benth.	Fabaceae	TCTA, SRA
304	*Pleurolobus gangeticus* (L.) J.St.-Hil. ex H.Ohashi & K.Ohashi	Fabaceae	SRA, TCTA
305	*Plumbago zeylanica* L.	Plumbaginaceae	SFD, SRA
306	*Plumeria alba* L.	Apocynaceae	TCTA, SRA
307	*Pogonatherum crinitum* Kunth	Poaceae	SFD, SRA
308	*Polycarpaea corymbosa* (L.) Lam.	Caryophyllaceae	ERS, RCF

309	*Polygala persicariifolia* DC.	Polygalaceae	ERS, SFD
310	*Polytrias indica* (Houtt.) Veldkamp	Poaceae	SRA, SFD
311	*Pongamia pinnata* (L.) Pierre	Fabaceae	TCTA
312	*Portulaca oleracea* L.	Portulacaceae	SFD, RCF
313	*Portulaca pilosa* L.	Portulacaceae	SFD
314	*Pothos scandens* L.	Araceae	TCTA
315	*Pouzolzia zeylanica* (L.) Benn.	Urticaceae	SFD, SRA
316	*Premna tomentosa* Willd.	Lamiaceae	TCTA
317	*Psilotrichum elliottii* Baker	Amaranthaceae	SFD, SRA
318	*Pterocarpus marsupium* Roxb.	Fabaceae	TCTA
319	*Pupalia lappacea* (L.) Juss.	Amaranthaceae	SRA, SFD
320	*Rhamphicarpa fistulosa* Benth.	Orobanchaceae	EFV
321	*Rhinacanthus nasutus* (L.) Kurz	Acanthaceae	SFD, SRA
322	*Ricinus communis* L.	Euphorbiaceae	TCTA, SRA
323	*Rostellaria hedyotidifolia* Nees	Acanthaceae	ERS, SFD, B
324	*Rostellularia procumbens* (L.) Nees	Acanthaceae	SFD, SRA
325	*Rotala malampuzhensis* R.V.Nair ex C.D.K.Cook	Lythraceae	SEP
326	*Rotheca serrata* (L.) Steane & Mabb.	Lamiaceae	TCTA
327	*Ruellia prostrata* Poir.	Acanthaceae	SRA, TCTA
328	*Rungia pectinata* Nees	Acanthaceae	ERS,SFD, SRA
329	*Saccharum spontaneum* L.	Poaceae	SRA
330	*Sacciolepis indica (L.) A. Chase*	Poaceae	SRA, TCTA
331	*Samanea saman* (Jacq.) Merr.	Fabaceae	TCTA
332	*Santalum album* L.	Santalaceae	TCTA
333	*Schleichera oleosa* (Lour.) Oken.	Sapindaceae	TCTA
334	*Scleromitrion diffusum* (Willd.) R.J.Wang	Rubiaceae	SEP, SFD
335	*Scoparia dulcis* L.	Plantaginaceae	SRA
336	*Senegalia caesia* (L.) Maslin, Seigler & Ebinger	Fabaceae	TCTA
337	*Senna auriculata* (L.) Roxb.	Fabaceae	SRA
338	*Senna hirsuta* (L.) H.S.Irwin & Barneby	Fabaceae	TCTA
339	*Senna occidentalis* (L.) Link	Fabaceae	TCTA, SRA
340	*Senna tora* Roxb.	Fabaceae	SRA, TCTA
341	*Sesamum indicum* L.	Pedaliaceae	SRA, SFD
342	*Sesamum prostratum* Retz.	Pedaliaceae	ERS
343	*Sesamum radiatum* Schum. in Schum. & Thonn.	Pedaliaceae	ERS, SRA
344	*Setaria flavida* (Retz.) Veldkamp	Poaceae	ERS, SFD
345	*Setaria pumila* Roem. & Schult.	Poaceae	ERS, SRA
346	*Sida acuta* Burm.f.	Malvaceae	SRA, TCTA
347	*Sida cordata* (Burm.f.) Borss.Waalk.	Malvaceae	SRA, TCTA
348	*Sida cordifolia* L.	Malvaceae	SRA

349	*Sida rhombifolia* L.	Malvaceae	SRA, TCTA
350	*Smithia blanda* Wall.	Fabaceae	EFV, ERS
351	*Smithia gracilis* Benth.	Fabaceae	ERS, EFV
352	*Solanum torvum* Sw.	Solanaceae	TCTA
353	*Spermacoce articularis* L. f.	Rubiaceae	SFD
354	*Spermacoce hispida* L.	Rubiaceae	ERS, SFD
355	*Spermacoce ocymoides* Burm.f.	Rubiaceae	SFD, SRA
356	*Spermacoce pusilla* Wall.	Rubiaceae	ERS, SFD
357	*Spondias pinnata* (L.f.) Kurz	Anacardiaceae	TCTA
358	*Sporobolus indicus* (L.) R.Br.	Poaceae	SFD, SRA
359	*Sporobolus pilifer* (Trin.) Kunth	Poaceae	SRA
360	*Sporobolus tenuissimus* (Mart. ex Schrank) Kuntze	Poaceae	ERS
361	*Stachytarpheta jamaicensis* (L.) Vahl	Verbenaceae	SFD, SRA
362	*Sterculia foetida* L.	Malvaceae	TCTA
363	*Sterculia urens* Roxb.	Malvaceae	TCTA
364	*Streblus asper* Lour.	Moraceae	TCTA, SRA
365	*Striga angustifolia* (D.Don) Saldanha	Orobanchaceae	ERS, EFV
366	*Strobilanthes crossandra* (Steud.) J.R.I.Wood	Acanthaceae	SRA
367	*Strychnos nux-vomica* L.	Loganiaceae	TCTA, SRA
368	*Strychnos potatorum* L.f.	Loganiaceae	TCTA
369	*Swietenia mahagoni* (L.) Jacq.	Meliaceae	TCTA
370	*Synedrella nodiflora* Gaertn.	Asteraceae	SRA
371	*Syzygium cumini* (L.) Skeels	Myrtaceae	TCTA
372	*Tamarindus indica* L.	Fabaceae	TCTA
373	*Tecoma stans* (L.) Kunth	Bignoniaceae	TCTA
374	*Tectona grandis* L.f.	Lamiaceae	TCTA
375	*Tephrosia maxima* Pers.	Fabaceae	SRA, SFD
376	*Tephrosia pumila* Pers.	Fabaceae	SFD, SRA
377	*Tephrosia purpurea* Pers.	Fabaceae	SFD,SRA, ERS
378	*Tephrosia villosa* (L.) Pers.	Fabaceae	SRA, SFD
379	*Terminalia anogeissiana* Gere & Boatwr.	Combretaceae	TCTA, SRA
380	*Terminalia arjuna* (Roxb. ex DC.) Wight & Arn.	Combretaceae	TCTA
381	*Terminalia paniculata* Roth	Combretaceae	TCTA
382	*Themeda triandra* Forssk.	Poaceae	SRA, TCTA
383	*Theriophonum fischeri* Sivad.	Araceae	RCF
384	*Tinospora cordifolia* (Willd.) Miers ex Hook.f. & Thomson	Menispermaceae	TCTA, SRA
385	*Torenia crustacea* (L.) Cham. & Schltdl.	Linderniaceae	SRA, SFD
386	*Tragia involucrata* L.	Euphorbiaceae	TCTA
387	*Trema orientale* Blume	Cannabaceae	TCTA, SRA
388	*Trianthema portulacastrum* L.	Aizoaceae	SFD, SRA

389	*Tribulus terrestris* L.	Zygophyllaceae	SRA, SFD
390	*Tridax procumbens* L.	Asteraceae	SFD, SRA
391	*Trigastrotheca pentaphylla* (L.) Thulin	Molluginaceae	SFD, SRA
392	*Tripogon bromoides* Roth	Poaceae	ERS,SFD, SRA
393	*Triumfetta rhomboidea* Jacq.	Malvaceae	TCTA, SRA
394	*Urena lobata* L.	Malvaceae	TCTA, SFD
395	*Urena lobata* subsp. *sinuata* (L.) Borss.Waalk.	Malvaceae	SRA, SFD
396	*Urochloa distachyos* (L.) T.Q.Nguyen	Poaceae	SRA, SFD
397	*Utricularia graminifolia* Vahl	Lentibulariaceae	EFV
398	*Utricularia lazulina* P.Taylor	Lentibulariaceae	EFV
399	*Vicoa indica* DC.	Asteraceae	ERS, SFD
400	*Vitex altissima* L.f.	Lamiaceae	TCTA, SRA
401	*Vitex negundo* L.	Lamiaceae	TCTA, SRA
402	*Waltheria indica* L.	Malvaceae	TCTA
403	*Wattakaka volubilis* Stapf	Apocynaceae	TCTA, SRA
404	*Wrightia tinctoria* R.Br.	Apocynaceae	TCTA, SRA
405	*Xenostegia tridentata* (L.) D.F.Austin & Staples	Convolvulaceae	TCTA, SFD
406	*Xylia xylocarpa* (Roxb.) W.Theob.	Fabaceae	TCTA
407	*Xyris pauciflora* Willd.	Xyridaceae	EFV, ERS
408	*Yamazakia pusilla* (Willd.) W.R.Barker, Y.S.Liang & Wannan Merr.	Linderniaceae	SFD, SRA
409	*Ziziphus mauritiana* Lam.	Rhamnaceae	RCF
410	*Ziziphus oenoplia* (L.) Mill.	Rhamnaceae	TCTA, SRA
411	*Zornia gibbosa* Span.	Fabaceae	ERS, SFD

** EFV - Ephemeral Flush Vegetation, ERS - Exposed Rock Surfaces, RCF- Rock crevices or Fissures, SEP- Small Ephemeral Pools, SFD - Soil-Filled Depressions, SRA - Soil-Rich Areas, TCTA- Tree Cover and Tree Associated, B – Boulders, RP - Rock Pools

Annexure X

Endemic taxa in Walayar forest range

Sl. No	Binomial name	IPNI Family	Distribution
1	*Argostemma courtallense* Arn.	Rubiaceae	India
2	*Dioscorea alata* L.	Dioscoreaceae	India
3	*Flacourtia montana* J.Graham	Salicaceae	India
4	*Lindernia tamilnadensis* M.G.Prasad & Sunojk.	Linderniaceae	India
5	*Rhamphicarpa fistulosa* Benth.	Orobanchaceae	India
6	*Ruellia prostrata* Poir.	Acanthaceae	India
7	*Sesamum prostratum* Retz.	Pedaliaceae	India
8	*Smithia blanda* Wall. ex Wight & Arn.	Fabaceae	India
9	*Tetrapilus dioicus* (Roxb.) L.A.S.Johnson	Oleaceae	India
10	*Acalypha capitata* Willd.	Euphorbiaceae	Peninsular India
11	*Acalypha malabarica* Müll.Arg.	Euphorbiaceae	Peninsular India
12	*Aerides maculosa* Lindl.	Orchidaceae	Peninsular India
13	*Alstonia venenata* R.Br.	Apocynaceae	Peninsular India
14	*Arundinella ciliata* Nees ex Miq.	Poaceae	Peninsular India
15	*Baccaurea courtallensis* (Wight) Müll.Arg.	Phyllanthaceae	Peninsular India
16	*Barleria buxifolia* L.	Acanthaceae	Peninsular India
17	*Barleria tomentosa* Roth	Acanthaceae	Peninsular India
18	*Beilschmiedia gemmiflora* (Blume) Kosterm.	Lauraceae	Peninsular India
19	*Bridelia stipularis* Blume	Phyllanthaceae	Peninsular India
20	*Canthium rheedei* DC.	Rubiaceae	Peninsular India
21	*Carissa spinarum* L.	Apocynaceae	Peninsular India
22	*Chionanthus mala-elengi* (Dennst.) P.S.Green	Oleaceae	Peninsular India
23	*Chrysopogon asper* B.Heyne ex Blatt. & McCann	Poaceae	Peninsular India
24	*Chrysopogon hackelii* (Hook.f.) C.E.C.Fisch.	Poaceae	Peninsular India
25	*Crotalaria leptostachya* Benth.	Fabaceae	Peninsular India
26	*Curcuma decipiens* Dalzell	Zingiberaceae	Peninsular India
27	*Cyanotis tuberosa* (Roxb.) Schult.f.	Commelinaceae	Peninsular India
28	*Cymbopogon martini* (Roxb.) Will.Watson	Poaceae	Peninsular India
29	*Dendrobium barbatulum* Lindl.	Orchidaceae	Peninsular India
30	*Dysolobium pilosum* (Willd.) Maréchal	Fabaceae	Peninsular India
31	*Eragrostis riparia* Nees	Poaceae	Peninsular India

32	*Euploca marifolia* var. *rottleri* (Lehm.) Ancy & P.Javad	Boraginaceae	Peninsular India
33	*Henckelia incana* Spreng.	Gesneriaceae	Peninsular India
34	*Impatiens minor* (DC.) Bennet	Balsaminaceae	Peninsular India
35	*Indigofera uniflora* Buch.-Ham. ex Roxb.	Fabaceae	Peninsular India
36	*Litsea coriacea* (B.Heyne ex Nees) Hook.f.	Lauraceae	Peninsular India
37	*Mallotus resinosus* Merr.	Euphorbiaceae	Peninsular India
38	*Murdannia semiteres* (Dalzell) Santapau	Commelinaceae	Peninsular India
39	*Mussaenda frondosa* L.	Rubiaceae	Peninsular India
40	*Naregamia alata* Wight & Arn.	Meliaceae	Peninsular India
41	*Neonauclea purpurea* (Roxb.) Merr.	Rubiaceae	Peninsular India
42	*Oryza officinalis* Wall.	Poaceae	Peninsular India
43	*Osbeckia aspera* Blume	Melastomataceae	Peninsular India
44	*Pandanus canaranus* Warb.	Pandanaceae	Peninsular India
45	*Radermachera xylocarpa* K.Schum.	Bignoniaceae	Peninsular India
46	*Sida rhombifolia* L.	Malvaceae	Peninsular India
47	*Spermacoce hispida* L.	Rubiaceae	Peninsular India
48	*Swertia corymbosa* (Griseb.) Wight ex C.B.Clarke	Gentianaceae	Peninsular India
49	*Terminalia paniculata* Roth	Combretaceae	Peninsular India
50	*Tetrastigma sulcatum* Gamble	Vitaceae	Peninsular India
51	*Argyreia pomacea* Choisy	Convolvulaceae	South India
52	*Arundinella mesophylla* Nees ex Steud.	Poaceae	South India
53	*Dimeria raizadae* V.J.Nair, Sreek. & N.C.Nair	Poaceae	South India
54	*Fimbristylis narayanii* C.E.C.Fisch.	Cyperaceae	South India
55	*Premna paucinervis* Gamble	Lamiaceae	South India
56	*Rhynchoglossum scabrum* Dalzell	Gesneriaceae	South India
57	*Tragia bicolor* Miq.	Euphorbiaceae	South India
58	*Actinodaphne salicina* Meisn.	Lauraceae	Southern Western Ghats
59	*Arisaema barnesii* C.E.C.Fisch.	Araceae	Southern Western Ghats
60	*Artocarpus hirsutus* Lam.	Moraceae	Southern Western Ghats
61	*Boesenbergia pulcherrima* Kuntze	Zingiberaceae	Southern Western Ghats
62	*Cinnamomum malabatrum* (Burm.f.) J.Presl	Lauraceae	Southern Western Ghats
63	*Commelina wightii* Raizada	Commelinaceae	Southern Western Ghats
64	*Crotalaria heyneana* Graham ex Wight & Arn.	Fabaceae	Southern Western Ghats
65	*Curcuma vamana* M.Sabu & Mangaly	Zingiberaceae	Southern Western Ghats
66	*Dimeria deccanensis* Bor	Poaceae	Southern Western Ghats

67	*Drypetes confertiflor*a Pax & K.Hoffm.	Putranjivaceae	Southern Western Ghats
68	*Eugenia wynadensis* Bedd.	Myrtaceae	Southern Western Ghats
69	*Euonymus angulatus* Wight	Celastraceae	Southern Western Ghats
70	*Ficus dalhousieae* Miq.	Moraceae	Southern Western Ghats
71	*Glycosmis nelliyampathiensis* Jabeena & Maya	Rutaceae	Southern Western Ghats
72	*Gomphostemma heyneanum* Wall. ex Benth.	Lamiaceae	Southern Western Ghats
73	*Henckelia fischeri* (Gamble) A.Weber & B.L.Burtt	Gesneriaceae	Southern Western Ghats
74	*Holigarna arnottiana* Hook.f.	Anacardiaceae	Southern Western Ghats
75	*Hopea parviflora* Bedd.	Dipterocarpaceae	Southern Western Ghats
76	*Impatiens gardneriana* Wight	Balsaminaceae	Southern Western Ghats
77	*Ixora ravikumarii* Kottaim.	Rubiaceae	Southern Western Ghats
78	*Lepidagathis spinosa* Wight ex Nees	Acanthaceae	Southern Western Ghats
79	*Monoon fragrans* (Dalzell) B.Xue & R.M.K.Saunders	Annonaceae	Southern Western Ghats
80	*Osbeckia gracilis* Bedd.	Melastomataceae	Southern Western Ghats
81	*Phyllocephalum courtallense* (Wight) Narayana	Asteraceae	Southern Western Ghats
82	*Phyllocephalum rangacharii* (Gamble) Narayana	Asteraceae	Southern Western Ghats
83	*Piper wightii* Miq.	Piperaceae	Southern Western Ghats
84	*Rostellaria hedyotidifolia* Nees	Acanthaceae	Southern Western Ghats
85	*Rungia wightiana* Nees	Acanthaceae	Southern Western Ghats
86	*Smilax wightii* A.DC.	Smilacaceae	Southern Western Ghats
87	*Smithia gracilis* Benth.	Fabaceae	Southern Western Ghats
88	*Stachyphrynium spicatum* K.Schum.	Marantaceae	Southern Western Ghats
89	*Strobilanthes ciliata* Nees	Acanthaceae	Southern Western Ghats
90	*Strobilanthes dupeni* Bedd. ex C.B.Clarke	Acanthaceae	Southern Western Ghats
91	*Syzygium laetum* (Buch.-Ham.) Gandhi	Myrtaceae	Southern Western Ghats
92	*Tabernaemontana alternifolia* L.	Apocynaceae	Southern Western Ghats
93	*Theriophonum fischeri* Sivad.	Araceae	Southern Western Ghats
94	*Theriophonum infaustum* N.E.Br.	Araceae	Southern Western Ghats
95	*Thunbergia tomentosa* Wall. ex Nees	Acanthaceae	Southern Western Ghats
96	*Torenia hirsuta* Willd.	Linderniaceae	Southern Western Ghats
97	*Torenia lindernioides* C.J.Saldanha	Linderniaceae	Southern Western Ghats
98	*Curcuma mutabil*is Škorničk., M.Sabu & Prasanthk.	Zingiberaceae	Southern Western Ghats (Kerala)
99	*Eriocaulon palghatense* R.Ansari & N.P.Balakr.	Eriocaulaceae	Southern Western Ghats (Kerala)
100	*Geissaspis cristata* var. *tenella* (Benth.) M.R.Almeida	Fabaceae	Southern Western Ghats (Kerala)

101	*Heliotropium keralense* Sivar. & Manilal	Boraginaceae	Southern Western Ghats (Kerala)
102	*Oldenlandia hygrophila* Bremek.	Rubiaceae	Southern Western Ghats (Kerala)
103	*Polyalthia malabarica* (Bedd.) I.M.Turner	Annonaceae	Southern Western Ghats (Kerala)
104	*Polygala bolbothrix* Dunn	Polygalaceae	Southern Western Ghats (Kerala)
105	*Rotala malampuzhensis* R.V.Nair ex C.D.K.Cook	Lythraceae	Southern Western Ghats (Kerala)
106	*Sida beddomei* Jacob	Malvaceae	Southern Western Ghats (Kerala)
107	*Thottea sivarajanii* E.S.S.Kumar, A.E.S.Khan & Binu	Aristolochiaceae	Southern Western Ghats (Kerala)
108	*Zingiber sabuanum* K.M.P.Kumar & A.Joe	Zingiberaceae	Southern Western Ghats (Palakkad)
109	*Amorphophallus commutatus* (Schott) Engl.	Araceae	Western Ghats
110	*Andrographis elongata* (Vahl) T.Anderson	Acanthaceae	Western Ghats
111	*Arisaema tortuosum* var. *neglectum* (Schott) Fisch.	Araceae	Western Ghats
112	*Asparagus gonocladus Baker*	Asparagaceae	Western Ghats
113	*Barleria courtallica* Nees	Acanthaceae	Western Ghats
114	*Barleria prattensis* Santapau	Acanthaceae	Western Ghats
115	*Cajanus lineatus* (Wight & Arn.) Maesen	Fabaceae	Western Ghats
116	*Canscora pauciflora* Dalzell	Gentianaceae	Western Ghats
117	*Canscora perfoliata* Lam.	Gentianaceae	Western Ghats
118	*Casearia wynadensis* Bedd.	Salicaceae	Western Ghats
119	*Curcuma aurantiaca* Zijp	Zingiberaceae	Western Ghats
120	*Cyanotis burmanniana* Wight	Commelinaceae	Western Ghats
121	*Cyrtococcum longipes* A.Camus	Poaceae	Western Ghats
122	*Dendrobium ovatum* Kraenzl.	Orchidaceae	Western Ghats
123	*Epithema carnosum* Benth.	Gesneriaceae	Western Ghats
124	*Ficus beddomei* King	Moraceae	Western Ghats
125	*Glochidion ellipticum* Wight	Phyllanthaceae	Western Ghats
126	*Gymnostachyum pubescens* (Lam.) M.R.Almeida	Acanthaceae	Western Ghats
127	*Habenaria furcifera* Lindl.	Orchidaceae	Western Ghats
128	*Habenaria rariflora* A.Rich.	Orchidaceae	Western Ghats
129	*Haplanthodes tentaculata* var. *neilgherryensis* (Wight) J.R.I.Wood	Acanthaceae	Western Ghats

130	*Hydnocarpus pentandrus* (Buch.-Ham.) Oken	Achariaceae	Western Ghats
131	*Hymenodictyon obovatum* Wall.	Rubiaceae	Western Ghats
132	*Impatiens dasysperma* Wight	Balsaminaceae	Western Ghats
133	*Impatiens scapiflora* B.Heyne	Balsaminaceae	Western Ghats
134	*Ixora brachiata* Roxb.	Rubiaceae	Western Ghats
135	*Justicia wynaadensis* B.Heyne	Acanthaceae	Western Ghats
136	*Kalanchoe olivacea* Dalzell	Crassulaceae	Western Ghats
137	*Lagerstroemia microcarpa* Wight	Lythraceae	Western Ghats
138	*Meiogyne pannosa* (Dalzell) J.Sinclair	Annonaceae	Western Ghats
139	*Memecylon talbotianum* D.Brandis	Melastomataceae	Western Ghats
140	*Momordica sahyadrica* Kattuk. & V.T.Antony	Cucurbitaceae	Western Ghats
141	*Nostolachma crassifolia* (Gamble) Deb & J.Lahiri	Rubiaceae	Western Ghats
142	*Polyspora obtusa* (Wall. ex Wight & Arn.) Niissalo & L.M.Choo	Theaceae	Western Ghats
143	*Salacia macrosperma* Wight	Celastraceae	Western Ghats
144	*Taxillus recurvus* (Wall. ex DC.) Tiegh.	Loranthaceae	Western Ghats
145	*Thunbergia mysorensis* (Wight) T.Anderson	Acanthaceae	Western Ghats
146	*Torenia bicolor* Dalzell.	Linderniaceae	Western Ghats
147	*Utricularia lazulina* P.Taylor	Lentibulariaceae	Western Ghats
148	*Xanthophyllum flavescens* Roxb.	Polygalaceae	Western Ghats
149	*Zingiber neesanum* (J.Graham) Ramamoorthy	Zingiberaceae	Western Ghats
150	*Zingiber nimmonii* Dalzell	Zingiberaceae	Western Ghats

Annexure XI

Diversity of threatened plants in Walayar hills (Barik *et al*., 2018)

Sl. No	Binomial name	Family
1	*Andrographis paniculata* (Burm.f.) Wall.	Acanthaceae
2	*Barleria courtallica* Nees	Acanthaceae
3	*Strobilanthes dupeni* Bedd. ex C.B.Clarke	Acanthaceae
4	*Hydnocarpus pentandrus* (Buch.-Ham.) Oken	Achariaceae
5	*Trianthema portulacastrum* L.	Aizoaceae
6	*Alternanthera philoxeroides* (Mart.) Griseb.	Amaranthaceae
7	*Alstonia venenata* R.Br.	Apocynaceae
8	*Anodendron parviflorum* (Roxb.) I.M.Turner	Apocynaceae
9	*Carissa spinarum* L.	Apocynaceae
10	*Cynanchum annularium* (Roxb.) Liede & Khanum	Apocynaceae
11	*Gymnema sylvestre* (Retz.) R.Br. ex Sm.	Apocynaceae
12	*Rauvolfia serpentina* Benth. ex Kurz	Apocynaceae
13	*Vincetoxicum indicum* (Burm.f.) Mabb.	Apocynaceae
14	*Amorphophallus commutatus* (Schott) Engl.	Araceae
15	*Spirodela polyrhiza* (L.) Schleid.	Araceae
16	*Aristolochia indica* L.	Aristolochiaceae
17	*Asparagus racemosus* Willd.	Asparagaceae
18	*Adenostemma lavenia* (L.) Kuntze	Asteraceae
19	*Xanthium strumarium* L.	Asteraceae
20	*Impatiens dasysperma* Wight	Balsaminaceae
21	*Oroxylum indicum* (L.) Benth. ex Kurz	Bignoniaceae
22	*Stereospermum colais* (Buch.-Ham. ex Dillwyn) Mabb.	Bignoniaceae
23	*Cochlospermum religiosum* (L.) Alston	Bixaceae
24	*Heliotropium keralense* Sivar. & Manilal	Boraginaceae
25	*Canarium strictum* Roxb.	Burseraceae
26	*Mesua ferrea* L.	Calophyllaceae
27	*Lobelia alsinoides* Lam.	Campanulaceae
28	*Lobelia nicotianifolia* Roth	Campanulaceae
29	*Cleome rutidosperma* var. *burmanni* (Wight & Arn.) M.O.Siddiqui & S.N.Dixit	Cleomaceae
30	*Garcinia cowa* Roxb.	Clusiaceae
31	*Garcinia gummi-gutta* (L.) N.Robson	Clusiaceae
32	*Gloriosa superba* L.	Colchicaceae
33	*Terminalia arjuna* (Roxb. ex DC.) Wight & Arn.	Combretaceae
34	*Terminalia bellirica* (Gaertn.) Roxb.	Combretaceae
35	*Terminalia chebula* Retz.	Combretaceae
36	*Commelina clavata* C.B.Clarke	Commelinaceae
37	*Commelina wightii* Raizada	Commelinaceae
38	*Cyanotis burmanniana* Wight	Commelinaceae
39	*Murdannia dimorpha* G.Brückn.	Commelinaceae

40	*Murdannia japonica* (Thunb.) Faden	Commelinaceae
41	*Murdannia semiteres* (Dalzell) Santapau	Commelinaceae
42	*Cuscuta chinensis* Lam.	Convolvulaceae
43	*Evolvulus alsinoides* L.	Convolvulaceae
44	*Operculina turpethum* (L.) Silva Manso	Convolvulaceae
45	*Xenostegia tridentata* (L.) D.F.Austin & Staples	Convolvulaceae
46	*Kalanchoe olivacea* Dalzell	Crassulaceae
47	*Trichosanthes cucumerina* L.	Cucurbitaceae
48	*Trichosanthes tricuspidata* Lour.	Cucurbitaceae
49	*Carex phacota* Spreng.	Cyperaceae
50	*Cyperus dubius* Rottb.	Cyperaceae
51	*Cyperus pangorei* Rottb.	Cyperaceae
52	*Fimbristylis argentea* Vahl	Cyperaceae
53	*Scleria lithosperma* (L.) Sw.	Cyperaceae
54	*Dioscorea alata* L.	Dioscoreaceae
55	*Dioscorea bulbifera* L.	Dioscoreaceae
56	*Dioscorea pentaphylla* L.	Dioscoreaceae
57	*Dioscorea spicata* Roth	Dioscoreaceae
58	*Drosera burmanni* Vahl	Droseraceae
59	*Drosera indica* L.	Droseraceae
60	*Elaeagnus conferta* Roxb.	Elaeagnaceae
61	*Elaeocarpus serratus* L.	Elaeocarpaceae
62	*Bergia capensis* L.	Elatinaceae
63	*Eriocaulon quinquangulare* L.	Eriocaulaceae
64	*Baliospermum solanifolium* (Burm.) Suresh	Euphorbiaceae
65	*Euphorbia tortilis* Rottler ex Ainslie	Euphorbiaceae
66	*Macaranga peltata* Müll.Arg.	Euphorbiaceae
67	*Micrococca mercurialis* Benth.	Euphorbiaceae
68	*Tragia bicolor* Miq.	Euphorbiaceae
69	*Abrus precatorius* L.	Fabaceae
70	*Albizia chinensis* (Osbeck.) Merr.	Fabaceae
71	*Alysicarpus bupleurifolius* (L.) DC.	Fabaceae
72	*Brachypterum scandens* (Roxb.) Miq.	Fabaceae
73	*Butea monosperma* Kuntze	Fabaceae
74	*Cajanus rugosus* (Wight & Arn.) Maesen	Fabaceae
75	*Canavalia gladiata* (Jacq.) DC.	Fabaceae
76	*Dysolobium pilosum* (Willd.) Maréchal	Fabaceae
77	*Erythrina suberosa* Roxb.	Fabaceae
78	*Grona heterophylla* (Willd.) H.Ohashi & K.Ohashi	Fabaceae
79	*Mucuna monosperma* DC. ex Wight	Fabaceae
80	*Mucuna pruriens* (L.) DC.	Fabaceae
81	*Neustanthus phaseoloides* Benth.	Fabaceae
82	*Phanera scandens* (L.) Lour. ex Raf.	Fabaceae

83	*Pseudarthria viscida* Wight & Arn.	Fabaceae
84	*Pterocarpus marsupium* Roxb.	Fabaceae
85	*Pycnospora lutescens* Schindl.	Fabaceae
86	*Saraca asoca* (Roxb.) W.J.de Wilde	Fabaceae
87	*Senegalia catechu* (L.f.) P.J.H.Hurter & Mabb.	Fabaceae
88	*Swertia corymbosa* (Griseb.) Wight ex C.B.Clarke	Gentianaceae
89	*Hydrilla verticillata* (L.f.) Royle	Hydrocharitaceae
90	*Curculigo orchioides* Gaertn.	Hypoxidaceae
91	*Mappia nimmoniana* (J.Graham) Byng & Stull	Icacinaceae
92	*Premna tomentosa* Willd.	Lamiaceae
93	*Vitex trifolia* L.	Lamiaceae
94	*Beilschmiedia gemmiflora* (Blume) Kosterm.	Lauraceae
95	*Cinnamomum malabatrum* (Burm.f.) J.Presl	Lauraceae
96	*Machilus glaucescens* (Nees) Wight	Lauraceae
97	*Strychnos nux-vomica* L.	Loganiaceae
98	*Strychnos potatorum* L.f.	Loganiaceae
99	*Abelmoschus esculentus* (L.) Moench	Malvaceae
100	*Abelmoschus moschatus* Medik.	Malvaceae
101	*Bombax insigne* Wall.	Malvaceae
102	*Hibiscus surattensis* L.	Malvaceae
103	*Waltheria indica* L.	Malvaceae
104	*Stachyphrynium spicatum* K.Schum.	Marantaceae
105	*Melia azedarach* L.	Meliaceae
106	*Artocarpus hirsutus* Lam.	Moraceae
107	*Ficus racemosa* L.	Moraceae
108	*Ficus tinctoria* G.Forst.	Moraceae
109	*Erythropalum scandens* Blume	Olacaceae
110	*Chionanthus mala-elengi* (Dennst.) P.S.Green	Oleaceae
111	*Jasminum flexile Vahl*	Oleaceae
112	*Acampe praemorsa* (Roxb.) Blatt. & McCann	Orchidaceae
113	*Aerides maculosa* Lindl.	Orchidaceae
114	*Crepidium purpureum* (Lindl.) Szlach.	Orchidaceae
115	*Dendrobium barbatulum* Lindl.	Orchidaceae
116	*Dendrobium ovatum* Kraenzl.	Orchidaceae
117	*Disperis monophylla* Blatt. ex C.E.C.Fisch.	Orchidaceae
118	*Habenaria digitata* Lindl.	Orchidaceae
119	*Habenaria furcifera* Lindl.	Orchidaceae
120	*Habenaria rariflora* A.Rich.	Orchidaceae
121	*Nervilia concolor* Schltr.	Orchidaceae
122	*Nervilia infundibulifolia* Blatt. & McCann	Orchidaceae
123	*Nervilia plicata* Schltr.	Orchidaceae
124	*Oberonia bicornis* Lindl.	Orchidaceae
125	*Pandanus canaranus* Warb.	Pandanaceae

126	*Glochidion ellipticum* Wight	Phyllanthaceae
127	*Glochidion zeylanicum* (Gaertn.) A.Juss.	Phyllanthaceae
128	*Phyllanthus emblica* L.	Phyllanthaceae
129	*Phyllanthus rheedei* Wight	Phyllanthaceae
130	*Piper longum* L.	Piperaceae
131	*Piper nigrum* L.	Piperaceae
132	*Plumbago indica* L.	Plumbaginaceae
133	*Plumbago zeylanica* L.	Plumbaginaceae
134	*Aristida adscensionis* L.	Poaceae
135	*Arundinella ciliata* Nees ex Miq.	Poaceae
136	*Arundo donax* L.	Poaceae
137	*Chrysopogon aciculatu*s Trin.	Poaceae
138	*Coix lacryma-jobi* L.	Poaceae
139	*Cyrtococcum oxyphyllum* Stapf	Poaceae
140	*Eragrostis riparia* Nees	Poaceae
141	*Eragrostis viscosa* Trin.	Poaceae
142	*Garnotia tenella* Janowski	Poaceae
143	*Megathyrsus maximus* (Jacq.) B.K.Simon & S.W.L.Jacobs	Poaceae
144	*Oryza rufipogon* Griff.	Poaceae
145	*Paspalum scrobiculatum* L.	Poaceae
146	*Portulaca pilosa* L.	Portulacaceae
147	*Embelia tsjeriam-cottam* (Roem. & Schult.) A.DC.	Primulaceae
148	*Drypetes confertiflor*a Pax & K.Hoffm.	Putranjivaceae
149	*Prunus ceylanica* Miq.	Rosaceae
150	*Canthium rheedei* DC.	Rubiaceae
151	*Knoxia sumatrensis* (Retz.) DC.	Rubiaceae
152	*Neonauclea purpurea* (Roxb.) Merr.	Rubiaceae
153	*Oldenlandia umbellata* L.	Rubiaceae
154	*Atalantia monophylla* (L.) DC.	Rutaceae
155	*Citrus hystrix* DC.	Rutaceae
156	*Glycosmis pentaphylla* (Retz.) DC.	Rutaceae
157	*Zanthoxylum asiaticum* (L.) Appelhans, Groppo & J.Wen	Rutaceae
158	*Santalum album* L.	Santalaceae
159	*Smilax wightii* A.DC.	Smilacaceae
160	*Smilax zeylanica* L.	Smilacaceae
161	*Pilea microphylla* (L.) Liebm.	Urticaceae
162	*Pouzolzia zeylanica* (L.) Benn.	Urticaceae
163	*Cayratia pedata* Gagnep.	Vitaceae
164	*Cissus vitiginea* L.	Vitaceae
165	*Leea indica* (Burm.f.) Merr.	Vitaceae
166	*Leea macrophylla* Roxb. ex Hornem.	Vitaceae
167	*Boesenbergia pulcherrima* Kuntze	Zingiberaceae
168	*Hedychium coronarium* J.Koenig	Zingiberaceae

Annexure XII

Additions to the Flora of Palghat district

Sl. No	IPNI Name without full author citation	IPNI Family
1	*Andrographis elongata* (Vahl) T.Anderson	Acanthaceae
2	*Andrographis paniculata* (Burm.f.) Wall.	Acanthaceae
3	*Asystasia gangetica* (L.) T.Anderson	Acanthaceae
4	*Barleria tomentosa* Roth	Acanthaceae
5	*Blepharis integrifolia* E.Mey. & Drège	Acanthaceae
6	*Justicia gendarussa* Burm.f.	Acanthaceae
7	*Justicia glauca* Rottler	Acanthaceae
8	*Justicia tranquebariensis* L.f.	Acanthaceae
9	*Lepidagathis incurva* Buch.-Ham. ex D.Don	Acanthaceae
10	*Lepidagathis spinosa* Wight ex Nees	Acanthaceae
11	*Rungia wightiana* Nees	Acanthaceae
12	*Strobilanthes ciliata* Nees	Acanthaceae
13	*Strobilanthes crossandra* (Steud.) J.R.I.Wood	Acanthaceae
14	*Thunbergia tomentosa* Wall. ex Nees	Acanthaceae
15	*Achyranthes aspera* var. *porphyristachya* (Wall. ex Moq.) Hook.f.	Amaranthaceae
16	*Alternanthera bettzickiana* (Regel) G.Nicholson	Amaranthaceae
17	*Alternanthera brasiliana* (L.) Kuntze	Amaranthaceae
18	*Alternanthera paronychioides* A.St.-Hil.	Amaranthaceae
19	*Alternanthera philoxeroides* (Mart.) Griseb.	Amaranthaceae
20	*Amaranthus hybridus* L.	Amaranthaceae
21	*Amaranthus tricolor* L.	Amaranthaceae
22	*Cyathula prostrata* (L.) Blume	Amaranthaceae
23	*Ouret* sp. Nova	Amaranthaceae
24	*Psilotrichum elliottii* Baker	Amaranthaceae
25	*Meiogyne pannosa* (Dalzell) J.Sinclair	Annonaceae
26	*Orophea zeylanica* Hook.f. & Thomson	Annonaceae
27	*Polyalthia malabarica* (Bedd.) I.M.Turner	Annonaceae
28	*Boucerosia umbellata* Wight & Arn.	Apocynaceae
29	*Calotropis procera* (Aiton) W.T.Aiton	Apocynaceae
30	*Carissa carandas* L.	Apocynaceae
31	*Cosmostigma cordatum* (Poir.) M.R.Almeida	Apocynaceae
32	*Cynanchum annularium* (Roxb.) Liede & Khanum	Apocynaceae
33	*Nerium oleander* L.	Apocynaceae
34	*Oxystelma esculentum* (L.f.) Decne.	Apocynaceae
35	*Rauvolfia tetraphylla* L.	Apocynaceae
36	*Amorphophallus commutatus* (Schott) Engl.	Araceae
37	*Amorphophallus paeoniifolius* (Dennst.) Nicolson	Araceae
38	*Amorphophallus* sp. Nova Aswani, Prabhuumar and Maya	Araceae
39	*Arisaema tortuosum* (Wall.) Schott	Araceae
40	*Arisaema tortuosum* var. *neglectum* (Schott) Fisch.	Araceae
41	*Thottea sivarajanii* E.S.S.Kumar, A.E.S.Khan & Binu	Aristolochiaceae

42	*Asparagus racemosus* Willd.	Asparagaceae
43	*Chlorophytum nimmonii* Dalzell	Asparagaceae
44	*Acmella radicans* (Jacq.) R.K.Jansen	Asteraceae
45	*Acmella uliginosa* (Sw.) Cass.	Asteraceae
46	*Ageratum houstonianum* Mill.	Asteraceae
47	*Blainvillea acmella* (L.) Philipson	Asteraceae
48	*Blumea lacera* (Burm.f.) DC.	Asteraceae
49	*Blumea laevis* (Lour.) Merr.	Asteraceae
50	*Blumea oxyodonta* DC.	Asteraceae
51	*Cosmos caudatus* Kunth	Asteraceae
52	*Eleutheranthera ruderalis* (Sw.) Sch.Bip.	Asteraceae
53	*Grangea maderaspatana* (L.) Poir.	Asteraceae
54	*Laggera alata* (DC.) Sch.Bip. ex Oliv.	Asteraceae
55	*Mikania micrantha* Kunth	Asteraceae
56	*Phyllocephalum courtallense* (Wight) Narayana	Asteraceae
57	*Phyllocephalum rangacharii* (Gamble) Narayana	Asteraceae
58	*Sphagneticola trilobata* (L.) Pruski	Asteraceae
59	*Tithonia diversifolia* (Hemsl.) A.Gray	Asteraceae
60	*Tithonia rotundifolia* S.F.Blake	Asteraceae
61	*Impatiens balsamina* L.	Balsaminaceae
62	*Impatiens dasysperma* Wight	Balsaminaceae
63	*Impatiens flaccida* Arn.	Balsaminaceae
64	*Impatiens sp nova Aswani, Maya and Prabhukumar*	Balsaminaceae
65	*Basella alba* L.	Basellaceae
66	*Begonia dipetala* Graham	Begoniaceae
67	*Mansoa alliacea* (Lam.) A.H.Gentry	Bignoniaceae
68	*Spathodea campanulata* P.Beauv.	Bignoniaceae
69	*Cordia dichotoma* G.Forst.	Boraginaceae
70	*Euploca marifolia* var. *rottleri* (Lehm.) Ancy & P.Javad	Boraginaceae
71	*Heliotropium keralense* Sivar. & Manilal	Boraginaceae
72	*Ananas comosus* (L.) Merr.	Bromeliaceae
73	*Opuntia ficus-indica* (L.) Mill.	Cactaceae
74	*Capparis brevispina* DC.	Capparaceae
75	*Capparis zeylanica* L.	Capparaceae
76	*Polycarpaea corymbosa* (L.) Lam.	Caryophyllaceae
77	*Euonymus angulatus* Wight	Celastraceae
78	*Salacia macrosperma* Wight	Celastraceae
79	*Cleome aspera* J.Koenig	Cleomaceae
80	*Cleome gynandra* L.	Cleomaceae
81	*Cleome rutidosperma* var. *burmanni* (Wight & Arn.) M.O.Siddiqui & S.N.Dixit	Cleomaceae
82	*Terminalia catappa* L.	Combretaceae
83	*Terminalia chebula* Retz.	Combretaceae
84	*Commelina clavata* C.B.Clarke	Commelinaceae
85	*Cyanotis burmanniana* Wight	Commelinaceae
86	*Murdannia dimorpha* G.Brückn.	Commelinaceae

87	*Murdannia nudiflora* (L.) Brenan	Commelinaceae
88	*Murdannia vaginata* G.Brückn.	Commelinaceae
89	*Argyreia elliptica* (Roth) Choisy	Convolvulaceae
90	Argyreia pomacea Choisy	Convolvulaceae
91	*Argyreia populifoli*a Choisy	Convolvulaceae
92	*Cuscuta chinensis* Lam.	Convolvulaceae
93	*Distimake aegyptius* (L.) A.R.Simões & Staples	Convolvulaceae
94	*Evolvulus alsinoides* L.	Convolvulaceae
95	*Ipomoea cairica* (L.) Sweet	Convolvulaceae
96	*Ipomoea carnea* subsp. *fistulosa* (Mart. ex Choisy) D.F.Austin	Convolvulaceae
97	*Ipomoea nil* (L.) Roth	Convolvulaceae
98	*Ipomoea obscur*a (L.) Ker Gawl.	Convolvulaceae
99	*Ipomoea purpurea* (L.) Roth	Convolvulaceae
100	*Ipomoea triloba* L.	Convolvulaceae
101	*Merremia hederacea* (Burm.f.) Hallier f.	Convolvulaceae
102	*Kalanchoe olivacea* Dalzell	Crassulaceae
103	*Cucumis sativu*s L.	Cucurbitaceae
104	*Momordica sahyadrica* Kattuk. & V.T.Antony	Cucurbitaceae
105	Bulbostylis barbata subsp. pulchella (Thwaites) T.Koyama	Cyperaceae
106	*Bulbostylis thouarsii* (Roem. & Schult.) Lye ex Veldkamp & Verloove	Cyperaceae
107	*Carex phacota* Spreng.	Cyperaceae
108	*Cyperus brevifolius* (Rottb.) Endl. ex Hassk.	Cyperaceae
109	*Cyperus haspan* L.	Cyperaceae
110	*Cyperus imbricatus* Retz.	Cyperaceae
111	*Cyperus macrostachyos* Lam.	Cyperaceae
112	*Cyperus neochinensis* (Tang & F.T.Wang) Bauters	Cyperaceae
113	*Cyperus pseudokyllingioides* Kük.	Cyperaceae
114	*Cyperus sesquiflorus* subspec. *cylindricus* (Nees) T.Koyama	Cyperaceae
115	*Cyperus squarrosus* L.	Cyperaceae
116	*Eleocharis dulci*s (Burm.f.) Trin. ex Hensch.	Cyperaceae
117	*Fimbristylis argentea* Vahl	Cyperaceae
118	*Fimbristylis microcary*a F.Muell.	Cyperaceae
119	*Fimbristylis schoenoides* Vahl	Cyperaceae
120	*Fimbristylis tetragona* R.Br.	Cyperaceae
121	*Fuirena ciliaris* (L.) Roxb.	Cyperaceae
122	*Schoenoplectiella articulat*a (L.) Lye	Cyperaceae
123	*Scleria oblata* S.T.Blake ex J.Kern	Cyperaceae
124	*Dioscorea alata* L.	Dioscoreaceae
125	*Dioscorea belophylla* (Prain) Voigt ex Haines	Dioscoreaceae
126	*Dioscorea hamiltonii* Hook.f.	Dioscoreaceae
127	*Dioscorea spicata* Roth	Dioscoreaceae
128	*Diospyros ebenum* J.Koenig	Ebenaceae
129	*Diospyros melanoxylon* Roxb.	Ebenaceae
130	*Diospyros trichophylla* Alston	Ebenaceae

131	*Elaeagnus indica* Serv.	Elaeagnaceae
132	*Bergia capensis* L.	Elatinaceae
133	*Eriocaulon sexangulare* L.	Eriocaulaceae
134	*Eriocaulon xeranthemum* Mart.	Eriocaulaceae
135	*Acalypha indica* L.	Euphorbiaceae
136	*Acalypha malabarica* Müll.Arg.	Euphorbiaceae
137	*Croton aromaticus* L.	Euphorbiaceae
138	*Croton hirtus* L'Hér.	Euphorbiaceae
139	*Euphorbia heterophylla* L.	Euphorbiaceae
140	*Euphorbia tithymaloides* L.	Euphorbiaceae
141	*Euphorbia tortilis* Rottler ex Ainslie	Euphorbiaceae
142	*Mallotus rhamnifolius* Müll.Arg.	Euphorbiaceae
143	*Micrococca mercurialis* Benth.	Euphorbiaceae
144	*Tragia bicolor* Miq.	Euphorbiaceae
145	*Acacia auriculiformis* A.Cunn. ex Benth.	Fabaceae
146	*Aeschynomene americana* L.	Fabaceae
147	*Albizia amara* (Roxb.) Boivin	Fabaceae
148	*Albizia lebbeck* (L.) Benth.	Fabaceae
149	*Alysicarpus heterophyllus* (Baker) Jafri & Ali	Fabaceae
150	*Alysicarpus monilifer* (L.) DC.	Fabaceae
151	*Cajanus rugosus* (Wight & Arn.) Maesen	Fabaceae
152	*Cajanus scarabaeoides* (L.) Thouars	Fabaceae
153	*Canavalia africana* Dunn ex Hutch.	Fabaceae
154	*Canavalia mollis* Wall. ex Wight & Arn.	Fabaceae
155	*Chamaecrista absus* (L.) H.S.Irwin & Barneby	Fabaceae
156	*Crotalaria calycina* Schrank	Fabaceae
157	*Crotalaria leptostachya* Benth.	Fabaceae
158	*Dalbergia lanceolaria* subsp. *paniculata* (Roxb.) Thoth.	Fabaceae
159	*Dalbergia sissoo* Roxb. ex DC.	Fabaceae
160	*Delonix regia* (Bojer) Raf.	Fabaceae
161	*Desmodium scorpiurus* (Sw.) Desv. ex DC.	Fabaceae
162	*Dysolobium pilosum* (Willd.) Maréchal	Fabaceae
163	*Erythrina stricta* Roxb.	Fabaceae
164	*Erythrina suberosa* Roxb.	Fabaceae
165	*Flemingia wallichii* Wight & Arn.	Fabaceae
166	*Geissaspis cristata* var. *tenella* (Benth.) M.R.Almeida	Fabaceae
167	*Hultholia mimosoides* (Lam.) Gagnon & G.P.Lewis	Fabaceae
168	*Indigofera astragalina* DC.	Fabaceae
169	*Indigofera colutea* (Burm.f.) Merr.	Fabaceae
170	*Indigofera glabra* L.	Fabaceae
171	*Indigofera tsiangiana* F.P.Metcalf	Fabaceae
172	*Libidibia coriaria* (Jacq.) Schltdl.	Fabaceae
173	*Mimosa diplotricha* C.Wright	Fabaceae
174	*Mucuna bracteata* DC. ex Kurz	Fabaceae
175	*Neustanthus phaseoloides* Benth.	Fabaceae
176	*Ohwia caudata* (Thunb.) H.Ohashi	Fabaceae

177	*Phanera scandens* (L.) Lour. ex Raf.	Fabaceae
178	*Prosopis juliflora* (Sw.) DC.	Fabaceae
179	*Samanea saman* (Jacq.) Merr.	Fabaceae
180	*Senegalia caesia* (L.) Maslin, Seigler & Ebinger	Fabaceae
181	*Senegalia catechu* (L.f.) P.J.H.Hurter & Mabb.	Fabaceae
182	*Smithia gracilis* Benth.	Fabaceae
183	*Stylosanthes fruticosa* (Retz.) Alston	Fabaceae
184	*Tephrosia canarensis* J.R.Drumm.	Fabaceae
185	*Tephrosia maxima* Pers.	Fabaceae
186	*Tephrosia pumila* Pers.	Fabaceae
187	*Vigna radiata* (L.) R.Wilczek	Fabaceae
188	*Vigna unguiculata* subsp. *sesquipedalis* (L.) Verdc.	Fabaceae
189	*Vigna unguiculata* subsp. *unguiculata* (L.) Walp.	Fabaceae
190	*Guilandina bonduc* L.	Fabceae
191	*Canscora pauciflora* Dalzell	Gentianaceae
192	*Swertia corymbosa* (Griseb.) Wight ex C.B.Clarke	Gentianaceae
193	*Henckelia fischeri* (Gamble) A.Weber & B.L.Burtt	Gesneriaceae
194	*Henckelia humboldtiana* (Gardner) A.Weber & B.L.Burtt	Gesneriaceae
195	*Rhynchoglossum obliquum* Blume	Gesneriaceae
196	*Rhynchoglossum scabrum* Dalzell	Gesneriaceae
197	*Hypoxis aurea* Lour.	Hypoxidaceae
198	*Coleus amboinicus* Lour.	Lamiaceae
199	*Coleus rotundifolius* (Poir.) A.Chev. & Perrot	Lamiaceae
200	*Leucas chinensis* (Retz.) Sm.	Lamiaceae
201	*Ocimum basilicum* L.	Lamiaceae
202	*Premna paucinervis* Gamble	Lamiaceae
203	*Rotheca microphylla* (Blume) Callm. & Phillipson	Lamiaceae
204	*Vitex trifolia* L.	Lamiaceae
205	*Volkameria heterophylla* Poir.	Lamiaceae
206	*Actinodaphne salicina* Meisn.	Lauraceae
207	*Beilschmiedia gemmiflora* (Blume) Kosterm.	Lauraceae
208	*Cinnamomum verum* J.Presl	Lauraceae
209	*Utricularia lazulina* P.Taylor	Lentibulariaceae
210	*Lindernia rotundifolia* (L.) Alston	Linderniaceae
211	*Lindernia tamilnadensis* M.G.Prasad & Sunojk.	Linderniaceae
212	*Torenia lindernioides* C.J.Saldanha	Linderniaceae
213	*Yamazakia viscosa* (Hornem.) W.R.Barker, Y.S.Liang & Wannan	Linderniaceae
214	*Mitrasacme prolifera* R.Br.	Loganiaceae
215	*Mitreola petiolata* (J.F.Gmel.) Torr. & A.Gray	Loganiaceae
216	*Taxillus recurvus* (Wall. ex DC.) Tiegh.	Loranthaceae
217	*Ammannia octandra* L.f.	Lythraceae
218	*Abelmoschus esculentus* (L.) Moench	Malvaceae
219	*Heritiera papilio* Bedd.	Malvaceae
220	*Hibiscus radiatus* Cav.	Malvaceae
221	*Hibiscus rosa-sinensis* L.	Malvaceae

222	*Hibiscus schizopetalus* (Dyer) Hook.f.	Malvaceae
223	*Melochia corchorifolia* L.	Malvaceae
224	*Sida beddomei* Jacob	Malvaceae
225	*Sida rhombifolia* subsp. *alnifolia* (L.) Ugbor.	Malvaceae
226	*Sterculia foetida* L.	Malvaceae
227	*Theobroma cacao* L.	Malvaceae
228	*Memecylon talbotianum* D.Brandis	Melastomataceae
229	*Osbeckia gracilis* Bedd.	Melastomataceae
230	*Osbeckia muralis* Naudin	Melastomataceae
231	*Melia azedarach* L.	Meliaceae
232	*Diploclisia glaucescens* (Blume) Diels	Menispermaceae
233	*Stephania japonica* (Thunb.) Miers	Menispermaceae
234	*Stephania wightii* (Arn. ex Wight) Dunn	Menispermaceae
235	*Paramollugo nudicaulis* (Lam.) Thulin	Molluginaceae
236	*Artocarpus altilis* (Parkinson) Fosberg	Moraceae
237	*Ficus arnottiana* (Miq.) Miq.	Moraceae
238	*Ficus costata* Aiton	Moraceae
239	*Ficus virens* Aiton	Moraceae
240	*Morus alba* L.	Moraceae
241	*Muntingia calabura* L.	Muntingiaceae
242	*Musa* × *paradisiaca* L.	Musaceae
243	*Myristica fragrans* Houtt.	Myristicaceae
244	*Eucalyptus globulus* Labill.	Myrtaceae
245	*Eugenia wynadensis* Bedd.	Myrtaceae
246	*Syzygium gardneri* Thwaites	Myrtaceae
247	*Nymphaea rubra* Roxb. ex Salisb.	Nymphaeaceae
248	*Nyctanthes arbor-tristis* L., Sp. Pl. 1: 6 (1753).	Oleaceae
249	*Disperis monophylla* Blatt. ex C.E.C.Fisch.	Orchidaceae
250	*Habenaria rariflora* A.Rich.	Orchidaceae
251	*Nervilia concolor* Schltr.	Orchidaceae
252	*Nervilia infundibulifolia* Blatt. & McCann	Orchidaceae
253	*Nervilia simplex* (Spreng.) Schltr.	Orchidaceae
254	*Oberonia bicornis* Lindl.	Orchidaceae
255	*Peristylus spiralis* A.Rich.	Orchidaceae
256	*Centranthera indica* Gamble	Orobanchaceae
257	*Biophytum sensitivum* (L.) DC.	Oxalidaceae
258	*Biophytum umbraculum* Welw.	Oxalidaceae
259	*Sesamum radiatum* Thonn. ex Hornem.	Pedaliaceae
260	*Antidesma alexiteria* L.	Phyllanthaceae
261	*Flueggea leucopyrus* Willd.	Phyllanthaceae
262	*Glochidion zeylanicum* (Gaertn.) A.Juss.	Phyllanthaceae
263	*Phyllanthus airy-shawii* Jean F.Brunel & Jacq.Roux	Phyllanthaceae
264	*Piper argyrophyllum* Miq.	Piperaceae
265	*Piper longum* L.	Piperaceae
266	*Piper wightii* Miq.	Piperaceae
267	*Limnophila heterophyll*a Benth.	Plantaginaceae

268	*Limnophila repens* Benth.	Plantaginaceae
269	*Mecardonia procumbens* (Mill.) Small	Plantaginaceae
270	*Stemodia verticillata* (Mill.) Hassl.	Plantaginaceae
271	*Plumbago indica* L.	Plumbaginaceae
272	*Alloteropsis cimicina* Stapf	Poaceae
273	*Apluda mutica* L.	Poaceae
274	*Apocopis cochinchinensis* A.Camus	Poaceae
275	*Apocopis mangalorensis* (Hochst. ex Steud.) Henrard	Poaceae
276	*Aristida setacea* Retz.	Poaceae
277	*Arthraxon hispidus* (Thunb.) Makino	Poaceae
278	*Arundinella setosa* Trin.	Poaceae
279	*Axonopus compressus* (Sw.) P.Beauv.	Poaceae
280	*Bothriochloa insculpta* (Hochst. ex A.Rich.) A.Camus	Poaceae
281	*Bothriochloa pertusa* (L.) A.Camus.	Poaceae
282	*Capillipedium assimile* (Steud.) A.Camus	Poaceae
283	*Chloris barbata* Sw.	Poaceae
284	*Chrysopogon asper* B.Heyne ex Blatt. & McCann	Poaceae
285	*Cymbopogon citratus* Stapf	Poaceae
286	*Cymbopogon martini* (Roxb.) Will.Watson	Poaceae
287	*Cyrtococcum deccanense* Bor	Poaceae
288	*Cyrtococcum longipes* A.Camus	Poaceae
289	*Cyrtococcum oxyphyllum* Stapf	Poaceae
290	*Cyrtococcum patens* (L.) A.Camus	Poaceae
291	*Dactyloctenium aegyptium* (L.) Willd.	Poaceae
292	*Dendrocalamus strictus* Nees	Poaceae
293	*Digitaria bicornis* (Lam.) Roem. & Schult.	Poaceae
294	*Digitaria radicosa* (J.Presl) Miq.	Poaceae
295	*Dimeria deccanensis* Bor	Poaceae
296	*Dimeria raizadae* V.J.Nair, Sreek. & N.C.Nair	Poaceae
297	*Enteropogon dolichostachyus* (Lag.) Keng	Poaceae
298	*Enteropogon monostachyus* Schum.	Poaceae
299	*Eragrostiella bifaria* (Vahl) Bor	Poaceae
300	*Eragrostis nigra* Nees ex Steud.	Poaceae
301	*Eragrostis riparia* Nees	Poaceae
302	*Eragrostis tef* (Zuccagni) Trotter	Poaceae
303	*Eragrostis tenella* (L.) P.Beauv. ex Roem. & Schult.	Poaceae
304	*Eragrostis viscosa* Trin.	Poaceae
305	*Eriochloa procera* (Retz.) C.E.Hubb.	Poaceae
306	*Garnotia courtallensis* Thwaites	Poaceae
307	*Isachne globosa* (Thunb.) Kuntze	Poaceae
308	*Isachne walkeri* Arn. ex Steud.	Poaceae
309	*Ischaemum molle* Hook.f.	Poaceae
310	*Ischaemum rugosum* Salisb.	Poaceae
311	*Megathyrsus maximus* (Jacq.) B.K.Simon & S.W.L.Jacobs	Poaceae
312	*Oplismenus burmanni* (Retz.) P.Beauv.	Poaceae
313	*Oryza meyeriana* Baill.	Poaceae

314	*Ottochloa nodosa* (Kunth) Dandy	Poaceae
315	*Panicum brevifolium* L.	Poaceae
316	*Panicum paludosum* Roxb.	Poaceae
317	*Pogonatherum crinitum* Kunth	Poaceae
318	*Polytrias indica* (Houtt.) Veldkamp	Poaceae
319	*Setaria flavida* (Retz.) Veldkamp	Poaceae
320	*Sorghum bicolor* (L.) Moench	Poaceae
321	*Sporobolus indicus* (L.) R.Br.	Poaceae
322	*Sporobolus tenuissimus* (Mart. ex Schrank) Kuntze	Poaceae
323	*Sporobolus virginicus* (L.) Kunth	Poaceae
324	*Trigonochloa uniflora* (Hochst. ex A.Rich.) P.M.Peterson & N.Snow	Poaceae
325	*Urochloa ramosa* (L.) T.Q.Nguyen	Poaceae
326	*Salomonia ciliata* DC.	Polygalaceae
327	*Drypetes confertiflor*a Pax & K.Hoffm.	Putranjivaceae
328	*Putranjiva roxburghii* Wall.	Putranjivaceae
329	*Ziziphus mauritiana* Lam.	Rhamnaceae
330	*Canthium coromandelicum* (Burm.f.) Alston	Rubiaceae
331	*Dentella repen*s var. *serpyllifolia* (Wall. ex Craib) Verdc.	Rubiaceae
332	*Discospermum sphaerocarpum* Dalzell	Rubiaceae
333	*Neonauclea purpurea* (Roxb.) Merr.	Rubiaceae
334	*Nostolachma crassifolia* (Gamble) Deb & J.Lahiri	Rubiaceae
335	*Oldenlandia hygrophila* Bremek.	Rubiaceae
336	*Ophiorrhiza rugosa* var. *decumbens* (Gardner ex Thwaites) Deb & Mondal	Rubiaceae
337	*Oxyceros rugulosus* (Thwaites) Tirveng.	Rubiaceae
338	*Pavetta zeylanica* Gamble	Rubiaceae
339	*Scleromitrion diffusum* (Willd.) R.J.Wang	Rubiaceae
340	*Spermacoce lasiocarpa* R.Br.	Rubiaceae
341	*Spermacoce latifolia* Aubl.	Rubiaceae
342	*Atalantia monophylla* (L.) DC.	Rutaceae
343	*Atalantia racemosa* Wight & Arn.	Rutaceae
344	*Bergera koenigii* L.	Rutaceae
345	*Chloroxylon swietenia* DC.	Rutaceae
346	*Citrus* × *aurantium* L.	Rutaceae
347	*Citrus hystrix* DC.	Rutaceae
348	*Glycosmis nelliyampathiensis* Jabeena & Maya	Rutaceae
349	*Paramignya monophylla* Wight	Rutaceae
350	*Flacourtia montana* J.Graham	Salicaceae
351	*Allophylus serratus* Kurz	Sapindaceae
352	*Dodonaea viscosa* Jacq.	Sapindaceae
353	*Nephelium lappaceum* L.	Sapindaceae
354	*Chrysophyllum oliviforme* L., Syst. Nat., ed. 10. 2: 937 (1759).	Sapotaceae
355	*Mimusops elengi* L.	Sapotaceae
356	*Ailanthus excelsus* Roxb).	Simaroubaceae

357	*Ailanthus triphysus* (Dennst.) Alston	Simaroubaceae
358	*Simarouba glauca* DC.	Simaroubaceae
359	*Smilax wightii* A.DC.	Smilacaceae
360	*Capsicum annuum* L.	Solanaceae
361	*Capsicum frutescens* L.	Solanaceae
362	*Datura stramonium* L.	Solanaceae
363	*Solanum lycopersicum* L.	Solanaceae
364	*Laportea bulbifer*a (Siebold & Zucc.) Wedd.	Urticaceae
365	*Pilea microphylla* (L.) Liebm.	Urticaceae
366	*Pilea victoriae* V.Suresh & Sojan	Urticaceae
367	*Duranta erecta* L.	Verbenaceae
368	*Pigea enneasperma* (L.) P.I.Forst.	Violaceae
369	*Cissus heyneana* Steud.	Vitaceae
370	*Cissus latifolia* Lam.	Vitaceae
371	*Cissus quadrangularis* L.	Vitaceae
372	*Leea asiatica* (L.) Ridsdale	Vitaceae
373	*Xyris pauciflora* Willd.	Xyridaceae
374	*Curcuma aromatica* Salisb.	Zingiberaceae
375	*Curcuma aurantiaca* Zijp	Zingiberaceae
376	*Curcuma decipiens* Dalzell	Zingiberaceae
377	*Curcuma longa* L.	Zingiberaceae
378	*Curcuma mutabili*s Škorničk., M.Sabu & Prasanthk.	Zingiberaceae
379	*Curcuma vamana* M.Sabu & Mangaly	Zingiberaceae
380	*Hedychium coronarium* J.Koenig	Zingiberaceae
381	*Meistera aculeata* (Roxb.) Škorničk. & M.F.Newman	Zingiberaceae
382	*Zingiber neesanum* (J.Graham) Ramamoorthy	Zingiberaceae
383	*Zingiber nimmonii* Dalzell	Zingiberaceae
384	*Zingiber officinale* Roscoe	Zingiberaceae
385	*Zingiber sabuanum* K.M.P.Kumar & A.Joe	Zingiberaceae
386	*Zingiber zerumbet* (L.) Sm.	Zingiberaceae
387	*Tribulus terrestris* L.	Zygophyllaceae

Annexure XIII

Taxa with extended distribution in Palakkad district

Sl. No	Binomial name	Family
1	*Acalypha malabarica* Müll.Arg.	Euphorbiaceae
2	*Acmella uliginosa* (Sw.) Cass.	Asteraceae
3	*Aeschynomene americana* L.	Fabaceae
4	*Alysicarpus monilifer* (L.) DC.	Fabaceae
5	*Ammannia octandra* L.f.	Lythraceae
6	*Andrographis elongata* (Vahl) T.Anderson	Acanthaceae
7	*Apocopis cochinchinensis* A.Camus	Poaceae
8	*Argyreia populifoli*a Choisy	Convolvulaceae
9	*Arundinella setosa* Trin.	Poaceae
10	*Bergia capensis* L.	Elatinaceae
11	*Biophytum umbraculum* Welw.	Oxalidaceae
12	*Blepharis integrifolia* E.Mey. & Drège	Acanthaceae
13	*Blumea lacera* (Burm.f.) DC.	Asteraceae
14	*Blumea laevis* (Lour.) Merr.	Asteraceae
15	*Bothriochloa insculpta* (Hochst. ex A.Rich.) A.Camus	Poaceae
16	*Bulbostylis barbata* subsp. *pulchella* (Thwaites) T.Koyama	Cyperaceae
17	*Bulbostylis thouarsii* (Roem. & Schult.) Lye ex Veldkamp & Verloove	Cyperaceae
18	*Cajanus rugosus* (Wight & Arn.) Maesen	Fabaceae
19	*Calotropis procera* (Aiton) W.T.Aiton	Apocynaceae
20	*Canavalia africana* Dunn ex Hutch.	Fabaceae
21	*Canavalia mollis* Wall. ex Wight & Arn.	Fabaceae
22	*Canscora pauciflora* Dalzell	Gentianaceae
23	*Capparis brevispina* DC.	Capparaceae
24	*Cissus discolor* Blume	Vitaceae
25	*Cleome aspera* J.Koenig	Cleomaceae
26	*Cleome gynandra* L.	Cleomaceae
27	*Coix lacryma-jobi* L.	Poaceae
28	*Curcuma decipiens* Dalzell	Zingiberaceae
29	*Cymbopogon citratus* Stapf	Poaceae
30	*Cymbopogon martini* (Roxb.) Will.Watson	Poaceae
31	*Cyperus imbricatus* Retz.	Cyperaceae
32	*Cyperus nutans* Vahl	Cyperaceae
33	*Cyperus pseudokyllingioides* Kük.	Cyperaceae
34	*Cyperus sesquiflorus* subspec. *cylindricus* (Nees) T.Koyama	Cyperaceae
35	*Cyrtococcum deccanense* Bor	Poaceae
36	*Digitaria radicosa* (J.Presl) Miq.	Poaceae
37	*Dimeria raizadae* V.J.Nair, Sreek. & N.C.Nair	Poaceae
38	*Dioscorea belophylla* (Prain) Voigt ex Haines	Dioscoreaceae
39	*Dioscorea hamiltonii* Hook.f.	Dioscoreaceae

40	*Dioscorea spicata* Roth	Dioscoreaceae
41	*Dioscorea wallichii* Hook.f.	Dioscoreaceae
42	*Eleocharis dulci*s (Burm.f.) Trin. ex Hensch.	Cyperaceae
43	*Embelia tsjeriam-cottam* (Roem. & Schult.) A.DC.	Primulaceae
44	*Enteropogon monostachyus* Schum.	Poaceae
45	*Eragrostis nigra* Nees ex Steud.	Poaceae
46	*Eragrostis tef* (Zuccagni) Trotter	Poaceae
47	*Eriochloa procera* (Retz.) C.E.Hubb.	Poaceae
48	*Erythrina suberosa* Roxb.	Fabaceae
49	*Eugenia wynadensis* Bedd.	Myrtaceae
50	*Euphorbia tortilis* Rottler ex Ainslie	Euphorbiaceae
51	*Fimbristylis microcary*a F.Muell.	Cyperaceae
52	*Fimbristylis schoenoides* Vahl	Cyperaceae
53	*Fimbristylis tetragona* R.Br.	Cyperaceae
54	*Flacourtia montana* J.Graham	Salicaceae
55	*Fuirena ciliaris* (L.) Roxb.	Cyperaceae
56	*Geissaspis cristata* var. *tenella* (Benth.) M.R.Almeida	Fabaceae
57	*Henckelia fischeri* (Gamble) A.Weber & B.L.Burtt	Gesneriaceae
58	*Indigofera glabra* L.	Fabaceae
59	*Indigofera tsiangiana* F.P.Metcalf	Fabaceae
60	*Ischaemum molle* Hook.f.	Poaceae
61	*Ischaemum rugosum* Salisb.	Poaceae
62	*Justicia glauca* Rottler	Acanthaceae
63	*Lepidagathis spinosa* Wight ex Nees	Acanthaceae
64	*Limnophila heterophyll*a Benth.	Plantaginaceae
65	*Megathyrsus maximus* (Jacq.) B.K.Simon & S.W.L.Jacobs	Poaceae
66	*Memecylon talbotianum* D.Brandis	Melastomataceae
67	*Mitreola petiolata* (J.F.Gmel.) Torr. & A.Gray	Loganiaceae
68	*Murdannia dimorpha* G.Brückn.	Commelinaceae
69	*Murdannia vaginata* G.Brückn.	Commelinaceae
70	*Nervilia infundibulifolia* Blatt. & McCann	Orchidaceae
71	*Ohwia caudata* (Thunb.) H.Ohashi	Fabaceae
72	*Oldenlandia umbellata* L.	Rubiaceae
73	*Opuntia ficus-indica* (L.) Mill.	Cactaceae
74	*Ottochloa nodosa* (Kunth) Dandy	Poaceae
75	*Paramollugo nudicaulis* (Lam.) Thulin	Molluginaceae
76	*Peristylus spiralis* A.Rich.	Orchidaceae
77	*Phanera scandens* (L.) Lour. ex Raf.	Fabaceae
78	*Phyllocephalum courtallense* (Wight) Narayana	Asteraceae
79	*Phyllocephalum rangacharii* (Gamble) Narayana	Asteraceae
80	*Polyalthia malabarica* (Bedd.) I.M.Turner	Annonaceae
81	*Premna paucinervis* Gamble	Lamiaceae
82	*Rhynchoglossum obliquum* Blume	Gesneriaceae
83	*Rhynchoglossum scabrum* Dalzell	Gesneriaceae
84	*Rostellularia procumbens* (L.) Nees	Acanthaceae
85	*Salomonia ciliata* DC.	Polygalaceae

86	*Scleromitrion diffusum* (Willd.) R.J.Wang	Rubiaceae
87	*Smithia gracilis* Benth.	Fabaceae
88	*Sorghum bicolor* (L.) Moench	Poaceae
89	*Sporobolus tenuissimus* (Mart. ex Schrank) Kuntze	Poaceae
90	*Sporobolus virginicus* (L.) Kunth	Poaceae
91	*Stemodia verticillata* (Mill.) Hassl.	Plantaginaceae
92	*Sterculia foetida* L.	Malvaceae
93	*Strobilanthes crossandra* (Steud.) J.R.I.Wood	Acanthaceae
94	*Tephrosia maxima* Pers.	Fabaceae
95	*Tephrosia pumila* Pers.	Fabaceae
96	*Thottea sivarajanii* E.S.S.Kumar, A.E.S.Khan & Binu	Aristolochiaceae
97	*Torenia lindernioides* C.J.Saldanha	Linderniaceae
98	*Tragia bicolor* Miq.	Euphorbiaceae

Annexure XIV

List of anemophilous taxa in Walayar hills

Sl. No	Binomial name	Family
1	*Achyranthes aspera* L.	Amaranthaceae
2	*Ailanthus excelsus* Roxb).	Simaroubaceae
3	*Ailanthus triphysus* (Dennst.) Alston	Simaroubaceae
4	*Albizia amara* (Roxb.) Boivin	Fabaceae
5	*Alloteropsis cimicina* Stapf	Poaceae
6	*Apluda mutica* L.	Poaceae
7	*Apocopis cochinchinensis* A.Camus	Poaceae
8	*Apocopis mangalorensis* (Hochst. ex Steud.) Henrard	Poaceae
9	*Aristida adscensionis* L.	Poaceae
10	*Aristida setacea* Retz.	Poaceae
11	*Arthraxon hispidus* (Thunb.) Makino	Poaceae
12	*Artocarpus heterophyllus* Lam.	Moraceae
13	*Artocarpus hirsutus* Lam.	Moraceae
14	*Arundinella ciliata* Nees ex Miq.	Poaceae
15	*Arundinella mesophylla* Nees ex Steud.	Poaceae
16	*Arundinella setosa* Trin.	Poaceae
17	*Arundo donax* L.	Poaceae
18	*Axonopus compressus* (Sw.) P.Beauv.	Poaceae
19	*Bambusa bambos* (L.) Voss	Poaceae
20	*Bothriochloa insculpta* (Hochst. ex A.Rich.) A.Camus	Poaceae
21	*Bothriochloa pertusa* (L.) A.Camus.	Poaceae
22	*Bulbostylis barbata* (Rottb.) C.B.Clarke	Cyperaceae
23	*Bulbostylis thouarsii* (Roem. & Schult.) Lye ex Veldkamp & Verloove	Cyperaceae
24	*Calamus rotang* L.	Arecaceae
25	*Calamus thwaitesii* Becc.	Arecaceae
26	*Capillipedium assimile* (Steud.) A.Camus	Poaceae
27	*Carex phacota* Spreng.	Cyperaceae
28	*Casuarina equisetifolia* L.	Casuarinaceae
29	*Cenchrus pedicellatus* (Trin.) Morrone	Poaceae
30	*Cenchrus setosus* Sw.	Poaceae
31	*Centotheca lappacea* Desv.	Poaceae
32	*Chloris barbata* Sw.	Poaceae
33	*Chromolaena odorat*a (L.) R.M.King & H.Rob.	Asteraceae
34	*Chrysopogon aciculatu*s Trin.	Poaceae
35	*Chrysopogon asper* B.Heyne ex Blatt. & McCann	Poaceae
36	*Chrysopogon hackelii* (Hook.f.) C.E.C.Fisch.	Poaceae
37	*Coix lacryma-jobi* L.	Poaceae
38	*Combretum albidum* G.Don	Combretaceae
39	*Combretum indicum* (L.) DeFilipps	Combretaceae
40	*Combretum latifolium* Blume	Combretaceae
41	*Cymbopogon citratus* Stapf	Poaceae

42	*Cymbopogon flexuosus* (Nees ex Steud.) Will.Watson	Poaceae
43	*Cymbopogon martini* (Roxb.) Will.Watson	Poaceae
44	*Cynodon dactylon* (L.) Pers.	Poaceae
45	*Cyperus brevifolius* (Rottb.) Endl. ex Hassk.	Cyperaceae
46	*Cyperus compressus* L.	Cyperaceae
47	*Cyperus cyperinus* (Retz.) Valck.Sur.	Cyperaceae
48	*Cyperus cyperoides* (L.) Kuntze	Cyperaceae
49	*Cyperus difformis* L.	Cyperaceae
50	*Cyperus diffusus* Vahl	Cyperaceae
51	*Cyperus distans* L.f.	Cyperaceae
52	*Cyperus dubius* Rottb.	Cyperaceae
53	*Cyperus exaltatus* Retz.	Cyperaceae
54	*Cyperus flavidus* Retz.	Cyperaceae
55	*Cyperus haspan* L.	Cyperaceae
56	*Cyperus imbricatus* Retz.	Cyperaceae
57	*Cyperus iria* L.	Cyperaceae
58	*Cyperus macrostachyos* Lam.	Cyperaceae
59	*Cyperus maderaspatanus* Willd.	Cyperaceae
60	*Cyperus mindorensis* (Steud.) Huygh	Cyperaceae
61	*Cyperus neochinensis* (Tang & F.T.Wang) Bauters	Cyperaceae
62	*Cyperus nutans* Vahl	Cyperaceae
63	*Cyperus pangorei* Rottb.	Cyperaceae
64	*Cyperus pilosus* Vahl	Cyperaceae
65	*Cyperus polystachyos* Rottb.	Cyperaceae
66	*Cyperus pseudokyllingioides* Kük.	Cyperaceae
67	*Cyperus pumilus* L.	Cyperaceae
68	*Cyperus richardii* Steud.	Cyperaceae
69	*Cyperus rotundus* L.	Cyperaceae
70	*Cyperus sesquiflorus* subspec. *cylindricus* (Nees) T.Koyama	Cyperaceae
71	*Cyperus squarrosus* L.	Cyperaceae
72	*Cyperus substramineus* Kük.	Cyperaceae
73	*Cyperus tenuispica* Steud.	Cyperaceae
74	*Cyrtococcum deccanense* Bor	Poaceae
75	*Cyrtococcum longipes* A.Camus	Poaceae
76	*Cyrtococcum oxyphyllum* Stapf	Poaceae
77	*Cyrtococcum patens* (L.) A.Camus	Poaceae
78	*Dactyloctenium aegyptium* (L.) Willd.	Poaceae
79	*Datura stramonium* L.	Solanaceae
80	*Dendrocalamus strictus* Nees	Poaceae
81	*Dichanthium annulatum* Stapf	Poaceae
82	*Digitaria bicornis* (Lam.) Roem. & Schult.	Poaceae
83	*Digitaria ciliaris* (Retz.) Koeler	Poaceae
84	*Digitaria longiflora* Pers.	Poaceae
85	*Digitaria radicosa* (J.Presl) Miq.	Poaceae
86	*Dimeria deccanensis* Bor	Poaceae

87	*Dimeria ornithopoda* Trin.	Poaceae
88	*Dimeria raizadae* V.J.Nair, Sreek. & N.C.Nair	Poaceae
89	*Dimocarpus longan* Lour.	Sapindaceae
90	*Dodonaea viscosa* Jacq.	Sapindaceae
91	*Eleocharis dulci*s (Burm.f.) Trin. ex Hensch.	Cyperaceae
92	*Elephantopus scabe*r L.	Asteraceae
93	*Eleusine indica* (L.) Gaertn.	Poaceae
94	*Enteropogon dolichostachyus* (Lag.) Keng	Poaceae
95	*Enteropogon monostachyus* Schum.	Poaceae
96	*Eragrostiella bifaria* (Vahl) Bor	Poaceae
97	*Eragrostis gangetica* Steud.	Poaceae
98	*Eragrostis japonic*a Trin.	Poaceae
99	*Eragrostis nigra* Nees ex Steud.	Poaceae
100	*Eragrostis pilos*a (L.) P.Beauv.	Poaceae
101	*Eragrostis riparia* Nees	Poaceae
102	*Eragrostis tef* (Zuccagni) Trotter	Poaceae
103	*Eragrostis tenella* (L.) P.Beauv. ex Roem. & Schult.	Poaceae
104	*Eragrostis unioloide*s Nees ex Steud.	Poaceae
105	*Eragrostis viscosa* Trin.	Poaceae
106	*Eriochloa procera* (Retz.) C.E.Hubb.	Poaceae
107	*Fimbristylis aestivalis* var. *aestival*is (Retz.) Vahl	Cyperaceae
108	*Fimbristylis argentea* Vahl	Cyperaceae
109	*Fimbristylis dichotoma* subsp. *dichotom*a (L.) Vahl	Cyperaceae
110	*Fimbristylis dipsacea* (Rottb.) C.B.Clarke	Cyperaceae
111	*Fimbristylis microcary*a F.Muell.	Cyperaceae
112	*Fimbristylis narayanii* C.E.C.Fisch.	Cyperaceae
113	*Fimbristylis schoenoides* Vahl	Cyperaceae
114	*Fimbristylis tetragona* R.Br.	Cyperaceae
115	*Fuirena ciliaris* (L.) Roxb.	Cyperaceae
116	*Garnotia courtallensis* Thwaites	Poaceae
117	*Garnotia tenella* Janowski	Poaceae
118	*Garuga pinnata* Roxb.	Burseraceae
119	*Getonia floribunda* Roxb.	Combretaceae
120	*Girardinia diversifolia* (Link) Friis	Urticaceae
121	*Givotia moluccana* (L.) Sreem.	Euphorbiaceae
122	*Heteropogon contortus* (L.) P.Beauv. ex Roem. & Schult.	Poaceae
123	*Hevea brasiliensis* (Willd. ex A.Juss.) Müll.Arg.	Euphorbiaceae
124	*Holoptelea integrifolia* (Roxb.) Planch.	Ulmaceae
125	*Hydnocarpus alpinus* Wight	Achariaceae
126	*Hydnocarpus pentandrus* (Buch.-Ham.) Oken	Achariaceae
127	*Isachne globosa* (Thunb.) Kuntze	Poaceae
128	*Isachne walkeri* Arn. ex Steud.	Poaceae
129	*Ischaemum molle* Hook.f.	Poaceae
130	*Ischaemum rangacharianum* C.E.C.Fisch.	Poaceae
131	*Ischaemum rugosum* Salisb.	Poaceae
132	*Ischaemum timorense* Kunth	Poaceae

133	*Leptochloa chinensis* Nees	Poaceae
134	*Limnophila heterophyll*a Benth.	Plantaginaceae
135	*Mallotus philippensis* (Lam.) Müll.Arg.	Euphorbiaceae
136	*Mallotus resinosus* Merr.	Euphorbiaceae
137	*Mallotus rhamnifolius* Müll.Arg.	Euphorbiaceae
138	*Mallotus tetracoccus* Kurz	Euphorbiaceae
139	*Martynia annua* L.	Martyniaceae
140	*Megathyrsus maximus* (Jacq.) B.K.Simon & S.W.L.Jacobs	Poaceae
141	*Micrococca mercurialis* Benth.	Euphorbiaceae
142	*Microstachys chamaelea* (L.) Müll.Arg.	Euphorbiaceae
143	*Mikania micrantha* Kunth	Asteraceae
144	*Millingtonia hortensis* L.f.	Bignoniaceae
145	*Nephelium lappaceum* L.	Sapindaceae
146	*Oplismenus burmanni* (Retz.) P.Beauv.	Poaceae
147	*Oplismenus compositus* P.Beauv.	Poaceae
148	*Oryza meyeriana* Baill.	Poaceae
149	*Oryza officinalis* Wall.	Poaceae
150	*Oryza rufipogon* Griff.	Poaceae
151	*Oryza sativa* L.	Poaceae
152	*Ottochloa nodosa* (Kunth) Dandy	Poaceae
153	*Panicum brevifolium* L.	Poaceae
154	*Panicum notatum* Retz.	Poaceae
155	*Panicum paludosum* Roxb.	Poaceae
156	*Parthenium hysterophorus* L.	Asteraceae
157	*Paspalum conjugatum* P.J.Bergius	Poaceae
158	*Paspalum scrobiculatum* L.	Poaceae
159	*Perotis indica* (L.) Kuntze	Poaceae
160	*Phyllanthus airy-shawii* Jean F.Brunel & Jacq.Roux	Phyllanthaceae
161	*Phyllanthus amarus* Schumach. & Thonn.	Phyllanthaceae
162	*Phyllanthus emblica* L.	Phyllanthaceae
163	*Phyllanthus maderaspatensis* L.	Phyllanthaceae
164	*Phyllanthus reticulatus* Poir.	Phyllanthaceae
165	*Phyllanthus rheedei* Wight	Phyllanthaceae
166	*Phyllanthus urinaria* L.	Phyllanthaceae
167	*Phyllanthus virgatus* G.Forst.	Phyllanthaceae
168	*Phyllocephalum courtallense* (Wight) Narayana	Asteraceae
169	*Phyllocephalum rangacharii* (Gamble) Narayana	Asteraceae
170	*Pilea microphylla* (L.) Liebm.	Urticaceae
171	*Pimpinella heyneana* (DC.) Benth.	Apiaceae
172	*Pogonatherum crinitum* Kunth	Poaceae
173	*Polytrias indica* (Houtt.) Veldkamp	Poaceae
174	*Pouzolzia zeylanica* (L.) Benn.	Urticaceae
175	*Pupalia lappacea* (L.) Juss.	Amaranthaceae
176	*Radermachera xylocarpa* K.Schum.	Bignoniaceae
177	*Saccharum spontaneum* L.	Poaceae
178	*Sacciolepis indica* (L.) Chase	Poaceae

179	*Sacciolepis interrupta* Stapf	Poaceae
180	*Schleichera oleos*a (Lour.) Oken	Sapindaceae
181	*Schoenoplectiella articulat*a (L.) Lye	Cyperaceae
182	*Scleria lithosperma* (L.) Sw.	Cyperaceae
183	*Scleria oblata* S.T.Blake ex J.Kern	Cyperaceae
184	*Setaria flavida* (Retz.) Veldkamp	Poaceae
185	*Setaria pumila* Roem. & Schult.	Poaceae
186	*Solanum violaceum* Ortega	Solanaceae
187	*Sorghum bicolor* (L.) Moench	Poaceae
188	*Spodiopogon rhizophorus* (Steud.) Pilg.	Poaceae
189	*Sporobolus indicus* (L.) R.Br.	Poaceae
190	*Sporobolus pilifer* (Trin.) Kunth	Poaceae
191	*Sporobolus tenuissimus* (Mart. ex Schrank) Kuntze	Poaceae
192	*Sporobolus virginicus* (L.) Kunth	Poaceae
193	*Terminalia anogeissiana* Gere & Boatwr.	Combretaceae
194	*Terminalia arjuna* (Roxb. ex DC.) Wight & Arn.	Combretaceae
195	*Terminalia bellirica* (Gaertn.) Roxb.	Combretaceae
196	*Terminalia catappa* L.	Combretaceae
197	*Terminalia chebula* Retz.	Combretaceae
198	*Terminalia elliptica* Willd.	Combretaceae
199	*Terminalia paniculata* Roth	Combretaceae
200	*Tetrameles nudiflora* R.Br.	Tetramelaceae
201	*Themeda triandra* Forssk.	Poaceae
202	*Tragia bicolor* Miq.	Euphorbiaceae
203	*Tragia involucrata* L.	Euphorbiaceae
204	*Trema orientale* Blume	Cannabaceae
205	*Trichodesma indicum* (L.) Sm.	Boraginaceae
206	*Trigonochloa uniflora* (Hochst. ex A.Rich.) P.M.Peterson & N.Snow	Poaceae
207	*Tripogon bromoides* Roem. & Schult.	Poaceae
208	*Typha angustifolia* L.	Typhaceae
209	*Urochloa distachyos* (L.) T.Q.Nguyen	Poaceae
210	*Urochloa panicoides* P.Beauv.	Poaceae
211	*Urochloa ramosa* (L.) T.Q.Nguyen	Poaceae

Annexure XV

List of anemochorous taxa in Walayar hills

Sl. No	Binomial name	Family
1	*Acilepis divergens* (DC.) H.Rob. & Skvarla	Asteraceae
2	*Acmella calva* (DC.) R.K.Jansen	Asteraceae
3	*Acmella radicans* (Jacq.) R.K.Jansen	Asteraceae
4	*Acmella uliginosa* (Sw.) Cass.	Asteraceae
5	*Adenostemma lavenia* (L.) Kuntze	Asteraceae
6	*Adina cordifolia* (Roxb.) Hook.f. & Benth.	Rubiaceae
7	*Aganosma cymosa* (Roxb.) G.Don	Apocynaceae
8	*Ageratum conyzoides* L.	Asteraceae
9	*Ageratum houstonianum* Mill.	Asteraceae
10	*Ailanthus excelsus* Roxb).	Simaroubaceae
11	*Ailanthus triphysus* (Dennst.) Alston	Simaroubaceae
12	*Albizia amara* (Roxb.) Boivin	Fabaceae
13	*Albizia chinensis* (Osbeck.) Merr.	Fabaceae
14	*Albizia lebbeck* (L.) Benth.	Fabaceae
15	*Albizia odoratissima* (L.f.) Benth.	Fabaceae
16	*Alstonia scholaris* (L.) R.Br.	Apocynaceae
17	*Alstonia venenata* R.Br.	Apocynaceae
18	*Ancistrocladus heyneanus* Wall. ex J.Graham	Ancistrocladaceae
19	Andrographis alata (Vahl) Nees	Acanthaceae
20	*Andrographis echioides* Nees	Acanthaceae
21	*Andrographis elongata* (Vahl) T.Anderson	Acanthaceae
22	*Andrographis paniculata* (Burm.f.) Wall.	Acanthaceae
23	*Anodendron parviflorum* (Roxb.) I.M.Turner	Apocynaceae
24	*Aristida setacea* Retz.	Poaceae
25	*Aristolochia indica* L.	Aristolochiaceae
26	*Asclepias curassavica* L.	Apocynaceae
27	*Bambusa bambos* (L.) Voss	Poaceae
28	*Blainvillea acmella* (L.) Philipson	Asteraceae
29	*Blumea axillaris* DC.	Asteraceae
30	*Blumea lacera* (Burm.f.) DC.	Asteraceae
31	*Blumea laevis* (Lour.) Merr.	Asteraceae
32	*Blumea oxyodonta* DC.	Asteraceae
33	*Bombax ceiba* L.	Malvaceae
34	*Bombax insigne* Wall.	Malvaceae
35	*Bulbostylis barbata* subsp. *pulchella* (Thwaites) T.Koyama	Cyperaceae
36	*Bulbostylis barbata* (Rottb.) C.B.Clarke	Cyperaceae
37	*Bulbostylis thouarsii* (Roem. & Schult.) Lye ex Veldkamp & Verloove	Cyperaceae
38	*Calotropis gigantea* (L.) W.T.Aiton	Apocynaceae
39	*Calotropis procera* (Aiton) W.T.Aiton	Apocynaceae

40	*Capillipedium assimile* (Steud.) A.Camus	Poaceae
41	*Cardiospermum halicacabum* L.	Sapindaceae
42	*Carex phacota* Spreng.	Cyperaceae
43	*Ceiba pentandra* (L.) Gaertn.	Malvaceae
44	*Cenchrus pedicellatus* (Trin.) Morrone	Poaceae
45	*Cenchrus setosus* Sw.	Poaceae
46	*Chloris barbata* Sw.	Poaceae
47	*Chloroxylon swietenia* DC.	Rutaceae
48	*Chromolaena odorat*a (L.) R.M.King & H.Rob.	Asteraceae
49	*Clematis zeylanica* Poir.	Ranunculaceae
50	*Cochlospermum religiosum* (L.) Alston	Bixaceae
51	*Combretum albidum* G.Don	Combretaceae
52	*Combretum indicum* (L.) DeFilipps	Combretaceae
53	*Combretum latifolium* Blume	Combretaceae
54	*Corchorus aestuans* L.	Malvaceae
55	*Cosmostigma cordatum* (Poir.) M.R.Almeida	Apocynaceae
56	*Crassocephalum crepidioides* S.Moore	Asteraceae
57	*Cryptolepis buchananii* Roem. & Schult.	Apocynaceae
58	*Cyanthillium cinereum* (L.) H.Rob.	Asteraceae
59	*Cynanchum annularium* (Roxb.) Liede & Khanum	Apocynaceae
60	*Cyperus brevifolius* (Rottb.) Endl. ex Hassk.	Cyperaceae
61	*Cyperus compressus* L.	Cyperaceae
62	*Cyperus cyperinus* (Retz.) Valck.Sur.	Cyperaceae
63	*Cyperus cyperoides* (L.) Kuntze	Cyperaceae
64	*Cyperus difformis* L.	Cyperaceae
65	*Cyperus diffusus* Vahl	Cyperaceae
66	*Cyperus distans* L.f.	Cyperaceae
67	*Cyperus dubius* Rottb.	Cyperaceae
68	*Cyperus exaltatus* Retz.	Cyperaceae
69	*Cyperus flavidus* Retz.	Cyperaceae
70	*Cyperus haspan* L.	Cyperaceae
71	*Cyperus imbricatus* Retz.	Cyperaceae
72	*Cyperus iria* L.	Cyperaceae
73	*Cyperus macrostachyos* Lam.	Cyperaceae
74	*Cyperus maderaspatanus* Willd.	Cyperaceae
75	*Cyperus mindorensis* (Steud.) Huygh	Cyperaceae
76	*Cyperus neochinensis* (Tang & F.T.Wang) Bauters	Cyperaceae
77	*Cyperus nutans* Vahl	Cyperaceae
78	*Cyperus pangorei* Rottb.	Cyperaceae
79	*Cyperus pilosus* Vahl	Cyperaceae
80	*Cyperus polystachyos* Rottb.	Cyperaceae
81	*Cyperus pseudokyllingioides* Kük.	Cyperaceae
82	*Cyperus pumilus* L.	Cyperaceae

83	*Cyperus richardii* Steud.	Cyperaceae
84	*Cyperus rotundus* L.	Cyperaceae
85	*Cyperus sesquiflorus* subspec. *cylindricus* (Nees) T.Koyama	Cyperaceae
86	*Cyperus squarrosus* L.	Cyperaceae
87	*Cyperus substramineus* Kük.	Cyperaceae
88	*Cyperus tenuispica* Steud.	Cyperaceae
89	*Cyrtococcum patens* (L.) A.Camus	Poaceae
90	*Dalbergia lanceolaria* subsp. *paniculata* (Roxb.) Thoth.	Fabaceae
91	*Dalbergia latifolia* Roxb.	Fabaceae
92	*Dalbergia sissoides* Graham ex Wight & Arn.	Fabaceae
93	*Dalbergia sissoo* Roxb. ex DC.	Fabaceae
94	*Dendrocalamus strictus* Nees	Poaceae
95	*Dioscorea alata* L.	Dioscoreaceae
96	*Dioscorea belophylla* (Prain) Voigt ex Haines	Dioscoreaceae
97	*Dioscorea bulbifera* L.	Dioscoreaceae
98	*Dioscorea hamiltonii* Hook.f.	Dioscoreaceae
99	*Dioscorea oppositifolia* L.	Dioscoreaceae
100	*Dioscorea pentaphylla* L.	Dioscoreaceae
101	*Dioscorea spicata* Roth	Dioscoreaceae
102	*Dioscorea wallichii* Hook.f.	Dioscoreaceae
103	*Dodonaea viscosa* Jacq.	Sapindaceae
104	*Eleocharis dulci*s (Burm.f.) Trin. ex Hensch.	Cyperaceae
105	*Elephantopus scabe*r L.	Asteraceae
106	*Eleutheranthera ruderali*s (Sw.) Sch.Bip.	Asteraceae
107	*Emilia sonchifolia* (L.) DC.	Asteraceae
108	*Eragrostiella bifaria* (Vahl) Bor	Poaceae
109	*Eragrostis gangetica* Steud.	Poaceae
110	*Eragrostis pilos*a (L.) P.Beauv.	Poaceae
111	*Eragrostis riparia* Nees	Poaceae
112	*Eragrostis tenella* (L.) P.Beauv. ex Roem. & Schult.	Poaceae
113	*Eragrostis unioloide*s Nees ex Steud.	Poaceae
114	*Eragrostis viscosa* Trin.	Poaceae
115	*Eranthemum capense* L.	Acanthaceae
116	*Erigeron bonariensis* L.	Asteraceae
117	*Fimbristylis aestivalis* var. *aestival*is (Retz.) Vahl	Cyperaceae
118	*Fimbristylis argentea* Vahl	Cyperaceae
119	*Fimbristylis dichotoma* subsp. *dichotom*a (L.) Vahl	Cyperaceae
120	*Fimbristylis dipsacea* (Rottb.) C.B.Clarke	Cyperaceae
121	*Fimbristylis microcary*a F.Muell.	Cyperaceae
122	*Fimbristylis narayanii* C.E.C.Fisch.	Cyperaceae
123	*Fimbristylis schoenoides* Vahl	Cyperaceae
124	*Fimbristylis tetragona* R.Br.	Cyperaceae
125	*Garuga pinnata* Roxb.	Burseraceae

126	*Getonia floribunda* Roxb.	Combretaceae
127	*Girardinia diversifolia* (Link) Friis	Urticaceae
128	*Gouania microcarpa* DC.	Rhamnaceae
129	*Grangea maderaspatana* (L.) Poir.	Asteraceae
130	*Hemidesmus indicus* (L.) R.Br.	Apocynaceae
131	*Heritiera papilio* Bedd.	Malvaceae
132	*Heteropogon contortus* (L.) P.Beauv. ex Roem. & Schult.	Poaceae
133	*Hiptage benghalensis* (L.) Kurz	Malpighiaceae
134	*Holarrhena pubescens* Wall. & G.Don	Apocynaceae
135	*Holoptelea integrifolia* (Roxb.) Planch.	Ulmaceae
136	*Hopea parviflora* Bedd.	Dipterocarpaceae
137	*Hymenodictyon obovatum* Wall.	Rubiaceae
138	*Hymenodictyon orixense* (Roxb.) Mabb.	Rubiaceae
139	*Ichnocarpus frutescens* (L.) W.T.Aiton	Apocynaceae
140	*Laggera alata* (DC.) Sch.Bip. ex Oliv.	Asteraceae
141	*Mansoa alliacea* (Lam.) A.H.Gentry	Bignoniaceae
142	*Mikania micrantha* Kunth	Asteraceae
143	*Millingtonia hortensis* L.f.	Bignoniaceae
144	*Moringa oleifera* Lam.	Moringaceae
145	*Neonauclea purpurea* (Roxb.) Merr.	Rubiaceae
146	*Nerium oleander* L.	Apocynaceae
147	*Oroxylum indicum* (L.) Benth. ex Kurz	Bignoniaceae
148	*Oxystelma esculentum* (L.f.) Decne.	Apocynaceae
149	*Pergularia daemia* (Forssk.) Chiov.	Apocynaceae
150	*Perotis indica* (L.) Kuntze	Poaceae
151	*Phyllocephalum courtallense* (Wight) Narayana	Asteraceae
152	*Phyllocephalum rangacharii* (Gamble) Narayana	Asteraceae
153	*Pimpinella heyneana* (DC.) Benth.	Apiaceae
154	*Plumeria alba* L.	Apocynaceae
155	*Pouzolzia zeylanica* (L.) Benn.	Urticaceae
156	*Pristimera arnottiana* (Wight) R.H.Archer	Celastraceae
157	*Pterocarpus marsupium* Roxb.	Fabaceae
158	*Radermachera xylocarpa* K.Schum.	Bignoniaceae
159	*Saccharum spontaneum* L.	Poaceae
160	*Spathodea campanulata* P.Beauv.	Bignoniaceae
161	*Sphagneticola trilobata* (L.) Pruski	Asteraceae
162	*Stereospermum colais* (Buch.-Ham. ex Dillwyn) Mabb.	Bignoniaceae
163	*Strobocalyx arboreus* Sch.Bip.	Asteraceae
164	*Swietenia mahagoni* (L.) Jacq.	Meliaceae
165	*Synedrella nodiflora* Gaertn.	Asteraceae
166	*Tecoma stans* (L.) Kunth	Bignoniaceae
167	*Terminalia anogeissiana* Gere & Boatwr.	Combretaceae
168	*Terminalia arjuna* (Roxb. ex DC.) Wight & Arn.	Combretaceae

169	*Terminalia elliptica* Willd.	Combretaceae
170	*Terminalia paniculata* Roth	Combretaceae
171	*Tithonia diversifolia* (Hemsl.) A.Gray	Asteraceae
172	*Tithonia rotundifolia* S.F.Blake	Asteraceae
173	*Tridax procumbens* L.	Asteraceae
174	*Tripogon bromoides* Roem. & Schult.	Poaceae
175	*Typha angustifolia* L.	Typhaceae
176	*Vicoa indica* DC.	Asteraceae
177	*Vincetoxicum indicum* (Burm.f.) Mabb.	Apocynaceae
178	*Wattakaka volubilis* Stapf	Apocynaceae
179	*Wrightia tinctoria* R.Br.	Apocynaceae

Annexure XVI

List of medicinal plants in Walayar hills

Sl. No	Binomial name	Family
1	*Andrographis paniculata* (Burm.f.) Wall.	Acanthaceae
2	*Barleria prattensis* Santapau	Acanthaceae
3	*Blepharis maderaspatensis* (L.) B.Heyne	Acanthaceae
4	*Ecbolium viride* (Forssk.) Alston	Acanthaceae
5	*Hygrophila auriculata* (Schumach.) Heine	Acanthaceae
6	*Hygrophila ringens* (L.) R.Br. ex Spreng.	Acanthaceae
7	*Justicia adhatoda* L.	Acanthaceae
8	*Justicia gendarussa* Burm.f.	Acanthaceae
9	*Rhinacanthus nasutus* (L.) Kurz	Acanthaceae
10	*Strobilanthes ciliata* Nees	Acanthaceae
11	*Hydnocarpus alpinus* Wight	Achariaceae
12	*Hydnocarpus pentandrus* (Buch.-Ham.) Oken	Achariaceae
13	*Trianthema portulacastrum* L.	Aizoaceae
14	*Achyranthes aspera* L.	Amaranthaceae
15	*Alternanthera sessilis* (L.) DC.	Amaranthaceae
16	*Amaranthus spinosus L.*	Amaranthaceae
17	*Pancratium triflorum* Roxb.	Amaryllidaceae
18	*Anacardium occidentale* L.	Anacardiaceae
19	*Holigarna arnottiana* Hook.f.	Anacardiaceae
20	*Lannea coromandelica* (Houtt.) Merr.	Anacardiaceae
21	*Spondias pinnata* (L.f.) Kurz	Anacardiaceae
22	*Ancistrocladus heyneanus* Wall. ex J.Graham	Ancistrocladaceae
23	*Monoon longifolium* (Sonn.) B.Xue & R.M.K.Saunders	Annonaceae
24	*Centella asiatica* (L.) Urb.	Apiaceae
25	*Aganosma cymosa* (Roxb.) G.Don	Apocynaceae
26	*Alstonia scholaris* (L.) R.Br.	Apocynaceae
27	*Alstonia venenata* R.Br.	Apocynaceae
28	*Calotropis gigantea* (L.) W.T.Aiton	Apocynaceae
29	*Carissa carandas* L.	Apocynaceae
30	*Catharanthus pusillus* G.Don	Apocynaceae
31	*Catharanthus roseus* (L.) G.Don	Apocynaceae
32	*Cosmostigma cordatum* (Poir.) M.R.Almeida	Apocynaceae
33	*Cryptolepis buchananii* Roem. & Schult.	Apocynaceae
34	*Cynanchum annularium* (Roxb.) Liede & Khanum	Apocynaceae
35	*Gymnema sylvestre* (Retz.) R.Br. ex Sm.	Apocynaceae
36	*Hemidesmus indicus* (L.) R.Br.	Apocynaceae
37	*Holarrhena pubescens* Wall. & G.Don	Apocynaceae
38	*Ichnocarpus frutescens* (L.) W.T.Aiton	Apocynaceae
39	*Nerium oleander* L.	Apocynaceae

40	*Oxystelma esculentum* (L.f.) Decne.	Apocynaceae
41	*Pergularia daemia* (Forssk.) Chiov.	Apocynaceae
42	*Rauvolfia serpentina* Benth. ex Kurz	Apocynaceae
43	*Rauvolfia tetraphylla* L.	Apocynaceae
44	*Tabernaemontana alternifolia* L.	Apocynaceae
45	*Vincetoxicum indicum* (Burm.f.) Mabb.	Apocynaceae
46	*Wattakaka volubilis* Stapf	Apocynaceae
47	*Wrightia tinctoria* R.Br.	Apocynaceae
48	*Amorphophallus paeoniifolius* (Dennst.) Nicolson	Araceae
49	*Arisaema tortuosum* (Wall.) Schott	Araceae
50	*Colocasia esculent*a (L.) Schott	Araceae
51	*Pothos scandens* L.	Araceae
52	*Hydrocotyle javanica* Thunb.	Araliaceae
53	*Areca catechu* L.	Arecaceae
54	*Borassus flabellifer* L.	Arecaceae
55	*Caryota urens* L.	Arecaceae
56	*Cocos nucifera* L.	Arecaceae
57	*Phoenix loureiroi* Kunth	Arecaceae
58	*Aristolochia indica* L.	Aristolochiaceae
59	*Thottea siliquosa* (Lam.) Ding Hou	Aristolochiaceae
60	*Asparagus gonocladus Baker*	Asparagaceae
61	*Asparagus racemosus* Willd.	Asparagaceae
62	*Acanthospermum hispidum* DC.	Asteraceae
63	*Acmella calva* (DC.) R.K.Jansen	Asteraceae
64	*Ageratum conyzoides* L.	Asteraceae
65	*Chromolaena odorat*a (L.) R.M.King & H.Rob.	Asteraceae
66	*Cyanthillium cinereum* (L.) H.Rob.	Asteraceae
67	*Eclipta prostrata* (L.) L.	Asteraceae
68	*Elephantopus scabe*r L.	Asteraceae
69	*Emilia sonchifolia* (L.) DC.	Asteraceae
70	*Sigesbeckia orientalis* L.	Asteraceae
71	*Sphaeranthus indicus* L.	Asteraceae
72	*Xanthium strumarium* L.	Asteraceae
73	*Mansoa alliacea* (Lam.) A.H.Gentry	Bignoniaceae
74	*Oroxylum indicum* (L.) Benth. ex Kurz	Bignoniaceae
75	*Stereospermum colais* (Buch.-Ham. ex Dillwyn) Mabb.	Bignoniaceae
76	*Cochlospermum religiosum* (L.) Alston	Bixaceae
77	*Cordia dichotoma* G.Forst.	Boraginaceae
78	*Ehretia microphylla* Lam.	Boraginaceae
79	*Heliotropium indicum* L.	Boraginaceae
80	*Heliotropium keralense* Sivar. & Manilal	Boraginaceae
81	*Trichodesma indicum* (L.) Sm.	Boraginaceae
82	*Brassica juncea* (L.) Czern.	Brassicaceae

83	*Ananas comosus* (L.) Merr.	Bromeliaceae
84	*Canarium strictum* Roxb.	Burseraceae
85	*Garuga pinnata* Roxb.	Burseraceae
86	*Mesua ferrea* L.	Calophyllaceae
87	*Lobelia nicotianifolia* Roth	Campanulaceae
88	*Carica papaya* L.	Caricaceae
89	*Polycarpaea corymbosa* (L.) Lam.	Caryophyllaceae
90	*Celastrus paniculatus* Willd.	Celastraceae
91	*Salacia chinensis* L.	Celastraceae
92	*Salacia macrosperma* Wight	Celastraceae
93	*Cleome viscosa* L.	Cleomaceae
94	*Garcinia gummi-gutta* (L.) N.Robson	Clusiaceae
95	*Gloriosa superba* L.	Colchicaceae
96	*Getonia floribunda* Roxb.	Combretaceae
97	*Terminalia anogeissiana* Gere & Boatwr.	Combretaceae
98	*Terminalia arjuna* (Roxb. ex DC.) Wight & Arn.	Combretaceae
99	*Terminalia bellirica* (Gaertn.) Roxb.	Combretaceae
100	*Terminalia chebula* Retz.	Combretaceae
101	*Commelina benghalensi*s L.	Commelinaceae
102	*Evolvulus alsinoides* L.	Convolvulaceae
103	*Hewittia malabarica* (L.) Suresh	Convolvulaceae
104	*Ipomoea aquatica* Forssk.	Convolvulaceae
105	*Ipomoea obscur*a (L.) Ker Gawl.	Convolvulaceae
106	*Ipomoea pes-tigridis* L.	Convolvulaceae
107	*Operculina turpethum* (L.) Silva Manso	Convolvulaceae
108	*Xenostegia tridentata* (L.) D.F.Austin & Staples	Convolvulaceae
109	*Alangium salviifolium* (L.f.) Wangerin	Cornaceae
110	*Hellenia speciosa* (J.Koenig) S.R.Dutta	Costaceae
111	*Benincasa hispida* (Thunb.) Cogn.	Cucurbitaceae
112	*Coccinia grandis* (L.) Voigt	Cucurbitaceae
113	*Cucumis maderaspatanus* L.	Cucurbitaceae
114	*Cucumis sativu*s L.	Cucurbitaceae
115	*Diplocyclos palmatus* (L.) C.Jeffrey	Cucurbitaceae
116	*Momordica charantia* L.	Cucurbitaceae
117	*Momordica dioica* Roxb. ex Willd.	Cucurbitaceae
118	*Momordica sahyadrica* Kattuk. & V.T.Antony	Cucurbitaceae
119	*Trichosanthes cucumerina* L.	Cucurbitaceae
120	*Trichosanthes tricuspidata* Lour.	Cucurbitaceae
121	*Cyperus rotundus* L.	Cyperaceae
122	*Eleocharis dulci*s (Burm.f.) Trin. ex Hensch.	Cyperaceae
123	*Dillenia pentagyna* Roxb.	Dilleniaceae
124	*Dioscorea alata* L.	Dioscoreaceae
125	*Dioscorea bulbifera* L.	Dioscoreaceae

126	*Dioscorea oppositifolia* L.	Dioscoreaceae
127	*Diospyros ebenum* J.Koenig	Ebenaceae
128	*Diospyros melanoxylon* Roxb.	Ebenaceae
129	*Acalypha fruticosa* Forssk.	Euphorbiaceae
130	*Acalypha indica* L.	Euphorbiaceae
131	*Acalypha paniculata* Miq.	Euphorbiaceae
132	*Baliospermum solanifolium* (Burm.) Suresh	Euphorbiaceae
133	*Euphorbia hirta* L.	Euphorbiaceae
134	*Euphorbia thymifolia* L.	Euphorbiaceae
135	*Euphorbia tithymaloides* L.	Euphorbiaceae
136	*Homonoia riparia* Lour.	Euphorbiaceae
137	*Macaranga peltata* Müll.Arg.	Euphorbiaceae
138	*Mallotus philippensis* (Lam.) Müll.Arg.	Euphorbiaceae
139	*Micrococca mercurialis* Benth.	Euphorbiaceae
140	*Microstachys chamaelea* (L.) Müll.Arg.	Euphorbiaceae
141	*Ricinus communis* L.	Euphorbiaceae
142	*Tragia involucrata* L.	Euphorbiaceae
143	*Abrus precatorius* L.	Fabaceae
144	*Aeschynomene indica* L.	Fabaceae
145	*Albizia amara* (Roxb.) Boivin	Fabaceae
146	*Albizia chinensis* (Osbeck.) Merr.	Fabaceae
147	*Albizia lebbeck* (L.) Benth.	Fabaceae
148	*Butea monosperma* Kuntze	Fabaceae
149	*Cajanus cajan* (L.) Huth	Fabaceae
150	*Canavalia gladiata* (Jacq.) DC.	Fabaceae
151	*Cassia fistula* L.	Fabaceae
152	*Chamaecrista absus* (L.) H.S.Irwin & Barneby	Fabaceae
153	*Clitoria ternatea* L.	Fabaceae
154	*Dendrolobium triangulare* Schindl.	Fabaceae
155	*Erythrina variegata* L.	Fabaceae
156	*Flemingia macrophylla* (Willd.) Kuntze ex Merr.	Fabaceae
157	*Grona heterophylla* (Willd.) H.Ohashi & K.Ohashi	Fabaceae
158	*Grona triflora* (L.) H.Ohashi & K.Ohashi	Fabaceae
159	*Hultholia mimosoides* (Lam.) Gagnon & G.P.Lewis	Fabaceae
160	*Indigofera tsiangiana* F.P.Metcalf	Fabaceae
161	*Mimosa pudica* L.	Fabaceae
162	*Mucuna monosperma* DC. ex Wight	Fabaceae
163	*Mucuna pruriens* (L.) DC.	Fabaceae
164	*Phyllodium pulchellum* Desv.	Fabaceae
165	*Pleurolobus gangeticus* (L.) J.St.-Hil. ex H.Ohashi & K.Ohashi	Fabaceae
166	*Polhillides velutina* (Willd.) H.Ohashi & K.Ohashi	Fabaceae
167	*Pongamia pinnata* (L.) Pierre, Fl. Forest	Fabaceae
168	*Prosopis juliflora* (Sw.) DC.	Fabaceae

169	*Pseudarthria viscida* Wight & Arn.	Fabaceae
170	*Pterocarpus marsupium* Roxb.	Fabaceae
171	*Saraca asoca* (Roxb.) W.J.de Wilde	Fabaceae
172	*Senegalia caesia* (L.) Maslin, Seigler & Ebinger	Fabaceae
173	*Senegalia catechu* (L.f.) P.J.H.Hurter & Mabb.	Fabaceae
174	*Senegalia chundra* (Roxb. ex Rottler) Maslin	Fabaceae
175	*Senegalia rugata* Britton & Rose	Fabaceae
176	*Senna auriculata* Roxb.	Fabaceae
177	*Senna occidentalis* (L.) Link	Fabaceae
178	*Senna tora* Roxb.	Fabaceae
179	*Spatholobus parviflorus* Kuntze	Fabaceae
180	*Tamarindus indica* L.	Fabaceae
181	*Tephrosia purpurea* Pers.	Fabaceae
182	*Teramnus labialis* Spreng.	Fabaceae
183	*Vachellia nilotica* subsp. *indica* (Benth.) Kyal. & Boatwr.	Fabaceae
184	*Vigna mungo* (L.) Hepper	Fabaceae
185	*Vigna radiata* (L.) R.Wilczek	Fabaceae
186	*Vigna umbellata* (Thunb.) Ohwi & H.Ohashi	Fabaceae
187	*Guilandina bonduc* L.	Fabceae
188	*Canscora diffusa* (Vahl) R.Br. ex Roem. & Schult.	Gentianaceae
189	*Canscora pauciflora* Dalzell	Gentianaceae
190	*Ottelia alismoides* (L.) Pers.	Hydrocharitaceae
191	*Curculigo orchioides* Gaertn.	Hypoxidaceae
192	*Sarcostigma kleinii* Wight & Arn.	Icacinaceae
193	*Basilicum polystachyon* (L.) Moench	Lamiaceae
194	*Callicarpa tomentosa* (L.) L.	Lamiaceae
195	*Clerodendrum infortunatum* L.	Lamiaceae
196	*Colebrookea oppositifolia* Sm.	Lamiaceae
197	*Coleus amboinicus* Lour.	Lamiaceae
198	*Coleus strobilifer* (Roxb.) A.J.Paton	Lamiaceae
199	*Gmelina arborea* Roxb. ex Sm.	Lamiaceae
200	*Leucas aspera* Link	Lamiaceae
201	*Leucas lavandulifolia* Sm., Cycl. [A. Rees]	Lamiaceae
202	*Ocimum americanum* L.	Lamiaceae
203	*Ocimum basilicum* L.	Lamiaceae
204	*Ocimum gratissimum* L.	Lamiaceae
205	*Ocimum tenuiflorum* L.	Lamiaceae
206	*Premna tomentosa* Willd.	Lamiaceae
207	*Rotheca serrata* (L.) Steane & Mabb.	Lamiaceae
208	*Tectona grandis* L.f.	Lamiaceae
209	*Vitex negundo* L.	Lamiaceae
210	*Vitex trifolia* L.	Lamiaceae
211	*Volkameria inermis* L.	Lamiaceae

212	*Cinnamomum malabatrum* (Burm.f.) J.Presl	Lauraceae
213	*Cinnamomum verum* J.Presl	Lauraceae
214	*Careya arborea* Roxb.	Lecythidaceae
215	*Strychnos nux-vomica* L.	Loganiaceae
216	*Strychnos potatorum* L.f.	Loganiaceae
217	*Dendrophthoe falcat*a (L.f.) Ettingsh.	Loranthaceae
218	*Ammannia baccifera* L.	Lythraceae
219	*Lagerstroemia speciosa* Pers.	Lythraceae
220	*Lawsonia inermis* L.	Lythraceae
221	*Trapa natans* L.	Lythraceae
222	*Hiptage benghalensis* (L.) Kurz	Malpighiaceae
223	*Abelmoschus moschatus* Medik.	Malvaceae
224	*Abutilon indicum* (L.) Sweet	Malvaceae
225	*Azanza lampas* Alef.	Malvaceae
226	*Bombax ceiba* L.	Malvaceae
227	*Grewia tiliifolia* Vahl	Malvaceae
228	*Helicteres isora* L.	Malvaceae
229	*Hibiscus hispidissimus* Griff.	Malvaceae
230	*Hibiscus rosa-sinensis* L.	Malvaceae
231	*Hibiscus surattensis* L.	Malvaceae
232	*Sida acuta* Burm.f.	Malvaceae
233	*Sida cordata* (Burm.f.) Borss.Waalk.	Malvaceae
234	*Sida cordifolia* L.	Malvaceae
235	*Sida rhombifolia* L.	Malvaceae
236	*Sida rhombifolia* subsp. *alnifolia* (L.) Ugbor.	Malvaceae
237	*Sterculia guttata* Roxb.	Malvaceae
238	*Sterculia urens* Roxb.	Malvaceae
239	*Thespesia populnea* (L.) Sol. ex Corrêa	Malvaceae
240	*Triumfetta rhomboidea* Jacq.	Malvaceae
241	*Martynia annua* L.	Martyniaceae
242	*Memecylon umbellatum* Burm.f.	Melastomataceae
243	*Azadirachta indic*a A.Juss.	Meliaceae
244	*Cipadessa baccifera* Miq.	Meliaceae
245	*Melia azedarach* L.	Meliaceae
246	*Naregamia alata* Wight & Arn.	Meliaceae
247	*Anamirta cocculus* (L.) Wight & Arn.	Menispermaceae
248	*Cissampelos pareira* L.	Menispermaceae
249	*Cyclea peltata* (Lam.) Hook.f. & Thomson	Menispermaceae
250	*Diploclisia glaucescens* (Blume) Diels	Menispermaceae
251	*Tiliacora acuminata* (Lam.) Miers	Menispermaceae
252	*Tinospora cordifolia* (Willd.) Miers ex Hook.f. & Thomson	Menispermaceae
253	*Glinus oppositifolius* (L.) Aug.DC.	Molluginaceae
254	*Paramollugo nudicaulis* (Lam.) Thulin	Molluginaceae

255	*Trigastrotheca pentaphylla* (L.) Thulin	Molluginaceae
256	*Ficus benghalensis* L.	Moraceae
257	*Ficus callosa* Willd.	Moraceae
258	*Ficus microcarp*a L.f.	Moraceae
259	*Ficus racemosa* L.	Moraceae
260	*Ficus religiosa* L.	Moraceae
261	*Ficus tinctoria* G.Forst.	Moraceae
262	*Morus alba* L.	Moraceae
263	*Streblus asper* Lour.	Moraceae
264	*Moringa oleifera* Lam.	Moringaceae
265	*Musa* × *paradisiaca* L.	Musaceae
266	*Myristica fragrans* Houtt.	Myristicaceae
267	*Eucalyptus globulus* Labill.	Myrtaceae
268	*Psidium guajava* L.	Myrtaceae
269	*Syzygium cumini* (L.) Skeels	Myrtaceae
270	*Nelumbo nucifera* Gaertn.	Nelumbonaceae
271	*Boerhavia diffusa* L.	Nyctaginaceae
272	*Boerhavia erecta* L.	Nyctaginaceae
273	*Nymphaea rubra* Roxb. ex Salisb.	Nymphaeaceae
274	*Chionanthus mala-elengi* (Dennst.) P.S.Green	Oleaceae
275	*Jasminum auriculatum* Vahl	Oleaceae
276	*Myxopyrum smilacifolium* Blume	Oleaceae
277	*Nyctanthes arbor-tristis* L., Sp. Pl. 1: 6 (1753).	Oleaceae
278	*Tetrapilus dioicus* (Roxb.) L.A.S.Johnson	Oleaceae
279	*Ludwigia hyssopifolia* (G.Don) Exell	Onagraceae
280	*Acampe praemorsa* (Roxb.) Blatt. & McCann	Orchidaceae
281	*Nervilia concolor* Schltr.	Orchidaceae
282	*Nervilia plicata* Schltr.	Orchidaceae
283	*Striga angustifolia* (D.Don) Saldanha	Orobanchaceae
284	*Biophytum reinwardtii* (Zucc.) Klotzsch	Oxalidaceae
285	*Biophytum sensitivum* (L.) DC.	Oxalidaceae
286	*Oxalis corniculata* L.	Oxalidaceae
287	*Passiflora foetida* L.	Passifloraceae
288	*Pedalium murex* L.	Pedaliaceae
289	*Sesamum indicum* L.	Pedaliaceae
290	*Antidesma acidum* Retz.	Phyllanthaceae
291	*Aporosa cardiosperma* (Gaertn.) Merr.	Phyllanthaceae
292	*Baccaurea courtallensis* (Wight) Müll.Arg.	Phyllanthaceae
293	*Breynia quadrangularis* (J.G.Klein ex Willd.) Chakrab. & N.P.Balakr.	Phyllanthaceae
294	*Bridelia stipularis* Blume	Phyllanthaceae
295	*Flueggea virosa* (Roxb. ex Willd.) Royle	Phyllanthaceae
296	*Phyllanthus airy-shawii* Jean F.Brunel & Jacq.Roux	Phyllanthaceae
297	*Phyllanthus amarus* Schumach. & Thonn.	Phyllanthaceae

298	*Phyllanthus emblica* L.	Phyllanthaceae
299	*Phyllanthus maderaspatensis* L.	Phyllanthaceae
300	*Phyllanthus urinaria* L.	Phyllanthaceae
301	*Phyllanthus virgatus* G.Forst.	Phyllanthaceae
302	*Piper longum* L.	Piperaceae
303	*Piper nigrum* L.	Piperaceae
304	*Piper wightii* Miq.	Piperaceae
305	*Scoparia dulcis* L.	Plantaginaceae
306	*Plumbago indica* L.	Plumbaginaceae
307	*Plumbago zeylanica* L.	Plumbaginaceae
308	*Arundo donax* L.	Poaceae
309	*Bambusa bambos* (L.) Voss	Poaceae
310	*Cymbopogon citratus* Stapf	Poaceae
311	*Cymbopogon flexuosus* (Nees ex Steud.) Will.Watson	Poaceae
312	*Cymbopogon martini* (Roxb.) Will.Watson	Poaceae
313	*Cynodon dactylon* (L.) Pers.	Poaceae
314	*Dactyloctenium aegyptium* (L.) Willd.	Poaceae
315	*Oryza sativa* L.	Poaceae
316	*Paspalum scrobiculatum* L.	Poaceae
317	*Saccharum spontaneum* L.	Poaceae
318	*Themeda triandra* Forssk.	Poaceae
319	*Pontederia vaginalis* Burm.f.	Pontederiaceae
320	*Portulaca oleracea* L.	Portulacaceae
321	*Ardisia solanacea* Roxb.	Primulaceae
322	*Embelia tsjeriam-cottam* (Roem. & Schult.) A.DC.	Primulaceae
323	*Putranjiva roxburghii* Wall.	Putranjivaceae
324	*Clematis zeylanica* Poir.	Ranunculaceae
325	*Ziziphus mauritiana* Lam.	Rhamnaceae
326	*Ziziphus oenoplia* (L.) Mill.	Rhamnaceae
327	*Ziziphus xylopyrus* (Retz.) Willd.	Rhamnaceae
328	*Adina cordifolia* (Roxb.) Hook.f. & Benth.	Rubiaceae
329	*Canthium rheedei* DC.	Rubiaceae
330	*Catunaregam spinosa* (Thunb.) Tirveng.	Rubiaceae
331	*Geophila repens* (L.) I.M.Johnst.	Rubiaceae
332	*Hymenodictyon orixense* (Roxb.) Mabb.	Rubiaceae
333	*Ixora coccinea* L.	Rubiaceae
334	*Mussaenda frondosa* L.	Rubiaceae
335	*Oldenlandia corymbosa* L.	Rubiaceae
336	*Oldenlandia herbacea* (L.) Roxb.	Rubiaceae
337	*Oldenlandia umbellata* L.	Rubiaceae
338	*Ophiorrhiza mungos* L.	Rubiaceae
339	*Atalantia monophylla* (L.) DC.	Rutaceae
340	*Bergera koenigii* L.	Rutaceae

341	*Chloroxylon swietenia* DC.	Rutaceae
342	*Citrus* × *aurantium* L.	Rutaceae
343	*Clausena indica* Oliv.	Rutaceae
344	*Glycosmis pentaphylla* (Retz.) DC.	Rutaceae
345	*Naringi crenulata* (Roxb.) Nicolson	Rutaceae
346	*Zanthoxylum asiaticum* (L.) Appelhans, Groppo & J.Wen	Rutaceae
347	*Flacourtia indica* (Burm.f.) Merr.	Salicaceae
348	*Santalum album* L.	Santalaceae
349	*Allophylus serratus* Kurz	Sapindaceae
350	*Cardiospermum halicacabum* L.	Sapindaceae
351	*Dodonaea viscosa* Jacq.	Sapindaceae
352	*Harpullia arborea* (Blanco) Radlk.	Sapindaceae
353	*Nephelium lappaceum* L.	Sapindaceae
354	*Sapindus emarginatus* Vahl	Sapindaceae
355	*Sapindus trifoliatus* L.	Sapindaceae
356	*Schleichera oleos*a (Lour.) Oken	Sapindaceae
357	*Mimusops elengi* L.	Sapotaceae
358	*Ailanthus excelsus* Roxb).	Simaroubaceae
359	*Ailanthus triphysus* (Dennst.) Alston	Simaroubaceae
360	*Smilax zeylanica* L.	Smilacaceae
361	*Capsicum annuum* L.	Solanaceae
362	*Capsicum frutescens* L.	Solanaceae
363	*Datura metel* L.	Solanaceae
364	*Datura stramonium* L.	Solanaceae
365	*Physalis angulata* L.	Solanaceae
366	*Solanum americanum* Mill.	Solanaceae
367	*Solanum melongena* subsp. *cumingii* (Dunal) J.Samuel	Solanaceae
368	*Solanum multiflorum* Roth	Solanaceae
369	*Solanum torvum* Sw.	Solanaceae
370	*Solanum violaceum* Ortega	Solanaceae
371	*Symplocos acuminata* Miq.	Symplocaceae
372	*Typha angustifolia* L.	Typhaceae
373	*Holoptelea integrifolia* (Roxb.) Planch.	Ulmaceae
374	*Pouzolzia zeylanica* (L.) Benn.	Urticaceae
375	*Phyla nodiflora* (L.) Greene	Verbenaceae
376	*Causonis trifolia* (L.) Mabb. & J.Wen	Vitaceae
377	*Cayratia pedata* Gagnep.	Vitaceae
378	*Cissus discolor* Blume	Vitaceae
379	*Cissus latifolia* Lam.	Vitaceae
380	*Cissus quadrangularis* L.	Vitaceae
381	*Cissus vitiginea* L.	Vitaceae
382	*Leea indica* (Burm.f.) Merr.	Vitaceae
383	*Leea macrophylla* Roxb. ex Hornem.	Vitaceae

384	*Curcuma aromatica* Salisb.	Zingiberaceae
385	*Curcuma longa* L.	Zingiberaceae
386	*Hedychium coronarium* J.Koenig	Zingiberaceae
387	*Zingiber officinale* Roscoe	Zingiberaceae
388	*Zingiber zerumbet* (L.) Sm.	Zingiberaceae
389	*Tribulus terrestris* L.	Zygophyllaceae

Annexure XVII

List of wild edible taxa in Walayar range

Sl. No	Binomial name	Family	Useful part
1	*Abelmoschus esculentus* (L.) Moench	Malvaceae	Unripe fruit
2	*Abelmoschus moschatus* Medik.	Malvaceae	Unripe fruit
3	*Alangium salviifolium* (L.f.) Wangerin	Cornaceae	Fruits
4	*Amaranthus hybridus* L.	Amaranthaceae	Leaf and tender stem
5	*Amaranthus spinosus L.*	Amaranthaceae	Leaf and tender stem
6	*Amaranthus tricolor* L.	Amaranthaceae	Leaf and tender stem
7	*Amaranthus viridis* L.	Amaranthaceae	Leaf and tender stem
8	*Amorphophallus paeoniifolius* (Dennst.) Nicolson	Araceae	Rhizome
9	*Anacardium occidentale* L.	Anacardiaceae	Fruits & nuts
10	*Ananas comosus* (L.) Merr.	Bromeliaceae	Fruits
11	*Annona squamosa* L.	Annonaceae	Fruits
12	*Artocarpus altilis* (Parkinson) Fosberg	Moraceae	Fruits
13	*Artocarpus heterophyllus* Lam.	Moraceae	Fruits
14	*Artocarpus hirsutus* Lam.	Moraceae	Fruits
15	*Asparagus gonocladus Baker*	Asparagaceae	Rhizome
16	*Asparagus racemosus* Willd.	Asparagaceae	Rhizome
17	*Azadirachta indic*a A.Juss.	Meliaceae	Fruits
18	*Bambusa bambos* (L.) Voss	Poaceae	Seeds & young stem
19	*Bergera koenigii* L.	Rutaceae	Leaf and fruits
20	*Boerhavia diffusa* L.	Nyctaginaceae	Leaf
21	*Boerhavia erecta* L.	Nyctaginaceae	Leaf
22	*Borassus flabellifer* L.	Arecaceae	Fruits
23	*Brassica juncea* (L.) Czern.	Brassicaceae	Seeds
24	*Breynia retusa* (Dennst.) Alston	Phyllanthaceae	Fruits
25	*Bridelia retusa* A.Juss.	Phyllanthaceae	Fruits
26	*Cajanus cajan* (L.) Huth	Fabaceae	Fruits
27	*Capsicum annuum* L.	Solanaceae	Fruits
28	*Capsicum frutescens* L.	Solanaceae	Fruits
29	*Cardiospermum halicacabum* L.	Sapindaceae	Leaf
30	*Carica papaya* L.	Caricaceae	Fruits
31	*Carissa carandas* L.	Apocynaceae	Fruits
32	*Centella asiatica* (L.) Urb.	Apiaceae	Leaf
33	*Cinnamomum malabatrum* (Burm.f.) J.Presl	Lauraceae	Bark
34	*Cinnamomum verum* J.Presl	Lauraceae	Bark

35	*Cissus quadrangularis* L.	Vitaceae	Stem
36	*Citrus* × *aurantium* L.	Rutaceae	Fruits
37	*Citrus hystrix* DC.	Rutaceae	Fruits
38	*Coccinia grandis* (L.) Voigt	Cucurbitaceae	Fruits
39	*Cocos nucifera* L.	Arecaceae	Fruits
40	*Coffea arabica* L.	Rubiaceae	Fruits
41	*Coleus amboinicus* Lour.	Lamiaceae	Leaf
42	*Coleus rotundifolius* (Poir.) A.Chev. & Perrot	Lamiaceae	Fruits
43	*Colocasia esculent*a (L.) Schott	Araceae	Rhizome & leaf
44	*Cucumis sativu*s L.	Cucurbitaceae	Fruits
45	*Cucurbita maxima* Duchesne	Cucurbitaceae	Fruits
46	*Cucurbita pepo* L.	Cucurbitaceae	Fruits
47	*Curcuma longa* L.	Zingiberaceae	Rhizome
48	*Dioscorea alata* L.	Dioscoreaceae	Rhizome
49	*Dioscorea belophylla* (Prain) Voigt ex Haines	Dioscoreaceae	Rhizome
50	*Dioscorea bulbifera* L.	Dioscoreaceae	Rhizome
51	*Dioscorea hamiltonii* Hook.f.	Dioscoreaceae	Rhizome
52	*Dioscorea oppositifolia* L.	Dioscoreaceae	Rhizome
53	*Dioscorea pentaphylla* L.	Dioscoreaceae	Rhizome
54	*Dioscorea spicata* Roth	Dioscoreaceae	Rhizome
55	*Dioscorea wallichii* Hook.f.	Dioscoreaceae	Rhizome
56	*Elaeagnus indica* Serv.	Elaeagnaceae	Fruits
57	*Ficus benghalensis* L.	Moraceae	Fruits
58	*Ficus hispida* L.f.	Moraceae	Fruits
59	*Ficus racemosa* L.	Moraceae	Fruits
60	*Ficus religiosa* L.	Moraceae	Fruits
61	*Flacourtia indica* (Burm.f.) Merr.	Salicaceae	Fruits
62	*Flacourtia montana* J.Graham	Salicaceae	Fruits
63	*Garcinia cowa* Roxb.	Clusiaceae	Fruits
64	*Garcinia gummi-gutta* (L.) N.Robson	Clusiaceae	Fruits
65	*Glycosmis pentaphylla* (Retz.) DC.	Rutaceae	Fruits
66	*Gymnema sylvestre* (Retz.) R.Br. ex Sm.	Apocynaceae	Leaf
67	*Hemidesmus indicus* (L.) R.Br.	Apocynaceae	Root
68	*Hibiscus lobatus* (Murray) Kuntze	Malvaceae	Fruits
69	*Holoptelea integrifolia* (Roxb.) Planch.	Ulmaceae	Fruits
70	*Justicia adhatoda* L.	Acanthaceae	Leaf
71	*Mangifera indica* L.	Anacardiaceae	Fruits
72	*Manihot esculenta* Crantz	Euphorbiaceae	Roots
73	*Manilkara zapota* (L.) P.Royen	Sapotaceae	Fruits
74	*Mimosa pudica* L.	Fabaceae	Young stem and leaf
75	*Mimusops elengi* L.	Sapotaceae	Fruits

76	*Momordica charantia* L.	Cucurbitaceae	Fruits
77	*Momordica dioica* Roxb. ex Willd.	Cucurbitaceae	Fruits
78	*Momordica sahyadrica* Kattuk. & V.T.Antony	Cucurbitaceae	Fruits
79	*Moringa oleifera* Lam.	Moringaceae	Leaf and fruits
80	*Morus alba* L.	Moraceae	Fruits
81	*Muntingia calabura* L.	Muntingiaceae	Fruits
82	*Musa* × *paradisiaca* L.	Musaceae	Fruits
83	*Myristica fragrans* Houtt.	Myristicaceae	Fruits
84	*Nelumbo nucifera* Gaertn.	Nelumbonaceae	Leaf petiole and rhizome
85	*Nymphaea nouchali* Burm.f.	Nymphaeaceae	Leaf petiole and rhizome
86	*Nymphaea rubra* Roxb. ex Salisb.	Nymphaeaceae	Leaf petiole and rhizome
87	*Ocimum gratissimum* L.	Lamiaceae	Leaf
88	*Ocimum tenuiflorum* L.	Lamiaceae	Leaf
89	*Opuntia dillenii* Haw.	Cactaceae	Fruits
90	*Opuntia ficus-indica* (L.) Mill.	Cactaceae	Fruits
91	*Oryza sativa* L.	Poaceae	Seeds
92	*Oxalis corniculata* L.	Oxalidaceae	Whole plant
93	*Passiflora foetida* L.	Passifloraceae	Fruits
94	*Peperomia pellucida* (L.) Kunth	Piperaceae	Whole plant
95	*Phyllanthus amarus* Schumach. & Thonn.	Phyllanthaceae	Whole plant
96	*Phyllanthus emblica* L.	Phyllanthaceae	Fruits
97	*Phyllanthus reticulatus* Poir.	Phyllanthaceae	Fruits
98	*Physalis angulata* L.	Solanaceae	Fruits
99	*Piper argyrophyllum* Miq.	Piperaceae	Fruits
100	*Piper longum* L.	Piperaceae	Fruits
101	*Piper nigrum* L.	Piperaceae	Fruits
102	*Pithecellobium dulce* (Roxb.) Benth.	Fabaceae	Aril
103	*Plumbago zeylanica* L.	Plumbaginaceae	Leaf
104	*Psidium guajava* L.	Myrtaceae	Fruits
105	*Rauvolfia serpentina* Benth. ex Kurz	Apocynaceae	Whole plant
106	*Ricinus communis* L.	Euphorbiaceae	Fruits
107	*Schleichera oleos*a (Lour.) Oken	Sapindaceae	Fruits
108	*Scoparia dulcis* L.	Plantaginaceae	Whole plant
109	*Senna tora* Roxb.	Fabaceae	Leaf
110	*Sesamum indicum* L.	Pedaliaceae	Seeds
111	*Sesamum radiatum* Thonn. ex Hornem.	Pedaliaceae	Seeds
112	*Solanum americanum* Mill.	Solanaceae	Fruits
113	*Solanum lycopersicum* L.	Solanaceae	Fruits
114	*Solanum melongena* subsp. *cumingii* (Dunal) J.Samuel	Solanaceae	Fruits
115	*Solanum melongena* L.	Solanaceae	Fruits

116	*Solanum torvum* Sw.	Solanaceae	Fruits
117	*Sorghum bicolor* (L.) Moench	Poaceae	Kernal
118	*Spondias pinnata* (L.f.) Kurz	Anacardiaceae	Fruits
119	*Stachyphrynium spicatum* K.Schum.	Marantaceae	Rhizome
120	*Streblus asper* Lour.	Moraceae	Latex
121	*Syzygium cumini* (L.) Skeels	Myrtaceae	Fruits
122	*Talinum portulacifolium* Asch. ex Schweinf.	Portulacaceae	Leaf
123	*Tamarindus indica* L.	Fabaceae	Fruits
124	*Terminalia catappa* L.	Combretaceae	Fruits
125	*Theobroma cacao* L.	Malvaceae	Seeds
126	*Trapa natans* L.	Lythraceae	Fruits
127	*Trianthema portulacastrum* L.	Aizoaceae	Leaf
128	*Tribulus terrestris* L.	Zygophyllaceae	Fruits
129	*Trichosanthes cucumerina* L.	Cucurbitaceae	Fruits
130	*Trichosanthes tricuspidata* Lour.	Cucurbitaceae	Fruits
131	*Vigna mungo* (L.) Hepper	Fabaceae	Fruits
132	*Vigna radiata* (L.) R.Wilczek	Fabaceae	Fruits
133	*Vigna unguiculata* subsp. *sesquipedalis* (L.) Verdc.	Fabaceae	Fruits, Tender leaf
134	*Vigna unguiculata* subsp. *unguiculata* (L.) Walp.	Fabaceae	Fruits, Tender leaf
135	*Zingiber officinale* Roscoe	Zingiberaceae	Rhizome
136	*Ziziphus mauritiana* Lam.	Rhamnaceae	Fruits
137	*Ziziphus oenoplia* (L.) Mill.	Rhamnaceae	Fruits
138	*Ziziphus rugosa* Lam.	Rhamnaceae	Fruits
139	*Ziziphus xylopyrus* (Retz.) Willd.	Rhamnaceae	Fruits

Annexure XVIII

List of wild ornamental plants in Walayar range

Sl. No	Binomial name	Family
1	*Abelmoschus moschatus* Medik.	Malvaceae
2	*Abutilon indicum* (L.) Sweet	Malvaceae
3	*Abutilon persicum* (Burm.f.) Merr.	Malvaceae
4	*Acampe praemorsa* (Roxb.) Blatt. & McCann	Orchidaceae
5	*Aerides maculosa* Lindl.	Orchidaceae
6	*Anisomeles indica* (L.) Kuntze	Lamiaceae
7	*Antigonon leptopus* Hook. & Arn.	Polygonaceae
8	*Argyreia elliptica* (Roth) Choisy	Convolvulaceae
9	*Argyreia pomacea* Choisy	Convolvulaceae
10	*Argyreia populifoli*a Choisy	Convolvulaceae
11	*Asclepias curassavica* L.	Apocynaceae
12	*Asparagus gonocladus Baker*	Asparagaceae
13	*Asparagus racemosus* Willd.	Asparagaceae
14	*Asystasia dalzelliana* Santapau	Acanthaceae
15	*Asystasia gangetica* (L.) T.Anderson	Acanthaceae
16	*Azanza lampas* Alef.	Malvaceae
17	*Barleria buxifolia* L.	Acanthaceae
18	*Barleria courtallica* Nees	Acanthaceae
19	*Barleria prattensis* Santapau	Acanthaceae
20	*Barleria prionitis* L.	Acanthaceae
21	*Barleria tomentosa* Roth	Acanthaceae
22	*Bauhinia purpurea* L.	Fabaceae
23	*Begonia dipetala* Graham	Begoniaceae
24	*Bidens pilosa* L.	Asteraceae
25	*Boucerosia umbellata* Wight & Arn.	Apocynaceae
26	*Butea monosperma* Kuntze	Fabaceae
27	*Callicarpa tomentosa* (L.) L.	Lamiaceae
28	*Camonea umbellata* (L.) A.R.Simões & Staples	Convolvulaceae
29	*Capparis brevispina* DC.	Capparaceae
30	*Careya arborea* Roxb.	Lecythidaceae
31	*Carissa carandas* L.	Apocynaceae
32	*Cascabela thevetia* (L.) Lippold	Apocynaceae
33	*Chassalia curviflora* Thwaites	Rubiaceae
34	*Clerodendrum chinense* (Osbeck) Mabb.	Lamiaceae
35	*Clerodendrum infortunatum* L.	Lamiaceae
36	*Colebrookea oppositifolia* Sm.	Lamiaceae
37	*Cosmos caudatus* Kunth	Asteraceae
38	*Cosmos sulphureus* Cav.	Asteraceae

39	*Crateva magn*a DC.	Capparaceae
40	*Datura metel* L.	Solanaceae
41	*Datura stramonium* L.	Solanaceae
42	*Dendrobium barbatulum* Lindl.	Orchidaceae
43	*Dendrobium ovatum* Kraenzl.	Orchidaceae
44	*Eranthemum capense* L.	Acanthaceae
45	*Erigeron bonariensis* L.	Asteraceae
46	*Getonia floribunda* Roxb.	Combretaceae
47	*Globba marantina* L.	Zingiberaceae
48	*Globba sessiliflora* Sims	Zingiberaceae
49	*Gloriosa superba* L.	Colchicaceae
50	*Gmelina arborea* Roxb. ex Sm.	Lamiaceae
51	*Hedychium coronarium* J.Koenig	Zingiberaceae
52	*Hedychium flavescens* Carey ex Rosc.	Zingiberaceae
53	*Hellenia speciosa* (J.Koenig) S.R.Dutta	Costaceae
54	*Ichnocarpus frutescens* (L.) W.T.Aiton	Apocynaceae
55	*Impatiens balsamina* L.	Balsaminaceae
56	*Impatiens dasysperma* Wight	Balsaminaceae
57	*Impatiens flaccida* Arn.	Balsaminaceae
58	Impatiens gardneriana Wight	Balsaminaceae
59	*Impatiens scapiflora* B.Heyne	Balsaminaceae
60	*Ipomoea cairica* (L.) Sweet	Convolvulaceae
61	*Ipomoea nil* (L.) Roth	Convolvulaceae
62	*Ipomoea obscur*a (L.) Ker Gawl.	Convolvulaceae
63	*Ipomoea pes-tigridis* L.	Convolvulaceae
64	*Ipomoea purpurea* (L.) Roth	Convolvulaceae
65	*Ipomoea staphylina* Roem. & Schult.	Convolvulaceae
66	*Ixora brachiata* Roxb.	Rubiaceae
67	*Ixora cuneifolia* Roxb.	Rubiaceae
68	*Ixora ravikumarii* Kottaim.	Rubiaceae
69	*Jasminum auriculatum* Vahl	Oleaceae
70	*Jasminum coarctatum* Roxb.	Oleaceae
71	*Jasminum flexile Vahl*	Oleaceae
72	*Kalanchoe olivacea* Dalzell	Crassulaceae
73	*Leonotis nepetifolia* (L.) R.Br.	Lamiaceae
74	*Lobelia nicotianifolia* Roth	Campanulaceae
75	*Memecylon umbellatum* Burm.f.	Melastomataceae
76	*Murdannia semiteres* (Dalzell) Santapau	Commelinaceae
77	*Mussaenda frondosa* L.	Rubiaceae
78	*Neonauclea purpurea* (Roxb.) Merr.	Rubiaceae
79	*Operculina turpethum* (L.) Silva Manso	Convolvulaceae
80	*Opuntia dillenii* Haw.	Cactaceae
81	*Opuntia ficus-indica* (L.) Mill.	Cactaceae

82	*Osbeckia aspera* Blume	Melastomataceae
83	*Osbeckia gracilis* Bedd.	Melastomataceae
84	*Pancratium triflorum* Roxb.	Amaryllidaceae
85	*Parasopubia delphiniifolia* (L.) H.-P.Hofm. & Eb.Fisch.	Orobanchaceae
86	*Plumbago indica* L.	Plumbaginaceae
87	*Plumbago zeylanica* L.	Plumbaginaceae
88	*Polyspora obtusa* (Wall. ex Wight & Arn.) Niissalo & L.M.Choo	Theaceae
89	*Rhinacanthus nasutus* (L.) Kurz	Acanthaceae
90	*Rhynchoglossum notonianum* (Wall.) B.L.Burtt	Gesneriaceae
91	*Rhynchoglossum obliquum* Blume	Gesneriaceae
92	*Rhynchoglossum scabrum* Dalzell	Gesneriaceae
93	*Rotheca microphylla* (Blume) Callm. & Phillipson	Lamiaceae
94	*Rotheca serrata* (L.) Steane & Mabb.	Lamiaceae
95	*Saraca asoca* (Roxb.) W.J.de Wilde	Fabaceae
96	*Sphagneticola trilobata* (L.) Pruski	Asteraceae
97	*Stachytarpheta jamaicensis* (L.) Vahl	Verbenaceae
98	*Strobilanthes aurita* J.R.I.Wood	Acanthaceae
99	*Strobilanthes ciliata* Nees	Acanthaceae
100	*Strobilanthes dupeni* Bedd. ex C.B.Clarke	Acanthaceae
101	*Strobilanthes heyneana* Nees	Acanthaceae
102	*Swertia corymbosa* (Griseb.) Wight ex C.B.Clarke	Gentianaceae
103	*Syzygium laetum* (Buch.-Ham.) Gandhi	Myrtaceae
104	*Tabernaemontana alternifolia* L.	Apocynaceae
105	*Theriophonum fischeri* Sivad.	Araceae
106	*Thunbergia mysorensis* (Wight) T.Anderson	Acanthaceae
107	*Thunbergia tomentosa* Wall. ex Nees	Acanthaceae
108	*Tithonia diversifolia* (Hemsl.) A.Gray	Asteraceae
109	*Tithonia rotundifolia* S.F.Blake	Asteraceae
110	*Torenia bicolor* Dalzell.	Linderniaceae
111	*Torenia hirsuta* Willd.	Linderniaceae
112	*Trapa natans* L.	Lythraceae
113	*Volkameria inermis* L.	Lamiaceae
114	*Wendlandia thyrsoidea* Steud.	Rubiaceae
115	*Zingiber zerumbet* (L.) Sm.	Zingiberaceae

Annexure XIX

Generic representation in Walayar hills with single species

Sl. No	Genera	Sl. No	Genera	Sl. No	Genera
1	*Abrus*	35	*Asclepias*	69	*Cassia*
2	*Acacia*	36	*Axonopus*	70	*Casuarina*
3	*Acampe*	37	*Azadirachta*	71	*Catunaregam*
4	*Acanthospermum*	38	*Azanza*	72	*Causonis*
5	*Acilepis*	39	*Baccaurea*	73	*Cayratia*
6	*Actinodaphne*	40	*Baliospermum*	74	*Ceiba*
7	*Adenostemma*	41	*Bambusa*	75	*Celastrus*
8	*Adina*	42	*Basella*	76	*Celosia*
9	*Aeginetia*	43	*Basilicum*	77	*Centella*
10	*Aerides*	44	*Begonia*	78	*Centotheca*
11	*Aganosma*	45	*Beilschmiedia*	79	*Centranthera*
12	*Aglaia*	46	*Benincasa*	80	*Centrosema*
13	*Alangium*	47	*Bergera*	81	*Cereus*
14	*Allmania*	48	*Bergia*	82	*Chassalia*
15	*Allophylus*	49	*Bidens*	83	*Chionanthus*
16	*Alloteropsis*	50	*Blainvillea*	84	*Chloris*
17	*Ampelocissus*	51	*Boesenbergia*	85	*Chlorophytum*
18	*Anacardium*	52	*Borassus*	86	*Chloroxylon*
19	*Anamirta*	53	*Boucerosia*	87	*Chromolaena*
20	*Ananas*	54	*Brachypterum*	88	*Chrysophyllum*
21	*Ancistrocladus*	55	*Brassica*	89	*Cipadessa*
22	*Anisomeles*	56	*Butea*	90	*Cissampelos*
23	*Annona*	57	*Callicarpa*	91	*Clausena*
24	*Anodendron*	58	*Calopogonium*	92	*Cleistanthus*
25	*Antigonon*	59	*Camonea*	93	*Clematis*
26	*Apluda*	60	*Canarium*	94	*Clitoria*
27	*Aporosa*	61	*Capillipedium*	95	*Coccinia*
28	*Ardisia*	62	*Carallia*	96	*Cochlospermum*
29	*Areca*	63	*Cardiospermum*	97	*Cocos*
30	*Argostemma*	64	*Carex*	98	*Coffea*
31	*Ariopsis*	65	*Careya*	99	*Coix*
32	*Aristolochia*	66	*Carica*	100	*Coldenia*
33	*Arthraxon*	67	*Caryota*	101	*Colebrookea*
34	*Arundo*	68	*Cascabela*	102	*Colocasia*

Sl. No	Genera	Sl. No	Genera	Sl. No	Genera
103	*Corchorus*	147	*Emilia*	191	*Hoppea*
104	*Cordia*	148	*Entada*	192	*Huberantha*
105	*Cosmostigma*	149	*Epithema*	193	*Hultholia*
106	*Crassocephalum*	150	*Eragrostiella*	194	*Hunteria*
107	*Crateva*	151	*Eranthemum*	195	*Hydrilla*
108	*Crepidium*	152	*Erigeron*	196	*Hydrocotyle*
109	*Cryptolepis*	153	*Eriochloa*	197	*Hydrolea*
110	*Curculigo*	154	*Erythropalum*	198	*Hypoxis*
111	*Cuscuta*	155	*Eucalyptus*	199	*Ichnocarpus*
112	*Cyanthillium*	156	*Eugenia*	200	*Kalanchoe*
113	*Cyathula*	157	*Euonymus*	201	*Knoxia*
114	*Cyclea*	158	*Floscopa*	202	*Lagascea*
115	*Cynanchum*	159	*Fuirena*	203	*Laggera*
116	*Cynodon*	160	*Garuga*	204	*Lannea*
117	*Dactyloctenium*	161	*Geophila*	205	*Lantana*
118	*Delonix*	162	*Getonia*	206	*Lawsonia*
119	*Dendrocalamus*	163	*Girardinia*	207	*Leonotis*
120	*Dendrolobium*	164	*Givotia*	208	*Lepisanthes*
121	*Dendrophthoe*	165	*Glinus*	209	*Leptochloa*
122	*Desmodium*	166	*Gliricidia*	210	*Leucaena*
123	*Dichanthium*	167	*Gloriosa*	211	*Libidibia*
124	*Dichrostachys*	168	*Gmelina*	212	*Litsea*
125	*Digera*	169	*Gomphostemma*	213	*Luffa*
126	*Dillenia*	170	*Gomphrena*	214	*Macaranga*
127	*Dimocarpus*	171	*Gouania*	215	*Machilus*
128	*Diploclisia*	172	*Grangea*	216	*Maesa*
129	*Diplocyclos*	173	*Grewia*	217	*Mangifera*
130	*Discospermum*	174	*Guilandina*	218	*Manilkara*
131	*Disperis*	175	*Gymnostachyum*	219	*Mansoa*
132	*Distimake*	176	*Haplanthodes*	220	*Mappia*
133	*Dodonaea*	177	*Harpullia*	221	*Martynia*
134	*Dolichos*	178	*Helicteres*	222	*Mecardonia*
135	*Dopatrium*	179	*Hellenia*	223	*Megathyrsus*
136	*Duranta*	180	*Hemidesmus*	224	*Meiogyne*
137	*Dysolobium*	181	*Heritiera*	225	*Meistera*
138	*Ecbolium*	182	*Heteropogon*	226	*Melia*
139	*Eclipta*	183	*Hevea*	227	*Melochia*
140	*Ehretia*	184	*Hewittia*	228	*Merremia*
141	*Elaeocarpus*	185	*Hiptage*	229	*Mesosphaerum*
142	*Eleocharis*	186	*Holarrhena*	230	*Mesua*
143	*Elephantopus*	187	*Holigarna*	231	*Micrococca*
144	*Eleusine*	188	*Holoptelea*	232	*Microstachys*
145	*Eleutheranthera*	189	*Homonoia*	233	*Mikania*
146	*Embelia*	190	*Hopea*	234	*Miliusa*

Sl. No	Genera	Sl. No	Genera	Sl. No	Genera
235	*Millingtonia*	272	*Paramignya*	309	*Prunus*
236	*Mimusops*	273	*Paramollugo*	310	*Pseudarthria*
237	*Mitracarpus*	274	*Parasopubia*	311	*Pseudopogonatherum*
238	*Mitragyna*	275	*Parthenium*	312	*Psidium*
239	*Mitrasacme*	276	*Passiflora*	313	*Psilotrichum*
240	*Mitreola*	277	*Pavonia*	314	*Pterocarpus*
241	*Morinda*	278	*Pedalium*	315	*Pupalia*
242	*Moringa*	279	*Peperomia*	316	*Putranjiva*
243	*Morus*	280	*Pergularia*	317	*Pycnospora*
244	*Muntingia*	281	*Peristylus*	318	*Radermachera*
245	*Musa*	282	*Perotis*	319	*Remusatia*
246	*Mussaenda*	283	*Phanera*	320	*Rhamphicarpa*
247	*Myristica*	284	*Phaulopsis*	321	*Rhinacanthus*
248	*Myxopyrum*	285	*Phoebe*	322	*Rhopalephora*
249	*Naregamia*	286	*Phoenix*	323	*Ricinus*
250	*Naringi*	287	*Phyla*	324	*Rothia*
251	*Nelumbo*	288	*Phyllodium*	325	*Ruellia*
252	*Neonauclea*	289	*Physalis*	326	*Saccharum*
253	*Nephelium*	290	*Pigea*	327	*Salomonia*
254	*Nerium*	291	*Pimpinella*	328	*Samanea*
255	*Neustanthus*	292	*Pistia*	329	*Santalum*
256	*Nicoteba*	293	*Pithecellobium*	330	*Saraca*
257	*Nostolachma*	294	*Platostoma*	331	*Sarcostigma*
258	*Nyctanthes*	295	*Pleurolobus*	332	*Schleichera*
259	*Oberonia*	296	*Plumeria*	333	*Schoenoplectiella*
260	*Ohwia*	297	*Pogonatherum*	334	*Scleromitrion*
261	*Operculina*	298	*Polhillides*	335	*Scoparia*
262	*Orophea*	299	*Polyalthia*	336	*Scurrula*
263	*Oroxylum*	300	*Polycarpaea*	337	*Sesbania*
264	*Orthosiphon*	301	*Polycarpon*	338	*Sigesbeckia*
265	*Ottelia*	302	*Polyspora*	339	*Simarouba*
266	*Ottochloa*	303	*Polytrias*	340	*Sorghum*
267	*Oxalis*	304	*Pongamia*	341	*Spathodea*
268	*Oxyceros*	305	*Pothos*	342	*Spatholobus*
269	*Oxystelma*	306	*Pouzolzia*	343	*Sphaeranthus*
270	*Pancratium*	307	*Pristimera*	344	*Sphagneticola*
271	*Pandanus*	308	*Prosopis*	345	*Sphenoclea*

Sl. No	Genera	Sl. No	Genera	Sl. No	Genera
346	*Spirodela*	365	*Tectona*	384	*Uraria*
347	*Spodiopogon*	366	*Teramnus*	385	*Vachellia*
348	*Spondias*	367	*Tetrameles*	386	*Vanda*
349	*Stachyphrynium*	368	*Tetrapilus*	387	*Vicoa*
350	*Stachytarpheta*	369	*Tetrastigma*	388	*Vincetoxicum*
351	*Stemodia*	370	*Themeda*	389	*Wahlenbergia*
352	*Stereospermum*	371	*Theobroma*	390	*Waltheria*
353	*Streblus*	372	*Thespesia*	391	*Wattakaka*
354	*Striga*	373	*Tiliacora*	392	*Wendlandia*
355	*Strobocalyx*	374	*Tinospora*	393	*Wrightia*
356	*Stylosanthes*	375	*Trapa*	394	*Xanthium*
357	*Swertia*	376	*Trema*	395	*Xanthophyllum*
358	*Swietenia*	377	*Trianthema*	396	*Xenostegia*
359	*Symplocos*	378	*Tribulus*	397	*Xylia*
360	*Synedrella*	379	*Tridax*	398	*Xyris*
361	*Tabernaemontana*	380	*Trigastrotheca*	399	*Zanthoxylum*
362	*Talinum*	381	*Trigonochloa*	400	*Zehneria*
363	*Tamarindus*	382	*Tripogon*	401	*Zornia*
364	*Tecoma*	383	*Typha*		

Annexure XX

Invasive taxa recorded from Walayar hill ranges

Sl. No	Binomial name	Family	Nativity
1	*Acacia auriculiformis* A.Cunn. ex Benth.	Fabaceae	A
2	*Acanthospermum hispidum* DC.	Asteraceae	B
3	*Acmella radicans* (Jacq.) R.K.Jansen	Asteraceae	TSAM
4	*Aeschynomene americana* L.	Fabaceae	TAM
5	*Ageratum conyzoides* L.	Asteraceae	TAM
6	*Ageratum houstonianum* Mill.	Asteraceae	TAM
7	*Alternanthera paronychioides* A.St.-Hil.	Amaranthaceae	TAM
8	*Alternanthera philoxeroides* (Mart.) Griseb.	Amaranthaceae	TAM
9	*Antigonon leptopus* Hook. & Arn.	Polygonaceae	TAM
10	*Asclepias curassavica* L.	Apocynaceae	TAM
11	*Blainvillea acmella* (L.) Philipson	Asteraceae	TAM
12	*Blumea lacera* (Burm.f.) DC.	Asteraceae	TAM
13	*Borassus flabellifer* L.	Arecaceae	TA
14	*Calotropis gigantea* (L.) W.T.Aiton	Apocynaceae	TA
15	*Calotropis procera* (Aiton) W.T.Aiton	Apocynaceae	TA
16	*Catharanthus pusillus* G.Don	Apocynaceae	TAM
17	*Chamaecrista absus* (L.) H.S.Irwin & Barneby	Fabaceae	TAM
18	*Chloris barbata* Sw.	Poaceae	TAM
19	*Chromolaena odorat*a (L.) R.M.King & H.Rob.	Asteraceae	TAM
20	*Cleome gynandra* L.	Cleomaceae	TAM
21	*Cleome rutidosperma* var. *burmanni* (Wight & Arn.) M.O.Siddiqui & S.N.Dixit	Cleomaceae	TAM
22	*Cleome viscosa* L.	Cleomaceae	TAM
23	*Corchorus aestuans* L.	Malvaceae	TAM
24	*Crassocephalum crepidioides* S.Moore	Asteraceae	TAM
25	*Crotalaria pallid*a Aiton	Fabaceae	TAM
26	*Croton bonplandianus* Baill.	Euphorbiaceae	TSAM
27	*Cuscuta chinensis* Lam.	Convolvulaceae	M
28	*Cyperus difformis* L.	Cyperaceae	TAM
29	*Cyperus iria* L.	Cyperaceae	TAM
30	*Datura metel* L.	Solanaceae	TAM
31	*Digera muricata* Mart.	Amaranthaceae	SWA
32	*Distimake aegyptius* (L.) A.R.Simões & Staples	Convolvulaceae	TAM
33	*Echinochloa colonum* (L.) Link	Poaceae	TSAM
34	*Echinochloa crus-galli* (L.) P.Beauv.	Poaceae	TSAM
35	*Eclipta prostrata* (L.) L.	Asteraceae	TAM
36	*Emilia sonchifolia* (L.) DC.	Asteraceae	TAM
37	*Euphorbia heterophylla* L.	Euphorbiaceae	TAM
38	*Evolvulus nummularius* (L.) L.	Convolvulaceae	TAM

39	*Fuirena ciliaris* (L.) Roxb.	Cyperaceae	TAM
40	*Gomphrena celosioides* Mart.	Amaranthaceae	TAM
41	*Grangea maderaspatana* (L.) Poir.	Asteraceae	TSAM
42	*Impatiens balsamina* L.	Balsaminaceae	TAM
43	*Indigofera astragalina* DC.	Fabaceae	TAM
44	*Indigofera hendecaphylla* Jacq.	Fabaceae	TSAM
45	*Ipomoea carnea* subsp. *fistulosa* (Mart. ex Choisy) D.F.Austin	Convolvulaceae	TAM
46	*Ipomoea eriocarpa* R.Br.	Convolvulaceae	TA
47	*Ipomoea hederifolia* L.	Convolvulaceae	TAM
48	*Ipomoea obscur*a (L.) Ker Gawl.	Convolvulaceae	TA
49	*Ipomoea pes-tigridis* L.	Convolvulaceae	TEA
50	*Ipomoea staphylina* Roem. & Schult.	Convolvulaceae	TA
51	*Lagascea mollis* Cav.	Asteraceae	TCAM
52	*Lantana camara* L.	Verbenaceae	TAM
53	*Leonotis nepetifolia* (L.) R.Br.	Lamiaceae	TA
54	*Leucaena leucocephala* (Lam.) de Wit	Fabaceae	TAM
55	*Martynia annua* L.	Martyniaceae	TAM
56	*Mecardonia procumbens* (Mill.) Small	Plantaginaceae	TNA
57	*Melochia corchorifolia* L.	Malvaceae	TAM
58	*Mesosphaerum suaveolens* (L.) Kuntze	Lamiaceae	TAM
59	*Mikania micrantha* Kunth	Asteraceae	TAM
60	*Mimosa diplotricha* C.Wright	Fabaceae	TAM
61	*Mimosa pudica* L.	Fabaceae	B
62	*Ocimum americanum* L.	Lamiaceae	TAM
63	*Opuntia dillenii* Haw.	Cactaceae	TAM
64	*Oxalis corniculata* L.	Oxalidaceae	E
65	*Parthenium hysterophorus* L.	Asteraceae	TNA
66	*Passiflora foetida* L.	Passifloraceae	TSAM
67	*Pedalium murex* L.	Pedaliaceae	TAM
68	*Peperomia pellucida* (L.) Kunth	Piperaceae	TSAM
69	*Physalis angulata* L.	Solanaceae	TAM
70	*Pilea microphylla* (L.) Liebm.	Urticaceae	TSAM
71	*Pistia stratiotes* L.	Araceae	TAM
72	*Pontederia crassipes* Mart.	Pontederiaceae	TAM
73	*Portulaca oleracea* L.	Portulacaceae	TSAM
74	*Prosopis juliflora* (Sw.) DC.	Fabaceae	ME
75	*Saccharum spontaneum* L.	Poaceae	TWA
76	*Scoparia dulcis* L.	Plantaginaceae	TAM
77	*Senna hirsuta* (L.) H.S.Irwin & Barneby	Fabaceae	TAM
78	*Senna occidentalis* (L.) Link	Fabaceae	TSAM
79	*Senna tora* Roxb.	Fabaceae	TSAM
80	*Sesbania bispinosa* (Jacq.) W.Wight	Fabaceae	TAM

81	*Sida acuta* Burm.f.	Malvaceae	TAM
82	*Solanum americanum* Mill.	Solanaceae	TAM
83	*Solanum torvum* Sw.	Solanaceae	W
84	*Spermacoce hispida* L.	Rubiaceae	TAM
85	*Stachytarpheta jamaicensis* (L.) Vahl	Verbenaceae	TAM
86	*Synedrella nodiflora* Gaertn.	Asteraceae	W
87	*Tribulus terrestris* L.	Zygophyllaceae	TAM
88	*Tridax procumbens* L.	Asteraceae	TCAM
89	*Triumfetta rhomboidea* Jacq.	Malvaceae	TAM
90	*Typha angustifolia* L.	Typhaceae	TAM
91	*Urena lobata* L.	Malvaceae	TA
92	*Waltheria indica* L.	Malvaceae	TAM
93	*Xanthium strumarium* L.	Asteraceae	TAM

* TAM - Tropical America, TSAM - Tropical South America, TA - Tropical Africa, TCAM - Tropical Central America, TNA - Tropical North America, W - West Indies, B - Brazil, A - Australian, TSA - Temperate South America, TWA - Tropical West Asia, TEA - Tropical East Africa, E - Europe, M - Mediterranean, ME - Mexico, SWA - South West Asia

Annexure XXI

Taxa with ethnobotanical significance in Walayar hills

Sl. No	Botanical Name	IPNI Family	Local Name	Useful part	Category	Uses
1	*Abelmoschus moschatus* Medik.	Malvaceae	Kasthurivenda	Fruits	F	Food
2	*Abrus precatorius* L.	Fabaceae	Kunni, Kunnikuru	Seeds	A	Ayurveda medicines – for eye diseases, snake bites
3	*Acalypha fruticosa* Forssk.	Euphorbiaceae	Balamunja	Leaves	C	Post delivery bath
4	*Acampe praemorsa* (Roxb.) Blatt. & McCann	Orchidaceae	Maravazha	Flower buds	A	Ear pain
5	*Acmella calva* (DC.) R.K.Jansen	Asteraceae	Palluvedhana chedi	Flower buds	A	Tooth ache
6	*Ailanthus excelsus* Roxb.	Simaroubaceae	Matti	Wood	M	Furniture
7	*Alangium salviifolium* (L.f.) Wangerin	Cornaceae	Ankolam	Fruit	F	Edible fruit
8	*Alstonia scholaris* (L.) R.Br.	Apocynaceae	Daivappala, Ezhilamppala, Yekshippala	Seeds	A	Ayurveda medicine
9	*Amaranthus hybridus* L.	Amaranthaceae	Cheera	Stem and Leaf	F	Edible food
10	*Amorphophallus paeoniifolius* (Dennst.) Nicolson	Araceae	Chena	Tuber	F	food
11	*Anacardium occidentale* L.	Anacardiaceae	Kashumavu	Fruits and nuts	F	Food
12	*Anamirta cocculus* (L.) Wight & Arn.	Menispermaceae	Pollakai	Fruits and seeds	A	Ayurvedic medicines
13	*Annona squamosa* L.	Annonaceae	Seethapazham	Fruits	F	Food
14	*Aristolochia indica* L.	Aristolochiaceae	Garudakodi	Stem above ground and roots	A	snake bite, Rheumatism, Stomach ache

15	*Artocarpus hirsutus* Lam.	Moraceae	Anjili, Ayani	Bark, fruits	F	Food, Cancer treatment
16	*Asparagus gonoclados* Baker	Asparagaceae	Sathavari	Rhizome	A	Ayurvedic medicine, pickle preparation, food
17	*Azadirachta indica* A.Juss.	Meliaceae	Ariyaveppu	Tree	A, M	Fever, Wood
18	*Baccaurea courtallensis* (Wight) Müll.Arg.	Phyllanthaceae	Mootilpazham	Fruits and seeds	A	Ayurvedic medicines
19	*Bambusa bambos* (L.) Voss in Vilmorin	Poaceae	Mula	Seeds	F, M	food
20	*Bergera koenigii* L.	Rutaceae	Karivepu	Leaves	C, F	Hair oil preparation and food
21	*Biophytum reinwardtii* (Zucc.) Klotzsch	Oxalidaceae	Mukkuti	Whole plant	A	Ayurveda medicine
22	*Boerhavia diffusa* L.	Nyctaginaceae	Thamizhama, Thazhuthama, Thavizhama	Whole plant	F	food
23	*Borassus flabellifer* L.	Arecaceae	Pana	Tender leaf, fruit, Mature leaf	F	food
24	*Calamus rotang* L.	Arecaceae	Chooral	Stem	M	Furniture
25	*Calotropis gigantea* (L.) R. Br. in Ait.f.	Apocynaceae	Erikku	Milky latex	A	Eye problems
26	*Canarium strictu*m Roxb.	Burseraceae	Kunthirikkam, Kungiliyium	Bark exudate	M	Fumigation
27	*Capsicum frutescens* L.	Solanaceae	Kantharimulaku	Fruits and seeds	F, A	food and medicine
28	*Cardiospermum halicacabum* L.	Sapindaceae	Uzhinja, Valliuzhinja	Whole plant	A, M	Ayurvedic medicine, ceremony material
29	*Carica papaya* L.	Caricaceae	Pappaya	Fruit	F	Edible fruit
30	*Catharanthus roseus* (L.) G.Don	Apocynaceae	Savam-naripoovu	Whole plant	A	Several ailments of eye and body
31	*Cinnamomum malabatrum* (Burm.f.) J.Presl	Lauraceae	Patta	Bark	F	Spices in food

32	*Cissus quadrangularis* L.	Vitaceae	Changalamparanda	Stem	A	treating cattle dysentery and other indigestion problems
33	*Cleistanthus collinus* (Roxb.) Benth. ex Hook.f.	Euphorbiaceae	Odugu	Fruits and seeds	M	Fish poisoning
34	*Coccinia grandis* (L.) Voigt	Cucurbitaceae	Koval	Fruits	F	Edible fruit
35	*Coix lacryma-jobi* L.	Poaceae	Konthamani	Seeds	M	Seeds used for ornaments making
36	*Coleus amboinicus* Lour.	Lamiaceae	Panikoorka	Leaves	A	Fever
37	*Coleus strobilifer* (Roxb.) A.J.Paton	Lamiaceae	Karpooravalli	Leaves	A	For skin infections especially in feet
38	*Colocasia esculenta* (L.) Schott in Schott & Endl.	Araceae	Chembu	Rhizome, Leaf and petiole	F	Food
39	*Curculigo orchioides* Gaertn	Hypoxidaceae	Nelpana, Nilappana	Whole plant	A	For cough, jaundice, asthma, and piles
40	*Curcuma aromatica* Salisb.	Zingiberaceae	Kasthurimanjal, Kattumanjal	Rhizome	A, F	Ayurveda medicines, food
41	*Curcuma longa* L.	Zingiberaceae	Manjal	Rhizome	A, F	Medicinal, food
42	*Cyclea peltata* (Lam.) Hook. f. & Thoms.	Menispermaceae	Padakizhangu, Padathali, Padavalli	Leaf and roots	A	Blood purification, Brain enhancer
43	*Cynanchum annularium* (Roxb.) Liede & Khanum	Apocynaceae	Thinnampala	Tuber	A	Ayurvedic medicine - Indigestion
44	*Cyperus rotundus* L.	Cyperaceae	Karimuttan, Kuzhimuthanga, Muthanga	Rhizome	A	Ayurvedic medicine, sedative
45	*Dalbergia latifoli*a Roxb.	Fabaceae	Eeti, Kariveeti, Veeti	Wood	M	Furniture
46	*Datura metel* L.	Solanaceae	Ummam	Fruits and	A	Atshma and lung

				seeds		problems
47	*Dioscorea alata* L.	Dioscoreaceae	Kaachil	Rhizome	F	food
48	*Dioscorea oppositifolia* L.	Dioscoreaceae	Kaachil	Tuber	F	Food
49	*Ecbolium viride* (Forssk.) Alston	Acanthaceae	Koranda	Young leaf	A	Wound healing
50	*Eclipta prostrata* (L.) L.	Asteraceae	Kanjunni	Whole plant	C	Hair oil making
51	*Embelia tsjeriam-cottam* (Roem. & Schult.) A.DC.	Primulaceae	Ammimuriyan	Leaves	A	Leaves
52	*Emilia sonchifolia* (L.) DC.	Asteraceae	Muyalcheviyan	Whole plant	A	Ayurveda medicine
53	*Garcinia gummi-gutta* (L.) N.Robson	Clusiaceae	Kodampuli	Fruits	F	Edible fruit
54	*Gliricidia sepium* (Jacq.) Kunth ex Walp.	Fabaceae	Cheema konna	Live tree and wood	M	Biofencing
55	*Gymnema sylvestre* (Retz.) R.Br. ex Sm.	Apocynaceae	Chakkarakolli	Leaves	A	Diabetes, snake bite, malaria
56	*Helicteres isora* L.	Malvaceae	Edampiri-Valampiri	Fruit and seeds	C	Hair oil, other oil preparation
57	*Hemidesmus indicus* (L.) R. Br. in Ait.f.,	Apocynaceae	Nannari, Narunandi, Naruneendi	woody root stock	F	For making juice syrup
58	*Hibiscus rosa-sinensis* L.	Malvaceae	Chembarathi	Leaves and flowers	C	Hair oil preparation
59	*Holigarna arnottiana* Hook.f.	Anacardiaceae	Cheru	Fruits	A	medicine
60	*Hydnocarpus pentandrus* (Buch.-Ham.) Oken	Achariaceae	Marotti	Fruits	A	Fruits
61	*Ichnocarpus frutescens* (L.) R. Br. in Ait.f.	Apocynaceae	Palvalli	Whole plant	A	Rheumatism, body pain
62	*Jatropha curcas* L.	Euphorbiaceae	Kadalavanakku	Leaves and fruits	A	Skin infections
63	*Justicia adhatoda* L.	Acanthaceae	Aadalodakam	Tender leaf, bark	A	Tender leaf for drinking (Tea like), Leaf, bark for treating fever, cough, cold, asthsma, bronchitis and in other ayurvedic

						medicines
64	*Justicia gendarussa* Burm. f.	Acanthaceae	Vathakodi, Vathamkolli	Whole plant	A	Rheumatoid arthritis
65	*Lawsonia inermis* L.	Lythraceae	Mylanchi	Leaves	A	Hair oil, ring worm disease in foot and other skin infections
66	*Leucas aspera* Link	Lamiaceae	Thumba	Whole plant	A	Fever, Body pain, Stomach pain, dysentry
67	*Luffa aegyptiaca* Mill.	Cucurbitaceae	Peechinga	Fruits	C	Bath purpose
68	*Manihot carthagenensis* subsp. *glaziovii* (Müll.Arg.) Allem	Euphorbiaceae	Kattu-rubber	Live tree	M	Biofencing
69	*Manilkara zapota* (L.) P.Royen	Sapotaceae	Sapota	Fruits	F	Fruit
70	*Momordica charantia* L.	Cucurbitaceae	Kaipa	Fruits	F	Edible fruit
71	*Momordica sahyadrica* Kattuk. & V.T.Antony	Cucurbitaceae	Kattuppavel	Fruits	A	Digestion
72	*Mussaenda frondosa* L.	Rubiaceae	Vellila thali	Leaves and flowers	C	Hair oil preparation
73	*Nervilia concolor* Schltr.	Orchidaceae	Nilathamara, Orilathamara	Rhizome	A	Headache
74	*Ocimum basilicum* L.	Lamiaceae	Ramathulasi	Leaves	A	Fever and cough
75	*Ocimum tenuiflorum* L.	Lamiaceae	Krishnatulasi	Leaves	A	Fever
76	*Opuntia dillenii* Haw.	Cactaceae	Kallichedi	Fruit	F	Edible fruit
77	*Oroxylum indicum* (L.) Benth. ex Kurz	Bignoniaceae	Palakapayyani	Wood and seeds	M	wood for furniture and seeds paste for treating burns and wounds
78	*Ouret lanata* (L.) Kuntze	Amaranthaceae	Cherula, Pongalpoovu	Whole plant	A, M	Ayurveda medicine, Holy rituals
79	*Pancratium triflorum* Roxb.	Amaryllidaceae	Kattulli	Underground stem - Bulb	A	for burns and skin problems

80	*Phoenix loureiroi* Kunth	Arecaceae	Ichampullu Chittinthal	Leaf	M	Broom making
81	*Phyllanthus airy-shawii* Brunel & Roux	Phyllanthaceae	Keezharnelli	Whole plant	A	Jaundice
82	*Phyllanthus emblica* L.	Phyllanthaceae	Nelli	Fruits and seeds	C	Hair oil, Diabetes, tooth paste, cleansing agent
83	*Phyllanthus urinaria* L.	Phyllanthaceae	Chuvannakizhanelli	Whole plant	A	Jaundice
84	*Piper argyrophyllum* Miq.	Piperaceae	Kattukurumulaku	Whole plant	F, A	Food, Ayurveda medicine for cough, fever, stomach upset
85	*Piper longum* L.	Piperaceae	Pippali, Thippali	Spikes	A	Fever, cough, Bronchitis, stomach upsets
86	*Piper nigrum* L.	Piperaceae	Kurumulaku	Mature fruits	F	Spices in food
87	*Pleurolobus gangeticus* (L.) J.St.-Hil. ex H.Ohashi & K.Ohashi	Fabaceae	Orila	Whole plant	A	Vomiting, cough, asthma
88	*Plumbago zeylanica* L.	Plumbaginaceae	Vellakoduveli	Whole plant	A	medicine
89	*Pongamia pinnata* (L.) Pierre	Fabaceae	Ungu	Bark and seeds	C	Oil preparation for wound healing
90	*Pseudarthria viscida* (L.) Wight & Arn.	Fabaceae	Moovila	Whole plant	A	Ayurvedic medicines like Dasamoolarishtam, asthma and nervous dysfunction
91	*Pterocarpus marsupium* Roxb.	Fabaceae	Venga	Plant exudate, Wood	C, M	Used in baby cosmetics (Baby bindhi spot) and Furniture
92	*Rauvolfia serpentina* (L.) Benth. ex Kurz	Apocynaceae	Amalpori, Sarpagandhi	Whole plant	A	Snake bite, Cancer treatment
93	*Ricinus communis* L.	Euphorbiaceae	Aavannakku	Seeds	C	oil
94	*Ruellia prostrata* Poir.	Acanthaceae	Thuppalampotti	Leaf	A	Wound healing
95	*Sapindus trifoliatus* L.	Sapindaceae	Soapinkaimaram,	Fruits	C	Ayurvedic shampoo and

			Uravanjikkaya			cleansers
96	*Scoparia dulcis* L.	Plantaginaceae	Kallurukki	Whole plant	A	Kidney stone
97	*Senegalia catechu* (L.f.) P.J.H.Hurter & Mabb.	Fabaceae	Karingali	Bark	A	Skin problems, blood purifier
98	*Senegalia rugata* Britton & Rose	Fabaceae	Cheenikka, Cheevikka	Seeds	C	Hair cleanser
99	*Senna tora* (L.) Roxb.	Fabaceae	Chakramandarakam, Thakara	Leaves	F	Food
100	*Sesamum indicum* L.	Pedaliaceae	Ellu	Seeds	F	For vaadham treatment, skin of plant used
101	*Sida acuta* Burm. f.	Malvaceae	Malamkurunthotti	Leaf, Root	C, A	Hair oil, Rheumatism, Headache
102	*Sida rhombifolia* L.	Malvaceae	Kurumthotti	Leaf, Root	C, A	Hair oil, Rheumatism, Headache
103	*Simarouba glauca* DC.	Simaroubaceae	Lakshmitharu	Wood	M	Wooden toy making, Paper making
104	*Solanum torvum* Sw.	Solanaceae	Chunda, Cheruchunda	Fruits	F	food
105	*Solanum violaceum* Ortega ssp. violaceum	Solanaceae	Chunda, Cheruchunda	Seeds	A, F	Tooth ache
106	*Spondias pinnata* (L.f.) Kurz	Anacardiaceae	Ambazham	Fruits and bark	F, M	Food and wood
107	*Strobilanthes ciliatus* Nees	Acanthaceae	Karimkurinji	Leaves and stem	A	Fever, cough, bronchitis, anti-inflammatory which reduces pain
108	*Strychnos nux-vomica* L.	Loganiaceae	Kanjiram	Seeds	A	For poison preparation
109	*Syzygium cumini* (L.) Skeels	Myrtaceae	Njaval	Fruits	F	Food
110	*Tamarindus indica* L.	Fabaceae	Puli, Valampuli	Wood, fruits	M, F	Furniture, food
111	*Tectona grandis* L. f.	Verbenaceae	Thekku	Wood	M	Furniture
112	*Terminalia bellirica* (Gaertn.) Roxb.	Combretaceae	Thanni, Thannikka	Fruits & seeds	A	Fruits and seeds Ayurveda medicines, treating rheumatism and other skin disorders,

113	*Terminalia paniculata* Roth	Combretaceae	Maruthu, Pullamaruthu	Wood	M	Furniture
114	*Tinospora cordifolia* (Willd.) Miers.	Menispermaceae	Chitamruthu	Stem	A	Blood Pressure
115	*Trianthema portulacastrum* L.	Aizoaceae	Vallikeera	whole plant	F	Food
116	*Trichosanthes cucumerina* L.	Cucurbitaceae	Kattupadavalam	Fruits and leaves	F	Food
117	*Uraria rufescens* Schindl.	Fabaceae	Moovila	Whole plant	A	Ayurveda medicines like Dasamoolarishta, Dhanwantharam thailam
118	*Vitex trifolia* L.	Verbenaceae	Nochi, Vellanochi	right side Root	A	snake bite
119	*Wattakaka volubilis* (L. f.) Stapf	Apocynaceae	Kakkalankodi	Leaf	A	For burns and skin bumps
120	*Wrightia tinctoria* (Roxb.) R. Br.	Apocynaceae	Dhanthappala, Thinnamppala	Leaves, seeds	A, C	Skin diseases, Hair oil preparations, For wounds
121	*Xylia xylocarpa* (Roxb.) Taub.	Fabaceae	Irul	Wood	M	Furniture
122	*Zingiber officinale* Rosc.	Zingiberaceae	Inchi	Rhizome	F, A	food and medicine
123	*Ziziphus mauritiana* Lam.	Rhamnaceae	Elanthan	Mature fruits	F	Wild edible fruit
124	*Ziziphus oenoplia* (L.) Mill.	Rhamnaceae	Kottaipazham, Mulli, Thodalli	Fruit	F	Food

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363	*Dichanthium annulatum* Stapf	172	
364	*Dichrostachys cinerea* (L.) Wight & Arn.	211	26: g
365	*Dicliptera foetida* Blatt.	455	76: g
366	*Dicliptera paniculata* (Forssk.) I.Darbysh.	455	
367	*Digera muricata* Mart.	370	
368	*Digitaria bicornis* (Lam.) Roem. & Schult.	173	
369	*Digitaria ciliaris* (Retz.) Koeler	173	
370	*Digitaria longiflora* Pers.	174	
371	*Digitaria radicosa* (J.Presl) Miq.	174	
372	*Dillenia pentagyna* Roxb.	200	25: e
373	*Dimeria deccanensis* Bor	174	
374	*Dimeria ornithopoda* Trin.	175	
375	*Dimeria raizadae* V.J.Nair, Sreek. & N.C.Nair	175	
376	*Dimocarpus longan* Lour.	327	
377	*Dioscorea alata* L.	107	
378	*Dioscorea belophylla* (Prain) Voigt ex Haines	107	
379	*Dioscorea bulbifera* L.	107	8: h
380	*Dioscorea hamiltonii* Hook.f.	108	
381	*Dioscorea oppositifolia* L.	108	9: a
382	*Dioscorea pentaphylla* L.	108	9: b
383	*Dioscorea spicata* Roth	109	9: c
384	*Dioscorea wallichii* Hook.f.	109	9: d
385	*Diospyros buxifolia* Hiern	382	63: g
386	*Diospyros ebenum* J.Koenig	382	63: h
387	*Diospyros melanoxylon* Roxb.	383	64: a
388	*Diospyros trichophylla* Alston	383	
389	*Diploclisia glaucescens* (Blume) Diels	198	
390	*Diplocyclos palmatus* (L.) C.Jeffrey	275	40: g
391	*Discospermum sphaerocarpum* Dalzell	390	65: e
392	*Disperis monophylla* Blatt. ex C.E.C.Fisch.	113	10: f
393	*Distimake aegyptius* (L.) A.R.Simões & Staples	423	
394	*Dodonaea viscosa* Jacq.	327	
395	*Dolichos trilobus* L.	237	
396	*Dopatrium junceum* (Roxb.) Benth.	441	74: h
397	*Drosera burmanni* Vahl	363	59: h
398	*Drosera indica* L.	363	60: a

399	*Drypetes confertiflor*a Pax & K.Hoffm.	284	
400	*Drypetes oblongifolia* (Bedd.) Airy Shaw	285	
401	*Duranta erecta* L.	469	79: d
402	*Dysolobium pilosum* (Willd.) Maréchal	238	
403	*Ecbolium viride* (Forssk.) Alston	455	76: h
404	*Echinochloa colonum* (L.) Link	175	23: a
405	*Echinochloa crus-galli* (L.) P.Beauv.	176	
406	*Eclipta prostrata* (L.) L.	496	
407	*Ehretia microphylla* Lam.	419	70: f
408	*Elaeagnus conferta* Roxb.	258	37: d
409	*Elaeagnus indica* Serv.	259	
410	*Elaeocarpus serratus* L.	282	42: e
411	*Elatostema acuminatum* (Poir.) Brongn	269	39: c
412	*Elatostema heyneanum* (Wedd.) Hallier f.	270	39: d
413	*Elatostema lineolatum* Wight	270	39: e
414	*Eleocharis dulci*s (Burm.f.) Trin. ex Hensch.	153	20: g
415	*Elephantopus scabe*r L.	496	83: a
416	*Eleusine indica* (L.) Gaertn.	176	
417	*Eleutheranthera ruderali*s (Sw.) Sch.Bip.	496	
418	*Embelia tsjeriam-cottam* (Roem. & Schult.) A.DC.	384	64: c
419	*Emilia sonchifolia* (L.) DC.	497	
420	*Entada phaseoloides* Merr.	212	
421	*Enteropogon dolichostachyus* (Lag.) Keng	176	
422	*Enteropogon monostachyus* Schum.	177	
423	*Epithema carnosum* Benth.	439	74: d
424	*Eragrostiella bifaria* (Vahl) Bor	177	23: b
425	*Eragrostis gangetica* Steud.	178	
426	*Eragrostis japonic*a Trin.	178	
427	*Eragrostis nigra* Nees ex Steud.	178	
428	*Eragrostis pilos*a (L.) P.Beauv.	179	
429	*Eragrostis riparia* Nees	179	
430	*Eragrostis tef* (Zuccagni) Trotter	179	
431	*Eragrostis tenella* (L.) P.Beauv. ex Roem. & Schult.	179	
432	*Eragrostis unioloide*s Nees ex Steud.	180	
433	*Eragrostis viscosa* Trin.	180	
434	*Eranthemum capense* L.	456	77: a
435	*Erigeron bonariensis* L.	497	83: b
436	*Eriocaulon palghatense* R.Ansari & N.P.Balakr.	140	17: b
437	*Eriocaulon quinquangulare* L.	140	17: c
438	*Eriocaulon sexangulare* L.	140	17: d
439	*Eriocaulon xeranthemum* Mart.	141	17: e

440	*Eriochloa procera* (Retz.) C.E.Hubb.	181	
441	*Erythrina stricta* Roxb.	238	32: a
442	*Erythrina suberosa* Roxb.	238	32: b
443	*Erythrina variegata* L.	239	32: c
444	*Erythropalum scandens* Blume	358	58: h
445	*Eucalyptus globulus* Labill.	319	
446	*Eugenia wynadensis* Bedd.	319	50: f
447	*Euonymus angulatus* Wight	279	
448	*Euphorbia heterophylla* L.	293	44: h
449	*Euphorbia hirta* L.	294	
450	*Euphorbia thymifolia* L.	294	
451	*Euphorbia tithymaloides* L.	294	45: a
452	*Euphorbia tortilis* Rottler ex Ainslie	295	45: b
453	*Euploca marifolia* (J.Koenig ex Retz.) Ancy & P.Javad	419	70: g
454	*Euploca marifolia* var. *rottleri* (Lehm.) Ancy & P.Javad	420	
455	*Evolvulus alsinoides* L.	424	71: e
456	*Evolvulus nummularius* (L.) L.	424	71: f
457	*Ficus arnottiana* (Miq.) Miq.	264	38: e
458	*Ficus beddomei* King	264	
459	*Ficus benghalensis* L.	264	38: f
460	*Ficus callosa* Willd.	265	38: g
461	*Ficus costata* Aiton	265	
462	*Ficus dalhousieae* Miq.	265	38: h
463	*Ficus exasperata* Vahl	266	
464	*Ficus hispida* L.f.	266	
465	*Ficus microcarp*a L.f.	266	
466	*Ficus racemosa* L.	267	
467	*Ficus religiosa* L.	267	
468	*Ficus tinctoria* G.Forst.	267	
469	*Ficus tsjakel*a Burm.f.	268	39: a
470	*Ficus virens* Aiton	268	
471	*Fimbristylis aestivalis* var. *aestival*is (Retz.) Vahl	154	20: h
472	*Fimbristylis argentea* Vahl	154	21: a
473	*Fimbristylis dichotoma* subsp. *dichotom*a (L.) Vahl	155	21: b
474	*Fimbristylis dipsacea* (Rottb.) C.B.Clarke	155	21: c
475	*Fimbristylis microcary*a F.Muell.	155	
476	*Fimbristylis narayanii* C.E.C.Fisch.	156	
477	*Fimbristylis schoenoides* Vahl	156	21: d
478	*Fimbristylis tetragona* R.Br.	156	
479	*Flacourtia indica* (Burm.f.) Merr.	289	44: a
480	*Flacourtia montana* J.Graham	289	44: b

481	*Flemingia macrophylla* (Willd.) Kuntze ex Merr.	239	32: d
482	*Flemingia strobilifera* (L.) W.T.Aiton	239	32: e
483	*Flemingia wallichii* Wight & Arn.	240	32: f
484	*Floscopa scandens* Lour.	126	
485	*Flueggea leucopyrus* Willd.	306	47: d
486	*Flueggea virosa* (Roxb. ex Willd.) Royle	306	47: e
487	*Fuirena ciliaris* (L.) Roxb.	157	21: e
488	*Garcinia cowa* Roxb.	283	42: g
489	*Garcinia gummi-gutta* (L.) N.Robson	283	42: h
490	*Garnotia courtallensis* Thwaites	181	
491	*Garnotia tenella* Janowski	181	
492	*Garuga pinnata* Roxb.	323	51: e
493	*Geissaspis cristata* Wight & Arn.	240	32: g
494	*Geissaspis cristata* var. *tenella* (Benth.) M.R.Almeida	240	32: h
495	*Geophila repens* (L.) I.M.Johnst.	391	65: f
496	*Getonia floribunda* Roxb.	312	49: a
497	*Girardinia diversifolia* (Link) Friis	270	39: f
498	*Givotia moluccana* (L.) Sreem.	295	45: c
499	*Glinus oppositifolius* (L.) Aug.DC.	373	62: b
500	*Gliricidia sepium* (Jacq.) Kunth	241	33: a
501	*Globba marantina* L.	135	15: g
502	*Globba sessiliflora* Sims	135	15: h
503	*Glochidion ellipticum* Wight	307	
504	*Glochidion zeylanicum* (Gaertn.) A.Juss.	307	47: f
505	*Gloriosa superba* L.	110	9: f
506	*Glycosmis nelliyampathiensis* Jabeena & Maya	333	53: b
507	*Glycosmis pentaphylla* (Retz.) DC.	333	53: c
508	*Gmelina arborea* Roxb. ex Sm.	475	
509	*Gomphostemma heyneanum* Wall. ex Benth.	475	80: d
510	*Gomphrena celosioides* Mart.	370	61: d
511	*Gouania microcarpa* DC.	259	37: e
512	*Grangea maderaspatana* (L.) Poir.	498	
513	*Grewia tiliifolia* Vahl	343	55: d
514	*Grona heterocarpos* (L.) H.Ohashi & K.Ohashi	241	33: b
515	*Grona heterophylla* (Willd.) H.Ohashi & K.Ohashi	242	33: c
516	*Grona triflora* (L.) H.Ohashi & K.Ohashi	242	33: d
517	*Guilandina bonduc* L.	212	26: h
518	*Gymnema inodorum* (Lour.) Decne.	412	69: d
519	*Gymnema sylvestre* (Retz.) R.Br. ex Sm.	412	
520	*Gymnostachyum pubescens* (Lam.) M.R.Almeida	456	
521	*Habenaria digitata* Lindl.	113	10: h

522	*Habenaria furcifera* Lindl.	114	
523	*Habenaria rariflora* A.Rich.	114	11: a
524	*Haplanthodes tentaculata* var. *neilgherryensis* (Wight) J.R.I.Wood	456	
525	*Harpullia arborea* (Blanco) Radlk.	328	52: a
526	*Hedychium coronarium* J.Koenig	135	16: a
527	*Hedychium flavescens* Carey ex Rosc.	136	16: b
528	*Helicteres isora* L.	343	
529	*Heliotropium indicum* L.	420	70: h
530	*Heliotropium keralense* Sivar. & Manilal	420	
531	*Hellenia speciosa* (J.Koenig) S.R.Dutta	131	15: a
532	*Hemidesmus indicus* (L.) R.Br.	413	69: e
533	*Henckelia fischeri* (Gamble) A.Weber & B.L.Burtt	439	
534	*Henckelia humboldtiana* (Gardner) A.Weber & B.L.Burtt	439	74: e
535	*Henckelia incana* Spreng.	440	
536	*Heritiera papilio* Bedd.	344	
537	*Heteropogon contortus* (L.) P.Beauv. ex Roem. & Schult.	182	
538	*Hevea brasiliensis* (Willd. ex A.Juss.) Müll.Arg.	295	
539	*Hewittia malabarica* (L.) Suresh	425	71: g
540	*Hibiscus hispidissimus* Griff.	345	55: e
541	*Hibiscus lobatus* (Murray) Kuntze	345	55: f
542	*Hibiscus radiatus* Cav.	345	55: g
543	*Hibiscus rosa-sinensis* L.	345	
544	*Hibiscus schizopetalus* (Dyer) Hook.f.	346	55: h
545	*Hibiscus surattensis* L.	346	56: a
546	*Hibiscus vitifolius* L.	346	56: b
547	*Hiptage benghalensis* (L.) Kurz	286	43: b
548	*Holarrhena pubescens* Wall. & G.Don	413	69: f
549	*Holigarna arnottiana* Hook.f.	324	
550	*Holoptelea integrifolia* (Roxb.) Planch.	261	38: b
551	*Homonoia riparia* Lour.	296	45: d
552	*Hopea parviflora* Bedd.	355	57: h
553	*Hoppea fastigiata* (Griseb.) C.B.Clarke	403	68: c
554	*Huberantha cerasoides* (Roxb.) Chaowasku	95	6: d
556	*Hultholia mimosoides* (Lam.) Gagnon & G.P.Lewis	212	27: a
557	*Hunteria zeylanica* Gardner ex Thwaites	414	69: g
558	*Hydnocarpus alpinus* Wight	286	43: c
559	*Hydnocarpus pentandrus* (Buch.-Ham.) Oken	286	43: d
560	*Hydrilla verticillata* (L.f.) Royle	106	8: f
561	*Hydrocotyle javanica* Thunb.	504	

562	*Hydrolea zeylanica* Vahl	435	73: h
563	*Hygrophila auriculata* (Schumach.) Heine	457	77: b
564	*Hygrophila ringens* (L.) R.Br. ex Spreng.	457	77: c
565	*Hymenodictyon obovatum* Wall.	391	
566	*Hymenodictyon orixense* (Roxb.) Mabb.	392	65: g
567	*Hypoxis aurea* Lour.	117	12: a
568	*Ichnocarpus frutescens* (L.) W.T.Aiton	414	69: h
569	*Impatiens balsamina* L.	378	
570	*Impatiens dasysperma* Wight	379	63: c
571	*Impatiens flaccida* Arn.	379	
572	*Impatiens gardneriana* Wight	379	
573	*Impatiens minor* (DC.) Bennet	380	
574	*Impatiens scapiflora* B.Heyne	380	
575	*Impatiens sp nov Aswani, Maya and Prabhukumar*	379	
576	*Indigofera astragalina* DC.	243	33: e
577	*Indigofera colutea* (Burm.f.) Merr.	243	33: f
578	*Indigofera glabra* L.	244	
579	*Indigofera hendecaphylla* Jacq.	244	
580	*Indigofera hirsuta* L.	244	33: g
581	*Indigofera tsiangiana* F.P.Metcalf	244	33: h
582	*Indigofera uniflora* Buch.-Ham. ex Roxb.	245	34: a
583	*Ipomoea alba* L.	425	71: h
584	*Ipomoea aquatica* Forssk.	426	72: a
585	*Ipomoea cairica* (L.) Sweet	426	72: b
586	*Ipomoea carnea* subsp. *fistulosa* (Mart. ex Choisy) D.F.Austin	426	
587	*Ipomoea eriocarpa* R.Br.	427	
588	*Ipomoea hederifolia* L.	427	
589	*Ipomoea nil* (L.) Roth	427	72: c
590	*Ipomoea obscur*a (L.) Ker Gawl.	428	
591	*Ipomoea pes-tigridis* L.	428	
592	*Ipomoea purpurea* (L.) Roth	428	72: d
593	*Ipomoea sagittifoli*a Burm.f.	429	
594	*Ipomoea staphylina* Roem. & Schult.	429	72: e
595	*Ipomoea triloba* L.	429	72: f
596	*Ipomoea wightii* Choisy	430	72: g
597	*Isachne globosa* (Thunb.) Kuntze	182	23: c
598	*Isachne walkeri* Arn. ex Steud.	182	
599	*Ischaemum molle* Hook.f.	183	
600	*Ischaemum rangacharianum* C.E.C.Fisch.	183	23: d
601	*Ischaemum rugosum* Salisb.	183	

602	*Ischaemum timorense* Kunth	184	
603	*Ixora brachiata* Roxb.	392	
604	*Ixora coccinea* L.	392	
605	*Ixora cuneifolia* Roxb.	393	65: h
606	*Ixora ravikumarii* Kottaim.	393	
607	*Jasminum auriculatum* Vahl	436	
608	*Jasminum coarctatum* Roxb.	437	74: a
609	*Jasminum flexile Vahl*	437	74: b
610	*Jatropha curcas* L.	296	45: e
611	*Jatropha gossypifolia* L.	297	45: f
612	*Justicia adhatoda* L.	458	
613	*Justicia gendarussa* Burm.f.	458	
614	*Justicia glauca* Rottler	459	
615	*Justicia tranquebariensis* L.f.	459	
616	*Justicia wynaadensis* B.Heyne	459	
617	*Kalanchoe olivacea* Dalzell	201	
618	*Knoxia sumatrensis* (Retz.) DC.	393	66: a
619	*Lagascea mollis* Cav.	498	
620	*Lagerstroemia microcarpa* Wight	316	50: a
621	*Lagerstroemia speciosa* Pers.	316	
622	*Laggera alata* (DC.) Sch.Bip. ex Oliv.	498	83: c
623	*Lannea coromandelica* (Houtt.) Merr.	325	51: f
624	*Lantana camara* L.	470	
625	*Laportea bulbifera* (Siebold & Zucc.) Wedd.	271	
626	*Laportea interrupta* (L.) Chew	271	39: 9
627	*Lawsonia inermis* L.	317	50: b
628	*Leea asiatica* (L.) Ridsdale	205	
629	*Leea indica* (Burm.f.) Merr.	205	26: a
630	*Leea macrophylla* Roxb. ex Hornem.	205	26: b
631	*Lemna gibba* L.	103	
632	*Lemna perpusilla* Torr.	103	8: a
633	*Leonotis nepetifolia* (L.) R.Br.	476	
634	*Lepidagathis incurva* Buch.-Ham. ex D.Don	459	77: d
635	*Lepidagathis spinosa* Wight ex Nees	460	77: e
636	*Lepisanthes tetraphylla* Radlk.	328	52: b
637	*Leptochloa chinensis* Nees	184	80: e
638	*Leucaena leucocephala* (Lam.) de Wit	213	
639	*Leucas aspera* Link	476	
640	*Leucas chinensis* (Retz.) Sm.	477	
641	*Leucas lavandulifolia* Sm., Cycl. [A. Rees]	477	80: f
642	*Libidibia coriaria* (Jacq.) Schltdl.	213	

643	*Limnophila heterophyll*a Benth.	442	
644	*Limnophila indica* (L.) Druce	442	75: a
645	*Limnophila repens* Benth.	442	75: b
646	*Lindernia hyssopioides* Haines	445	75: f
647	*Lindernia rotundifolia* (L.) Alston	445	
648	*Lindernia tamilnadensis* M.G.Prasad & Sunojk.	445	
649	*Litsea coriacea* (B.Heyne ex Nees) Hook.f.	99	
650	*Lobelia alsinoides* Lam.	487	
651	*Lobelia nicotianifolia* Roth	487	82: e
652	*Ludwigia hyssopifolia* (G.Don) Exell	318	50: d
653	*Ludwigia peruviana* (L.) H.Hara	318	50: e
654	*Luffa aegyptiaca* Mill.	276	
655	*Macaranga peltata* Müll.Arg.	297	45: g
656	*Machilus glaucescens* (Nees) Wight	99	7: b
657	*Maesa indica* (Roxb.) Sweet	384	64: d
658	*Mallotus philippensis* (Lam.) Müll.Arg.	298	45: h
659	*Mallotus resinosus* Merr.	298	46: a
660	*Mallotus rhamnifolius* Müll.Arg.	298	46: b
661	*Mallotus tetracoccus* Kurz	299	46: c
662	*Mangifera indica* L.	325	
663	*Manihot carthagenensis* subsp. *glaziovii* (Müll.Arg.) Allem	299	
664	*Manihot esculenta* Crantz	299	
665	*Manilkara zapota* (L.) P.Royen	381	
666	*Mansoa alliacea* (Lam.) A.H.Gentry	466	78: h
667	*Mappia nimmoniana* (J.Graham) Byng & Stull	385	64: g
668	*Martynia annua* L.	448	
669	*Mecardonia procumbens* (Mill.) Small	443	
670	*Megathyrsus maximus* (Jacq.) B.K.Simon & S.W.L.Jacobs	184	
671	*Meiogyne pannosa* (Dalzell) J.Sinclair	95	
672	*Meistera aculeata* (Roxb.) Škorničk. & M.F.Newman	136	16: c
673	*Melia azedarach* L.	337	54: c
674	*Melochia corchorifolia* L.	347	
675	*Memecylon talbotianum* D.Brandis	321	51: b
676	*Memecylon umbellatum* Burm.f.	322	51: c
677	*Merremia hederacea* (Burm.f.) Hallier f.	430	72: h
678	*Mesosphaerum suaveolens* (L.) Kuntze	477	
679	*Mesua ferrea* L.	284	
680	*Micrococca mercuriali*s Benth.	300	
681	*Microstachys chamaelea* (L.) Müll.Arg.	300	46: d
682	*Mikania micrantha* Kunth	499	

683	*Miliusa tomentosa* (Roxb.) Finet & Gagnep.	96	6: e
684	*Millingtonia hortensis* L.f.	466	
685	*Mimosa diplotricha* C.Wright	214	
686	*Mimosa pudica* L.	214	
687	*Mimusops elengi* L.	381	63: f
688	*Mitracarpus hirtus* DC.	393	66: b
689	*Mitragyna parvifolia* Korth.	394	66: c
690	*Mitrasacme prolifera* R.Br.	404	68: d
691	*Mitreola petiolata* (J.F.Gmel.) Torr. & A.Gray	404	
692	*Momordica charantia* L.	276	40: h
693	*Momordica dioica* Roxb. ex Willd.	277	
694	*Momordica sahyadrica* Kattuk. & V.T.Antony	277	41: a
695	*Monoon fragrans* (Dalzell) B.Xue & R.M.K.Saunders	96	6: f
696	*Monoon longifolium* (Sonn.) B.Xue & R.M.K.Saunders	96	
697	*Morinda coreia* Buch.-Ham.	394	66: d
698	*Moringa oleifera* Lam.	355	
699	*Morus alba* L.	268	
700	*Mucuna bracteata* DC. ex Kurz	245	34: b
701	*Mucuna monosperma* DC. ex Wight	245	34: c
702	*Mucuna pruriens* (L.) DC.	246	34: d
703	*Muntingia calabura* L.	338	54: d
704	*Murdannia dimorpha* G.Brückn.	127	14: b
705	*Murdannia esculenta* (Wall. ex C.B.Clarke) Abeyw.	127	14: c
706	*Murdannia japonica* (Thunb.) Faden	128	14: d
707	*Murdannia nudiflora* (L.) Brenan	128	14: e
708	*Murdannia semiteres* (Dalzell) Santapau	128	14: f
709	*Murdannia spirata* G.Brückn.	129	14: g
710	*Murdannia vaginata* G.Brückn.	129	
711	*Musa* × *paradisiaca* L.	130	
712	*Mussaenda frondosa* L.	395	
713	*Myristica fragrans* Houtt.	94	
714	*Myxopyrum smilacifolium* Blume	437	74: c
715	*Naregamia alata* Wight & Arn.	337	
716	*Naringi crenulata* (Roxb.) Nicolson	333	53: d
717	*Nelumbo nucifera* Gaertn.	200	
718	*Neonauclea purpurea* (Roxb.) Merr.	395	
719	*Nephelium lappaceum* L.	328	52: c
720	*Nerium oleander* L.	414	
721	*Nervilia concolor* Schltr.	114	
722	*Nervilia infundibulifolia* Blatt. & McCann	115	11: b
723	*Nervilia plicata* Schltr.	115	11: c

724	*Nervilia simplex* (Spreng.) Schltr.	115	11: d
725	*Neustanthus phaseoloides* Benth.	246	34: e
726	*Nicoteba betonica* Lindau	460	77: f
727	*Nostolachma crassifolia* (Gamble) Deb & J.Lahiri	395	
728	*Nyctanthes arbor-tristis* L., Sp. Pl. 1: 6 (1753).	438	
729	*Nymphaea nouchali* Burm.f.	90	5: a
730	*Nymphaea rubra* Roxb. ex Salisb.	90	5: b
731	*Oberonia bicornis* Lindl.	116	11: e
732	*Ocimum americanum* L.	478	
733	*Ocimum basilicum* L.	478	
734	*Ocimum gratissimum* L.	479	
735	*Ocimum tenuiflorum* L.	479	
736	*Ohwia caudata* (Thunb.) H.Ohashi	246	34: f
737	*Oldenlandia corymbosa* L.	396	66: e
738	*Oldenlandia herbacea* (L.) Roxb.	396	66: f
739	*Oldenlandia hygrophila* Bremek.	396	
740	*Oldenlandia umbellata* L.	397	66: g
741	*Operculina turpethum* (L.) Silva Manso	430	73: a
742	*Ophiorrhiza mungos* L.	397	66: h
743	*Ophiorrhiza rugosa* var. *decumbens* (Gardner ex Thwaites) Deb & Mondal	397	
744	*Oplismenus burmanni* (Retz.) P.Beauv.	185	
745	*Oplismenus compositus* P.Beauv.	185	23: e
746	*Opuntia dillenii* Haw.	377	63: a
747	*Opuntia ficus-indica* (L.) Mill.	377	63: b
748	*Orophea zeylanica* Hook.f. & Thomson	97	6: g
749	*Oroxylum indicum* (L.) Benth. ex Kurz	467	79: a
750	*Orthosiphon thymiflorus* (Roth) Sleesen	479	80: g
751	*Oryza meyeriana* Baill.	186	
752	*Oryza officinalis* Wall.	186	
753	*Oryza rufipogon* Griff.	186	23: f
754	*Oryza sativa* L.	187	
755	*Osbeckia aspera* Blume	322	
756	*Osbeckia gracilis* Bedd.	322	
757	*Osbeckia muralis* Naudin	323	51: d
758	*Ottelia alismoides* (L.) Pers.	106	8: g
759	*Ottochloa nodosa* (Kunth) Dandy	187	
760	*Ouret lanata* (L.) Kuntze	371	61: e
761	*Ouret sp. nov*	371	
762	*Oxalis corniculata* L.	282	42: d
763	*Oxyceros rugulosus* (Thwaites) Tirveng.	398	67: a

764	*Oxystelma esculentum* (L.f.) Decne.	415	
765	*Pancratium triflorum* Roxb.	117	12: b
766	*Pandanus canaranus* Warb.	109	9: e
767	*Panicum brevifolium* L.	187	
768	*Panicum notatum* Retz.	187	23: g
769	*Panicum paludosum* Roxb.	188	
770	*Paramignya monophylla* Wight	334	53: e
771	*Paramollugo nudicaulis* (Lam.) Thulin	374	
772	*Parasopubia delphiniifolia* (L.) H.-P.Hofm. & Eb.Fisch.	485st	82: c
773	*Parthenium hysterophorus* L.	499	
774	*Paspalum conjugatum* P.J.Bergius	188	
775	*Paspalum scrobiculatum* L.	188	23: h
776	*Passiflora foetida* L.	287	43: f
777	*Pavetta hispidula* Wight & Arn.	398	67: b
778	*Pavetta zeylanica* Gamble	398	67: c
779	*Pavonia zeylanica* (L.) Cav.	347	56: c
780	*Pedalium murex* L.	448	
781	*Peperomia pellucida* (L.) Kunth	90	5: c
782	*Pergularia daemia* (Forssk.) Chiov.	415	70: a
783	*Peristylus spiralis* A.Rich.	116	11: f
784	*Perotis indica* (L.) Kuntze	189	24: a
785	*Persicaria barbata* (L.) Hara	362	59: e
786	*Persicaria chinensis* (L.) H.Gross	362	59: f
787	*Persicaria glabra* (Willd.) M.Gómez	363	59: g
788	*Phanera scandens* (L.) Lour. ex Raf.	221	28: g
789	*Phaulopsis imbricata* Sweet	460	77: g
790	*Phoebe lanceolata* (Nees) Nees	100	7: c
791	*Phoenix loureiroi* Kunth	122	12: h
792	*Phyla nodiflora* (L.) Greene	470	79: e
793	*Phyllanthus airy-shawii* Jean F.Brunel & Jacq.Roux	308	47: g
794	*Phyllanthus amarus* Schumach. & Thonn.	308	
795	*Phyllanthus emblica* L.	308	47: h
796	*Phyllanthus maderaspatensis* L.	309	48: a
797	*Phyllanthus reticulatus* Poir.	309	48: b
798	*Phyllanthus rheedei* Wight	309	48: c
799	*Phyllanthus urinaria* L.	309	48: d
800	*Phyllanthus virgatus* G.Forst.	310	48: e
801	*Phyllocephalum courtallense* (Wight) Narayana	500	
802	*Phyllocephalum rangacharii* (Gamble) Narayana	500	
803	*Phyllodium pulchellum* Desv.	247	34: g
804	*Physalis angulata* L.	432	73: d

805	*Pigea enneasperma* (L.) P.I.Forst.	287	43: e
806	*Pilea microphylla* (L.) Liebm.	272	39: h
807	*Pilea victoriae* V.Suresh & Sojan	272	40: a
808	*Pimpinella heyneana* (DC.) Benth.	505	83: h
809	*Piper argyrophyllum* Miq.	91	5: d
810	*Piper longum* L.	91	5: e
811	*Piper nigrum* L.	92	5: f
812	*Piper umbellatum* L.	92	5: g
813	*Piper wightii* Miq.	92	
814	*Pistia stratiotes* L.	104	8: b
815	*Pithecellobium dulce* (Roxb.) Benth.	214	27: b
816	*Platostoma hispidum* (L.) A.J.Paton	480	80: h
817	*Pleurolobus gangeticus* (L.) J.St.-Hil. ex H.Ohashi & K.Ohashi	247	34: h
818	*Plumbago indica* L.	361	
819	*Plumbago zeylanica* L.	361	59: d
820	*Plumeria alba* L.	415	
821	*Pogonatherum crinitum* Kunth	189	
822	*Pogostemon pubescens* Benth.	480	
823	*Pogostemon purpurascens* Dalzell	480	81: a
824	*Polhillides velutina* (Willd.) H.Ohashi & K.Ohashi	248	35: a
825	*Polyalthia malabarica* (Bedd.) I.M.Turner	97	
826	*Polycarpaea corymbosa* (L.) Lam.	364	60: c
827	*Polycarpon prostratum* (Forssk.) Asch. & Schweinf.	364	60: d
828	*Polygala bolbothrix* Dunn	257	
829	*Polygala persicariifolia* DC.	257	37: b
830	*Polyspora obtusa* (Wall. ex Wight & Arn.) Niissalo & L.M.Choo	384	64: e
831	*Polytrias indica* (Houtt.) Veldkamp	189	
832	*Pongamia pinnata* (L.) Pierre, Fl. Forest	248	35: b
833	*Pontederia crassipes* Mart.	130	
834	*Pontederia vaginalis* Burm.f.	130	
835	*Portulaca oleracea* L.	375	62: e
836	*Portulaca pilosa* L.	375	62: f
837	*Pothos scandens* L.	104	8: c
838	*Pouzolzia zeylanica* (L.) Benn.	272	40: b
839	*Premna paucinervis* Gamble	481	81: b
840	*Premna tomentosa* Willd.	481	81: c
841	*Pristimera arnottiana* (Wight) R.H.Archer	280	41: h
842	*Prosopis juliflora* (Sw.) DC.	215	27: c
843	*Prunus ceylanica* Miq.	258	37: c
844	*Pseudarthria viscida* Wight & Arn.	248	35: c

845	*Pseudopogonatherum trispicatum* (Schult.) Ohwi	190	
846	*Psidium guajava* L.	320	
847	*Psilotrichum elliottii* Baker	371	
848	*Pterocarpus marsupium* Roxb.	249	
849	*Pupalia lappacea* (L.) Juss.	372	61: f
850	*Putranjiva roxburghii* Wall.	285	43: a
851	*Pycnospora lutescens* Schindl.	249	
852	*Radermachera xylocarpa* (Roxb.) K.Schum.	467	
853	*Rauvolfia serpentina* Benth. ex Kurz	416	
854	*Rauvolfia tetraphylla* L.	416	70: b
855	*Remusatia vivipara* (Roxb.) Schott	105	8: d
856	*Rhamphicarpa fistulosa* Benth.	486	
857	*Rhinacanthus nasutus* (L.) Kurz	461	77: h
858	*Rhopalephora scaberrima* (Blume) Faden	129	14: h
859	*Rhynchoglossum notonianum* (Wall.) B.L.Burtt	440	74: f
860	*Rhynchoglossum obliquum* Blume	440	74: g
861	*Rhynchoglossum scabrum* Dalzell	441	
862	*Ricinus communis* L.	300	46: e
863	*Rostellaria hedyotidifolia* Nees	461	78: a
864	*Rostellularia diffusa* (Nees) Nees	462	78: b
865	*Rostellularia procumbens* (L.) Nees	462	
866	*Rotala indica* (Willd.) Koehne	317	
867	*Rotala malampuzhensis* R.V.Nair ex C.D.K.Cook	317	
868	*Rotheca microphylla* (Blume) Callm. & Phillipson	481	81: d
869	*Rotheca serrata* (L.) Steane & Mabb.	482	81: e
870	*Rothia indica* Druce	250	35: d
871	*Ruellia prostrata* Poir.	462	
872	*Rungia pectinata* Nees	463	78: c
873	*Rungia wightiana* Nees	463	
874	*Saccharum spontaneum* L.	190	
875	*Sacciolepis indica* (L.) Chase	190	24: b
876	*Sacciolepis interrupta* Stapf	191	
877	*Salacia chinensis* L.	280	42: a
878	*Salacia macrosperma* Wight	280	
879	*Salomonia ciliata* DC.	257	
880	*Samanea saman* (Jacq.) Merr.	215	
881	*Santalum album* L.	359	
882	*Sapindus emarginatus* Vahl	329	
883	*Sapindus trifoliatus* L.	329	52: e
884	*Saraca asoca* (Roxb.) W.J.de Wilde	221	28: h
885	*Sarcostigma kleinii* Wight & Arn.	386	64: h

886	*Schleichera oleos*a (Lour.) Oken	329	52: f
887	*Schoenoplectiella articulat*a (L.) Lye	157	21: f
888	*Scleria lithosperma* (L.) Sw.	157	21: g
889	*Scleria oblata* S.T.Blake ex J.Kern	157	
890	*Scleromitrion diffusum* (Willd.) R.J.Wang	399	67: d
891	*Scoparia dulcis* L.	443	
892	*Scurrula cordifolia* G.Don	360	59: b
893	*Senegalia caesia* (L.) Maslin, Seigler & Ebinger	216	27: d
894	*Senegalia catechu* (L.f.) P.J.H.Hurter & Mabb.	216	
895	*Senegalia chundra* (Roxb. ex Rottler) Maslin	217	27: e
896	*Senegalia pennata* (L.) Maslin	217	27: f
897	*Senegalia rugata* Britton & Rose	217	
898	*Senna auriculata* Roxb.	218	27: g
899	*Senna hirsuta* (L.) H.S.Irwin & Barneby	218	27: h
900	*Senna occidentalis* (L.) Link	218	28: a
901	*Senna tora* Roxb.	219	28: b
902	*Sesamum indicum* L.	449	76: a
903	*Sesamum prostratum* Retz.	449	
904	*Sesamum radiatum* Thonn. ex Hornem.	449	
905	*Sesbania bispinosa* (Jacq.) W.Wight	250	35: e
906	*Setaria flavida* (Retz.) Veldkamp	191	
907	*Setaria pumila* Roem. & Schult.	191	24: c
908	*Sida acuta* Burm.f.	348	
909	*Sida beddomei* Jacob	348	
910	*Sida cordata* (Burm.f.) Borss.Waalk.	349	56: d
911	*Sida cordifolia* L.	349	56: e
912	*Sida rhombifolia* L.	349	56: f
913	*Sida rhombifolia* subsp. *alnifolia* (L.) Ugbor.	350	
914	*Sigesbeckia orientalis* L.	500	83: d
915	*Simarouba glauca* DC.	335	53: h
916	*Smilax wightii* A.DC.	110	9: g
917	*Smilax zeylanica* L.	111	9: h
918	*Smithia blanda* Wall.	250	35: f
919	*Smithia conferta* Sm.	251	35: g
920	*Smithia gracilis* Benth.	251	
921	*Solanum americanum* Mill.	433	
922	*Solanum lycopersicum* L.	433	
923	*Solanum melongena* L.	434	73: e
924	*Solanum melongena* subsp. *cumingii* (Dunal) J.Samuel,	434	
925	*Solanum multiflorum* Roth	434	
926	*Solanum torvum* Sw.	434	

927	*Solanum violaceum* Ortega	435	
928	*Sorghum bicolor* (L.) Moench	192	
929	*Spathodea campanulata* P.Beauv.	467	
930	*Spatholobus parviflorus* Kuntze	251	35: h
931	*Spermacoce articularis* L.f.	399	
932	*Spermacoce hispida* L.	400	
933	*Spermacoce lasiocarpa* R.Br.	400	67: e
934	*Spermacoce latifolia* Aubl.	400	
935	*Spermacoce ocymoides* Burm.f.	401	67: f
936	*Spermacoce pusilla* Wall.	401	67: g
937	*Sphaeranthus indicus* L.	500	
938	*Sphagneticola trilobata* (L.) Pruski	501	
939	*Sphenoclea zeylanica* Gaertn.	435	73: g
940	*Spirodela polyrhiza* (L.) Schleid.	105	8: e
941	*Spodiopogon rhizophorus* (Steud.) Pilg.	192	
942	*Spondias pinnata* (L.f.) Kurz	326	
943	*Sporobolus indicus* (L.) R.Br.	192	24: d
944	*Sporobolus pilifer* (Trin.) Kunth	193	
945	*Sporobolus tenuissimus* (Mart. ex Schrank) Kuntze	193	
946	*Sporobolus virginicus* (L.) Kunth	193	24: e
947	*Stachyphrynium spicatum* K.Schum.	131	
948	*Stachytarpheta jamaicensis* (L.) Vahl	471	79: f
949	*Stemodia verticillata* (Mill.) Hassl.	443	75: c
950	*Stephania japonica* (Thunb.) Miers	198	
951	*Stephania wightii* (Arn. ex Wight) Dunn	198	
952	*Sterculia foetida* L.	350	
953	*Sterculia guttata* Roxb.	351	56: g
954	*Sterculia urens* Roxb.	351	56: h
955	*Stereospermum colais* (Buch.-Ham. ex Dillwyn) Mabb.	468	79: b
956	*Streblus asper* Lour.	268	39: b
957	*Striga angustifolia* (D.Don) Saldanha	486	82: d
958	*Strobilanthes aurita* J.R.I.Wood	463	78: d
959	*Strobilanthes ciliata* Nees	464	
960	*Strobilanthes crossandra* (Steud.) J.R.I.Wood	464	
961	*Strobilanthes dupeni* Bedd. ex C.B.Clarke	464	
962	*Strobilanthes heyneana* Nees	465	78: e
963	*Strobocalyx arboreus* Sch.Bip.	501	83: e
964	*Strychnos nux-vomica* L.	404	
965	*Strychnos potatorum* L.f.	405	68: e
966	*Strychnos wallichiana* Steud. ex A.DC.	405	
967	*Stylosanthes fruticosa* (Retz.) Alston	252	36: a

968	*Swertia corymbosa* (Griseb.) Wight ex C.B.Clarke	403	
969	*Swietenia mahagoni* (L.) Jacq.	338	
970	*Symplocos acuminata* Miq.	385	64: f
971	*Synedrella nodiflora* (L.) Gaertn.	501	
972	*Syzygium cumini* (L.) Skeels	320	50: g
973	*Syzygium gardneri* Thwaites	321	50: h
974	*Syzygium laetum* (Buch.-Ham.) Gandhi	321	51: a
975	*Tabernaemontana alternifolia* L.	416	
976	*Talinum portulacifolium* Asch. ex Schweinf.	376	62: g
977	*Tamarindus indica* L.	222	
978	*Taxillus recurvus* (Wall. ex DC.) Tiegh.	360	
979	*Taxillus tomentosus* (B.Heyne ex Roth) Tiegh.	360	59: c
980	*Tecoma stans* (L.) Kunth	468	
981	*Tectona grandis* L.f.	482	
982	*Tephrosia canarensis* J.R.Drumm.	252	36: b
983	*Tephrosia maxima* Pers.	253	
984	*Tephrosia pumila* Pers.	253	36: c
985	*Tephrosia purpurea* Pers.	253	36: d
986	*Tephrosia villosa* (L.) Pers.	254	36: e
987	*Teramnus labialis* Spreng.	254	36: f
988	*Terminalia anogeissiana* Gere & Boatwr.	312	49: b
989	*Terminalia arjuna* (Roxb. ex DC.) Wight & Arn.	313	49: c
990	*Terminalia bellirica* (Gaertn.) Roxb.	313	49: d
991	*Terminalia catappa* L.	313	
992	*Terminalia chebula* Retz.	314	49: e
993	*Terminalia elliptica* Willd.	314	49: f
994	*Terminalia paniculata* Roth	314	49: g
995	*Tetrameles nudiflora* R.Br.	278	41: e
996	*Tetrapilus dioicus* (Roxb.) L.A.S.Johnson	438	
997	*Tetrastigma sulcatum* Gamble	206	
998	*Themeda triandra* Forssk.	194	24: f
999	*Theobroma cacao* L.	351	57: a
1000	*Theriophonum fischeri* Sivad.	105	
1001	*Theriophonum infaustum* N.E.Br.	106	
1002	*Thespesia populnea* (L.) Sol. ex Corrêa	352	57: b
1003	*Thottea siliquosa* (Lam.) Ding Hou	93	
1004	*Thottea sivarajanii* E.S.S.Kumar, A.E.S.Khan & Binu	94	
1005	*Thunbergia mysorensis* (Wight) T.Anderson	465	78: f
1006	*Thunbergia tomentosa* Wall. ex Nees	465	78 g
1007	*Tiliacora acuminata* (Lam.) Miers	199	25: c
1008	*Tinospora cordifolia* (Willd.) Miers ex Hook.f. &	199	

	Thomson		
1009	*Tithonia diversifolia* (Hemsl.) A.Gray	502	83: f
1010	*Tithonia rotundifolia* S.F.Blake	502	
1011	*Torenia crustacea* (L.) Cham. & Schltdl.	446	
1012	*Torenia bicolor* Dalzell.	446	75: g
1013	*Torenia hirsuta* Willd.	446	
1014	*Torenia lindernioides* C.J.Saldanha	447	
1015	*Tragia bicolor* Miq.	301	
1016	*Tragia involucrata* L.	301	46: f
1017	*Trapa natans* L.	318	50: c
1018	*Trema orientale* Blume	261	38: c
1019	*Trianthema portulacastrum* L.	372	61: g
1020	*Tribulus terrestris* L.	206	26: c
1021	*Trichodesma indicum* (L.) Sm.	421	71: a
1022	*Trichodesma zeylanicum* (Burm.f.) R.Br.	421	71: b
1023	*Trichosanthes cucumerina* L.	277	41: b
1024	*Trichosanthes tricuspidata* Lour.	278	41: c
1025	*Tridax procumbens* L.	503	
1026	*Trigastrotheca pentaphylla* (L.) Thulin	374	62: c
1027	*Trigonochloa uniflora* (Hochst. ex A.Rich.) P.M.Peterson & N.Snow	194	
1028	*Tripogon bromoides* Roem. & Schult.	194	24: g
1029	*Triumfetta pilosa* Roth	352	57: c
1030	*Triumfetta rhomboidea* Jacq.	352	
1031	*Typha angustifolia* L.	138	16: h
1032	*Uraria rufescens* Schindl.	254	36: g
1033	*Urena lobata* L.	353	57: d
1034	*Urena lobata* subsp. *sinuata* (L.) Borss.Waalk.	353	57: e
1035	*Urochloa distachyos* (L.) T.Q.Nguyen	195	
1036	*Urochloa panicoides* P.Beauv.	195	
1037	*Urochloa ramosa* (L.) T.Q.Nguyen	196	24: h
1038	*Utricularia graminifolia* Vahl	468	79: c
1039	*Utricularia lazulina* P.Taylor	469	
1040	*Vachellia nilotica* subsp. *indica* (Benth.) Kyal. & Boatwr.	219	28: c
1041	*Vanda testacea* Rchb.f.	116	11: g
1042	*Vicoa indica* DC.	503	83: g
1043	*Vigna mungo* (L.) Hepper	255	
1044	*Vigna radiata* (L.) R.Wilczek	255	
1045	*Vigna umbellata* (Thunb.) Ohwi & H.Ohashi	255	36: h
1046	*Vigna unguiculata* subsp. *sesquipedalis* (L.) Verdc.	256	
1047	*Vigna unguiculata* subsp. *unguiculata* (L.) Walp.	256	

1048	*Vincetoxicum indicum* (Burm.f.) Mabb.	417	70: c
1049	*Vitex altissima* L.f.	483	81: f
1050	*Vitex negundo* L.	483	
1051	*Vitex trifolia* L.	483	81: g
1052	*Volkameria heterophylla* Poir.	484	81: h
1053	*Volkameria inermis* L.	484	82: a
1054	*Wahlenbergia erecta* (Roth ex Roem. & Schult.) Tuyn	487	82: f
1055	*Waltheria indica* L.	354	57: f
1056	*Wattakaka volubilis* Stapf	417	70: d
1057	*Wendlandia thyrsoidea* Steud.	401	67: h
1058	*Wrightia tinctoria* R.Br.	417	
1059	*Xanthium strumarium* L.	503	
1060	*Xanthophyllum flavescens* Roxb.	258	
1061	*Xenostegia tridentata* (L.) D.F.Austin & Staples	431	73: b
1062	*Xylia xylocarpa* (Roxb.) W.Theob.	220	28: d
1063	*Xyris pauciflora* Willd.	139	17: a
1064	*Yamazakia pusilla* (Willd.) W.R.Barker, Y.S.Liang & Wannan	447	75: h
1065	*Yamazakia viscosa* (Hornem.) W.R.Barker, Y.S.Liang & Wannan	447	
1066	*Zanthoxylum asiaticum* (L.) Appelhans, Groppo & J.Wen	334	53: f
1067	*Zehneria maysurensis* Arn.	278	41: d
1068	*Zingiber neesanum* (J.Graham) Ramamoorthy	137	
1069	*Zingiber nimmonii* Dalzell	137	16: d
1070	*Zingiber officinale* Roscoe	138	16: e
1071	*Zingiber sabuanum* K.M.P.Kumar & A.Joe	138	16: f
1072	*Zingiber zerumbet* (L.) Sm.	138	16: g
1073	*Ziziphus mauritiana* Lam.	260	37: f
1074	*Ziziphus oenoplia* (L.) Mill.	260	37: g
1075	*Ziziphus rugosa* Lam.	260	37: h
1076	*Ziziphus xylopyrus* (Retz.) Willd.	261	37: a
1077	*Zornia gibbosa* Span.	256	37: a

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ISSN 0974-7907 (Online) | ISSN 0974-7893 (Print)

Note

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26 February 2020 | Vol. 12 | No. 3 | Pages: 15400–15404
DOI: 10.11609/jott.5673.12.3.15400-15404

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Journal of Threatened Taxa | www.threatenedtaxa.org | 26 February 2020 | 12(3): 15400–15404
ISSN 0974-7907 (Online) | ISSN 0974-7893 (Print)
DOI: https://doi.org/10.11609/jott.5673.12.3.15400-15404
#5673 | Received 01 January 2020 | Final received 07 February 2020 | Finally accepted 11 February 2020
PLATINUM OPEN ACCESS

NOTE

Record of *Oldenlandia hygrophila Bremek.* (Spermacoceae: Rubiaceae), a lesser known herb from Palghat Gap of Western Ghats, Kerala, India

Vadakkeveedu Jagadesh Aswani [1], Vasudevan Ambat Rekha [2], Pathiyil Arabhi [3], Manjakulam Khadhersha Jabeena [4], Kunnamkumarath Jisha [5] & Maya Chandrashekaran Nair [6]

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The genus *Oldenlandia* L. (1753) belonging to the tribe Spermacoceae Chamisso & Schlechtendal ex de Candolle (1830) of the family Rubiaceae is well distributed in the tropical and subtropical regions of the world (Govaerts et al. 2013). In India, the occurrence of the genus *Oldenlandia* is often debated with variable number of citations as 27 species (Hooker 1880) in the Flora of British India and 45 species (Gamble & Fischer 1923) in the Madras Presidency region alone. Estimates reveal the documentation of 14 species and one variety from the state of Kerala (Sasidharan 2011; Jose et al. 2015; Soumya et al. 2017).

Materials and Methods

During the exploratory studies on the floristic diversity of granitic hillocks in Walayar forest range of southern Western Ghats, the authors came across this taxon growing on the rocky outcrops near the dam site of Malampuzha in Palakkad District in July 2017. The specimens of the taxon were procured and herbarium was prepared using standard herbarium procedures. The plant specimens were characterised, measured and illustrated.

The specimen was identified to be *Oldenlandia hygrophila* Bremek. collected by Prof. Vasudevan Nair in 1972 cited from Malampuzha dam vicinity of Palakkad District (Bremekamp 1974) and confirmed the taxa from the type specimens deposited at Kew Herbarium (*O. hygrophila*: bar code no: K000031277). Regional herbaria (MH, KFRI and CALI) were consulted to check the presence of earlier collections of the taxon and found that N. Sasidharan had collected the taxa from Thrissur District in 1987 (Acc. No. KFRI 6945, collection No: N.S. 4635). Later, the taxa was reported from Muthanga region of Wayanad District in Kerala by Ratheesh Narayanan (RNMK 2228) in 2009. The taxon

Editor: K.P. Rajesh, Zamorin's Guruvayurappan College, Calicut, India. **Date of publication:** 26 February 2020 (online & print)

Citation: Aswani, V.J., V.A. Rekha, P. Arabhi, M.K. Jabeena, K. Jisha & M.C. Nair (2020). Record of *Oldenlandia hygrophila* Bremek. (Spermacoceae: Rubiaceae), a lesser known herb from Palghat Gap of Western Ghats, Kerala, India. *Journal of Threatened Taxa* 12(3): 15400–15404. https://doi.org/10.11609/jott.5673.12.3.15400-15404

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Funding: Kerala State Council for Science Technology and Environment (KSCSTE), Govt. of Kerala, The Council of Scientific and Industrial Research (CSIR).

Competing interests: The authors declare no competing interests.

Acknowledgements: First author and Jisha K. sincerely acknowledge financial support provided under the research fellowship programme and back-to-lab scheme by Kerala State Council for Science Technology and Environment (KSCSTE), Govt. of Kerala. Jabeena, M.K. acknowledges The Council of Scientific and Research Institute (CSIR) for the financial assistance. Authors like to extend sincere thanks to Director of Collegiate Education, Govt. of Kerala, and Principal, Govt. Victoria College, Palakkad for infrastructural support and encouragement. Authors are grateful to Prof. R. Vasudevan Nair, Rtd. Professor of Botany, Govt. Victoria College, Palakkad and Dr. K. M. Prabhukumar, CMPR, Kottakkal for their valuable comments in confirming the identity of the taxa. Rekha Vasudevan A., acknowledges University Grants Commission for granting FDP and authorities of Mercy College, Palakkad for necessary permissions in pursuing research. The authors sincerely acknowledge the support from Department of Forests, Govt. of Kerala for necessary permissions and assistance in exploring the forests of Palakkad District.

was not able to relocate from its type locality after its first collection by Prof. R. Vasudevan Nair in 1972. The acronyms for the herbaria follow the Index Herbariorum (Thiers 2018). The protologues of the allied taxa *Oldenlandia pumila* (L.f.) DC. and *Oldenlandia dineshii* Sojan & V. Suresh were also compared.

Oldenlandia hygrophila Bremek., Kew Bull. 29: 359. 1974; Narayanan, Fl. Stud. Wayanad Dist. 435. 2009. *Hedyotis hygrophila* (Bremek.) Bennet, Journ. Econ. Tax. Bot. 4: 592. 1983; Sasidharan et al., Bot. Stud. Med. Pl. Kerala 18. 1996; Sasidh. & Sivar., Fl. Pl. Thrissur For. 221. 1996; Dutta & Deb, Taxonomic Revision Hedyotis 140. 2004 (Figure 1 and Images 1,2).

Annual, erect, branched or unbranched herbs, 25–130 mm tall. Entire plant with sparsely distributed setiform cuticular protuberances. Stem quadrangular, minutely winged when old. Stipules connate, interpetiolar, 1.5–2

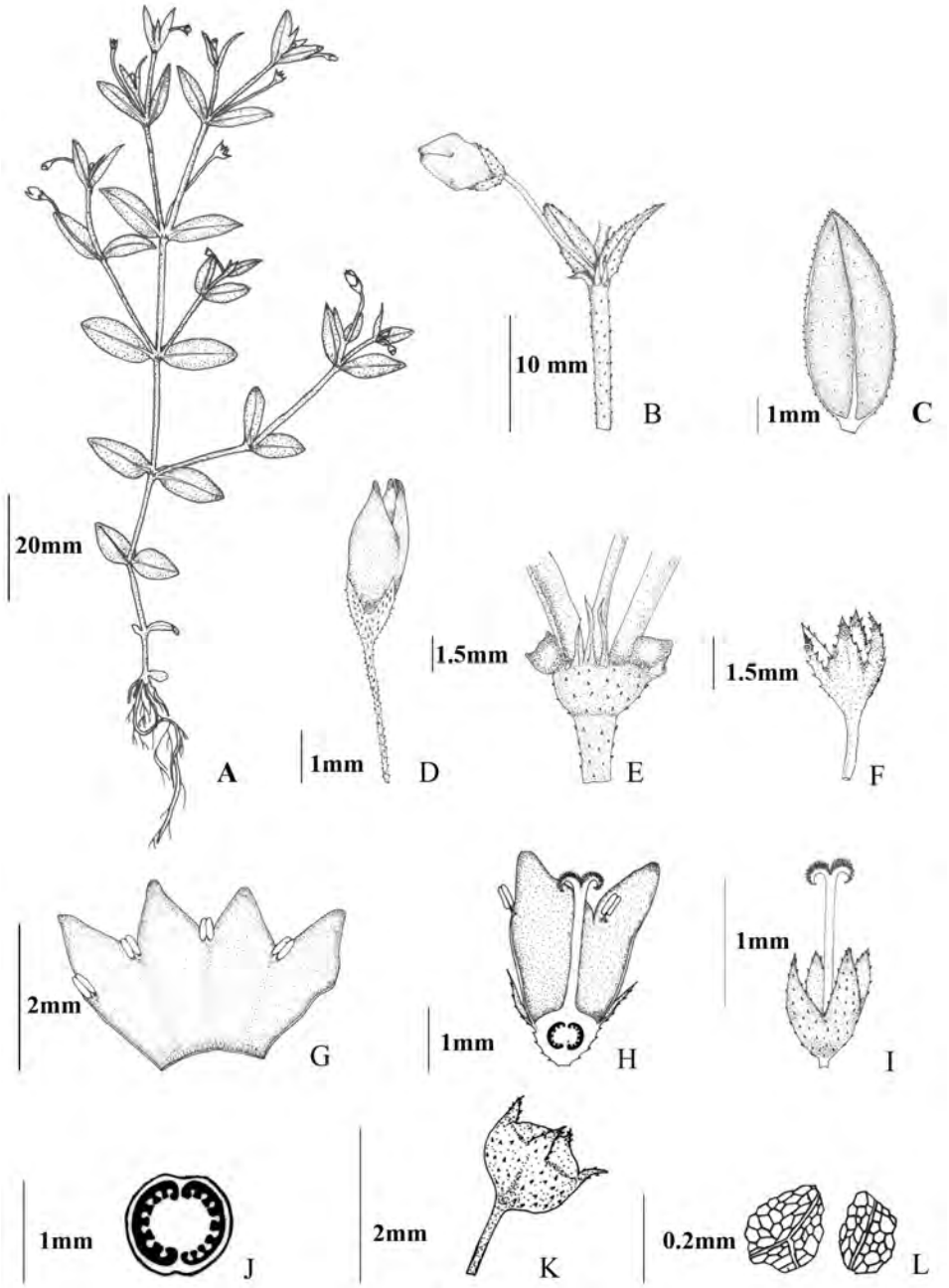

Figure 1. ***Oldenlandia hygrophila*** **Bremek.: A—habit | B—portion of a flowering twig | C—single leaf | D—single flower | E—part of node showing stipules | F—calyx | G—corolla tube opened showing stamens | H—L.S. of flower | I—gynoecium | J—C.S. of ovary | K—capsule | L—seeds. © V.J. Aswani & A. Rekha Vaudevan.**

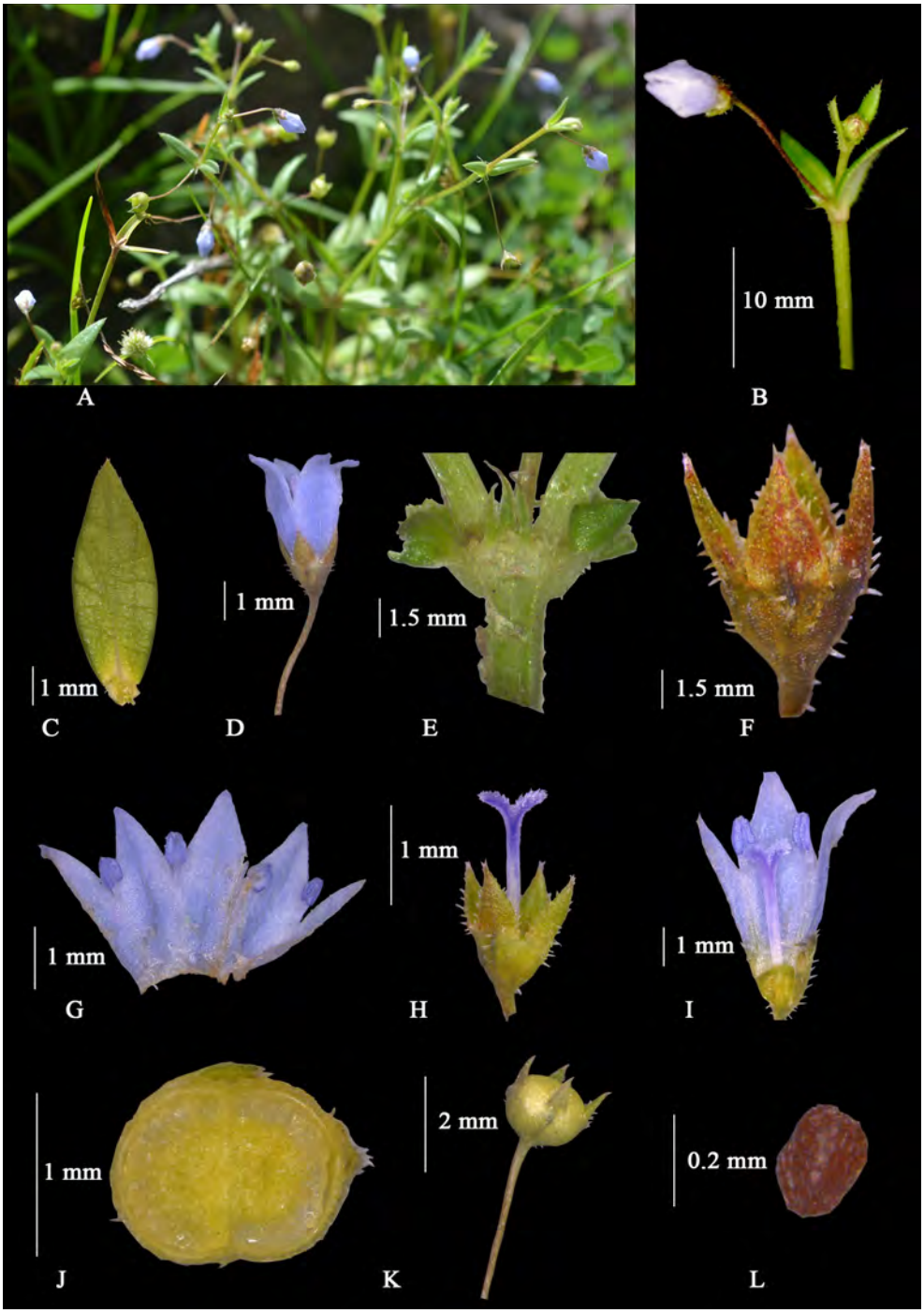

Image 1. ***Oldenlandia hygrophila*** **Bremek.: A—habit | B—portion of a flowering twig | C—single leaf | D—single flower | E—part of node showing stipules | F—calyx | G—corolla tube opened showing stamens | H—gynoecium | I—L.S. of flower | J—C.S. of ovary | K—capsule | L—seeds. © V.J. Aswani & M.K. Jabeena.**

mm long, 1–1.2 mm wide, with three bristles, middle one longer than the other two. Leaves sessile, 5–12 mm × 2–5 mm, linear lanceolate, 1–nerved, lamina base attenuate, margins recurved. Flowers axillary solitary, 3–3.5 mm long, corolla lobes not spreading when open. Pedicel slender, 6–10 mm, hypanthium ovoid and both laden with setiform cuticular protuberances. Calyx lobes 4, 1.5–2 mm × 0.8–1 mm, reaching one fourth of the corolla tube, margins entire, apex acute. Corolla blue, tube 2–2.2 mm long, lobe 1mm long, oblong, apex acute, glabrous outside and with small hyaline hairs inside at the base. Stamens 4, inserted, adnate to sinus of corolla

Table 1. Taxonomic delineation of *Oldenlandia hygrophila* from *O. dineshii* and *O. pumila*

Taxonomic Trait	*Oldenlandia hygrophila*	*O. dineshii*	*O. pumila*
Habit	Erect herb, branched and unbranched, 25–130 mm tall	Erect herb, dichotomously branched 50–200 mm tall	Branched prostrate or diffuse herbs
Stem	4–angled, minutely winged with setiform cuticular protuberances	4–angled, minutely winged, glabrous	Acutely angular, minutely dentate on ribs
Leaf	Linear-lanceolate, setiform cuticular protuberances present, 5–12 × 2–5 mm	Linear-lanceolate, sparsely scabrid, 10–20 × 5–8 mm	Elliptic-lanceolate, 7–18 x 1–6 mm
Leaf margin and leaf apex	Entire with regular setiform cuticular protuberances, recurved, apex acute, base attenuate	Apex acute, base attenuate	Scabrid above along margin and midrib below
Stipules	Bristles 3, 1.5–2 mm long, base broad up to 1–1.2 mm, middle one longer than other two	Bristles 2–3, 2–4 mm long, base broad up to 5mm.	Bristles 2–5, 2–3 mm long
Inflorescence	Axillary, solitary flowers alternating at nodes	Axillary, solitary or terminal 2–4 flowered cyme	Solitary or 2–flowered cyme
Flowers	3–3.5 mm long, blue	5–7 mm long, blue, campanulate	3–4 mm long, white
Pedicel	6–10 mm	4–6 mm long	10–15 mm long
Hypanthium	Ovoid with setiform cuticular protuberances	Ovoid, puberulous	Ovoid
Level of calyx lobes	One fourth of corolla tube	Much below the corolla tube	Below the level of corolla
Calyx	Margin entire with setiform cuticular protuberances, apex acute 1.5–2 × 0.8–1 mm long	Margin setulose, apex acute, 0.7–1 × 0.5–0.7 mm long	Margin dentate, lobes 4, rarely 5, ovate–lanceolate or triangular, apex acute, 0.5–0.6 mm long
Corolla	Lobes not spreading, tube 2–2.2 mm long, lobes 1mm long, oblong, acute at tip, glabrous outside and minute hyaline hairs at the base of corolla tube inside, apex slightly reflexed	Broadly campanulate, tube 2.5–4 mm long, lobes 2.5–3.5 mm long, minutely pubescent outside glabrous inside, apex reflexed	2mm long, tube 1.2–1.3 mm long, pubescent at throat; lobes 0.5–0.8 x 0.5–0.6 mm, ovate, acute, incurved at apex.
Stamens	Inserted, filaments 0.25mm long, glabrous	Inserted, filaments 0.7–1 mm long, hairy	Included, filaments 0.2–0.3 mm long
Anther	0.75mm	1–1.2 mm	3–4 mm long
Stigma	Bilobed, papilose	Bifid, hispid	Bilobed, papillose fleshy, tufted hairy
Capsule	Sub–globose 2×2 mm	Ovoid, 2.5–3 × 1.5–2.5 mm	Ellipsoid or oblong-ovoid
Seed	Many, angular, with minor grooves 0.2–0.3 x 0.2–0.3 mm	Many, angular 0.3–0.5 x 0.3–0.5 mm	Many, 0.7 x 0.1 mm, angular

lobes, introrse. Filaments 0.25mm long, glabrous. Anthers linear 0.75mm. Style 1.5mm long, glabrous. Stigma bilobed, 1mm, densely papillose. Ovary 1×1mm, 2–celled, many ovuled in axile placentation. Capsule sub-globose, 2×2 mm, loculicidally dehiscent from apex, with slightly raised crown above. Seeds numerous, trigonal, reticulate 0.3×0.2 mm.

Specimens examined: 361 (GVCH), 24 vii 2017, INDIA: Kerala: Palakkad District, Walayar range, Akathethara section, Koomachimala, 10.829°N, 76.676°E, 14m, coll. Aswani & Maya; 177855 (MH) 24.vii.2017, INDIA: Kerala: Palakkad District, Walayar range, Akathethara section, Koomachimala, 10.829°N, 76.676°E, 14m, coll. Aswani & Maya; 7004 (CALI) 24.vii.2017, INDIA: Kerala: Palakkad District, Walayar range, Akathethara section, Koomachimala, 10.829°N, 76.676°E, 14m, coll. Aswani & Maya.; 399 (GVCH) 12.viii.2017, INDIA: Kerala: Palakkad District, Walayar range, Akathethara section, Malampuzha (Koomachimala), 10.834°N, 76.680°E, 48m, coll. Aswani & Arabhi; 543 (GVCH) 15.ix.2017, INDIA: Kerala: Palakkad District, Walayar range, Akathethara section, Dhoni Hills, Neelippara, 10.8647°N, 76.6282°E, 282m, coll. Aswani & Rekha; 4173 (GVCH) 08.vii.2019, INDIA: Kerala: Palakkad District, Walayar range, Akathethara section, Malampuzha (Koomachimala), 10.829°N, 76.676°E, 15m, coll. Aswani & Jabeena (GVCH– Government Victoria College Herbarium).

Phenology: Flowering: June–August; Fruiting: July–September.

Distribution: India, Kerala: Palakkad, Wayanad, Thrissur districts.

Additional specimens examined: K000031277 (K), s.n. 1972, India, Kerala, Malampuzha near Palghat hardly 100m below, coll. R. Vasudevan Nair; 6945(KFRI), Collection no: N.S. 4635, 22.ix.1987, Peechi, Thrissur, coll. N. Sasidharan.

Ecology: This plant grows at an elevation of 14–252m in hydro geomorphic exposed rock surfaces along with *Drosera indica* L., *Utricularia lazulina* P.Taylor, *U. graminifolia* Vahl, *Indigofera uniflora* Buch. - Ham.

ex Roxb., *Desmodium triflorum* (L.) DC. and *Polygala persicariifolia* DC.

Threat status: This taxon could not be recollected from its earlier reported locations of forest areas in Thrissur and Wayanad districts of Kerala except from its type locality near Malampuzha Village very near to Malampuzha Dam region of Palakkad District, Kerala after its first collection in 1972. Exhaustive surveys across Palghat gap region covering the nearby forest ranges also could not locate the taxon. This gives us evidence of its narrow distributional range and that it can considered endemic to southern Western Ghats (restricted to Kerala). Till date, the taxon's existence was doubted due to lack of collection or further reports. This may be the reason that the taxon has not yet been evaluated as per the IUCN Red List 2019. Since the population size is very small, distributed in a narrow stretch of hydro-geomorphic habitats of less than 10km^2, the taxon can be assigned the status of Critically Endangered (CR) as per IUCN version 2019-3 (IUCN 2019).

Taxonomic delineation of *Oldenlandia hygrophila* from *O. dineshii* and *O. pumila*

Oldenlandia hygrophila is similar to *O. dineshii* in quadrangular stem and possession of blue flowers, but differs in the presence of setiform cuticular protuberance all over the plant, solitary axillary flowers smaller in size (2.5–3.0 x 1.5–2.0 mm), corolla lobes not spreading when open, sepals reaching one fourth the length of corolla tube, corolla tube glabrous outside, but with hyaline hairs at the base inside and glabrous staminal filaments. *O. hygrophila* differs from *O. pumila* in having erect nature of plant, linear-lanceolate leaves, solitary axillary blue flowers, shorter pedicels, calyx lobes reaching one-fourth the level of corolla lobes, corolla with minute hyaline hairs at the base of corolla tube inside and with sub–globose capsule. Comparison of taxonomic characters of *O. hygrophila* with *O. dineshii* and *O. pumila* is given in Table 1.

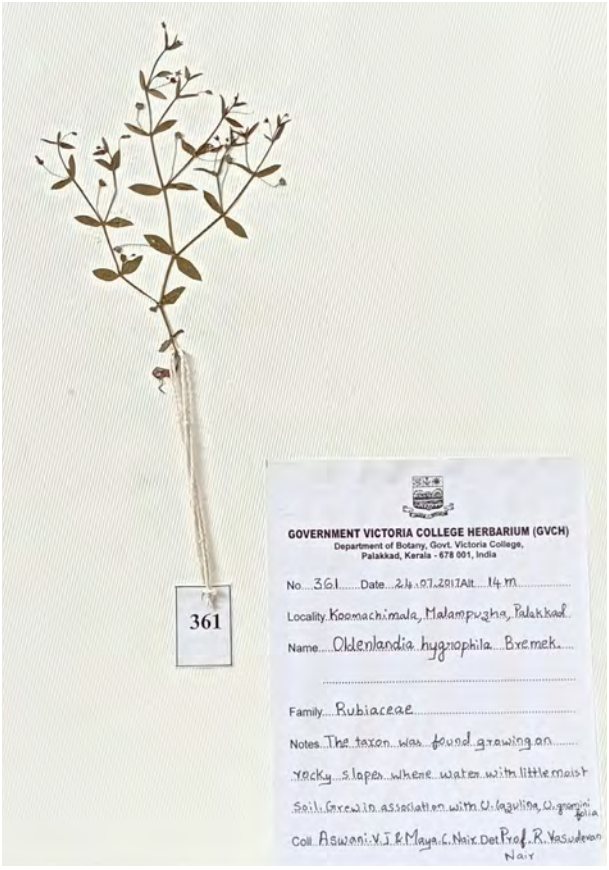

Image 2. Herbarium of *Oldenlandia hygrophila* Bremek.

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ISSN 0974-7907 (Online) | ISSN 0974-7893 (Print)

February 2020 | Vol. 12 | No. 3 | Pages: 15279–15406
Date of Publication: 26 February 2020 (Online & Print)
DOI: 10.11609/jott.2020.12.3.15279-15406

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ISSN 0974-7907 (Online) | ISSN 0974-7893 (Print)

Note

The Malay Cardamom *Meistera aculeata* (Roxb.) Škornič. & M.F. Newman (Zingiberaceae: Alpinioideae) from the Palghat gap: a new record to Kerala, India

Vadakkeveedu Jagadesh Aswani, Manjakulam Khadhersha Jabeena & Maya Chandrashekaran Nair

26 April 2021 | Vol. 13 | No. 5 | Pages: 18406–18410
DOI: 10.11609/jott.6578.13.5.18406-18410

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Member

Journal of Threatened Taxa | www.threatenedtaxa.org | 26 April 2021 | 13(5): 18406–18410
ISSN 0974-7907 (Online) | ISSN 0974-7893 (Print)
https://doi.org/10.11609/jott.6578.13.5.18406-18410
#6578 | Received 17 August 2020 | Final received 12 March 2021 | Finally accepted 30 March 2021
OPEN ACCESS
NOTE

The Malay Cardamom *Meistera aculeata* (Roxb.) Škorničk. & M.F. Newman (Zingiberaceae: Alpinioideae) from the Palghat gap: a new record to Kerala, India

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Zingiberaceae, the ginger family, comprises 53 genera and more than 1,375 species widely distributed throughout tropical Africa, Asia, and America (Kress et al. 2002; Kong et al. 2010). *Amomum* Roxb s.l. is the second largest genus in the family Zingiberaceae with about 150–180 species (Xia et al. 2004). The distribution of the genus in India is concentrated in northeastern India, peninsular India, and the Andaman & Nicobar Islands with 22 species (Thomas & Sabu 2012). *Amomum* is reported to have 48 species in the Flora of British India (Hooker 1894), while five species were reported by Fischer (1928) in the Flora of Presidency of Madras. Recent taxonomic studies have resulted in the discovery of 12 taxa under the genus *Amomum* (Thomas et al. 2010, 2012a,b, 2014, 2015, 2016; Thomas & Sabu 2012; Hareesh & Sabu 2018).

Presently *Amomum* is circumscribed to a monophyletic genus based on multi-marker phylogenetic framework using matK and nrITS as markers. The targeted sampling combined with the molecular data, phylogenetic analysis and morphological characters allowed the re-circumscription of 10 clades of the genus *Amomum* as separate genera (De Boer et al. 2018). Accordingly, certain species in the genus *Amomum* are either resurrected or transferred to the genus *Meistera* Giseke.

Meistera is characterized by semi-lunar anther crest, echinate fruit and solitary flower in each fertile bract (Thomas & Sabu 2018). The genus comprises 42 species and three varieties, and is distributed from Sri Lanka and India, throughout the Indo-Chinese region to Sundaland (De Boer et al. 2018).

During the exploratory studies on the floristic diversity in the Walayar forest range of the southern Western Ghats, the authors collected specimens belonging to the genus *Meistera* growing on the foothills of Jamanthimala coming under Pudussery North Section (10.863°N & 76.789°E) near the Palakkad Gap region in June 2019. The specimens were preserved as herbarium using standard herbarium procedures. The specimen was identified as *Meistera aculeata* (Roxb.) Skornick. & M.F. Newman after consulting relevant taxonomic

Editor: V. Sampath Kumar, Botanical Survey of India, Coimbatore, India. **Date of publication:** 26 April 2021 (online & print)

Citation: Aswani, V.J., M.K. Jabeena & M.C. Nair (2021). The Malay Cardamom *Meistera aculeata* (Roxb.) Škorničk. & M.F.Newman (Zingiberaceae: Alpinioideae) from the Palghat gap: a new record to Kerala, India. *Journal of Threatened Taxa* 13(5): 18406–18410. https://doi.org/10.11609/jott.6578.13.5.18406-18410

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Funding: 1.Kerala State Council for Science, Technology and Environment (KSCSTE), Govt. of Kerala [No. KSCSTE/769/2018 - FSHP LS]; 2. The Council of Scientific and Industrial Research (CSIR) [08/675(0001)/2017-EMR-1]

Competing interests: The authors declare no competing interests.

Acknowledgements: First author sincerely acknowledges the financial support received under the research fellowship programme by Kerala State Council for Science Technology and Environment (KSCSTE), Govt. of Kerala. Jabeena, M.K. thank the Council for Scientific and Industrial Research (CSIR) for the financial assistance. Authors like to extend sincere thanks to Director of Collegiate Education, Govt. of Kerala, and Principal, Govt. Victoria College, Palakkad for the facilities provided for carrying out research. First author wish to thank Dr. M. Sabu and Dr. Thomas V.P. for their valuable comments in confirming the identity of the taxa. The authors sincerely acknowledge the support from Department of Forests, Govt. of Kerala for necessary permissions and assistance in exploring the forests of Palakkad District.

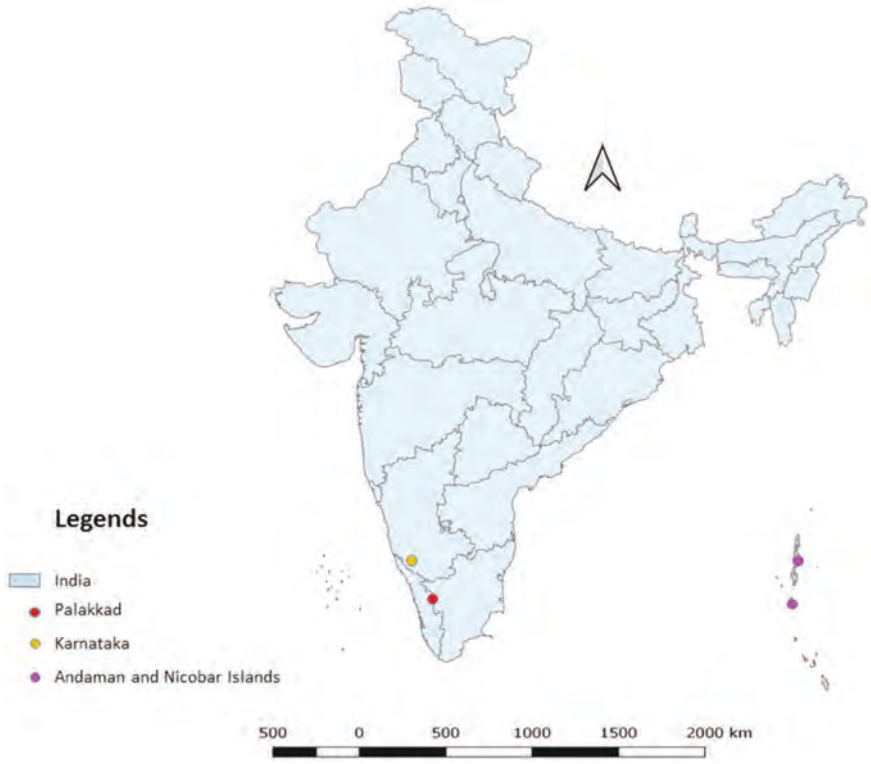

Figure 1. Known locations of the Malay Cardamom *Meistera aculeata* (Roxb.) Škorničk. & M.F. Newman in India. Map by V.J. Aswani.

literature and the type specimen housed at the Natural History Museum (BM).

Balakrishnan & Nair (1979) reported this species from the Andaman & Nicobar islands and recently, this was reported from Kodagu in Karnataka (Patil & Lakshminarasimhan 2018) as a new addition to its distribution in mainland India. Our collection from the foothills of Jamanthimala forms a new record to the flora of Kerala as this taxon has not been included in any of the literature pertaining to the flowering plants of Kerala (Vajravelu 1990; Sasidharan 2002, 2011; Nayar et al. 2006, 2014) as well as the revisionary studies on *Amomum* s.l. (Sabu 2006; Thomas 2011). A detailed description of the taxon along with photographs and distribution map is provided. The specimens are deposited at Madras Herbarium (MH), Calicut University Herbarium (CALI), and Government Victoria College Herbarium (GVCH).

Meistera aculeata (Roxb.) Škorničk. & M.F.Newman in Taxon 67(1): 25. 2018. *Amomum aculeatum* Roxb. in Asiat. Res. 11: 344, t. 6. 1810 & Fl. Ind., Carey and Wall. ed. 1: 40. 1820; Baker in Hook. f. Fl. Brit. Ind. 6: 242. 1894; N.P. Balakr. & N.G. Nair in J. Bombay Nat. Hist. Soc. 76: 196. 1979; Vasudeva Rao in J. Econ. Taxon Bot. 8: 151. 1986; Karthik. et al. Fl. Ind. Enumerat. -Monocot.: 290. 1989; Sameer Patil & Lakshmin. in J. Threat. Taxa 10(13): 12850. 2018. *Amomum hatuanum* Náves in Fernandez-Villar & Naves, Nov. App.: 224. 1880 (Image 1).

Type: Ind. Orient., India, *William Roxburgh* s.n. (BM000958151, Image!)

Perennial herb, 2–3.5 m tall with distichous leaves. Root stock rhizomatous, branched and creamy brown within. Leafy shoots elongated, 2–3 cm thick, reddish brown towards base. Leaves sessile or shortly petiolate; lamina 30–60 cm long and 5–9 cm broad, oblong-lanceolate, acuminate at apex, cuneate at base, margins entire, glabrous on both surfaces, midrib yellowish-green, glabrous; petioles 0–3 mm long. Ligules bifid or subentire, longer than petiole, 1–1.5 cm long. Spikes many flowered borne directly from root stock, peduncles 10–15 cm long, 1–1.25 cm thick, glabrous. Bracts many, imbricate, very closely sheathing and spirally arranged, ovate, reddish-brown, cuspidate at apex, 4–6 cm long, 2.5–3.5 cm broad, glabrous inside and puberulous outside. Fertile bracts pinkish-red, ovate, cuspidate at apex, 4–5 cm long and 2–2.5 cm wide, puberulous towards base inside, glabrous towards apex on both surfaces. Each floral bract subtends a single flower. Bracteole tubular, abruptly 3 lobed, 1.4–1.6 cm long, membranous towards apex, glabrous on both surfaces. Flowers 1–4, open simultaneously in a head pattern with older flowers beneath which appears brown and slimy, 4–4.5 cm long. Calyx tubular, 2–2.5 cm long, 1.2–1.6 cm wide, 3 lobed from middle,

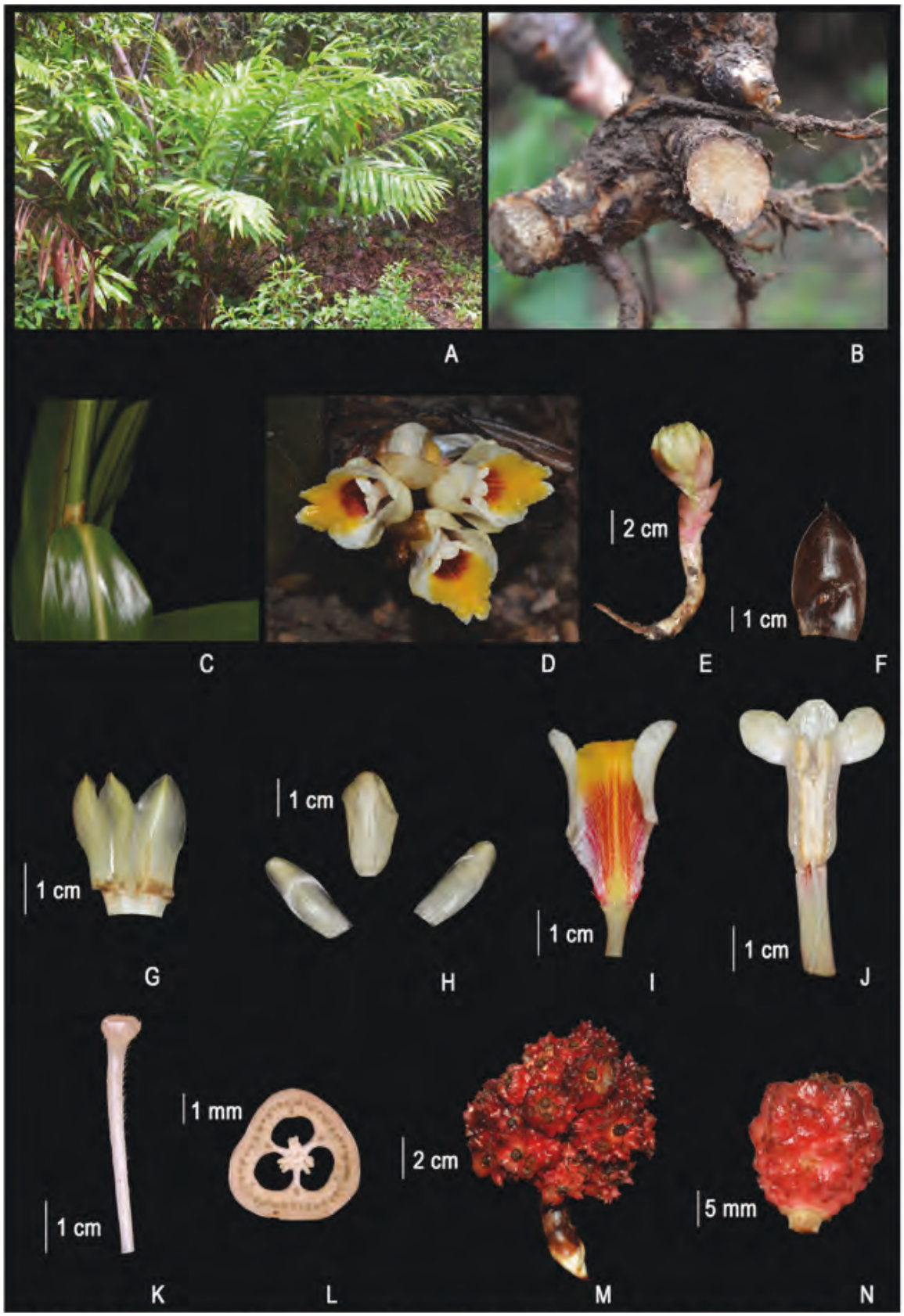

Image 1. ***Meistera aculeata*** **(Roxb.) Škorničk. & M.F.Newman. A—Habit | B—Rhizome | C—Ligule | D—Flowers | E—Inflorescence at bud stage | F—Floral bract | G—Calyx | H—Petals | I—Labellum | J—Stamen with petaloid anther crest | K—A portion of style with stigma | L—C.S of Ovary | M—Fruit cluster | N—Single fruit. © Aswani, V.J. & Jabeena M.K.**

apex mucronate, margins ciliate. Corolla tube 1.8–2.8 cm long, white, glabrous. Dorsal corolla lobe obovate, broader than lateral lobes, 2–2.8 cm long, rounded at apex, margins ciliate and slightly wavy. Lateral corolla lobes oblong, 1.2–1.5 x 1–1.5 cm long, rounded at apex, margins ciliate. Labellum obovate, trilobed, 3.5–3.6 cm wide, margins slightly undulate, glabrous. Median lobe truncate, clefted, white with yellow along with red streaks towards base and lateral lobes orbicular, lateral staminodes 2, subulate at base, red, 0.2–0.3 cm long, glabrous; anther one, oblong, 1.2–1.5 cm long, 0.3–0.4 cm broad furnished with a white petaloid anther crest; anther crest tri–lobed, middle lobe truncate or rounded and lateral lobes orbicular; thecae oblong, 1.2–1.5 cm long, white with irregular pink spots, apex rounded, base slightly acute, glabrous dehiscing throughout length. Gynoecium 4.8–5 cm, ovary 0.3–0.5 cm long, minutely pubescent, three celled with many ovules in each cell; style 3.8–4 cm long, glabrous except for ciliate hairs on one side half way long; stigma cup shaped, 0.1cm long and 0.15cm wide, creamy yellow with ciliate hairs in mouth region. Fruits 1.5–1.8 x 1.3 cm, echinate in clusters, glabrous, deep red when mature, many seeded.

Specimen examined: 177854 (MH) 23.vi.2019, INDIA: Kerala: Palakkad District, Walayar forest range, Pudussery North Section, Jamanthimala, 10.863°N & 76.789°E, 559.2m, coll. Aswani & Maya; 7005 (CALI) 23.vi.2019, Palakkad District, Walayar forest range, Pudussery North Section, Jamanthimala, 10.863°N & 76.789°E, 559.2m, coll. Aswani & Maya; 4078 (GVCH), 23.vi.2019, Palakkad District, Walayar forest range, Pudussery North Section, Jamanthimala, 10.863°N & 76.789°E, 559.2m, coll. Aswani & Maya; 4153 (GVCH) 01.vii.2019, Palakkad District, Walayar range, Pudussery North Section, Jamanthimala, 10.864°N & 76.788°E, 561.8m coll. Aswani; 4385 (GVCH) 19.vii.2019, Palakkad District, Walayar range, Akamalavaram section, Malampuzha (Moochikadavu), 10.880°N & 76.703°E, 500.5m, coll. Aswani & Maya.

Flowering: May–July; Fruiting: July–August.

Distribution: India (Karnataka: Kodagu – Pushpagiri Wildlife Sanctuary; Kerala: Palakkad, Walayar, Pudussery North, Jamanthimala; Andaman Islands: Figure 1), Myanmar, Thailand, Vietnam, Indonesia, Malay Archipelago, Malaysia, also extending across Wallace's Line to Sulawesi, New Guinea, and Australia.

Ecology: This plant grows at an elevation of 500–600m in humus-covered semi-evergreen forest floor. Small populations at an average of 20–30 mature plants were observed within a distance of 100m. The taxon was found growing in some restricted localities of Walayar forest range along with *Ancistrocladus heyneanus* Wall. ex J. Graham, *Atalantia monophylla* D.C., *Dioscorea oppositifolia* L., *Cyclea peltata* (Lam.) Hook.f. & Thomson and *Anamirta cocculus* (L.) Wight & Arn.

Discussion

In the Palghat Gap region, exhaustive surveys covering the nearby forest ranges could not locate this species. Recently, this species was reported from Pushpagiri Wildlife sanctuary, Kodagu, Karnataka (Patil & Lakshminarasimhan 2018) and earlier from Andaman & Nicobar Islands (Balakrishnan & Nair 1979). Further, the threat status of the taxon is designated as Least Concern on the IUCN Red List (Olander 2020). As the population is discrete and discontinuous, the most appropriate causes for these disjunctions need to be studied and exhaustive explorations are required to fix the threat status of this taxon.

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ISSN 0974-7907 (Online) | ISSN 0974-7893 (Print)

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Date of Publication: 26 April 2021 (Online & Print)
DOI: 10.11609/jott.2021.13.5.18099-18410

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Phytotaxa 496 (3): 269–274
https://www.mapress.com/j/pt/
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Article

ISSN 1179-3155 (print edition)
PHYTOTAXA
ISSN 1179-3163 (online edition)

https://doi.org/10.11646/phytotaxa.496.3.5

Glycosmis nelliyampathiensis (Rutaceae), a new species from southern Western Ghats, Kerala, India

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Abstract

A new species, *Glycosmis nelliyampathiensis* from Nelliyampathy hill ranges of southern Western Ghats, Palakkad, Kerala, India is described and illustrated here. The plant differs from its allied species *G. angustifolia* in terms of its unifoliolate leaves, elliptic leaflets, 1–4 flowered monochasial cymose inflorescence, hairiness of the corolla apex, sub-capitate stigma and ellipsoid-oblong fruit.

Keywords: Aurantioideae, *Glycosmis angustifolia*, Nelliyampathy, Palakkad

Introduction

The genus *Glycosmis* Correa (1805:384) belongs to the tribe Clauseneae Engler (1931:187) of the sub-family Aurantioideae Engler (1896:95). The sub-family Aurantioideae is a strongly supported monophyletic group that is defined by a number of morphological, cytological and chemical synapomorphies (Chase *et al.* 1999, Groppo *et al*. 2008, Kubitzki *et al.* 2011, Morton & Telmer 2014). *Glycosmis* is a very well-characterized genus and can be distinguished from its nearest allies, *Clausena* Burm.f. (1768:87) and *Murraya* J. Koenig (1771:554) by its persistent style, ferruginous puberulent bracts, bracteoles and sepals (Gamble 1919, Stone 1985, Nair 1992). The genus consists of about 51 species with a distribution range from tropical and subtropical Asia to northern Australia (POWO 2021). In India, 16 taxa (8 species and 8 varieties) were recognized so far (Nair & Nayar 1997, Murugan & Manickam 2004).

While exploring the floristic diversity of the hill ranges of Nelliyampathy forest region of Kerala, the authors came across an unknown population of *Glycosmis* in Kurissumala area, which was morphologically distinct from known species. Detailed morphological studies revealed that the collected specimens show close resemblance with *G. angustifolia* Lindl. (1832: 6378) ex Wight & Arn. (1834: 93) in terms of having a distinct gynophore which is broader than the glabrous 3-celled ovary but differs in many attributes (Table 1). Based on these observations, it is apparent that, the collected species is so far unknown to science and which is described and illustrated here as *Glycosmis nelliyampathiensis sp. nov.*

Materials and methods

Explorations for documenting the floristic diversity of hill ranges of Nelliyampathy forest of Palakkad district, Kerala were conducted between 2017 and 2020. The specimens of the new taxon were collected in June 2019 and herbarium was made using standard procedures (Bridson & Forman 1998, De Vogel 1987). In order to assess the population size of the taxon, the area was divided into small grids of 2×2 km area and the number of mature individuals in each

Accepted by Prabhukumar K.M.: 25 Mar. 2021; published: 14 Apr. 2021

grid were counted (Cox 1990). Morphological traits of the specimens were characterized, measured, illustrated and photographed using Leica S8 APO Stereo Zoom microscope. The protologues of the allied taxa along with other literature were compared (Hooker 1875, Stone 1985, Nair 1992, Nair & Nayar 1997). The identity of the taxon has been further confirmed through the examination of type sheets and other voucher specimens housed at various herbaria (K, BM, CAL, CALI, MH).

Taxonomy

Glycosmis nelliyampathiensis Jabeena & Maya *sp. nov.* (Figs 1 & 2)

Type:—INDIA: Kerala: Palakkad district, Kurissumala, Nelliyampathy hills, 10°31'28.9"N, 76°40'04.6"E, 950 m, 22 June 2019, *Jabeena M.K. & Maya C. Nair* 2062 (Holotype: MH; Isotype: CALI, LWG)

Diagnosis:—*Glycosmis nelliyampathiensis* Jabeena & Maya *sp. nov.* morphologically shows similarities with its allied species *G. angustifolia* but differs from the latter by its unifoliolate leaves (vs. pinnate leaves), elliptic leaflets (vs. lanceolate), 1–4 flowered monochasial cymose inflorescence (vs. compound racemose), hairiness at apex of corolla lobes (vs. glabrous), sub-capitate stigma (vs. obtuse) and ellipsoid-oblong fruit (vs. globose or sub-globose).

Description:—Small tree up to 4 m high. Stem terete, younger parts minutely hairy. Leaves born on an articulated petiole, unifoliolate (rarely 2-3 foliolate), up to 5-leaflets in juvenile shoots; leaflets alternate; petiolule 0.3–0.5 cm, grooved above; lamina 7–9 × 3–4 cm, elliptic, acute at base, entire at margin, obtuse at apex, minutely hairy beneath, glabrous above, pellucid gland dotted, midrib prominent, lateral veins obscure. Flowers in axillary 1–4 flowered monochasial cyme, actinomorphic, 0.7–0.8 × 0.4–0.5 cm, bisexual, pentamerous, fragrant. Sepals 5, green, gamosepalous, ca. 0.1 cm long, ovate, acute at apex, outer surface with rusty puberulent hairs, imbricate. Petals 5, 0.5 × 0.2 cm, ovate, obtuse at apex with hyaline hairs, white, imbricate. Stamens 10, all fertile, outer longer 0.3–0.4 × 0.08–0.12 cm, inner shorter 0.15–0.23 × 0.08–0.12 cm; anthers oblong, yellow, adnate, with an apical gland; filaments broad, white, glabrous. Ovary 3-loculed, seated on a swollen gynophore broader than the ovary, ca. 2×1.5 mm, ovoid, gland-dotted, glabrous; style thick, small; stigma sub-capitate; ovule 1 in each locule, pendulous. Fruit a berry with a remnant persistent style, 1-seeded, ca. 1 × 0.7 cm, ellipsoid-oblong, gland dotted, creamy turning pink, glabrous. Seed ca. 0.8 × 0.5 cm, glabrous.

Phenology:—Flowering and fruiting during June–September.

Etymology:—The specific epithet is named after the type locality, Nelliyampathy hill ranges in Palakkad District, Kerala, India.

Distribution and ecology:—Specimens of the new species were collected from four different locations of Nelliyampathy hills of Kerala *viz*., Keshavanpara, Kurissumala, Mattumala and Chakkaliyampara at an elevation of 950–1100 m. The new species is found growing in semi-evergreen forests along with *Clausena indica* (Dalzell 1851: 33) Oliver (1861: 36) and *Aglaia edulis* (Roxburgh 1824: 430) Wallich (1840: 26), and each population consists of 5–8 mature individuals. Currently, the taxon is known only from the hill ranges of Nelliyampathy and exhaustive explorations in Western Ghats are inevitable to confirm the distribution and status assignment.

Additional specimens examined:—INDIA. Kerala: Palakkad District, Nelliyampathy hills, Mattumala, 10˚32′31.8″ N, 76˚42′05.2″ E, 951 m, 15 May 2019, *Jabeena M.K. & Maya C. Nair* 1794 (CALI); Chakkaliyampara, 10˚31′38.5″ N, 76˚40′19.4″ E, 1033 m, 06 July 2019, *Jabeena M.K. & Maya C. Nair* 2125 (CALI); 26 August 2019, *Jabeena M.K. & Maya C. Nair* 2339 (MH); Keshavanpara, 10˚31′31″ N, 76˚39′47″ E, 960 m, 20 August 2020, *Jabeena M.K. & Maya C. Nair* 4160 (LWG)

Taxonomic key to the Indian species of *Glycosmis*

1. Ovary seated on a distinct gynophore 2
- Ovary seated on a minute fleshy disc 11
2. Gynophore broader than ovary; ovary glabrous 3
- Gynophore narrow; ovary rusty-puberulent or pilose 7
3. Ovary 1-loculed ..... *G. tirunelveliensis*
- Ovary 3–5 loculed 4
4. Ovary 3-loculed 5
- Ovary 4–5 loculed 6

5. Inflorescence condensed paniculate cyme; petals glabrous; stigma oblong; fruit globose or sub-globose ..... *G. angustifolia*
- Inflorescence a monochasial cyme; petals hairy at apex; stigma sub-capitate; fruit ellipsoid-oblong ..... *G. nelliyampathiensis*
6. Sepals deltoid; style continuous with ovary, not clearly distinct, glabrous ..... *G. macrocarpa*
- Sepals ovate; style distinct, deciduous tomentose ..... *G. borana*
7. Ovary ellipsoid; style distinct; stigma sub-capitate ..... *G. pilosa*
- Ovary ovoid-cylindric, rarely sub-globose; style scarcely distinct from ovary; stigma truncate 8
8. Leaflets linear-lanceolate, acute at both ends ..... *G. mauritiana* var. *linearifolia*
- Leaflets ovate or elliptic, apex acute or acuminate 9
9. Secondary nerves of leaflets upto 8 pairs ..... *G. mauritiana* var. *mauritiana*
- Secondary nerves of leaflets upto 16 pairs 10
10. Leaflets long acuminate at apex, lustrous ..... *G. mauritiana* var. *insularis*
- Leaflets short acuminate at apex, not lustrous ..... *G. mauritiana* var. *andamanensis*
11. Berries sub-globose, creamy white or salmon-reddish when ripe, mamillate 12
- Berries obovoid or oblong, purplish-black when ripe, smoothly or pitted glandular 13
12. Ovary conical or ovoid-cylindric; base cuneate or obtuse; apex acute, obtuse, rounded or acuminate; flowers perfect ..... *G. pentaphylla* var. *pentaphylla*
- Ovary columnar; base and apex tapering; flowers abortive ..... *G. pentaphylla* var. *linearifolia*
13. Sepals ovate, ferruginous pubescent; berries solitary axillary ..... *G. singuliflora*
- Sepals sub-orbicular, puberulent or glabrous; berries few to many in axillary or terminal paniculate infructescence 14
14. Leaves simple ..... *G. cyanocarpa* var. *simplicifolia*
- Leaves compound (1 or 3 or 5 foliolate) 15
15. Panicles short, condensed, up to 3 cm long ..... *G. cyanocarpa* var. *linearifolia*
- Panicles spreading, up to 10 cm long 16
16. Apex caudate acuminate; leaflets greenish or yellow on drying ..... *G. cyanocarpa* var. *cymosa*
- Apex abruptly acuminate; leaflets brown on drying ..... *G. cyanocarpa* var. *fuscescens*

Acknowledgements

First author acknowledges financial support provided by Council of Scientific and Industrial Research (CSIR) and Aswani V.J. is grateful to Kerala State Council for Science Technology and Environment (KSCSTE), Govt. of Kerala for financial assistance. Authors like to extend sincere thanks to Director of Collegiate Education, Govt. of Kerala, and Principal, Govt. Victoria College, Palakkad for infrastructural support and encouragement. Authors are grateful to Dr. K. Narayanan Nair, Senior Principal Scientist, Plant Diversity, Systematics and Herbarium Division, CSIR-National Botanical Research Institute for his valuable suggestions in confirming the novelty of the taxa and Dr. Mathew Dan, Senior Scientist, JNTBGRI, Thiruvananthapuram for assistance in procuring germplasm of *G. angustifolia*. The authors sincerely acknowledge the support from Department of Forests, Govt. of Kerala for necessary permissions and assistance in exploring the forests of Palakkad District.

TAbl E 1. Taxonomic delineation of *Glycosmis nelliyampathiensis sp. nov.* from *G. angustifolia.*

Characters	*Glycosmis nelliyampathiensis sp. nov.*	*G. angustifolia*
Habit	small tree up to 4 m tall	shrub, 2–3 m tall
Leaves	unifoliolate (rarely 2–3 foliolate). In juvenile stage, leaflets upto 5, alternate	leaves pinnate, leaflets 2–5, alternate or opposite.
Leaf Lamina	elliptic, obtuse at apex	narrowly lanceolate, obtusely acuminate at apex
Inflorescence	1–4 flowered monochasial cyme	15-20 flowered short compound raceme
Petal	obtuse with hairy apex	obtusely acuminate with glabrous apex
Stigma	sub-capitate	obtuse
Fruit	ellipsoid-oblong	globose or sub-globose

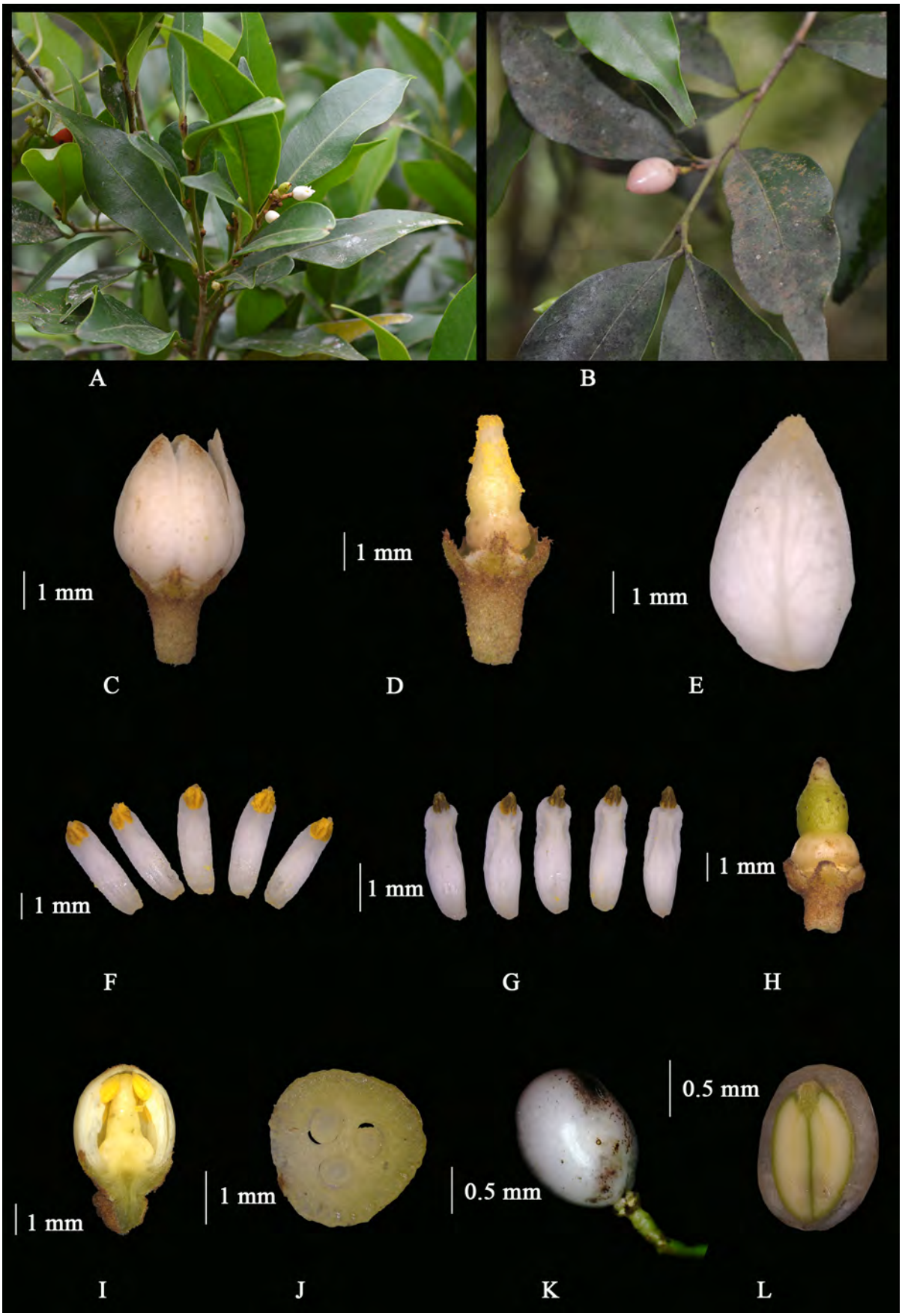

FIGURE 1. *Glycosmis nelliyampathiensis* A. Habit. B. Fruiting twig C. Single flower. D. Calyx with gynoecium. E. Petal. F. Inner stamens. G. Outer stamens. H. Gynoecium. I. L.S. of flower. J. C.S. of ovary. K. Fruit. L. L.S. of Fruit. (Photos: Jabeena M. K. and Aswani V. J)

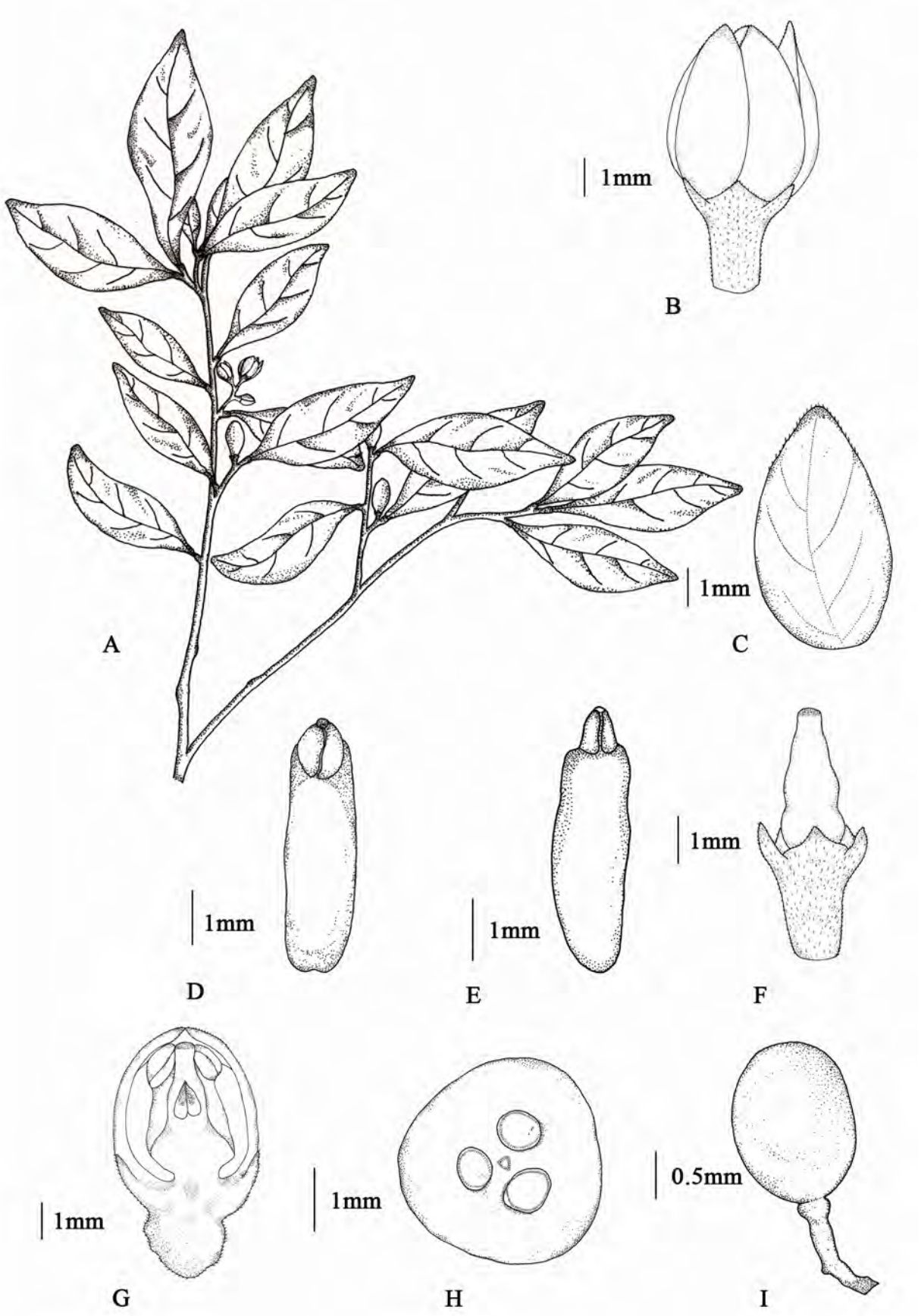

FIGURE 2. *Glycosmis nelliyampathiensis* A. Habit. B. Single flower. C. Petal. D. Inner stamen. E. Outer stamen. F. Calyx with gynoecium. G. L.S. of flower. H. C.S. of ovary I. Fruit (Illustration by Jabeena M. K. from Jabeena M.K. & Maya C. Nair 2062)

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