TAXONOMY, MOLECULAR PHYLOGENY AND ECOLOGICAL FUNCTIONS IN FOREST DYNAMICS OF *FICUS* L. (MORACEAE) IN THE WESTERN GHATS

Thesis submitted to the
University of Calicut in partial fulfilment of the
requirements for the award of degree of

DOCTOR OF PHILOSOPHY IN BOTANY

By

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OCTOBER 2023

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This is to certify that the thesis entitled "**TAXONOMY, MOLECULAR PHYLOGENY AND ECOLOGICAL FUNCTIONS IN FOREST DYNAMICS OF *FICUS* L. (MORACEAE) IN THE WESTERN GHATS**", submitted to the University of Calicut by Mr. Sreehari S Nair, for the award of PhD. Degree in Botany is a record of bonafide doctoral research work carried out by him under the supervision and guidance of Dr. Amitha Bachan K.H., Assistant Professor and Research Guide, Research Department of Botany of this College during the period 2019–2023. No part of this thesis has formed the basis for the award of any degree or diploma or other similar title or recognition previously.

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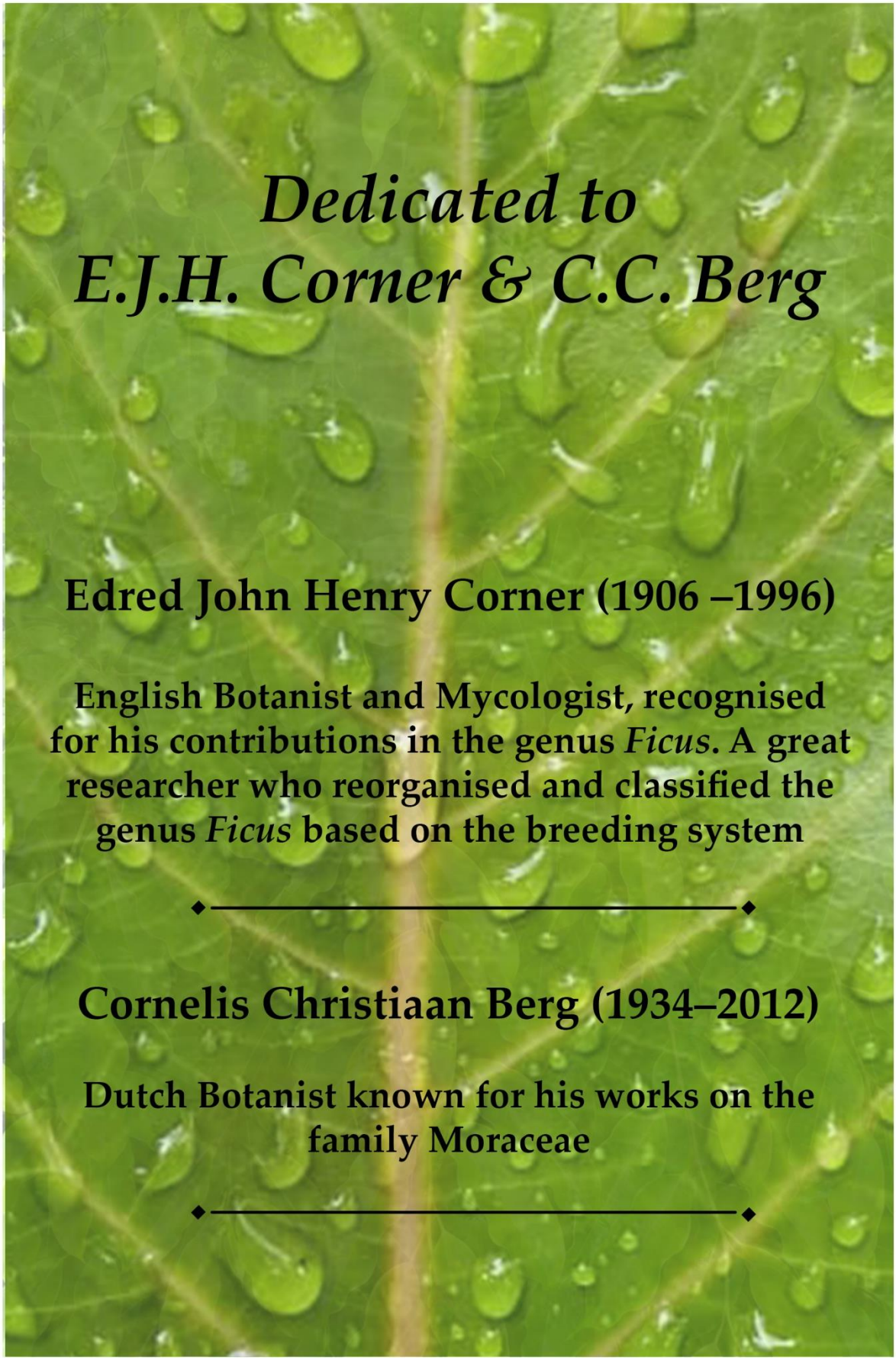
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DECLARATION

I, **Sreehari S Nair,** hereby declare that the thesis entitled **"TAXONOMY, MOLECULAR PHYLOGENY AND ECOLOGICAL FUNCTIONS IN FOREST DYNAMICS OF *FICUS* L. (MORACEAE) IN THE WESTERN GHATS"** being submitted in partial fulfilment of requirements for the degree of **Doctor of Philosophy in Botany** of the **University of Calicut** embodies the results of a bonafide research work done by me under the guidance of Dr. Amitha Bachan K.H., Assistant Professor and Research Guide, Research Department of Botany, MES Asmabi College, Kodungallur, Kerala, India. No part of this thesis has formed the basis for the award of any degree or diploma or any other similar title or recognition previously.

P. Vemballur

Sreehari S Nair



Dedicated to E.J.H. Corner & C.C. Berg

Edred John Henry Corner (1906 –1996)

English Botanist and Mycologist, recognised for his contributions in the genus *Ficus*. A great researcher who reorganised and classified the genus *Ficus* based on the breeding system

Cornelis Christiaan Berg (1934–2012)

Dutch Botanist known for his works on the family Moraceae

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ABSTRACT

The present study focuses on the taxonomy, phenetic analysis, molecular phylogeny, and ecological role in forest dynamics of the genus *Ficus* L. in the Western Ghats. A total of 37 taxa of *Ficus* (34 species, 2 subspecies, and 3 varieties) were recorded in the present study. *F. virens* var. *dispersa* was reported as a new distributional record to India and *F. virens* var. *matthewii* was recorded as a new distributional record in Kerala state. 24 taxa belonged to the subgenus *Urostigma* and no member was recorded from the subgenus *Ficus.* The IUCN status of *F. beddomei* is evaluated as Endangered category, two under Vulnerable category (*F. costata* and *F. dalhousiae*) and one under Data Deficient category (*F. travancorica*). The IUCN status of 14 taxa were Least Concern and 19 were Not Evaluated. As per the phenetic analysis, the clustering based on syconium characters was different from the clustering based on overall morphological characters. The clustering pattern based on overall morphological characters was almost similar to the infrageneric and natural classification systems. The present molecular study using markers *ITS* and *trnH-psbA* provided adequate delimitation even between the morphologically similar and cryptic taxa. *ITS* and *trnH-psbA* were found to be the efficient markers for molecular studies in the genus *Ficus.* The results of molecular analysis using *trnH-psbA* did not match the infrageneric and natural classifications. 66.6% of the *Ficus* species studied were dominant species in representing vegetation, providing canopy cover, and maintaining the ecological integrity of the vegetation. The general assumption of figs killing the host species and hence destroying the vegetation was found to be ecologically wrong, as figs provide more canopy cover in the vegetation and eventually replace only a single tree, especially in canopy gap filling in disturbed tropical evergreen forests.

Keywords: *Ficus,* Taxonomy, Phenetics, Molecular phylogeny, Ecology, Western Ghats.

സംഗ്രഹം

പശ്ചിമഘട്ടത്തിലെ ആൽ വർഗ്ഗത്തിൽപ്പെട്ട (ജനുസ്സ് - ഫൈക്കസ്) ചെടികളുടെ വർഗ്ഗീകരണ ശാസ്ത്രം, സാമ്യ-വ്യത്യാസ പഠനം, തന്മാത്ര-തലത്തിലെ പരിണാമ പഠനം, കാടിന്റെ സ്വഭാവ രൂപീകരണത്തിലെ പങ്ക് തുടങ്ങിയ വിഷയങ്ങളാണ് ഈ പഠനത്തിന്റെ ഭാഗമാക്കിയത്. ആകെ 37 ഇനം ആൽ വർഗ്ഗത്തിൽപ്പെട്ട ചെടികളാണ് പശ്ചിമഘട്ട പ്രദേശത്ത് നിന്ന് ഈ പഠനത്തിന്റെ ഭാഗമായി തിരിച്ചറിയാൻ സാധിച്ചിട്ടുള്ളത്. അതിൽ *F. virens* var. *dispersa* എന്ന ഇനം ഇന്ത്യയിലും, *F. virens* var. *matthewii* എന്ന ഇനം കേരളത്തിലും കാണപ്പെടുന്നുണ്ട് എന്നത് ഈ പഠനത്തിലൂടെ മനസ്സിലാക്കാൻ സാധിച്ചു. യൂറോസ്റ്റിഗ്മ എന്ന ഉപ-ജനുസ്സിൽ 24 അംഗങ്ങൾ ഉള്ളതായും അതുപോലെ ഫൈക്കസ് എന്ന ഉപ-ജനുസ്സിൽപ്പെട്ട അംഗങ്ങളാരും ഈ പ്രദേശത്ത് കാണപ്പെടുന്നില്ല എന്നും മനസ്സിലാക്കാൻ സാധിച്ചു. അന്താരാഷ്ട്രപരിസ്ഥിതി സംരക്ഷണസംഘടനയുടെ വംശനാശ ഭീഷണി നേരിടുന്ന സസ്യങ്ങളുടെ പട്ടികയിൽ *F. beddomei* എന്ന ഇനം ആൽമരം ഉൾപ്പെട്ടിട്ടുണ്ട്. കൂടാതെ *F. costata, F. dalhousiae* എന്നീ ഇനങ്ങൾ ഭാവിയിൽ വംശനാശ ഭീഷണി നേരിടുന്ന വിഭാഗമായി മാറാൻ സാധ്യതയുള്ളതായി മനസ്സിലാക്കാൻ സാധിച്ചു.

ആൽ വർഗ്ഗത്തിൽപ്പെട്ട സസ്യങ്ങളെ അവയുടെ പൂക്കളുടെ സ്വഭാവത്തിന്റെ അടിസ്ഥാനത്തിലും പൊതുസ്വഭാവത്തിന്റെ അടിസ്ഥാനത്തിലും തരംതിരിക്കാൻ സാധിക്കും. ഇതിൽ പൊതുസ്വഭാവത്തിന്റെ അടിസ്ഥാനത്തിലുള്ള വർഗ്ഗീകരണമാണ് കൂടുതൽ കൃത്യതയുള്ളതും ശരിയായതും എന്നും മനസിലാക്കാം. വളരെ സമാനമായതും, തിരിച്ചറിയാൻ ബുദ്ധിമുട്ടേറിയതുമായ ആൽ വർഗ്ഗത്തിൽപ്പെട്ട സസ്യങ്ങളെപ്പോലും കൃത്യമായി വേർതിരിക്കാൻ തന്മാത്ര-തലത്തിലെ പഠനത്തിനായി ഉപയോഗിച്ച *ITS*, *trnH-psbA* എന്നീ മാർക്കറുകൾക്ക് സാധിക്കും എന്നും മനസ്സിലായി.

പഠനവിധേയമാക്കിയ സസ്യങ്ങളിൽ, 66.6 ശതമാനവും വനങ്ങളുടെ സ്വഭാവികതയും സന്തുലിനാവസ്ഥയും നിലനിർത്തുന്നതിൽ പ്രധാന പങ്കു വഹിക്കുന്നുണ്ട്. ആൽ വൃക്ഷങ്ങൾ ആതിഥേയസസ്യങ്ങളെ നശിപ്പിക്കുകയും അതുവഴി അവിടുത്തെ സസ്യ-വിസ്തൃതിയെ ഇല്ലാതാക്കുകയും ചെയ്യുമെന്ന പൊതു അനുമാനം പാരിസ്ഥിതികമായി തെറ്റാണെന്ന് മനസ്സിലാക്കാൻ സാധിച്ചു. കാരണം ആൽവൃക്ഷങ്ങൾ ആതിഥേയ വൃക്ഷത്തിൽ പടർന്ന് കയറുകയും തുടർന്ന് ആ വൃഷം ക്ഷയിക്കുമ്പോൾ, അതിനെ മാറ്റി സ്ഥാപിക്കുകയും, അതുവഴി സസ്യപടർപ്പ് കൂട്ടുകയും ചെയ്യുന്നു. ഉഷ്ണമേഖലാ നിത്യഹരിത വനങ്ങളിൽ സസ്യപടർപ്പ് ഇടമുറിയാതെ നിലനിർത്താൻ ഇത് വളരെയധികം സഹായകമാവുകയും ചെയ്യുന്നു.

സൂചകപദം: ഫൈക്കസ്, വർഗ്ഗീകരണ ശാസ്ത്രം, സാമ്യ-വ്യത്യാസ പഠനം, തന്മാത്ര-തലത്തിലെ പരിണാമ പഠനം, പരിതഃസ്ഥിതിവിജ്ഞാനം, പശ്ചിമഘട്ടം.

GENERAL INTRODUCTION

CHAPTER 1

Chapter 1

GENERAL INTRODUCTION

The Moraceae family commonly called the mulberry family or the fig family, is one of the most abundant and diverse family among the angiosperm plants. *Ficus* L. is the dominant and popular genus in the family and are generally referred as 'figs'. The genus *Ficus* L. is characterised by the presence of simple, alternate leaves, milky latex, three primary nerves, cystolith and typically the hypanthodium inflorescence. Figs are widely distributed in the world and mainly in the tropics and sub tropics (Corner, 1965a; Berg, 1989; Berg & Corner; 2005) and is seen from low to high altitudes. They are also diverse with respect to the habitat pattern, as it ranges from shrubs, trees, climbers, epiphytes as well as hemi epiphytes and are regarded as one among the oldest and most successful species of higher plants (Lansky & Paavilainen, 2011). The figs are ecologically important in many aspects including its wide range of adaptability, symbiotic relationship with wasps, as stranglers which fill canopy gaps in the degraded forest and its ability of resilience to various threats and natural disasters.

The genus was first described by Linnaeus (1753) in Species Plantarum. Later many revision works were done in the genus from ancient times but the works remained incomplete and problematic due to the varied nomenclature as well as identification problems. Major contribution of works at global level in the genus were done by Corner since 1930. The Asian region alone had more than 350 species of *Ficus* L. (Serrato *et al*., 2004). From India, the first reports on the genus were made by Roxburgh (1832)

documenting 55 species and subsequent works were done by King (1887-1888) recording 207 species from the Indo-Malayan region. Scattered works have been reported in the genus and the major ones include the works on the species like *F. dalhousiae* Miq. (Kumara *et al*., 2013), *F. guttata*, (Wight) King and *F. amplocarpa*, Govind. & Masil. (Govindarajalu & Masilamoney, 1982; Sudhakar & Murthy, 2016a), *F. anamalayana* J.V. Sudhakar & G.V.S. Murthy (Sudhakar & Murthy, 2015). The most recent work on *Ficus* L. is the revision work on the genus *Ficus* L. in India by Botanical Survey of India (BSI). The work recorded the occurrence of 115 taxa of *Ficus* L. in India within the current political boundary (Chaudhary *et al*., 2012). Many of the species show complexity with respect to the vegetative and floral characters.

Pollination studies in the taxon was carried out with great importance. The plants in the genus are pollinated by wasps belonging to the family Agaonidae (Ramírez, 1969), and its interaction is greatly mutualistic. The wasps show sexual dimorphy and it accounts for the species-specific interaction between the plant and the wasp. It has been reported that plant is not pollinated by any other group of wasps and this kind of pollination is rare in plant kingdom (Ramírez, 1969). The species-specific pollination pattern is one of the major causes for the variation in the distribution and survival of the plant.

The Fig trees are highly valued in religious, economic and medicinal aspects. From ancient times figs are considered to be sacred and are worshipped throughout India. *F. benghalensis*, *F. religiosa* etc. are some of the religiously important and sacred species of figs (Sitaramam, 2009; Khan, 2017). Phytochemical studies have been done in many taxa of *Ficus* L. due its medicinal properties in various parts. The plant parts are used in Ayurvedic and Unani medicinal formulations. A major improvement is by the finding

that figs are a good remedy for diabetics (Khan *et al.,* 2017). Figs are supposed to have many anti-oxidant properties. (Sirisha, *et al*., 2010). *Ficus* is one of the important forest trees in the family Moraceae (Mabberley, 2017).

Figs are considered to be a keystone species in many ecosystem (Harrison, 2005). Many insects, birds and mammals depend on the figs for their food and shelter. Most of the plants flower throughout the year and can meet the needs of its ecosystem (Gautier-hion & Michaloud, 1989). Figs are very attractive and many species of birds and animals depend on figs for their staple food. The figs are considered most important suppliers of the 60-70% diets of Great Hornbills (Bachan, 2006) and more than 17 species have been reported from a single forest patch in the Western Ghats (Bachan & Jisy). Nair *et al.,* (2021a) reported 33 taxa of *Ficus* from the Kerala region of Western Ghats. The figs are good avenue trees and are planted as shade trees and also as ornamental trees (Sudhakar *et al*., 2017).

The genus remains complex with respect to the typical pollination, mutualism and the hypanthodium inflorescence with numerous minute enclosed flowers, made the revision more interesting but very problematic. Lack of comprehensive work in the genus drives up to do the revision work on the genus periodically.

1.1 Objectives

1. Understand the diversity, taxonomic revision of the genus *Ficus* in the Western Ghats with support of molecular data
2. Understand the phylogenetic relationship of traditional fig groups Atthi (Trees with cauliflorous inflorescence), Itthi (Epiphytes and Hemi epiphytes) and Aal (Independent trees)
3. Understand the ecological significance of figs in the forest dynamics

To achieve these objectives, the entire work plan was divided into four broad areas, 1. Taxonomy, 2. Phenetic analysis, 3. Phylogenetic analysis and 4. Ecological study.

1.2 Significance of the study

The genus *Ficus* includes the most diverse species in the family Moraceae. The species within the genus are difficult to identify due to its mystifying taxonomic characteristics. The entire genus requires a thorough critical revision using both living plant materials and preserved specimens. The intra and inter specific delimitation within the genus can be better understood and the taxonomic identity can be fine-tuned with a thorough revision of the genus *Ficus* in the Western Ghats region. More information on the species variations can be gleaned from a thorough study based on live plant materials. DNA barcoding methods can be used to sort out the tangled taxonomy of these species. The Internal Transcribed Spacer (*ITS*) and *trnH-psbA* regions are useful molecular markers in the genus *Ficus*. The use of DNA barcoding techniques can be used to separate the taxonomically complex species. The identification and species delimitation problems can be resolved with this study.

The infrageneric classification of *Ficus* is of great complexity and is entirely based on few morphological characters. The phenetic analysis using the complete set of morphological characters (both vegetative and floral) will elucidate the trend in the classification system. The phenetic clustering can be validated with the current classification and the variations can be determined. A correlation with the natural grouping (*Atthi*, *Itthi* or *Aal*) or the habit and inflorescence-based clustering can provide better evidence to the classification and evolution of the genus which can be further resolved with molecular evidences.

The ecological role of figs in the forest dynamics is analysed here to understand the role of the stranglers in the forest dynamics especially maintain the vegetation cover with the representing ecosystem.

1.3 Study area

The area of the present study is the Western Ghats (Fig. 1.1). It is one of the 36 biodiversity hot spots in the world and one among the four in India. It runs parallel along the western coast of India extending from Tapti River Valley in Gujarat to Kanyakumari in Tamil Nadu. It covers an approximate area of 1,60,000 km^2 in the states of Gujarat, Goa, Maharashtra, Karnataka, Kerala and Tamil Nadu. The average height in the mountain range is between 300 - 2700 m. Western ghats covers almost 6 % of the total area of the country and contribute to 30 % of the total biodiversity of the country. 58 protected areas are found within the Western Ghats region covering around 10 % of the total area. The major vegetation in the Western Ghats are the evergreen forests, semi-evergreen forests, moist deciduous forests and dry deciduous forests. The evergreen forests are home to most of the endemic species in the Western Ghats. More than four thousand species are reported from the area of which nearly 38 % are endemic (Nair & Daniel, 1986). The climatic condition varies within the Western Ghats. The vegetation of Western Ghats is mainly influenced by the heavy rainfall from South West monsoon which starts from early June and continue up to late September. The southern part of the Western Ghats receives more rain than the northern part (Pascal *et al.*, 2004).

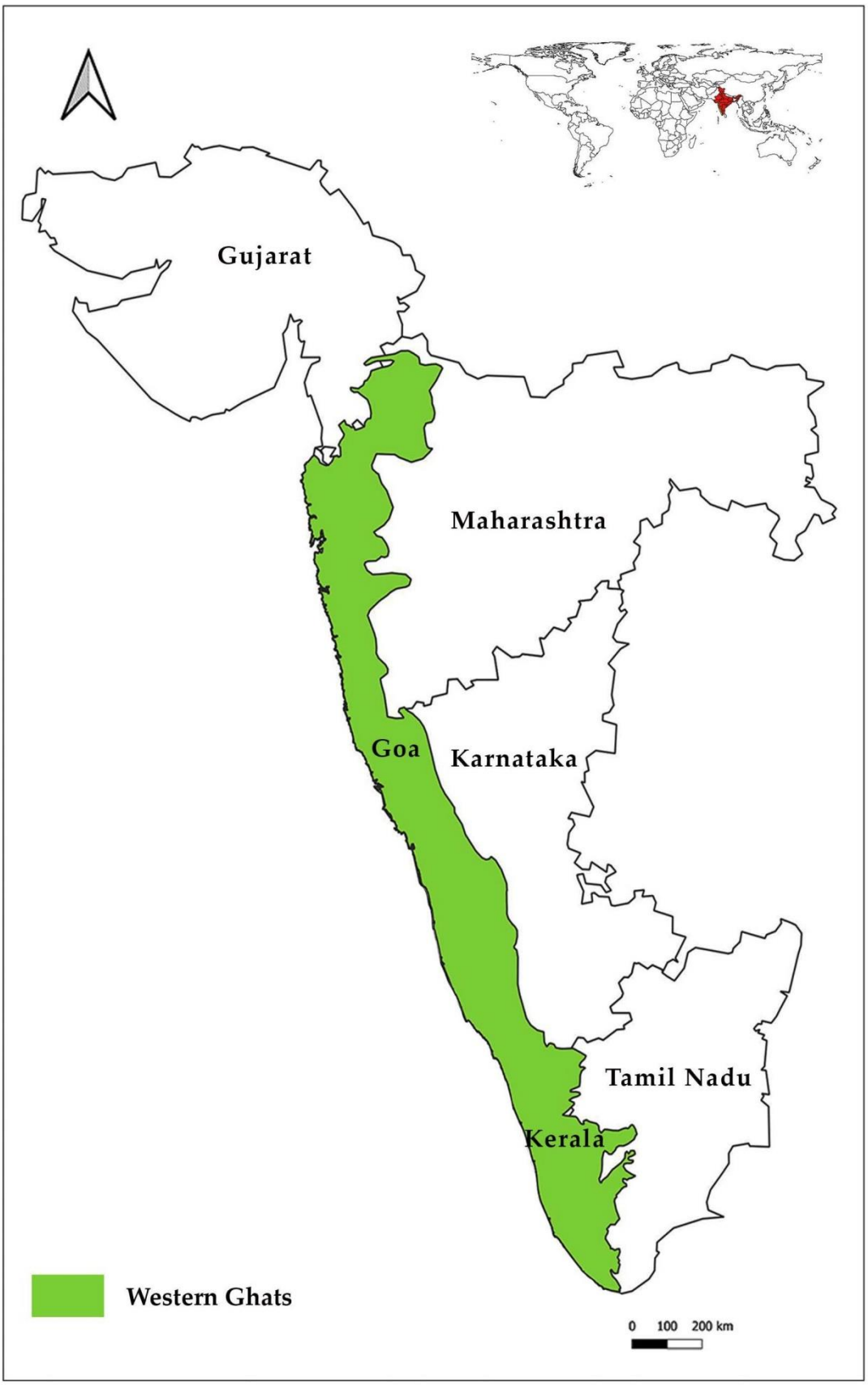


Fig. 1.1. Study area - The Western Ghats.

1.4 Plan of the thesis

The thesis entitled "**Taxonomy, molecular phylogeny and ecological functions in forest dynamics of *Ficus* L. (Moraceae) in the Western Ghats**" is presented in 8 chapters.

Chapter 1 begins with general introduction about the family *Moraceae* and the genus *Ficus.* The chapter includes details on the study area, objectives of the work, its significance, general methodology and plan of the thesis.

Chapter 2 provides a detailed review of relevant literature about the taxonomic and floristic works, phenetics, molecular phylogeny and ecological studies done on the genus.

Chapter 3 deals with the taxonomic work. The chapter has a brief introduction and detailed methods adopted. A complete taxonomic revision of the genus *Ficus* L. within the Western Ghats region including the infrageneric classification, identification keys, taxonomic enumeration of all the taxa supported with scientific plates, illustrations and distribution maps, as well as discussion on comparative morphology are provided in this chapter.

Chapter 4 presents the phenetic study carried out on the genus. A short introduction and detailed methodology on the phenetic analysis is provided. The phenetic study was carried out for morphological features, syconium characters and also in a wholistic manner combining both. The results of the phenetic analysis are provided with dendrograms. The chapter also includes the discussion part of the phenetic analysis.

Chapter 5 describes the molecular phylogenetic study using two markers *ITS* and *trnH-psbA.* Introduction and methodology of the molecular

phylogenetic analysis are provided in the first part followed by a detailed methods adopted and the separate results for Maximum Likelihood and Bayesian analysis using *ITS* and *trnH-psbA* markers. The trees generated for each analysis are provided and the chapter ends with a detailed discussion on the major findings.

Chapter 6: This chapter deals with the ecology part, where the phytosociological parameters of selected fig species are enumerated and analysed to understand their role in vegetation dynamics. The chapter includes a short introduction and comprehensive methodology. The results of the analysis are provided with graphs and end with the discussion. **Chapter 7** deals with the summary and conclusion of the work, and **Chapter 8** presents the recommendations. This is followed by the references and appendices related to the work

REVIEW OF LITERATURE

CHAPTER 2

Chapter 2

REVIEW OF LITERATURE

2.1. Taxonomy

The genus *Ficus* was described for the first time by Linnaeus (1753) in his landmark publication, the Species Plantarum. He described seven species of *Ficus*, of which four were typical Indian species, *viz., F. benghalensis, F. indica, F. racemosa* and *F. religiosa*. The genus was listed under *Cryptogamia* and was later changed to *Polygamia Polyoecia*. The rearrangement was based on the floral arrangement inside the receptacles. The first-level classification of the genus was proposed (Thunberg, 1786), which included around 27 species of *Ficus*.

The earlier literature on the genus accounts for the works of a few, like Willdenow (1798), who made a detailed account of the genus and the number of species studied increased to 73 from the previous works. *Ficus* was treated under *Triandria Monogynia* by Vahl (1805), indicating that floral characters were wrongly inferred. Similarly, the genus was treated under *Dioecia Tetrandria* (Persoon, 1807) and 93 species were listed. Rees (1819) claimed that *Ficus* should be classed within the *Dioecia* and identified 105 species under four sections based on leaf morphology. A documentation of nine species of *Ficus* was made by Roth (1821).

F. rigida was described as a new species from Malaysia (Jack, 1822). The new species was mentioned as tree in its habit, with 1–3 axillary smooth syconium. A detailed documentation of the figs of Malayan areas was done (Blume, 1825). The majority of the species mentioned in the work were new

to science. The species were presented as per the classification based on leaf morphology and the floral characters were according to the concepts of Vahl (1805).

Roxburgh (1832) reported 55 species of *Ficus* from India, among which 38 were described as anew and also proposed a classification on the basis of the attachment of the syconium. The classification was later revised by Miquel (1844), who modified it based on the floral characters alone. Again, another classification was proposed in which the genus *Ficus* was divided into eight genera (Gasparrini, 1844)

An elaborate work on the genus was done, which recognised about 378 species of *Ficus* (Miquel, 1847, 1848a, 1848b, 1848c, 1848d). Also, the genus *Ficus* was divided into eight genera entirely based on the floral characters. Four species of *Ficus, viz., F. amplocarpa (Pogonotrophe macrocarpa), F. guttata (Covellia guttata), F. religiosa (Urostigma religiosum)* and *F. benghalensis (U. benghalense),* were illustrated in Icones Plantarum Indiae Orientalis (Wight, 1853).

In 1864, Thwaites provided an enumeration of the plants from Ceylon. Eleven species from the subgenus *Urostigma* and six species belonging to the subgenus *Ficus* were listed in the work. *Ficus* was treated under the tribe *Artocarpeae* (Bentham & Hooker, 1880). Four subgenera were mentioned in the work: *Urostigma, Eusyce, Synoecia* and *Covellia*. The subgenus *Pharmacosycea* was included doubtfully. An updated classification of the genus was made based on the general habitat, position of leaves and receptacles (Miquel, 1867) and based on these characters, the genus was subdivided into six subgenera, namely *Urostigma, Pharmacosycea, Erythrogyne, Eusyce* and *Covellia*. The majority of the species belonged to subg. *Urostigma*.

King (1887–1888) worked on the *Ficus* of the Indo-Malayan and Chinese regions. This work stands as a major taxonomic document on the genus from the Indian subcontinent. The genus *Ficus* was divided into seven sections, chiefly on the basis of their floral features. A total of 207 species were listed in these seven sections. The work was supplemented with an elaborated description, details on its allied species and illustrations.

Almost fifty years after the monograph of King (1887–1888), a comprehensive global revision of the subgenus *Synoecia* was published (Corner, 1938). The revisionary work compiled all the members of the subgenus and resolved the identification problems of the described species. Many of the species' novelties were merged into the already-described species. It was concluded that a total of 13 species and four varieties are included within this subgenus. The Australian species of *Ficus* introduced to Florida were studied, giving prominence to the correct nomenclature, descriptions and location of the specimens (Barrett, 1946a). Seven Australian *Ficus* introduced to Florida were enumerated with their descriptions, synonyms and nomenclatural notes documented.

A distributional range of the genus *Ficus* was first made by Corner (1958). He reported the presence of 57 species of figs in the Indian region. The subgenus *Pharmacosycea* was previously known only from America and was considered an American group. He reported the presence of 46 species of *Ficus* from the Asian Australian region that belong to the subgenus *Pharmacosycea* and found that most of the endemic species of the subgenus lie in the New Caledonia region and the endemism reduces towards the Ceylon region. The members of the *F. benghalensis* group showed a distribution pattern similar to that of the family Dipterocarpaceae but were not found in African regions. He mentioned *F. tinctoria* as the most widely

distributed fig. The entire genus was divided into three subgenera *Urostigma*, *Pharmacosycea* and *Ficus*, which represented monoecious banyans, monoecious trees and dioecious plants, respectively.

Taxonomic notes on the new subsections, new species and new varieties of *Ficus* from the Asian and Australian regions were presented (Corner, 1962a). *F. microcarpa* var. *rigo* belongs to the subgenus *Urostigma* as a new variety, along with many other species and varieties from the Asian and Australian regions. The new variety differs from the typical variety in the absence of abundant aerial roots and possesses broad, obtuse leaves and large figs, which turn yellow to orange on maturity. New subsections *Papuasyce* and *Lepidotus*, were added to the section *Sycocarpus* of the subgenus *Ficus*.

A new classification of *Ficus* was proposed with special emphasis on the specificity and morphology of the pollinating wasps, along with the morphology and physiology of the figs (Ramírez, 1977a). The new classification was an updated version of the classification proposed by Corner (1965a).

In-depth research was done on the taxonomic complexity of *F. glaberrima* and *F. arnottiana* (Corner, 1978). The species under the subg. *Urostigma* were found to have the same shape and size of the leaves with few exceptions and produce either sessile or pedunculate syconium. The pedunculate form is supposed to be the primitive form and the sessile one being the advanced form. In South India and Ceylon, it was discovered that *F. beddomei*, *F. costata* and *F. dalhousiae* are species with restricted geographic distribution.

According to a revised classification of figs based on sexuality put forth by Berg (1989), *Ficus* was split into two main groupings, the first of which contained only monoecious species and the second of which contained gynodioecious species. The distribution of figs in the Africa, America and Asia- Australia regions along with details of the pollinating wasps were also provided. Barrett (1946b) provided a detailed note on the species, *F. tsjahela*. Nomenclature history, synonyms and character differences with its allied taxa were made out for the species.

One of the two species of *Ficus* of the subg. *Pharmacosycea* in the Flora of Tamil Nadu Carnatic by Matthew (1983) remains erroneously listed under *F. dalhousiae* and its identity was later revealed as *F. albipila*. The species was reported as a new record for India (Rani, 1985) and it was mentioned that the species has not yet been reported from western Thailand or the Malay Peninsula. And later, it was correctly identified as a new species, *F. anamalayana* (Sudhakar & Murthy, 2015) and was clearly described and distinguished from its allied taxa. The African figs were published with their descriptions and key to subgenera, subsections and all the species (van Greuning, 1990). 25 taxa of *Ficus* were enumerated in the work.

A checklist of the plants reported after 1935 from Kerala was presented (Manilal & Raveendrakumar, 1998). The list documented 625 taxa new to the flora diversity of Kerala, of which three taxa belonged to the genus *Ficus: F. auriculata, F. glaberrima* var. *bracteata* and *F. rigida* var. *bracteata*.

Sasidharan and Augustine (1999) reported the presence of two species of *Ficus* new to India, *viz., F. caulocarpa* and *F. costata*, from the Idukki district of Kerala. It was mentioned that *F. caulocarpa* shows affinity with *F. tsjahela* in the shape of the leaves and *F. costata* was similar to *F. arnottiana* in the

colour of the dried leaves and the shape and size of the receptacles. *F. superba* and *F. fergusonii* were reported for the first time in India from Kerala (Priyadarsanan, 1999a). Both species were mentioned as rare. *F. superba* was reported as indigenous and *F. fergusonii* was mentioned as endemic to Sri Lanka and getting naturalised in India.

A form of *F. obliqua* was reinstated as a new species, *F. baola* (Berg, 2002a), as it differs in the sharp tip of the leaves, the peduncular apex changed to a low cupule, and strongly by the slit-shaped ostiolar aperture. A rare and local endemic species of *Ficus, F. cupulata*, was collected from its type locality, Pachmarhi Biosphere Reserve, in Hoshangabad district, Madhya Pradesh (Khanna & Kumar, 2002). The characteristic features of the species, like its shrubby habit, lack of aerial roots and cupular nature of basal bracts, distinguish it from closely related species like *F. benghalensis* and *F. mollis.* The species was rediscovered after 86 years, ensuring that it is not extinct. This species has only three collections, including its recollection from the type locality (Chantarasuwan *et al*., 2013).

The subg. *Pharmacosycea* sect. *Oreosycea* members of the Western Pacific region were surveyed and a total of ten species, comprising three new species and one new subspecies, were recorded (Berg, 2002b). In the publication, a thorough description of the sect. *Oreosycea* members from the Solomon Islands, Fiji, and The New Hebrides regions was presented, along with identification keys.

F. hispida var. *badiostrigosa* was reported from the Khitchakoot National Park in Thailand (Chantrasuwan & Kumtong, 2005). This variety was different from other varieties in the presence of geocarpic figs, or figs produced on stolons creeping on the ground covered with dark brown hairs.

This variety shows distribution in evergreen forests or as pioneers in secondary forests.

The diversity and indigenous uses of figs in Central and Western Nepal were reviewed by Kunwar and Bussmann (2006). Out of the 36 species of *Ficus* native to Nepal, 16 species were documented in the study area. 21 species of *Ficus* found in Nepal were used indigenously as food, fodder, medicine, wood and for religious purposes; among them, *F. benghalensis* was used to treat 22 medical ailments.

F. alongensis, a poorly defined species, was reinstated with species rank (Berg, 2007a); the taxa were treated under *F. subpisocarpa* and earlier treated as a variety of *F. superba*. The closely aligned taxa of *F. alongensis* were *F. concinna, F. maclellandii* and *F. microcarpa.* Even though Corner (1960a) noted the occurrence of the species in North East India, the distribution was not confirmed as most of the collections were from SE China, Vietnam, Laos and Cambodia.

Taxonomic studies on *Ficus* in the tropical American region led to the discovery of eleven new species of figs (Berg, 2007b). The newly described and illustrated species were *F. cotopaxiensis, F. ecuadorensis, F. francoae, F. loxensis, F. maximoides, F. pastasana, F. quichuana, F. quistocochensis, F. rimacana, F. sumacoana* and *F. valaria*. A new subspecies of *F. jacobii* was described, *viz.*, *F. jacobii* subsp. *mantana*. *Ficus malacocarpa* was reduced to *F. popenoei* as a new subspecies, *i.e.*, *F. popenoei* subsp. *malacocarpa*. All the species except *F. ecuadorensis, F. loxensis* and *F. maximoides* were members of subg. *Urostigma*, while the mentioned three species were members of subg. *Pharmacosycea*. Taxonomic studies on the genus by Berg (2007c) in Thailand presented 20 species of *Ficus* that needed taxonomic clarifications. Six new

combinations, one new subspecies, and lectotypifications for three species, including *F. talbotii*, were proposed in the work.

A species of *Ficus* collected from Sulawesi showed heterogeneity in the characters and was renamed from *F. schwarzii* to *F. miquelii* by Corner. Detailed studies with herbarium materials and live plants revealed that the materials fit into three species rather than a single species. Thus, *F. rosulata* was described as a new species by separating from *F. schwarzii* and *F. kalimantana* was added as a new species based on the herbarium re-examination (Berg, 2010).

Whitfeld and Welblen (2010) described five functionally dioecious species of *Ficus* from Northern Papua New Guinea. One species each from subg. *Sycidium*, sect. *Sycidium* (*F. sangumae*) and subg. *Sycomorus*, sect. *Sycocarpus* (*F. aurantiacafolia*), three from subg. *Sycomorus*, sect. *Adenosperma* (*F. rubrijuvenis, F. rubrivestimenta, F. wamanguana*) were the newly described figs.

The plate by van Rheede (1678) in Hortus Malabaricus served as the basis for the type of *F. racemosa*. Uncertainty resulted from the illustration of the fruits on the plate differing from the description given. Upadhyay and Srivastava (2010) studied the characters and made the typification of the species based on material collected from the area of Rheede's work.

The diversity assessment of *Ficus* in Katerniaghat Wildlife Sanctuary, Uttar Pradesh, exposed the presence of 11 species in the area (Kumar *et al.*, 2011). Seven species of *Ficus* were added as novel to the world, namely, *F. buntaensis, F. flavistipulata, F. jambiensis, F. porata, F. sama-rana, F. sorongensis* and *F. temburongensis* (Berg, 2012). Three species belonged to the subg. *Sycomorus* sect. *Adenosperma* were native to Papua New Guinea (*F. porata* and

F. sorongensis) and the Philippines (*F. sama-rana*), while the rest of the species were members of the sect. *Sycocarpus*. *F. temburongensis* was native to Borneo; *F. buntaensis* and *F. flavistipulata* were collected from Sulawesi; and *F. jambiensis* was collected from Sumatra. Pederneira and Neto (2012) described an endemic fig of sect. *Pharmacosycea* from the Barbacoa municipality of Colombia and named as *Ficus dewolfii*. The new species was distinct from other species by its caudate leaf apex and lateral veins, which deviate from the midrib almost at a right angle. *F. benjaminoides*, commonly called Tenasserim Banyan was proposed as a new species by Mason (1850). The new species closely resembled *F. benjamina* and was considered new to science. As *F. benjamina* is a highly variable species and the characters of the newly described plant are consistent, *F. benjaminoides* was neotypified and synonymized under *F. benjamina* (Turner, 2012).

F. caulocarpa, F. costata and *F. geniculata* were reported as new distributional records for the states of Tamil Nadu, Karnataka and Andhra Pradesh, respectively (Sudhakar & Murthy, 2012). Chaudhary *et al.* (2012) provided a checklist of the *Ficus* from the Indian boundary. About 115 taxa, including 89 species and 26 infraspecific taxa of *Ficus*, were provided in the checklist. 10 species were mentioned as endemic and the most species diversity was found in the North Eastern regions of the country.

Murugan *et al.* (2013) reviewed the diversity and distribution of *Ficus* in Andhra Pradesh and recorded 26 species from the state. Also mentioned that only 70 species of *Ficus* occur in India. The endemic fig, *F. dalhousiae*, was first reported from Karnataka (Kumara *et al.*, 2013). The species was formerly reported from the states of Kerala, Tamil Nadu and Andhra Pradesh only.

F. nebulosilvana, F. palmarensis and *F. plectonervata* were reported as new species belonging to the subgenus *Urostigma* section Americana from Colombia (Medina, 2014). The conservation status of *F. palmarensis* was assessed as vulnerable, while the other two species were considered to be of Least Concern. Upadhyay and Chakrabarty (2014) described *F. jarawae* as a new species from the Andaman Islands, India. The new species was a member of the subg. *Sycomorus*, section *Sycocarpus* and subsection *Sycocarpus* and alligned to the *F. calcarata* group.

The Andaman and Nicobar Islands were home to 54 species, according to Tiwari *et al*. (2014). *F. andamanica* was found to be endemic and 15 species were confined to the islands only. *F. costata* was also reported from the area in addition to its distribution in Kerala.

A very unique fig, *F. krishnae*, was reinstated as a species based on morphological, cytological and anatomical data (Tiwari *et al*., 2015). The study reported that both species show variations in a lot more characters in addition to the formation of cup-shaped structures in the leaves. A new species of *Ficus*, *F. anamalayana* Sudhakar & G.V.S. Murthy was described from the Anamalai Hills of Western Ghats by Sudhakar and Murthy (2015). The new species belongs to the subgenus *Pharmacosycea* and was morphologically alligned to *F. dalhousiae* Miq. The earlier collections of the new species from Tamil Nadu deposited in herbaria were misidentified as *F. albipila* and reported as a new record to India. While some other collections of the species from Kerala deposited in the Madras Herbarium (MH) were misidentified as collections of *F. dalhousiae* due to their morphological similarity.

A detailed taxonomic account of the diversity of *Ficus* from Assam (Dhungana *et al*., 2015) documented 28 taxa from the genus. The taxonomic

study on the genus by Tiwari (2016) documented 38 taxa of *Ficus*, including 7 cultivated species within the Gangetic plains of India. *F. benjamina* subsp. *comosa* was treated as a separate taxon in the study, while later the taxa got merged under *F. benjamina*. Uttarakhand has a report of 27 taxa of *Ficus* (Pramanick, 2016), distributed within 600–1700 m altitude. The diversity assessment of the genus *Ficus* in the Vazhachal forests of the Western Ghats was done (Bachan & Jisy, 2016). A total of 17 species, with two species each in the threatened and endemic categories, were listed. The study recommended that the forests of Kerala are more diverse with figs than currently estimated.

The identity and conservation status of two endemic figs, *F. guttata and F. amplocarpa*, were assessed (Sudhakar & Murthy, 2016a). The conservation status of *F. guttata* was evaluated as Endangered and that of *F. amplocarpa* as Near Threatened. The detailed micro- and macromorphological study revealed that *F. laevis* is not distributed in South India, and the records of *F. laevis* are misidentified specimens of *F. amplocarpa* only.

F. superba, previously reported only from Kerala in India, showed its distribution range in the Western Ghats and Eastern Ghats of Tamil Nadu and *F. middletonii* was reported from Andhra Pradesh as a new distributional record in addition to its distribution in Thailand and Tamil Nadu (Sudhakar & Murthy, 2016b). *F. talbotii* King was added to the list of species found in the Andaman and Nicobar Islands by Sudhakar and Murthy (2017). The species has previously been documented in parts of Peninsular India. *F. talbotii* resembles *F. amplissima* but can be differentiated from it by its small figs and caudate leaf apex.

A pictorial guide to the 26 species of *Ficus* from Madhya Pradesh based on the systematic studies done on the genus in the state was provided by Dubey *et al*. (2019). The book was supplemented with identification keys, descriptions and pictures. Pederneiras *et al*. (2019) did the nomenclatural revision and lectotypification of *F. crocata* and its allied species. About 160 species are included in the sect. *Americanae* of the genus *Ficus*. The species complex of *F. crocata* comprises 18 morphologically allied species, which are delimited by a circular to triangular rim around the ostiole.

F. fergusonii was reported for the first time from the Nadugani hills of Tamil Nadu and *F. travancorica* was reported for the first time from Karnataka (Reddy *et al*., 2020). *F. fergusonii* was earlier reported only from Kerala, India. *F. travancorica* was reported earlier from the states of Kerla and Tamil Nadu and was considered endemic to the area. *F. travancorica* was treated under *F. glaberrima* and the species rank of the status was reinitiated in the study. Debbarma *et al.* (2020) reported *F.* altissima as a new report from Tripura. The study differentiated *F. altissima* from its morphologically similar species, *F. benghalensis.* The taxonomic revision of the genus *Ficus* in the northeastern regions of India was carried out by Debbarma *et al*. (2020). 23 taxa of figs were documented in the study, with four new distributional records. Mohapatra *et al*. (2020) reported *F. costata* from Goa. The species was earlier reported from the states of Kerala, Karnataka and the Nicobar Islands only. The report provided evidence for the extended distribution of the species in Goa.

Wakhidah *et al.* (2021) provided a detailed review of *F. benjamina*. The study revealed that the species is distributed in India and South China, extending to Southeast Asia, Australia, and the Pacific Islands and found up to 1300 m elevation. The systematic reassessment supported by

morphological and molecular data confirmed the rank of *F. krishnae* as a separate species (Mahima *et al*., 2021). The study differentiated the species from *F. benghalensis* and revealed the taxonomic ambiguity.

Ficus virens var. *matthewii* Chantaras was reported as a new distributional report from Kerala state (Nair *et al*., 2021b). The taxon showed variations from the common variety, *Ficus virens* var. *virens* in the characters like branching of basal lateral veins, size of basal bracts, indumentum of basal bracts, size of stipules, indumentum of stipules, size of the syconium and ostiole.

A new variety of *Ficus virens*, *Ficus virens* var. *dispersa* Chantaras, was reported as an addition to the Indian flora (Nair *et al*., 2021c). The taxon was collected from the Idukki district of Kerala and showed more affinity with *F. prolixa*. The characters like size and indumentum of the stipule, length of the petiole, size, shape, apex and the number of lateral veins of the lamina, syconium size and position of the male flowers differentiated *Ficus virens* var. *dispersa* from other varieties of *Ficus virens.*

Paramesh *et al*. (2022) reported *F. middletonii* from the state of Telangana. The species was earlier reported only from Tamil Nadu in India and formed an extended distribution of the species in India. A new climbing species of *Ficus* from the subg. *Synoecia, F. motuoensis*, was described from Southwest China (Zhang *et al.,* 2022a). The new species was distinct from the other climbing figs by the smaller size of its leaves and spotted receptacles. It was suggested that the type locality of the new species being near Assam, India, with a good number of individuals, the species could extend its distribution range to India also. The morphologically aligned species of *F. motuoensis* from the Indian region are *F. diversiformis* and *F. hederacea*.

Ficus caulocarpa (Miq.) Miq., *Ficus sagittata* Vahl and *Ficus subulata* Blume were reported as new distributional records from Tripura (Debbarma *et al.,* 2022). The threat status of *F. caulocarpa* was assessed as Critically Endangered in the state, with an area of occupancy of 8 km^2. *F. sagittata* and *F. subulata* were recorded as Endangered in the state. The IUCN status of all three species was Least Concern.

Ficus species were included in the floristic and taxonomic works carried out in India. The number of taxa of *Ficus* documented in each of the work is presented in the table 2.1.

Table 2.1 Number of taxa of *Ficus* listed in the floras from India

Name of the district/ state	**Authors**	**Year of publication**	**No. of taxa mentioned**
Andhra Pradesh			
West Godavari	Rao *et al.*	1986	6
Anantapur	Pullaiah and Yesoda	1989	7
Nizamabad	Pullaiah and Rao	1995	6
Kurnool	Raju and Pullaiah	1995	8
Andhra Pradesh	Pullaiah and Moulavi	1997	17
Visakhapatnam	Subba Rao and Kumari	2008	16
Chittoor	Chetty *et al.*	2008	17
Arunachal Pradesh			
Namdapha	Chauhan	1996	19
Bihar			
Bhagalpur	Varma	1981	6

West Champaran	Bhattacharya and Sarkar	1998	15
Hazaribagh	Paria and Chattopadhyay	2000	5
Chhattisgarh			
Raipur, Durg and Rajnandgaon	Verma *et al.*	1985	12
Goa			
Goa, Diu Daman Dadra and Nagarhaveli	Rao	1986	17
Bhagwan Mahavir National Park	Datar and Lakshminarasimhan	2013	12
Gujarat			
Gujarat	Shah	1978	13
Saurashtra	Bole and Pathak	1988	8
Himachal Pradesh			
Himachal Pradesh (Analysis)	Chowdhery and Wadhwa	1984	16
Sirmaur	Kaur and Sharma	2004	7
Jharkhand			
Palamau District	Sarma and Sarkar	2002	12
Karnataka			
Karnataka (Analysis)	Sharma *et al.*	1984	22
Karnataka	Saldanha	1984	21
Eastern Karnataka	Singh	1988	13
Coorg	Keshava Murthy and Yoganarasimhan	1990	7

Udupi	Bhat	2003	19
Kerala			
Calicut	Manilal and Sivarajan	1982	11
Palghat	Subramanian *et al.*	1987	4
Silent Valley	Manilal	1988	5
Cannanore	Ramachandran and Nair	1988	10
Palghat including Silent valley National Park	Vajravelu	1990	14
Thiruvananthapuram	Mohanan and Henry	1994	7
Thenmala	Subramanian	1995	7
Thrissur	Sasidharan and Sivarajan	1996	13
Nilambur	Sivarajan and Mathew	1997	12
Agasthyamala	Mohanan and Sivadasan	2002	14
Pathanamthitta	Kumar *et al.*	2005	14
Alappuzha	Sunil and Sivadasan	2009	11
Madhya Pradesh			
Pachmarhi and Bori Reserves	Mukherjee	1984	11
Madhya Pradesh	Roy *et al.*	1992	9
Madhya Pradesh	Mudgal *et al.*	1997	25
Bilaspur	Murti and Panigrahi	1999	10
Madhya Pradesh (Supplement)	Khanna *et al.*	2001	1

Maharashtra			
Khandala	Santapau	1967	14
Akola	Kamble and Pradhan	1988	6
Sindhudurg	Kulkarni	1988	12
Nasik	Lakshminarasimhan and Sharma	1991	10
Yavatmal	Karthikeyan and Kumar	1993	4
Raigad	Kothari and Moorthy	1993	15
Mahabaleshwar and Adjoinings	Deshpande and Sharma	1995	9
Buldhana	Diwakar and Sharma	2000	4
Maharashtra	Singh *et al.*	2001	24
Sanjay Gandhi National Park Borivali, Mumbai	Pradhan *et al.*	2005	12
Meghalaya			
Jowai and vicinity	Balakrishnan	1983	19
Nagpur	Ugemuge	1986	4
Mizoram			
Mizoram	Sinha *et al.*	2002	35
Punjab			
Punjab	Nair	1978	7
Rajasthan			
Tonk	Shetty and Pandey	1983	4
Banswara	Singh	1983	6

Rajasthan	Shetty and Singh	1991	14
Tamil Nadu			
Courtallum	Nair and Nayar	1986	7
Tamil Nadu (Analysis)	Henry *et al.*	1987	36
Nallamalais	Ellis	1990	6
Central Tamil Nadu	Matthew	1991	21
Palni Hills	Matthew	1999	25
Central and North Tamil Nadu	Britto	2019	22
Telangana			
Telangana	Pullaiah	2015	19
Uttarakhand			
Chamoli	Nithani	1985	14
Corbett National Park	Pant	1986	10
Uttar Pradesh			
Allahabad	Misra and Verma	1992	6
Agra	Sharma and Dhakre	1995	5
Uttar Pradesh	Sinha and Shukla	2020	17
West Bengal			
Murshidabad	Bakshi	1984	7
West Bengal	Lakshminarasimhan *et al.*	2019	45

2.2. Phenetics

Numerical taxonomic methods were used to classify 20 Nigerian cultivars of *Dioscorea cayenensis* (Akoroda, 1982). 49 characters of the plants were observed, which clustered the species into four clusters. The clustering pattern was not similar to the existing classifications.

Rua (1996) carried out phenetic analysis on the subgenus *Poa* L. 58 exomorpholoical characters of seven species of Poa were recorded from 48 herbarium specimens. The observations concluded that growth habitat alone could not clarify the taxonomic status of the subgenus *Poa* above the species rank. No phenetic gaps were observed for many of the species within the subgenus that were treated as distinct species in earlier studies, except for the presence and absence of rhizomes.

Phenetic analysis was used for the taxonomic delimitation of *Quercus acutifolia* and *Q. conspersa* of the family Fagaceae (Romero *et al*., 2000). Leaf margins and the presence of awns were noted as the characteristics that separated the two species.

Seven species were identified within the section *Datura* of the genus *Datura* based on morphometry (Cavazos *et al*., 2000). The study was based on 39 characters, which included both qualitative and quantitative characters. Two species, which were considered synonyms under *Datura discolor* were supported here as independent species.

Morphometric analysis was carried out using leaf characters for the 31 species of *Ficus* (Sonibare *et al*., 2004). 10 morphological characters of leaves were studied and it was found that a positive correlation exists between various morphological traits. While a negative correlation was found between the characters leaf length and width ratio, petiole length and

fruit length ratio, The cluster analysis supported the existing subgeneric classification of the genus.

According to Loutfy *et al.* (2005), Ficus species belonging to the subgenera *Urostigma* and *Sycomorus* have similarities in their leaf architecture. 24 Ficus species 96 characteristics were examined. The UPGMA analysis's findings did not agree with how *Ficus* are currently classified, indicating that the classification of figs needs to be revised.

In the genus *Thottea* Rottb. (Aristolochiaceae), the floral characteristics that distinguish the species were investigated (Shaiju & Omanakumari, 2009). Utilising 15 morphological criteria, eight species from the Western Ghats were examined. Based on the analysis, two clusters were created, and three major inflorescence pattern types—axillary inflorescence arising from the foliar axis, (ii) nodding type arising from the lower nodes, and (iii) an unusual ground-level inflorescence—were identified.

To understand the identity of *Aechmea* (Bromeliaceae) species, phenetic analysis was employed (Faria *et al.,* 2010). The study group included the *A. bromeliifolia* complex. 16 characters were used for the study and a total of six taxa, including two varieties, were recorded based on the phenetic analysis.

Esmaiel *et al*. (2014) assessed the genetic relatedness among 21 species of ornamental *Ficus* using morphological traits supported by molecular markers. The similarity coefficients were computed as the presence and absence of each morphological character, denoted by 1 and 0, respectively. The species were separated into two major clades based on the 12 morphological traits studied.

Rahman, *et al,* (2013) studied the phenetic relationship between 11 species of *Senna* Mill. (Caesalpiniaceae) using 32 morphological characters. The cluster analysis separated the species into three main clusters. The species-relatedness was consistent with the anatomical and cytological studies in the genus, indicating the possibility of a wider application of numerical taxonomy in the plants.

Morphometric analysis using qualitative and quantitative characters was done for *Solanum* spp. in the southern Western Ghats (Anilkumar & Murugan, 2014). The UPGMA analysis clustered the taxa into three clusters, and three taxa were separated out as non-clusters. The study supported the subspecies status of two taxa under *S. violaceum*, *viz*., *S. violaceum* subsp. *violaceum* and *S. violaceum* subsp.*multiflorum.*

The *Anthurium augustinum* complex comprises some endemic species belonging to the family Araceae. Cardozo *et al.* (2014) studied the morphometry of the endemic species in the *Anthurium augustinum* complex. They were taxonomically confusing and shared overlapping characters. Morphometric analysis proved the overlap in leaf shape outline within the complex. Five species were distinguished from the complex based on other morphological characters.

Kolawole *et al.* (2016) performed morphometric analysis for the *Jatropha* Linn. species using 12 morphological traits. The leaf morphological traits were found to have a more significant role in discriminating the species of *Jatropha* than other traits studied. *J. podagrica and J. multifida* were found as the most closely related species, which supports the already existing classification of the genus.

Chukwuma *et al.* (2016) studied twenty morphological characters of six *Berlinia* species from the Nigerian area. *Eriobotrya* Lindl (Rosaceae) was classified using numerical taxonomic methods (Zhang *et al*., 2017). 25 species were studied using 53 morphological traits. The species were divided into five clusters, congruent with the traditional classification and the phylogenetic analysis. Leaf morphology played a significant role in the species delimitation.

Yeşil *et al*. (2018) studied the fruit morphology of 26 taxa of *Pimpinella* from the Turkish region. 28 binary characters, including both fruit morphology and other morphological characters, were studied. The cluster analysis separated the taxa into two groups: group A with white-flowered species and group B with two subgroups: subgroup 1 with yellow-coloured flowers with hairy fruits and subgroup 2 with white-coloured flowers with glabrous fruits. It was found that the shape of the fruit is not correlated with the surface ornamentation.

Numerical taxonomic analysis was conducted for 76 species from 31 genera of the Asclepiadaceae family in order to evaluate the character variance in this family (El-Gazzar *et al*., 2018). The analysis backed up the family's current generic classification. Character differences were detected in the floral characteristics, pollination apparatus structure, and vegetative morphology. A numerical study separated the entire family into two major groups: the Asclepiadoideae in the first group and the Secamonoideae and Periplocoideae in the second group.

Hesperis L. is a group of ambiguous plants in the family Brassicaceae. Multivariate analysis was done for the species delimitation of the Iranian and Turkish members of *Hesperis* (Farouji *et al.,* 2018). The cluster analysis separated the 33 *Hesperis* species based on 30 qualitative and 27 quantitative

morphological characters into 5 clades or phenons and significantly separated all the species studied. The characters, including life forms, indumentum, leaf and stem characters, petal and sepal length and colour and fruit features were found to be the major morphological characters that defined the species.

To understand the morphological grouping above the species level in the section *Dysosmia* of the genus *Passiflora* (Passifloraceae), phenetic and cladistic analyses were done (Svoboda & Ballard, 2018). 24 quantitative characters were considered for the study. The cluster analysis indicated the presence of three major lineages within the section based on fruit colour and indumentum pattern.

Cystolith micromorphology of 19 species of Indian *Ficus* was studied and it was found that cystoliths vary in size, shape and sculpture pattern (Mohapatra & Janarthanam, 2020). The aculeate sculpture pattern was found to be the most common among the species studied. Cystoliths were completely absent in *F. tinctoria* subsp. *gibbosa*. If present, the cystolith was present either on abaxial or adaxial surfaces or in both epidermises. It was also found that the Principal Cluster Analysis (PCA) pattern of these cystolith micromorphological characters was not supported by the molecular studies

20 morphological characters of the leaves were combined with AFLP primers to find the genetic diversity between 17 cultivated *Ficus* species from Egypt (Mostafa *et al*., 2020). Different clustering patterns were obtained for the morphological and molecular data sets. Leaf characters alone were not found to properly differentiate the species of *Ficus* under study, while the molecular markers alone as well as the combined characters provided good species resolution.

Morphometric studies using *Syconium* and leaf characters were employed for species delimitation in the *Ficus aurea* complex (Hernández-Esquivel *et al*., 2020). The complex lacked both taxonomic and phylogenetic approaches to delimitating the species. The four forms within this complex showed variation both in syconium and leaf morphology. The variations in the syconium morphology were correlated with geography and rainfall, while the leaf characters were not. The delimitation suggested elevates the taxonomic status of the plants from rank of form to species.

The taximetrics and comparative morphology of *Nymphoides* species in Kerala were studied (Pavisha *et al*., 2020). A total of 22 multi-state qualitative characters of the genus were considered for the phenetic analysis of seven species of *Nymphoides*. The dendrogram separated the studied species into two groups, which shared 44% of character similarity between the groups.

The morphological differentiation in the *Habenaria parviflora* complex was studied using 18 morphological characters (Cruz-Lustre *et al*., 2020). Only two taxa distinguished themselves from the complex due to the high level of morphological complexity. The investigation showed that the characters previously disregarded for identification—such as the quantity of flowers, the size of the ovary, and the angles between floral structures—were crucial for differentiating the complex's taxa.

Multivariate studies were done in the species complexes of *Ficus* using 53 morphological characters (Mahima, 2020). A high level of correlation was found between *F. amplissima* and *F. talbotii*.

Syconium diversity and phenetic analysis using syconium characters were done for 33 taxa of *Ficus* from the Kerala part of the Western Ghats

(Nair *et al.,* 2021a). 22 characters with 104-character states were used for the analysis. The phenetic analysis using the syconium characters separated all the taxa and grouped the trees with cauliflorous inflorescence, hemi epiphytic-epiphytic life forms and independent trees similar to the natural classification of the figs as "*Atthi, Itthi* and *Aal*". A taxonomic key for the identification of taxa solely based on syconium morphology was also proposed. The clustering pattern based on the phenetic analysis was similar to the clustering pattern based on the phylogenetic analysis.

Leaf based phenetic analysis was carried out for selected members of *Ficus* from the Southern Western Ghats region using 16 characters and 102-character states (Nair *et al.,* 2021d). The clustering pattern had resemblance with the natural classification of the figs than the already existing infrageneric classification.

2.3. Phylogeny

The phylogeny of the figs and the pollinating wasps was studied by Herre *et al.* (1996). *rbcL* and *tRNA* spacer regions of the fig plants and mitochondrial *COI-COII* and 12S ribosomal genes of the fig wasps were used to construct the phylogeny. The *rbcL* marker showed less variability in the *Ficus* species studied. *Ficus* was found as a monophyletic group and the members of *Pharmacosycea* were found as the most primitive group of figs. No specific split was found between the monoecious and dioecious members of figs. The markers studied for the fig wasps also failed to produce good resolution. Thus, the identification of suitable markers capable of producing good resolution and sequence variations was found to be more important.

Weiblen (2000) studied the phylogeny of the dioecious figs using *ITS* markers and morphology. The functionally dioecious figs were not

monophyletic in origin. The previous classification system was not supported by molecular analysis using *ITS* and was based on combined molecular and morphological analysis.

A strong correlation always exists between the fig and the fig wasps and both always tend to coevolve. A change in the life history of the fig will eventually change the pollinator wasps. Jousselin *et al*. (2003) studied the character evolution in the life history of the figs and the coadaptation of the wasps with the aid of molecular phylogeny. *ITS* and *ETS* markers were employed in the molecular analysis. The breeding system and the growth form of the plants were studied as character traits. The phylogenetic analysis using the *ITS* marker alone showed that most of the subgenera of *Ficus* are monophyletic in origin. A character evolution study suggested that hemiepiphytism evolved several times in the genus. The shape of the ostiole and the head of the pollinating wasps showed a strong correlation. The section *Oreosycea* was not found to belong to the subgenus *Pharmacosycea*; instead, it was found to be a part of the group of dioecious members.

The phylogenetic relationship of Moraceae and the alterations in reproductive traits were studied using the chloroplast gene *ndhF* (Datwyler & Weiblen, 2004). The study indicated that Moraceae is monophyletic and dioecy is the ancestral trait in the family. Whole Castilleae members, along with some Artocarpeae members, were identified as the sister group of *Ficus*. Monoecious characters originated independently. A positive correlation was found between the presence of involucral bracts and entomophily. Molecular dating found that the origin of *Ficus* was from the tribe *Castilleae* and the mutualism with the wasps originated much before that, with the presence of the involucral bracts supporting the finding.

The biogeography and divergence in the family Moraceae were studied (Zerega *et al*., 2005). It was supposed that Moraceae had Gondwanan origins and the tropical distribution of the members was due to vicariance resulting from the breakdown of the Gondwanan regions. A Single Sequence Repat (SSR) marker was developed for *F. insipida* to study the consequences of forest fragmentation of the pollen and seed-mediated gene flow (Vignes *et al.,* 2006). Out of the thirteen microsatellite loci isolated, eleven were polymorphic. A high level of species affinity was observed with other species members for the markers. Crozier *et al*. (2007) developed 11 polymorphic microsatellite loci for *F. religiosa* and *F. rubiginosa*. The heterozygosities ranged from 0.12 to 0.90 in *F. racemosa* and from 0.25 to 1.0 in *F. rubiginosa*.

ITS, ETS and *G3pdh* were used to reconstruct the phylogeny of *Ficus* section Malvanthera (Rønsted *et al*., 2008a). The phylogenetic analysis mentioned the section as monophyletic, which does not match the previous taxonomic classifications, indicating that the morphological classification is not congruent with the phylogenetic classification.

G3pdh DNA sequences were used in combination with *ITS* and *ETS* to carry out phylogenetic analysis of 100 species of *Ficus* (Rønsted *et al*., 2008b), representing all the subgenera. *G3pdh* was found to have only limited resolution in delimiting the species, while support increases when combined with *ITS* and *ETS* markers. The advantage of *G3pdh* over the other markers was its easy amplification rate. Subg. *Pharmacosycea* was not found to be monophyletic and the section *Pharmacosycea* formed a sister group to the rest of the *Ficus.* Only the subg. *Sycidium* was monophyletic; all the other subgenera were polyphyletic or were not clearly monophyletic.

Using a mix of morphological and molecular data, Clement and Weiblen (2009) attempted to explain the phylogenetic relationship and floral

evolution in the Moraceae family. It was concluded that the inclusion of morphological information in phylogenetic analysis improved resolution and clade support, but that morphological information alone was null or ineffective in predicting phylogenetic relationships in the family Moraceae. However, the tribe *Ficeae* was supported solely by morphological traits, and the support gained greater clarity with the addition of DNA information. While the categorization of the genus *Ficus* was left unaltered, the study suggested a new classification that included new tribes in the family.

trnH-psbA regions were observed as an efficient molecular marker to differentiate the species in the genus *Dendrobium* (Yao *et al*., 2009). Significant differences were found in the sequences within the genus *Dendrobium* and with other members similar to this genus. *trnH-psbA* showed an average difference of 1.2% dissimilarity in the sequences. In the genus *Dendrobium*, some regions within the *trnH-psbA* region show consistent sequences and can be treated as barcode regions for the authentication of the genus.

A molecular assessment of 23 species of *Ficus* was done using *ISSR* markers for identification (Rout & Aparajita, 2009). Out of the 21 markers used in the study, only nine provided a clear banding profile and only five produced a good *ISSR* profile. Better profiles were obtained in the primers with (AG/GA)n and (GT/TG)n dinucleotides. The study also suggested that the genetic relationship based on the *ISSR* markers was similar to the relationship based on morphological characters.

The population genetic structure of two dioecious independent figs, *F. hispida* and *F. exasperata*, was studied using co-dominant nuclear microsatellite markers from the Western Ghats region (Dev *et al*., 2011). Both male and female individuals of *F. hispida* had the same allelic diversity. *F. exasperata* had a higher mean genetic diversity and Shannon's diversity index

value. The spatial correlation genetic analysis showed that the genetic correlation decreased with the increase in the distance between the individuals.

The phylogeny of Rosales was studied and it was inferred that they are strongly monophyletic (Zhang *et al*., 2011). Moraceae formed a sister clade with Urticaceae based on the ten plastids and two nuclear genes studied.

Xu *et al*. (2011) studied the biogeography of *Ficus* with *ITS, ETS* and *G3pdh* sequences. They discovered the ancestor of *Ficus* to be present in the Gondwana land. The genus was supposed to have originated in the Neotropical America and India-Southeast Asia regions around 60 Mya. Like many other studies, this molecular study also showed that the traditional fig classification is not supported by molecular evidence. The Indian subcontinent, an earlier part of the Gondwana land, played a major role in the origin and diversification of *Ficus*. Many of the present African species might have evolved on the Indian subcontinent and later dispersed to African land.

Among the insect-plant interactions, the interaction between fig and fig wasps was determined to be the first case of long-term codiversification (Cruaud *et al*., 2012). The subgenera *Sycomorus, Sycidium* and *Synoecia* of the genus *Ficus* were identified as monophyletic. The high level of codiversification between the figs and the fig wasps is mainly driven by the matches in their phenotypic traits.

Five plastid loci (*rbcL, matK, trnH-psbA, psbKpsbI*, and *atpF-atpH*) along with one nuclear locus (*ITS*) were implemented to identify the *Ficus* species in China (Li *et al*., 2012). The PCR amplification success was lowest for *matK*.

ITS showed the most variable sites and parsimony-informative characters. Among the plastic loci, the noncoding *psbK-psbI* and *trnH-psbA* showed more variable sites than the other coding regions. The combination of *ITS* and *trnH-psbA* showed the fewest barcoding gaps. The species discrimination rates were found to be higher for the *ITS* marker. The combination of *rbcL* and *matK* markers showed the least success in *Ficus*. Even though *ITS* showed the most variations and can be considered a single barcode in *Ficus*, the species resolution increased when combined with *trnH-psbA*.

The use of the *trnH-psbA* marker in barcoding studies and its combinations were tested (Pang *et al*., 2012). The specific intergenic regions from eudicots, monocotyledons, gymnosperms, mosses, and ferns were retrieved. *matK, rbcL*, and *ITS2* were also retrieved for the combination study. The average base pair length of the *trnH-psbA* region was found to be 152 bp to 851 bp in eudicots. A success rate of 88.6% was observed for the genus *Ficus* and was found most in the genus *Solanum* (96.5). Comparing all three markers studied, *trnH- psbA* had the highest identification rate. Also, the combination of *trnH-psbA* with *ITS2* showed a much higher species-distinctive efficiency than the combination with the other three markers, especially in the species-rich genera. It was also concluded that the intergenic spacer *trnH-psbA* is more effective than the combined *matK-rbcL* in the genus Ficus.

The flowering pattern of plants is controlled by environmental as well as genetic factors. The change in genetic factors will eventually lead to new adaptations. Yang *et al*. (2014) studied the genetic reasons for the change in flowering patterns in *F. microcarpa*. Eight microsatellite markers were used to study the genetic variations. The flowering pattern showed variations in

characters like the number of figs produced, the average number of syconia per branch and flowering dates in summer and spring. The plants with similar microsatellite genotypes showed similar flowering patterns. Thus, it was concluded that the genotype of the plant determines certain characters, which in turn influence the flowering pattern.

Phylogenetic analysis exclusively for the section *Pharmacosycea* of subgenus *Pharmacosycea* was carried out with nuclear markers *ITS, G3pdh* and *ETS* (Pederneiras *et al*., 2015). The study included 20 species from the section *Pharmacosycea* and 31 species from the rest of the subgenera. The section was found to be monophyletic and positioned as a sister clade to the rest of the genera, as per the Bayesian analysis. *Ficus* subsect. *Carautaea* was proposed as a new subsection. Members of the subsection were hemi-epiphytic with adventitious roots. Still, the group was placed under *Pharmacosycea* rather than *Urostigma*, considering other morphological similarities with *Pharmacosycea*.

Molecular studies on the morphologically cryptic and highly sacred plant *F. krishnae* were carried out to find out the difference in sequence similarity with *F. benghalensis* (Anand *et al*., 2016). Both nuclear and chloroplast DNA were employed to find the sequence differentiation. It was found that there was no dissimilarity in the *ITS* sequences for the two taxa and hardly any specific variation in the phylogenetically informative cpDNA regions. Both the taxa showed variations in the morphological characters but showed no significant variations at the molecular level. It indicated the possibility of a recent speciation in the species and that the morphological variations could be due to mutations in the genes responsible for the phenetic expressions.

Ficus subg. *Ficus* sect. *Eriosycea* contains a group of morphologically variable species called the 'hairy-fig complex'. The phylogeny and taxonomic delimitation of the complex were done using *ITS, ETS* and *trnH-psbA* sequences (Lu *et al.,* 2016). Four species were found within the complex. *ETS* and *trnH-psbA* sequences produced trees with low resolution. The varieties of *F. hirta* were not supported by molecular data, while two varieties were included in *F. simplicissima.* 15 microsatellite markers were created by Fu *et al*. (2017) for the widely dispersed *Ficus* species, *F. virens*. The markers showed a significant degree of polymorphism, allowing us to examine the species' genetic makeup and gene flow.

Bruun-Lund *et al*. (2018) investigated the hyper-diversification patterns in the genus *Ficus* in the tropical rainforests and found that *Ficus* exhibits a more sole diversification pattern than other genera. This typical pattern led them to adapt and extend their distribution to a wide range of niches (Corner, 1961). The analysis revealed a constant rate of speciation in the genera without any sudden change in the rate of speciation events. It was found that species with active pollination diversify at a faster rate than those with passive pollination. The monoecious species evolved at a greater rate than the dioecious species and dioecious species tend to transform into monoecious species. The diversification rate was much higher for the epiphytic life forms than the other life forms, while the transition rate between the life forms was much lower in all the cases. It was inferred that fig plants exhibit 'museum model' of evolution in which the rate of speciation is constant and there is little rate of extinction. The high rate of diversification might be mostly favoured by its uninterrupted global distribution pattern compared to many other genera of plants. The high

diversification rate was positively correlated with active pollination, monoecy and hemi epiphytic life forms.

The species delimitation in the *F. auriculata* complex was very confusing. To understand the species distinctness and to rebuild the phylogenetic relationship of the species *F. auriculata, F. oligodon, F. hainanensis, F. beipeiensis* and *F. variegata*. Nuclear, chloroplast and SSR markers were employed (Zhang *et al*., 2018). F. auriculata showed different forms, and many species were merged under the name. Phylogenetic analysis showed that F. auriculata had a paraphyletic lineage with species like *F. racemosa, F. semicordata* and *F. tikoua*. The species within this complex were pollinated by nonspecific pollinators. This could be considered a reason for the lack of differentiation between the species. Molecular studies with nuclear, chloroplast, and SSR markers exposed *F. variegata* as a separate species independent from *F. auriculata* that belonged to the subsect. *Neomorphe*. While the other three species, *viz., F. oligodon, F. hainanensis* and *F. beipeiensis*, were *F. auriculata* only, as the character differences were variations of *F. auriculata*.

To resolve the problems in the relationship within the subg. *Synoecia* and its alleles: phylogenetic analysis was done using three nuclear markers (Zhang *et al*., 2020). The subg. *Synoecia* mainly comprises the climbing members of the genus *Ficus*. The climbing habitat was found to originate independently from the terrestrial shrubs or trees. The climbing habitat was treated as an autapomorphic character rather than a synapomorphic character. Hence, it is suggested not to consider it a strong character trait to separate the groups.

Mahima *et al*. (2020a) studied the phylogeny of the *F. virens* complex using *ITS2* and *trnH-psbA* sequences along with morphological traits. The

phylogenetic tree prepared with separate markers was almost identical in its topology. The analysis using the combined set of markers showed that all the species studied in the *F. virens* complex are distinct taxa with different lineages. The morphological analysis showed maximum similarity between the species *F. virens* and *F. middletonii*. The combined analysis with a set of molecular and morphological characters also separated the species with good posterior probability values, supporting them as distinct species. The study concluded that both *ITS2* and *trnH-psbA* are efficient markers in delimiting species in the genus and supported the idea that the combination of both morphological and molecular characters could provide a better resolution in reconstructing the phylogeny (Wiens, 2004; Chantarasuwan *et al*., 2015).

Sánchez *et al*. (2020) determined the best DNA barcode for 16 species of forage plant species of legumes and grasses in sub-alpine grasslands using the markers *rbcL, matK* and *trnH-psbA*. It was noted that *trnH-psbA* provided the best results in identifying the grass and legume species compared to the other two markers. However, closely related plant species were not separated by any of these markers. Overall, it was found that the marker *trnH-psbA* can be considered a suitable marker for species identification in grasslands.

Castilleae forms the closest relative of *Ficus* and was commonly referred to as "Involucrata", as both of them shared the common character of involucral bracts. The evolution and classification of *Ficus* and its close relatives were studied (Clement *et al*., 2020) using *ITS, ETS, G3pdh, ncpGS* and *GBSSI* markers. The ML tree produced using the *ITS* marker alone showed that *Urostigma* was monophyletic; it was an exception to all previous studies that mentioned *Urostigma* as paraphyletic. But on combined analysis,

it was found that *Sycidium, Sycomorus* and *Synoecia* were monophyletic, whereas subgenera *Ficus, Pharmacosycea* and *Urostigma* were polyphyletic. *Pharmacosycea* was identified as a sister to the rest of the genus *Ficus.*

Mahima *et al.* (2020b) used the DNA barcoding technique to delimit the endemic complexes of *Ficus, F. guttata* and *F. dalhousiae*. Three species, namely *F. amplocarpa, F. guttata* and *F. laevis*, represented the *F. guttata* complex. The *F. dalhousiae* complex had two species, *F. anamalayana* and *F. dalhousiae*. *ITS2* and *trnH-psbA* markers were employed for the phylogenetic analysis. *trnH-psbA* showed higher parsimony-informative sites and divergence than *ITS2*. The molecular analysis showed that posterior probabilities were high for *F. amplocarpa*, *F. guttata* and *F. laevis* and hence they were distinct taxa. Similar was the case of *F. anamalayana* and *F. dalhousiae*, which showed divergence both on molecular and morphological data and hence, were treated as separate species.

A preliminary analysis was done using the *ITS* sequences for 29 taxa of *Ficus* from Kerala (Nair & Bachan, 2020a). Even the highly morphologically similar and cryptic species of *Ficus* were well separated using phylogenetic analysis. All the species with cauliflorous inflorescence were clustered together.

Anakha & Hari (2021) carried out the DNA barcoding of two *Jasminum* species, *viz., J. auriculatum* and *J. fluminense*, using two chloroplast markers, *trnH-psbA* and *matK*. Comparing both markers, *matK* showed the least differentiation compared to *trnH-psbA*. It was confirmed that the marker *trnH-psbA* is more efficient than *matK* in resolving the complexity in *Jasminum*. The *ITS* and *trnH-psbA* regions were used to identify the phylogenetic position of the Apiaceae member *Phlojodicarpus villosus* (Valuyskikh & Shadrin, 2021) and it was found that the combination of these

nuclear and chloroplast markers is suitable for the identification of taxa within this genus.

Three fossil leaves from the subgenus *Urostigma* were described as new to science (Dong *et al*., 2022) in lacustrine sediments from the middle Miocene of the Fotan Group, South China. A large number of fossil records of *Ficus* were reported from India since the Paleocene periods, while the proper identification of the taxa was always problematic. The newly described species were *F. fujianensis, F. zhangpuensis* and *Ficus* sp. respectively. *F. fujianensis* was morphologically similar to *F. microcarpa*; it indicates the connection between India and South China in the Miocene period, as supported by many other works. It is predicted that the Tibetan region was a corridor between the Indian region and South China in the Paleogene.

A complete chloroplast genome analysis of *Ficus* revealed that the traditional subgenera in the genus *Ficus* are not monophyletic (Zhang *et al*., 2022b), while the nuclear genome disagrees with it. The chloroplast genome in figs encodes 113 unique genes and is mostly conserved. The divergence hot spots with the chloroplast genome were found in the non-coding regions within the chloroplast genome. And these hotspot regions were highly effective in species delimitation. Based on the divergence study, it was estimated that the Ficus evolved in the Late Cretaceous period, approximately 74.5 Mya and underwent rapid diversification in the early to middle Miocene period. *clpP, rbcL* and *ccsA* were the chloroplast genes that were found to have contributed towards the adaptational changes in *Ficus*.

The whole genome sequencing of *F. benghalensis* and *F. religiosa* suggested that the adaptive evolution of the genes that aid in longer longevity is a complex phenomenon (Chakraborty *et al*., 2022). Similar to

many other long-lived trees, these species of *Ficus* have enzymes that play a role in the terpenoid backbone biosynthesis pathway, which is highly potent against pests and pathogen attacks. The genes that induce longevity are much more evolved in *F. benghalensis* and *F. religiosa*. The CAM photosynthetic pathway was also found in these plants, which might help the plants in epiphytic stages store and conserve water. The CAM pathway also increased leaf longevity. The genes responsible for auxin synthesis were advanced in *F. benghalensis*, which helps the species produce more aerial roots, resulting in an increased survival rate.

The *F. sarmentosa* complex is comprised of 10 species and 10 varieties with overlapping morphological complexities. The phylogenetic study of the complex using three nuclear loci confirmed the species status of the taxa *F. pumila, F. howii, F. dinganensis, F. pubigera* and *F. anserina.* A new species, *F. muricata,* was described from the complex. *F. yunnanensis* was described as new to science by elevating the rank status of *F. pubigera* var. *maliformis* (Zhang *et al*., 2023).

2.4. Ecology

The evolution of the strangling habit of the subgenus *Urostigma* suggested that the plants might have adapted in response to the light intensity on the forest floor (Ramírez, 1977b). As the figs are capable of germinating in the natural pockets of the host trees, they avoid competition for light with other plants on the forest floor. *Urostigma*, being a monoecious member, was supposed to have originated from the non-epiphytic monoecious member *Pharmacosycea*, as both share numerous characters in common, including pollinators.

The fruiting phenologies of *F. yoponensis* and *F. insipida* were studied for seven years (Milton *et al*., 1982). Both species produced fruits in all the months during the study period, and the fruiting pattern was found to be asynchronous. They exhibited a peak fruiting season while the fruits were available throughout the year, even in small quantities.

While figs are always considered a key stone species, ecological studies on *Ficus* in the Makokou Forest in Gabon noted that figs are not the staple food for the frugivores, as crown production is lower and the fruiting pattern is irregular (Gautier-Hion & Michaloud, 1989). Monkeys consume figs occasionally and in very low quantities. The low density of *Ficus* species in the forest and infrequent fruiting patterns were regarded as possible reasons for the less consumption of figs by the fauna members in the forest.

The nutrient-rich organic matter was found to be the crucial factor that determined the growth of the epiphytes (Putz & Holbrook, 1989). Copernicia palms were the major hosts of the strangler figs in llanos near Calabozo. These palms were the roosting sites for many frugivorous birds and animals. The humus-filled leaf sheaths provided suitable germination sites for the fig seeds dispersed by these frugivorous birds and animals. The organic matter within the sheaths was more nutrient-rich than the soil in the study area. *F. pertusa* and *F. trigonata* were observed to produce upward-growing roots that reach the crown of the palm. It provides support for the strangler to hold on to the host palm even if the leaf sheath (germination site) falls down.

The unique role of figs in providing food to frugivores was studied (Lambert & Marshall, 1991). Both major and minor fruiting periods were observed in Ficus, which ensured the availability of fruits in all seasons. Bird-dispersed and non-bird-dispersed figs were observed, and they differed

in their syconium characters. The non-bird figs were usually large, dull-coloured and less fleshy compared to the bird-dispersed figs. The fig crops were abundant when the other fruits were scarce and provided nutrient-rich food to the frugivores. The frugivores with a small home range were found to feed on other plants when the availability of figs in their home range was scarce or the distribution of fig plants was low in the area.

Unlike the other members of the *Pharmacosycea,* which are all large independent trees, *F. crassiuscula* has developed a strangling habitat. This species starts its life as a vine, strangles around the host, and becomes a large canopy tree (Daniels & Lawton, 1991). *Guarea* spp. were found to be the best preferred hosts for *F. crassiuscula*. But there were many other potentially suitable trees for the fig to consider as hosts. The host size was found to have no significant role in the establishment of figs.

The host relationship of *F. burtt-davyi*, a small strangler, have shown that this species causes less damage to the host tree (Compton & Musgrave, 1993). Unlike other stranglers, this species of Ficus does not produce roots that sheath around the trunk of the host tree. Only less damage was made to the trunk of the host tree and this allowed the expansion of the trunk. The small size of the fig also made less mechanical damage to the host trunk. The germination and establishment of the fig plant was found more on the large and old hosts plants.

Putz *et al*. (1995) studied the phenological variations in the epiphytic and tree forms of the two fig species, *F. pertusa* and *F. trigonata*. Both epiphytic and tree forms produced more leaves during the wet season. The epiphytic form remained leafless for more time than the tree form in both species, mostly due to the low availability of water. Leaves had a longer life span on the trees compared to the epiphytes. Fruit production in both

species was initiated only after the root got properly established in the soil, or simply epiphytic figs were not found to fruit.

The transformations undergone by a hemi-epiphyte during its growth phase were studied (Holbrook & Putz, 1996). Changes in the structure of the leaf and water relations were noted between the epiphytic and independent phases. The leaf area of the epiphytic species was larger than that of the normal ground-rooted species. The epiphytic species had two to three times more stomata than the non-epiphytic plants.

Five species of hemi epiphytic figs were studied to understand whether the figs have host specificity or exhibit distinct canopy positions (Laman, 1996). Dipterocarpaceae members were the common host tree for the strangler figs studied. Canopy specificity was observed for the figs studied. *F. stupenda* occupied the top canopy, while *F. xylophylla* and *F. consociate* preferred lower canopy levels. The figs found in the lower canopy level preferred small host trees. It was observed that the figs specialised for the lower part of the canopy and preferred small trees, as the host provided suitable germination sites for the figs at that particular height compared to the large trees. Another reason for the canopy-level specialisation of figs was the dispersal agents. A dispersal agent that stays in the lower part of the canopy may disperse the fig seed to that part of the canopy only and the fig could establish itself at that canopy level only.

Considering the light intensity as the factor that determined the canopy specificity, it was supposed that the species that preferred the sub-canopy may be tolerant to low light intensities only. Hence, germination on the upper canopy in high light intensity may lead to the death of the figs.

Patel (1996) noted that the trees with fruits dispersed by animals were more frequently found as hosts to the stranglers than the trees with fruits dispersed by mechanical means. The strangling figs on the road sides were found attached to the figs as their host trees. Most of the fig hosts were also stranglers, like *F. amplissima, F. benghalensis, F. microcarpa, F. religiosa, F. tinctoria, F. tsjahela* and *F. virens*. The non-stranger figs, *F. exasperata* and *F. racemosa*, were also found as hosts to the stranglers. In some cases, both the strangler and the host were of the same species of *Ficus*. From the study area, the strangling figs were found to be in larger numbers on the roadside than in the forest areas.

A comparative study was conducted on the phenology of fig and non-fig trees in the forest (Patel, 1997). The phenological characters like leaf flushing, flowering and fruiting were studied. Phenological differences were observed in deciduous and evergreen forests. For non-fig plants, flowering mostly occurs in the dry season, followed by fruiting in the early monsoon. Leaf flushing occurred in the middle of the hot season. In the evergreen forests, the non-fig trees flowered almost all the year, except during the heavy monsoon, which was followed by the fruiting season. Leaf flushing occurred during the dry seasons. For the figs, the flowering took place almost two to three times a year. Thus, the non-fig trees exhibited clear seasonality in their phenological characters.

The frugivores that visit strangler figs were studied (Athreya, 1997a) and observed that mostly the visitation happens between 7.30 a.m. and 9.00 a.m. The stranglers were *F. drupacea, F. microcarpa* and *F. amplissima*. 26 species of frugivores were found visiting *F. amplissima*. Except for peak visitation during the day, an equal rate of visitation was observed during the

rest of the day. Species specificity was detected for the frugivores, and mostly they preferred eating the large figs.

The host specificity for *Ficus* was noted in the primary forests of Karian Shola National Park. Plants with zoochorous fruits like *Vitex altissima*, *Diospyros bourdilloni* and *Eugenia* sp. were found to be some of the most common host trees of figs and mostly preferred due to the large number of cavities they have that favour the germination of the figs (Athreya, 1997b; Athreya, 1999).

The diversity of the strangler figs in the evergreen forests of Karian Shola National Park, Southern Western Ghats, was studied (Athreya, 1999). The strangler fig diversity was found to be higher in the open forest area than in the primary forests. The open cervices of the fallen branches were the most common site of fig seed germination. Free-living fig species were not found in the open forests and were found in low densities in the primary forests. The free-living fig species found in the open forests and the primary forests were entirely different. The survival rate of the saplings was found to be higher on *Vitex altissima*. Old trees with decaying trunks were a good preference for establishing figs, as they ensured a continuous supply of nutrients for the growth of the saplings. Sunlight was found to have less impact on the survival of the strangler figs.

F. hispida and *F. tsjakela* were found as components in the tropical wet evergreen forest of the Agasthyamalai Region of the Western Ghats (Varghese & Balasubramanyan, 1999). *F. hispida* was found in the west-coast evergreen forest with an IVI value of 12.84. *F. tsjakela* in the same forest was occupied with an IVI value of only 4.45, while in the hilltop evergreen forest, the IVI value of the species was 8.49. In the west evergreen forest, both

species had an IVI value almost in the same range of 6.47 and 6.42, respectively, for *F. tsjakela* and *F. hispida,* respectively.

Sundarapandian and Swamy (2000) examine the ecosystem structure and forest composition of the Western Ghats region. Evergreen forests represented the most species-rich areas. With an increase in the altitude gradient, the species richness was found to decrease as climatic conditions like temperature, relative humidity, etc. tend to vary.

The diversity of the epiphytic species in the Dry Rainforest in the Lower Hunter Valley was studied (Doyle, 2000). *Ficus macrophylla* ssp. *macrophylla* and *F. superba* var. *henneana* were the figs found in the area. The majority of the figs were epiphytic on *Olea paniculata* and *Drypetes deplanchei*, as these host trees provided suitable pockets rich with nutrient substratum for the growth of the saplings.

1274 bird and mammal species in 523 genera and 92 families were found to feed figs based on a global review (Shanahan *et al*., 2001). Around 10% of the bird species in the world prefer to feed fig species. A strong relationship was found between the fig-eating bird family and the *Ficus* species, mostly influenced by the shape, size, and texture of the fig. The fig eaters were either specialists, generalists, or casual consumers. Fig specialists were found to be more common in the Old World than in the Neotropics, suggesting that the Old-World figs were more nutritive than the New World figs. Generally being soft in texture, the figs were easily manageable by all types of large or small birds. The protein and carbohydrate content in the figs were found to be variable but were always high in fibre and water content.

Kandavel (2002) reported 21 species of *Ficus* from the moist deciduous forests. The distribution of *Ficus* was found to be determined by factors like floristic composition, type of species, topography, altitude, rainfall, forest fire and biotic pressure. The species diversity was found to be higher in undisturbed areas. *F. racemosa* was the most common species in all types of forests studied, as well as the *Ficus* species with the greatest number of individuals. Among the hemi epiphytes noted, 65% of them were found to be rooted in live plants. The hemi-epiphytic species *F. dalhousiae* was found to be attached to rock substratum only. Host specificity was not observed for any of the species in the study.

27 species of figs associated with 35 families of host trees were found in the Bornean lowland rain forest (Harrison *et al*., 2003). The size of the host tree was the only significant factor that determined the fig association. The majority of the figs were associated with the trees of the Dipterocarpaceae family.

The study on the host association of *F. watkinsiana* revealed that the large size of the host tree was the major factor that determined the fig association (Male & Roberts, 2005), as the large surface area may provide more suitable germination sites. The distribution of *F. watkinsiana* was not random in any of the host trees. No correlation was observed between bark character and the fig association. Also, previous studies suggested that the trees that produce fleshy fruits are more attracted by frugivores and may be a better preferred host for figs. But no relation was found between *F. watkinsiana* and the fleshy fruit-producing trees.

Primates and hornbills were found to consume all types of figs (Kinnaird & O'Brien, 2005). The high nutrition content, especially the high calcium content and the digestibility of the figs attracted the primates and

birds. Among the 10 fruiting plants consumed by them, six were *Ficus* species. Bachan (2006) reported that 60–70% of the diet of Great Hornbills comes from the fig species.

The assessment of the mortality rate of the figs showed that 74% of the deaths of hemi-epiphytic figs are caused by the host tree falling (Harrison, 2006). It was observed that as the fig produced a greater number of aerial roots, the chances of death of the fig tree reduced, or the mortality rate of figs decreased, when the aerial roots touched the ground and were capable of independent development. As the figs were observed to establish only on old trees that provide suitable pockets filled with humus for the germination of the fig seedling, the host plants were found to have enough time for their own growth and establishment.

The applicability of *Ficus* in forest restoration was studied (Kuaraksa *et al*., 2012). The dense root system of the figs and the large number of fruits they produce that are supposed to attract and support a large number of frugivores are the reasons to choose *Ficus* for restoration activities. The leafing phenology of the dioecious figs was the same for both male and female plants. But exhibited phenology changes during the hot and cold seasons. Male plants had a greater response to seasonal variations than female plants. Males produced fruits in peak stages during the hot season before the onset of the rain, and females produced fruits enormously during the rainy season.

A study on the phenological pattern of *Ficus* (Azmil & Juliana, 2013) showed variation in the leaf fall pattern in *Ficus* species. No correlation was observed between the leaf fall and rainfall. It was observed that *F. hispida* sheds its leaves during times of water shortage. A continuous trend in syconium initiation was observed in the majority of the species.

The strangler figs growing on the stone walls were studied (Jim, 2014). The strangler species of *Ficus* were found to be suitable species for urban stone walls due to their epiphytic nature, growth in limited resources and the production of aerial roots. The establishment of figs on the walls creates a new habitat in the vacant area. Unlike the host tree in forests that is supposed to be killed by the strangler, the stone wall remains intact without much damage.

Ndolo Ebika *et al*. (2015) tried to resolve the confusion over the terms tree and hemi-epiphyte in the genus *Ficus*. A tree germinates on the forest floor or on the ground, while hemi-epiphyte germinates on the host tree and develops roots that gradually reach the ground. As the roots of the hemi-epiphyte reach the ground, it establishes itself as a large tree and thereby develops into a free-standing strangler that derives nutrition and water from the soil and uses the host trunk for support. The strangler sheaths around the host tree and progressively decays the host trunk, leaving the hollow sheath alone and transforming into a pseudo-trunk.

The frugivore consumption of the syconium of *F. superba* was studied (Hamada & Hanya, 2016). The major consumers of syconium were the Japanese macaques, and they preferred it at high temperatures. While birds consumed the syconium during the low temperature and when the fruits were available in plenty. Even when the density of the *F. superba* trees and the syconium were low, macaques preferred to consume them in large quantities at high temperatures. It was observed that birds consumed insects during high temperatures and all types of fruits during the cold season. As macaques consumed more syconium, they were the major dispersers of *F. superba* in the warm-temperate forest in Yakushima.

The phytosociological study on the Chithalikavu, a sacred grove in Thrissur district, Kerala, reported that *F. benghalensis* was found to have the most basal area (Deepa *et al.,* 2017). *Strychnos nux-vomica* was identified as the most dominant species in the groove.

The role of figs for insectivores was studied (Mackay *et al*., 2018). Insectivores visited the plants more than the frugivores and it was observed that the fig wasps attracted the insectivores and not any other insects. The number of insectivores that visited the trees increased when the figs were in the ripening stage. There was a decrease in the number of insectivores feeding on the fig plants when frugivores started feeding the fruits, mostly to avoid predation. Insectivores prefer to feed on fig plants in small populations rather than large populations.

A species-specific mutualistic interaction exists between the figs and fig wasps. To understand the maintenance of this continuous pattern between the fig trees and fig wasps, a phenological survey was done on the species *F. caulocarpa* and *F. subpisocarpa* (Chiang *et al*., 2018). Both species were found to produce fruits in a seasonal pattern. The reproductive phenology of the figs seemed to be adapted according to the pollinators and the seed dispersal agents. The year-long production of the fruits maintained the pollinators and provided a nutritional source for the fauna feeding on the trees.

Around 20% of the breeding bird species in the urban areas of Taiwan were found to consume fruits (Walther *et al*., 2018). The majority of the endemic and native bird species consider figs in their diet. Among the species of figs consumed by birds, *F. microcarpa, F. caulocarpa* and *F. subpisocarpa* were found to be the most consumed. The genus *Ficus* was

identified as the most diverse genera in the Moraceae based on spatial distribution (Lu *et al*., 2023).

Kharat and Mokat (2018) carried out floristic and ecological studies on Mayureshwar and Rehekuri wildlife sanctuaries in Maharashtra. Fabaceae and Poaceae were noted as dominant families in both sanctuaries. *F. benghalensis* and *F. virens* recorded IVI values of 4.45 and 4.85, respectively, in Mayureshwar Wildlife Sanctuary. The IVI values were 2.45 for each *F. benghalensis* and *F. virens* in Rhekuri Wildlife Sanctuary.

The phytological studies on the tropical moist forests of Kuldiha Wildlife Sanctuary in Odisha recorded 108 plant species from the area (Rout *et al*., 2018). Euphorbiaceae was noted as the most dominant family and *Terminalia tomentosa* was recorded with the greatest IVI value. No species of *Ficus* were recorded in the sanctuary.

Sukumaran *et al*. (2018) reported 102 plants from a sacred groove in Kanyakumari District. *F. benghalensis* and *F. religiosa* were identified among the members that formed the top canopy layers.

F. benghalensis, *F. microcarpa* and *F. tsjakela* were reported as some of the important components in the western grove of the Sanghukulangara Kavu (Bachan & Devika, 2021). *Hopea parviflora* was the dominant species in the vegetation and was conquered by the fig species. The invasion by the figs on the host trees was found to cover the forest canopy much more successfully.

F. religiosa, F. benghalensis and *F. hispida* were found to be some of the dominant species in the Ratanpur forest, Bilaspur district of Chhattisgarh (Soni & Namdeo, 2022).

TAXONOMY

CHAPTER 3

Chapter 3

TAXONOMY

3.1 Introduction

Ficus is the most abundant genus in the family Moraceae and are commonly called 'figs' or 'fig plants'. They are supposed to be originated in the Asia minor region and successfully established in all parts of the world. Exhaustive taxonomic study on the genus by Corner since 1930 reduced the number of species from around 2600 to about 735 species (Berg & Corner, 2005) and concluded about 500 distinct species distributed in the Asian – Australian regions. 115 taxa of *Ficus* were recorded from India and majority of them reported from the north eastern parts of the country (Chaudhary *et al*., 2012). Sudhakar (2014) reported the presence of 53 taxa of *Ficus* from the Peninsular India region with 34 taxa from the subg. *Urostigma* alone.

Linnaeus (1753) proposed the genus *Ficus* for the first time with the description of seven species. The major revisionary works on the genus were based on the studies by Miquel (1847, 1848a, 1848b, 1848c, 1848d), Corner (1960a, 1965a) and lastly from the Malaysian region by Berg and Corner (2005). Only few comprehensive studies were done on the figs of the Indian region. 55 species of *Ficus* from the Indian region were reported by Roxburgh (1832). A detailed study on the genus was done by King (1887-1888) in the Indo-Malayan and Chinese regions. This study recorded a total of 207 species. Later along with some scattered works on the genus, few taxonomic works were done in the genus (Sudhakar, 2014; Dhungana, 2015; Tiwari, 2016).

The genus was first classified by Thunberg (1786) based on the leaf characters and were later significantly modified (Roxburgh, 1832; Miquel, 1844, 1867; Elmer, 1937; Corner, 1960a, 1965a). According to the latest classification, the genus is divided into six subgenera namely *Ficus, Pharmacosycea, Sycidium, Sycomorus, Synoecia* and *Urostigma* (Berg, 2003a) based on the characters such as monoecy-dioecy, adventitious roots, bracts, stipules, position of figs, stigmas and wax glands.

The diversity of the habit in the genus varies from shrubs, climbers, small (up to 5 m) to medium (up to 10 m) to large trees (up to 30 m) epiphytic trees, hemi-epiphyte trees and lithophytic trees. All the species in this genus possess latex and stipules. The genus is easily distinguished from other angiosperm genera by the specialised inflorescence called 'hypanthodium'. The unisexual flowers are embedded within a closed receptacle. The infructescence is the characteristic syconium, that itself resembles a small angiosperm fruit. Aerial roots are usually present in the subg. *Urostigma,* and are completely absent in the subg. *Pharmacosycea* and subg. *Sycomorus.*

The present study aims to provide a critical review of all the species of *Ficus* in the Western Ghats based on live plant materials and preserved specimens for taxonomic and nomenclatural analysis, which will provide a detailed account on the diversity of the genus and will fine tune the taxonomic identity as well as can understand the intra and inter specific delimitation with in the genus. An updated description of the species, supplemented with the synonyms, citations and all the relevant details like its distribution, habit, habitat, phenology, IUCN status etc. is provided as a detailed account on the genus *Ficus* of the Western Ghats.

3.2 Materials and methods

Literature survey

Literature references related to the genus were collected from various institute and university libraries. The information retrieval system, Biodiversity Heritage Library (BHL) of the New York Botanical Garden (http://www.biodiversityheritagelibrary.org), Tropicos (http://www.tropicos.org) and Botanicus (http://www.botanicus.org) of Missouri Botanical Garden Libraries were used to access classical literatures. Online libraries like JSTOR (https://www.jstor.org), Index Nominum Genericorum (ING) of Smithsonian National Museum of Natural History (http://botany.si.edu/ing), Fig Web: Figs and fig wasps of the world (www.figweb.org), online flora data bases like eFloras.org (http://www.efloras.org/) were also used to collect literatures.

Specimen collection

Extensive field work was conducted for the collection of the species. Field visits were done mainly in the fruiting seasons to collect both the vegetative and floral parts. All the targeted species were collected alive. Multiple accessions of the species were taken for the study and different populations of each species were studied to understand the variations within and between the species. The phenological and other observed characters of the collected specimens were noted down in the field book from the field itself. The collected specimens were taken to lab and used for further studies. The syconium of the collected species were properly marked and kept in FAA solution for further studies.

Herbarium preparation

The specimen collected from the fields with appropriate size were used to prepare herbarium following the conventional methods (Bridson & Forman, 1992). The specimens were dried and properly mounted on herbarium sheets of 28 x 42 cm size. The sheets were correctly labelled with all the adequate information about the plant. Colour photos were added to the herbarium sheets to enrich the information so that the colour of the syconium and plant parts can be compared even with the fresh materials as such colour characters are lost when the specimen is dried. The herbarium specimens were deposited in the herbarium of MES Asmabi College (MESAH) and Herbarium of University of Calicut (CALI).

Specimen examination

In addition to the personal collections, herbarium specimens housed at different herbariums were referred and critically reviewed for the taxonomic identity and also to understand the variations, distribution pattern and phenology of the taxa. The herbariums visited were CALI, KFRI, TBGT, KUBH, MH, BSI and BLAT. The virtual database of herbariums like JCB, K, E, L, U, P, C, B, G, LINN, BM, CAL and BSID were also referred. Around 3,000 herbarium specimens were referred. The acronyms of the herbariums were according to Index Herbariorum (Thiers, 2011) and the detailed list of the herbaria consulted is provided as Appendix I. The details of the herbarium sheets referred were provided in the specimens examined part of description of each species.

Plant identification

The vegetative and floral features of the collected specimens were studied in detail and data sheet was prepared specifically for the genus. A

model data sheet prepared is given in Appendix II. The floral features of the specimens were observed using stereo microscope and the photographs of the floral parts were taken using Labomed LB-340 microscope and Cooling Tech digital microscope. The observed characters of the specimens were noted in the data sheet.

The collected specimens were identified using taxonomic keys based on relevant literatures like Corner (1965a), Berg and Corner (2005), Sudhakar (2017) and various regional floras (Santapau, 1967; Saldanha, 1984; Henry *et al.*, 1987; Sasidharan & Sivarajan, 1996; Mohanan & Sivadasan, 2002; Pullaiah, 2015). The confirmation of the identity was made by consulting the type specimens as well as the protologue of each taxon. The type images of the species were obtained from various herbariums and is given as Appendix III.

Preparation of description, illustrations, photo plates and distribution maps.

A detailed description of the taxon under study were made with reference to the characters observed from own collections as well as from the herbarium specimens. A wide range of authentic preserved specimens of each species apart from the live materials were examined to understand variations within the taxon. This was recorded into a data sheet prepared for the study, having 143 characters and 601-character states. This was then summarised to develop the taxonomic description of each taxon. The terminologies used in the descriptions were based on authentic literatures (Beentje, 2016; Simpson, 2019).

Illustrations were drawn on standard gateway paper using 0.05 mm, 0.1 mm and 0.2 mm micro tip pens (Rotring and Artline). The photographs

of the specimens taken using microscope were used to prepare the scientific photo plates. Proportionate scales were given for each picture depicted in the illustrations and photo plates following metric system of measurement. Distribution map of each species were prepared using QGIS ver. 3.27 software. The GPS reading of the species were plotted on the shape file of the map of India.

Nomenclature and citations

The citations of the plants were followed according to International Plant Names Index (IPNI). The author names were based on the guidelines of Brummitt and Powell (1992). Nomenclature was done as per the Shenzhen Code (Turland *et al*., 2018). Online data bases like Plants of the World Online (http://powo.science.kew.org/) and The World Flora Online (https://www.worldfloraonline.org/) were also referred.

Presentation of data

A detailed enumeration on the genus including the citations of *Ficus,* its synonyms and types, taxonomic description, habitats, distribution and phenology was provided first. The classification proposed by Berg and Corner (2005) was followed and a detailed account on the current infrageneric classification was given.

Three types of keys were prepared for the identification of the taxa of the genus *Ficus* in the Western Ghats, based on vegetative characters only, syconium characters alone and based on combination of vegetative and floral characters. Under the systematic treatment the correct name of each taxon, its nomenclatural citation, synonyms, detailed description, common and vernacular names, flowering and fruiting period, distribution, habitat, IUCN status, etymology, uses, notes and specimens examined were given.

All the observed morphological and floral characters were added up in the description. The specimens examined were given in the order of state in India, district, locality, altitude, date of collection, collector, collection number and the acronym of herbarium respectively. The data was supplemented with photo plates, illustration and distribution map for each taxon.

3.3 Systematic treatment

Ficus L.

Ficus L., Sp. Pl. 1059. 1753; Vahl., Enum. Pl. 2: 181. 1805; Roxb., FI. Ind. 3: 528. 1832; Miq., London J. Bot. 6: 571. 1847; Miq., Ann. Mus. Bot. Lugd.-Bat. 3. 214. 1867; H. Drury, Handb. Ind. Fl. 3: 222. 1869; D. Brandis, For. Fl. North-West and Central Ind., 411. 1874; Kurz., For. Fl. Brit. Burma 435. 1877; King, Ann. Roy. Bot. Gard. (Calcutta) 1: 1. 1887; A.K. Nairne, Fl. Pl. Western Ind. 304. 1894; J. Cameron, For. Trees of Mysore and Coorg 270. 1894; Hook.f., Fl. Brit. India 5: 494. 1898; H. Trimen, Handb. Fl. Ceylon 4: 83. 1898; Talbot, Trees Bombay 2: 324. 1902; D. Prain, Bengal Plants 2: 971. 1903; T. Cooke, Fl. Pres. Bombay 2: 643. 1908; Bourd., For. Trees Travancore 355. 1908; Rama Rao, Fl. Pl. Travancore 379. 1914; J.F. Duthie, Fl. Upper Gang. Plain 142. 1915; Brandis, Indian Trees 598. 1921; H.N. Ridley, Fl. Malay Peninsula 3: 325. 1924; C.E.C. Fisch. in Gamble, Fl. Madras 3: 1361. 1928; U.N. Kanjilal *et al.*, Fl. Assam 4: 233. 1940; H. Santapu, Fl. Khandala 256. 1953; Corner, Gard. Bull. Singapore 17: 381. 1960 & 21: 14. 1965; G.L. Shah, Fl. Gujarat 642. 1978; N.C. Nair, Fl. Punjab Plains, Haryana and Punjab states 11(1): 242. 1978; Corner in Dass. & Forsb., Rev. Handb. Fl. Ceylon 3: 230. 1981; S.K. Varma, Fl. Bhagalpur 360. 1981; Manilal &

Sivar., Fl. Calicut 274. 1982; B.V. Shetty & R.P. Pandey, Fl. Tonk Dist. 179. 1983; V. Singh, Fl. Banswara Dist. 3: 214. 1983; A.K. Mukherjee, Fl. Pachmarhi & Bori Reserves 281. 1984; B.D. Sharma *et al.,* Fl. Karnataka: analysis 258. 1984; C.J. Saldanha, Fl. Karnataka 112. 1984; D.N. G. Bakshi, Fl. Murshidabad Dist. 300. 1984; H.J. Chowdhery & B.M. Madhwa, Fl. Himachal Pradesh Analysis 2: 657. 1984; B.D. Naithani, Fl. Chamoli 2: 578. 1985; D.M. Verma *et al.,* Fl. Raipur, Durg & Rajnandgaon 355. 1985; K.K.N. Nair & M.P. Nayar, Fl. Courtallum 1: 39. 1986; N.R. Ugemuge, Fl. Nagpur Dist, Maharashtra 338. 1986; P.C. Pant, Fl. Corbet N. P. 147. 1986; R.S. Rao *et al.,* Fl. Goa, Diu Daman Dadra & Nagar haveli 2: 406. 1986; R.S. Rao *et al.,* Fl. West Godavari Dist. 374. 1986; V. Chithra in A.N. Henry *et al.,* Fl. Tamil Nadu Ind., Ser I: Analysis 2: 252. 1987; Subramanian *et al.,* Fl. Palghat 123. 1987; Bole & J.M. Pathak, Fl. Saurashtra 2: 291. 1988; Kamble & S.G. Pradan, Fl. Akola Dist. 211. 1988; Manilal, Fl. Silent Valley 259. 1988; B.G. Kulkarni, Fl. Sindhudurg 416. 1988; N.P. Singh, Fl. Eastern Karnataka 2: 583. 1988; V.S. Ramach. & V.J. Nair, Fl. Cannanore Dist. 430. 1988; T. Pullaiah & N. Yesoda, Fl. Anantapur Dist. 230. 1989; Kesh. Murthy & S.N. Yogan. Fl. Coorg 420. 1990; Vajr., Fl. Palghat Dist. 444. 1990; Lakshmin. & B.D. Sharma, Fl. Nasik Dist. 437. 1991; P.J. Parmar in B.V. Shetty & V. Singh, Fl. Rajasthan 2: 798. 1991; K.M. Matthew, Excur. Fl. Central Tamil Nadu 482. 1991; B. K. Misra & B. K. Verma, Fl. Allahabad Dist. Uttar Pradesh 345. 1992; G.P. Roy & B.K. Shukla, Fl. Madhya Pradesh 406. 1992; Kothari & Moorthy, Fl. Raigad Dist. 3: 374. 1993; S. Karthikeyan & A. Kumar, Fl. Yavatmal Dist. Maharashtra 231. 1993; M. Mohanan & Henry, Fl. Thiruvanthapuram 431. 1994; A.K. Sharma & J.S. Dhakre Fl. Agra Dist. 254. 1995; D. Deshp. *et al.,* Fl.

Mahabaleshwar and Adjoinings 2: 552. 1995; T. Pullaiah & B.R.P. Rao, Fl. Nizamabad 320. 1995; Subram., Fl. Thenmala Div. 350. 1995; V. Raju & T. Pullaiah, Fl. Kurnool 434. 1995; Sivar. & Mathew, Fl. Nilambur 662. 1996; Sasidh. & Sivar., Fl. Pl. Thrissur Forest 427. 1996; T. Pullaiah & D.A. Moulali, Fl. Andhra Pradesh 2: 895. 1997; V. Mudgal *et al.,* Fl. Madhya Pradesh 2: 607. 1997; P.K. Bhattacharyya & K. Sarkar, Fl. West Champaran, Bihar 62. 1998; K.M. Matthew, Fl. Palni Hills 1172. 1999; S.K. Murthi & Panigrahi, Fl. Bilaspur Dist. 2: 563. 1999; N.D. Paria & S.P. Chattopadhyay, Fl. Hazaribagh Dist. 1: 83. 2000; P.G. Diwakar & B.D. Sharma Fl. Buldhana Dist. Maharashtra State 293. 2000; T. Pullaiah *et al.,* Fl. Guntur Dist. 324. 2000; N.P. Singh *et al.,* Fl. Maharashtra Dicot 2: 931. 2001; Mohanan & Sivadasan, Fl. Agasthyamala 628. 2002; Singh *et al.,* Fl. Mizoram 566. 2002; T.K. Sarma & A.K. Sarkar, Fl. Palamau Dist. Jharkhand 573. 2002; K.G. Bhat, Fl. Udupi. 590. 2003; Wu *et al.,* Fl. China 5: 37. 2003; H. Kaur & M. Sharma, Fl. Sirmaur 587. 2004; Sasidh. & Sivar., Bio. Docu. Kerala part 6: Flow. Plant. 438. 2004; Anil Kumar *et al.,* Fl. Pathanamthitta 461. 2005; S.G. Pradhan *et al.,* Fl. Sanjay Gandhi National Park 3: 572. 2005; Berg & Corner in Nooteboom, Fl. Malesiana 17(2): 1-702. 2005; K.M. Chetty *et al.,* Fl. Pl. Chittoor Dist. 331. 2008; Subba Rao & Kumari, Fl. Visakhapatnam Dist. 2: 212. 2008; Sunil & Sivadasan, Fl. Alappuzha Dist. 659. 2009; C. C. Berg *et al.,* Fl. Thailand 10(4): 499-650. 2011; Chaudhary *et al.,* Taiwania, 57(2): 193-215. 2012; Mandar & Lakshmin., Fl. Bhagwan Mahavir 227. 2013; T. Pullaiah, Fl. Telangana 2: 877. 2015; For. Plant. Nilgiris 44. 2015; Bachan & Jisy, Meridian 5(1): 49. 2016; Sudhakar *et al.,* Figs of Eastern Ghats, India 36. 2017; Ficus sp. Madhya Pradesh 15. 2019; Fl. Karnataka. A Check List 2: 507. 2019;

P. Lakshmin. *et al.,* Fl. West Bengal 641. 2019; S. J. Britto, Fl. Central and North Tamil Nadu 961. 2019; G.P. Sinha & A.N. Shukla, Fl. Uttar Pradesh 2: 471. 2020; S. S. Dash & A.A. Mao, Fl. Pl. India, 2: 536. 2020; R. Gogoi *et al.,* Fl. Sikkim 281. 2021. **Type:** *Ficus carica* L., (LINN-1240.1!)

Gonosuke Raf., Sylva Tellur. 58. 1838. (Subg. *Sycomorus* subsect. *Sycocarpus*). **Type:** *G. hispida* (L.f.) Raf. (= *Ficus hispida* L.f.).

Mastosuke Raf., Sylva Tellur. 59. 1838. (Subg. *Urostigma* subsect. *Malvanthera*). **Type:** *Mastosuke rubiginosa* (Desf. ex Vent.) Raf. (= *Ficus rubiginosa* Desf. ex Vent.).

Necalistis Raf., Sylva Tellur. 58. 1838. (Subg. *Sycidium* sect. *Sycidium*). **Type:** *N. turbinata* (Willd.) Raf. (= *Ficus turbinata* Willd.).

Oluntos Raf., Sylva Tellur.: 58. 1838. (Subg. *Urostigma* sect. *Americana*). **Type:** *Oluntos trigona* Raf. (= *Ficus trigona* L.f.).

Perula Raf., Sylva Tellur. 58. 1838. (Subg. *Urostigma* subsect. *Conosycea*). **Type:** *P. benghalensis* (L.) Raf. (= *F. benghalensis* L.)

Rephesis Raf., Sylva Tellur. 59. 1838. (Subg. *Urostigma* sect. *Galoglychia*). **Type:** *R. ovata* (Vahl) Raf. (= *Ficus ovata* Vahl)

Tremotis Raf., Sylva Tellur. 59. 1838. (Subg. *Sycomorus* subsect. *Neomorphe*). **Type:** *Tremotis cordata* Raf. (= *Ficus auriculata* Lour.).

Varinga Raf., Sylva Tellur. 58. 1838. (Subg. *Synoecia* subsect. *Plagiostigma*). **Type:** *Varinga* repens Raf. (= *Ficus pumila* L.).

Caprificus Gasp., Nov. Gen. Fic. 6. 1844. (Subg. *Ficus*). **Type:** Not designated.

Sycomorphe Miq., Ann. Sci. Nat., Bot., sér. 3,1: 35. 1844. (Subg. *Sycomorus* subsect. *Sycocarpus*). **Type:** *Sycomorphe roxburghii* Miq. (= *Ficus hispida* L.f.).

Sycomorus Gasp., Ric. Caprifico: 86. 1845. (Subg. *Sycomorus*). **Type:** *Ficus sycomorus* L.

Pogonotrophe Miq., London J. Bot. 6: 525. 1847. (Subg. *Synoecia* subsect. *Pogonotrophe*). **Lectotype:** *Pogonotrophe vagans* Miq. (= *Ficus laevis* Blume).

Synoecia Miq., London J. Bot. 7: 469. 1848. (Subg. *Synoecia*). **Lectotype:** *Synoecia diversifolia* Miq. (= *Ficus deltoidea* Jack).

Bosscheria de Vriese & Teijsm., Natuurk. Tijdschr. Ned.-Indië 23: 212. 1861. (Subg. *Sycomorus* sect. *Bosscheria*). **Type:** *Bosscheria minahassae* de Vriese & Teijsm. (= *Ficus minahassae* Miq.).

Dammaropsis Warb., Bot. Jahrb. Syst. 13: 296. 1891. (Subg. *Sycomorus* sect. *Dammaropsis*). **Type:** *Dammaropsis kingiana*Warburg (= *Ficus dammaropsis* Diels).

Plagiostigma Zucc., Abh. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. 4(3): 154.1846. (Subg. *Synoecia* subsect. *Plagiostigma*). **Type:** Not designated.

Covellia Gasp., Nov. Gen. Fic. 10. 1844. **Type:** *Covellia ulmifolia* Gasp. (= *Ficus ulmifolia* Lam.).

Cystogyne Gasp., Ric. Caprifico: 84. 1845. **Type:** *Cystogyne leucosticta* Gasp. (= *Ficus leucantatoma* Poiret).

Visiania Gasp., Nov. Gen. Fic.: 9. 1844. **Type:** *Ficus elastica* Roxburgh

Galoglychia Gasp., Nov. Gen. Fic.: 10. 1844. **Type:** Not designated.

Macrophthalma Gasp., Ric. Caprifico: 83. 1845. **Type:** *Macrophthalma elastica* (Roxb.) Gasp. (= *Ficus elastica* Roxb.)

Tenorea Gasp., Nov. Gen. Fic. 6: 1844. (nom. illeg.) **Type:** *Tenorea heterophylla* Gasp.

Urostigma Gasp., Nov. Gen. Fic. 7. 1844. (nom. superfl.) **Type:** *Ficus religiosa* L.

Pharmacosycea Miq., London J. Bot. 7: 64. 1848. **Lectotype:** *Pharmacosycea radula* (Humb. & Bonpl. ex Willd.) Miq. (= *Ficus maxima* Mill.).

Stilpnophyllum (Endl.) Drury, Handb. Ind. Fl. 3: 225. 1869. nom. illeg. **Type:** Not designated.

Erythrogyne Vis., G. Gasparrini, Ric. Caprifico: 86. 1845. **Type:** *Erythrogyne lutescens* Vis.

Shrubs, woody climbers or trees, independent, epiphytic, hemi epiphytic or lithophytic; aerial roots present or absent, usually present in epiphytic or hemi epiphytic forms; bark smooth, white to pale yellow to pale brown; young twigs terete, core solid or hollow, smooth or lenticellate, glabrous or pubescent; pale green–pale brown; inter node 0.5–10.0 cm long; latex milky or watery, white or pale yellow. Stipule caducous, ovate to widely ovate, 0.5–15.0 x 0.1–2.0 cm, margins usually entire, apex narrowly acute to acute, base truncate, glabrous or hairy, pale green to red. Petiole articulated or non-articulated, terete, sometimes canaliculate, 0.5–20.0 cm long, glabrous or hairy, pale green to pale brown. Leaves simple, alternate rarely opposite, spiral or rarely distichous; lamina ovate to widely ovate to lance ovate to lanceolate to oblong to obovate to elliptic to widely elliptic to round, sometimes lobed, 1.5–40 x 1.0–35.0 cm, margins entire or undulate to serrate to dendate to denticulate, acumen 0.1–5.0 cm long or absent, apex

obtuse to acute to acuminate to cuspidate to obtuse to rounded to caudate, base obtuse to rounded to cordate to cuneate to sub cordate to oblique to attenuate to truncate, glabrous or hairy, pale green to red when young, dark green on maturity, coriaceous or subcoriaceous or chartaceous, venation brochidodromous; basal veins 3–4, lateral veins 3–14 pairs, sometimes numerous, waxy glands present or absent. Receptacles axillary or cauliflorous, solitary, paired or clustered, monoecious or (gyno)dioecious, sessile or pedunculate; basal bracts present or rarely absent, usually persistent, 3, free, 0.1–0.4 mm long, ovate or widely ovate, glabrous or hairy, green to pale brown to brown. Syconium 0.5–7.0 cm across, obovoid to globose to sub globose to oblong to ovoid to ellipsoid to turbinate, glabrous or hairy, usually green when young, yellow to red to purple when mature. Ostiole 0.5–2.0 x 0.5–2 mm; outer bracts present, free, ovate, 1.0–4.0 mm long, glabrous or hairy, yellow to pale brown; inner bracts present, free, lanceolate, 1.0–3.0 mm long, glabrous or hairy, yellow to pale brown. Male flowers usually near ostiole, 1.0–5.0 mm long, sessile or pedicellate; tepals 3–4 or 6, free, 1.0–5.0 mm long, lanceolate, glabrous or rarely hairy, yellow–pale brown; stamen usually 1, anther 0.5–2.5 mm, filament 0.5–1.5 mm long. Female flowers usually at the base or scattered, 1.0–6.0 mm long; sessile or pedicellate; tepals 3–4 or 6, free, 1.0–5.0 mm long, lanceolate, glabrous or rarely hairy, yellow–pale brown; stigma 0.5 mm long; style 0.5–2.0 mm long; ovary 0.5–4.0 mm long, obovoid to ovoid to globose, glabrous, pale yellow to pale brown. Gall flowers scattered, 1.0–5.0 mm long; sessile or pedicellate; tepals 3–4 or 6, free, 1.0–5.0 mm long, lanceolate, glabrous or rarely hairy, yellow–pale brown; stigma short up to 1.0 mm; style 0.5–1.5 mm long; ovary 0.5–4.0 mm long, obovoid or globose, glabrous, white to pale yellow to pale

brown. Achenes 0.5–2.0mm, obovoid to widely ovate to ovoid to trigonous to oblong to ellipsoid to globose, white to pale brown.

Common Name: Fig, fig tree.

Distribution: The genus is distributed in the tropical and subtropical areas with about 750 species (Chaudhary *et al*., 2012).

Habit: A wide range of habit patterns is shown by the plants in this genus, including shrubs, independent trees, woody climbers, epiphytes and hemi epiphytes.

Habitat: The genus is found in various habitats like evergreen, semi evergreen, moist deciduous, deciduous and shola forests. The plants are also found in the plains and also planted as avenue tress and for aesthetic purposes.

Flowering and fruiting: The flowering of the genus varies considerably. Some of the species flower all throughout the year, while others bloom two to three times a year. It is observed that the seasonal figs flower mainly in the drier months from March – May in addition to other minor flowering seasons.

IUCN Status: Globally 411 species of *Ficus* are currently assessed in the IUCN Red List, of which 72% are in the LC category. 7.1 % species is designated as DD, 2.2 % of the species are CR, 7.8% of species assigned the rank EN, 7.5% falls in the VU category and 3.4% species are NT (IUCN, 2022-2023).

3.4 Infrageneric classification

The first level of classification of the genus *Ficus* was made by Thunberg (1786) considering the shape of the leaves as the distinguishing character. In 1832, Roxburgh proposed a classification of the genus *Ficus* in which he divided all the species into two sections based on the nature of the attachment of the syconium. The first section includes species with solitary or paired syconium and the second section includes species with fasicled, racemed or panicled syconium. Even though the classification was simple, it was relied only on the character of nature of the attachment of syconium.

Miquel (1844) proposed a sectional level classification of the genus *Ficus* based on floral characters. He divided the genus into two sections *Carica* and *Sycocarpus.* He was the first to propose such a classification of *Ficus* based on the floral characters even though Roxburgh (1832) examined the flowers in detail. In the meantime, the genus *Ficus* was divided into eight groups according to the classification proposed by Gasparrini (1844). He named the groups as *Ficus, Carpificus, Tenorea, Urostigma, Visiania, Cystogyne, Galoglychia* and *Covellia* respectively.

Based on the floral details of the plant, Miquel (1847) put forth a new classification. In this classification, he divided the entire genus *Ficus* into seven genera: *Urostigma, Pharmacosycea, Pogonotrophe, Sycomorus, Ficus, Covellia* and *Synoecia*. He included around 378 species and among them 167 species under *Urostigma*, 12 under *Pharmacosycea*, 16 under *Pogonotrophe*, 12 under *Sycomorus*, 137 in *Ficus*, 31 included in *Covellia* and rest of the species in *Synoecia.*

Ficus was later rearranged into eight groups without designating the rank by Endlicher (1850). *Sycomorphe, Rhizocladus, Erythrogyne, Galogluchia,*

Cystogyne, Stilpnophyllum, Urostigma and *Carica* were the groups he mentioned.

Miquel (1867) himself retreated the groups under the single genus *Ficus* due to the lack of practicability in identification of the species when treating them under several genera. In the new classification, he divided the genus *Ficus* into six subgenera *Urostigma, Erythrogyne, Synoecia, Eusyce, Covellia* and *Pharmacosycea* with 143, 21, 18, 209, 48 and 110 species respectively, based on wide range of characters including floral features, position of figs and leaves.

Bentham and Hooker (1880), also followed the classification of Miquel (1867) in Genera Plantarum, and included four of the subgenera *Urostigma, Eusyce, Synoecia* and *Covellia* but doubtfully added the subgenus *Pharmacosycea* mentioning them as a group slightly different form *Urostigma*.

In the work of King (1887-1888), he divided the genus *Ficus* into mainly seven sections viz. *Paleomorphe, Urostigma, Synoecia, Sycidium, Covellia, Eusyce* and *Neomorphe* chiefly based on the floral characters and the sections were divided into series and subseries. Overall, the classification has two groups based on the sexuality of the flowers, in which the group I included section *Paleomorphe* with pseudo-hermaphrodite flowers and male flowers having a rudimentary pistil. Group II comprised the rest of the sections, all with unisexual flowers and male flowers without a rudimentary pistil.

Elmer (1937) worked on the figs of Philippine and made a classification based on their habit and general characters. He divided the genus into five sections *Pseudopalmae, Areolatae, Tuberculatae, Strangulares* and *Sessiliflorae.*

A major revision of the genus was done by Corner (1958) and developed a convenient system of classification. He divided the genus into three subgenera, *Urostigma* (monoecious banyans), *Pharmacosycea* (monoecious trees) and *Ficus* (dioecious figs). Later Corner (1960a, 1960b), proposed an updated classification of the genus, according to which he divided the genus into three subgenus, 12 sections, 13 subsections, 50 series and 34 subseries. Later in 1965, he revised the classification and added the number of subgenera to four viz. *Urostigma, Pharmacosycea, Sycomorus* and *Ficus*, 15 sections, 14 subsections, 54 series and 38 sub series. Among them, three subgenera namely, *Urostigma, Pharmacosycea* and *Sycomorus* included monoecious members, while subgenus *Ficus* represented only dioecious members. A detailed list of classification proposed by Corner (1965a) is provided in table 3.1.

Considering that no mutualistic relationships with the pollinating agents were involved in the classification, Ramirez (1977a) put out a classification including the specificity of the pollinating agents and the fig species. The classification had modifications from the system proposed by Corner (1965a). The subsection *Eriosycea* was transferred to the rank of section in the subgenus *Ficus.* From the subgenus *Ficus,* series *Rivulares* and *Pseudopalmeae* were moved to the subgenus *Sycomorus. Scabrae* and *Varinga* were considered sections within subgenus *Sycidium. Phaeopilosae* and *Paleomorphe* were elevated to sectional rank. The subgenus *Sycomorus* was divided into eight sections.

Berg (1986) added a new section *Galoglychia* under the subgenus *Urostigma* and added six subsections under section *Galoglychia.* Berg (1989) divided the genus into two major groups *viz.* Group 1 with all monoecious species and group 2 with predominantly (gyno) dioecious species. This

classification was based on several characters including the pollinator affinity. Group 1 was further divided into two subgroups containing subgenus *Urostigma* and *Pharmacosycea* respectively. While the group 2 included the subgenus *Ficus* and *Sycomorus,* also the species from section *Sycidium.* The subdivisions of this group were not established due to the existing confusions within the subgenus.

Berg (2003a) again divided the genus into six subgenera. The classification was based on characters like sexuality, adventitious roots, bracts, stipules, position of figs, stigmas and wax glands. The subgenera he proposed included *Pharmacosycea* and *Urostigma* with only monoecious species, *Ficus, Sycidium* and *Synoecia* comprised of only (gyno) dioecious species and the subg. *Sycomorus* included both (gyno) dioecious and a few monoecious species. The subgenus was further divided into sections and subsections, as provided in table 3.2

Table 3.1. Classification of *Ficus* proposed by Corner (1965a).

SUBGENUS	**SECTION**	**SUBSECTION**	**SERIES**	**SUBSERIES**
Urostigma (Gasp.) Miq.	*Urostigma* (Gasp.) Miq.		*Religiosae* Miq.	
			Superbae Corner	
			Caulobotryae Miq.	
			Orthoneurae Corner	
	Leucogyne Corner			
	Conosycea (Miq.) Corner	*Conosycea* (Miq.) Corner	*Validae* Miq.	
			Drupaceae Corner	*Drupaceae* Corner
				Indicae Corner
				Zygotricheae Corner
				Crassirameae Corner
		Dictyoneuron Corner	*Glaberrimae* Corner	

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<tr><th>SUBGENUS</th><th>SECTION</th><th>SUBSECTION</th><th>SERIES</th><th>SUBSERIES</th></tr>
<tr><td rowspan="8"></td><td rowspan="4"></td><td rowspan="3"></td><td colspan="2">Dubiae Corner</td></tr>
<tr><td colspan="2">Subvalidae (Miq.) Corner</td></tr>
<tr><td colspan="2">Perforatae Corner</td></tr>
<tr><td rowspan="2">Benjamina (Miq.) Corner</td><td colspan="2">Benjamineae Miq.</td></tr>
<tr><td colspan="2">Callophylleae Corner</td></tr>
<tr><td>Stilpnophyllum Endl.</td><td colspan="3"></td></tr>
<tr><td colspan="2" rowspan="4">Malvanthera Corner</td><td rowspan="3">Malvanthereae Corner</td><td>Eubracteatae Corner</td></tr>
<tr><td>Malvanthereae Corner</td></tr>
<tr><td>Platypodeae Corner</td></tr>
<tr><td colspan="2">Cyclanthereae Corner</td><td>Hesperidiiformes Corner</td></tr>
</table>

SUBGENUS	**SECTION**	**SUBSECTION**	**SERIES**	**SUBSERIES**
Pharmacosycea Miq.	*Oreosycea* (Miq.) Corner		*Vasculosae* Corner	*Albipilae* Corner
				Vasculosae Corner
			Nervosae Corner	
			Austrocaledonicae Corner	
	Pharmacosycea Miq.			
Sycomorus (Gasp.) Miq.				
Ficus Corner	*Ficus* Corner	*Ficus* Corner	*Rivulares* Corner	
			Pseudopalmeae Corner	
			Sinosyceae Corner	
			Cariceae Corner	
			Erythrogyneae Corner	
			Podosyceae Corner	*Podosyceae* Corner

SUBGENUS	SECTION	SUBSECTION	SERIES	SUBSERIES
				Basitepalae Corner
		Eriosycea (Miq.) Corner	*Eriosyceae* Corner	*Eriosyceae* Corner
				Trichosyceae Corner
				Dehiscentes Corner
				Cuneifoliae Corner
			Auratae Corner	*Auratae* Corner
				Monandreae Corner
	Rhizocladus Endl.		*Plagiostigmaticae* Corner	*Plagiostigmaticae* Corner
				Pogonotropheae (Miq) Corner
			Ramentaceae Corner	*Pantonianae* Corner
				Balanotae Corner
				Irritantes Corner
				Ramentaceae Corner

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<tr><th>SUBGENUS</th><th>SECTION</th><th>SUBSECTION</th><th>SERIES</th><th>SUBSERIES</th></tr>
<tr><td rowspan="8"></td><td colspan="2" rowspan="4"></td><td rowspan="2"></td><td>Excavatae Corner</td></tr>
<tr><td>Araneosae Corner</td></tr>
<tr><td colspan="2">Distichoideae Corner</td></tr>
<tr><td colspan="2">Distichae Corner</td></tr>
<tr><td colspan="2">Trichocarpeae Corner</td></tr>
<tr><td colspan="2" rowspan="3">Kalosyce (Miq.) Corner</td><td colspan="2">Apiocarpeae Corner</td></tr>
<tr><td rowspan="2">Punctatae Corner</td><td>Punctatae Corner</td></tr>
<tr><td>Ruginerviae Corner</td></tr>
<tr><td>Sinosycidium Corner</td><td colspan="3"></td></tr>
<tr><td rowspan="3">Sycidium Miq.</td><td rowspan="3">Sycidium Miq.</td><td colspan="2">Prostratae Corner</td></tr>
<tr><td colspan="2">Pungentes Corner</td></tr>
<tr><td colspan="2">Phaeopilosae Corner</td></tr>
</table>

SUBGENUS	SECTION	SUBSECTION	SERIES	SUBSERIES
			Copiosae Corner	
			Scabrae Miq.	
		Varinga (Miq.) Corner	*Heterophylleae* Corner	
			Cyrtophylleae Corner	
			Exasperatae Corner	
		Palaeomorphe (King) Corner	*Pallidae* Miq.	
			Subulatae Corner	
			Cuspidatae Miq.	
			Minutuliflorae Sata	
			Fibrosifoliae Corner	
	Adenosperma Corner		*Amphigenae* Corner	
			Hypogenae Corner	
	Neomorphe King		*Auriculatae* Corner	

SUBGENUS	SECTION	SUBSECTION	SERIES	SUBSERIES
			Variegatae Corner	*Variegatae* Corner
				Laciniatae Corner
	Sycocarpus Miq.	*Auriculisperma* Corner	*Cynaroides* Corner	
			Theophrastoides Corner	
			Vitienses Corner	
		Dammaropsis (Warb.) Corner		
		Papuasyce Corner		
		Lepidotus Corner		
		Macrostyla Corner		
		Sycocarpus Miq.	*Longetuberculatae* Sata	
			Tuberculifasciculatae Sata	*Praestantes* Corner
				Calopilinae Corner
				Congestae Corner

SUBGENUS	SECTION	SUBSECTION	SERIES	SUBSERIES
				Hispidae Corner
				Axillares Corner
				Fulvidulae Corner
				Geocarpicae Corner
				Tuberculifasciculatae Corner

Table 3.2. Classification of *Ficus* proposed by Berg and Corner (2005)

SUBGENUS	**SECTION**	**SUBSECTION**
Ficus Corner	*Ficus* Corner	*Ficus* Corner
		Frutescentiae Sata
		Eriosycea Miq.
		Auratae (Corner) C.C. Berg
Pharmacosycea (Miq.) Miq.	*Pharmacosycea* (Miq.) Benth. & Hook. f.	*Bergianae* Carvajal & Shabes
		Petenenses Carvajal & Shabes
		Glandulosae C.C. Berg
		Pedunculatae Sata
	Sycidium Miq.	
	Palaeomorphe King	
Sycomorus (Gasp.) Miq.	*Sycocarpus* Miq.	*Sycocarpus* Miq.
		Macrostyla Corner
	Sycomorus (Gasp.) Miq.	*Sycomorus* (Gasp.) Miq.
		Neomorphe (King) C.C. Berg
	Adenosperma Corner	
	Bosscheria (Teijsm. & de Vriese) C.C. Berg	
	Dammaropsis (Warb.) C.C. Berg	
	Hemicardia C.C. Berg	
	Papuasyce (Corner) C.C. Berg	
	Kissosycea Miq.	

SUBGENUS	SECTION	SUBSECTION
	Rhizocladus Endl.	*Plagiostigma* (Miq.) C.C. Berg
		Pogonotrophe (Miq.) C.C. Berg
		Punctulifoliae Sata
		Trichocarpeae (Corner) C.C. Berg
Urostigma (Gasp.) Miq.	*Stilpnophyllum* Endl.	*Stilpnophyllum* (Endl.) C.C. Berg
		Malvanthera (Corner) C.C. Berg
	Urostigma (Gasp.) Endl.	*Urostigma* (Gasp.) C.C. Berg
		Conosycea (Miq.) C.C. Berg
	Americana Miq.	
	Galoglychia (Gasp.) Endl.	

***Ficus* subg. *Pharmacosycea* (Miq.) Miq.**

Ficus L. subg. *Pharmacosycea* (Miq.) Miq., Ann. Mus. Bot. Lugd.-Bat. 3: 299. 1867; Corner, Gard. Bull. Singapore 17: 405. 1960; Corner in Dass. & Forsb., Rev. Handb. Fl. Ceylon 3: 233. 1981; Berg, Blumea, 48(2): 289-301. 2003; Berg & Corner in Nooteboom, Fl. Malesiana 17(2): 137-168. 2005; Berg *et al.,* Fl. Thailand 10(4): 531. 2011; S. J. Britto, Fl. Central and North Tamil Nadu 963. 2019.

Trees, independent, aerial roots absent; Leaves simple, alternate, spiral; lamina symmetric, margins entire, coriaceous, wax glands usually in the axils of the basal lateral veins beneath or absent. Receptacles axillary, just below the leaves, solitary, pedunculate, monoecious; basal bracts present, persistent; inter floral bracts present.

Pharmacosycea was initially introduced as a separate genus by Miquel (1847) and later reconsidered as a subgenus by Miquel (1867). Being a monoecious group, Bentham and Hooker (1880) uncertainly considered the subgenus, as it had much similarity with the subg. *Urostigma*. Later Corner (1960a, 1960b) added all the monoecious independent trees in the subg. *Pharmacosycea* and divided them into two sections, *Pharmacosycea* and *Oreosycea*. Again sect. *Oreosycea* was divided into series and subseries. The same was followed in the classification by Corner (1965a). Sect. *Pharmacosycea* is neotropical while, sect. *Oreosycea* is paleotropical. Berg (2003a) treated sect. *Oreosycea* into two subsect. *Glandulosae* and *Pedunculatae* each containing two groups. *Ficus austrocaledonica* group & *Ficus nervosa* group in subsect. *Glandulosae* and *Ficus albipila* group & *Ficus vasculosa* group in subsect. *Pedunculatae.*

Distribution: The subgenus is distributed all throughout the world, in the paleotropics and neotropics with about 70 species. Chaudhary *et al.*, (2012) reported seven taxa in this subgenus. In the Western Ghats region only three species is so far reported and members of sect. *Oreosycea* is only present according to the present study.

Species belonging to subg. *Pharmacosycea* sect. *Oreosycea* subsect. *Glandulosae*

1. *F. anamalayana* Sudhakar & G. V. S. Murthy
2. *Ficus nervosa* Roth.

Species belonging to subg. *Pharmacosycea* sect. *Oreosycea* subsect. *Pedunculatae*

1. *F. callosa* Willd.

Ficus subg. *Synoecia* (Miq.) Miq.

Ficus L. subg. *Synoecia* (Miq.) Miq., Ann. Mus. Bot. Lugd.-Bat. 3: 289. 1867; Berg, Blumea, 48(3): 551-571. 2003; Berg & Corner in Nooteboom, Fl. Malesiana 17(2): 467-558. 2005; Berg *et al.,* Fl. Thailand 10(4): 578. 2011.

Root climbers, small roots present on the nodes; Leaves simple, alternate, spiral; acrophylls on fertile branches and bathyphylls on sterile branches; lamina symmetric, margins entire, waxy glands in the axils of both basal lateral veins. Receptacles axillary, ramiflorous or cauliflorous, solitary or in pairs, pedunculate, dioecious; basal bracts present, persistent; inter floral bracts present or absent.

Synoecia was initially treated as a genus by Miquel (1847) by splitting the genus *Ficus*. Later, it was assigned as a rank of subgenus by Miquel (1867). The subgenus was retained in the work of Bentham and Hooker (1880), while King (1887-1888) treated it the rank of a section. Later on, the subgenus was omitted in all the revisions even by Corner (1960a, 1965a). *Synoecia* was then added by Berg (2003c) and placed as a subgenus among the gynodioecious members. The subgenus is alienated into two sections Sect. *Kissosycea* and Sect. *Rhizocladus.* The characters of the male flowers like their position within the receptacle, number of stamens, shape and size of

the anthers were used to distinguish the sections and further divisions. Sect. *Rhizocladus* is further divided into four subsections *viz*. *Plagiostigma, Pogonotrophe, Punctulifoliae* and *Trichocarpeae*. Subsect. *Punctulifoliae* has two groups, *Ficus villosa*-group and *Ficus baeuerlenii*-group. *Ficus villosa*-group is sub grouped into *Ficus villosa*-subgroup and *Ficus excavata*-subgroup (Berg, 2003c).

Distribution: About 70 species of *Ficus* are included in this subgenus distributed from Solomon Islands to Sri Lanka. 18 taxa are reported from the Indian region (Chaudhary *et al.*, 2012) and three species from the Western Ghats region of which two are endemic to Southern Western Ghats belonging to subsect. *Pogonotrophe.*

Species belonging to subg. *Synoecia* sect. *Rhizocladus* subsect. *Pogonotrophe*

1. *Ficus amplocarpa* Govind. & Masil.
2. *Ficus guttata* (Wight) Wight ex King

Species belonging to subg. *Synoecia* sect. *Rhizocladus* subsect. *Plagiostigma*

1. *Ficus pumila* L.

***Ficus* L. subg. *Sycidium* (Miq.) Mildbr. & Burret**

Ficus L. subg. *Sycidium* (Miq.) Mildbr. & Burret, Bot. Jahrb. Syst. 46: 174. 1912; Berg, Blumea, 48(3): 573-597. 2003; Berg & Corner in Nooteboom, Fl. Malesiana 17(2): 169-299. 2005; Berg *et al.*, Fl. Thailand 10(4): 536. 2011.

Trees or shrubs, independent or epiphytic, adventitious roots present or absent; Leaves simple, alternate, spiral or distichous; lamina symmetric, margins usually serrate or lobed, waxy glands present on the lower side of the lamina. Receptacles axillary, on branches, solitary or in pairs,

pedunculate, dioecious; basal bracts absent, peduncular bracts present, persistent; inter floral bracts absent.

Sycidium was first considered as a section under the genus *Ficus* by Miquel (1848c). King (1887-1888) also followed the same classification and thus the rank remain unchanged. Later Mildbraed and Burret (1912), treated *Sycidium* as a subgenus. Again, Corner (1960a, 1965a) provided sectional rank to *Sycidium* and considered it under the subgenus *Ficus.* Berg (2003d) separated *Sycidium* from other (gyno) dioecious members and assigned the rank of subgenus. The subg. *Sycidium* was divided into two sections viz. *Sycidium* and *Palaeomorphe.* The further subgroups of sect. *Sycidium* were *Ficus conocephalifolia* - group, *Ficus copiosa*-group, *Ficus heterophylla* - group, *Ficus montana*-group and *Ficus ulmifolia* - group. Sect. *Palaeomorphe* comprises *Ficus subulate* - group and *Ficus tinctoria* - group as subgroups (Berg, 2003d).

Distribution: The subgenus comprises of about 115 taxa in the world (Berg & Corner, 2005) and 16 taxa in the Indian region (Chaudhary *et al.*, 2012). The two subspecies under *F. tinctoria, viz., Ficus tinctoria* subsp. *gibbosa* and *Ficus tinctoria* subsp. *parasitica* were found to be distinct rather than a single taxon.

Species belonging to subg. *Sycidium* sect. *Sycidium*

1. *Ficus exasperata* Vahl.
2. *Ficus heterophylla* L.f.

Species belonging to subg. *Sycidium* sect. *Palaeomorphe*

1. *Ficus tinctoria* subsp. *gibbosa* (Blume) Corner
2. *Ficus tinctoria* subsp. *parasitica* (J. Koenig ex Willd.) Corner

***Ficus* L. subg. *Sycomorus* (Gasp.) Miq.**

Ficus L. subg. *Sycomorus* (Gasp.) Miq., Ann. Mus. Bot. Lugd.-Bat. 3: 295. 1867; Corner in Dass. & Forsb., Rev. Handb. Fl. Ceylon 3: 233. 1981; Berg, Blumea, 49(1): 155-200. 2004; Berg & Corner in Nooteboom, Fl. Malesiana 17(2): 301-465. 2005; Berg *et al.,* Fl. Thailand 10(4): 558. 2011; S. J. Britto, Fl. Central and North Tamil Nadu 962. 2019.

Trees or shrubs, independent, adventitious roots absent; Leaves simple, alternate or opposite, spiral or distichous; lamina symmetric, margins usually entire, waxy glands in the axils of the basal lateral veins. Receptacles axillary, cauliflorous or on spurs arising from the stem, clustered or in pairs, short pedunculate, monoecious or dioecious; basal bracts absent, peduncular bracts present, persistent; inter floral bracts mostly present.

Gasparrini (1844) introduced the term *Sycomorus* and Miquel (1847) considered it as a separate genus by splitting it from the genus *Ficus*. Later, it was remerged under the genus *Ficus* by Miquel (1867). With out any further divisions Corner (1965a) treated it as a subgenus covering some of the monoecious members. Ramirez (1977) divided the subg. *Sycomorus* into eight sections and updated the classification. The major classification was done by Berg (2004a), in which he divided the subgenus into seven sections viz. sect. *Sycomorus, Adenosperma, Bosscheria, Dammaropsis, Hemicardia, Papuasyce* and *Sycocarpus*. Sect. *Sycomorus* is divided into two subsections *Sycomorus* and *Neomorphe*. *Sycocarpus* and *Macrostyla* are the two subsections of sect. *Sycocarpus*. Again, the subsect. *Sycocarpus* has three named groups *Axillares, Cauliflorae, Flagelliflorae* and a group mentioned 'mixed'. *Ficus calcarata*-group & *Ficus lepicarpa*-group and *Ficus congesta*-group & *Ficus pachyrrhachis*-group belongs to groups *Axillares* and *Cauliflorae* respectively. Group *Flagelliflorae* comprises of *Ficus geocarpa*-group, *Ficus ribes*-group, *Ficus stolonifera*-group

and *Ficus subterranea*-group. *Ficus cereicarpa*-group is included in the unnamed 'mixed' group (Berg, 2004a).

Distribution: The subgenus comprises of about 140 species distributed from Africa to the Pacific (Berg, 2004a) and 13 species reported from India (Chaudhary *et al.*, 2012). The present study confirms that the subgenus is represented by three species in the Western Ghats region.

Species belonging to subg. *Sycomorus* sect. *Sycocarpus* subsect. *Sycocarpus*

1. *Ficus hispida* L.f.

Species belonging to subg. *Sycomorus* sect. *Sycomorus* subsect. *Neomorphe*

1. *Ficus auriculata* Lour.

Species belonging to subg. *Sycomorus* sect. *Sycomorus* subsect. *Sycomorus*

1. *Ficus racemosa* L.

***Ficus* L. subg. *Urostigma* (Gasp.) Miq.**

Ficus L. subg. *Urostigma* (Gasp.) Miq., Ann. Mus. Bot. Lugd.-Bat. 3: 285. 1867; Corner, Gard. Bull. Singapore 17: 370. 1960; Corner in Dass. & Forsb., Rev. Handb. Fl. Ceylon 3: 232. 1981; Berg, Blumea, 49(2&3): 463-480. 2004; Berg & Corner in Nooteboom, Fl. Malesiana 17(2): 559-700. 2005; Berg *et al.*, Fl. Thailand 10(4): 596. 2011; S. J. Britto, Fl. Central and North Tamil Nadu 962. 2019.

Trees, mostly epiphytic, adventitious roots present; Leaves simple, spiral or distichous; lamina symmetric, margins usually entire, waxy gland present at the base of the midrib. Receptacles axillary, mostly below the leaves, solitary or in pairs, sessile or pedunculate, monoecious; basal bracts present, persistent; inter floral bracts usually present.

The term *Urostigma* was introduced as a group by Gasparrini (1844). Later, Miquel (1847) mentioned it as separate genus and then made into a

subgenus by Miquel (1867). Bentham and Hooker (1880) also followed the same rank while King (1887-1888) stated a sectional rank. It was divided into five sections in the classification of Corner (1965a) and was added to seven sections by Ramirez (1977). Berg (1986) treated the two monoecious subg. *Urostigma* and *Pharmacosycea* under the same group and the proposed the detailed classification. Subg. *Urostigma* was divided into four sections, *Urostigma, Americana, Galoglychia* and *Stilpnophyllum.* Further, sect. *Urostigma* comprises of two subsections, *Urostigma* and *Conosycea. Stilpnophyllum* and *Malvanthera* were the subsections of sect. *Stilpnophyllum* (Berg 2004c).

Distribution: Subg. *Urostigma* is one of the most widespread members of the genus *Ficus* distributed in the pan tropics and neo tropics. Around 45 taxa of *Ficus* belonging to subg. *Urostigma* is reported to occur in India and about 20 taxa in the Western Ghats region. Two varieties of *F. virens* namely *Ficus virens* var. *dispersa* and *Ficus virens* var. matthewii were reported as new distributional records to India and Kerala respectively (Nair *et al.,* 2021b, 2021c).

Species belonging to subg. *Urostigma* sect. *Urostigma* subsect. *Conosycea*

1. *Ficus beddomei* King.
2. *Ficus benghalensis* L.
3. *Ficus benjamina* L.
4. *Ficus binnendijkii* (Miq.) Miq.
5. *Ficus costata* Aiton.
6. *Ficus dalhousiae* Miq.
7. *Ficus drupacea* Thunb.
8. *Ficus elastica* Roxb ex Hornem.
9. *Ficus fergusonii* (King) T.B. Worth. ex Corner
10. *Ficus krishnae* C. DC.
11. *Ficus microcarpa* L.f.
12. *Ficus mollis* Vahl.
13. *Ficus talbotii* King.

Species belonging to subg. *Urostigma* sect. *Urostigma* subsect. *Urostigma*

1. *Ficus amplissima* Smith.
2. *Ficus arnottiana* (Miq.) Miq.
3. *Ficus caulocarpa* (Miq.) Miq.
4. *Ficus middletonii* Chantaras.
5. *Ficus religiosa* L.
6. *Ficus superba* (Miq.) Miq.
7. *Ficus travancorica* King.
8. *Ficus tsjahela* Burm.f.
9. *Ficus virens* var. *dispersa* Chantaras.
10. *Ficus virens* var. *matthewii* Chantaras.
11. *Ficus virens* var. *virens* Aiton.

3.5 Diagnostic key to the species of *Ficus* in Western Ghats

3.5.1 Key based on vegetative characters alone

1a. Leaves opposite .....***F. hispida***

1b. Leaves alternate **2**

2a. Leaf with leafy appendages and a cup shaped structure on the dorsal side of the lamina .....***F. krishnae***

2b. Leaf without leafy appendages and a cup shaped structure on the dorsal side of the lamina **3**

3a. Leaves heterophyllous either on the entire plant or during young stages of the plant **4**

3b. Leaves not heterophyllous either on the entire plant or during any stages of the plant **6**

4a. Petiole above 5.0 cm, pubescent; lamina rarely lobed in juvenile stages, margins entire, apex cuspidate or obtuse, glabrous .....***F. callosa***

4b. Petiole below 5.0 cm, scabrous or strigose; lamina lobed in juvenile stages of the plant or during any stages of the plant, margins serrate, apex acute or acuminate, scabrous or puberulent **5**

5a. Petiole strigose; leaf heterophyllous in young stages of the plant, apex acute or acuminate, base obtuse .....***F. exasperata***

5b. Petiole scabrous; leaf heterophyllous in all stages of the plant, leaf apex acuminate, base rounded or subcordate ..... ***F. heterophylla***

6a. Leaves widely elliptic ..... ***F. auriculata***

6b. Leaves ovate or widely ovate or lanceolate or round or elliptic or lance ovate or oblong or obovate **7**

7a. Stipules glabrous **8**

7b. Stipules hairy **23**

8a. Petiole articulated **9**

8b. Petiole not articulated **22**

9a. Leaves symmetric **10**

9b. Leaves asymmetric **21**

10a. Waxy glands at the base of the midrib beneath **11**

10b. Waxy glands two in the axils of the lateral nerves..... ***F. anamalayana***

11a. Lateral nerves numerous, sometimes indistinct **12**

11b. Lateral nerves up to 14 pairs, clearly distinct **14**

12a. Stipules lance ovate, apex narrowly acute; leaf margin undulate, apex acuminate, subcoriaceous ..... ***F. benjamina***

12b. Stipules lanceolate, apex acute; leaf margin entire, apex cuspidate or obtuse, coriaceous **13**

13a. Petioles below 3.0 cm; lamina ovate or lanceovate, 10.0–25.0 cm long; stipules below 2.0 cm ..... ***F. elastica***

13b. Petioles up to 6.0 cm; lamina ovate or elliptic or lance ovate, 3.0–8.0 cm long; stipules above 2.0 cm ..... ***F. microcarpa***

14a. Stipules widely ovate; leaf base obtuse ..... ***F. beddomei***

14b. Stipules ovate or lanceolate or lanceovate; leaf base rounded or cordate or truncate **15**

15a. Lamina pubescent; stipules lanceovate ..... ***F. dalhousiae***

15b. Lamina glabrous; stipules ovate or lanceolate **16**

16a. Stipules ovate; lamina ovate or lanceolate, apex cuspidate ..... ***F. virens* var. *dispersa***

16b. Stipules lanceolate; lamina ovate to widely ovate to lanceolate to elliptic to obovate, apex acute or acuminate **17**

17a. Internode above 5.0 cm; stipules 3.0 cm to 5.0 cm and above; acumen above 3.0 cm long ..... ***F. religiosa***

17b. Internode below 5.0 cm; stipules below 4.0 cm; acumen below 2.0 cm long **18**

18a. Stipules above 5.0 cm long; lamina elliptic to lanceovate, 10.0–30.0 cm long, coriaceous ..... ***F. travancorica***

18b. Stipules below 4.0 cm long; lamina ovate to widely ovate to lanceolate to obovate, 5.0–20.0 cm long, subcoriaceous **19**

19a. Petiole below 3.0 cm long; lamina lanceolate, base cuneate..... ..... ***F. binnendijkii***

19b. Petiole above 4.0 cm long; lamina ovate to widely ovate to obovate, base rounded or cordate **20**

20a. Stipules above 3.0 cm, apex acute or narrowly acute; petioles up to 12.0 cm long; lamina widely ovate, apex acuminate, base rounded or cordate ..... ***F. arnottiana***

20b. Stipules up to 2.0 cm, apex narrowly acute; petioles below 8.0 cm long; lamina ovate or lanceolate or elliptic or obovate, apex acute, base rounded or truncate ..... ***F. virens* var. *virens***

21a. Petiole glabrous or pubescent; lamina ovate, apex obtuse, base cordate, subcoriaceous, lateral veins 3–6 pairs ..... ***F. pumila***

21b. Petiole puberulous; lamina lanceovate, apex acuminate, base cuneate or truncate or oblique, coriaceous, lateral veins 3–4 pairs ....***F. tinctoria* subsp. *gibbosa***

22a. Stipule lanceolate, above 5.0 cm long; petiole 4.0–10.0cm long; lamina lanceolate to lanceovate, apex cuspidate, base cordate, subcoriaceous .. ..***F. tsjakela***

22b. Stipule ovate, below 3.0 cm long; petiole 1.0–6.0 cm long; lamina ovate to elliptic to lanceovate, apex acute, base obtuse, coriaceous ....***F. amplissima***

23a. Lamina asymmetric..... ***F. tinctoria* subsp. *parasitica***

23b. Lamina asymmetric **24**

24a. Stipules ovate or widely ovate **25**

24b. Stipules lanceolate or lanceovate **30**

25a. Lamina elliptic or oblong, apex acuminate; stipule tomentose..... .....***F. drupacea***

25b. Lamina ovate or widely ovate or elliptic or lanceovate, apex acute or cuspidate or obtuse or caudate; stipule hairy other than tomentose.... **26**

26a. Petiole canaliculate, glabrous or pubescent; lamina ovate or elliptic or lanceovate, base obtuse or rounded, waxy glands at the base of the midrib..... **27**

26b. Petiole not canaliculate, tomentose; lamina widely ovate, base cordate or subcordate, waxy glands two in the axils of the lateral nerves **29**

27a. Stipules widely ovate, pubescent; petiole pubescent; leaf apex obtuse, base rounded .....***F. benghalensis***

27b. Stipules ovate, sericeous or puberulent; petiole glabrous; leaf apex caudate or acute, base obtuse **28**

28a. Lamina ovate or lanceovate, 5.0–15.0 cm long, apex caudate, lateral veins 11–14 pairs; stipules below 1.0 cm ..... ***F. talbotii***

28b. Lamina elliptic or lanceovate, 5.0–25.0 cm long, apex acute, lateral veins 9–12 pairs; stipules above 1.0 cm ..... ***F. fergusonii***

29a. Petioles up to 10.0 cm long; lamina cuspidate, base subcordate, glabrous; internode 2.0–5.0 cm and above ..... ***F. amplocarpa***

29b. Petioles below 5.0 cm long; lamina acute, base cordate or subcordate, glabrous or pubescent; internode 2.0–4.0 cm only ..... ***F. guttata***

30a. Stipules, petioles and lamina tomentose; leaf apex rounded or acute .... ***F. mollis***

30b. Stipules, petioles and lamina not tomentose; leaf apex acute or acuminate or obtuse **31**

31a. Petioles and lamina pubescent ..... ***F. nervosa***

31b. Petioles and lamina glabrous **32**

32a. Stipules persistent, pubescent ..... ***F. middletonii***

32b. Stipules caducous, tomentose or puberulous **33**

33a. Petioles canaliculate; lateral veins below 12 pairs **34**

33b. Petioles not canaliculate; lateral veins above 14 pairs..... ***F. costata***

34a. Stipules below 2.0 cm long, apex acute **35**

34b. Stipules up to 3.0 cm long, apex narrowly acute; waxy glands two in the axils of the lateral nerves ..... ***F. racemosa***

35a. Internode below 4.0 cm long; stipule puberulous **36**

35b. Internode above 5.0 cm long; stipule tomentose ..... ***F. virens* var. *matthewii***

36a. Lamina ovate or elliptic or oblong, 5.0–20.0 cm long, base rounded, acumen below 1.0 cm, lateral veins 9–12 pairs ..... ***F. caulocarpa***

36b. Lamina elliptic or oblong, 10.0–20.0 cm long, base obtuse or rounded, acumen up to 1.5 cm, lateral veins 5–10 pairs ..... ***F. superba***

3.5.2 Key based on syconium characters alone

1a. Figs sessile **2**

1b. Figs pedunculate **14**

2a. Syconium obovoid or oblong or ellipsoid or sub globose **3**

2b. Syconium globose **5**

3a. Figs solitary or paired; basal bracts pubescent; syconium 2.0–3.0 cm across, ellipsoid or sub globose; male flowers scattered ..... ***F. drupacea***

3b. Figs paired; basal bracts glabrous; syconium 1.0–2.0 cm across, obovoid or oblong; male flowers near ostiole **4**

4a. Basal bracts 1.0–2.0 mm, ovate; syconium obovoid ..... ***F. binnendijkii***

4b. Basal bracts less than 1.0 mm, widely ovate; syconium oblong ..... ***F. elastica***

5a. Basal bracts ovate **6**

5b. Basal bracts widely ovate **7**

6a. Figs clustered; basal bracts 1.0–4.0 mm; syconium glabrous or pubescent; male flowers arranged near the ostiole; female flowers at the base of the receptacle ..... ***F. amplissima***

6b. Figs solitary or paired; basal bracts 2.0–5.0 mm; syconium puberulous; male flowers and female flowers scattered throughout the receptacle ... . ***F. fergusonii***

7a. Syconium glabrous **8**

7b. Syconium hairy **12**

8a. Syconium less than 1.0 cm across, with scars; outer bracts pubescent; inner bracts widely ovate ..... ***F. talbotii***

8b. Syconium 1.0 cm or above across, without scars; outer bracts glabrous; inner bracts lanceolate or lanceovate **9**

9a. Basal bracts pubescent or glabrous; ostiolar diameter less than 1.0 mm; inner bracts lanceovate; male flowers near the ostiole and scattered .... ***F. microcarpa***

9b. Basal bracts glabrous; ostiolar diameter 1.0–2.0 mm; inner bracts lanceolate; male flowers near the ostiole **10**

10a. Figs less than 1.0 cm across, clustered or paired ..... ***F. tsjakela***

10b. Figs up to 2.0 cm across, solitary or paired **11**

11a. Outer ostiolar bracts ovate; male flowers pedicellate; female flowers at the base; basal bracts less than 3.0 mm ..... ***F. benjamina***

11b. Outer ostiolar bracts widely ovate; male flowers sessile; female flowers scattered; basal bracts 2.0–3.0 mm ..... ***F. religiosa***

12a. Figs paired; basal bracts glabrous or puberulous; syconium puberulous; outer bracts puberulous or glabrous; male flowers scattered .... ***F. krishnae***

12b. Figs clustered; basal bracts pubescent; syconium puberulent or tomentose; outer bracts pubescent or villose or pilose; male flowers near ostiole **13**

13a. Basal bracts less than 5.0 mm, pubescent or tomentose; syconium less than 1 cm across, tomentose; male flowers less than 1.0 mm, pedicellate; female flowers at the base, sessile; gall flowers sessile .....***F. mollis***

13b. Basal bracts above 5.0 mm, pubescent; syconium up to 3.0 cm across, puberulent; male flowers 3.0 mm and above, sessile; female flowers scattered, pedicellate; gall flowers pedicellate ..... ***F. benghalensis***

14a. Figs dioecious **15**

14b. Figs monoecious **23**

15a. Peduncle strigose; basal bracts and syconium hispid.....***F. hispida***

15b. Peduncle glabrous or hairy other than strigose; basal bracts and syconium glabrous or hairy other than hispid **16**

16a. Figs axillary **17**

16b. Figs cauliflorous **21**

17a. Basal bracts present..... **18**

17b. Basal bracts absent **19**

18a. Figs solitary; peduncle above 1.1 cm, up to 3.0 cm; basal bracts glabrous or sericeous; syconium above 4.0 cm, obovoid or turbinate; outer bracts ovate, pubescent or tomentose ..... ***F. pumila***

18b. Figs paired or clustered; peduncle up to 1.0 cm; basal bracts pubescent; syconium below 2.0 cm, globose; outer bracts widely ovate, glabrous .. ..***F. tinctoria* subsp. *parasitica***

19a. Figs solitary; peduncle up to 2.0 cm, pubescent or scabrous; syconium up to 3.0 cm across; outer bracts strigose or scabrous **20**

19b. Figs paired; peduncle below 1.0 cm, strigulose; syconium 1.0 cm or below across; outer bracts glabrous ..... ***F. tinctoria* subsp. *gibbosa***

20a. Peduncle scabrous; figs globose, scabrous; outer bracts ovate, strigose; tepals pubescent; female flowers at the base .....***F. exasperata***

20b. Peduncle pubescent; figs obovoid, globose; outer bracts widely ovate, scabrous; tepals glabrous; female flowers scattered ..... ***F. heterophylla***

21a. Peduncle angular, villous; syconium turbinate, pilose ..... ***F. auriculata***

21b. Peduncle terete, glabrous; syconium globose, glabrous or pubescent . **22**

22a. Peduncle 1.0–2.0 cm long; basal bracts caducous, below 3.0 mm, glabrous; syconium above 5.0 cm across, glabrous; male flowers pedicellate..... ***F. amplocarpa***

22b. Peduncle 2.0–3.0 cm long; basal bracts persistent, above 4.0 mm, pubescent; syconium below 5.0 cm across, pubescent; male flowers sessile..... ***F. guttata***

23a. Basal bracts present..... **24**

23b. Basal bracts absent.....***F. nervosa***

24a. Peduncle glabrous **25**

24b. Peduncle hairy **32**

25a. Peduncle angular; syconium up to 3.0 cm across, obovoid..... **26**

25b. Peduncle terete; syconium up to 2.0 cm across, globose **27**

26a. Figs solitary or paired; peduncle 2.0–3.0 cm long; basal bracts ovate, glabrous; outer bracts glabrous .....***F. beddomei***

26b. Figs clustered; peduncle up to 1.0 cm long; basal bracts widely ovate, puberulous; outer bracts puberulous ..... ***F. virens* var. *matthewii***

27a. Receptacles clustered **28**

27b. Receptacles solitary or paired **30**

28a. Peduncle 1.0–3.0 cm long; syconium up to 2.0 cm across, glabrous or puberulous; outer bracts 1.0–3.0 cm in size .....***F. virens* var. *virens***

28b. Peduncle below 1.0 long; syconium up to 1.0 cm across, glabrous; outer bracts 1.0–2.0 cm in size **29**

29a. Basal bracts up to 2.0 mm in size, ovate, glabrous; outer bracts widely ovate; female flowers at the base .....***F. arnottiana***

29b. Basal bracts above 2.0 mm in size, widely ovate, pubescent; outer bracts ovate; female flowers scattered .....***F. superba***

30a. Figs solitary or paired, 1.0–2.0 cm across; inner bracts less than 1.0 mm in size .....***F. costata***

30b. Figs paired, less than 1.0 cm across; inner bracts up to 2.0 mm in size **31**

31a. Basal bracts ovate, glabrous; outer bracts above 2.0 mm in size; male flowers near ostiole, above 3.0 mm in size, pedicellate, tepals free; female flowers scattered ..... ***F. travancorica***

31b. Basal bracts widely ovate, puberulous; outer bracts below 1.0 mm in size; male flowers scattered, below 2.5 mm in size, sessile, tepals united; female flowers at the base .....***F. virens* var. *dispersa***

32a. Figs clustered on the main trunk, rarely axillary; peduncle puberulous; basal bracts caducous .....***F. racemosa***

32b. Figs axillary; peduncle pubescent; basal bracts persistent **33**

33a. Peduncle below 1.0 cm long; syconium obovoid or oblong or globose **34**

33b. Peduncle 1.1–3.0 cm long; syconium globose **36**

34a. Basal bracts ovate, pubescent; outer bracts widely ovate; inner bracts lanceovate; tepals above 1.0 mm long ..... ***F. dalhousiae***

34b. Basal bracts widely ovate. Glabrous or pubescent or puberulous; outer bracts ovate; inner bracts lanceolate **35**

35a. Basal bracts pubescent; syconium obovoid or oblong, pubescent; outer bracts pubescent; male flowers pedicellate, tepals united .... ***F. anamalayana***

35b. Basal bracts glabrous or puberulous; syconium globose, glabrous; outer bracts glabrous; male flowers sessile, tepals free ..... ***F. caulocarpa***

36a. Figs solitary; basal bracts pubescent; syconium above 3.0 cm across, glabrous; outer bracts widely ovate, pubescent; male flowers pedicellate ..... ***F. callosa***

36b. Figs paired; basal bracts puberulous; syconium below 2.0 cm across, glabrous or pubescent; outer bracts ovate, glabrous; male flowers sessile ..... ***F. middletonii***

3.5.3 Key based on combination of vegetative and floral characters

1a. Leaves opposite ..... ***F. hispida***

1b. Leaves alternate **2**

2a. Figs sessile **3**

2b. Figs pedunculate **15**

3a. Leaf with lamina cup shaped appendages at the base and with leafy appendages .....***F. krishnae***

3b. Leaf without lamina cup shaped appendages at the base and without leafy appendages **4**

4a. Aerial roots absent; lamina entire; petiole and lamina strictly glabrous, base of the lamina obtuse or cordate or truncate; syconium globose **5**

4b. Aerial roots present; lamina entire or undulate; petiole and lamina glabrous or hairy, base of the lamina obtuse or rounded or cordate or subcordate or cuneate; syconium obovoid or ellipsoid or oblong or globose or sub globose **8**

5a. Stipules sericeous; petioles less than 4.0 cm; leaf apex caudate, lateral veins 11–14 or more; basal bracts and outer ostiolar bracts hairy ..... ***F. talbotii***

5b. Stipules glabrous; petioles above 4.0 cm; leaf apex not caudate, lateral veins 7–10; basal bracts and outer ostiolar bracts glabrous **6**

6a. Petioles 2.0–6.0 cm long; lamina ovate or elliptic or lanceolate, apex acute, base obtuse, figs clustered; basal bracts widely ovate .....***F. amplissima***

6b. Petioles 6.0–10.0 cm long; lamina ovate or widely ovate or lanceolate, apex not acute, base not obtuse; figs solitary or paired or clustered; basal bracts ovate **7**

7a. Lamina ovate or widely ovate 5.0–20.0 cm long, apex acuminate, acumen above 2.0 cm long; figs solitary or paired, syconium up to 2.0 cm across .....***F. religiosa***

7b. Lamina lanceolate or lanceovate, 5.0–25.0 cm long, apex cuspidate, acumen less than 1.5 cm long; figs paired or clustered, syconium up to 1.0 cm across..... ***F. tsjakela***

8a. Young twigs, stipules, petioles, lamina, syconium and basal bracts hairy **9**

8b. Young twigs, stipules, petioles, lamina, syconium and basal bracts glabrous **11**

9a. Young twigs tomentose; stipules lanceolate; lamina less than 15.0 cm, apex acute or rounded; syconium up to 1.0 cm across .....***F. mollis***

9b. Young twigs pubescent; stipules widely ovate; lamina up to 30.0 cm, apex acuminate or obtuse; syconium 2.0–3.0 cm across **10**

10a. Stipules up to 4.0 cm long, pubescent; lamina ovate or widely ovate, apex obtuse, lateral veins 5–8 pairs; syconium clustered, globose, puberulent ..... ***F. benghalensis***

10b. Stipules up to 2.0 cm long, tomentose; lamina elliptic or oblong, apex acuminate, lateral veins 7–14 pairs; syconium solitary or paired, globose, ellipsoid or sub globose, glabrous .....***F. drupacea***

11a. Stipules above 2.0 cm long; petiole above 4.0 cm in length; lamina up to 25.0 cm long; basal bracts ovate..... **12**

11b. Stipules less than 2.0 cm long; petiole less than 4.0 cm in length; lamina less than 15.0 cm long; basal bracts widely ovate **13**

12a. Stipules lanceolate, above 5.0 cm long, glabrous; lamina leathery, ovate – lanceovate, apex cuspidate, lateral veins numerous; syconium oblong, glabrous .....***F. elastica***

12b. Stipules ovate, less than 3.0 cm long, puberulent; lamina subcoriaceous, elliptic – lanceovate, apex acute, lateral veins 9–12 pairs; syconium globose, puberulous ..... ***F. fergusonii***

13a. Lamina lanceolate, up to 15.0 cm long, base cuneate, acumen up to 1.0 cm, lateral veins 11–14 pairs; syconium obovoid ..... ***F. binnendijkii***

13b. Lamina ovate to lanceovate, up to 10.0 cm long, base obtuse, acumen absent, lateral veins numerous; syconium globose **14**

14a. Stipules lanceovate, up to 2.0 cm long; lamina undulate, apex acuminate; syconium paired, up to 2.0 cm across; basal bracts glabrous, 2.0 mm; female flowers at the base of the syconium ..... ***F. benjamina***

14b. Stipules lanceolate, 1.0 cm long; lamina entire, apex cuspidate or obtuse; syconium clustered, 1.0 cm across; basal bracts glabrous or puberulent, up to 3.0 mm; female flowers scattered throughout the syconium ..... ***F. microcarpa***

15a. Figs monoecious **16**

15b. Figs dioecious **30**

16a. Epiphytic climber; stipules above 5.0 cm long..... ***F. travancorica***

16b. Epiphytic or independent trees; stipules less than 5.0 cm long **17**

17a. Figs cauliflorous ..... ***F. racemosa***

17b. Figs axillary **18**

18a. Young twigs tomentose; basal bracts absent ..... ***F. nervosa***

18b. Young twigs glabrous or hairy other than tomentose; basal bracts present..... **19**

19a. Stipules puberulent; lamina coriaceous sometimes lobed in juvenile stages; petiole pubescent; figs strictly solitary ..... ***F. callosa***

19b. Stipules glabrous or hairy other than puberulent; lamina not coriaceous, not lobed in juvenile stages; petiole glabrous; figs solitary or paired or clustered..... **20**

20a. Stipules widely ovate; lamina leathery; syconium with ribs on the surface; basal bracts above 4.0 mm; all flowers 3.0 mm and above .... ***F. beddomei***

20b. Stipules ovate or lanceolate or lanceovate; lamina sub coriaceous; syconium without ribs on the surface; basal bracts up to 4.0 mm; all flowers below 3.0 mm..... **21**

21a. Leaf apex acute, base cordate, lateral veins 14 pairs or more; outer bracts pubescent **22**

21b. Leaf apex acute or acuminate or obtuse, base not cordate, lateral veins less than 14; outer bracts glabrous or puberulous **23**

22a. Young twigs glabrous; stipules lanceolate, up to 4.0 cm long; petiole above 8.0 cm long; lamina ovate or widely ovate; receptacles paired; basal bracts widely ovate; syconium obovoid or oblong; tepals of male flower united..... ***F. anamalayana***

22b. Young twigs puberulent; stipules lanceovate, above 5.0 cm long; petiole up to 8.0 cm long; lamina ovate or lanceovate; receptacles paired or clustered; basal bracts ovate; syconium obovoid or globose; tepals of male flower free ..... ***F. dalhousiae***

23a. Stipules up to 4.0 cm long; lamina widely ovate, acumen above 1.5 cm long ..... ***F. arnottiana***

23b. Stipules less than 3.0 cm long; lamina ovate or elliptic or lanceovate or oblong or lanceolate or obovate, acumen below 1.5 cm long **24**

24a. Stipules tomentose; petiole up to 12.0 cm; peduncle angular; syconium obovoid ..... ***F. virens* var. *matthewii***

24b. Stipules glabrous or pubescent or puberulous; petiole less than 10.0 cm; peduncle terete; syconium globose **25**

25a. Stipules ovate; leaf apex cuspidate; syconium solitary or paired .... ***F. virens* var. *dispersa***

25b. Stipules lanceolate; leaf apex acute or acuminate; syconium paired or clustered..... **26**

26a. Trees 10–15 m tall; receptacles paired; basal bracts ovate **27**

26b. Trees 25–35 m tall; receptacles clustered; basal bracts widely ovate ... **28**

27a. Stipules persistent, pubescent; lamina ovate or widely ovate, length up to 15.0 cm, apex acute or acuminate, base obtuse or rounded, lateral veins up to 10 pairs; syconium 1.0–2.0 cm across, glabrous or pubescent ..... ***F. middletonii***

27b. Stipules caducous, puberulous; lamina ovate or elliptic, length up to 20.0 cm, apex acuminate, base rounded or subcordate, lateral veins up to 14 pairs; syconium below 1.0 cm across, glabrous ..... ***F. costata***

28a. Stipule narrowly acute, glabrous; petiole less than 8.0 cm long; peduncle above 2.0 cm long; syconium above 1.0 cm across, glabrous or puberulous; inner bracts above 1.0 mm ..... ***F. virens* var. *virens***

28b. Stipule acute, puberulous; petiole less than 10.0 cm long; peduncle below 1.0 cm long; syconium below 1.0 cm across, glabrous; inner bracts below 1.0 mm **29**

29a. Aerial roots present; young twigs glabrous; lamina ovate or elliptic or oblong, lateral veins 9–12 pairs; peduncle pubescent; male flowers sessile..... ***F. caulocarpa***

29b. Aerial roots absent; young twigs puberulous; lamina elliptic or oblong, lateral veins 5–10 pairs; peduncle glabrous; male flowers pedicellate ....***F. superba***

30a. Climbers **31**

30b. Shrubs or trees **33**

31a. Stipules lanceolate; stipules glabrous or tomentose; petiole canaliculate, up to 2.0 cm long, glabrous or pubescent; lamina lanceovate, less than 5.0 cm long; figs axillary, obovoid or turbinate; peduncle pubescent .... ***F. pumila***

31b. Stipules ovate; stipules pubescent; petioles not canaliculate, 4.0–10.0 cm long, tomentose; lamina widely ovate, up to 15.0 cm long; figs cauliflorous, globose; peduncle glabrous **32**

32a. Young twigs pubescent; petiole up to 10.0 cm long; leaf apex cuspidate, base subcordate, lamina glabrous; basal bracts caducous; less than 4.0 cm in size, glabrous; syconium above 5.0 cm in size, glabrous ....***F. amplocarpa***

32b. Young twigs pubescent or tomentose; petiole up to 4.0 cm long; leaf apex acute, base cordate or subcordate, lamina glabrous or pubescent; basal bracts persistent, above 4.0 cm in size, puberulous; syconium below 5.0 cm in size, pubescent ..... ***F. guttata***

33a. Figs cauliflorous, turbinate, 5.0–6.0 cm across; lamina 20.0–40.0 cm in size .....***F. auriculata***

33b. Figs axillary, globose or obovoid, 1.0–3.0 cm across; lamina 5.0–20.0 cm in size **34**

34a. Independent plants; young twigs scabrous; leaves heterophyllous in entire stage of the plant or in juvenile stages; figs solitary **35**

34b. Epiphytic or lithophytic plants; young twigs pubescent or glabrous; leaves not heterophyllous; figs paired or clustered **36**

35a. Trees; stipule strigose; lamina lobed in young stages and entire when mature, apex acute or acuminate, base obtuse; peduncle scabrous; syconium globose, scabrous; tepals pubescent .....***F. exasperata***

35b. Shrubs; stipules glabrous; lamina lobed in entire plant, apex acuminate, base rounded or subcordate; peduncle pubescent; syconium obovoid, glabrous; tepals glabrous ..... ***F. heterophylla***

36a. Small tree, 3–10 m height; aerial roots absent; young twigs glabrous; stipules less than 1.0 cm long, glabrous; petiole pubescent or hispid; lamina less than 10.0 cm in size, base oblique or cuneate or truncate, glabrous, lateral veins 3–4 pairs; figs paired, less than 1.0 cm across; peduncle strigulose, scabrous; basal bracts absent .... ***F. tinctoria* subsp. *gibbosa***

36b. Medium size tree, 10–15 m height; aerial roots present; young twigs pubescent; stipules above 1.0 cm long, strigulose; petiole puberulous; lamina up to 15.0 cm in size, base oblique, hispid or hirtellous, lateral veins 5–8 pairs; figs paired or clustered, up to 2.0 cm across, pubescent; peduncle puberulent; basal bracts present ....***F. tinctoria* subsp. *parasitica***

3.6 Enumeration of taxa

3.6.1. *Ficus amplissima* Sm.

Ficus amplissima Sm., in Rees Cycl. 14: no. 68. 1810; Miq., Ann. Mus. Bot. Lugd.-Bat. 3: 287. 1867; King, Ann. Roy. Bot. Gard. (Calcutta) 1: 179. 1888; Corner, Gard. Bull. Singapore 18: 84. 1960; Corner, Gard. Bull. Singapore 21: 11. 1965; Santapau & Janardhanan, Fl. Saurashtra 46. 1967; G.L. Shah, Fl. Gujarat 643. 1978; Corner in Dass & Forsb., Rev. Handb. Fl. Ceylon 3: 242. 1981; B.D. Sharma *et al.,* Fl. Karnataka: Analysis 258. 1984; C.J. Saldanha, Fl. Karnataka 114. 1984; D.M. Verma *et al.,* Fl. Raipur, Durg & Rajnandgaon 356. 1985; V. Chithra in A.N. Henry *et al.,* Fl. Tamil Nadu, Ind., Ser I: Analysis 2: 251. 1987; Bole & J.M. Pathak, Fl. Saurashtra 2: 292. 1988; Kamble & S. G. Pradan, Fl. Akola Dist. 211. 1988; Manilal, Fl. Silent Valley 259. 1988; N.P. Singh, Fl. Eastern Karnataka 2: 584. 1988; B.G. Kulkarni, Fl. Sindhudurg 417. 1988; T. Pullaiah & N. Yesoda, Fl. Anantapur Dist. 231. 1989; Kesh. Murthy & S.N. Yogan. Fl. Coorg 420. 1990; Vajr., Fl. Palghat Dist. 445. 1990; K.M. Matthew, Excur. Fl. Central Tamil Nadu 482. 1991; Lakshmin. & B.D. Sharma, Fl. Nasik Dist. 438. 1991; P.J. Parmar in B.V. Shetty & V. Singh, Fl. Rajasthan 2: 800. 1991; Kothari & Moorthy, Fl. Raigad Dist. 3: 377. 1993; D. Deshp. *et al.,* Fl. Mahabaleshwar & Adjoinings 2: 553. 1995; V. Raju & T. Pullaiah, Fl. Kurnool 435. 1995; Sasidh. & Sivar., Fl. Pl. Thrissur Forest 427. 1996; T. Pullaiah & D.A. Moulali, Fl. Andhra Pradesh 2: 896. 1997; V. Mudgal *et al.,* Fl. Madhya Pradesh 2: 610. 1997; Sasidh., Fl. Chinnar W. L. S. 297. 1999; K.M. Matthew, Fl. Palni Hills 1178. 1999; T. Pullaiah *et al.,* Fl. Guntur Dist. 324. 2000; N.P. Singh *et al.,* Fl. Maharashtra Dicot 2: 933. 2001; P. Daniel & P. Umamaheshwari, Fl. Gulf Mannar South. Ind. 405. 2001; Singh *et*

al., Fl. Bihar 475. 2001; K.G. Bhat, Fl. Udupi 592. 2003; Sasidh. & Sivar., Bio. Docu. Kerala part 6: Flow. Plant. 438. 2004; Anil Kumar *et al.,* Fl. Pathanamthitta 462. 2005; S.G. Pradhan *et al.,* Fl. Sanjay Gandhi National Park 3: 572. 2005; K.M. Chetty *et al.,* Fl. Pl. Chittoor Dist. 331. 2008; Sunil, Fl. Alappuzha Dist. 660. 2009; Chaudhary *et al.,* Taiwania 57(2): 207. 2012; Chantaras. *et al.,* Syst. Bot. 38(3): 683. 2013; T. Pullaiah, Fl. Telangana 2: 878. 2015; Sudhakar *et al.,* Figs of Eastern Ghats 26. 2017; Ficus sp. Madhya Pradesh 7. 2019; S.J. Britto, Fl. Central & North Tamil Nadu 965. 2019; S.S. Dash & A.A. Mao, Fl. Pl. India, 2: 537. 2020. *F. indica* Willd., Sp. Pl. 4: 1146. 1806. *F. tsiela* Roxb. ex Buch.-Ham., Trans. Linn. Soc. London 15: 149. 1826; Roxb., Fl. Ind. 3: 549. 1832; Wight, Icon. Pl. Ind. Orient. 2: 668. 1843; King in Hook.f., Fl. Brit. lndia 5: 515. 1888; J. Cameron, For. Trees of Mysore & Coorg 284. 1894; H. Trimen, Handb. Fl. Ceylon 4: 92. 1898; Talbot, Trees Bombay 2: 329. 1902; Bourd., For. Trees Travancore 366. 1908; T. Cooke, Fl. Pres. Bombay 2: 650. 1908; Rama Rao, Fl. Pl. Travancore 382. 1914; Brandis, Indian Trees 603. 1921; C.E.C. Fisch. in Gamble, Fl. Madras 3: 1362. 1928; R.S. Rao *et al.,* Fl. Goa, Diu, Daman, Dadra & Nagar haveli 2: 410. 1986. **Type:** Rheede 3: 85. t. 63. 1682. Based on *F. tsiela* Rheed.

Urostigma pseudobenjaminum Miq., London J. Bot. 6: 566. 1847. *Ficus pseudobenjamina* (Miq.) Miq., Ann. Mus. Bot. Lugduno–Batavi 3: 286. 1867. **Type:** India. Tamil Nadu, Cudaloor, *R. Wight 4503* (Type- K, K000880020!).

Urostigma pseudotsiela Miq., London J. Bot. 6: 566. 1847. *Ficus pseudotsiela* (Miq.) King, Ann. Roy. Bot. Gard. (Calcutta)1: t.74. 1887. **Type:** Ind. Orientalis, *R. Wight.* in Herb. Hook. (Holotype- K).

Fig. 3.1 – 3.3

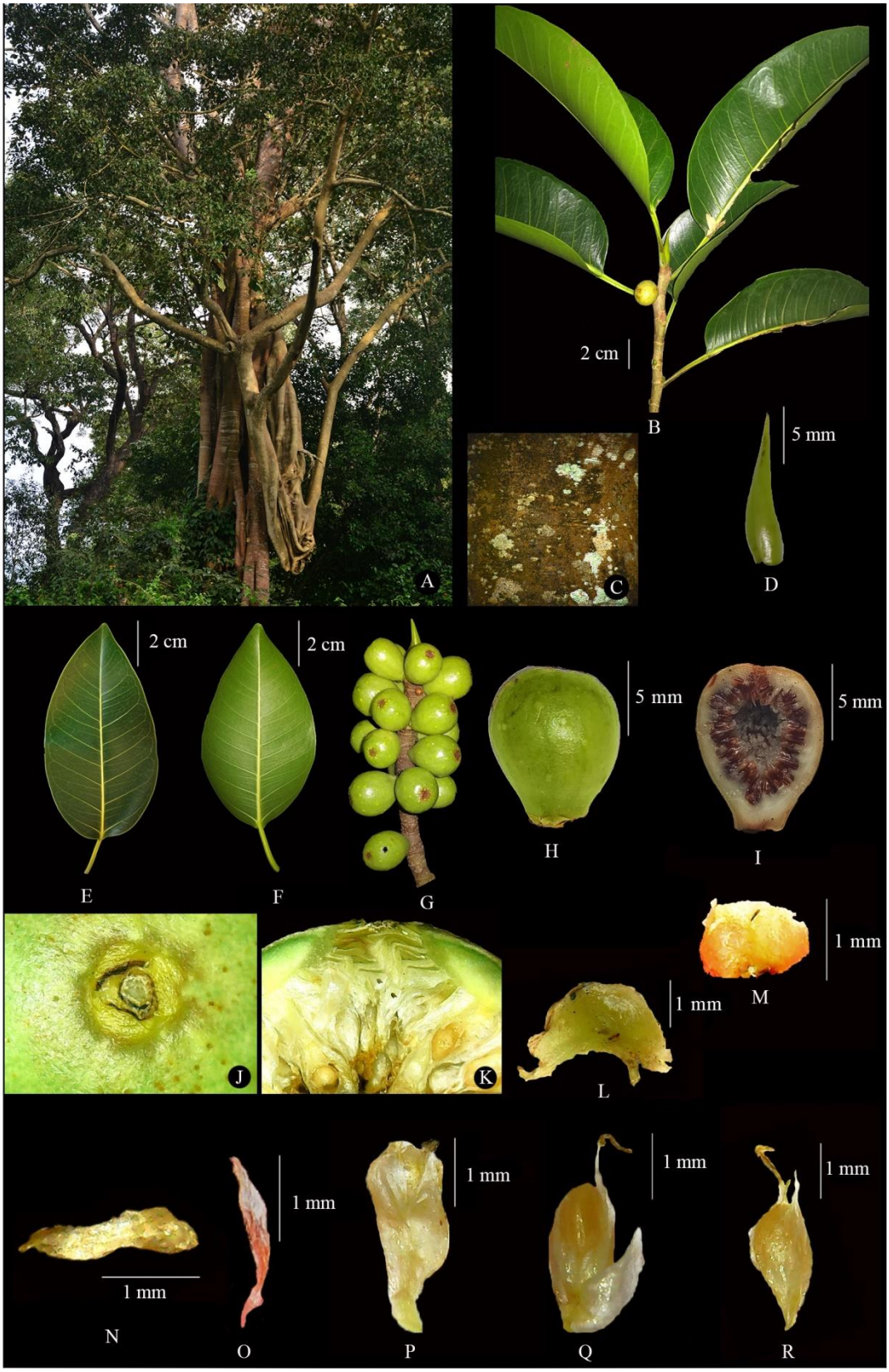


Fig. 3.1. ***Ficus amplissima*** Sm.: **A.** Habit; **B.** Twig; **C.** Bark; **D.** Stipule; **E.** Leaf adaxial side; **F.** Leaf abaxial side; **G.** Receptacles; **H.** Syconium; **I.** Syconium L. S.; **J.** Ostiole; **K.** Ostiolar L. S.; **L.** Basal bract; **M.** Outer ostiolar bract; **N.** Inner ostiolar bract; **O.** Tepal; **P.** Male flower; **Q.** Female flower; **R.** Gall flower.

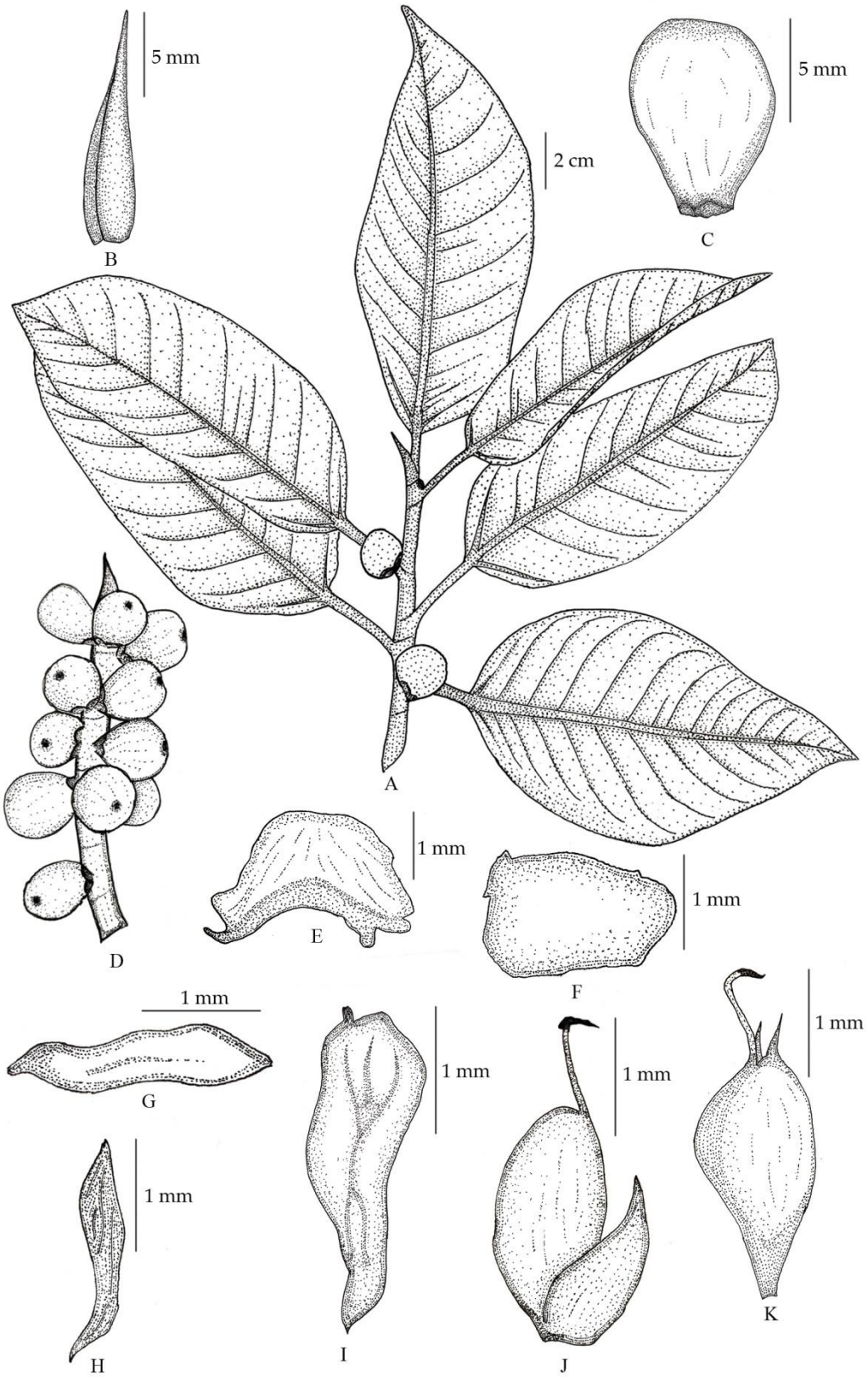


Fig. 3.2. ***Ficus amplissima*** Sm.: **A.** Twig; **B.** Stipule; **C.** Syconium; **D.** Receptacles; **E.** Basal bract; **F.** Outer ostiolar bract; **G.** Inner ostiolar bract; **H.** Tepal; **I.** Male flower; **J.** Female flower; **K.** Gall flower.

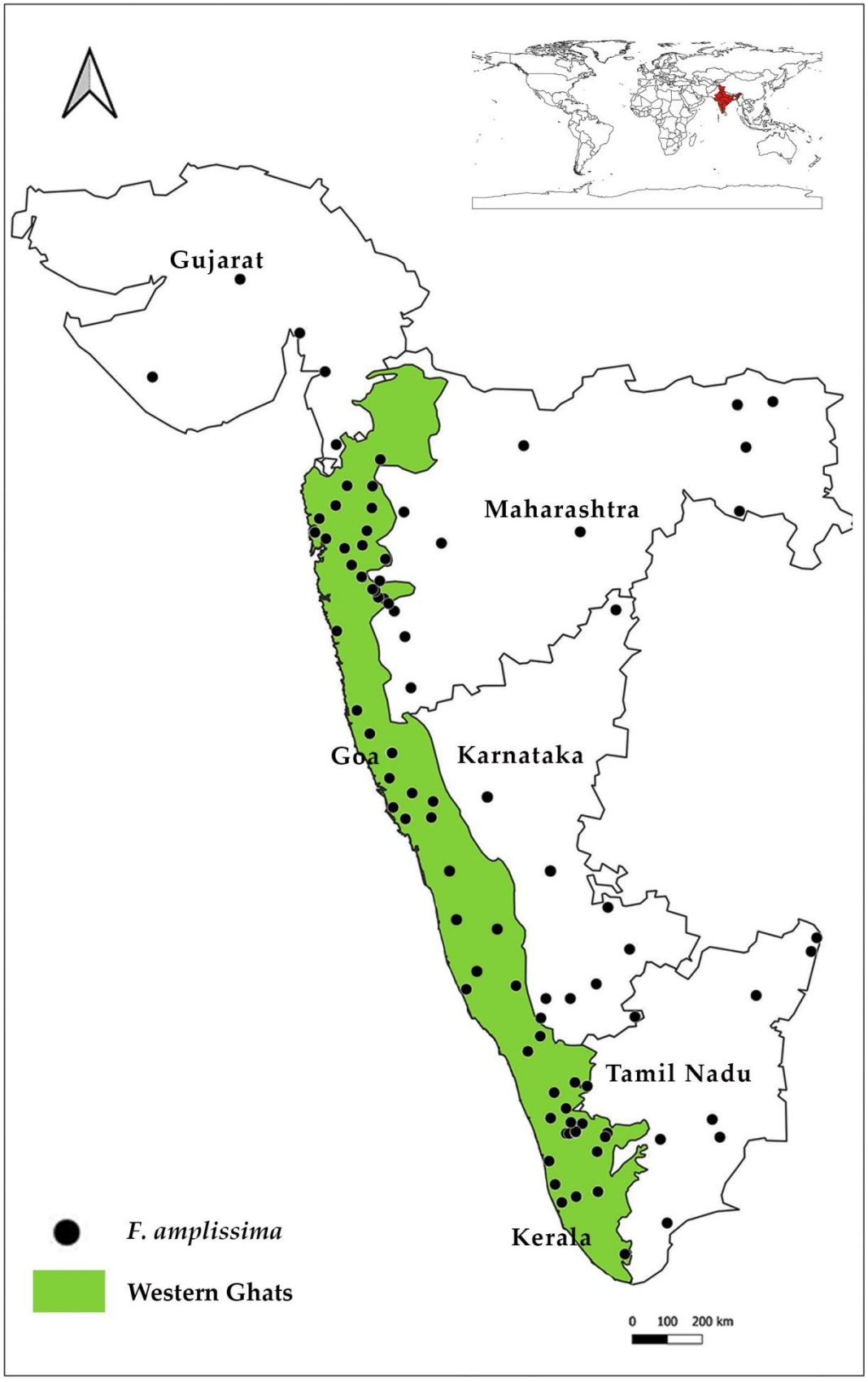


Fig. 3.3. *F. amplissima* Sm. - Distribution map.

Tree up to 30 m height, hemi epiphytic, aerial roots absent; bark smooth, white to pale yellow; young twigs terete, core solid, smooth, glabrous, pale brown; inter node 1.0–2.8 cm long; latex milky, white. Stipule caducous, ovate, 1.3–2.8 x 0.4–0.9 cm, margins entire, apex narrowly acute, base truncate, glabrous, pale green. Petiole not articulated, terete, canaliculate, 1.8–5.6 cm long, glabrous, pale green. Leaves simple, alternate, spiral; lamina symmetric, elliptic to lanceovate to ovate, 7.5–17.2 x 4.6–8.4 cm, margins entire, acumen 0.2–0.3 cm long, apex acute, base obtuse, glabrous, red to pale green when young, dark green on maturity, coriaceous, venation brochidodromous; basal veins 3–4, lateral veins 7–10 pairs, waxy glands at the base of the midrib beneath. Receptacles axillary, clustered, monoecious, sessile; basal bracts present, persistent, 3, free, 2.0–4.0 mm long, ovate, glabrous, pale green. Syconium 0.8–1.2 cm across, globose, glabrous or rarely pubescent when young, green when young, purple with spots when mature. Ostiole 0.5–1.6 mm; outer bracts present, free, ovate, 0.5–1.0 mm long, glabrous, pale-yellow; inner bracts present, free, lanceolate, 1.0–1.5 mm long, glabrous, white. Male flowers near ostiole, 2.6 mm long, pedicellate; pedicel 0.7 mm long; tepals 2–3, free, 2.0 mm long, lanceolate, glabrous, pale yellow to white; stamen 1, anther 1.0 mm, filament 0.9 mm long. Female flowers at the base, 3.0 mm long, sessile; tepal 2–3, free, 2.0 mm long, lanceolate, glabrous, pale yellow to white; stigma 0.2–0.3 mm long; style 0.6 mm long; ovary 2.0 mm long, obovoid, glabrous, white. Gall flowers scattered, 3.0 mm long, sessile; tepals 2–3, free, 2–3 mm long, lanceolate, glabrous, pale brown; stigma 1.0 mm long; style 0.5 mm long; ovary 1.5 mm long, obovoid, glabrous, pale brown. Achenes 1.0 mm, widely ovate, pale brown.

Local names: *Itthi* (Mal.); *Ichi, Kal-ichchi* (Tam.); *Bilibasuri* (Kan.) *Pimpri* (Mar.).

Common names: Indian bat tree, Yellowed barked fig.

Flowering and fruiting: Two to three times a year.

Distribution: This species is native to India, Sri Lanka and Maldives. In India, the species is found in the central and south provinces.

Habitat: Commonly seen as an hemi epiphyte on other trees in evergreen, moist and dry deciduous forests, up to 1200 m elevation. Also found in plains.

IUCN status: Not Evaluated (NE).

Etymology: The term '*amplissima*' denotes the production of figs in large amounts or spacious arrangement of leaves on the stem.

Uses: The figs are eaten to treat mouth ulcer (Shi *et al.,* 2018). According to Arunachalam and Parimelazhagan (2013), the leaves extracts are used to treat wounds. The plant is a good avenue tree. Crushed bark is used in the treatment of abdominal disorders. Root bark is used to treat chronic cough and other pulmonary infections. Latex from the fruit and root is used in treatment of eye diseases. Figs are edible and eaten by birds. Wood is used in making toys and pots (Mudgal *et al.,*1997). van Rheede (1678), mentioned that a decoction prepared using the bark of the tree along with pepper is used in the treatment of chronic diseases and to treat pulmonary infections. Latex obtained from the roots and figs are used to treat eye diseases.

Notes: The species is easily identified by the white to pale yellow coloured smooth bark and the hemi epiphytic habit. Bourdillon (1908) noted that this species is commonly distributed in the drier parts of South India, but not

common in Travancore. Most of the literatures indicated that all parts of the species are glabrous, while Saldanha (1984) mentioned that the receptacles are pubescent in young stage. Santapau (1967) and Mudgal *et al.,* (1997) stated that the receptacles are hairy with pubescent, puberulous to villous indumentum. Some of the depositions from BSI and Blatter collected from Pune, Maharashtra had indumentum in the syconium. Tiwary (2016), observed both glabrous and hairy syconium in the species and found that the hairs fall on maturity making the syconium glabrous. Sudhakar *et al.,* (2014), mentioned it as a separate variety, considering the indumentum of the leaves. But it seems that the plant has to be studied in detail and see whether the taxa have to be separated in to varieties or not as many of the species in the genus are highly variable, showing considerable level of morphological variations.

Saldanha (1984), observed the presence of 4 basal bracts in the syconium, only 3 basal bracts were observed in our study similar to all other referred literatures. The presence of aerial roots was mentioned in few literatures, but aerial roots were not observed as such in the case of *F. benghalensis* or *F. microcarpa,* hence the presence of aerial roots in *F. amplissima* is not considered here as a prominent character. Male flowers were mentioned sessile by King (1890).

Specimens examined: India, **Andhra Pradesh,** Adilabad District, Along Kadam River, 30 January 1987, *T. Ravisankar 85150* (MH); Danthapalli stream, 27 March1988, *T. Ravisankar 86540* (MH). Alluri Sitharama Raju (East Godavari) District, Devipatnam, 125 m, 25 June 1965, *G.V. Subba Rao 24419* (MH). Anantapur District, Suiganamalai, 27 January 1937, *K. Cherian Jacob s.n.*; Pennakonda, 11 July 1957, *S.K. Wagh SKW6108*; S. K. University Campus, 350 m, 24 May 1982, *T. Pullaiah & N. Yesoda 512*. Chittoor District,

Ramakrishna Thirtham, 490 m, 11 December 2003, *G.V.S. Murthy 117471* (BSID). Guntur District, Mobbu chintapalli, 25 March 2009, *T. P & Sandhya Rani 33660* (BSID). Kadapa District, Balapallam (Balapalla), 250 m, 21 February 1963, *J.L. Ellis 15750* (MH). Kaimur District, Akhlaspur (Aklaspur), 200 m, 27 July 1964, *G.V. Subba Rao 20231* (MH). Krishna District, Vijayawada, 08 May 1986, *P. Venkanna 6058* (MH); Kondapalli Sacred Grove, 302 m, 09 October 2015, *J. Swamy & S. Nagaraju 7122* (BSID). Kurnool District, Diguavametta, 02 March 1957, *S.K. Wagh SKW5359* (BLAT); *ibid.,* 02 March 1957, *S.K. Wagh SKW5360* (BLAT). Nellore District, on way to Rajampeta before Chittivelu, 19 February 1998, *P. Venu 109961* (BSID); Venkatagiri, 21 February 1998, *P. Venu 110004* (BSID); Penchala Kona, 183 m, 13 July 2017, *J. Swamy & S. Nagaraju 8169* (BSID). Prakasam District, Peddarutla, 650 m, 23 June 1987, *V.B. Hosagoudar 84932* (BSID). Srikakulam District, Duggeru Forest, 250 m, 25 May 1979, *G.V. Subba Rao 62519* (MH). Tirupathi District, Balapalli, 250 m, 13 January 1982, *J.L. Ellis 15750* (KFRI); *s.loc.,* 07 January 1900, *J.S. Gamble 15004* (MH). **Goa,** Dadra & Nagar Haveli District, Carchond forests, 13 November 1970, *M.Y. Ansari 126965* (BSI). North Goa District, on the way from Caranzol to Valpai, 02 May 1963 *K.C. Kanodia 88482* (BSI); Porvorim, 10 November 1963, *Seshagiri Rao Rolla 92942* (BSI); South Goa District, Nadquem, 26 April 1963, *K.C. Kanodia 88302* (BSI). **Gujarat**, Ahmednagar District, Bechueeu, Veraval, 23 August 1960, *Seshagiri Rao Rolla 63907* (BSI). Bharuch District, Ankaleshwar, near railway station, 05 May 1957, *S.K. Jain 17404* (BSI); Dahaj, 08 May 1957, *S.K. Jain 17684* (BSI); Kavi, 09 May 1957, *S.K. Jain 17790* (BSI). Bhavnagar District, Ghoga, 10 May 1951, *S.K. Jain 17904* (BSI). Jamnagar District, Balachadi, 20 October 1945, *H. Santapau 7643* (BLAT). Junagadh District, Junagadh fort, 24 October 1957, *H. Santapau 13741* (BLAT). Valsad District, Dharmapur, 14 June 1958, *P.S. Toor 39135*

(BSI). **Karnataka,** Bidar District, Aurad road, 22 January 1971, *N.P. Singh 142763* (BSI). Bijapur District, Sitamani R. F., 17 January 1976, *N.P. Singh 142578* (BSI). Chamarajanagar District, Madeshwaramalai R. F., Kollegal Division, 733 m, 29 January 1984, *B.R. Ramesh & M. Deshayes HIFP BRR0731* (HIFP). Kalaburgi District, Kunchwaram R. F., Chincholi, 10 February 1975, *N.P. Singh 128650* (BSI). Mysore District, *s.loc.,* 16 December 1903, *C.A. Barber 6243* (MH); Hunsur, 12 April 1905, *C.A. Barber 6972* (MH); Nagarahole, 05 January 1959, *R.K. Arora 41763* (BSI). Tumkur District, Madhugiri, 07 January 1976, *N. P. Singh 142197* (BSI); Along the road side, Maralubavi, 15 September 1979, *S.R. Ramesh & K.R. Keshava Murthy 2736* (JCB). Uttar Kannada District, Dandelli, 09 March 1957, *S.K. Jain 16053* (BSI); *s.loc.,* May 1883, *W.A. Talbot 606* (BSI); Merda forest, 02 April 1951, *J. Fernandez JF 2342* (BLAT). **Kerala,** Alappuzha District, Karthikappally, *C.N. Sunil 2036* (CALI); near KSRTC bus stand Alappuzha, 1 m, 28 December 2019, *Sreehari S. Nair 12938* (MESAH). Idukki District, Tannikkudi, 890 m, 04 September 1993, *Jomy Augustine 12340* (KFRI); Sabarimala, P. T. R., 700 m, 25 October 1993, *Jomy Augustine 12573* (CALI & KFRI); Pamba, 460 m, 27 January 1996, *Jomy Augustine 17154* (KFRI); Karimutty, Chinnar W. L. S., 950 m, 29 February 1996, *K.K. Sajeev 15981* (KFRI); Karimutty, Chinnar W. L. S., 928 m, 30 January 2021, *Sreehari S. Nair & K.H. Amitha Bachan 12120* (MESAH). Kannur District, Bekal, 100 m, 27 December 1980, *R. Ansari 70042* (MH). Palakkad District, Panthenthode, Silent Valley Range Forest, 30 June 1983, *C. Satish Kumar 11384* (CALI); Anamari, 01 July 1983, *s.coll., 34150* (CALI); way to kathalakandi, 700 m, 24 February 1979, *E. Vajravelu 60654* (MH). Thrissur District, Peechi, 85 m, 13 October 1986, *N. Sasidharan 3871* (KFRI); Vazhachal, 240 m, 02 December 2008, *K.H. Amitha Bachan 117714* (CALI). Wayanad District, Laccadi, 760 m, 11 October 1978, *C.R. Suresh & K.S. Manilal 21744*

(CALI). **Madhya Pradesh**, Bastar District, Near Kerkal, 733 m, 07 February 1961, *N.P. Balakrishnan & A.N. Henry 11886* (MH). Dhar District, Near Jolana, 25 February 1968, *K.C. Kowdir KC12* (BSI). Indore District, Puppy - Eugine vicinity, Kalakural, 19 April 1963, *A.R.K. Shashtry 84272* (BSI); Manpur, Bherughat, 22 April 1963, *A.R.K. Shashtry 87562* (BSI); **Maharashtra,** Ahmednagar District, Kavanji forest, 15 December 1976, *S. Karthikeyan 148469* (BSI); Sidewadi, Kuran area, 06 December 1983, *P.L. Narasimhan 166219* (BSI); Kalsubai Forest, 24 March 1984, *P.L. Narasimhan 166353* (BSI); Khandgaon, December 1986, *Rajendra Shinde 804* (BLAT). Akola District, Chikhalwal, 20 February 1978, *S.Y. Kamble 152667* (BSI). Bhandara District, Kakudi Forest, 27 September 1976, *S.K. Malhotra 144892* (BSI); Penganga felling, Kharbi, 13 February 1977, *S. Karthikeyan 149046* (BSI); Kharbi, 14 February 1977, *S. Karthikeyan 149051* (BSI). Burhanpur District, Khandesh, December 1918, *s.coll. 27249* (BLAT). Chandrapur District, Khetutida road, 13 March 1971, *B.M. Wedhwa 133837* (BSI); Khad Sangi, 09 March 1973, *B.M. Wedhwa 133740* (BSI). Jalna District, Jaidevwadi, 16 February 1983, *P.L. Narasimhan 165487* (BSI). Mumbai District, National Park, Borivali, 07 February 1952, *G. Kaliani Walla GK79* (BLAT); *ibid.*, 06 December 1955, *P.S. Herbert SH1097* (BLAT); Shiwaji park, Bombay, 02 September 1956, *R.R. Fernandez R2719* (BLAT); *ibid.*, 02 September 1956, *R.R. Fernandez R2720* (BLAT); *ibid.*, 22 September 1956, *R.R. Fernandez R2718* (BLAT); National Park, Borivali, 08 November 1956, *P.S. Herbert SH2676* (BLAT); *ibid.*, 08 November 1956, *P.S. Herbert SH2677* (BLAT); Sewri, Bombay, 17 November 1956, *R.R. Fernandez R3345* (BLAT); Willington sports club, Bombay, 14 February 1957, *R.R. Fernandez R3680* (BLAT); *ibid.*, 14 February 1957, *R.R. Fernandez R3681* (BLAT); Prabhadevi, Bombay, 14 February 1957, *R.R. Fernandez R2717* (BLAT); National Park, Borivali, 18 July 1957, *P.S. Herbert*

SH2746 (BLAT); *ibid.,* 18 July 1957, *P.S. Herbert SH2747* (BLAT); Marve Road, Malad, 07 August 1957, *G.L. Shah Shah8887* (BLAT); Bombay, 16 September 1957, *Y.A. Marchaut 249* (BLAT); Central dairy to calf rearing unit, 07 April 1958, *S.C. Tavakari T1031* (BLAT). Nashik District, Vilholi, Dalisar Range, 17 September 1968, *K.V. Billore 116752* (BSI); Phopshi village, 26 October 1983, *P.L. Narasimhan 166176* (BSI). Pune District, *s.loc.,* 25 February 1905 *s.coll., 42* (MH); Kamthadi, 02 June 1902, *G.A. Gammie 15260* (BSI); Lonavla, 30 January 1955, *N.A. Irani NI618* (BLAT); Sinhagad Fort, 25 January 1957, *G.S. Puri 10913* (BSI); Ambavane, 15 May 1957, *K.B.G 18229* (BSI); Sambar hill, near Bhorgiri, 24 December 1960, *K.P. Janardhanan 70115* (BSI); Taundelwadi, 27 January 1961, *K.P. Janardhanan 69007* (BSI); Harami hills, Bhorgiri, Khed Taluka, 18 April 1961, *K.P. Janardhanan 69695* (BSI); Bhorgiri, Khed Taluka, 18 April 1961, *K.P. Janardhanan 72010* (BSI); Kharp jungle near Vandri, Khed Taluka, 03 December 1961, *K.P. Janardhanan 76199* (BSI); Nandgaon Village, near temple, Ambavane, 30 March 1964, *B. Venkata Reddi 97655* (BSI); Naudgaon, Ambavane, 21 April 1965, *B. Venkata Reddi 100989* (BSI); Koregaon park, Pune, 556 m, 24 August 2022, *Sreehari S. Nair 12211* (MESAH). Raigad District, Jummapatti, 10 March 1950, *N.A. Irani NI4909* (BLAT). Ratnagiri District, 1 Km to West of Dapoli, 27 August 1965, *B.G. Kulkarni 106349* (BSI); Temple plot, Amboli Ghat, 21 April 1971, *B.G. Kulkarni 128860* (BSI); Rami ghat, 24 KM from Amboli, 24 April 1971, *B.G. Kulkarni 128893* (BSI); Dongar, 20 December 1982, *P.G. Diwakar 164737* (BSI). Satara District, Tadoshi, Koyana, 29 December 1978, *R.K. Kochhar 158089* (BSI); Khandala, 02 October 1982, *P.G. Diwakar 164376* (BSI); *ibid.,* April 1914, *H. Santapau H83* (BLAT). Sindhudurg District, Amboli banglow to Veagurla road, 29 December 1907, *R.K. Bhide s.n*. (BSI). Thane District, Mokhada, 15 April 1902, *G.A. Ryan 614* (BSI); Mandvi, 20 February 1962, *N.Y. Das*

NYD7089 (BLAT); Belpada, Murbad Range, 09 June 1967, *K.V. Billore 110880* (BSI); Thunga hill, Mandvi Range, 19 January 1968, *K.V. Billore 113665* (BSI). **Odisha,** Ganjam District, Pralisai, 500 ft, 02 January 1884, *J.S. Gamble 13843* (MH). **Tamil Nadu,** Chengalpattu District, Ennore V.G.P.S. Wounder Land Campus, 24 June 1984, *D. Narasimhan 556* (MH). Coimbatore District, Kottadi, 3800 ft, 14 March 1931, *K. Cherian Jacob 322* (MH); Kottadi, 14 March 1931, *K.C. Jacob 81408* (MH); Basic training school, 468 m, 01 May 1967, *M. Chandrabose 28965* (MH). Dharmapuri District, Near Pereri Chitteri, 25 December 1990, *T. Ravisankar 95539* (MH & BSID). Dindugal District, Sirumalais, 13 July 1960, *J. Pallithanam JP6398* (BLAT). Madras District, *s.loc.*, 04 January 1900, *G. King s.n.* (MH); Guindy Park R. F., 09 February 1976, *A.N. Henry 47196* (MH). Pudukottai District, Nanthamali forest, 125 m, 25 June 1984, *C. Arulappan 22* (MH); Arimalam Forest, 14 July 1984, *C. Arulappan 44* (MH). Ramanathapuram District, Karaikkudi, 125 m, 02 December 1977, *N.C. Nair 53045* (MH); Valinokkam (Vallinokam), 2 m, 17 September 1988, *V. Balasubramaniam 1812* (MH). Thiruvallur District, Athippattu, 01 April 1991, *T. Ravi Shankar 95562* (BSID). Tirupati (N. Arcot) District, Chandragiri, 26 February 1914, *s.coll., 10075* (MH). Tiruvallur District, Athipattu, 01 April 1991, *T. Ravisankar 95562* (MH). Vellore (N. Arcot) District, Mananden, 02 March 1914, *s.coll., 10174* (MH); On the way to Kambukudi, 1100 m, 08 September 1958, *K. Subramanyam 6509* (MH). Viluppuram (S. Arcot) District, Gangavaram R. F., 150 m, 20 February 1979, *K. Ramamurthy 60353* (MH). **Telangana,** Hyderabad District, Santh Nagar, 31 August 2008, *Dr. V. Sampath Kumar & K. Chandra Sekar 402* (BSID). Kumuram Bheem District, Asifabad - Range, Dhanora – Beat, 354 m, 08 February 2015, *P.S. Annamma 4970* (BSID). Mahabubnagar District, Environmental Education Centre, at Mannanur, 600 m, 11 February 1998, *S.R. Srinivasan 109736* (BSID); Borapuram temple, 618

m, 05 November 2008, *B.R, S.K.B & B.S. S32375* (BSID). Medak District, Edupayala R. F., 19 February 1998, *R. Gopalan 113437* (BSID). Nagarkurnool District, Mallela Theertham, 03 March 2014, *L. Rasingam 4673* (BSID). Warangal District, Etturnagaram, 12 December 2001, *P. Venu 109972* (BSID). Khammam (Karimnagar) District, Near Battigudem, 04 April 1988, *N. Rama Rao & T. Ravisankar 86587* (MH). **Uttarakhand**, Chamoli District, Urgam, 28 December 1961, *N.Y. Das NYD 3162* (BLAT); *ibid.*, 28 December 1961, *N.Y. Das NYD3163* (BLAT).

3.6.2. *Ficus amplocarpa* Govind. & Masil.

Ficus amplocarpa Govind. & Masil., Proc. Indian Acad. Sci. (Pl. Sci.) 91: 117. 1982; Chithra in A.N. Henry *et al.*, Fl. Tamil Nadu 2: 251. 1987; S.S. Dash & A.A. Mao, Fl. Pl. India, 2: 537. 2020. *F. macrocarpa* (Miq.) King, Ann. Roy. Bot. Gard. Calcutta 1: 166, t. 208. 1888 & in Hook.f., Fl. Brit. India 5: 534. 1888; Fyson, Fl. South India Hill St. 1: 541: t. 473. 1932; Rama Rao, Fl. Pl. Travancore: 384. 1914; Brandis, Indian Trees: 610. 1921; Vajr., Fl. Palghat: 447. 1990. *Pogonotrophe macrocarpa* Miq., London J. Bot. 7: 74. 1848; Wight, Icon. Pl. Ind. Orient. 6: 8, t. 1965. 1853. *Covellia macrocarpa* H. Drury, Handb. Ind. Fl. 3: 222. 1869. **Type:** Peninsular Ind. Orientalis, September 1836, *R. Wight 3007* (Isotype- E, E00288920!).

Pogonotrophe wightiana Miq., London J. Bot. 7: 74. 1848. **Type:** Peninsula Ind. Orientalis, 1836, *R. Wight 940* (Isotype- E, E00288921!).

Ficus vagans Roxb. var. *macrocarpa* Miq., Ann. Mus. Bot. Lugd.-Bat. 3: 293. 1867. **Type:** India, Karnataka, 1852, *R. Wight 3006* (Type- K, K000880202!).

Ficus laevis Blume var. *macrocarpa sensu* (Miq.) Corner, Gard. Bull. Singapore 18: 7. 1960 & 21(1): 53. 1965; B.D. Sharma *et al.,* Fl. Karnataka 2: 259. 1984; C.J. Saldanha, Fl. Karnataka 1: 117. 1984; K.M. Matthew, Fl. Palni Hills 2: 1181. 1999; Sasidh. & Sivar., Bio. Docu. Kerala part 6: Flow. Plant. 440. 2004; Chaudhary *et al.,* Taiwania 57: 199. 2012; Fl. Karnataka. A Check List 2: 508. 2019.

Ficus laevis sensu Manilal, Fl. Silent Valley 260. 1988.

Fig. 3.4 – 3.6

Scandent climber, aerial roots absent; bark smooth, lenticellate, brown; young twigs terete, core solid, pubescent, brown; inter node 2.7–7.1 cm long; latex milky, white. Stipule caducous, ovate, 1.5–2.1 x 0.5–0.7 cm, margins entire, apex acute, base truncate, pubescent, brown. Petiole articulated, terete, 2.6–8.1 cm long, tomentose, brown. Leaves simple, alternate, spiral; lamina symmetric, widely ovate, 6.5–13.8 x 3.7–11.6 cm, margins entire, acumen 0.8–2.2 cm long, apex cuspidate, base sub cordate, glabrous, pale green when young, dark green on maturity, subcoriaceous, venation brochidodromous; basal veins 3–4, lateral veins 3–4 pairs, waxy glands in the axils of the basal lateral veins. Receptacles cauliflorous, clustered, dioecious, pedunculate; peduncle 1.4–2.0 cm, glabrous, pale brown; basal bracts present, caducous, 3, free, 2.5–3.0 mm long, widely ovate, glabrous, pale brown. Syconium 4.8–6.2 cm across, globose, glabrous with scars on the surface, green when young, pale red when mature. Ostiole 0.6–0.8 cm; outer bracts present, free, ovate, 3.0 mm long, glabrous, brown; inner bracts present, free, lanceolate, 4.0–6.0 mm long, glabrous, yellow. Male flowers near ostiole, 4.5 mm long, pedicellate; pedicel 2.0 mm long, glabrous, pale brown; tepals 6, fused, 3.0 mm long, lanceolate, glabrous, pale red; stamen 1, anther 1.5 mm, filament 0.5 mm long. Female flowers scattered, 4.0 mm long,

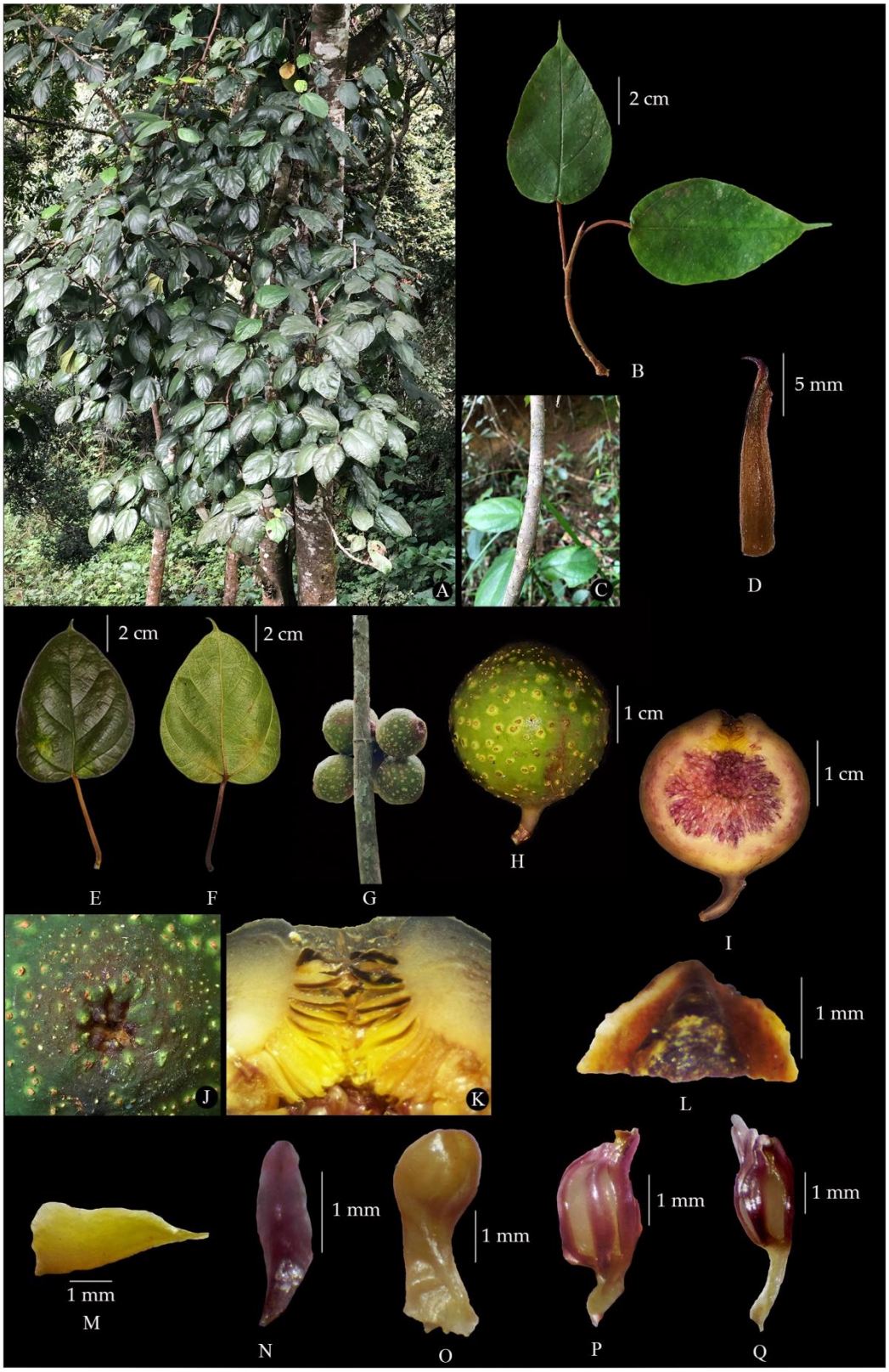


Fig. 3.4. ***Ficus amplocarpa*** Govind. & Masil.: **A.** Habit; **B.** Twig; **C.** Bark; **D.** Stipule; **E.** Leaf adaxial side; **F.** Leaf abaxial side; **G.** Receptacles; **H.** Syconium; **I.** Syconium L. S.; **J.** Ostiole; **K.** Ostiolar L. S.; **L.** Basal bract; **M.** Inner ostiolar bract; **N.** Tepal; **O.** Male flower; **P.** Female flower; **Q.** Gall flower.

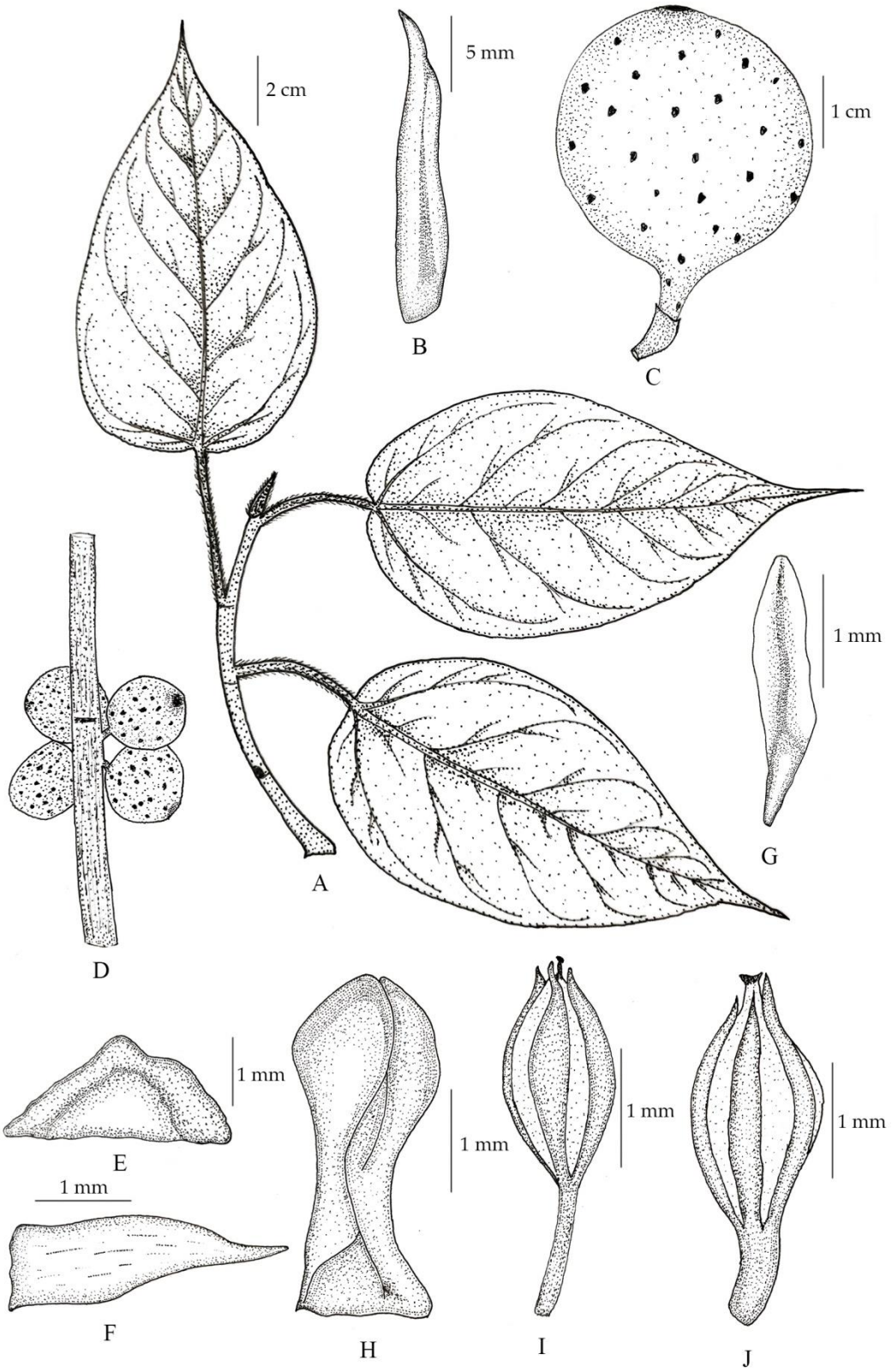


Fig. 3.5. ***Ficus amplocarpa*** Govind. & Masil.: **A.** Twig; **B.** Stipule; **C.** Syconium; **D.** Receptacles; **E.** Basal bract; **F.** Inner ostiolar bract; **G.** Tepal; **H.** Male flower; **I.** Female flower; **J.** Gall flower.

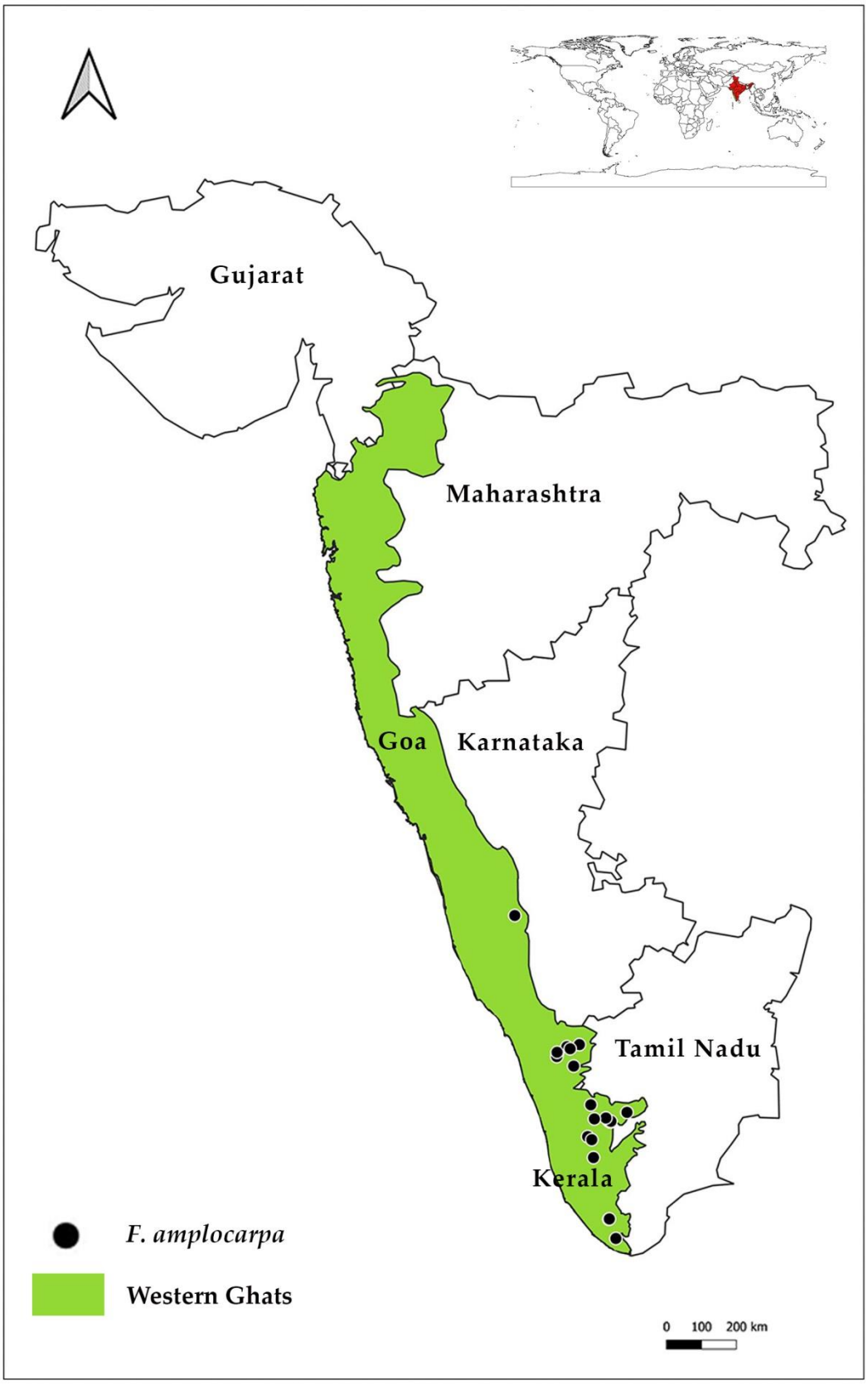


Fig. 3.6. *Ficus amplocarpa* Govind. & Masil. - Distribution map.

pedicellate; pedicel 1.0 mm long, glabrous, pale brown; tepals 6, fused, 2.0 mm long, lanceolate, glabrous, pale red; stigma short; style 1.0 mm long; ovary 2.0 mm long, obovoid, glabrous, pale brown. Gall flowers scattered, 5.0 mm long, pedicellate; pedicel 2.0 mm long, glabrous, pale brown; tepals 6, fused, 3.0 mm long, lanceolate, glabrous, pale red; stigma short; style 1.0 mm long; ovary 2.0 mm long, obovoid, glabrous, yellow. Achenes 1.0 mm, obovoid, pale brown.

Local names: Nil

Common names: Nil

Flowering and fruiting: September - July.

Distribution: The species is distributed in the states of Kerala, Tamil Nadu and Karnataka. This species is endemic to the Southern Western Ghats.

Habitat: Found in the evergreen and shola forests at an elevation up to 2300 m.

IUCN status: Not Evaluated (NE).

Etymology: The species epithet denotes the surplus or ample production of figs.

Uses: the species is not so far included in any medicinal combinations and not in treatment of any diseases. It is heard from the tribals of Kerala that usually monkeys are fond of eating figs, but not the figs of *F. amplocarpa.* The latex from the figs of *F. amplocarpa* agglutinates in the mouth of monkeys when eaten and causes their death from suffocation.

Notes: The taxonomic identity and nomenclatural status of *F. amplocarpa* was a great question as it morphologically matches with *F. guttata,* another endemic and uncommon species in the southern Western Ghats with rare

distribution pattern. *F. amplocarpa* was earlier mentioned as *F. macrocarpa.* King (1887-1888) treated it under the section Neomorphe and was moved to section *Rhizocladus* by Corner (1960b) being a root climber species. The section included *F. laevis,* a similar species with respect to the leaf morphology. Considering the similarity in the leaf morphology, *F. macrocarpa* was merged under *F. laevis* as a new variety *ie*. *F. laevis* var *macrocarpa* and *F. guttata* treated as a synonym of the new variety. Govindarajalu and Masilamoney (1982) studies the species thoroughly with the support of anatomical and morphological data and reinstated the species rank of *F. macrocarpa* with proposing the new name *F. amplocarpa* and also made *F. guttata* as a distinct taxon from *F. amplocarpa.* Chaudhary *et al.* (2012), retreated *F. amplocarpa* in the subgenus Synoecia and *F. guttata* under subgenus Sycomorus. Later, Sudhakar and Murthy (2016a), placed both the species under the common subgenus *Synoecia.*

A few literatures including Manilal (1988) erroneously reported the occurrence of *F. laevis* in southern states of India. *F. laevis* being distinct from the other two taxa in having axillary and long peduncled syconium. On the basis of field surveys and detailed herbarium reference, we support the observations of Sudhakar and Murthy (2016a), that *F. laevis* is not occurring in the southern states and is confined to the north eastern states.

Govindarajalu and Masilamoney (1982), and Henry (1987), described the species as a tall scandent tree, but actually the species is a scandent root climber. Table 3.3. shows a detailed comparison of *F. amplocarpa* and *F. guttata.* (Sudhakar & Murthy, 2016a) mentioned the conservation status of the species as Near Threatened.

Table 3.3. Comparison of characters between *F. amplocarpa* and *F. guttata.*

Characters	***F. amplocarpa***	***F. guttata***
Leaves	Membranous	Coriaceous or subcoriaceous
Internodes	Fistular	Solid
Lamina	Glabrous or puberulous	Densely to thinly tomentose or pubescent
Figs	Without resin exudates on maturity	With resin exudates on maturity

Specimens examined: India, **Kerala,** Idukki District, Uppupara, 1100 m, 20 November 1993, *Jomy Augustine 12708* (CALI); Rajamalai, 22 February 1995, *A. Nazarudean 21226* (TBGT); Anamudy Shola Forest, 1987 m, 31 January 2021, *Sreehari S. Nair & K.H. Amitha Bachan 12127* (MESAH); Pampadum Shola Forest, 01 February 2021, *Sreehari S. Nair & K.H. Amitha Bachan 12130* (MESAH). Palakkad District, Walakkad, 27 February 1983, *C.R. Suresh 11149* (CALI); *ibid.,* 27 February 1983, *C.R. Suresh 11150* (CALI). Thiruvananthapuram District, Athirumala, 20 January 1992, *N. Mohanan 10778* (TBGT). **Tamil Nadu,** Nilgiri District, Avalanche, 04 June 1987, *N. Mohanan 8362* (TBGT).

3.6.3. *Ficus anamalayana* Sudhakar & G.V.S. Murthy

Ficus anamalayana Sudhakar & G.V.S. Murthy, Rheedea 25(1): 1–8. 2015. Sudhakar *et al.,* Figs of Eastern Ghats, India. 28. 2017; S.S. Dash & A.A. Mao, Fl. Pl. India 2: 549. 2020. **Type:** India, Tamil Nadu, Coimbatore district, Anamalais (Anamalai Tiger Reserve), on the way from Aliyar to Attakatti, near forest check post, 300 m, 25 October 2010, *J.V. Sudhakar 122947* (Holotype- CAL, CAL0000025310!; Isotype- MH, MH00003344!).

Ficus dalhousiae sensu K.M. Matthew, Mat. Fl. Tamil Nadu Carnatic: 344. 1981, non Miq. 1867.

Ficus albipila sensu N. Rani, J. Bombay Nat. Hist. Soc. 82: 235. 1985, non (Miq.) King 1888; Chithra in A.N. Henry *et al.,* Fl. Tamil Nadu 2: 251. 1987; K.M. Matthew, Fl. Tamil Nadu Carnatic 4: t. 593. 1988, Fl. Centr. Tamil Nadu 482. 1991, J. Econ. Taxon. Bot., 20: 12. 1996 & Fl. Palni hills 2: 1177. 1999.

Fig. 3.7 – 3.9

Tree up to 15 m height, independent, usually attached to rocks, aerial roots usually absent; bark smooth lenticellate, pale brown; young twigs terete, core solid, glabrous, green; inter node 0.8–1.5 cm; latex milky, white. Stipules caducous, lanceolate, 2.8–3.4 x 1.0–1.2 cm, margins entire, apex narrowly acute, base truncate, glabrous, green. Petiole articulated, terete, 9.0–19 cm, glabrous, green. Leaves simple, alternate, spiral; lamina symmetric, ovate to widely ovate, 19.8–32.0 x 13.0–19.0 cm, margins entire, acumen 0.2–0.6 cm, apex acute, base cordate, lamina glabrous, pubescent on the veins, green on abaxial, dark green on adaxial, subcoriaceous, venation brochidodromous; basal veins 3–4, lateral veins 13–14 pairs, waxy glands two in the axils of the lateral nerves. Receptacles axillary, paired, monoecious, pedunculate; peduncle stout, 0.7–0.9 cm, pubescent, green; basal bracts present, persistent, 3, fused at the base, 2.5–4.0 mm, widely ovate, pubescent, green. Syconium 1.0–1.6 cm across, oblong–obovoid, pubescent, pale green to yellow; ostiole 0.5–1.0 mm, outer bracts present, free, ovate, 1.5–2.0 mm, pubescent, pale green to yellow; inner bracts present, free, lanceolate, 1.0–2.0 mm, glabrous, pale yellow. Male flowers few, near the ostiole, 3.0 mm long, pedicellate; pedicel 1.0 mm long; tepals 3, fused, 2.0 mm, lanceolate, glabrous, white–yellow; stamen 1, anther 1.2 mm, filament 0.8 mm. Female flowers at the base,

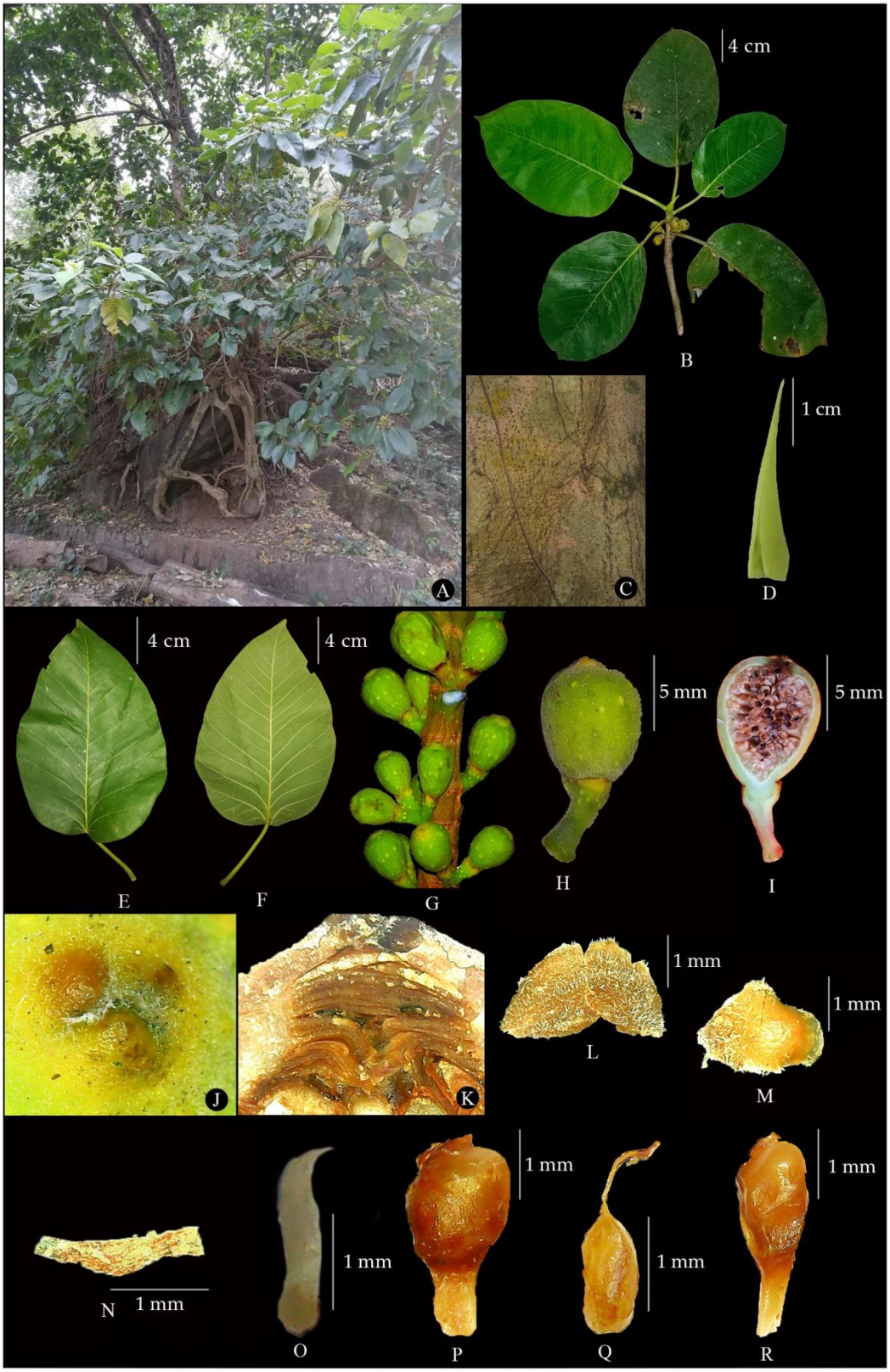


Fig. 3.7. ***Ficus anamalayana*** Sudhakar & G. V. S. Murthy: **A.** Habit; **B.** Twig; **C.** Bark; **D.** Stipule; **E.** Leaf adaxial side; **F.** Leaf abaxial side; **G.** Receptacles; **H.** Syconium; **I.** Syconium L. S.; **J.** Ostiole; **K.** Ostiolar L. S.; **L.** Basal bract; **M.** Outer ostiolar bract; **N.** Inner ostiolar bract; **O.** Tepal; **P.** Male flower; **Q.** Female flower; **R.** Gall flower.

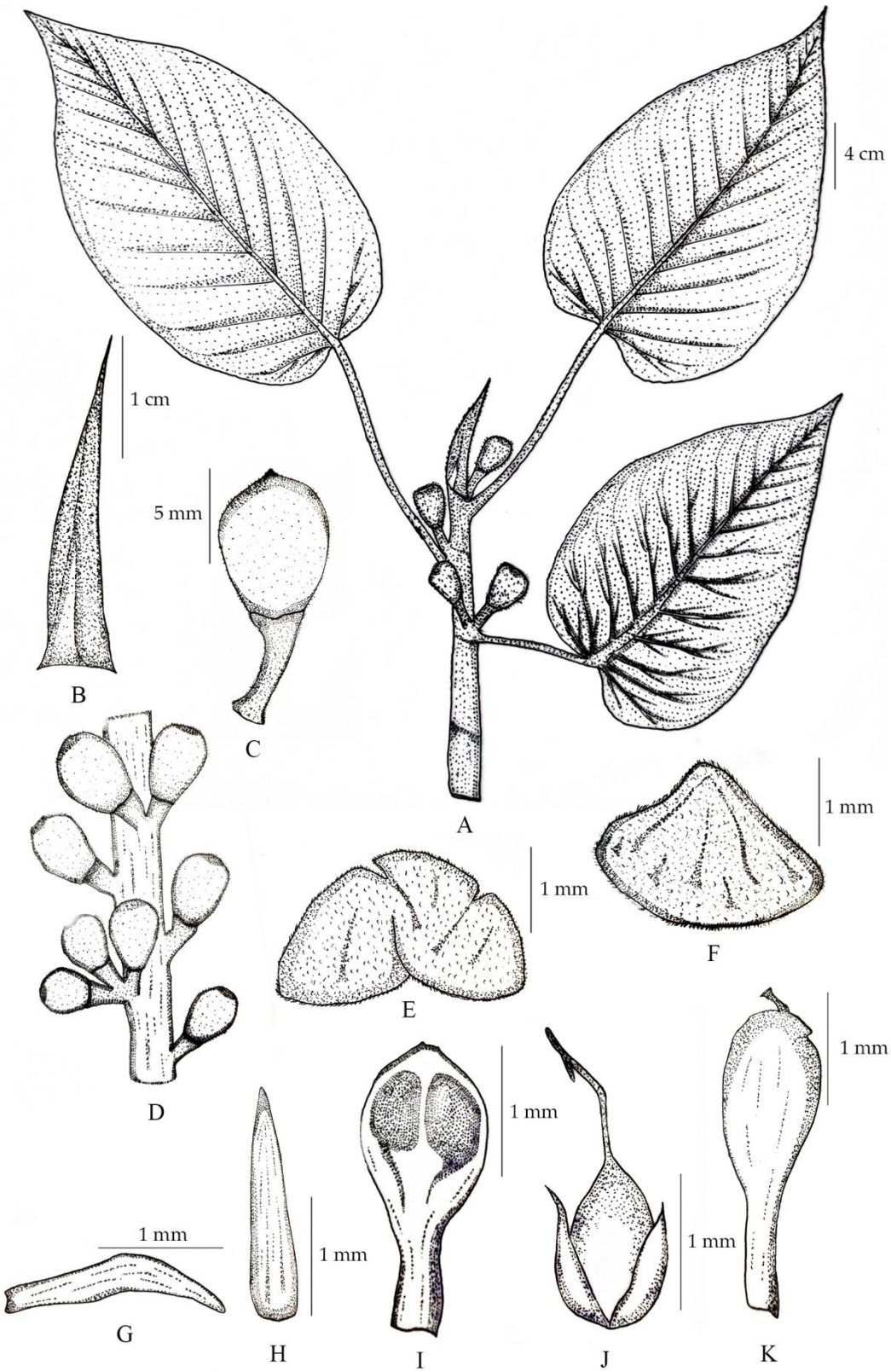


Fig. 3.8. ***Ficus anamalayana*** Sudhakar & G. V. S. Murthy: **A.** Twig; **B.** Stipule; **C.** Syconium; **D.** Receptacles; **E.** Basal bract; **F.** Outer ostiolar bract; **G.** Inner ostiolar bract; **H.** Tepal; **I.** Male flower; **J.** Female flower; **K.** Gall flower.

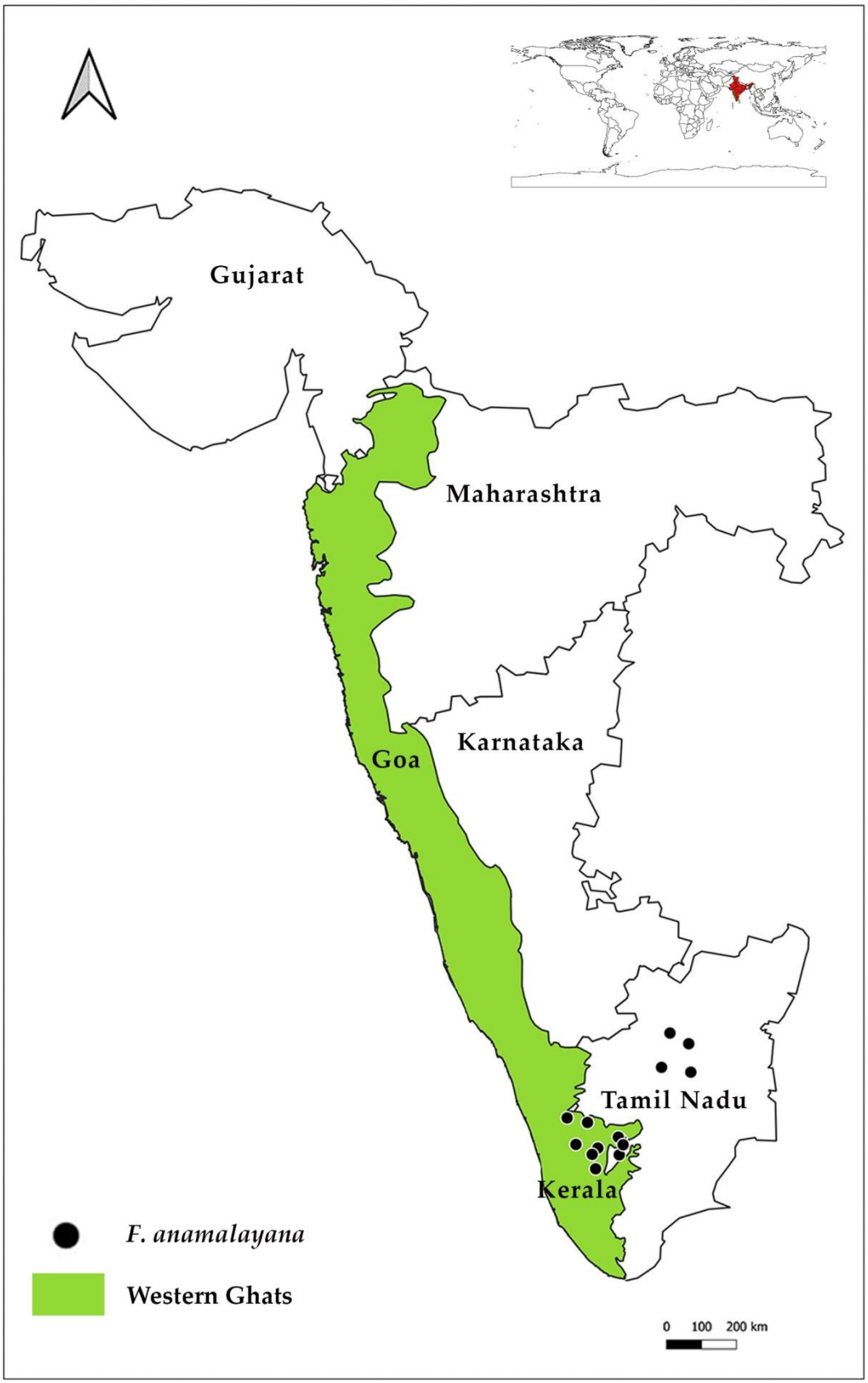


Fig. 3.9. *Ficus anamalayana* Sudhakar & G. V. S. Murthy- Distribution map.

3.0 mm long, sessile; tepals 3, free, 1.0–1.5 mm, lanceolate, glabrous, white; stigma bifid, style 0.9 mm, ovary 1.0 mm, obovoid, glabrous, pale brown. Gall flowers scattered, 3.2 mm, sessile; tepals 3, free, 2.0 mm, lanceolate, glabrous, white; stigma 0.2 mm, style 1.0 mm, ovary 2.0 mm, obovoid, glabrous, pale brown. Achenes 1.0–1.5 mm, ovoid, pale yellow.

Local name: *Kalitthi* (Mal.)

Common name: Nil

Flowering and fruiting: June to January.

Distribution: In Southern Western Ghats (Kerala and Tamil Nadu) and Eastern Ghats. Endemic.

Habitat: Semi-evergreen and deciduous forests. Usually found on the rocks.

IUCN Status: Not Evaluated (NE).

Etymology: The species epithet '*anamalayana*' refers to Anamalai Hills, the type locality of the plant.

Uses: No uses have been so far recorded for this species.

Notes: Sudhakar and Murthy (2015) described *F. anamalayana* as a new species. *F. anamalayana* shows morphological similarity with *F. albipila* and *F. dalhousiae*. Some of the earlier collections from Tamil Nadu region in Madras Herbarium (MH) were specimens of *F. anamalayana*. They were misidentified as *F. dalhousiae* by Matthew (1983), but Rani (1985) determined them as *F. albipila*. Some of the collections from Kerala were also mentioned as *F. dalhousiae*, but they were actually the specimens of *F. anamalayana* (Sudhakar & Murthy, 2015). The previous collections of *F. anamalayana* from Kerala state were from Idukki and Ernakulam districts only. Currently the species is collected from Nelliyampathi Hills of Palakkad district, Kerala state. The

conservation status of the species was mentioned as Least Concern (Sudhakar & Murthy, 2015).

Specimens examined: India, **Kerala,** Idukki District, Panamkutty, 320 m, 27 December 2021, *Sreehari S. Nair & Ebin P.J. 12171* (MESAH). Palakkad District, near forest check post, Nelliyampathi hills, 09 March 2020, *Sreehari S. Nair 12948* (MESAH). **Tamil Nadu,** Coimbatore District, Anamalai hills, Aliyar to Attakatti, near forest check post, 300 m, 15. 6. 2011, *J.V. Sudhakar 122978* (MH), Anamalai hills, Aliyar to Attakatti, on big rock near narrow curve, 350 m, 05.01.2012 *J.V. Sudhakar* 126784 (MH).

3.6.4. *Ficus arnottiana* (Miq.) Miq.

Ficus arnottiana (Miq.) Miq., Ann. Mus. Bot. Lugd-Bat. 3: 287.1867; King, Ann. Roy. Bot. Gard. (Calcutta) 1: 56, t. 68 A. 1888; King in Hook.f., Fl. Brit. India 5: 513. 1888; H. Trimen, Handb. Fl. Ceylon 4: 90. 1898; Talbot, Trees Bombay 2: 329. 1902; D. Prain, Bengal Plants 2: 980. 1903; T. Cooke, Fl. Pres. Bombay 2: 649. 1908; Bourd., For. Trees Travancore 1908. 364; Rama Rao, Fl. Pl. Travancore 382. 1914; J.F. Duthie, Fl. Upper Gang. Plain 152. 1915; Brandis, Indian Trees 602. 1921; C.E.C. Fisch. in Gamble, Fl. Pres. Madras 1363. 1928; H. Santapu, Fl. Khandala 257 1953; Corner, Gard. Bull. Singapore 21: 11. 1965; G.L. Shah, Fl. Gujarat 643. 1978; Corner in Dass. & Forsb., Rev. Handb. Fl. Ceylon 3: 244. 1981; B.V. Shetty & R.P. Pandey, Fl. Tonk Dist. 180. 1983; A.K. Mukh., Fl. Pachmarhi & Bori Reserves 282. 1984; B.D. Sharma *et al.*, Fl. Karnataka: analysis 258. 1984; C.J. Saldanha, Fl. Karnataka 114. 1984; B.D. Naithani, Fl. Chamoli 2: 579. 1985; K.K.N. Nair & M.P. Nayar, Fl. Courtallum 1: 39. 1986; P.C. Pant, Fl. Corbet N. P. 148. 1986; R.S. Rao, Fl. Goa, Diu, Damon, Dadra & Nagar Haveli 2: 408. 1986; V. Chithra in A.N. Henry *et al.*, Fl. Tamil Nadu Ind., Ser I: Analysis 2:

252. 1987; B.G. Kulkarni, Fl. Sindhudurg 417. 1988; N.P. Singh, Fl. Eastern Karnataka 2: 584. 1988; Bole & J.M. Pathak, Fl. Saurashtra 2: 292. 1988; Kamble & S.G. Pradan, Fl. Akola Dist. 212. 1988; K.M. Matthew, Excur. Fl. Central Tamil Nadu 482. 1991; Lakshmin. & B.D. Sharma, Fl. Nasik Dist. 438. 1991; P.J. Parmar in B.V. Shetty & V. Singh, Fl. Rajasthan 2: 800. 1991; Kothari & Moorthy, Fl. Raigad Dist. 3: 377. 1993; M. Mohanan & A.N. Henry, Fl. Thiruvanthapuram 432. 1994; D. Deshp. *et al.,* Fl. Mahabaleshwar & Adjoinings 2: 553. 1995; Sasidh. & Sivar. Fl. Pl. Thrissur For. 428. 1996; Pullaiah & D.A. Moulali, Fl. Andhra Pradesh 2: 897. 1997; V. Mudgal *et al.,* Fl. Madhya Pradesh 2: 611. 1997; P.K. Battacharya & K. Sarkar, Fl. West Champaran Dist. 64. 1998; K.M. Matthew, Fl. Palni Hills 1178. 1999; S.K. Murthi & Panigrahi, Fl. Bilaspur Dist. 2: 565. 1999; N.P. Singh *et al.,* Fl. Maharashtra Dicot 2: 933. 2001; Mohanan & Sivadasan, Fl. Agasthyamala. 629. 2002; K.G. Bhat, Fl. Udupi 592. 2003; Sasidh. & Sivar., Bio. Docu. Kerala part 6: Flow. Plant. 438. 2004; Anil Kumar *et al.,* Fl. Pathanamthitta 462. 2005; S.G. Pradhan *et al.,* Fl. Sanjay Gandhi National Park 3: 573. 2005; K.M. Chetty *et al.,* Fl. Pl. Chittoor Dist. 331. 2008; Subba Rao & Kumari, Fl. Visakhapatnam Dist. 2: 213. 2008; Berg *et al.,* Fl. Thailand 10(4): 604. 2011; Chaudhary *et al.,* Taiwania 57 (2): 207. 2012; Mandar & Lakshmin., Fl. Bhagwan Mahavir 227. 2013; Chantaras. *et al*., Syst. Bot. 38(3): 659. 2013; T. Pullaiah, Fl. Telangana 2: 879. 2015; Bachan & Jisy, Meridian. 5(1): 49. 2016; Sudhakar *et al.,* Figs of Eastern Ghats, India 30. 2017; S. John Britto, Fl. Central & North Tamil Nadu 967. 2019; Fl. Karnataka A Check List 2: 507. 2019; Ficus sp. Madhya Pradesh 11. 2019; P. Lakshmin. *et al.,* Fl. West Bengal 644. 2019; G.P. Sinha & A.N. Shukla, Fl. Uttar Pradesh 2: 472. 2020; S.S.

Dash & A.A. Mao, Fl. Pl. India, 2: 537. 2020. *Urostigma arnottianum* Miq., London J. Bot. 6: 564. 1847 (non Miq. 1867). **Type:** India, *s.n., s.coll.* 4575 (Holotype- K, K000674128!).

Urostigma courtallense Miq., London J. Bot. 6: 564. 1847. *Ficus arnottiana* var. *courtallensis* (Miq.) Miq. Ann. Mus. Bot. Lugd.-Bat. 3: 287. 1867. King, Ann. Roy. Bot. Gard. (Calcutta) 1: 56, t. 68 B. 1887; K.K.N. Nair & M.P. Nayar, Fl. Courtallum 2: 40. 1987. **Type:** India, Tamil Nadu, Courtallum, 1836 *R. Wight 942* (Isotype- E, E00207964).

Urostigma cordifolium Dalz. & Gibbs., Bombay Fl. 242. 1861. **Type:** India, Bombay Presidency, on the Ghats, *s.d., s.coll., s.n.*

Fig. 3.10 – 3.12

Tree, 10–15 m tall, usually epiphytic on rocks, aerial roots absent; bark smooth, pale yellow to pale brown; young twigs terete, solid, glabrous, pale brown; internode 0.5–4.3 cm long; latex milky, white. Stipule caducous, lanceolate, 2.0–3.8 x 1.0–1.4 cm, margins entire, apex narrowly acute to acute, base truncate, glabrous, pale red to yellow. Petiole articulated, terete, canaliculate, 2.0–12.0 cm long, glabrous, pale red–pale green. Leaves simple, alternate, spiral; lamina symmetric, widely ovate, 7.5–18.8 x 3.9–13.5 cm, margins entire, acumen 0.7–2.8 cm long, apex acuminate, base rounded to cordate, glabrous, pale red when young, green on maturity, subcoriaceous, venation brochidodromous; basal veins 3–4, lateral veins 6–10 pairs, wax glands at the base of the midrib. Receptacles axillary, clustered, monoecious, pedunculate; peduncle, 3.0–4.0 mm long, glabrous, pale green to yellow; basal bracts present, persistent, 3, forming a cup like structure, 1.0–2.0 mm long, ovate, glabrous, yellow to purple. Syconium 0.8–1.0 cm across, globose, glabrous, green when young, purple when mature. Ostiole 2.0–3.0 mm;

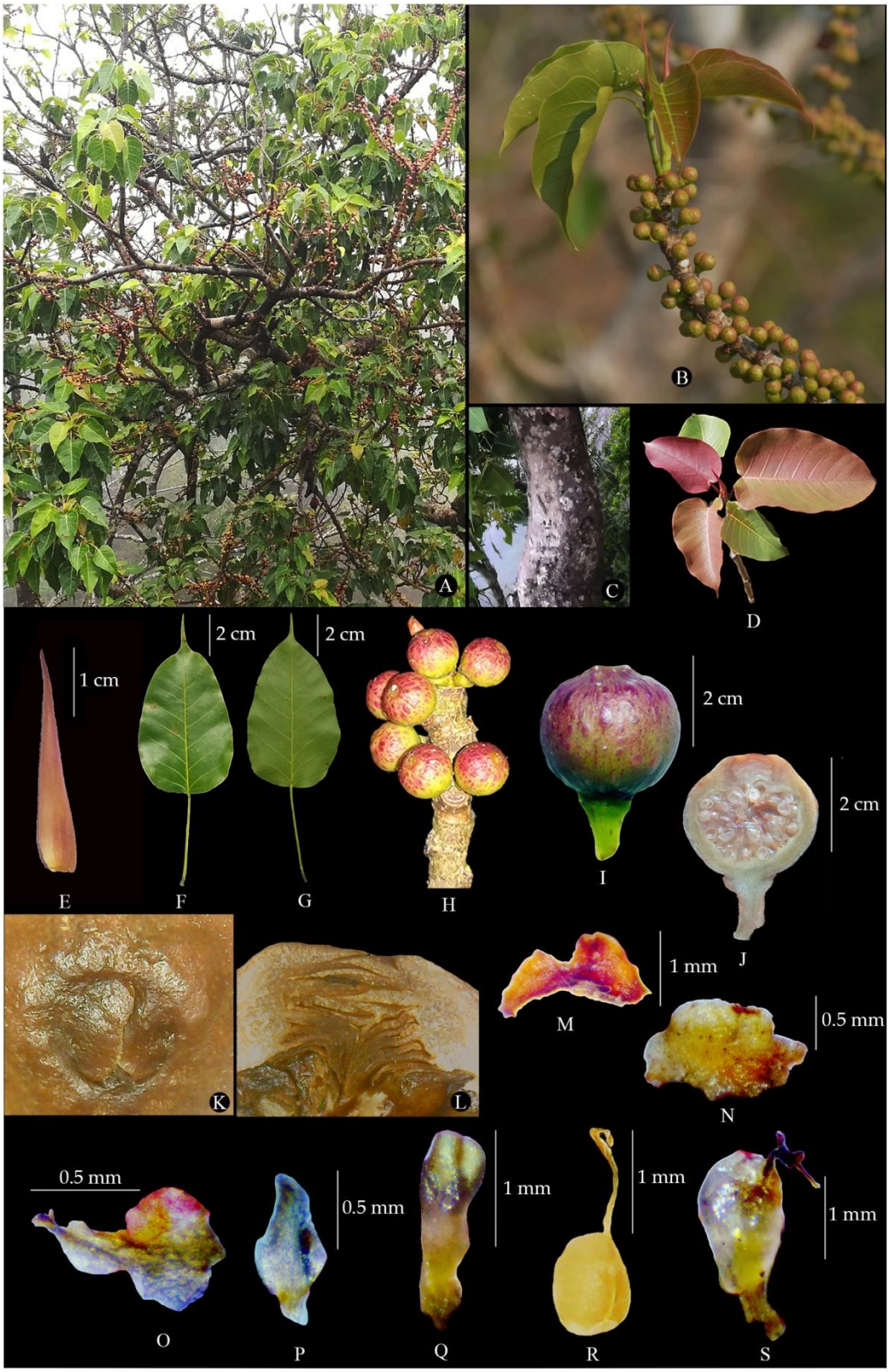


Fig.3.10. ***Ficus arnottiana*** (Miq.) Miq.: **A.** Habit; **B.** Twig; **C.** Bark; **D.** Young leaves; **E.** Stipule; **F.** Leaf adaxial side; **G.** Leaf abaxial side; **H.** Receptacles; **I.** Syconium; **J.** Syconium L. S.; **K.** Ostiole; **L.** Ostiolar L. S.; **M.** Basal bract; **N.** Outer ostiolar bract; **O.** Inner ostiolar bract; **P.** Tepal; **Q.** Male flower; **R.** Female flower; **S.** Gall flower.

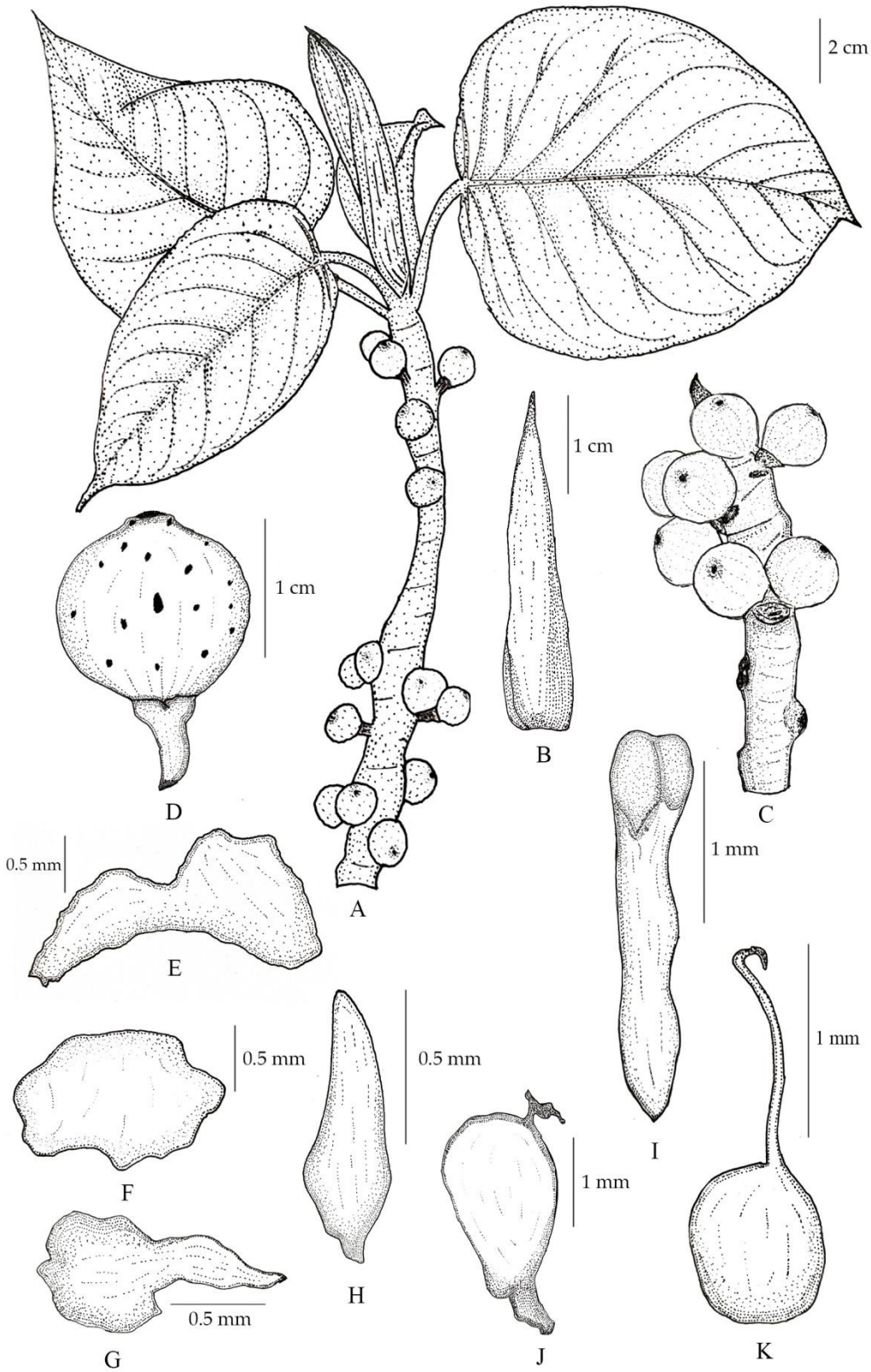


Fig. 3.11. ***Ficus arnottiana*** (Miq.) Miq.: **A.** Twig; **B.** Stipule; **C.** Receptacles; **D.** Syconium; **E.** Basal bract; **F.** Outer ostiolar bract; **G.** Inner ostiolar bract; **H.** Tepal; **I.** Male flower; **J.** Gall flower; **K.** Female flower.

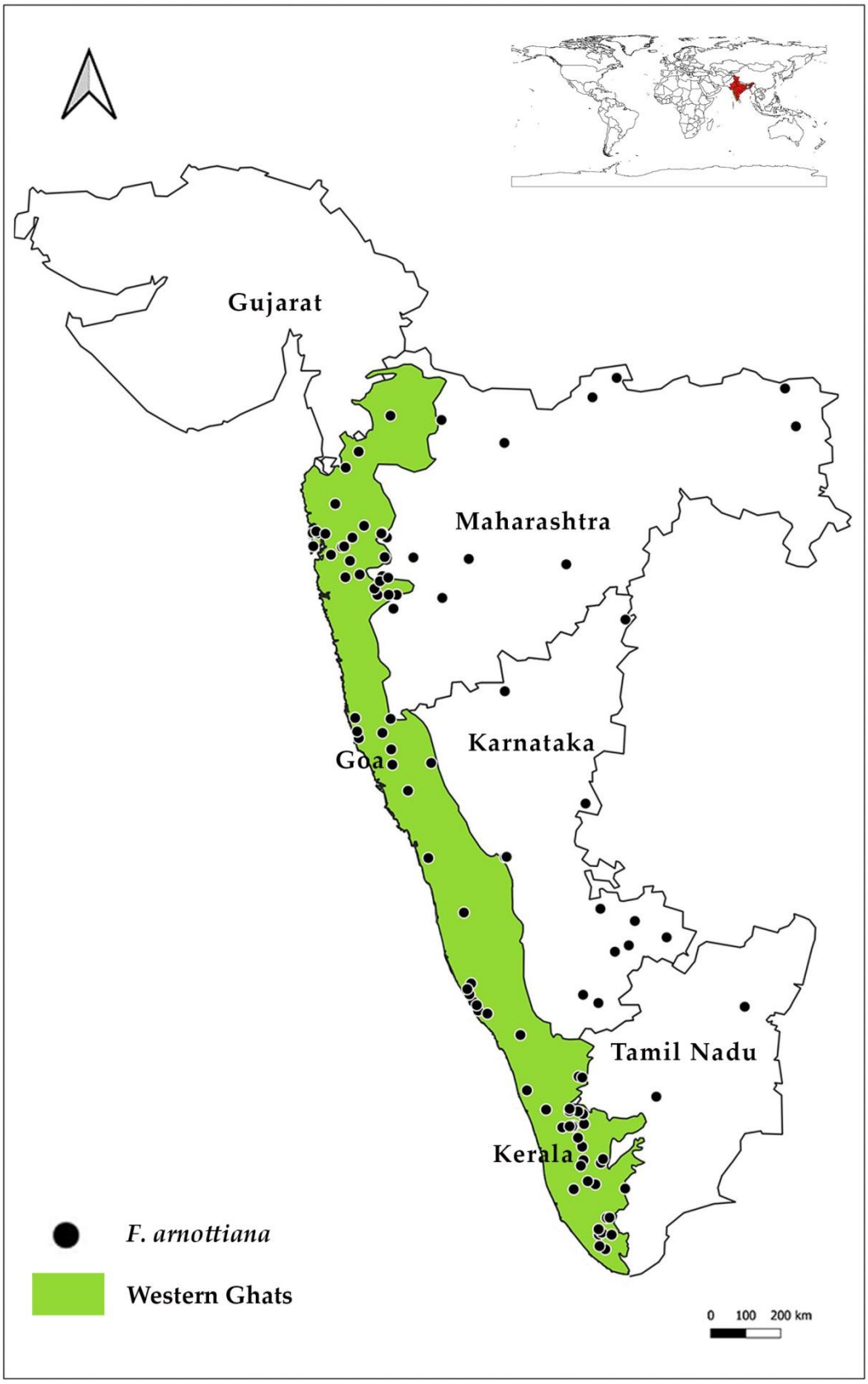


Fig.3.12. *Ficus arnottiana* (Miq.) Miq. - Distribution map.

outer bracts present, free, widely ovate, 1.0–1.2 mm long, glabrous, yellow to pale brown; inner bracts present, free, lanceolate, 1.0 mm long, glabrous, pale brown. Male flowers near ostiole, 2.0 mm long, pedicellate; pedicel 0.4 mm long; tepals 3, free, 1.0 mm long, lanceolate, glabrous, white to pale yellow; stamen 1, anther 0.8 mm long, filament 0.8 mm long. Female flowers near the base, 2.0 mm long, sessile; tepals 3, free, 1.0 mm long, lanceolate, glabrous, white to pale yellow; stigma bifid, 0.1–0.2 mm long; style 0.9 mm long; ovary 1.0 mm long, obovoid, glabrous, pale-yellow. Gall flowers 2.0 mm long, pedicellate; pedicel 0.2 mm long; tepals 3, free, 1.0 mm long, lanceolate, white to pale yellow coloured; stigma 0.1 mm long; style 0.1 mm long; ovary 1.6 mm long, obovoid, glabrous, pale-yellow. Achenes 0.6–1.0 mm, ovoid, pale yellow.

Local names: *Amakanniyan, Kallarayaal, Kallaal* (Mal.); *Bettadaarali* (Kan.); *Bassari, Palhi* (Hin.)

Common names: Rock fig, Wild peepal.

Flowering and fruiting: Two to three times a year.

Distribution: Native to Indian subcontinent, Andaman Islands and Sri Lanka. A species distributed all throughout India.

Habitat: In semi evergreen and moist deciduous forests. Usually found attached to rocks at an elevation up to 1400 m.

IUCN status: Not Evaluated (NE).

Etymology: Named in honour of the Scottish botanist George Arnott Walker Arnott, who assisted in the preparation of Illustrations of Indian Botany by Wight (1853).

Uses: According to Tiwari (2016), the bark of the plant is used for the treatment of diabetes, burning sensation, inflammation, diarrhoea and diabetes. Leaf is used in the treatment of skin diseases. Bark is used for the treatment of itches and boils in children also the plant has cooling effect and also purifies blood (Rama Rao, 1914).

Notes: The species is very near to the species *F. religiosa, F. rumphii and F. middletonii.* Two varieties were proposed for the species *viz., F. arnottiana* var. *courtallensis* and *Ficus arnottiana* var. *subcostata.* They were mentioned endemic to Tamil Nadu and Northeast & Central Himalayas respectively. These were later found as morphological variations of the species only. Variations were observed in the number of the lateral veins, many literatures cited the number of veins in between six to eight pairs (Fischer, 1928). We have observed the lateral veins within a range of six to ten pairs. King (1887-1888; 1890) mentioned male flowers as sessile, but the male flowers were found to be pedicellate.

Specimens examined: India, **Andhra Pradesh**, Anantapur District, Kalasamudram, 19 June 2010, *K. Raja Kullai Swamy & B. Sadasivaiah 39198* (BSID). Chittoor District, Homoly Konda, 05 May 1918, *s.coll. 15478* (MH); way to Thirumalai, 667 m, 02 March 1959, *K. Subramanyam 7840* (MH); Nerabylu, 650 m, 24 June 1969, *G.V. Subba Rao 32002* (MH) Sadasivakona, 27 November 2014, *K. Sankara Rao, Raja K. Swamy 157* (JCB). East Godavari District, Maredumilli, Valamuru, 550 m, 23 February 1994, *M. Mohanan 101363* (MH). Eluru District, Polavaram, 11 August 1957, *S.K. Wagh SKW 6987* (BLAT). Hoshangabad District, Around Pachmari, 08 October 1960, *J. Joseph 11317* (MH); Krishna District: Komlapatty, 13 September 1985, *P. Venkanna 5744* (MH). Krishna District, Kondapalli Sacred Grove, 359 m, 09 October 2015, *J. Swamy & S. Nagaraju 6396* (BSID). Tirupati District, Tirumala

2nd Ghat Road 2 Km milestone, 887 m, 14 February 2014, *P.V. Prasanna & M. Sankara Rao 3844* (BSID). Visakhapatnam District, Forest near Ananthagiri, 1100 m, 01 September 1960, *N.P. Balakrishnan 10971* (MH); Karakal, May. 1900, *C.A. Barber 1616* (MH); Kanaka, May 1901, *C.A. Barber 1681* (MH). **Chhattisgarh,** Bastar District, Laloi – Ghodajhar, 24 October 1945, *P.V. Bole 350* (BLAT). **Goa,** North Goa District, Mandovi, 09 May 1963, *Seshagiri Rao Rolla 89141* (BSI). **Karnataka,** Belgaum District, Sutagatti, *s.d*., *S.D. Mahajan 29787* (BSI). Bellary District, Bellari verma plateau, 21 August 1963, *K.C. Kanodia 89427* (BSI). Bidar District, Kuraupathi, 21 July 1976, *N.P. Singh 142713* (BSI). Bijapur District, Mannantiara forest, 19 December 2007, *P.G. Diwakar & R.K.R. Singh 193712* (BSI); Mudur forest, 26 June 2008, *P.G. Diwakar & R.K.R. Singh 184378* (BSI). Hassan District, Vanagur, 17 June 1970, *D.H. Nicolson, C. Saldanha & T.P. Ramamoorthy 193* (JCB). Kolar District, Narasimhadevar belta, 07 January 1976, *N.P. Singh 142165* (BSI). Mysore District, Somanathapur, 03 April 1905, *C.A. Barber 6889* (MH). Shimoga District, Barkana, Agumbae, 12 February 1961, *R. Sundara Raghavan 69591* (BSI). **Kerala**, Idukki District, Pamba, 950 m, 05 October 1976, *K. Vivekananthan 48605* (MH); Way to Meenmutty, 800 m, 22 April 1982, *Vatsavaya 71285* (MH); Kulamavu, 600 m, 12 October 1982, *C.N. Mohanan 74588* (MH); Puliyamala, 1300 m, 15 December 1982, *C.N. Mohanan 76123* (MH); Pindimedu, 25 m, 24 December 1988, *P. Bhargavan 90065* (MH); Sabarimala, P. T. R., 200 m, 16 September 1993, *Jomy Augustine 12437* (CALI); Koruyhode, P. T. R., 900 m, 21 September 1993, *Jomy Augustine 12437* (KFRI); Pamba Valley, P. T. R., 130 m, 23 November 1993, *N. Sasidharan & Jomy Augustine 12741* (KFRI). Kannur District, Madayippara slope, near fort, 14 June 2012, *C. Pramod 133506* (CALI). Kottayam District, Kurisumala, 1000 m, 03 May 1984, *Rev. Fr. Kadavil 493* (MH). Palakkad District, near Ayyappan

kovil, Nelliampathy, 925 m, 13 December 1979, *E. Vajravelu 52515* (MH); Ayyappan Koil Area, Nelliampathy, 13 February 1979, *E. Vajravelu 60405* (MH); Nelliampathy hills, 14 May 2019, *Sreehari S. Nair 12914* (MESAH). Thiruvananthapuram District, Forest near Kurisumalai, 850 m, 23 August 1975, *J. Joseph 46505* (MH); Ponmudi, 1025 m, 13 September 1977, *N.C. Nair 51041* (MH); *ibid.*, 1000 m, 16 November 1977, *M. Mohanan 52575* (MH); *ibid.*, 950 m, 29 July 1978, *M. Mohanan 56964* (MH); *ibid.*, 925 m, 16 March 1979, *M. Mohanan 61778* (MH); Agasthyamala, Bonacord, 700 m, 22 December 1988, *N. Mohanan 7934* (CALI & TBGT); Meenmutty, 700 m, 06 November 1990, *N. Mohanan 10150* (TBGT). Thrissur District, Pattikad, 70 m, 18 March 1980, *N. Sasidharan 1146* (CALI & KFRI); Sholayar, 1025 m, 05 February 1984, *K. Ramamurthy 72785* (MH); Athirapilly, 28 July 1987, *N. Sasidharan & V.V. Sivarajan 3982* (KFRI); Athirapilly, 20 m, 26 June 1996, *A.G. Pandurangan 30547* (TBGT); Sholayar, 700 m, 16 February 2005, *K.H. Amitha Bachan 99150* (CALI); Sholayar – Malakkapara, 1025 m, 05 February 1964, *K. Ramamurthy 72785* (MH); Ambalappara, 16 February 2021, *Sreehari S. Nair 12133* (MESAH). Wayanad District, Kappikalam, 800 m, 20 February 2002, *P. Naseeba 85210* (CALI); *ibid.*, 800 m, 20 February 2002, *P. Naseeba 85211* (CALI). **Madhya Pradesh**, Indore District, Bhor ghat, 7 miles from Choral, 22 October 1962, *A.S. Rao 84078* (BSI). Shajapur District, Nanora forest, 09 September 1965, *P.J. Cherian 108051* (BSI). **Maharashtra**, Akola District, Narnala Fort, 25 February 1978, *S.V. Kamble 152875* (BSI). Amravathi District, Makhala Forest, 26 June 1977, *M.Y. Ansari 147171* (BSI). Aurangabad District, Hills opposite to Ajanta Caves, 06 November 1961, *Seshagiri Rao Rolla 71443* (BSI). Beed District, Charok point, Ashti, October. 1921, *Blatter & Almedia A2* (BLAT). Bhandara District, Utawada foot hill, Vihigaon range, 20 October 1967, *K.V. Billore 112950* (BSI). Burhanpur District, Turaumal, Khandesh,

December. 1918, *s.coll. 27157* (BLAT). Dhule District, Sita Khai Surrounding, 09 May 1964, *Seshagiri Rao Rolla 96750* (BSI); Forest Rest House, 12 May 1964, *Seshagiri Rao Rolla 98303* (BSI). Kolhapur District, Near Radhanajari, 27 June 1957, *G.S. Puri 20055* (BSI). Mumbai District, Madh Island, Bombay, 27 July 1957, *G.L. Shah Shah8845* (BLAT); Marve-Madh Road, Malad, 10 May 1958, *G.L. Shah Shah 9818* (BLAT); Victoria Garden, Bombay, March. 1918, *s.coll. 15293* (BLAT); Salsette, November. 1918, *s.coll*. *28625* (BLAT). Nashik District, Tondawal, 13 July 1967, *John Cherian 111190* (BSI); Deodongara, 01 August 1983, *P.L. Narasimhan 165160* (BSI); Barhe, 08 August 1983, *P.L. Narasimhan 165225* (BSI). Palghar District, Tali Forest, Dharamapur, 15 June 1959, *P.S. Toor 39188* (BSI); Jivdani hill, near Virar, Mandvi range, 18 January 1968, *K.V. Billore 113637* (BSI); Dongerped – Umberkoi, 07 November 1970, *M.Y. Ansari 121966* (BSI). Pune District, Top of Urazighad fort, Purandhar, 07 May 1945, *H. Santapau 6193* (BLAT); Purandhar hill, 25 July 1956, *S.K. Jain 4165* (BSI); Dimbe, 17 October 1956, *G.S. Puri 8484* (BSI); Kolwan, 07 November 1956, *S.K. Jain 9690* (BSI); Ramling, 03 January 1958, *S.K. Jain 30814* (BSI); Pole, 15 February 1958, *Mahajan 32154* (BSI); Khed Taluka, at the foot of Kondeswar hill, 25 January 1961, *K.P. Janardhanan 66473* (BSI); Khed Taluka, Shiva Hill, 11 December 1961, *K.P. Janardhanan 76523* (BSI); Sinhagad, 28 August 1963, *M.Y. Ansari 87334* (BSI); Along Katraj - Suihagad Forest Path, 13 October 1963, *M.Y. Ansari 88029* (BSI); Dhangarwada, Ambavane, Lonavla, 23 December 1963, *B. Venkata Reddi 93384* (BSI); Forest on way to Kolaba, Ambavane, Lonavla, 16 March 1964, *B. Venkata Reddi 95964* (BSI); Shivneri Fort, Junnar, 27 March 1964, *K. Hemadri 98037* (BSI); Harveli Taluka, Askarwadi, Sihagad, 06 May 1964, *M.Y. Ansari 88082* (BSI); Shivneri Fort, Junnar, 13 May 1964, *K. Hemadri 98292* (BSI); Ambavane, Lonavla, 27 May 1964, *B. Venkata Reddi 97855* (BSI); *ibid*., 29 May 1964, *B. Venkata Reddi* 97878

(BSI); Bhadalwadi, 07 January 1965, *M.Y. Ansari 104771* (BSI); Raliganttill Range, Junnar, 23 September 1965, *K. Hemadri 107286* (BSI); Purandhar, December 1917, *s.coll*. *25412* (BLAT); *ibid.,* December 1917, *s.coll*. 25400 (BLAT); *ibid.,* May 1916, *s.coll. 25423* (BLAT). Raigad District, Matheran Eco point, 28 January 1957, *G.S. Puri 10985* (BSI); Water pipe- Jummapatti, 20 December 1958, *N.A. Irani NI2722* (BLAT); *ibid.,* 26 May 1959, *N.A. Irani NI4088* (BLAT); Shivmeri hill, 12 October 1962, *M.Y. Ansari 83727* (BSI); Kolaba, *s.d., S.K. Jain 35774* (BSI); Karnala, 23 June 1957, *K. B. G 18781* (BSI). Ratnagiri District, Way to Patgaon, 8 KM form Ghotge, 27 April 1966, *B.G. Kulkarni 108523* (BSI); Way to Ramghat, 9 KM from Chankal, 01 May 1966 *B.G. Kulkarni 108588* (BSI); Way to Phadyachawal, Naradave, 18 February 1970, *B.G. Kulkarni 120183* (BSI); Devgad Fort, 26 February 1970, *B.G. Kulkarni 120300* (BSI); Ramghat, Bhedshi, 26 May 1970, *B.G. Kulkarni 120466* (BSI); Riverside, Bheodshi, 29 April 1971, *B.G. Kulkarni 129401* (BSI). Satara District, Khandala, 13 August 1941, *H. Santapau 89* (BLAT); *ibid.,* 23 January 1942, *H. Santapau 823* (BLAT); *ibid.,* 23 January 1942, *H. Santapau 824* (BLAT); Meroli Forest, Khandala, 15 September 1957, *S.D. Mahajan 17200* (BSI); Forest nursery, Koyna, 07 February 1979, *R.K. Kochhar 158231* (BSI); Ambeghar, Koyna, 09 February 1979, *R.K. Kochhar 158284* (BSI); Khandala, 20 – 23 April1942, *H. Santapau 837* (BLAT); *ibid.,* March 1908, *s.coll*. *A8* (BLAT); *ibid.,* May. 1917, *s.coll*. *25471* (BLAT); *ibid.,* May 1917, *s.coll. 25538* (BLAT). Sindhudurg District, Achara, 22 February 1970, *B.G. Kulkarni 120254* (BSI); Amboli, *s.d., s.coll*. *25613* (BLAT). Thane District, Mumbra, 27 March 1954, *K.V. Shenoy KVS 2485* (BLAT); Naveb Ghat, Tokawade range, 14 June 1967, *K.V. Billore 110940* (BSI). **Odisha,** Angul District, Angul Tulka, 268 m, 25 September 2015, *K.C. Mohan 6764* (BSID), Kendujhar District, Raigoda, 18 October 2015, *K.C. Mohan 7093* (BSID); **Rajasthan,** Rajsamand District,

Chhapli, Undabari Nal, 10 October 1962, *K.C. Kanodia 82493* (BSI). Sirohi District, Mount Abu, 4000 ft, 30 July 1956, *S.K. Jain 5348* (BSI); *ibid., s. d., s.coll*. 22493 (BSI). **Tamil Nadu**, Chittoor District, Kambakkam Hills, 06 May 1913 *s.coll.* 8919 (MH), Coimbatore District, Udumanparai, Anamalais, 01 May 1903, *C.A. Barber 5734* (MH); Prailur, Kolligal, 3200 ft, 12 July 1930, *V. Narayana Swami 3902* (MH); Top slope of Konamalai, 24 September 1963, *C.P. Sreemadhavan 861* (MH); Perumal mudi, 1150 m, 11 March 1970, *M.V. Viswanathan MVV456* (MH). Dindugal District, way to Thulukkamparai, 300 m, 06 September 1969, *B.V. Shetty 32267* (MH). Kanyakumari District, Marutumalai, 15 February 2012, *T.N. Geetha Kumary & A.G. Pandurangan 64446* (TBGT). N. Arcot District, Kambrubudi, 900 m, 13 July 1958, *K. Subramanyan 6055* (MH). Ramanathapuram District, Kendiparai, 200 m, 23 September 1971, *E. Vajravelu 38711* (MH). Tenkasi District, forest out skirt at Moni falls and Tiger falls, 26 September 1975, *K.K.N. Nair 1120* (CALI); Main falls, Courtallam, 367 m, 26 May 1957, *K. Subramanyam 2943* (MH); Puliyaruvi – Courtallam, 133 m, 19 March 1958, *K. Subramanyam 5577* (MH). Thirunelly District, Main falls, 367 m, 26 May 1957, *K. Subramanyan 2943* (MH). Tiruchirappalli District, Kandiparai, Ayyanarkoil, 900 m, 23 September 1971, *E. Vajravelu 38711* (MH). Tirunelveli District, Upper dam to Kannikatti, 500 m, 11 July 1959, *K.M. Sebastine 8470* (MH). Vellore District, Poovankulam R. F., 900 m, 13 July 1958, *K. Subramanyam 6055* (MH); *s.loc., s.d., s.coll.* 4575 (K); *s.loc., s.d., s.coll. 4575* (K); *s.loc., s.d., R. Wight 3009* (L); *s.loc., s.d., R. Wight 3008* (L); s. *loc., s.d., R. Wight 2992* (L); *s.loc., s.d., R. Wight N865* (L); Ceylon, 1864, W. S. Kurz *s.n* (P); *s.loc.,* 1854, *M. Thwaites 2856* (P); **Telangana,** Mahabubnagar District, Pullajalamala, 800 m, 29 June 1987, *V.B. Hosagouda 84995* (BSID); Taravagu, Mannanur, 672 m, 02 June 2015, *L. Rasingam & S. Nagaraju 6611* (BSID).

3.6.5. *Ficus auriculata* Lour.

Ficus auriculata Lour., Fl. Cochinch. 2: 666. 1790; C.J. Saldanha, Fl. Karnataka 1: 114. 1984; D.N.G. Bakshi, Fl. Murshidabad Dist. 300. 1984; H.J. Chowdhery & B.M. Madhwa, Fl. Himachal Pradesh Analysis 2: 659. 1984; B.D. Naithani, Fl. Chamoli 2: 579. 1985; H. Kaur & M. Sharma, Fl. Sirmaur 588. 2004; V.S. Ramach. & V.J. Nair, Fl. Cannanore Dist. 431. 1988; Kesh. Murthy & S.N. Yogan. Fl. Coorg 420. 1990; T. Pullaiah & D.A. Moulali, Fl. Andhra Pradesh 2: 897. 1997; K.M. Matthew, Fl. Palni Hills 1178. 1999; Singh *et al.,* Fl. Mizoram 570. 2002; K.G. Bhat, Fl. Udupi 593. 2003; Sasidh. & Sivar., Bio. Docu. Kerala part 6: Flow. Plant. 438. 2004; Subba Rao & Kumari, Fl. Visakhapatnam Dist. 2: 214. 2008; Fl. Karnataka. A Check List 2: 507. 2019; P. Lakshmin. *et al.,* Fl. West Bengal 645. 2019; S.J. Britto, Fl. Central and North Tamil Nadu 968. 2019; S.S. Dash & A.A. Mao, Fl. Pl. India, 2: 537. 2020; R. Gogoi *et al.,* Fl. Sikkim 281. 2021.*Tremotis cordata* Raf. in Sylva Tellur.: 59. 1838. **Type:** Habitat in Cochinchina, cultivated, *s.d., s.coll. s.n.*

Ficus macrophylla Roxb. & Buch.-Ham. ex Sm., A. Rees, Cycl. 14: 32. 1810. *Covellia macrophylla* Miq., London J. Bot. 7: 465. 1848. *Ficus roxburghii* Wall. ex Steud., Nomencl. Bot., ed. 2, 1: 637. 1840. **Type:** India, East India, *s.d., W. Roxburgh s.n.* (Type- K, K000880223!).

Ficus rotundifolia Roxb., Fl. Ind. 3: 555. 1832. **Type:** India, *s.loc., s.d., W. Roxburgh s.n.* (Type- BR, BR0000005228577!).

Ficus sclerocarpa Griff., Not. Pl. Asiat. 4: 397. 1854. **Type:** India, East Bengal, *s.d., W. Roxburgh 4632* (Type- K, K000880224!).

Ficus regia Miq., Ann. Mus. Bot. Lugduno-Batavi 3: 230. 1867. **Type:** India, Sikkim, *s.d., J. D. Hooker s.n.* (Type- CAL, CAL0000025710!).

Ficus oligodon Miq., Ann. Mus. Bot. Lugduno-Batavi 3: 234. 1867. **Type:** India, Ind. orientales, Mont Khasia, 1859, *J.D. Hooker s.n.* (Type- P, P00710813!).

Ficus hainanensis Merr. & Chun, Sunyatsenia 2: 215. 1935. **Type:** China, Fan Yah, 998 m, 1932, *N. K. Chun & C. L. Tso 44155* (Type- B, B 10 0272328!).

Fig. 3.13 – 3.15

Tree up to 10 m height, independent, aerial roots absent; bark smooth, brown; young twigs terete, core hollow, pubescent, brown; inter node 2.0–9.0 cm long; latex milky, white. Stipule caducous, lanceovate, 1.9–2.2 x 0.7–1.2 cm, margins entire, apex narrowly acute, base truncate, puberulous, pale brown. Petiole articulated, terete, canaliculate, 7.0–13.0 cm long, puberulous, pale green. Leaves simple, alternate, spiral; lamina symmetric, widely elliptic, 23.4–38.0 x 19.6–35.0 cm, margins entire, serrate when young, acumen 0.5 cm long, apex acute, base cordate to rounded, puberulous when young and pilose on maturity, red to pale green when young, dark green on maturity, subcoriaceous, venation brochidodromous; basal veins 3, lateral veins 5–8 pairs, waxy glands on the axils of the basal lateral nerves. Receptacles cauliflorous, clustered, dioecious, pedunculate; peduncle 4.0–4.8 cm long, villous, green to pale brown; basal bracts present, persistent, 3 or 4, free, 0.8–1.0 cm long, widely ovate, puberulous, pale brown. Syconium 4.8–5.6 cm across, turbinate, pilose, green when young, pale brown to red with spots when mature. Ostiole 0.8–1.1 cm; outer bracts present, free, ovate, 0.5-0.8 cm long, pubescent, pale brown; inner bracts present, free, lanceolate, 2.0–2.5 mm long, glabrous, white. Male flowers near ostiole, 3.0 mm long; sessile; tepals 3, free, 2.5 mm long, lanceolate, glabrous, pale yellow; stamen 1, anther 2.0 mm, filament 1.0 mm long. Female flowers at the base, 3.5 mm

long, sessile; tepal 3, free, 2.5 mm long, lanceolate, glabrous, pale yellow; stigma 0.5 mm long; style 1.5 mm long; ovary 1.5 mm long, obovoid, glabrous, pale yellow. Gall flowers scattered, 4.0 mm long, pedicellate; pedicel 1.0 mm long; tepals 3, free, 2.5 mm long, lanceolate, glabrous, pale yellow; stigma 0.5 mm long; style 1.0 mm long; ovary 1.5 mm long, obovoid, glabrous, pale brown. Achenes 0.8–1.2 mm, ovoid, pale yellow.

Local names: *Atthi* (Mal.); *Timla* (Hin.)

Common names: Elephant ear fig, Roxburgh fig.

Flowering and fruiting: All throughout the year.

Distribution: It is a plant native to South China and Malaysia. It is distributed throughout India.

Habitat: Usually planted.

IUCN status: Least Concern (LC).

Etymology: The ostiolar bracts are ear shaped and the species epithet denotes the ear like appearance of these ostiolar bracts.

Uses: The plant is widely used for ornamental purposes. Commonly planted as a shade tree. The figs are edible and the leaves are used as fodder for cattle (Sudhakar *et al*., 2017). The fresh latex is used for the treatment of tooth diseases and juice prepared from stem bark is used in the treatment of diarrhoea (Lansky & Paavilainen, 2011).

Notes: Three forms were defined for the species and considered the species as highly variable (Berg *et al.*, 2011). Among them the most common form (cauliflorous) is considered as the standard form of the species and the same is described in this present study. *F. pomifera* Wall. ex King is usually treated as a synonym of *F. auriculata.* Based on the literatures and type specimen

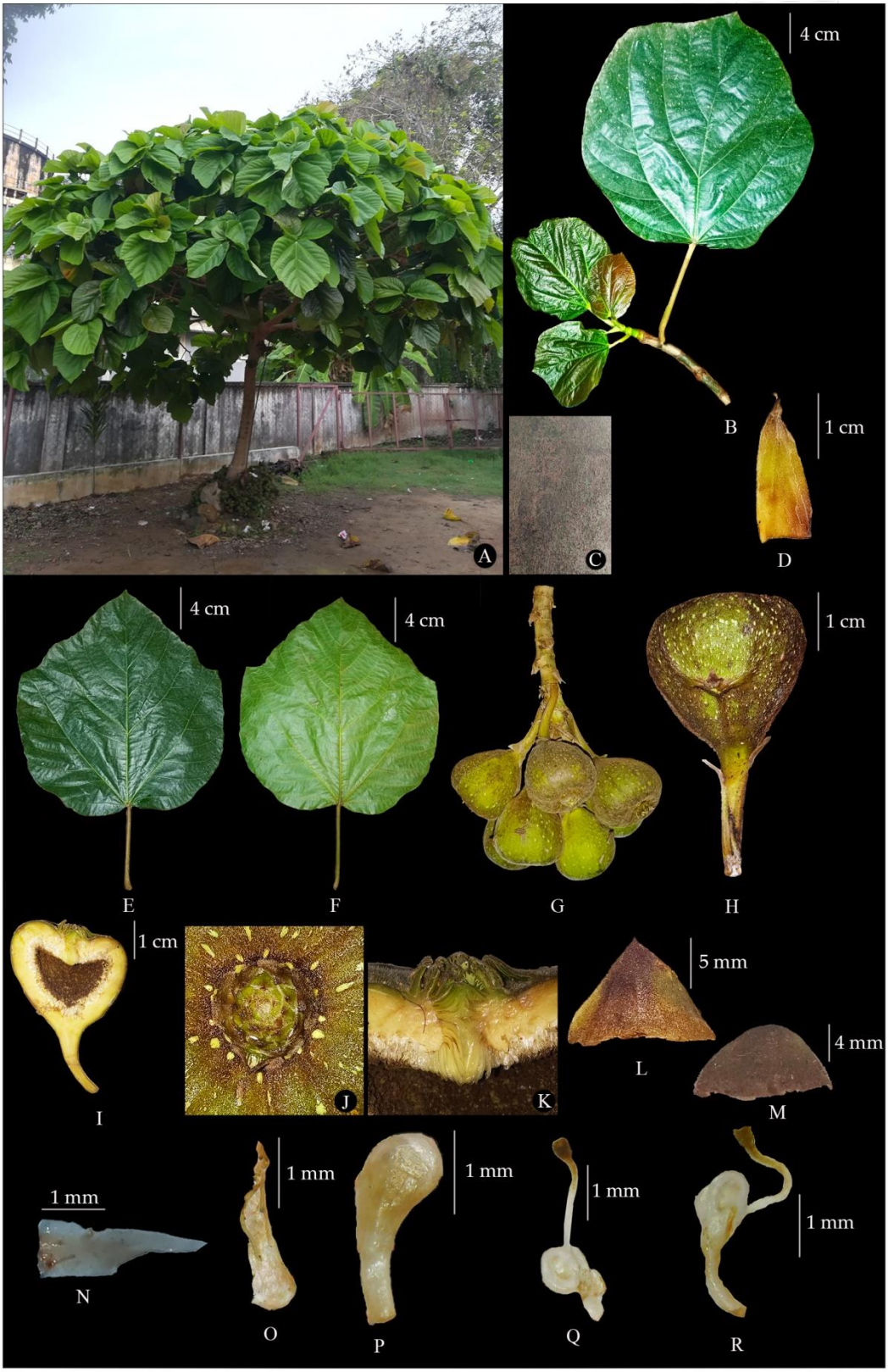


Fig. 3.13. ***Ficus auriculata*** Lour.: **A.** Habit; **B.** Twig; **C.** Bark; **D.** Stipule; **E.** Leaf adaxial side; **F.** Leaf abaxial side; **G.** Receptacles; **H.** Syconium; **I.** Syconium L. S.; **J.** Ostiole; **K.** Ostiolar L. S.; **L.** Basal bract; **M.** Outer ostiolar bract; **N.** Inner ostiolar bract; **O.** Tepal; **P.** Male flower; **Q.** Female flower; **R .** Gall flower.

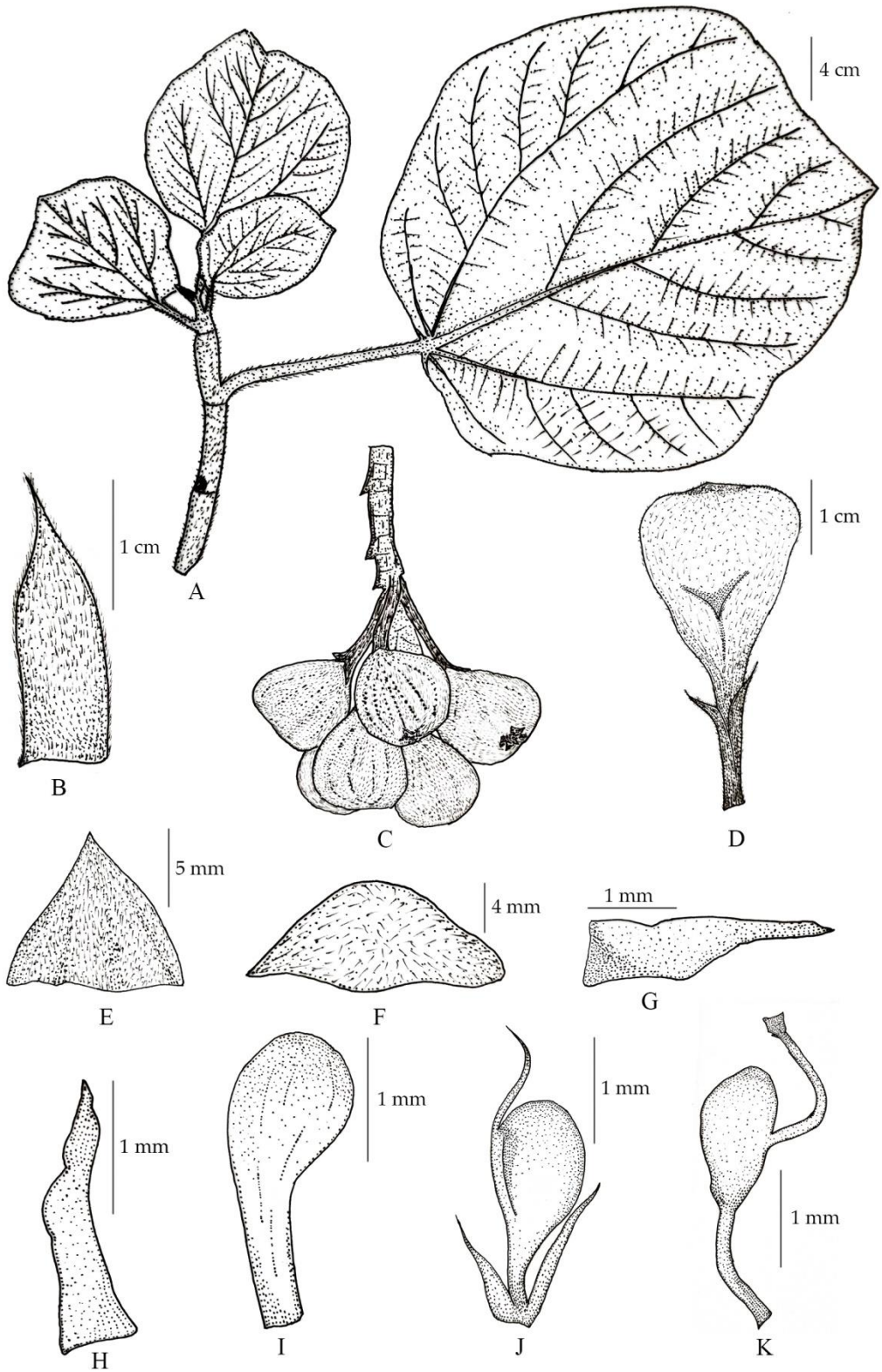


Fig. 3.14. ***Ficus auriculata*** Lour.: **A.** Twig; **B.** Stipule; **C.** Receptacles; **D.** Syconium; **E.** Basal bract; **F.** Outer ostiolar bract; **G.** Inner ostiolar bract; **H.** Tepal; **I.** Male flower; **J.** Female flower; **K.** Gall flower.

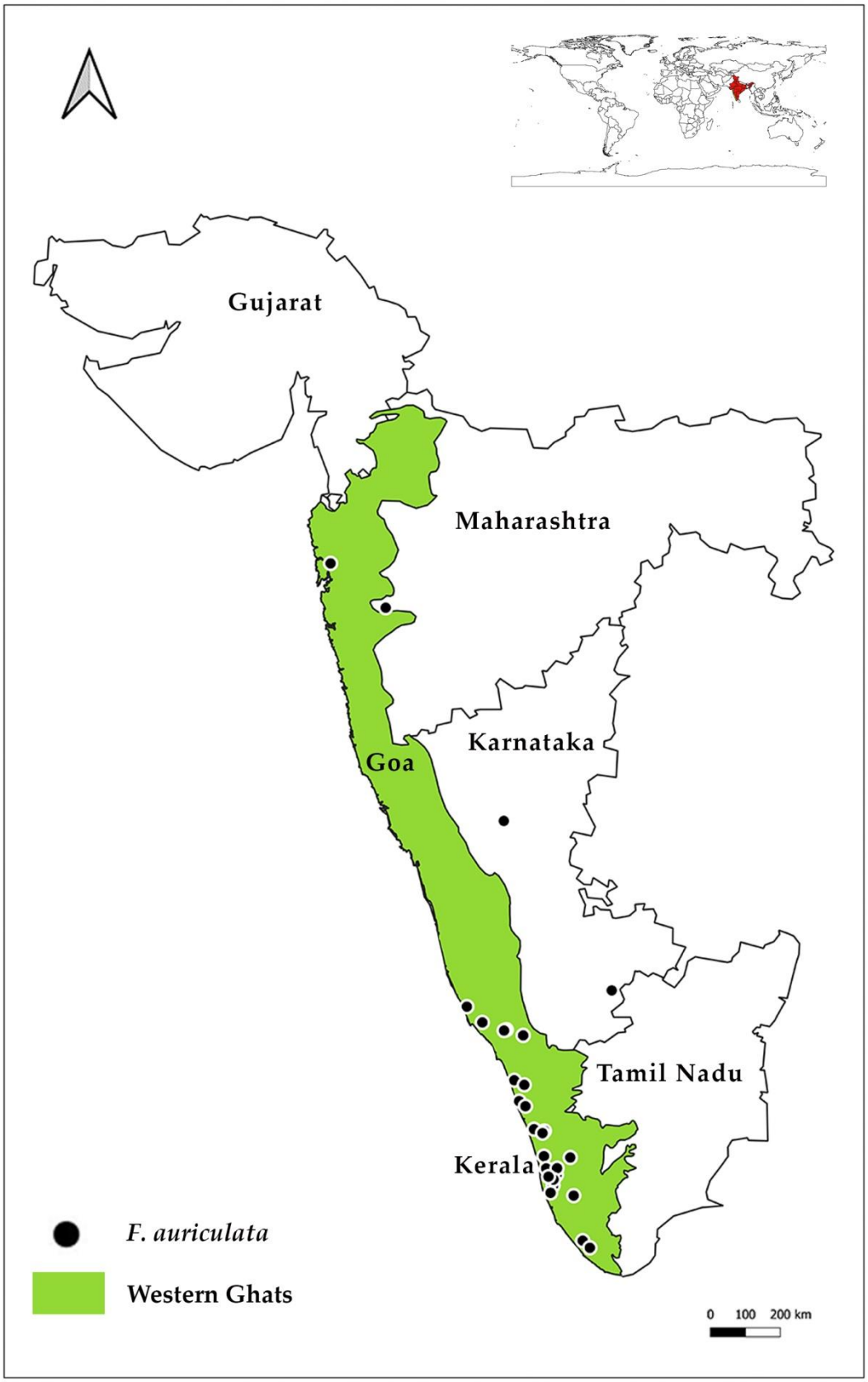


Fig. 3.15. *Ficus auriculata* Lour. - Distribution map.

(K001039295!), it is found that the species is not a synonym of *F. auriculata.* The species *F. pomifera* differs from *F. auriculata* in characters and is well differentiated by King (1887-1888). Hence, *F. pomifera* is not considered here as a synonym of *F. auriculata.*

Specimens examined: India, **Andhra Pradesh,** Visakhapatnam District, Near Dabuguda, Lakshmipuram, 900 m, 24 October 1986, *N. Rama Rao & D. Narasimhan 84222* (BSID); Sunkarametta, 11 May 1956, *H. Santapau 20589* (BLAT); Sunkarametta, 1200 m, 15 February 1965, *G.V. Subba Rao 22644* (MH); Saparla, 1000 m, 08 June 1968, *G.V. Subba Rao 30092* (MH); Towards Birmiralla, Minumuluru, 1150 m, 13 April 1976, *G.V. Subba Rao 47327* (MH); Sapparla, 1000 m, 08 June 1968, *G.V. Subba Rao 30092* (MH). **Assam,** West Garo Hills District, Garo Hills, 10 March 1950, *W.N. Koelz 24661* (L). **Himachal Pradesh,** Bhadwar District, 12 May 1933, *W.N. Koelz 4429* (MICH); Baijnath, 19 May 1933, *W.N. Koelz 4550* (MICH); *ibid.,* 20 May 1933, *W.N. Koelz 4551* (MICH). **Karnataka,** Bengaluru District, Towards Patalamma Gudi, 950 m, 14 October 1972, *G.V. Subba Rao 42588* (MH). Chikkamagaluru District, Balehonnur - Javali Junction, 850 m, 07 October 1979, *C.J. Saldanha 9671* (JCB). **Kerala,** Kannur District, Aralam, 250 m, 11 November 1978, *V.S. Ramachandran 58679* (MH); Aralam, 250 m, 26 February 1979, *V.S. Ramachandran 61930* (MH); Karimbam, 175 m, 23 June 1980, *R. Ansari 67820* (MH). Kottayam District, Thellakom, 28 m, 16 August 2022, *Sreehari S. Nair 12209* (MESAH). Malappuram District, Calicut University Botanical Garden (CUBG), 50 m, 30 May 1993, *T.K. Dominic 45733* (CALI). Pathanamthitta District, Vadasserykkara, 17 June 1994, *A. Nazarudean 22158* (TBGT). Thiruvananthapuram District, Thiruvananthapuram 09 July 2012, *G. Valsaladevi s.n.* (KUBH). **Maharashtra,** Mumbai District, Victoria Garden, Bombay, 20 September 1956, *R.R. Fernandez R2812* (BLAT); *ibid.,* February

1917, *s.coll. 15304* (BLAT). **Odisha,** Kalandhi District, Karlapat, 27 November 1991, *M. Brahmam 7574* (JCB). **Tamil Nadu,** Kodaikanal District, Madura, 25 March 1988, *K.M. Matthew 52576* (L).

3.6.6 *Ficus beddomei* King

Ficus beddomei King, Ann. Roy. Bot. Gard. (Calcutta) 1: 26, t. 24. 1887; King in Hook.f., Fl. Brit. India 5: 502. 1888; Bourd., For. Trees Travancore 360. 1908; Rama Rao, Fl. Pl. Travancore 380. 1914; Brandis, Indian Trees 600. 1921; C.E.C. Fisch. in Gamble, Fl. Madras 3: 1364. 1928; Corner, Gard. Bull. Singapore 21: 12. 1965; K.M. Matthew, Fl. Tamil Nadu, Carnatic 3: 1516, t. 110 b. 1983; B.D. Sharma *et al.,* Fl. Karnataka: analysis 258. 1984; C.J. Saldanha, Fl. Karnataka 115. 1984; V. Chithra in A.N. Henry *et al.,* Fl. Tamil Nadu Ind., Ser I: Analysis 2: 252. 1987; Vajr., Fl. Palghat Dist. 446. 1990; K.M. Matthew, Excur. Fl. Central Tamil Nadu 483. 1991; M. Mohanan & Henry, Fl. Thiruvanthapuram 432. 1994; Sasidh. & Sivar. Fl. Pl. Thrissur For. 428. 1996; V. Mudgal *et al.,* Fl. Madhya Pradesh 2: 611. 1997; Sivar. & Mathew, Fl. Nilambur 663. 1997; Sasidh., Fl. Periyar Tiger Reserve 392. 1998; K.M. Matthew, Fl. Palni Hills 1179. 1999; Mohanan & Sivadasan, Fl. Agasthyamala 630. 2002; Sasidh., Fl. Parambikulam W. L. S. 310. 2002; Sasidh. & Sivar., Bio. Docu. Kerala part 6: Flow. Plant. 438. 2004; Ratheesh Narayanan, Fl. Stud. Wayanad Dist. 770. 2009; Chaudhary *et al.,* Taiwania 57(2): 210. 2012; Bachan & Jisy, Meridian 5(1): 49. 2016; Sasidh., Fl. Aralam W. L. S. 377. 2017; Ficus sp. Madhya Pradesh 13. 2019; Fl. Karnataka: A Check List 2: 507. 2019. **Type:** India, Tinnevelly (Tirunelveli) hills, Sept. 1879, *R.H. Beddome s.n.* (Lectotype- K, K000880023!; Isolectotype- CAL- CAL0000014410!, BM- BM001053869!).

Ficus rama-varmae Bourd. J. Bombay Nat. Hist. Soc. 13: 155. 1900. **Type:** TBGT (Not seen).

Fig. 3.16 – 3.18

Tree up to 15–20 m height, hemi epiphytic, aerial roots absent; bark lenticellate, brown; young twigs terete, core solid, smooth, glabrous, pale brown; inter node 0.6–1.4 cm long; latex milky, white. Stipules caducous, widely ovate, 3.2–4.5 x 1.4–1.6 cm, margins entire, apex narrowly acute, base truncate, glabrous, pale green. Petiole articulated, terete, canaliculate, 3.5–8.5 cm long, glabrous, pale green. Leaves simple, alternate, spiral; lamina symmetric, ovate to widely ovate, 10.0–31.0 x 4.8–19.0 cm, margins entire, acumen 0.4–0.8 cm long, apex cuspidate, base obtuse, glabrous, pale green when young, dark green on maturity, coriaceous, venation brochidodromous; basal veins 3–4, lateral veins 9–12 pairs, waxy glands on the base of the midrib beneath. Receptacles axillary, solitary or paired, monoecious, pedunculate; peduncle 2.0–3.0 cm long, angular, glabrous, green; basal bracts present, persistent, 3, free, 0.6–0.9 cm long, ovate, glabrous, green to brown. Syconium 2.0–2.5 cm across, obovoid, with three ribs, glabrous, pale green when young, green with scars when mature. Ostiole 0.5–1.6 x 1.0–2.0 mm; outer bracts present, free, ovate, 2.0–4.0 mm long, glabrous, pale-brown; inner bracts present, free, lanceolate, 2.5 mm long, glabrous, pale brown. Male flowers prominent near ostiole, 4.5 mm long pedicellate; pedicel 2.0 mm long; tepals 4, free, 3.0 mm long, lanceolate, glabrous, pale brown; stamen 1, anther 2.5 mm, filament 1.5 mm long. Female flowers at the base, 3.5 mm long, sessile; tepal 4, free, 3.0 mm long, lanceolate, pale-yellow, glabrous; stigma 0.1–0.2 mm long; style 1.8 mm long; ovary 1.5 mm long, obovoid, glabrous, pale brown. Gall flowers scattered, 2.5 mm long, pedicellate; pedicel 0.5 mm long, tepals 4, free, 3.0 mm long,

lanceolate, glabrous, pale brown; stigma short; style 0.5 mm long; ovary 1.5 mm long, obovoid, glabrous, pale brown. Achenes 1.0 mm, obovoid, pale yellow.

Local names: *Thavittal, Chela* (Mal.); *Kurali, Urali* (Tam.)

Common names: Nil

Flowering and fruiting: November – April.

Distribution: Endemic to Western Ghats.

Habitat: Evergreen and semi evergreen forests.

IUCN status: Endangered (EN) (Bachan & Devika, 2022a).

Etymology: Named after R. H. Beddome, former Chief Conservator of Madras Forest Department who collected the specimen.

Uses: Wood used for making match boxes (Rama Rao, 1914).

Notes: Leaves up to 31 cm in size were collected during the present study. The previous collection records were measured up to 25 cm only. The collection in BM (BM001053869) was erroneously designated as holotype. Sudhakar, 2014 typified the species and denoted the collection from K (K00088023) as the lectotype which was the collection by R. H. Beddome from Tinnevelly hills, India.

King (1887-1888) mentioned that the species is remarkable with the sighting of only three specimens. While Bourdillon (1908) cited that the species as common in elevations of 1000 – 4000 ft. Saldanha (1984), mentioned that the basal bracts as 8.0 cm long. However, it is either a typo, where he meant 8 mm, as the receptacles are only 2.5 cm in size.

Specimens examined: India, **Karnataka,** Chikkamagaluru District, Kulhutty R. F., 1200 m, 02 March 1984, *E. Vajravelu 77898* (MH). Kodagu District,

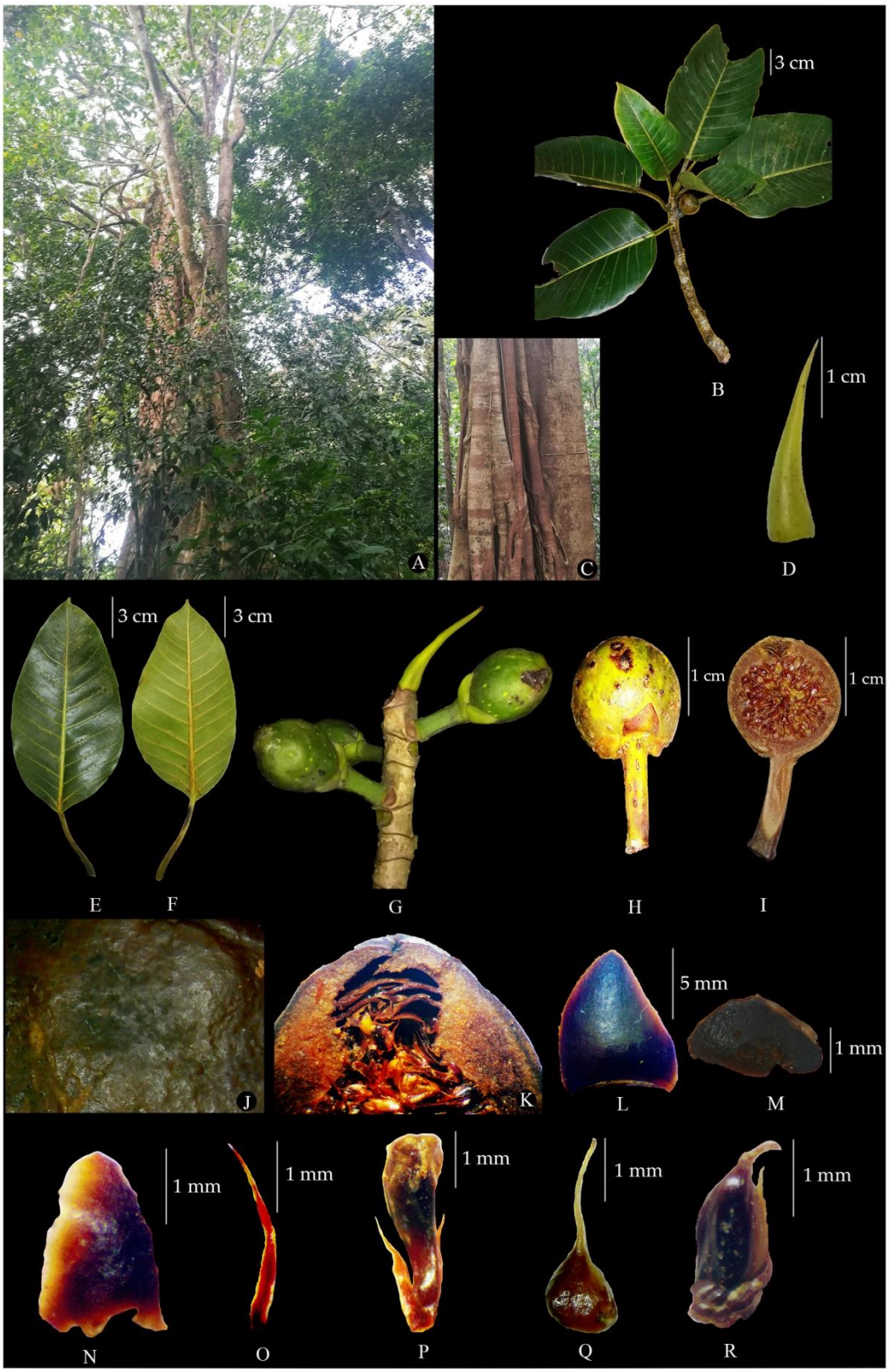


Fig. 3.16. ***Ficus beddomei*** King: **A.** Habit; **B.** Twig; **C.** Bark; **D.** Stipule; **E.** Leaf adaxial side; **F.** Leaf abaxial side; **G.** Receptacles; **H.** Syconium; **I.** Syconium L. S.; **J.** Ostiole; **K.** Ostiolar L. S.; **L.** Basal bract; **M.** Outer ostiolar bract; **N.** Inner ostiolar bract; **O.** Tepal; **P.** Male flower; **Q.** Female flower; **R.** Gall flower.

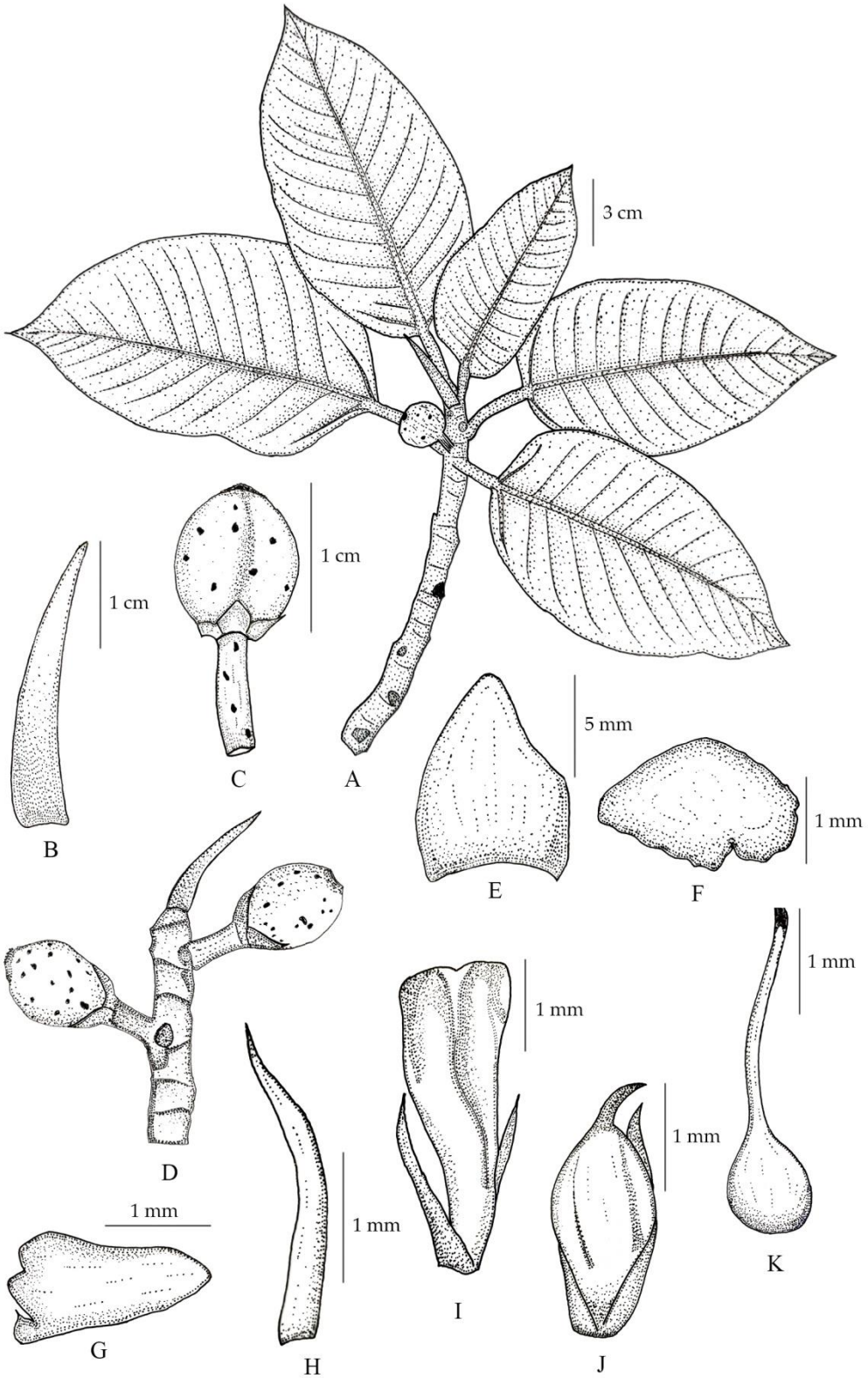


Fig. 3.17. ***Ficus beddomei*** King: **A.** Twig; **B.** Stipule; **C.** Syconium; **D.** Receptacles; **E.** Basal bract; **F.** Outer ostiolar bract; **G.** Inner ostiolar bract; **H.** Tepal; **I.** Male flower; **J.** Gall flower; **K.** Female flower.

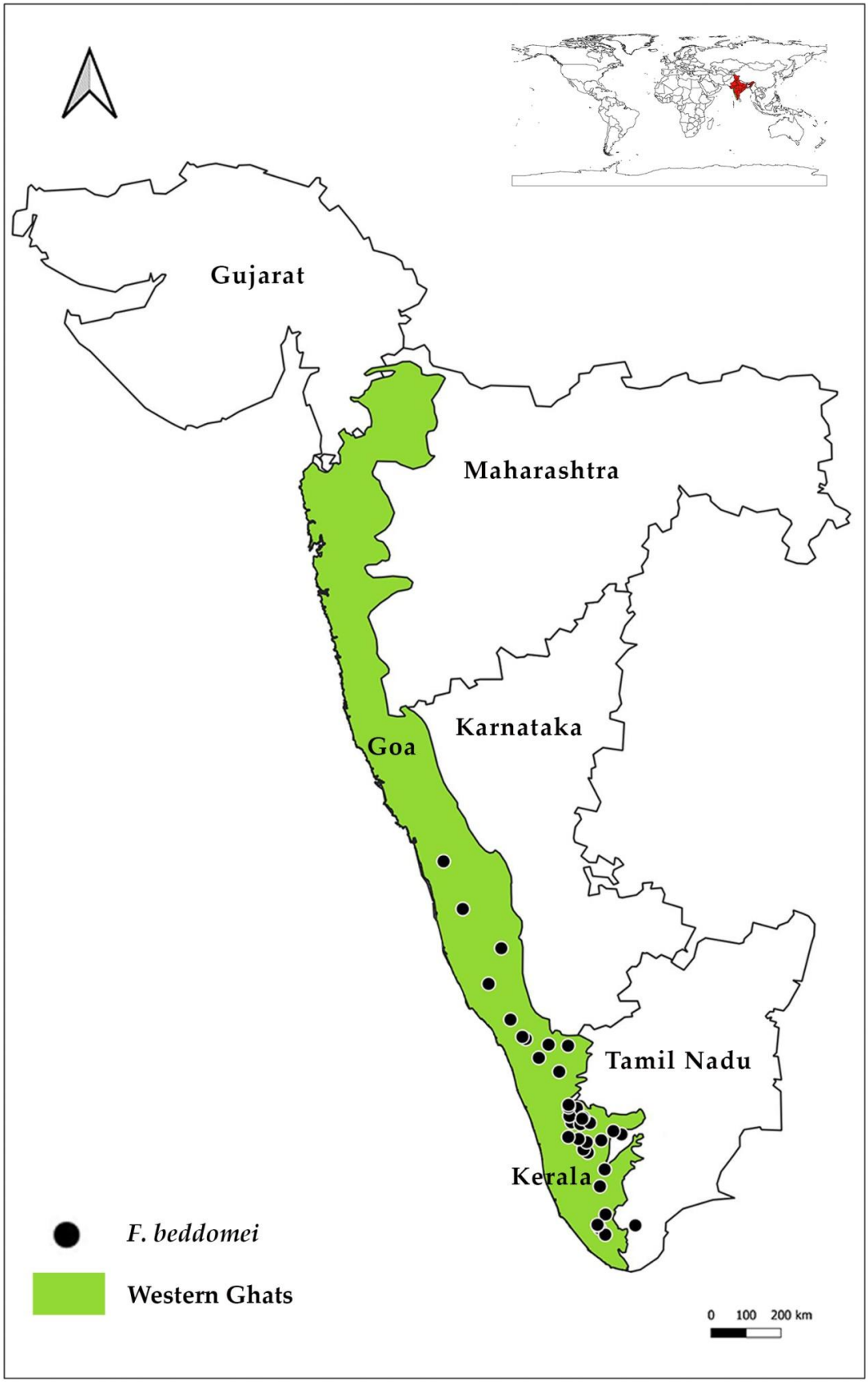


Fig. 3.18. *Ficus beddomei* King - Distribution map.

Umbalumotte, Pattighat R. F., Compt. 60, Baugamandala Range, 19 m, 24 February 1987, *B.R. Ramesh HIFP BRR1558* (HIFP). Shimoga District, Jogigundi falls, Agumbe, 21 February 1963, *R. Sundara Raghavan 86437* (BSI); Barakana, Agumbe, 31 August 1963, *R. Sundara Raghavan 90343* (BSI); Barakana, Agumbe, 28 March 1964, *R. Sundara Raghavan 97263* (BSI). **Kerala,** Idukki District, Way to Mangala devi temple, 900 m, 10 October 1976, *K. Vivekananthan 48665* (MH); Periakaual, 250 m, 27 March 1980, *K. Ramamurthy 66539* (MH); Meenmutty, 600 m, 15 February 1982, *C.N. Mohanan 73275* (MH); Adimaly, 13 July 1993, *A. Nazarudean 17811* (TBGT); Uppupara, P. T. R., 1000 m, 08 November 1993, *Jomy Augustine & N Sasidharan 12095* (CALI & KFRI) Tangal para, 2460 m, 08 October 2019, *Sreehari S. Nair & P.J. Ebin 12920* (MESAH). Kannur District, Chandanathode, 700 m, 05 December 1967, *J.L. Ellis 29488* (MH). Kottayam District, Cheeyappara falls, 525 m, 21 August 1965, *K.M. Sebastine 25342* (MH). Malappuram District, Vythiri, 760 m, 12 July 1978, *C.R. Suresh* & *K.S. Manilal 21722* (CALI); Nadukani, Way to Gudallore, 30 m, 18 January 1979, *N. Sasidharan 454* (KFRI); Nilambur, Thalichola, 04 February 1982, *s.coll.* 33919 (CALI). Palakkad District, Mukkali forest, 525 m, 02 June 1966, *E. Vajravelu 27776* (MH); Kaikatty to Ayyappan Kovil area, 650 m, 26 February 1975, *E. Vajravelu 45758* (MH); Karapara estate, 900 m, 29 October 1976, *E. Vajravelu 48759* (MH); Madampally forest, 525 m, 15 October 1979, *M. C. Nair 64649* (MH); Sairandhri, Silent Valley, 10 May 2019, *Sreehari S. Nair & K.H. Amitha Bachan 12903* (MESAH). Pathanamthitta District, Anathode forest, 1150 m, 09 May 1988, *R. Chandrashekaran 88501* (MH). Thiruvananthapuram District, Ponmudi, 07 March 1980, *C.E. Ridsdale 510* (CALI & L); Shola near upper sanatorium, 900 m, 07 March 1980, *K. Vivekananthan 66153* (MH); Ponmudi, 650 m, 08 March 1980, *M. Mohanan 66608* (MH); Athirumala, 1000 m, 25 August 1992, *N.*

Mohanan 10029 (TBGT). Thrissur District, Malakkappara, 1050 m, 22 May 2006, *K.H. Amitha Bachan 99076* (CALI). Wayanad District, Kurichiyamala, 800 m, 22 March 2016, *A. Nazarudean & P.M. Alister 87765* (TBGT). **Tamil Nadu,** Tirunelveli District, 4th Road, Deviyar (Deviar) Estate, 1300 m, 14 October 1992, *S.R. Srinivasan 100044* (MH). Coimbatore District, Anamalis, 14 November 1901, *C.A. Barber 4065* (MH); Udumpanparai, Anamalais, 01 May 1903, *C.A. Barber 5743* (MH). Dindugal District, Sirumalais, 17 June 1960, *J. Pallithanam JP6436* (BLAT). Nilgiri District, Paridalur, Devala, 900 m, 27 February 1973, E. Vajravelu 43758 (MH). Salem District, Sottupparai, 21 October 1978, *K.M. Matthew 18692* (L). Tinneveli District, Walaiyar Cardamom estate, 11 July 1976, *Kostermans 26274* (L); Tinnevelly Hills, *s.d., R.H. Beddome 7503* (BM); Tinnevelly Hills, September 1829, *R.H. Beddome 1814* (K).

3.6.7. *Ficus benghalensis* L.

Ficus benghalensis L., Sp. Pl. 1059. 1753; Thunberg, Dissert. Ficus. 14. 1786; Linn, Fl. Cochinch. 664. 1790; Vahl., Symb. Bot. 1: 82. 1790; Vahl., Enum. Pl. 2: 187. 1805; Wild., Sp. Pl., 4. 1135. 1806; Stokes, Bot. Mat. Med. 4: 635. 1812; Miq., Ann. Mus. Bot. Lugd.-Bat. 3. 285. 1867; D. Brandis, For. Fl. North-West and Central Ind., 412. 1874; Kurz., For. Fl. Brit. Burma 440. 1877; King, Ann. Roy. Bot. Gard. (Calcutta) 1: 18. 1887; King in Hook.f., Fl. Brit. India 5: 499. 1888; A.K. Nairne, Fl. Pl. Western Ind. 304. 1894; J. Cameron, For. Trees of Mysore & Coorg 271. 1894; H. Trimen, Handb. Fl. Ceylon 4: 86. 1898; W.A. Talbot, Trees Bombay 326. 1902; D. Prain, Bengal Plants 2: 979. 1903; T. Cooke, Fl. Pres. Bombay 2: 645. 1908; Bourd., For. Trees Travancore 358. 1908; Rama Rao, Fl. Pl. Travancore 380. 1914; J.F. Duthie, Fl. Upper Gang. Plain 147. 1915; Brandis, Indian Trees 600. 1921; H.N. Ridley, Fl. Malay

Peninsula 3: 331. 1924; C.E.C. Fisch. in Gamble, Fl. Madras 3: 1361. 1928; U.N. Kanjilal *et al.,* Fl. Assam 4: 240. 1940; H. Santapau, Fl. Khandala 256. 1953; Corner, Gard. Bull. Singapore 17: 381. 1960; Corner, Gard. Bull. Singapore 21: 14. 1965; G.L. Shah, Fl. Gujarat 644. 1978; N.C. Nair, Fl. Punjab Plains, Haryana and Punjab states 11(1): 243. 1978; N.C. Nair, Fl. Punjab Plains 243. 1978; Corner in Dass. & Forsb., Rev. Handb. Fl. Ceylon 3: 251. 1981; S.K. Varma, Fl. Bhagalpur 361. 1981; Manilal & Sivar., Fl. Calicut 277. 1982; B.V. Shetty & R.P. Pandey, Fl. Tonk Dist. 180. 1983; V. Singh, Fl. Banswara Dist. 3: 215. 1983; A.K. Mukherjee, Fl. Pachmarhi & Bori Reserves 282. 1984; B.D. Sharma *et al.,* Fl. Karnataka: Analysis 258. 1984; C.J. Saldanha, Fl. Karnataka 1: 115. 1984; D. N.G. Bakshi, Fl. Murshidabad Dist. 301. 1984; H.J. Chowdhery & B. M. Madhwa, Fl. Himachal Pradesh Analysis 2: 659. 1984; B.D. Naithani, Fl. Chamoli 2: 579. 1985; D.M. Verma *et al.,* Fl. Raipur, Durg & Rajnandgaon 356. 1985; K.K.N. Nair & M.P. Nayar, Fl. Courtallum 1: 40. 1986; N.R. Ugemuge, Fl. Nagpur Dist, Maharashtra 338. 1986; P.C. Pant, Fl. Corbet N. P. 148. 1986; R.S. Rao *et al.,* Fl. Goa, Diu Daman Dadra & Nagar haveli 2: 408. 1986; R.S. Rao *et al.,* Fl. West Godavari Dist. 374. 1986; V. Chithra in A.N. Henry *et al.,* Fl. Tamil Nadu Ind., Ser I: Analysis 2: 252. 1987; Bole & J.M. Pathak, Fl. Saurashtra 2: 293. 1988; Kamble & S.G. Pradan, Fl. Akola Dist. 212. 1988; B.G. Kulkarni, Fl. Sindhudurg 417. 1988; N.P. Singh, Fl. Eastern Karnataka 2: 585. 1988; V.S. Ramach. & V.J. Nair, Fl. Cannanore Dist. 431. 1988; T. Pullaiah & N. Yesoda, Fl. Anantapur Dist. 231. 1989; Kesh. Murthy & S.N. Yogan. Fl. Coorg 420. 1990; Vajr., Fl. Palghat Dist. 445. 1990; Lakshmin. & B.D. Sharma, Fl. Nasik Dist. 439. 1991; P.J. Parmar in B.V. Shetty & V. Singh, Fl. Rajasthan 2: 801.

1991; K.M. Matthew, Excur. Fl. Central Tamil Nadu 483. 1991; B.K. Misra & B.K. Verma, Fl. Allahabad Dist. Uttar Pradesh 345. 1992; G.P. Roy & B.K. Shukla, Fl. Madhya Pradesh 407. 1992; Kothari & Moorthy, Fl. Raigad Dist. 3: 375. 1993; S. Karthikeyan & A. Kumar, Fl. Yavatmal Dist. Maharashtra 232. 1993; A.K. Sharma & J.S. Dhakre Fl. Agra Dist. 254. 1995; T. Pullaiah & B.R.P. Rao, Fl. Nizamabad 321. 1995; Subram., Fl. Thenmala Div. 352. 1995; V. Raju & T. Pullaiah, Fl. Kurnool 435. 1995; Sivar. & Mathew, Fl. Nilambur 663. 1996; T. Pullaiah & D.A. Moulali, Fl. Andhra Pradesh 2: 897. 1997; V. Mudgal *et al.,* Fl. Madhya Pradesh 2: 611. 1997; P.K. Bhattacharyya & K. Sarkar, Fl. West Champaran, Bihar 64. 1998; Sasidh., Fl. Chinnar W. L. S. 297. 1999; K.M. Matthew, Fl. Palni Hills 1179. 1999; S.K. Murthi & Panigrahi, Fl. Bilaspur Dist. 2: 565. 1999; J.L. Ellis, Fl. Nallamalais 2: 379. 1990; N.D. Paria & S.P. Chattopadhyay, Fl. Hazaribagh Dist. 1: 84. 2000; P.G. Diwakar & B.D. Sharma Fl. Buldhana Dist. Maharashtra State 294. 2000; T. Pullaiah *et al.,* Fl. Guntur Dist. 324. 2000; N.P. Singh *et al.,* Fl. Maharashtra Dicot 2: 934. 2001; P. Daniel & P. Umamaheshwari, Fl. Gulf of Mannar, Sout. Ind. 405. 2001; Mohanan & Sivadasan, Fl. Agasthyamala 630. 2002; Singh *et al.,* Fl. Mizoram 571. 2002; T.K. Sarma & A.K. Sarkar, Fl. Palamau Dist. Jharkhand 574. 2002; K.G. Bhat, Fl. Udupi 593. 2003; H. Kaur & M. Sharma, Fl. Sirmaur 588. 2004; Sasidh. & Sivar., Bio. Docu. Kerala part 6: Flow. Plant. 438. 2004; Anil Kumar *et al.,* Fl. Pathanamthitta 463. 2005; S.G. Pradhan *et al.,* Fl. Sanjay Gandhi National Park 3: 573. 2005; Berg & Corner in Nooteboom, Fl. Malesiana 17(2): 630. 2005; K.M. Chetty *et al.,* Fl. Pl. Chittoor Dist. 331. 2008; Subba Rao & Kumari, Fl. Visakhapatnam Dist. 2: 215. 2008; Sunil & Sivadasan, Fl. Alappuzha Dist. 661. 2009;

Berg *et al.,* Fl. Thailand 10(4): 605. 2011; Chaudhary *et al.,* Taiwania, 57(2): 210. 2012; Mandar & Lakshmin., Fl. Bhagwan Mahavir 227. 2013; T. Pullaiah, Fl. Telangana 2: 879. 2015; For. Plant. Nilgiris 44. 2015; Bachan & Jisy, Meridian 5(1): 49. 2016; Sudhakar *et al.,* Figs of Eastern Ghats, India 36. 2017; Ficus sp. Madhya Pradesh 15. 2019; Fl. Karnataka. A Check List 2: 507. 2019; P. Lakshmin. *et al.,* Fl. West Bengal 645. 2019; S.J. Britto, Fl. Central and North Tamil Nadu 969. 2019; G.P. Sinha & A.N. Shukla, Fl. Uttar Pradesh 2: 472. 2020; S. S. Dash & A. A. Mao, Fl. Pl. India, 2: 538. 2020; R. Gogoi *et al.,* Fl. Sikkim 281. 2021. *Perula benghalensis* (L.) Raf. Sylva Tellur. 59. 1838. *Urostigma benghalense* (L.) Gasp., Giorn. Bot. Ital. 2: 215. 1844; Miq., London J. Bot. 6: 571. 1847; H. Drury, Handb. Ind. Fl. 3: 225. 1869. **Type:** India, Commelin, Hort. Med. Amstelod. Pl. Rar. 1: 119. t. 62, 1697; Syntype: *Royen Van* 900640 (Syntype-L, L 0052854!).

Ficus indica L., Sp. Pl. 1060. 1753; emend. Lam., Encycl. 2: 494. 1788; Roxb., Hort. Bengal. 65. 1814; Buch.-Ham., Trans. Linn. Soc. 13: 489. 1822; Roxb., FI. Ind. 3: 539. 1832; Wight, Ic. 6 t. 1989. 1853. *Ficus umbrosa* Salisb., Prodr. Stirp. Chap. Allerton. 16. 1796. **Type:** India, L1240.8 (LINN!).

Ficus lasiophylla Link, Enum. Hort. Berol. Alt. 2: 449. 1822. **Type:** Not found.

Ficus banyana Oken, Allg. Naturgesch. 3: 1561. 1841; Merr., J. Arnold Arbor. 31: 276 1950. **Type:** Peralu in Van Rheede p.49, t.28. 1678.

Fig. 3.19 – 3.21

Tree up to 30 m height, hemi epiphytic and later becoming independent, aerial roots present; bark smooth, white to pale yellow; young twigs terete, core solid, smooth, pubescent, pale brown; inter node 2.2–4.0 cm long; latex

milky, white. Stipule caducous, widely ovate, 1.6–3.1 x 0.6–0.8 cm, margins entire, apex narrowly acute, base truncate, pubescent, red to pale green. Petiole articulated, terete, canaliculate, 3.8–5.0 cm long, pubescent, pale green. Leaves simple, alternate, spiral; lamina symmetric, ovate to widely ovate, 4.2–23.1 x 2.7–13.1 cm, margins entire, acumen 0.1–0.3 cm long, apex obtuse, base rounded, pubescent when young, lamina glabrous and veins puberulent when mature, red to pale green when young, dark green on maturity, subcoriaceous, venation brochidodromous; basal veins 3–4, lateral veins 6–8 pairs; waxy gland on the base of the midrib. Receptacles axillary, clustered, monoecious, sessile; basal bracts present, persistent, 3, free, 0.9–1.2 cm long, widely ovate, pubescent, pale brown. Syconium 1.8–2.4 cm across, globose, puberulent, green when young, red with spots when mature. Ostiole 1.0–1.5 mm; outer bracts present, free, ovate, 2.0–2.5 mm long, pubescent to pilose, yellow to pale brown; inner bracts present, free, lanceolate, 2.5–3.0 mm long, glabrous, pale brown to yellow. Male flowers near ostiole, 4.0 mm long, pedicellate; pedicel 2.0 mm long; tepals 3-4, free, 2.0 mm long, lanceolate, glabrous, yellow to pale brown; stamen 1, anther 0.5 mm, filament 1.0 mm long. Female flowers scattered, 4.0 mm long, pedicellate; pedicel 0.5 mm long; tepal 3–4, free, 2.0 mm long, lanceolate, glabrous, pale brown to yellow; stigma 0.5 mm long; style 1.2 mm long; ovary 1.8 mm long, obovoid, glabrous, pale brown. Gall flowers scattered, 3.5 mm long, pedicellate; pedicel 2.0 mm long; tepals 3–4, free, 2.0 mm long, lanceolate, glabrous, pale yellow; stigma short; style 0.2 mm long; ovary 1.3 mm long, obovoid, glabrous, yellow. Achenes 1.0–1.5 mm, ovoid or trigonous, red to brown.

Local names: *Peraal, Vadavriksham* (Mal.); *Bargat* (Hin.); *Aladamara* (Kan.); *Aal, Ichchi* (Tam.).

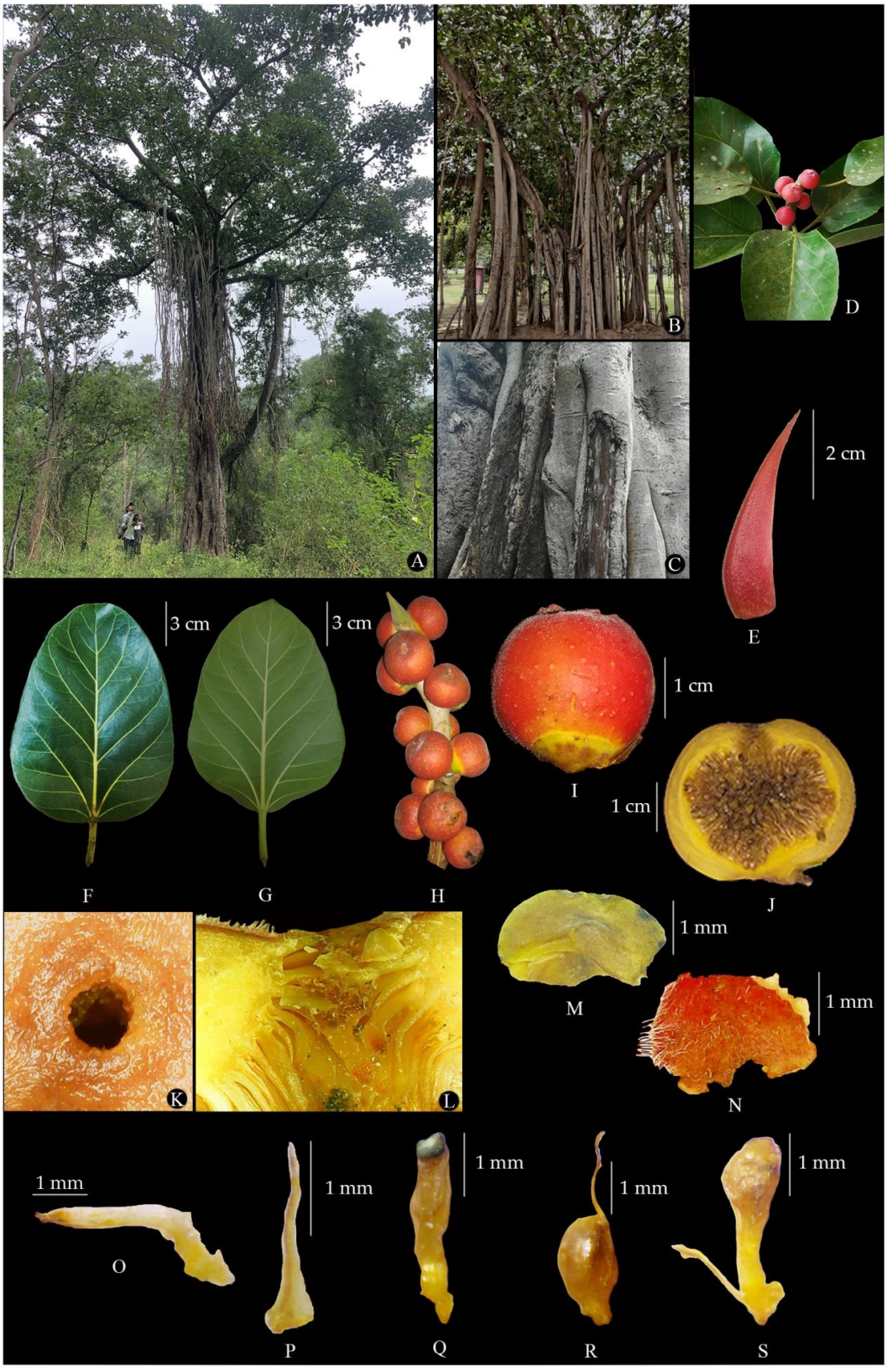


Fig. 3.19. ***Ficus benghalensis*** L.: **A.** Habit; **B.** Aerial roots; **C.** Bark; **D.** Twig; **E.** Stipule; **F.** Leaf adaxial side; **G.** Leaf abaxial side; **H.** Receptacles; **I.** Syconium; **J.** Syconium L. S.; **K.** Ostiole; **L.** Ostiolar L. S.; **M.** Basal bract; **N.** Outer ostiolar bract; **O.** Inner ostiolar bract; **P.** Tepal; **Q.** Male flower; **R.** Female flower; **S.** Gall flower.

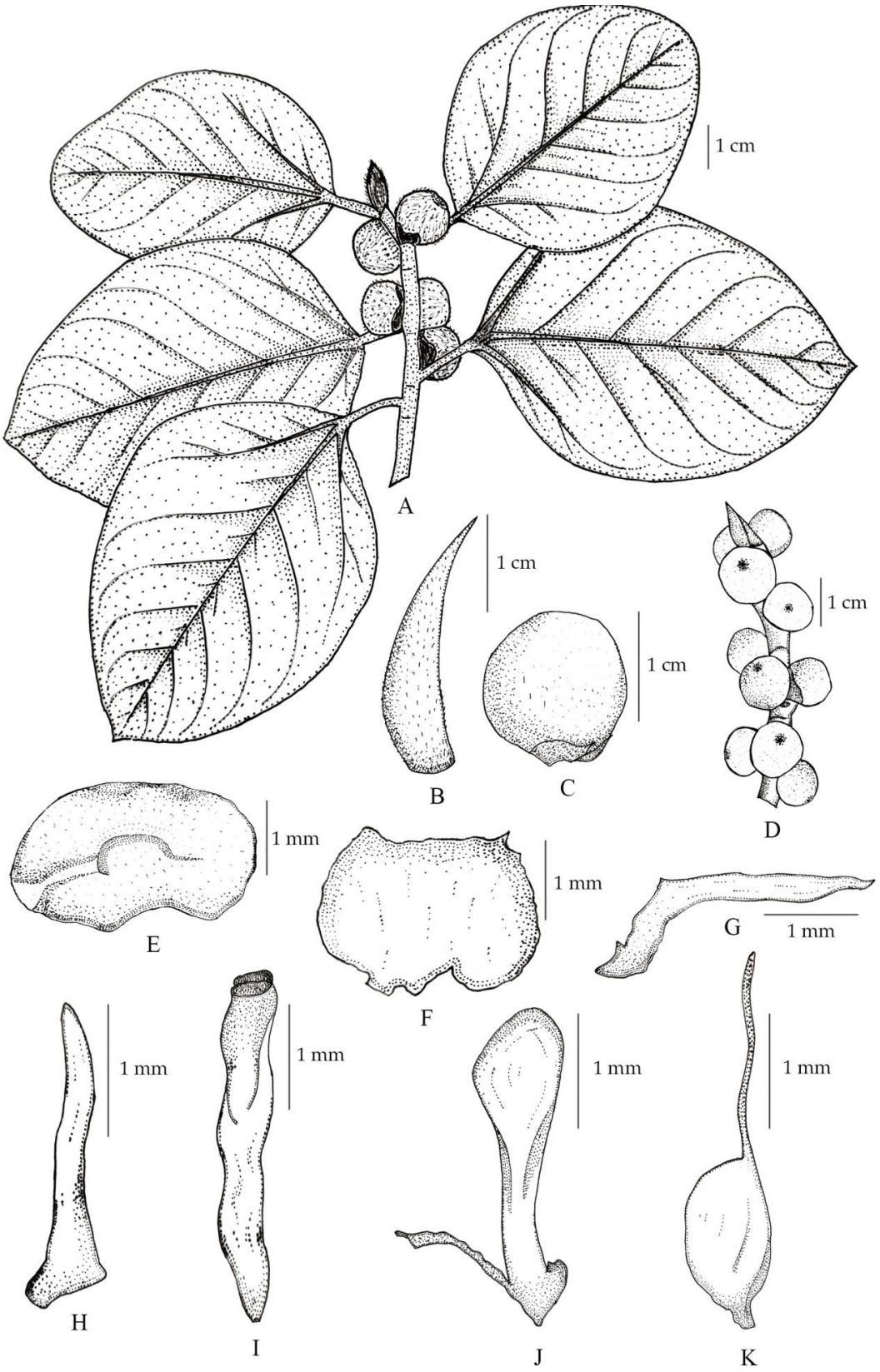


Fig. 3.20. ***Ficus benghalensis*** L.: **A.** Twig; **B.** Stipule; **C.** Syconium; **D.** Receptacles; **E.** Basal bract; **F.** Outer ostiolar bract; **G.** Inner ostiolar bract; **H.** Tepal; **I.** Male flower; **J.** Gall flower; **K.** Female flower.

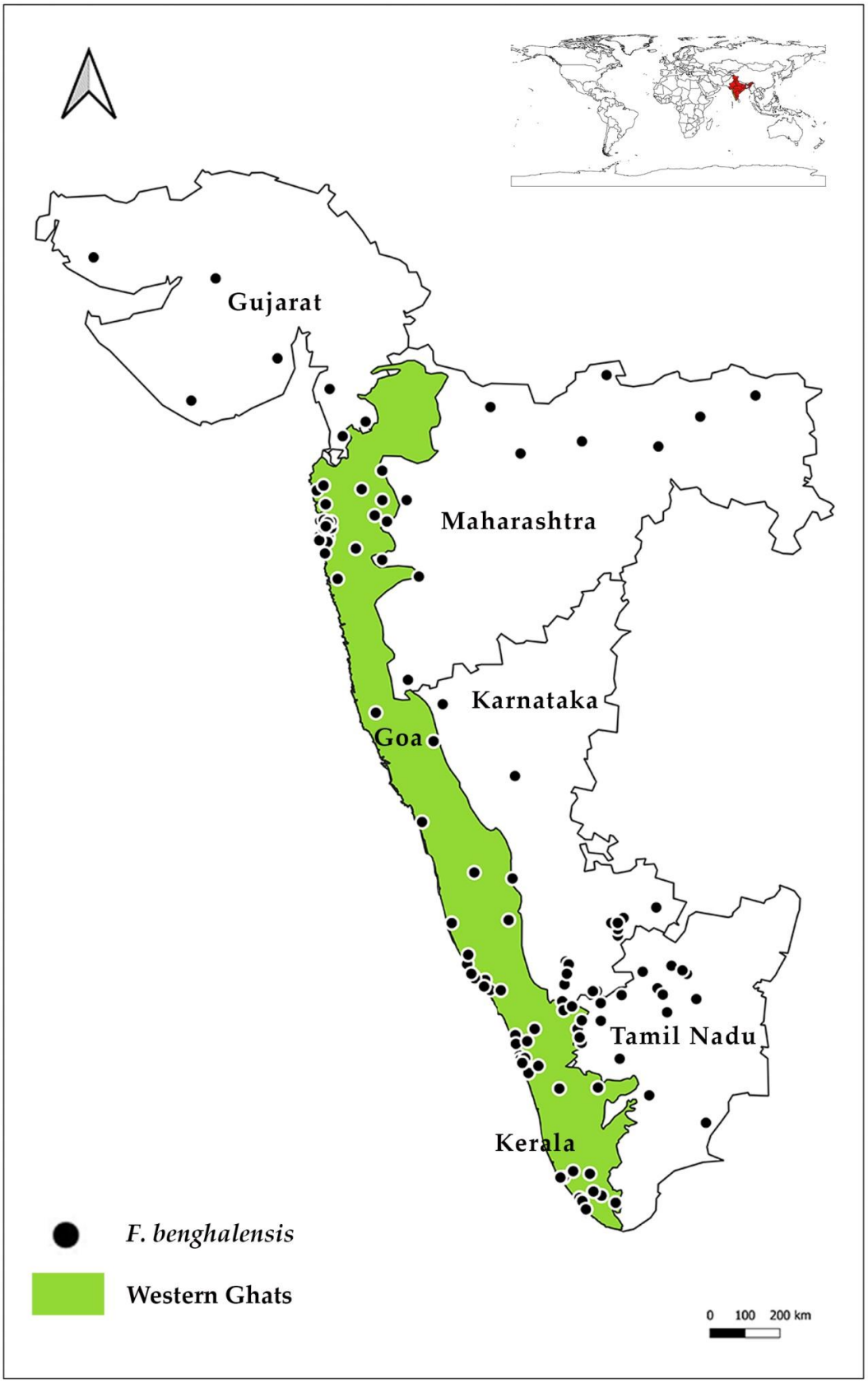


Fig. 3.21. *Ficus benghalensis* L.- Distribution map.

Common names: Banyan Tree, Indian Fig, Bengal Fig.

Flowering and fruiting: Two to three times in a year.

Distribution: Native to Indian sub-continent and Andaman Islands. Found throughout the country.

Habitat: Deciduous forests also in plains. Common in the temple premises, planted as sacred.

IUCN status: Not Evaluated (NE).

Etymology: The species epithet denotes the type locality Bengal.

Uses: The leaves of the plant are used as fodder for animals. Bark, roots and leaves have medicinal properties. Latex is used in the treatment of rheumatism and in the preparation of birdlime. Diarrhoea, dysentery and diabetics are treated with extract prepared from the bark. (Paria & Chattopadhyay, 2000). The wood is less durable.

Notes: The characters of *Ficus lasiophylla* Link, is very similar to *F. benghalensis* and is treated as a synonym of *F. benghalensis* according to Berg and Corner (2005). But the type material of *Ficus lasiophylla* was not found, as they are recorded as destroyed. Vahl (1805) described *Ficus cotoneifolia* based on the plant from India and mentioned the image and descriptions of van Rheede p.73, t.57.1682. *Ficus cotoneifolia* Vahl was treated as a synonym of *F. benghalensis* in Berg and Corner (2005) also Sudhakar (2014). But it is evident from the descriptions and the image that, *F. cotineifolia* is a having similar characters with *F. amplissima* than with *F. benghalensis.* The syntype of *F. cotoneifolia* in herbarium C (C10006713!) confirms similarity its similarity with *F. tsiela,* which is a synonym of *F. amplissima.* Hence, it is found that synonymizing *F. cotoneifolia* under *F. benghalensis* is wrong. So, *F. cotoneifolia* Vahl is not treated here as a synonym of *F. benghalensis.*

Ficus lancifolia Moench was mentioned as synonym, but observing the characters it is found that the taxa have peduncle. As *F. benghalensis* is a species with sessile syconium, *F. lancifolia* is not treated as a synonym of *F. benghalensis*. *Ficus umbrosa* Salisb., was identified as a synonym of *Kattallu,* mentioned in Hortus Malabaricus 3: p 73, t57. 1682, which is actually *F. drupacea* and not *F. benghalensis.*

The name *F. indica* was used to denote several species including, *F. tsiela* (*F. amplissima*), *F. drupacea* and *F. benghalensis.* Referring to the protologue of *F. indica,* as the presence of aerial roots are mentioned, it confirms that the name *F. indica* refers to the species *F. benghalensis.*

Specimens examined: India, **Andhra Pradesh,** Anantapur District, Jambugumpala R. F., 14 August 1982, *N. Yesoda 579* (MH); Thimmamma Marrimanu, 20 March 1988, *N. Rama Rao & M.K. Janarthanam s.n.* (MH). Chittoor District, Guntamadi Horsley Hill, 730 m, 12 November 2000, *G.V.S. Murthy 111931* (BSID); Talakona Sacred Groove, 626 m, 09 January 2016, *J. Swamy & S. Nagaraju 7478* (BSID). Cuddapah District, Bhumayyagari palli, 15 October 2009, *K. Raja Kullai Swamy, Rajasekhar & T. Pullaiah 37601* (BSID). Guntur District, Nagarjuna Konda Sacred Groove, 198 m, 13 October 2015, *J. Swamy & S. Nagaraju 7230* (BSID). Hablerud District, Farahabad, 01 March 2014, *L. Rasingam 4643* (BSID). Karimnagar District, Bhupatipur, 325 m, 22 July 1964, *G.V. Subba Rao 20175* (MH). Khammam District, Koriguttalu, 21 October 1995, *R. Rajan 106044* (BSID). Krishna District, Kondapalli Sacred Grove, 302 m, 09 October 2015, *J. Swamy & S. Nagaraju 7120* (BSID). Medak District, Medak, 23 November 1978, *Maesen L.J.G. Vander 3316* (L); Hamsapally extension, Rampur, 550 m, 16 May 1995, *R. Gopalan 104073* (BSID). Nandyal District, Mahanandi, 350 m, 23 August 1972, *J.L. Ellis 42344* (MH). Nellore District, 5 Km Rapur road, 09 January 2002, *P. Venu 113655*

(BSID); Penchala Kona, 183 m, 13 July 2016, *J. Swamy & S. Nagaraju 8162* (BSID); Narasimha Konda, 122 m, 17 July 2016, *J. Swamy & S. Nagaraju 7895* (BSID). Seoni District, Pincha, 315 m, 14 March 2016, *S. Nagaraju 8219* (BSID). Tirupati District, Kallamanaidu Peta, Satyavedu, 150 m, 08 October 1974, *M. Chandrabose 45262* (MH). Visakhapatnam District, Easter slope of the hill Simhachalam, 225 m, 06 May 1964, *G.V. Subba Rao 19365* (MH). **Gujarat,** Bhavnagar District, Bhavnagar Gogha circle, 13 May 1957, *S.K. Jain 17929* (BSI), Dwarka District, Barda, South of Ghumli, 29 October 1945, *H. Santapau 7841* (BLAT); Barda hills, 30 October 1945, *P.V. Bole Bole478* (BLAT). Kutch District, Nakhatrana, 31 January 1987, *S.K. Jain 11503* (BSI). Morbi District, Halvad, near lake, 26 July 1987, *A. Vaeavuda 22417* (BSI). Surat District, Majura, 16 June 1958, *P.S. Toor 39356* (BSI). Valsad District, Dhamani Forest, Dharmapur, 16 June 1958, *P.S. Toor 39274* (BSI). **Himachal Pradesh,** Kangra District, Negraoa, 10 March 1931, *W.N. Koelz 1713* (MICH); Bhadwar, 05 May 1933, *W.N. Koelz 4391* (MICH). **Karnataka**, Bangalore District, 18 March 1988, *N. Rama Rao & M. K. Janarthanam 85287* (MH). Belgaum District, Ukkad, *s.d.*, *S.D. Mahajan 29953* (BSI); Sutagatti, *s.d.*, *S.D. Mahajan 21505* (BSI). Chamarajanagar District, Bedaguli, 30 May 2014, *J. Jayanthi 195993* (BSI). Chikkamagaluru District, Lingalehalli, 13 October 1974, *R. Sundara Raghavan 132204* (BSI). Dakshina Kannada District, Mangalore, January 1847, *R.F. Hohenacker 501* (L). Gadag District, Mudagri, *s.d.*, *S.D. Mahajan 34383* (BSI). Hassan (Mysore) District, Sakleshpur (Saklaspur), 16 December 1903, *C.A. Barber 6225* (MH); *ibid.,* 19 December 1903, *C.A. Barber 6336* (MH); Bourdalboore forest, 14 January 1969, *C.J. Saldanha 12154* (JCB). Mysore District, Chamundi hills, 975 m, 12 March 1964, *K.M. Sebastine 18740* (MH). Bandipur District, 950 m, 24 August 1964, *B.D. Naithani 21162* (MH). Shimoga District, Tirthahalli, 15 March 1964, *R. Sundara Raghavan 96894*

(BSI). Uttara Kannada District, Gootybayal – Kadiri, 17 March 1983, T. Pullaiah 1243 (MH). **Kerala,** Alappuzha District, Chambakulam, Sea level, *C.N. Sunil 1525* (CALI). Idukki District, Alampetty, Chinnar, 780 m, 30 January 2021, *Sreehari S. Nair & K.H. Amitha Bachan 12112* (MESAH). Kannur District, Ezhimala, 15 m, 26 October 1982, *Nambiar & Sasidharan 2534* (KFRI); Kannoth, 150 m, 20 January 1979, *V.S. Ramachandran 58785* (MH); Kannavan, 150 m, 20 January 1979, *V.J. Nair 59701* (MH); Bagur R. F., 825 m, 22 June 1979, *V. S. Ramachandran 62723* (MH); Nilashwar, 150m, 09 October 1979, *R. Ansari 64832* (MH); Madayippara, near ITI, 18 June 2012, *C. Pramod 133568* (CALI). Kollam District, Vandalodu, Thenmalai Forest Road, 27 November 1961, *K.N. Subramanian 77167* (BSI). Malappuram District, University Campus, 21 August 1974, *V.V. Sivarajan 1804* (CALI); University Campus, 80 ft, 13 April 1976, *C.R. Suresh 12987* (CALI); *ibid.*, 06 July 1977, *Majeed 20710* (CALI); Nilambur, Mampad, 06 June 1983, *s.coll. 34122* (CALI). Thiruvananthapuram District, Agasthyamala, Bonacord, 700 m, 17 October 1987, *N. Mohanan 789* (CALI); Bonaccord, 700 m, 17 October 1989, *N. Mohanan 7807* (TBGT); M G College Campus, 29 December 1992, *Mathew Dan 13494* (TBGT); Agasthyamala, 700 m, 26 July 1994, *N. Mohanan & T. Shaju 16216* (TBGT); Karyavattom, 22 March 2018, *M.S. Vishnupriya 9428* (KUBH); Bonaccord, 700 m, N. Mohanan 16216 (TBGT); VSSC, Tumba, 20 m, *Teema Joseph 86947* (TBGT). Thrissur District, near Vadakkanchery, 50 m, 09 September 1976, *K. Ramamurthy 48432* (MH); Vazhachal, 400 m, 02 December 2008, *K.H. Amitha Bachan 117713* (CALI). **Madhya Pradesh**, Bastar District, Bank of river Indravathi, Jagdalpur, 633 m, 23 November 1958, *K. Subramanyam 7280* (MH). Hoshangabad District, Bori R. F., 550 m, 29 April 1961, *J. Joseph 12455* (MH). Indore District, Opposite Higher secondary school, Manpur, 22 December 1961, *A.S. Rao 79321* (BSI). Jabalpur District,

Road to Baghraji (Bagroji), 472 m, 15 March 1962, *K.M. Sebastine 13972* (MH). Khordha District, Hirapur, 430 m, 03 March 1960, *K. Subramanyam 10163* (MH). Mandla District, South Mandla, 10 February 1961, *J. Joseph 12265* (MH). Rewa District, beside the temple near the river Rewa town, 500 m, 11 February 1959, *K.M. Sebastine 7717* (MH). Satna District, Bairiha lake, 25 October 1962, *A.S. Rao 84210* (BSI). **Maharashtra,** Ahmednagar District, Supa, 06 April 1950, *J. Fernandez JF1197* (BLAT); *ibid.,* 06 April 1950, *J. Fernandez s.n*. (BLAT); Khandgaon, August 1985, *Rajendra Shinde 568* (BLAT). Akola District, Patur, 19 February 1978, *S.Y. Kamble 152622* (BSI). Amravathi District, Chikhaldara, Semadoh, 23 June 1977, *M.Y. Ansari 147104* (BSI). Bhandara District, Around Bhandara, 19 September 1976, *S.K. Malhotra 144603* (BSI). Burhanpur District, Turaumal, Khandesh, December 1918, *s.coll*., *27334* (BLAT). Jalna District, Chinchkheda, 15 May 1950, *J. Fernandez JF1498* (BLAT). Mumbai District, Elephanta Island, 23 May 1942, *H. Santapau 840* (BLAT); Madh Island, Andheri, 11 December 1955, *G.L. Shah Shah6555* (BLAT); Marve - Madh road, Malad, 31 December 1955, *G.L. Shah Shah6684* (BLAT); Madh Island, Andheri, 30 August 1957, *G.L. Shah Shah8983* (BLAT); Marve - Madh road, Malad, 26 October 1957, *G.L. Shah Shah9384* (BLAT); Marve - Madh road, Malad, 26 October 1957, *G.L. Shah Shah9381* (BLAT); near observation port U4, 23 January 1958, *S.C. Tavakari T570* (BLAT); Near the tank, opposite to out post, 27 January 1958, *S.C. Tavakari T628* (BLAT); Central dairy along Borvali road via U7, 13 April 1958, *S.C. Tavakari T1062* (BLAT); Central dairy to U25, U26, via U30, 22 April 1958, *S.C. Tavakari T1100A* (BLAT); Central dairy to U25, U26, via U31, 22 April 1958, *S.C. Tavakari T1100B* (BLAT): Uran, 03 October 1961, *P. Divakar PD 2713* (BLAT); Colaba , February 1917, *s.coll. 25620* (BLAT); Karandja, Colaba, January 1917, *s.coll. 25459* (BLAT); Walkeshwar, October 1916, *s.coll. 17078* (BLAT); Nashik

District: Ambewadi, 15 May 1957, *K.B.G 18272* (BSI); Kelzar, 09 December 1983, *P.L. Narasimhan 166262* (BSI); Palghar District: Mokhada, Vihigoon village, 18 October 1967, *K.V. Billore 111904A* (BSI). Panvel District, Shivansai, 16 August 1959, *N.Y. Das NYD 238* (BLAT). Pune District, Jumagadh, foot of Junnar, 24 October 1959, *H. Santapau 13731* (BLAT); Katewadi, Naveghat, 13 June 1967, *K.V. Billore 110916* (BSI); Koregaon park, 556 m, 24 August 2022, *Sreehari S. Nair 12213* (MESAH). Satara District, Khandala, Behrau's plateau, 14 June 1943, *H. Santapau 2209* (BLAT). Thane District, Kelwa temple, Palghan range, 13 January 1968, *K.V. Billore 113506* (BSI); Dharkhind, 08 October 1989, *A.N. Londhe 170325* (BSI). Yavatmal District, Mandar, 09 July 1961, *N.Y. Das NYD3334* (BLAT). **Odisha,** Angul District, Naleshwar, Tikarpada, 98 m, 07 May 2016, *K.C. Mohan & Swamy 7648* (BSID). **Rajasthan,** Sirohi District, Mount Abu, 26 April 1916, *s.coll. 25418* (BLAT); Mount Abu, 16 July 1951, *G.S. Puri 56643* (BSI); *ibid.,* May1916, *s.coll. 25422* (BLAT); Mount Abu, Rajaputra, October 1916, *s.coll. 25425* (BLAT). **Tamil Nadu,** Coimbatore District, Bolo oddu, 4000 ft, 15 August 1929, *V. Narayana Swami 78358* (MH); Antharagange hills (Authraganga halla), 3000 ft, 10 February 1930, *V. Narayana Swami 79013* (MH); Chikkally, 2500 m, 07 March 1931, *K.C. Jacob 116* (MH); Slopes of Maruthipparai, on the way to Karuppanayankiri hills, 25 May 1963, *C.P. Sreemadhavan CPS651* (MH); Agriculture College farm, 468 m, 07 November 1965, *M. Chandrabose 28803* (MH); Orchard, Agriculture College farm, 468 m, 07 November 1965, *M. Chandrabose 29053* (MH). Cuddalore (S. Arcot) District, Way to Parangipettai (Pasangipettai), 5 m, 30 July 1978, *K. Ramamurthy 58152* (MH). Dharmapuri District, Pennagaram, 500 m, 28 July 1964, *E. Vajravelu 20776* (MH); Theerthamalai R. F., 400 m, 13 November 1977, *E. Vajravelu 51826* (MH); Adiamankotta, T. B. area, 650 m, 16 July 1978, *E. Vajravelu 57833* (MH);

Koothadipatti (Kuthadipatti), 650 m, 30 July 1978, *E. Vajravelu 58021* (MH); Theerthamalai R. F., 400 m, *E. Vajravelu 51826* (MH). Dindugal District, Way to Sirumalai, 933 m, 26 April 1958, *K. Subramanyam 5798* (MH). Erode District, Near Varapalayam, 633 m, 23 February 1957, *K. Subramanyam 2443* (MH); Thamaraikari, 1000 m, 11 March 2008, *P. Satyanarayana 125553* (MH); Satyamangalam Forest Division, Gumdri, Koilur beak, 900 m, 21 March 2009, *P. Satyanarayana 122504* (MH). Kallakurichi District, Gomukanadhi, MHEP areas, Kalvarayan Hills (Kalrayans), 210 m, 27 June 1986, *V. Lakshamanan 77587* (MH). Kanyakumari District, Way to Sengamali Estate, 200 m, 27 July 1966, *B.V. Shetty 27994* (MH); Way to Ulakki aruir, Alagiapandiapuram, 300 m, 30 July 1977, *A.N. Henry 49470* (MH); way to Sengamal estate, 200 m, 27 July 1966, *B.V. Shetty 27994* (MH). Madras District, way to Sirumalai, 933 m, 26 April 1958, *K. Subramanyan 5798* (MH). Madurai District, Guindy Deer Park R. F., 05 October 1974, *A.N. Henry 45619* (MH). Nilgiri District, Bokkapuram R. F., 1100 m, 13 August 1970, *B.D. Sharma 35448* (MH); Kunjapanai R. F., 975 m, 12 May 1971, *E. Vajravelu 38374* (MH); Forest near valve house, 600 m, 28 July 1975, *E. Vajravelu 46333* (MH); Bokkapuram temple, 10 March 1991, *E. Vajravelu 96116* (MH); Mudumalai W. L. S., Moyar, 950 m, 12 March 1991, *E. Vajravelu 96168* (MH). Ramanathapuram District, Nagachi, 1300 m, 04 May 1987, *V. Balasubramaniam s.n.* (MH); Krusadai Island, 22 January 1994, *Dr. P. Daniel 100582* (MH). Salem District, Ghat road, Yercaud, 980 m, 16 February 1969, *D.B. Deb 31459* (MH). Sivaganga District, Sankarapathy kottai, Karaikudi (Karaikkudi), 100 m, 30 November 1977, *N.C. Nair 52961* (MH); Kallingalprakkaadu, Pudupatti (Puduppatti), 250 m, 21 February 1979, *N. C. Nair 61053* (MH); Selugai, 40 m, 11 January 1989, *V. Balasubramaniam 1973* (MH). Thanjavur District, Pudupatti (Puduppatti), 210 m, 19 July 1965, *E.*

Vajravelu 24807 (MH); Mangani Pillayar thope, Sea level, 12 August 1960, *K.M. Sebastine 10687* (MH); Paramki Vettikadu, 100 m, 19 May 1978, *V.J. Nair 56525* (MH). Tiruvallur District, Subba Reddy Palayam, near Minjur, 3 m, 11 May 1984, *D. Narasimhan 508* (MH); Thiruvannamalai (N. Arcot) Near Jamunamarathur (Jamnamuthur), 733 m, 16 July 1958, *K. Subramanyam 6112* (MH). Tiruchirappalli District, Sambari, Near Vairichettipalayam, 233 m, 12 August 1958, *K.M. Sebastine 6286* (MH). Vellore District, Kottaiyur R. F., Yelaegiri Hills, 925 m, 08 December 1984, *M.B. Viswanathan 602* (MH). Villupuram District, Near Sankaraparani river, 75 m, 21 February 1979, *K. Ramamurthy 60359* (MH); Auroville, 1.53 m, 09 February 1988, *R. Rajan 86400* (MH). Virudhunagar District, Virudhunagar, 08 June 1954, *D. Meenakshi Sundaram 22040* (MH); Kumaraswamy Koil, Rajapalayam, 300 m, 27 September 1971, *E. Vajravelu 38768* (MH). **Telangana**, Adilabad District, Near Palsi, 07 July 1987, *T. Ravi Shankar 85265* (BSID & MH). Mahabubnagar District, Vattavarlapalli, 800 m, 26 June 1987, *V.B. Hosagoudar 84961* (BSID); Mannanur forest Rest House, 575 m, 08 February 1998, *S.R. Srinivasan 109111* (BSID); Environmental Education Centre at Mannanur, 600 m, 11 February 1998, *S.R. Srinivasan 109741* (BSID). Medak District, Way to Madikonakutta, Naraspur, 713 m, 25 September 1958, *K.M. Sebastine 6726* (MH); Gangapur to Chownapur, 550 m, 25 January 1978, *R. Gopalan 106742* (BSID). **Uttarakhand,** Chamoli District, Urgam, 28 February 1961, *N.Y. Das NYD3160* (BLAT); *ibid*., 28 February 1961, *N.Y. Das NYD 3161* (BLAT); *s.loc*, 11 January 1978, *A. Mohan 11294* (L); *s.loc.*, 15 January 1949, *Joseph Fernandes 29* (P); *s.loc.*, July 1886, *J. S. Gamble 17576* (MH); *s.loc., s. d., R. Wight 2727* (L); *s.loc., s.d., R. Wight 33* (L).

3.6.8. *Ficus benjamina* L.

Ficus benjamina L., Mant. Pl. 129. 1767; Vahl., Enum. Pl. 2: 187. 1805; Roxb., Fl. Ind. 3: 550. 1832; Miq., Ann. Mus. Bot. Lugd.-Bat. 3. 267. 1867; Kurz., For. Fl. Brit. Burma 446. 1877; King, Ann. Roy. Bot. Gard. (Calcutta) 1: 43. 1887; Hook.f., Fl. Brit. India 5: 508. 1888; J. Cameron, For. Trees of Mysore and Coorg 278. 1894; Talbot, Trees Bombay 2: 327. 1902; D. Prain, Bengal Plants 2: 979. 1903; Bourd., For. Trees Travancore 361. 1908; Rama Rao, Fl. Pl. Travancore 380. 1914; Brandis, Indian Trees 604. 1921; H.N. Ridley, Fl. Malay Peninsula 3: 336. 1924; Fl. South Ind. Hill Stations, P.F. Fyson 1: 542. 1932; U.N. Kanjilal *et al.,* Fl. Assam 4: 243. 1940; Corner, Gard. Bull. Singapore 21: 21. 1965; Corner in Dass. & Forsb., Rev. Handb. Fl. Ceylon 3: 256. 1981; N.P. Balakrishnan, Fl. Jowai 2: 437. 1983; B.D. Sharma *et al.,* Fl. Karnataka: analysis 259. 1984; K.K.N. Nair & M. P. Nayar, Fl. Courtallum 1: 40. 1986; V. Chithra in A.N. Henry *et al.,* Fl. Tamil Nadu Ind., Ser I: Analysis 2: 252. 1987; K.M. Matthew, Excur. Fl. Central Tamil Nadu 483. 1991; T. Pullaiah & D.A. Moulali, Fl. Andhra Pradesh 2: 898. 1997; P.K. Bhattacharyya & K. Sarkar, Fl. West Champaran, Bihar 64. 1998; K.M. Matthew, Fl. Palni Hills 1179. 1999; S. K. Murthi & Panigrahi, Fl. Bilaspur Dist. 2: 566. 1999; N.P. Singh *et al.,* Fl. Maharashtra Dicot 2: 934. 2001; T.K. Sarma & A.K. Sarkar, Fl. Palamau Dist. Jharkhand 574. 2002; K.G. Bhat, Fl. Udupi. 593. 2003; Wu *et al.,* Fl. China 5: 45. 2003; Sasidh. & Sivar., Bio. Docu. Kerala part 6: Flow. Plant. 438. 2004; Berg & Corner in Nooteboom, Fl. Malesiana 17(2): 631. 2005; K.M. Chetty *et al.,* Fl. Pl. Chittoor Dist. 332. 2008; Berg *et al.,* Fl. Thailand 10(4): 605. 2011; Chaudhary *et al.,* Taiwania, 57(2): 210. 2012; Sudhakar *et al.,* Figs of Eastern Ghats, India 40. 2017; P. Lakshmin. *et al.,* Fl. West Bengal 646.

2019; S.J. Britto, Fl. Central and North Tamil Nadu 970. 2019; G.P. Sinha & A.N. Shukla, Fl. Uttar Pradesh 2: 473. 2020; S.S. Dash & A.A. Mao, Fl. Pl. India, 2: 538. 2020; R. Gogoi *et al.,* Fl. Sikkim 281. 2021. *Ficus parvifolia* Oken, Allg. Naturgesch. 3 (3): 1562. 1841. *Urostigma benjaminum* Miq., London J. Bot. 6: 583. 1847. **Type:** Itty aalu in van Rheede, Hort. Malab. 1: t.45, p.26. 1678.

Ficus nitida Thunb., Diss. Fic. 10. 1786. *Urostigma nitidum* (Thunb.) Miq., London J. Bot. 6: 582. 1847. *Ficus retusa* var. *nitida* (Thunb.) Miq. in Ann. Mus. Bot. Lugd.-Bat. 3: 267, 288. 1867. **Type:** Habitat in India.

Ficus comosa Roxb., Pl. Corom. 2: 14. t. 125. 1799. *Ficus benjamina* subsp. *comosa* (Roxb.) Panigrahi & Murti., Fl. Bilaspur Dist. 2: 566. 1999. **Type:** India, Roxburgh Icon No. 689-963.

Ficus haematocarpa Blume ex Decne., Nouv. Ann. Mus. Par. 3: 494. 1834. *Urostigma haematocarpum* Miq., London J. Bot. 6: 584. 1847. *Ficus benjamina* var. *haematocarpa* (Blume ex Decne.) Miq., Ann. Mus. Bot. Lugd.-Bat. 3: 288. 1867. **Type:** Indonesia, Timor, *s.d., A. Riedle s.n.* (Holotype- P, P06879557!; Isotype- E, E00301006!).

Ficus neglecta Decne., Nouv. Ann. Mus. Par. 3: 494. 1834. *Urostigma neglectum* Miq., Fl. Ned. Ind. 1(2): 347. 1859. **Type:** Indonesia, Timor, *s.d., s.coll. s.n.* (Holotype- P, P00230100!).

Urostigma nudum Miq., London J. Bot. 6: 584. 1847. *Urostigma benjaminum* var. *nudum* Miq., Pl. Jungh. 1: 50. 1851. *Ficus nuda* (Miq.) Miq., Ann. Mus. Bot. Lugd. Bat. 3: 288. 1867. *Ficus benjamina* var. *nuda* (Miq.) M.F. Barrett, Amer. Midl. Naturalist 45: 128. 1951; V. Chithra in A.N. Henry *et al.,* Fl. Tamil Nadu Ind., Ser I: Analysis 2: 252. 1987; V. Mudgal *et al.,* Fl. Madhya Pradesh 2: 613. 1997; Singh *et al.,* Fl. Mizoram 572. 2002;

Subba Rao & Kumari, Fl. Visakhapatnam Dist. 2: 216 2008. **Type:** Philippines, *s.loc., s.d., H. Cuming 1932* (Isotype- E, E00288951!)

Ficus umbrina Elmer., Leafl. Philipp. Bot. 1: 49. 1906. **Type:** Not seen.

Ficus xavieri Merr., Philipp. Journ. Sci. 20: 369. 1922. **Type:** Philippines, Laguna Province, Luzon, 1921, *F. Salvosa 28480* (Type-K, K001050699!).

Ficus benjamina var. *bracteata* Corner., Gard. Bull. Singapore 17: 396. 1960. **Type:** Papua New Guinea, Kokoda, 10.04.86, *C. E. Carr 16359* (Holotype- BM, BM001053868!).

Ficus benjaminoides Mason, Nat. Prod. Burmah: 88. 1850. **Type:** Burma, Tenasserim, 1877, *G. Gallatly 981* (Neotype- K, K000815980!, Isoneotype- BM, BM000949869!).

Fig. 3.22 – 3.24

Tree up to 10 m height, hemi-epiphytic and later becoming independent, aerial roots present; bark lenticellate, pale brown; young twigs terete, core solid, pale brown, smooth, glabrous; inter node 0.7–2.1 cm long; latex milky, white. Stipule caducous, lance-ovate, 0.6–1.7 x 0.1–0.2 cm, margins entire, apex narrowly acute, base truncate, glabrous, pale green. Petiole articulated, terete, canaliculate, 0.8–1.4 cm long, glabrous, pale green. Leaves simple, alternate, spiral; lamina symmetric, lance-ovate to ovate, 3.8–7.6 x 2.8–4.1 cm, margins undulate, acumen 0.4–0.9 cm long, apex acuminate, base obtuse, glabrous, pale green when young, dark green on maturity, subcoriaceous, venation brochidodromous; basal veins 3–4, lateral veins numerous, wax gland at the base of the midrib. Receptacles axillary, paired, monoecious, sessile; basal bracts present, not prominent, 2–3, free, 1.5–2.0 mm long, widely ovate, glabrous, yellow. Syconium 0.7–1.7 cm across, globose, glabrous,

pale green when young, yellow to orange or red when mature. Ostiole 1.4–1.7 mm wide; outer bracts present, free, ovate, 1.5–2.0 mm long, glabrous, pale yellow; inner bracts present, free, lanceolate, 1.2 mm long, glabrous, yellow to pale brown. Male flowers near ostiole, 2.2 mm long pedicellate; pedicel 0.5mm long; tepals 3-4, free, 1.5 mm long, lanceolate, glabrous, white to yellow; stamen 1, anther 0.4 mm, filament 0.6 mm long. Female flowers near the base, 2.0 mm long, sessile; tepal 3, free, 2.0 mm long, lanceolate, glabrous, pale brown; stigma bifid; style 0.7 mm long; ovary 1.25 mm long, obovoid, glabrous, pale brown. Gall flowers scattered, 1.3 mm long, sessile; tepals 3, free, 1.2 mm long, lanceolate, glabrous, pale brown; stigma short; style 0.5 mm long; ovary 0.8 mm long, obovoid, glabrous, yellow. Achenes 0.9–1.5 mm, ovoid, pale yellow.

Local names: *Itthi, Velaal* (Mal.); *Malai- ichchi, Malayathi* (Tam.); *Pukar, Kabra* (Hin.)

Common names: Benjamin fig, Java fig, Java tree, Malayan fig, Weeping fig, Oval leaved fig tree.

Flowering and fruiting: December to April.

Distribution: Native to India, Assam, Bangladesh and China. Introduced to other parts of the world as an avenue tree.

Habitat: Found in the plains, usually planted. One among the widest spread species of *Ficus*.

IUCN status: Least Concern (LC).

Etymology: The species is supposed to be named in honour of Benjamin Franklin.

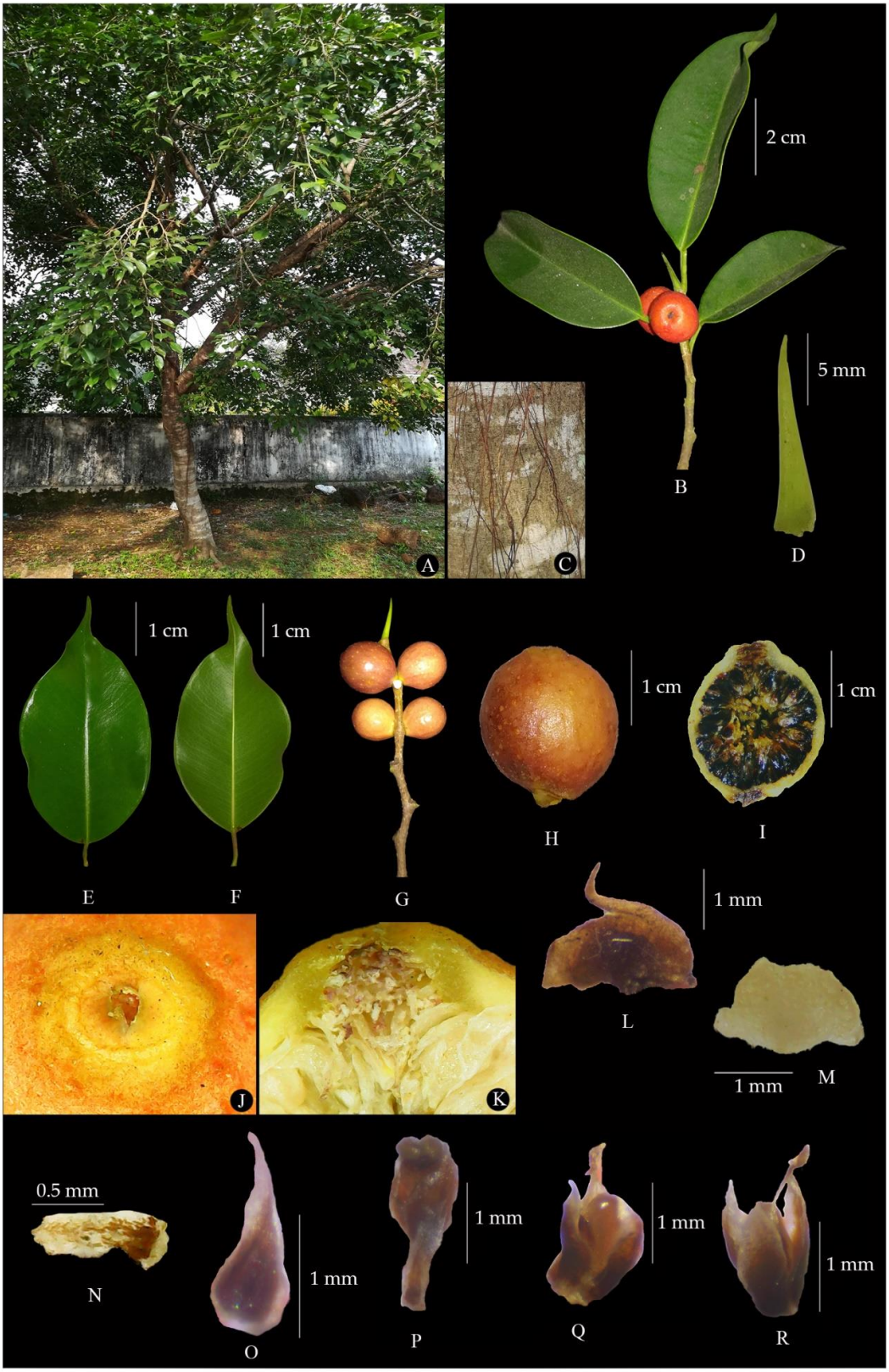


Fig. 3.22. ***Ficus benjamina*** L.: **A.** Habit; **B.** Twig; **C.** Bark; **D.** Stipule; **E.** Leaf adaxial side; **F.** Leaf abaxial side; **G.** Receptacles; **H.** Syconium; **I.** Syconium L. S.; **J.** Ostiole; **K.** Ostiolar L. S.; **L.** Basal bract; **M.** Outer ostiolar bract; **N.** Inner ostiolar bract; **O.** Tepal; **P.** Male flower; **Q.** Female flower; **R.** Gall flower.

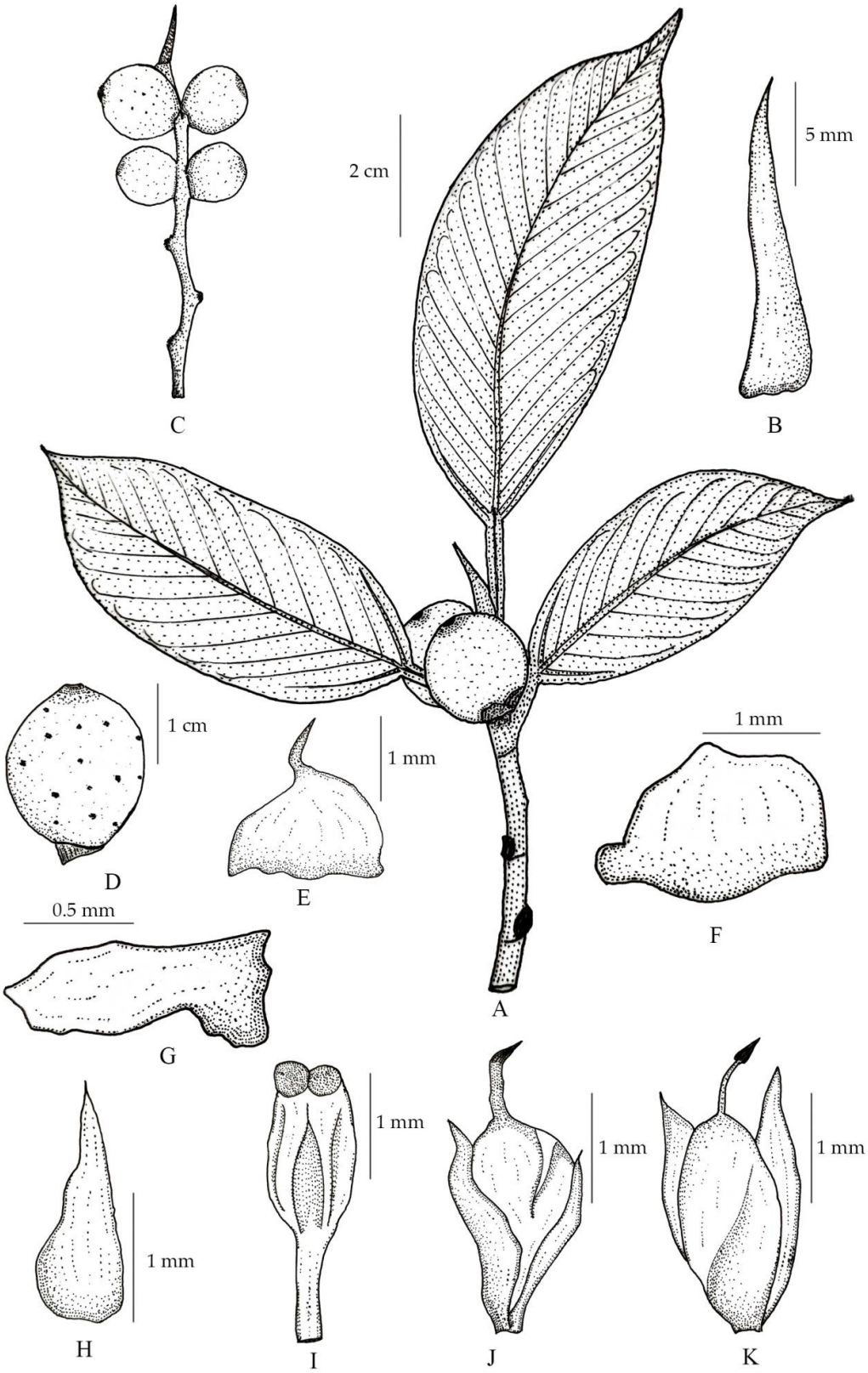


Fig. 3.23. ***Ficus benjamina*** L.: **A.** Twig; **B.** Stipule; **C.** Receptacles; **D.** Syconium; **E.** Basal bract; **F.** Outer ostiolar bract; **G.** Inner ostiolar bract; **H.** Tepal; **I.** Male flower; **J.** Female flower; **K.** Gall flower.

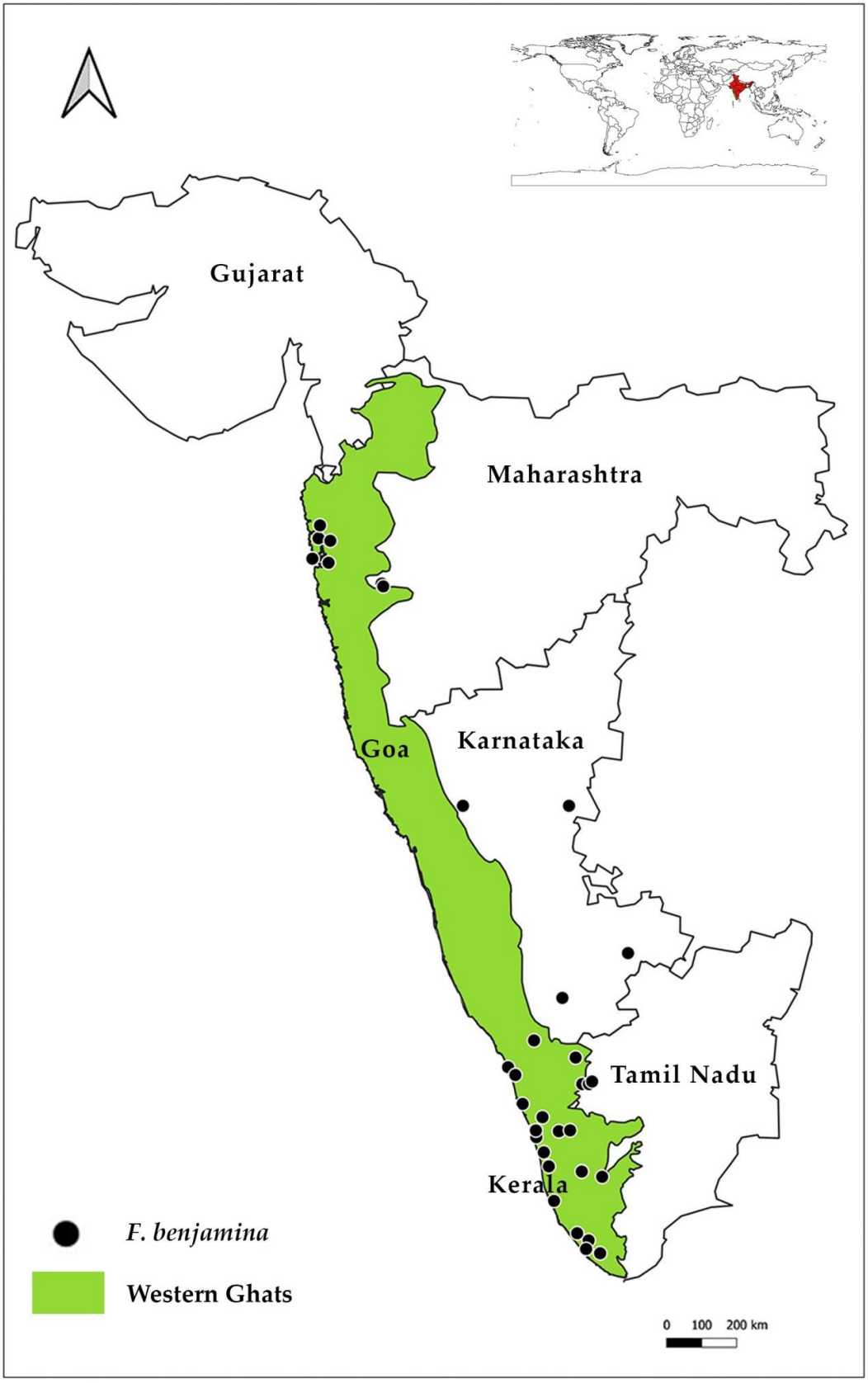


Fig. 3.24. *Ficus benjamina* L. - Distribution map.

Uses: commonly planted as an avenue tree and shade tree in parks, gardens and road side. A common plant in the gardens suitable for making topiaries. The wood is found to be more durable than other figs trees (Cameron, 1894). Figs are eaten by birds. And latex is supposed to have medicinal properties. The leaves are used for the treatment of ulcers (Tiwari, 2016).

Notes: The plant is believed to be native to India, but it is found commonly as cultivated or planted, rarely found in the forests as wild. It is a highly variable species with a number of subspecies and varieties proposed including, *Ficus benjamina* subsp. *comosa* and *Ficus benjamina* var. *nuda*. Being variable in characters like size and shape of the leaves and figs, currently the subspecies and varieties are merged under the taxon *Ficus benjamina.* Tiwari (2016), reported pseudo hermaphrodite flowers for the first time in the species. But pseudo hermaphrodite flowers were not observed in the present study. Usually, the size of the figs comes around a range of 1 cm only. The collection from University of Calicut campus (*Sreehari S. Nair 12926* MESAH) measured up to 1.7 cm across.

Specimens examined: India, **Andaman and Nicobar Islands**, South Andaman District, Namunaghar, South Andamans, 50 m, 15 June 1973, *N.P. Balakrishnan 251* (PBL); Near Chouldari, South Andamans, 50 m, 31 January 1974, *N.G. Nair 824* (PBL); Viper Island, South Andamans, 50 m, 21 March 1974, *N.P. Balakrishnan 989* (PBL); Kakana, Car Nicobar, 10 June 1974, *N.G. Nair 1603* (PBL); Viper Island, South Andamans, 29 July 1978, *P. Basu 6688* (BSID); Wandur, 03 January 2004, *K. Karthigeyan 19688* (PBL); Rutland, Bada Khadi, 26 February 2004, *K. Karthigeyan 21394* (PBL); Port Blair, 15 m, 12 January 1959, *K. Thothathri 9033* (MH). **Andhra Pradesh,** Chittoor District, Shesha theertham Road, 528 m, 15 April 2014, *P.V. Prasanna & M. Sankara Rao 4453* (BSID). East Godavari District, Maredu milli, 500 m, 21 May 1966,

G.V. Subba Rao 27297 (MH); Bhojeripakala, 500 m, 21 February 1994, *M. Mohanan 101313* (BSID); Bhojaripakala, 500 m, 21 February 1994, *M. Mohanan 101313* (MH). Visakhapatnam District, Ananlagiri, 910, 12 May 1964, *G.V. Subba Rao 19534* (MH); Kilagada, 900 m, 09 March 1965, *G.V. Subba Rao 22584* (MH); Towards Birmiralla. Minumuluru, 1150 m, 13 April 1976, *G.V. Subba Rao 47323* (MH). **Karnataka,** Bangalore District, High School playground, 09 July 1979, *C.J. Saldanha & K.P. Sreenath 8254* (JCB); *s.loc., s.d., R.D.A B159* (MH). **Kerala,** Kottayam District, Vaikom, 3 m, 12 November 2020, *Sreehari S. Nair 12928* (MESAH). Malappuram District, Calicut University Campus, 50 m, 12 February 1989, *P. Elsie Ouseph 51416* (CALI); Calicut University Botanical Garden, 50 m, 12 December 1992, *T.K. Dominic 45628* (CALI); Calicut University campus, 50 m, 08 November 2019, *Sreehari S. Nair 12926* (MESAH). Thiruvananthapuram District, VSSC, Tumba, 07 January 2016, *Teema Joseph 87038* (TBGT); Kanakakkunnu, 02 July 2017 *Akhilesh S.V. Nair 9324* (KUBH). Thrissur District, Sholayar, 700 m, 18 November 2008, *K.H. Amitha Bachan 117738* (CALI); Kannankuzhythodu, 80 m, 22 August 2009, *E.D. Jisy 117641* (CALI); *ibid.,* 80 m, 22 August 2009, *E.D. Jisy 117640* (CALI). **Maharashtra,** Mumbai District, Mahalakshmi, Bombay, 06 September 1956, *R.R. Fernandez R2762* (BLAT); Mahatma Gandhi Road, Bombay, 19 October 1956, *R.R. Fernandez R3106* (BLAT); *ibid.,* 19 October 1956, *R.R. Fernandez R3104A* (BLAT); Mahalakshmi, Bombay, 04 September 1957, *R.R. Fernandez R4310* (BLAT); *ibid.*, 04 September 1957, *R.R. Fernandez R4312* (BLAT); Mahatma Gandhi Road, Bombay, 19 October 1957, *R.R. Fernandez R3105* (BLAT); Mahalakshmi, Bombay, 04 September 1958, *R.R. Fernandez R4265* (BLAT); Victoria Garden, Bombay, March 1917, *s.coll. 15277* (BLAT). Pune District, Empress Garden, 10 May 2011, *S.C. Yadav 200668* (BSI). **Tamil Nadu,**

Viluppuram District, Auroville, 1.53 m, 13 November 1988, *R. Rajan 87714* (MH). **West Bengal**, Howrah District, Sibpur, May 1918, *s.coll. 7936* (BLAT).

3.6.9. *Ficus binnendijkii* (Miq.) Miq.

Ficus binnendijkii (Miq.) Miq., Ann. Mus. Bot. Lugduno – Batavi. 3: 288. 1867; King, Ann. Roy. Bot. Gard. (Calcutta) 1: 41. 1888; H.N. Ridley, Fl. Malay Peninsula 336. 1924; Corner, Gard. Bull. Singapore 17: 395. 1960; Corner, Gard. Bull. Singapore 21: 20. 1965; Berg & Corner in Nooteboom, Fl. Malesiana 17(2): 633. 2005; Berg *et al.,* Fl. Thailand 10(4): 608. 2011; Sudhakar *et al.,* Figs of Eastern Ghats, India 106. 2017. *Urostigma binnendijkii* Miq., Fl. Ned. Ind. 1(2): 341. 1859. **Type:** Indonesia, Java, *s.d., s.coll. 52046 A* (Holotype- L, U 0116554!).

Fig. 3.25 – 3.27

Tree up to 10 m height, independent, aerial roots present; bark lenticellate, brown; young twigs terete, core solid, smooth, glabrous, pale green; inter node 0.7–1.6 cm long; latex milky, white. Stipule caducous, lanceolate, 0.9–1.6 x 0.2–0.3 cm, margins entire, apex acute, base truncate, glabrous, pale green. Petiole articulated, terete, canaliculate, 0.7–1.5 cm long, glabrous, pale green. Leaves simple, alternate, spiral; lamina symmetric, lanceolate, 9.5–13.8 x 1.8–3.1 cm, margins entire, flat, acumen 0.6–1.2 cm long, apex acuminate, base cuneate, glabrous, pale green when young, dark green on maturity, subcoriaceous, venation brochidodromous; basal veins 3–4, lateral veins 12–16 pairs, waxy gland at the base of the midrib. Receptacles axillary, paired, monoecious, sessile; basal bracts present, persistent, 3, free, 2.0 mm long, widely ovate, glabrous, green. Syconium 0.6–0.9 cm across, obovoid, glabrous, pale green when young, yellow when mature. Ostiole 1.0 mm wide; outer bracts present, free, ovate, 1.0–1.5 mm long, glabrous, pale yellow;

inner bracts present, free, lanceolate, 1.0 mm long, glabrous, white. Male flowers around ostiole, 2.0 mm long, pedicellate; pedicel 0.8 mm long; tepals 3-4, free, 2.0 mm long, lanceolate, glabrous, white; stamen 1, anther 1.0 mm, filament 0.2 mm long. Female flowers scattered, 1.5 mm long, sessile; tepal 4, free, 2.0 mm long, lanceolate, glabrous, white; stigma 0.2; style 0.3 mm long; ovary 1.0 mm long, obovoid, glabrous, white. Gall flowers scattered, 1.8 mm long, sessile; tepals 4, free, 1.5 mm long, lanceolate, glabrous, white; stigma 0.3 mm; style 0.5 mm long; ovary 1.0 mm long, obovoid, glabrous, white. Achenes 1.0 mm, obovoid, pale yellow.

Local names: Nil.

Common names: Narrow leaved fig, long leaved fig, Binnendijk's fig.

Flowering and fruiting: March to April.

Distribution: Native to Malesia.

Habitat: In natural habitats, the plant is found in forests at altitudes up to 1000 m. In the present study the plant is commonly found in low altitude areas, also as planted tree.

IUCN status: Not Evaluated (NE).

Etymology: Named in honour of the former curator of Bogor Botanical Garden Java, S. Binnendijk.

Uses: It is an ornamental plant usually planted in avenues and parks.

Notes: The species is often confused with another similar taxa *Ficus maclellandii* King. The major differentiating characters between the two taxa are provided in table 3.4.

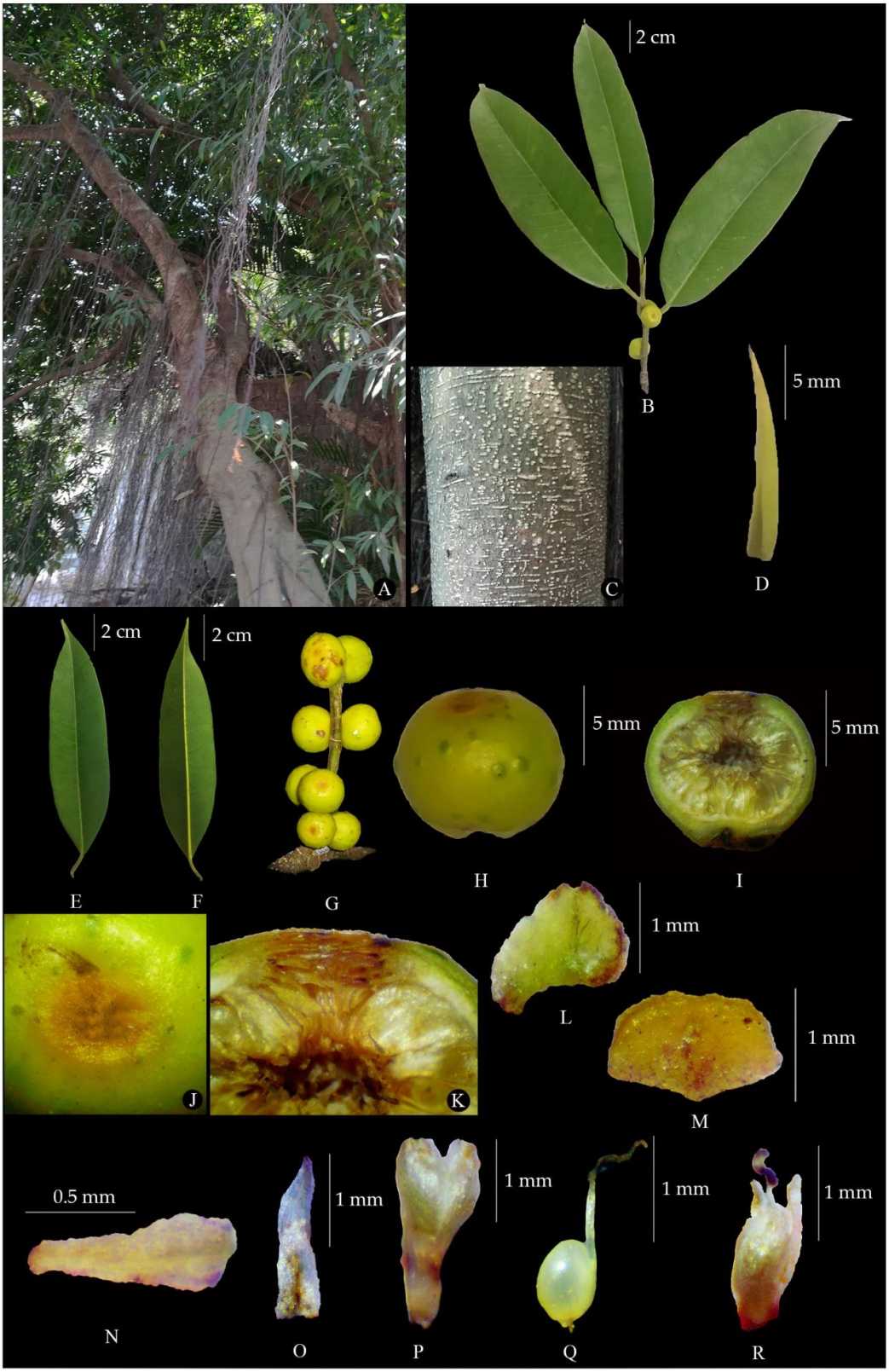


Fig. 3.25. ***Ficus binnendijkii*** (Miq.) Miq.: **A.** Habit; **B.** Twig; **C.** Bark; **D.** Stipule; **E.** Leaf adaxial side; **F.** Leaf abaxial side; **G.** Receptacles; **H.** Syconium; **I.** Syconium L. S.; **J.** Ostiole; **K.** Ostiolar L. S.; **L.** Basal bract; **M.** Outer ostiolar bract; **N.** Inner ostiolar bract; **O.** Tepal; **P.** Male flower; **Q.** Female flower; **R.** Gall flower.

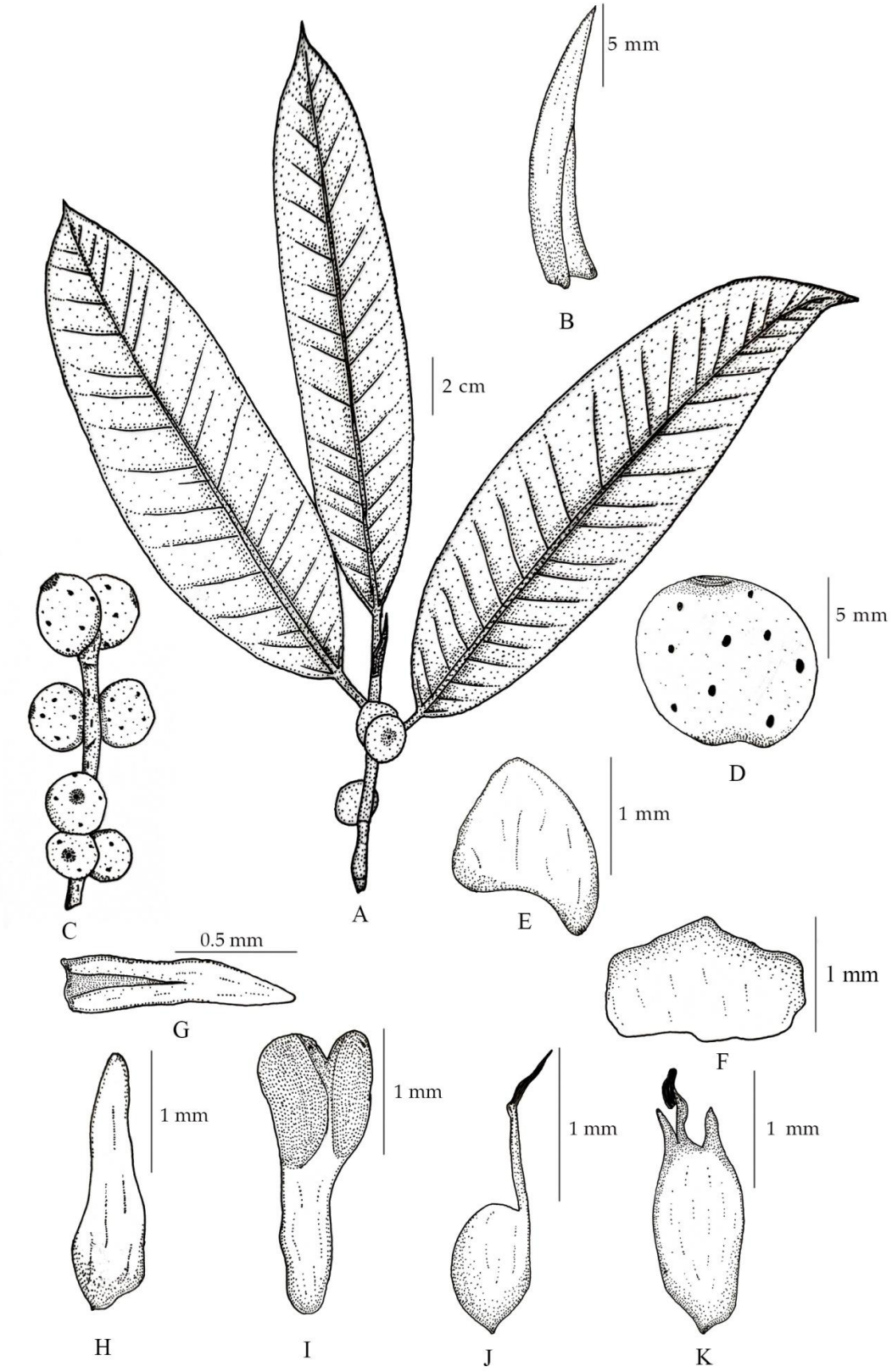


Fig. 3.26. ***Ficus binnendijkii*** (Miq.) Miq.: **A.** Twig; **B.** Stipule; **C.** Receptacles; **D.** Syconium; **E.** Basal bract; **F.** Outer ostiolar bract; **G.** Inner ostiolar bract; **H.** Tepal; **I.** Male flower; **J.** Female flower; **K.** Gall flower.

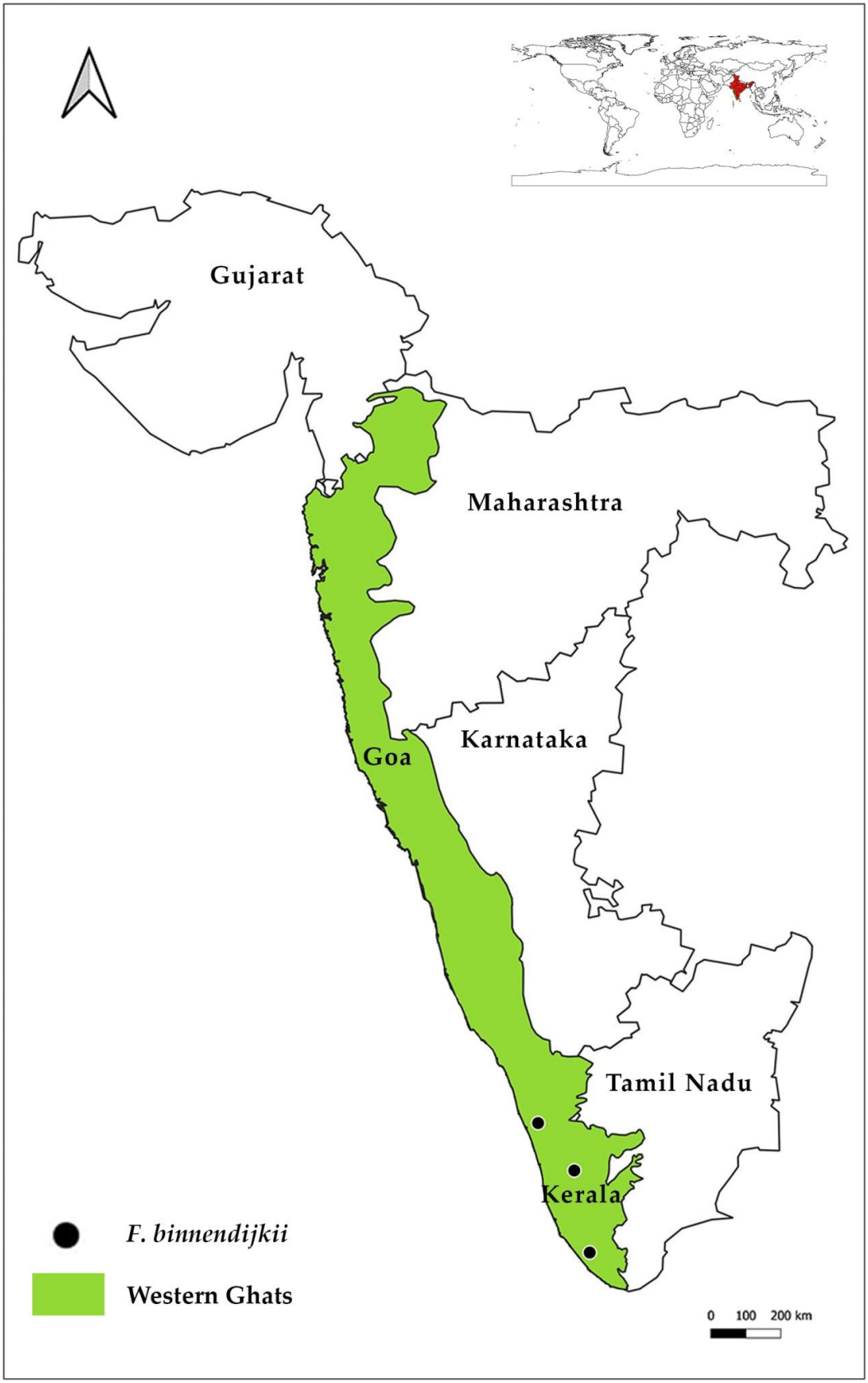


Fig. 3.27. *Ficus binnendijkii* (Miq.) Miq. - Distribution map.

Table 3.4. Differential characters of *F. binnendijkii* and *F. maclellandii.*

Character	*F. binnendijkii*	*F. maclellandii*
Height of the tree	Up to 10 m Tall	Up to 25 m tall
Nature of periderm	Persistent or flaking off	Persistent
Leaf apex	Acuminate	Acuminate to subcaudate
Leaf base	Cuneate to obtuse to rounded	Cuneate to rounded
Leaf margin	Flat or slightly revolute towards the base	Flat
Lateral veins	Prominent beneath and above, clearly visible	Slightly prominent beneath
Petiole	0.5–2.0 cm long, drying blackish to brown	0.5–2.5 cm long, drying blackish
Stipules	1–2 cm long, glabrous, caducous	0.5–1 cm long, yellowish, sub sericeous, caducous.
Basal bracts	Glabrous	Appressed-puberulous or glabrous
Receptacle	Glabrous, whitish to pinkish at maturity, apex convex to slightly concave	Sub glabrous, yellow to red at maturity, apex convex to flat

Specimens examined: India, **Kerala,** Ernakulam District, St. Theresa's College campus, 29 November 2019, *Sreehari S. Nair 12933* (MESAH). Thrissur District, Muakunnathukavu, 3 m, 29 March 2021, *Sreehari S. Nair 12148* (MESAH). **Indonesia**, Sumatra, N. Sumatra, Bt. Lawang, Bohorok, Langkat, 19 February 1973, *J. Dransfield 3238* (L); Java, Buitenzorg, Tjiletoeh, 02 December 1930, *Bakhuizen van den Brink 7658* (L); *ibid.*, 03 August 1931,

Bakhuizen van den Brink 7826 (L); *s.loc.,* 20 October 1960, *Rastini 253* (L); Culta, *s.d., Hort Bot Bogoriensis 52046A* (L); Batavia, 05 February 1929, *Bakhuizen van den Brink 7159* (L); *ibid.,* 23 June 1933, *Bakhuizen van den Brink 7956* (L); Goenoeng, *s.d., Reinwardt, CGC 52116A* (L). **Malaysia,** Borneo; Hill east of Pamerario river, 15 April 1970, *Nooteboom, HP & Chai PPK2107* (L); Borneo, 21st mile, Lambir - Subis road, 08 April 1976, *Tong 36578* (L); *s.loc.,* 26 April 1996, *E. Gardette, Ramlee, Angga, Jian, Gahri, Makmat Atan & Djalel 1747* (L).

3.6.10. *Ficus callosa* Willd.

Ficus callosa Willd., Mem. Acad. Berl. 102. 1978; Vahl, Enum. Pl. 2: 188. 1805; Miq., Ann. Mus. Bot. Lugd.-Bat. 3: 295. 1867; Kurz, For. Fl. Burma. 2: 454. 1877; King in Hook.f., Fl. Brit. India 5: 516. 1888; King, Ann. Roy. Bot. Gard. (Calcutta) 1: 64. 1887; H. Trimen, Handb. Fl. Ceylon 4: 93. 1898; Talbot, Trees Bombay 2: 330. 1902; T. Cooke, Fl. Pres. Bombay. 2: 651. 1908; Bourd., For. Trees Travancore. 366. 1908; Rama Rao, Fl. Pl. Travancore. 381. 1914; Brandis, Indian Trees. 601. 1921; C.E.C. Fisch. in Gamble, Fl. Madras. 1364. 1928; Corner, Gard. Bull. Singapore. 21: 29. 1965; Corner in Dass. & Forsb., Rev. Handb. Fl. Ceylon 3: 263. 1981; Manilal & Sivar., Fl. Calicut. 276. 1982; B.D. Sharma *et al.,* Fl. Karnataka: analysis 259. 1984; C.J. Saldanha, Fl. Karnataka. 115. 1984; R.S. Rao *et al.,* Fl. Goa Diu Daman Dadra & Nagar haveli 2: 408. 1986; V. Chithra in A.N. Henry *et al.,* Fl. Tamil Nadu Ind., Ser I: Analysis 2: 253. 1987; Kesh. Murthy & S.N. Yogan, Fl. Coorg 421. 1990; Vajr., Fl. Palghat Dist. 446. 1990; Kothari & Moorthy, Fl. Raigad Dist. 3: 378. 1993; K.M. Matthew, Fl. Palni Hills. 1179. 1999; Sasidh. & Sivar., Fl. Pl. Thrissur For. 428. 1996; N.P. Singh *et al.,* Fl. Maharashtra Dicot 2: 935. 2001; Mohanan & Sivadasan, Fl. Agasthyamala. 631. 2002; K.G. Bhat, Fl. Udupi. 593. 2003; Sasidh. & Sivar., Bio. Docu. Kerala part 6: 438.

2004; Berg & Corner, Fl. Malesiana, 17(2): 166. 2005; Anil Kumar *et al.,* Fl. Pathanamthitta. 463. 2005; Berg *et al.,* Fl. Thailand. 10(4): 611. 2011; Chaudhary *et al.,* Taiwania, 57(2): 206. 2012; Mandar & Lakshmin., Fl. Bhagwan Mahavir 228. 2013; Bachan & Jisy, Meridian. 5(1): 50. 2016; Fl. Karnataka A Check List 2: 507. 2019; S.S. Dash & A.A. Mao, Fl. Pl. India, 2: 538. 2020. **Type:** India, *s.loc. s.d., Willdenow 1797* (Holotype- B, B -W 19298 -01 0!).

Ficus scleroptera Miq., Pl. Jungh. 63. 1851; Fl. Ind. Bat. 1: 314. 1859; Fl. Ind. Bat., Suppl. 431. 1861. **Type:** Indonesia, Java, in Herb. Junghuhnianum, *s.d., Junghuhn 33* (Isotype- L, L 0039991!).

Ficus basidentula Miq., Fl. Ind. Bat. 1: 314. 1859; Ann. Mus. Bot. Lugd.-Bat. 3: 295. 1867. **Type:** Indonesia, Lesser Sunda Islands, Bali, Kaliomba, *s.d., s.coll., s.n.* (Type- U, U 0004589!).

Ficus cinerascens Thwaites, En. Pl. Zeyl. 266. 1861. **Type:** Sri Lanka, Ceylon, *s.d., Thwaites 2562* (Isotype- L, L 0039990!).

Ficus malunuensis Warb., Fragm. Fl. Philipp. 3: 196. 1905; Elmer, Leafl. Philipp. Bot. 1: 246. 1906: Merr., Enum. Philipp. Flow. Pl. 2: 56. 1923; Curran, Philipp. J. Sci. 53. t. 3. 1934; Sata, Contr. Hort. Inst. Taihoku Imp. Univ. 32: 189. 1944. **Type:** Philippines, Isabela, Malunu, 1888, *O. Warburg 11925* (Isotype- NY, 00431886!).

Ficus cordatifolia Elmer, Leafl. Philipp. Bot. 4: 1250. 1911. **Type:** Philippines, Todaya, District of Davao, Island of Mindanao, June 1909, *A.D.E. Elmer 10997* (Isotype- E, E00680996!).

Ficus longespathulata Sata, Contr. Hort. Inst. Taihoku Imp. Univ. 32: 323. 1944. **Type:** Not found.

Ficus longespathulata Sata var. *elongatospathulata* Sata, Contr. Hort. Inst. Taihoku Imp. Univ. 32. 323. 1944. **Type:** Not found.

Ficus longespathulata Sata var. *grandifolia* Sata, Contr. Hort. Inst. Taihoku Imp. Univ. 32: 323. 1944. **Type:** Not found.

Fig. 3.28 – 3.30

Tree up to 20 m height, independent, aerial roots absent; bark lenticellate, white to pale brown; young twigs terete, core solid, smooth, glabrous, green; inter node 0.8–6.5 cm long; latex milky, white. Stipule caducous, ovate, 0.8–1.3 x 0.5–0.8 cm, margins entire, apex narrowly acute, base truncate, puberulent, pale green. Petiole articulated, terete, 1.4–4.8 cm long, pubescent, green. Leaves simple, alternate, spiral; lamina symmetric, elliptic to lance ovate to ovate, sometimes lobed when juvenile, 9.4–23.6 x 5.1–11.0 cm, margins entire, acumen 0.4–0.8 cm long, apex cuspidate to obtuse, base obtuse to rounded, glabrous, pale green when young, dark green on maturity, chartaceous, venation brochidodromous; basal veins 3–4, lateral veins 6–13 pairs, waxy glands absent. Receptacles axillary, solitary, monoecious, pedunculate; peduncle 1.2–2.1 cm, pubescent, pale green; basal bracts present, persistent, 2–3, fused at the base, 04–0.6 cm long, ovate, pubescent with brown hairs, pale green to pale brown. Syconium 1.4–3.5 cm across, globose, glabrous, green when young, yellow when mature. Ostiole 1.0–2.0 mm; outer bracts present, free, widely ovate, 1.0–2.0 mm long, pubescent, pale green; inner bracts present, free, lanceolate, 2.0–3.0 mm long, glabrous, white. Male flowers near ostiole, 3.5 mm long, pedicellate; pedicel 1.5 mm long; tepals 3–4, free, 2.5 mm long, lanceolate, glabrous, pale brown; stamen 1, anther 1.4 mm, filament 0.6 mm long. Female flowers at the base, 3.0 mm long, sessile or short pedicellate; tepal 3–4, free, 2.5 mm long, lanceolate, glabrous, pale brown; stigma bifid, 0.1–0.2 mm long; style 2.0 mm

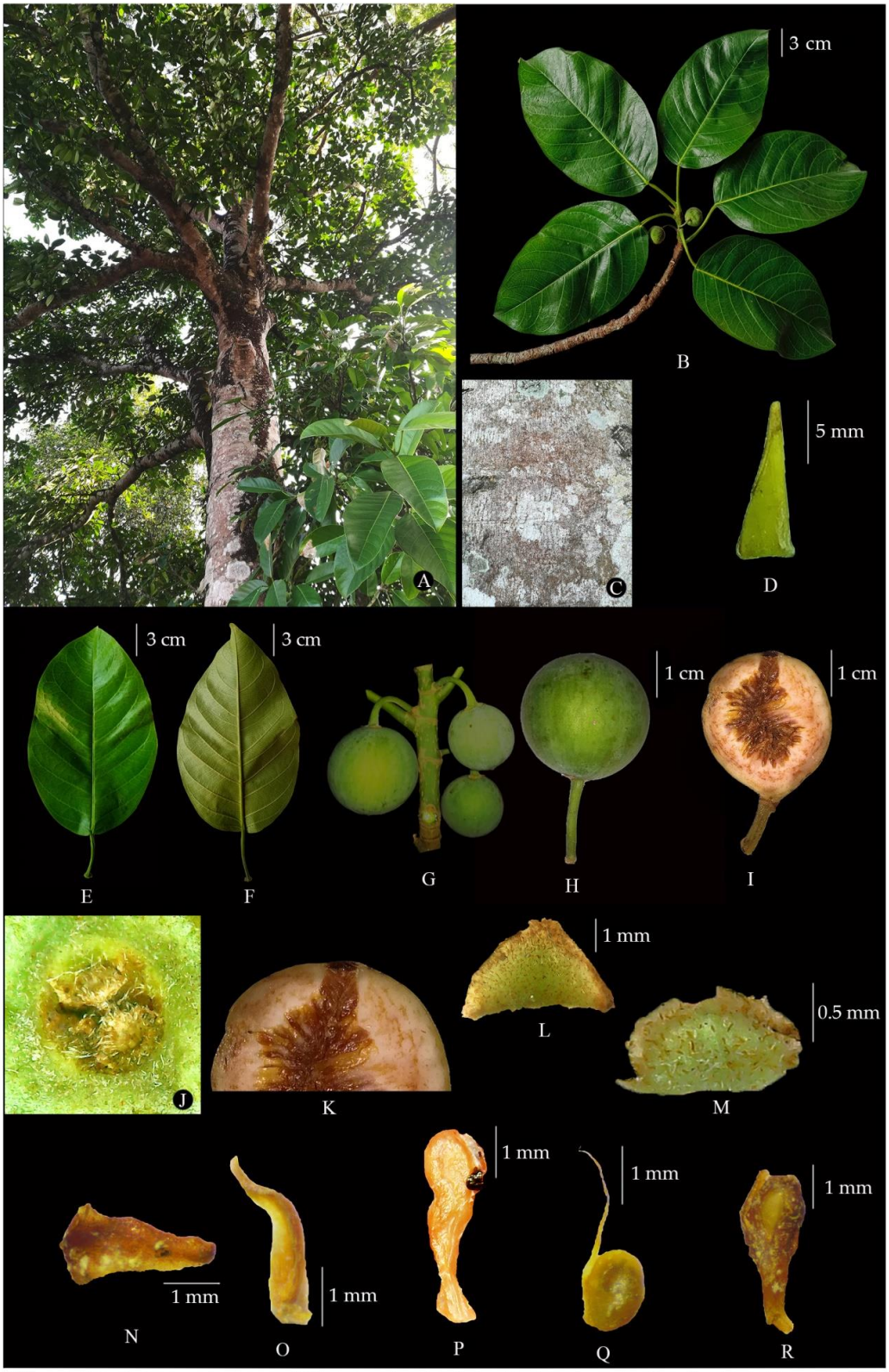


Fig. 3.28. ***Ficus callosa*** Willd.: **A.** Habit; **B.** Twig; **C.** Bark; **D.** Stipule; **E.** Leaf adaxial side; **F.** Leaf abaxial side; **G.** Receptacles; **H.** Syconium; **I.** Syconium L. S.; **J.** Ostiole; **K.** Ostiolar L. S.; **L.** Basal bract; **M.** Outer ostiolar bract; **N.** Inner ostiolar bract; **O.** Tepal; **P.** Male flower; **Q.** Female flower; **R.** Gall flower.

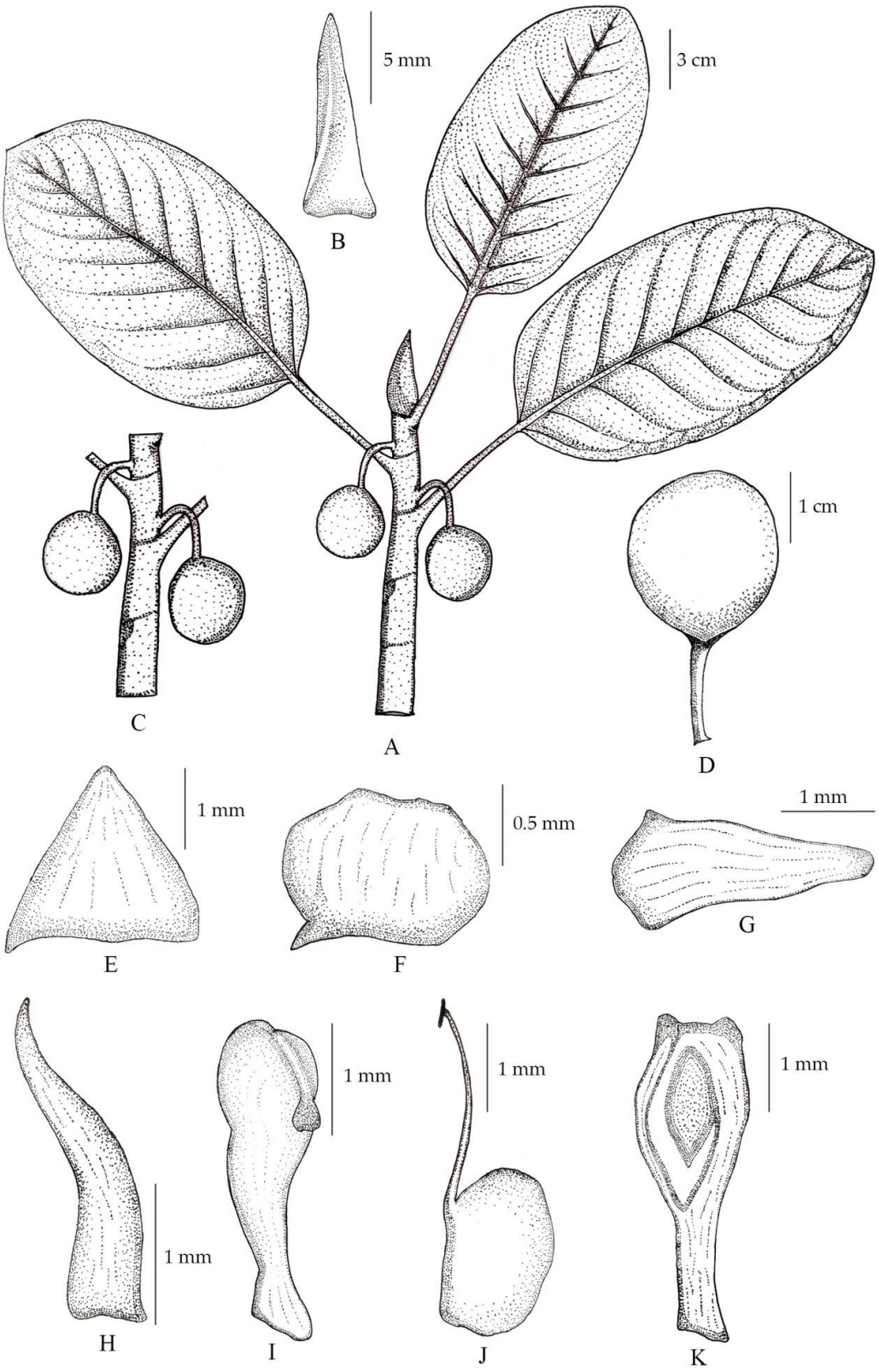


Fig. 3.29. *Ficus callosa* Willd.: A. Twig; **B.** Stipule; **C.** Receptacles; **D.** Syconium; **E.** Basal bract; **F.** Outer ostiolar bract; **G.** Inner ostiolar bract; **H.** Tepal; **I.** Male flower; **J.** Female flower; **K.** Gall flower.

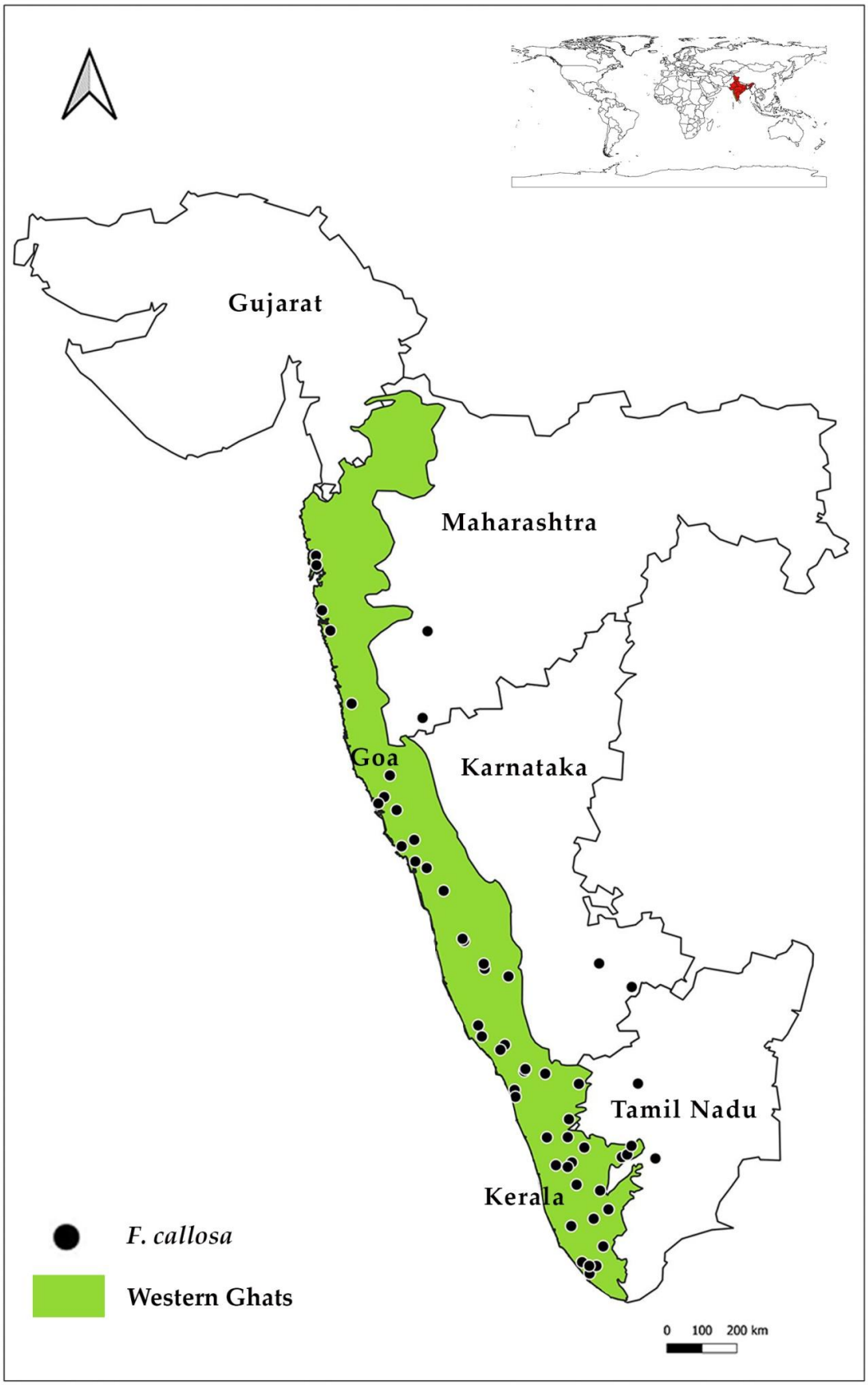


Fig. 3.30. *Ficus callosa* Willd. - Distribution map.

long; ovary 1.0 mm long, obovoid, glabrous, pale brown. Gall flowers scattered, 4.0 mm long, pedicellate; pedicel 1.5 mm long; tepals 4, free, 4.0 mm long, lanceolate, glabrous, pale brown; stigma short; style 0.5 mm long; ovary 2.0 mm long, obovoid, glabrous, pale brown. Achenes 1.0–1.5 mm, oblong, pale yellow.

Local names: *Kadaplavu, Venmaravu* (Mal.); *Koli-aal* (Tam.); *Neeruvate* (Kan.)

Common names: Calloused fig, Monkey fig tree.

Flowering and fruiting: March to May.

Distribution: Indo Malaysian regions. In India, the species is seen in Peninsular India regions.

Habitat: An evergreen tree commonly found in semi evergreen forests up to 1300 m altitude.

IUCN status: NE.

Etymology: The leaves of the plant is hard and coriaceous when dry. The species name '*callosa'* refers to this nature of the leaves.

Uses: wood was used in the manufacture of match boxes. Latex from the young leaves is used in the treatment of various mouth diseases and have anti-inflammatory activities (Lansky & Paavilainen, 2011). The figs are not consumed by humans but are eaten up by monkeys and crows.

Notes: The species shows lobed leaves in juvenile stages of the plant and on reaching maturity the plant produces leaves with entire margin. Corner (1981), observed the presence of four to six tepals, while only three to four tepals were observed in the present study. King (1887-1888), observed that the veins are minutely papillose or pubescent when young. But we observed only glabrous indumentum in the veins even in young stage of the leaves.

Specimens examined: India, **Goa,** North Goa District, Porvorim - Betrin road, 10 November 1963, *Seshagiri Rao Rolla 92944* (BSI); Paliyen, compound near paddy field, 25 March 1965, *J. Pallithanam 6118* (BSI). South Goa District, Dudhsagar road, 11 June 2004, *Mandar N. Datar 189338* (BSI); Panchi Forest, *s.d., K.C. Kowdir 96435* (BSI). **Karnataka,** Chikkamagaluru District, Ballatarayandurga top, 27 February 1963, *R. Sundara Raghavan 86965* (BSI); Charmudi Ghat, 27 October 1974, *R.S. Raghavan 134205* (BSI). Hassan District, Sakleshpur (Saklaspur), Barguai, 16 December 1903, *C.A. Barber 6227* (MH). Shivamogga District, Gersoppa falls, October 1919, *Hallberg 34995* (BLAT); Near silvi culture plot, Agumbe, 20 February 1963, *R. Sundara Raghavan 86386* (BSI). Hulikal ghat near temple, 23 March 1964, *R. Sundara Raghavan 97124* (BSI). Ghat forests, Agumbe, 18 June 1964, *R. Sundara Raghavan 74168* (BSI). Hulikal ghat, 150 m, 04 May 1979, *C.J. Saldanha & K.R. Keshava Murthy 7602* (JCB). Uttar Kannada District, Anshi, 25 February1887, *W.A. Talbot s.n.* (BSI); Jigani, *s.d., W.A. Talbot 3842* (BSI); Ganesh Gudi, 86 m, 17 March 2007, *N. Ayyappan & B.R. Ramesh HIFP BTWG307* (HIFP); Karwar, July 1920, *Bell 811* (BLAT); *ibid.*, October 1919, *Hallberg 34889* (BLAT). **Kerala,** Ernakulam District, Iringole, 09 July 1993, *V. Sarojini Menon 14615* (TBGT). Idukki District, Baypore, Sea level, 02 October 1976, *C.R. Suresh 22279* (CALI); Vandanmettu, 925 m, 26 August 1977, *K. Vivekananthan 50534* (MH); Kanjar, 18 October 1982, *C.N. Mohanan 74655* (MH); Kokkara, P. T. R., 880 m, 04 April 1994, *Jomy Augustine 13522* (KFRI & CALI); Kuttampuzha, 50 m, *P. Bhargavan 92096* (MH). Kannur District, Madayippara, Karuvathadam, 26 June 2012, *C. Pramod 133244* (CALI); Taliparamba farm, 19 May 1906, *C.A. Barber 7755* (MH). Kottayam District, Vellore, 5 m, 21 December 2020, *Sreehari S. Nair 12993* (MESAH). Malappuram District, Thali, 27 October 1971, *V.V. Sivarajan 1522* (CALI); Nadukani, Way to Gudallore, 19 January

1979, *N. Sasidharan 465* (KFRI); Calicut University Botanical Garden, 50 m, 26 April 1993, *T.K. Dominic 45705* (CALI). Palakkad District, Ayyappan Kovil, 900 m, 04 March 1975, *E. Vajravelu 46183* (MH); Pattam, Way to Chlakkayam forest, 600 m, 14 August 1988, *R. Chandrasekaran 89213* (MH); Moozhiar, 950 m, 20 March 1978, *C.N. Mohanan 54312* (MH); Nelliyampathi hills, 14 May 2019, *Sreehari S. Nair 12915* (MESAH). Thiruvananthapuram District, Karyavattom, 60 m, 17 February 2008, *S. Sowmya 6167* (KUBH); Aayiravillikavu, 04 November 2014, *P. Suresh Kumar 7364* (KUBH). Thrissur District, Peechi, 65 m, 19 March 1988, *N. Sasidharan 3946* (KFRI). Wayanad District, Laccadi, 760 m, 11 October 1978, *C.R. Suresh & K.S. Manilal* 21744 (CALI); Vythiri churam, 500 m, 05 February 2001, *M.K. Ratheesh Narayanan 1435* (CALI); Vythiri, 650 m, 29 June 2001, *M.K. Ratheesh Narayanan 1306* (CALI). **Maharashtra,** Kolhapur District, Danoli – Savantwadi, 12 May 1978, *S.M. Almedia SMA1571* (BLAT). Pune District, Patwardhan Garden, 20 November 1954, *S.K. Jain 29097* (BSI). Raigad District, Mhasla, October 1977, *M.J. Kothari 1564070* (BSI). Ratnagiri District, *s.loc.*, 02 January 1908, *R. K. Bhide s.n.* (BSI); Amboli – Savantwadi, 30 January 1983, *S.M. Almedia SMA4756* (BLAT). **Odisha,** Ganjam District, Saba, 27 January 1937, *W.N. Koelz 10867* (MICH). **Tamil Nadu,** Anna District, Kodavanar MHEP areas, Kodaikanal hills, 750 m, 17 June 1986, *K. Ramamurthy 83817* (MH). Dindugal District, Sirumalais, 13 March 1959, *J. Pallithanam JP4789* (BLAT). Kodaikanal District, Law's Ghat Road, 08 August 1987, *K.M Matthew 49998* (L); Pachalur Ghat Road, 1250 m, 01 November 1987, *K.M Matthew 50935* (L). Madurai District, way to Anduvan estate, 1300 m, 10 May 1992, *V. Lakshamanan 99501* (MH). Nilgiri District, Marappalam, Burliar, 1200 m, 07 September 1970, *B.D. Sharma 36076* (MH); Burliar, 750 m, 03 May 1971, *N.C. Rathakrishnan 38171* (MH); Pandalur, Devala Forest, 900 m, 27 February 1973, *E. Vajravelu 43756*

(MH); Marappalam, 850 m, 07 July 1973, *E. Vajravelu 44341* (MH). Tirunelveli District, Nataikal to Sangaltai, 26 September 1916, *s.coll. 13677* (MH).

3.6.11. *Ficus caulocarpa* (Miq.) Miq.

Ficus caulocarpa (Miq.) Miq., Ann. Mus. Bot. Lugd.- Bat. 3: 268, 287. 1867; Corner, Gard. Bull. Singapore. 21: 10. 1965; Corner in Dass. & Forsb., Rev. Handb. Fl. Ceylon 3: 240. 1981; C.J. Saldanha, Fl. Karnataka 116. 1984; Sasidh. & Sivar., Bio. Docu. Kerala part 6: Flow. Plant. 439. 2004; Berg & Corner in Nooteboom, Fl. Malesiana 17(2): 604. 2005; S.G. Pradhan *et al.,* Fl. Sanjay Gandhi National Park 3: 573. 2005; Berg *et al.,* Fl. Thailand. 10(4): 533. 2011; Sudhakar & Murthy, Indian J. For. 35(3): 345. 2012; Fl. Karnataka: A Check List 2: 507. 2019; *Ficus* sp. Madhya Pradesh 11. 2019; S.S. Dash & A.A. Mao, Fl. Pl. India, 2: 538. 2020. *Urostigma caulocarpum* Miq., London J. Bot. 6: 568, 1847; *Ficus infectoria* Roxb. var. *caulocarpa* (Miq.) King, Sp. *Ficus* 1:63, t. 79. 1887. **Type:** Philippines, Ins. Philippinae, 1841, *H. Cuming 1930* (Type- U, U 0004595!; L- L 0040005!; Isotype- BM, BM001124371!; E- E00564802!).

Urostigma stipulosum Miq., London J. Bot. 6: 568. 1847; *Ficus stipulosa* (Miq.) Miq., Ann. Mus. Bot. Lugd.-Bat. 3: 287. 1867. **Type:** Philippines. Ins. Philippinae, 1841, *Hugh Cuming 1978* (Isotype- BM, BM001124373!).

Ficus weinlandii K. Schum., Nachtr. Fl. Schutzgeb. Südsee 248. 1905. **Type:** Papua New Guinea, March 1890, *Weinland 180* (Lectotype- B; B 10 0086294!).

Fig. 3.31 – 3.33

Large tree, 30 m tall, hemi-epiphytic, aerial roots present; bark smooth, pale yellow to pale brown; young twigs terete, solid, glabrous, pale brown; internode 0.5–6.0 cm long; latex milky, white. Stipule caducous, lanceolate,

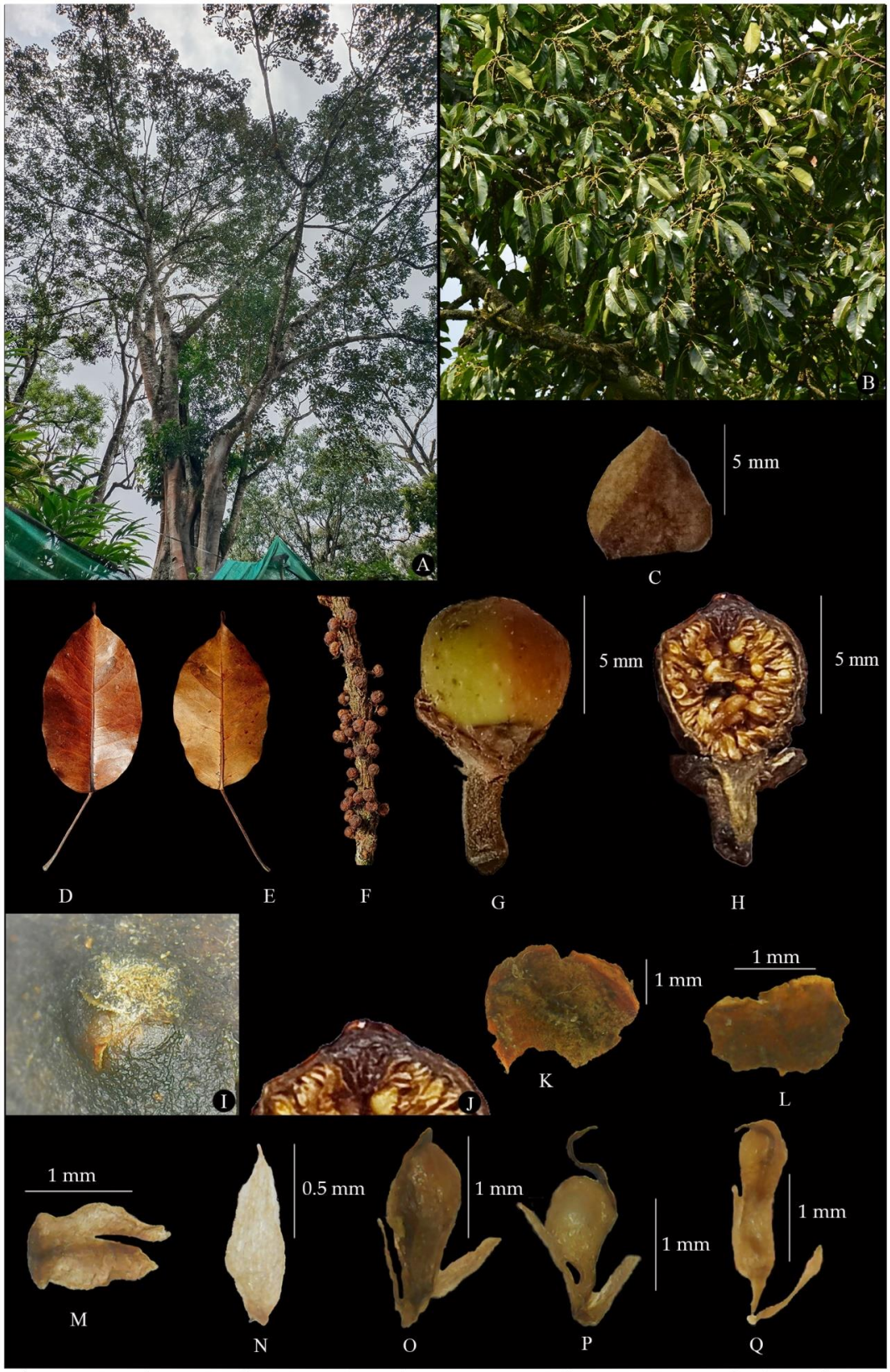


Fig. 3.31. ***Ficus caulocarpa*** (Miq.) Miq.: **A.** Habit; **B.** Twig; **C.** Stipule; **D.** Leaf adaxial side; **E.** Leaf abaxial side; **F.** Receptacles; **G.** Syconium; **H.** Syconium L. S.; **I.** Ostiole; **J.** Ostiolar L. S.; **K.** Basal bract; **L.** Outer ostiolar bract; **M.** Inner ostiolar bract; **N.** Tepal; **O.** Male flower; **P.** Female flower; **Q.** Gall flower.

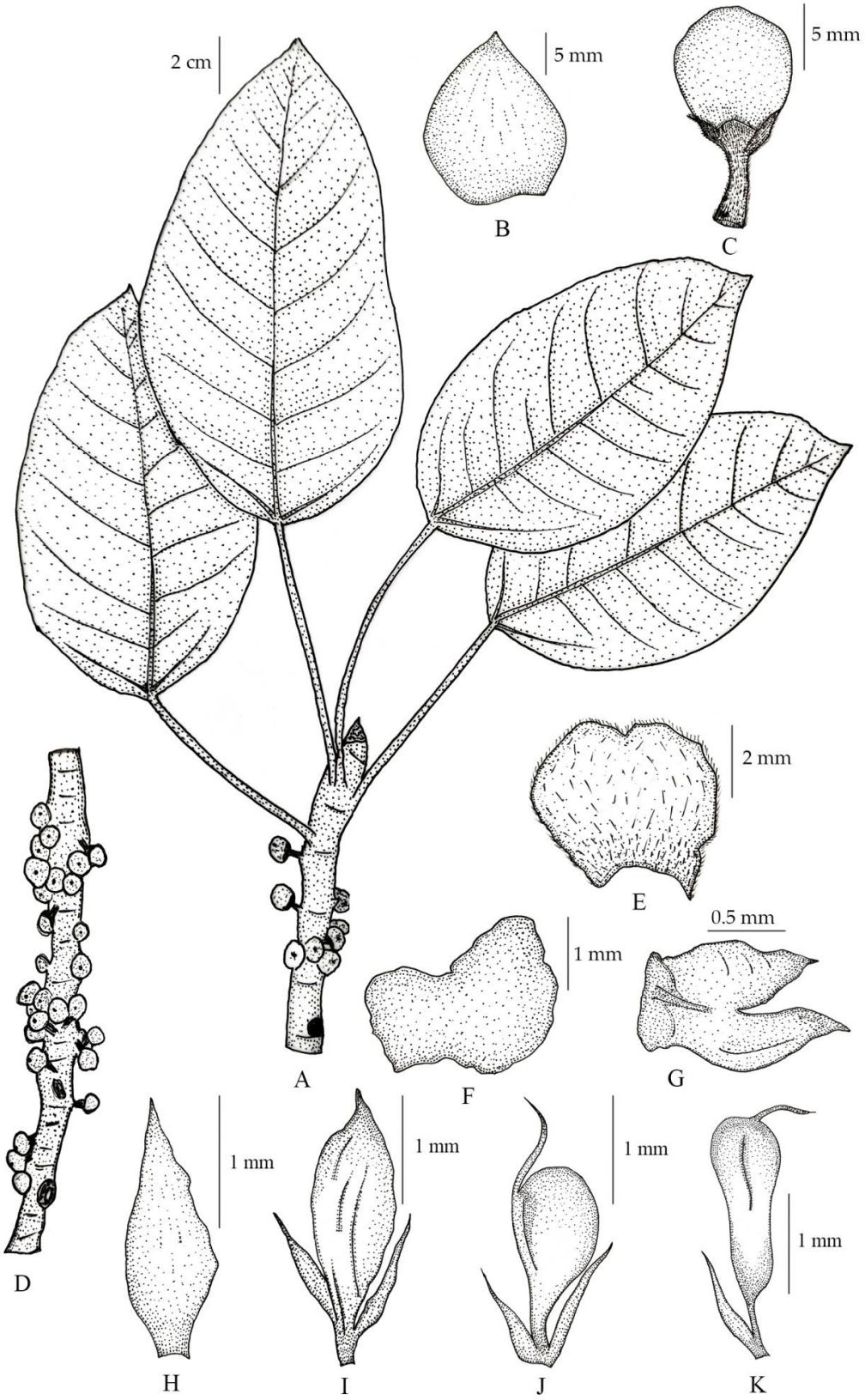


Fig. 3.32. ***Ficus caulocarpa*** **(Miq.) Miq.: A.** Twig; **B.** Stipule; **C.** Syconium; **D.** Receptacles; **E.** Basal bract; **F.** Outer ostiolar bract; **G.** Inner ostiolar bract; **H.** Tepal; **I.** Male flower; **J.** Female flower; **K.** Gall flower.

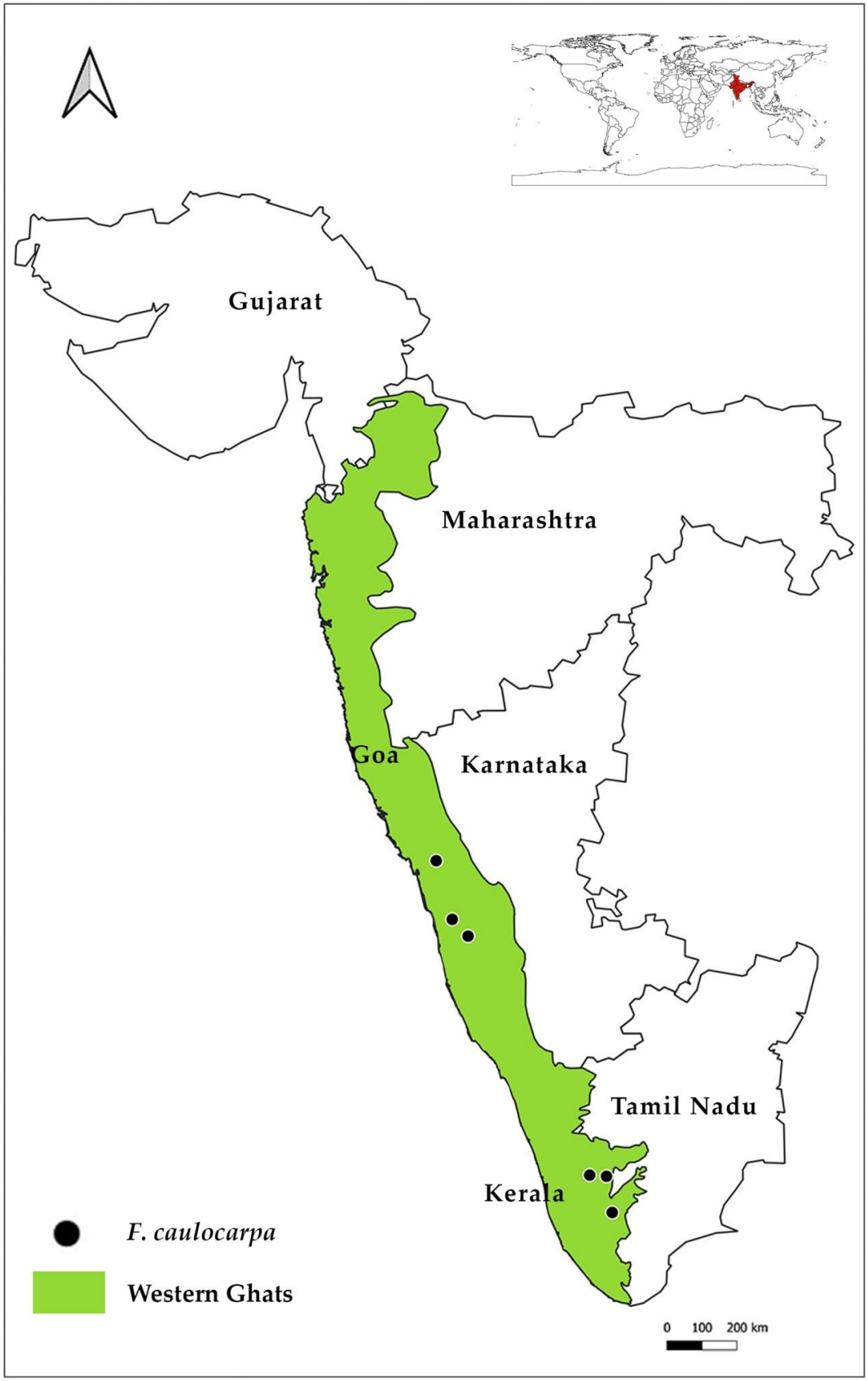


Fig. 3.33. *Ficus caulocarpa* (Miq.) Miq. - Distribution map.

0.5–2.0 x 0.5–1.0 cm, margins entire, apex acute, base truncate, puberulous, pale brown. Petiole articulated, terete, canaliculate, 4.0–9.5 cm long, glabrous, pale green. Leaves simple, alternate, spiral; lamina symmetric, ovate to elliptic to oblong, 8.7–16.7 x 4.0–9.4 cm, margins entire, wavy, acumen 0.3–0.6 cm long, apex acuminate, base rounded, glabrous, pale red when young, green on maturity, subcoriaceous, venation brochidodromous; basal veins 3–4, lateral veins 9–12 pairs, waxy glands at the base of the midrib. Receptacles axillary, clustered, monoecious, pedunculate; peduncle 0.4–0.6 cm long, pubescent, pale green to pale brown; basal bracts present, persistent, 3, free, 3.0–4.0 mm long, widely ovate, glabrous to puberulous, pale brown. Syconium 0.4–1.0 cm across, globose, glabrous, green when young, purple when mature. Ostiole 2.0–3.0 mm; outer bracts present, free, ovate, 1.5–2.0 mm long, glabrous, yellow to pale brown; inner bracts present, free, lanceolate, 1.0 mm long, glabrous, pale brown. Male flowers near ostiole, 2.0 mm long; sessile; tepals 3, free, 1.0–2.0 mm long, lanceolate, pale yellow, glabrous; stamen 1, anther 0.8 mm long, filament 1.2 mm long. Female flowers near the base, 2.0 mm long, sessile; tepals 3, free, 1.0–2.0 mm long, lanceolate, pale yellow, glabrous; stigma simple, 0.1–0.2 mm long; style 0.8 mm long; ovary 1.0 mm long, obovoid, glabrous, pale-yellow. Gall flowers, scattered, 1.5 mm long; sessile; tepals 3, free, 1.0 mm long, lanceolate, pale yellow; stigma 0.1 mm long; style 0.4 mm long; ovary 1.0 mm long, obovoid, glabrous, pale-brown. Achenes 1.0 mm, ovoid, pale brown.

Local names: Nil.

Common names: Nil.

Flowering and fruiting: November to May.

Distribution: The plant is native to the tropical biomes. In India, the plant is distributed in the states of Kerala, Tamil Nadu, Karnataka and Madhya Pradesh.

Habitat: Evergreen, semi evergreen and moist deciduous forests.

IUCN status: Least Concern (LC).

Etymology: The species epithet refers to the peduncled nature of the figs.

Uses: No uses so far reported for the species.

Notes: The peduncles were recorded as puberulous to glabrous by Berg and Corner (2005), and Berg *et al*. (2011). However, the peduncles were found to be pubescent in the present study. Chantarasuwan *et al*., (2013) observed that the female flowers were either sessile or pedunculate with dark red ovary. But only sessile female flowers with pale yellow ovary were noted in this study.

Specimens examined: India, **Karnataka,** Uttar Kannada District, Aivey, April 1883, *W.A. Talbot 461* (BSI). Shivamogga District, Belchikatti gudda, Agumbe, 20 June 1961, *R. Sundara Raghavan 74239* (BSI). Udupi District, Nagudi forest, Mookambika W. L. S., 25 June 2008, *P.G. Diwakar & R.K.R. Singh 184342* (BSI). **Kerala**, Ernakulam District, Urulanthanni, 320 m, 03 November 2020, *Sreehari S. Nair & P.J. Ebin 12989* (MESAH). Idukki District, Adimaly, 30 December 1993, *A. Nazarudean 19649* (TBGT); Kokkara, P. T. R., 881 m, 04 April 1994, *Jomy Augustine 13523* (KFRI); Munnar – Bodi Mettu road, 1360 m, 04 October 2022, *Sreehari S. Nair & P.J. Ebin 12216* (MESAH). **Tamil Nadu,** Kanyakumari District, Mahendragiri R. F., 600 m, 23 January 1978, *A.N. Henry 53238* (MH).

3.6.12. *Ficus costata* Aiton

Ficus costata Aiton, Hort. Kew 3: 452. 1789; Corner in Gard. Bull. Singapore 17: 379. 1960; 21(1): 11. 1965; Corner in Dass. & Forsb., Rev. Handb. Fl. Ceylon 3: 246. 1981; S.P. Mathew, J. Econ. Taxon. Bot. 22: 259. 1998; Sasidh. & J. Augustine, Rheedea 9(1): 77. 1999; Sasidh. & Sivar., Bio. Docu. Kerala part 6: Flow. Plant. 439. 2004; Sudhakar & Murthy, Indian J. For. 35(3): 346. 2012; S.S. Dash & A.A. Mao, Fl. Pl. India, 2: 539. 2020. **Type:** *s.loc,* 1778, *s.coll. s.n.* (Type- BM, BM000848515!).

Ficus caudiculata Trimen, J. Bot. 23: 243. 1885. **Type:** Sri Lanka, Paregodde (Paragoda), S. Prov., *H. Trimen s.n.* (Type- K, K000880024!).

Ficus mooniana King, Ann. Roy. Bot. Gard. (Calcutta) 1: 57. 1887. **Type:** Sri Lanka, Ceylon, *Thwaites 2464* (Type- U, U0043278!).

Fig. 3.34 – 3.36

Tree, 10–15 m tall, epiphytic when young, aerial roots absent; bark smooth, pale brown; young twigs terete, solid, glabrous, pale brown; internode 0.5–4.0 cm long; latex milky, white. Stipule caducous, lanceolate, 0.5–2.0 x 0.5–1.0 cm, margins entire, apex narrowly acute, base truncate, puberulous, pale red to yellow. Petiole articulated, terete, 2.0–5.0 cm long, glabrous, pale green. Leaves simple, alternate, spiral; lamina symmetric, ovate to elliptic, 5.0–20.0 x 3.9–8.0 cm, margins entire, acumen 0.4–1.2 cm long, apex acuminate, base rounded to subcordate, glabrous, pale red when young, green on maturity, subcoriaceous, venation brochidodromous; basal veins 3–4, lateral veins 10–18 pairs, waxy glands at the base of the midrib. Receptacles axillary, paired, monoecious, pedunculate; peduncle 3.0–8.0 mm long, glabrous, pale brown; basal bracts present, persistent, 3, free, 1.5–2.0 mm long, ovate, glabrous, pale brown. Syconium 0.8–1.0 cm across, globose, glabrous, green when young,

purple when mature. Ostiole 1.0–2.0 mm; outer bracts present, free, ovate, 1.0–1.5 mm long, glabrous, pale brown; inner bracts present, free, lanceolate, 1.0 mm long, glabrous, pale brown. Male flowers scattered, 1.5 mm long, pedicellate; pedicel 1.0 mm long; tepals 3, fused, 1.0 mm long, lanceolate, pale yellow, glabrous; stamen 1, anther 0.4 mm long, filament 0.6 mm long. Female flowers near the base, 2.0 mm long, sessile; tepals 3, free, 1.0 mm long, lanceolate, pale yellow, glabrous; stigma bifid, 0.1–0.2 mm long; style 0.9 mm long; ovary 1.0 mm long, obovoid, glabrous, pale-yellow. Gall flowers scattered, 1.5 mm long, pedicellate; pedicel 0.4 mm long; tepals 3, free, 1.0 mm long, lanceolate, pale yellow; stigma 0.1 mm long; style 0.1 mm long; ovary 0.8 mm long, obovoid, glabrous, pale yellow. Achenes 1.0 mm, ovoid, pale yellow.

Local names: Nil.

Common names: Nil.

Flowering and fruiting: October – January.

Distribution: The native range of the species is South West India and Sri Lanka. In India, this species is reported from the states of Kerala, Karnataka and Goa. Tiwari *et al.* (2014) recorded the presence of this species form Andaman and Nicobar Islands. The species was recorded to have an extended distribution in Goa (Mohapatra *et al.*, 2020).

Habitat: In evergreen and deciduous forests.

IUCN status: Vulnerable (VU) (Bachan & Devika, 2022b).

Etymology: The leaves of this species are areolate in appearance and the species epithet '*costata*' denotes this ribbed appearance of the leaves.

Uses: No uses so far reported for this species.

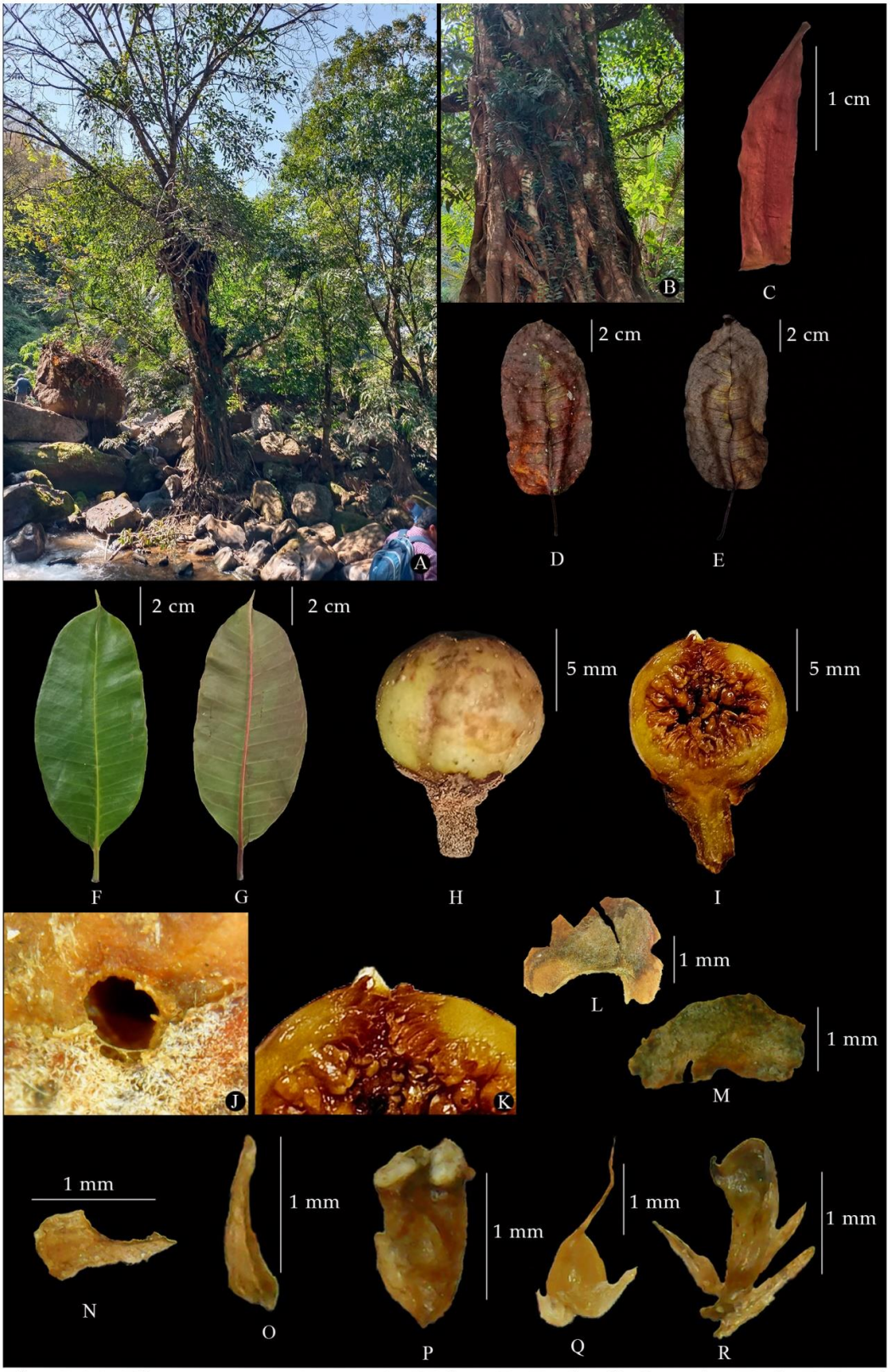


Fig. 3.34. ***Ficus costata*** Aiton: **A.** Habit; **B.** Bark; **C.** Stipule; **D & F.** Leaf adaxial side; **E & G.** Leaf abaxial side; **H.** Syconium; **I.** Syconium L. S.; **J.** Ostiole; **K.** Ostiolar L. S.; **L.** Basal bract; **M.** Outer ostiolar bract; **N.** Inner ostiolar bract; **O.** Tepal; **P.** Male flower; **Q.** Female flower; **R.** Gall flower.

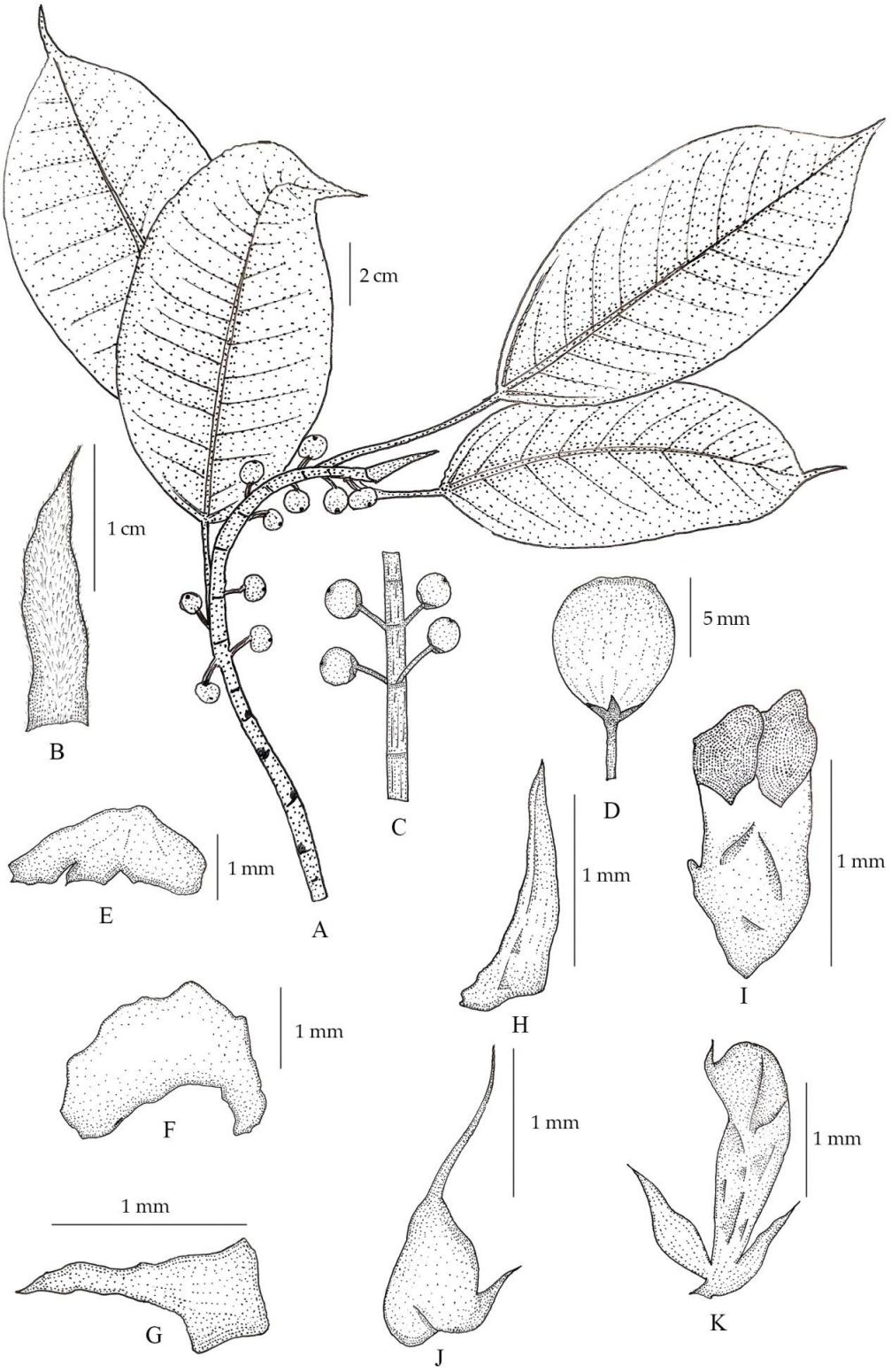


Fig. 3.35. ***Ficus costata*** Aiton: **A.** Twig; **B.** Stipule; **C.** Receptacles; **D.** Syconium; **E.** Basal bract; **F.** Outer ostiolar bract; **G.** Inner ostiolar bract; **H.** Tepal; **I.** Male flower; **J.** Female flower; **K.** Gall flower.

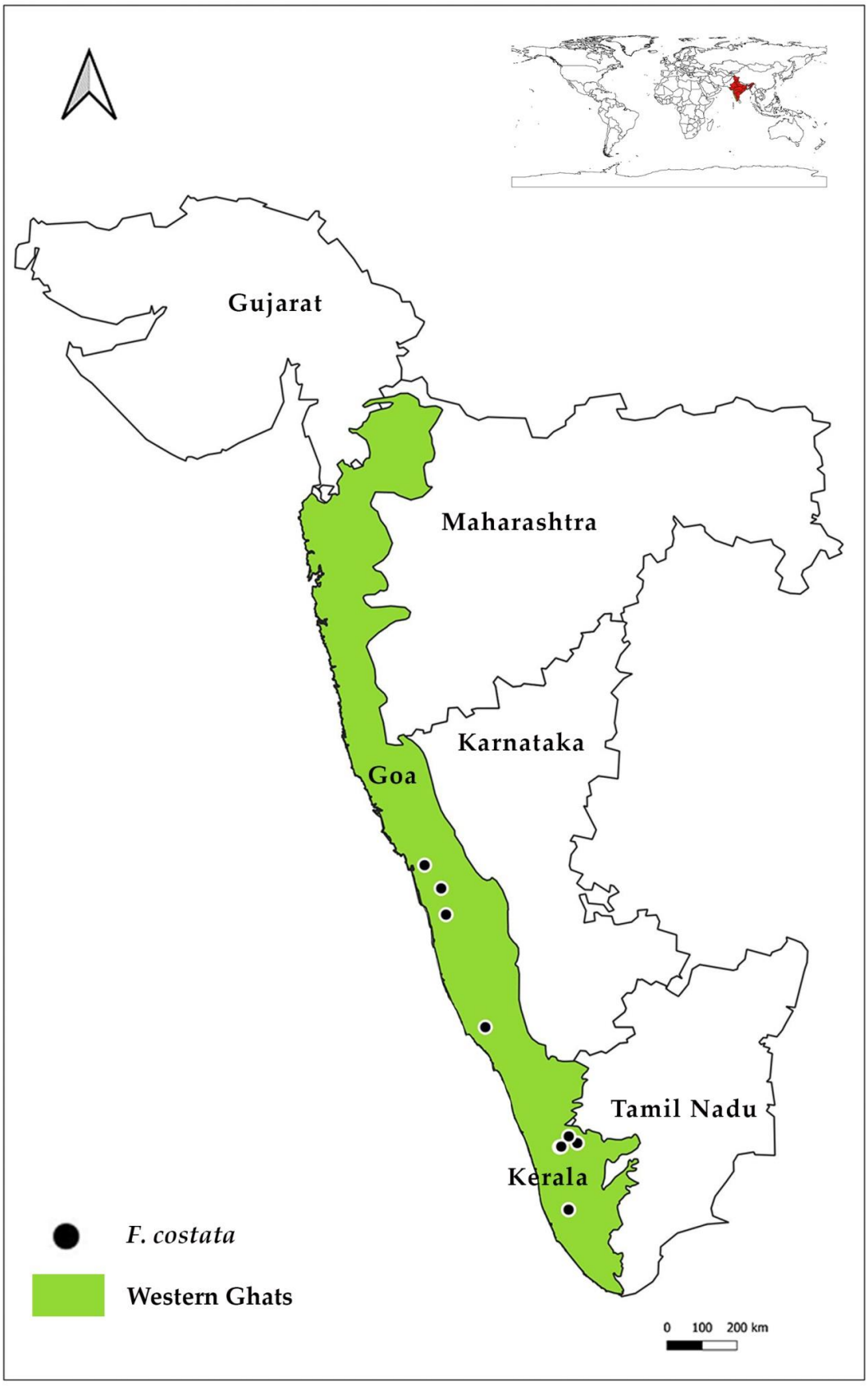


Fig. 3.36. *Ficus costata* Aiton - Distribution map.

Notes: This species is found to have a narrow range of distribution and is poorly recorded in the herbarium. The first record of this species from India was from Kerala (Sasidharan & Augustine, 1999).

Specimens examined: India, **Karnataka,** Shivamogga District, Gesoppa falls, October 1919, *Hall & Mecaum 35160* (BLAT). Udupi District, Mookambika Wild Life Sanctuary, 26 June 2008, *P.G. Diwakar & R.K.R. Singh 184359* (BSI). Uttar Kannada District, Yana, 30 November 1884, *W.A. Talbot 1627* (BSI). **Kerala,** Idukki District, Pamba Valley, P. T. R., 130 m, 23 November 1993, *N. Sasidharan & Jomy Augustine 12742* (KFRI); Pamba, 350 m, 28 December 1996, *Jomy Augustine 17072* (CALI); Panamkutty, 27 December 2021, *Sreehari S. Nair & P.J. Ebin 12175* (MESAH). Kannur District, Ezhimala, 200 ft, 23 September 1976, *C.R. Suresh 22236* (CALI). Thrissur District, Poringalkuthu, 24 January 1953, *J. Fernandez JF162* (BLAT); Poringal, 500 m, 28 July 1987, *N. Sasidharan & V.V. Sivarajan 4943* (KFRI); Vazhachal, 240 m, 24 November 2009, *K.H. Amitha Bachan 117705* (CALI).

3.6.13. *Ficus dalhousiae* (Miq.) Miq.

Ficus dalhousiae (Miq.) Miq. Ann. Mus. Bot. Lugduno - Batavi. 3: 285. 1867; King, Ann. Roy. Bot. Gard. (Calcutta) 1: 16. t 11. 1888; Hook.f., Fl. Brit. India. 5: 499. 1888; J. Cameron, For. Trees of Mysore and Coorg 270. 1894; Bourd., For. Trees Travancore 358. 1908; Rama Rao, Fl. Pl. Travancore 379. 1914; Brandis, Indian Trees 601. 1921; C.E.C. Fisch. in Gamble, Fl. Madras. 1364. 1928; Corner, Gard. Bull. Singapore 21: 12. 1965; V. Chithra in A.N. Henry *et al.,* Fl. Tamil Nadu Ind., Ser I: Analysis 2: 253. 1987; Vajr., Fl. Palghat Dist. 446. 1990; Sivar. & Mathew, Fl. Nilambur 664. 1996; Sasidh. & Sivar., Fl. Pl. Thrissur For. 428. 1996; T. Pulliah & D.A. Moulali, Fl. Andhra Pradesh. 2: 898. 1997; Sasidh. & Sivar., Bio. Docu. Kerala part 6: 439. 2004; K.M. Chetty *et al.,*

Fl. Pl. Chittoor Dist. 332. 2008; Chaudhary *et al.,* Taiwania 57(2): 211. 2012; For. Plant. Nilgiris 45. 2015; Sudhakar *et al.,* Figs of Eastern Ghats, India 45. 2017; Fl. Karnataka. A Check List 2: 507. 2019; S. S. Dash & A. A. Mao, Fl. Pl. India, 2: 539. 2020. *Urostigma dalhousiae* Miq., London J. Bot. 6: 571. 1847. **Type:** India, Peninsula Ind. orientalis, probably Tamil Nadu, 1837, *R. Wight 2998* (Holotype- L, U 0043083!; Lectotype- E, E00288934!).

Covellia costata Miq., London J. Bot. 7: 468. 1848; *Ficus costigera* Miq. Ann. Mus. Bot. Lugduno - Batavi. 3: 296. 1867; King, Ann. Roy. Bot. Gard. (Calcutta) 1: 180. 1888. **Type:** India, Peninsula Ind. orientalis, Tamil Nadu, Courtallum, July 1835, *R. wight 872*. (Isotype- E, E00288937!).

Fig. 3.37 – 3.40

Tree up to 15 m height, hemi epiphytic, aerial roots present; bark lenticellate, brown; young twigs terete, smooth, core solid, puberulent, green; inter node 0.8–2.8 cm long; latex white, milky. Stipules caducous, lance-ovate, 2.8–7.0 x 1.2–1.8 cm, margins entire, apex narrowly acute, base truncate, glabrous, pale red to purple. Petiole articulated, terete, 3.0–8.0 cm, glabrous, pale green. Leaves simple, alternate, spiral; lamina symmetric, lanceovate to ovate, 13.0–26.0 x 7.2–16.1 cm, margins entire, acumen 0.2–0.4 cm long, apex acute, base cordate, lamina glabrous, pubescent on the veins, purple to red when young, green on maturity, subcoriaceous, venation brochidodromous; basal veins 3–4, lateral veins 13–15 pairs, waxy glands on the base of the midrib. Receptacles axillary, paired or clustered, monoecious, pedunculate; peduncle 0.5–1.0 cm long, pubescent, green; basal bracts present, persistent, 3, fused, 0.3–0.4 cm long, ovate, pubescent, pale green. Syconium 1.0–1.5 cm, obovoid to globose, pubescent, pale green when young, yellow with scars when mature; ostiole 1.0–2.0 mm; outer bracts present, free, widely ovate, 1.5

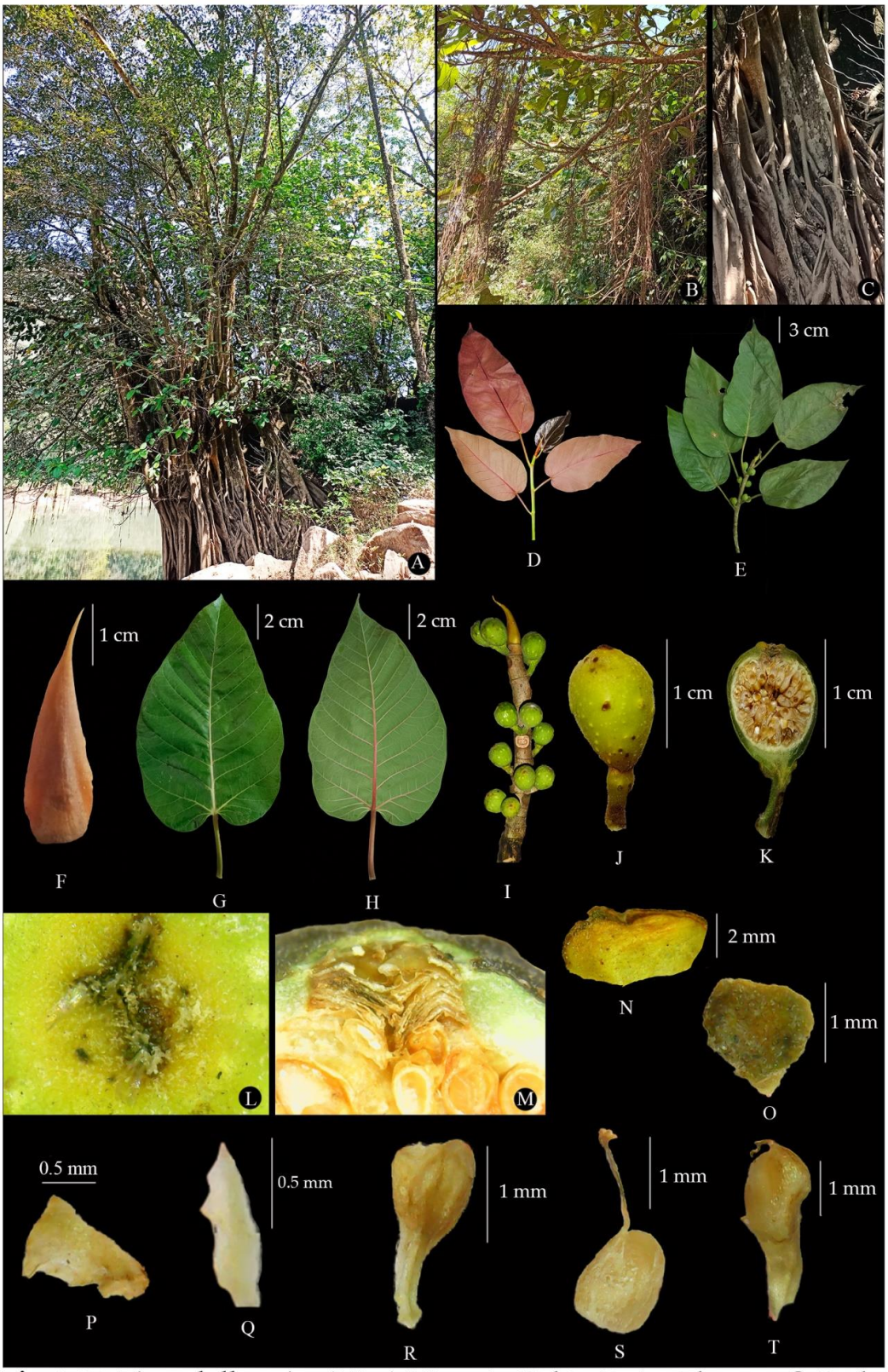


Fig. 3.37. ***Ficus dalhousiae*** (Miq.) Miq.: **A.** Habit; **B.** Aerial roots; **C.** Bark; **D & E.** Twig; **F.** Stipules; **G.** Leaf adaxial side; **H.** Leaf abaxial side; **I.** Receptacles; **J.** Syconium; **K.** Syconium L. S.; **L.** Ostiole; **M.** Ostiolar L. S.; **N.** Basal bract; **O.** Outer ostiolar bract; **P.** Inner ostiolar bract; **Q.** Tepal; **R.** Male flower; **S.** Female flower; **T.** Gall flower.

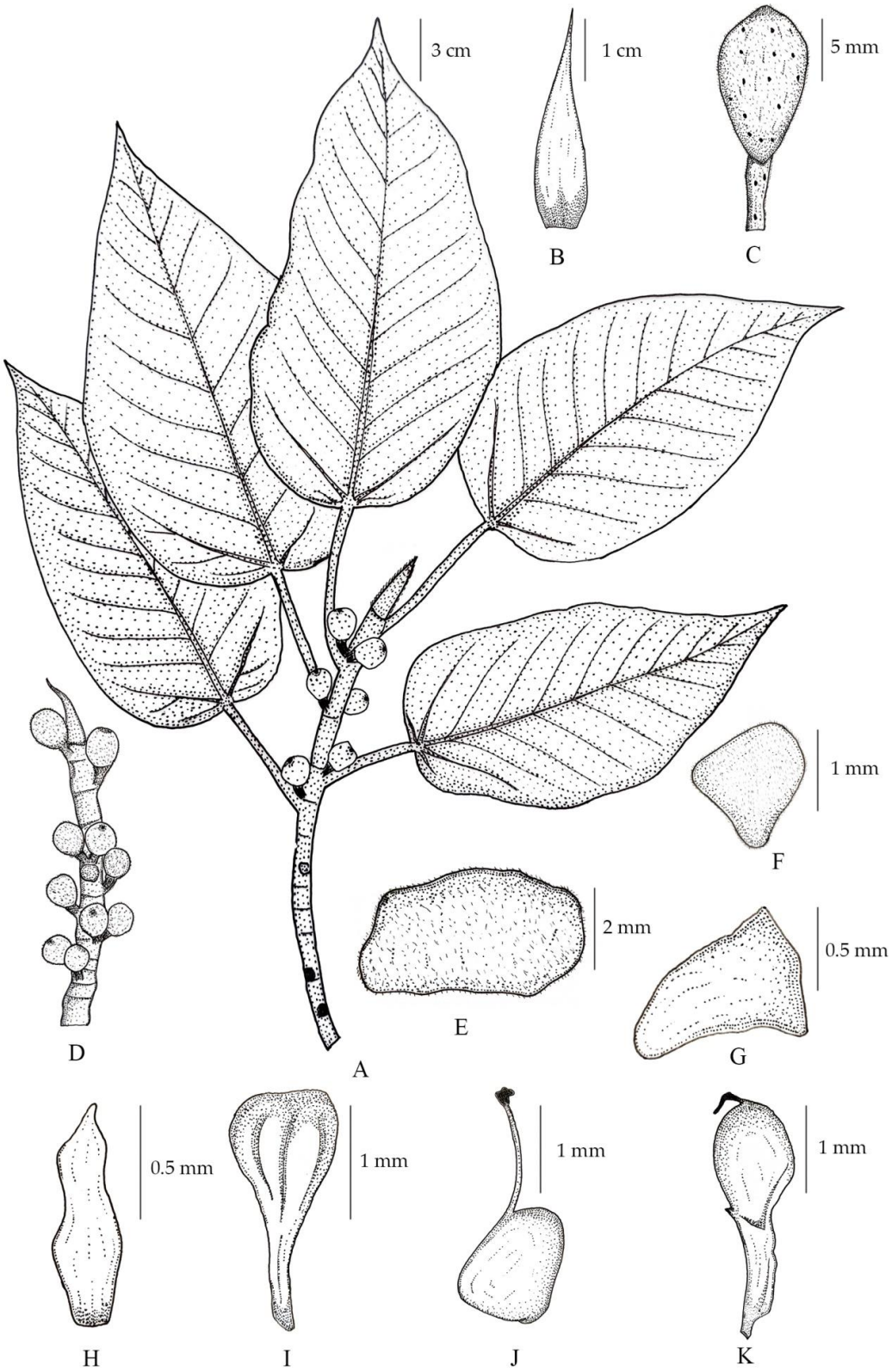


Fig. 3.38. ***Ficus dalhousiae*** (Miq.) Miq.: **A.** Twig; **B.** Stipule; **C.** Syconium; **D.** Receptacles; **E.** Basal bract; **F.** Outer ostiolar bract; **G.** Inner ostiolar bract; **H.** Tepal; **I.** Male flower; **J.** Female flower; **K.** Gall flower.

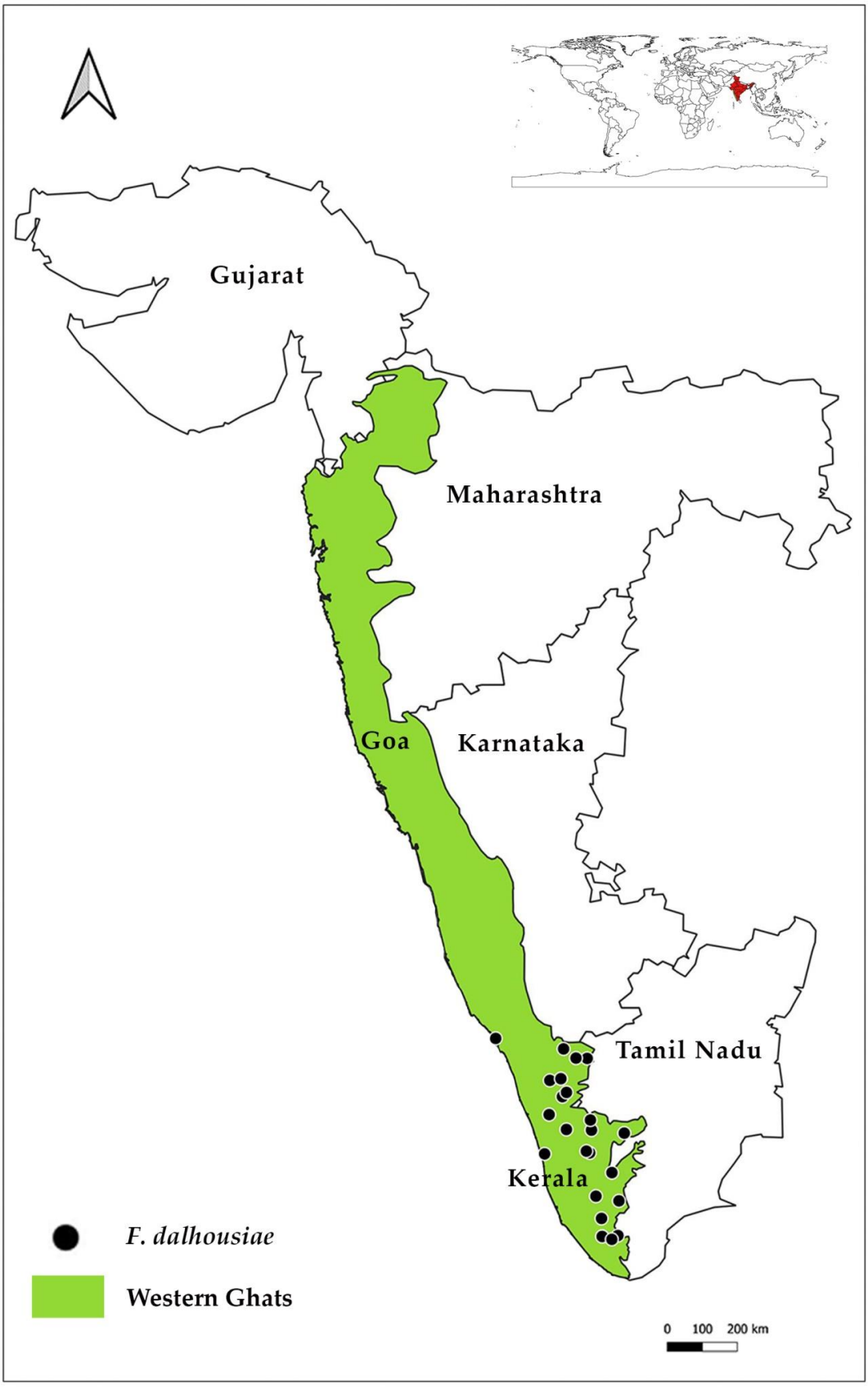


Fig. 3.39. *Ficus dalhousiae* (Miq.) Miq.- Distribution map.

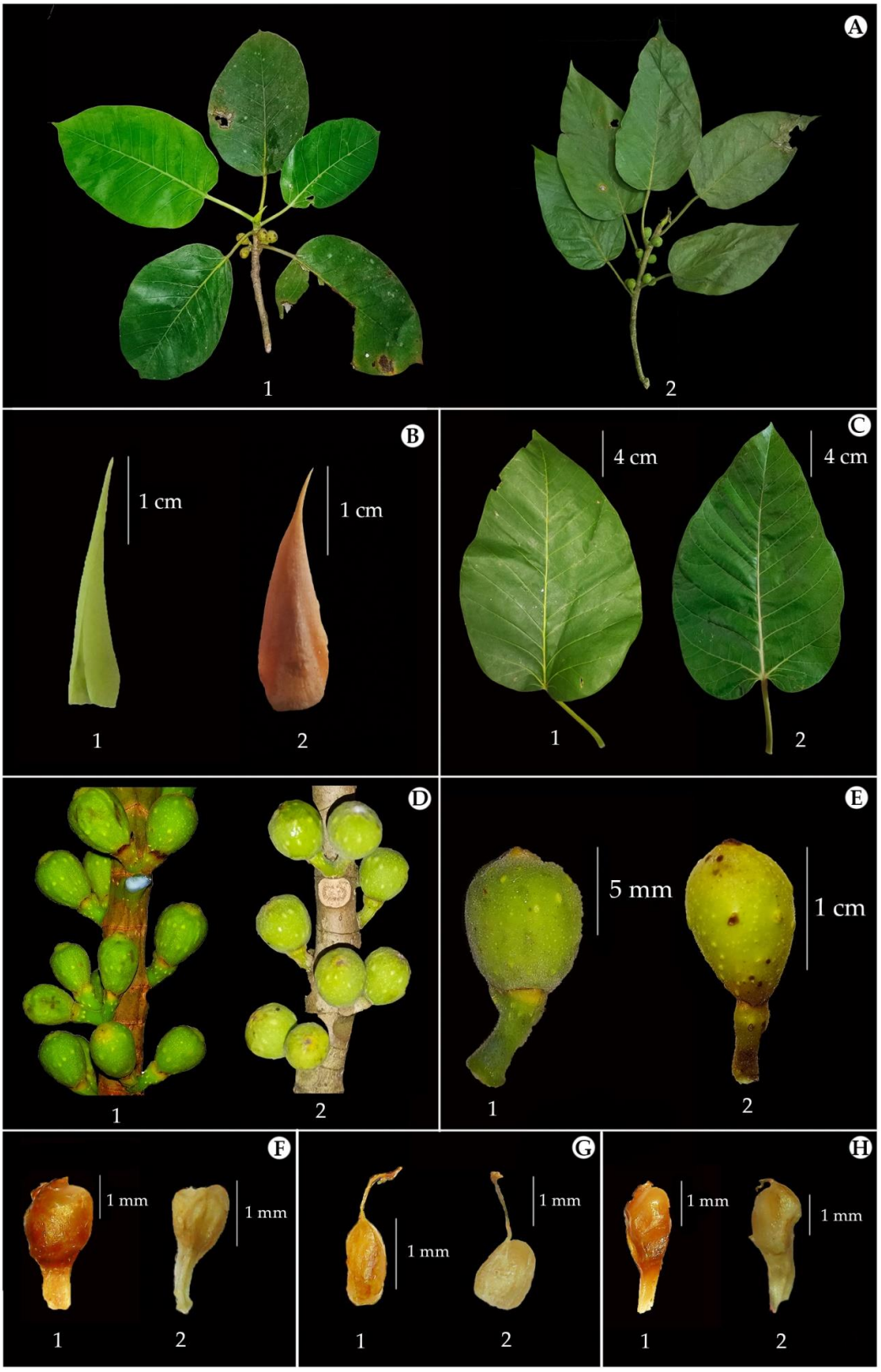


Fig. 3.40. Comparison between *Ficus anamalayana* and *Ficus dalhousiae*. **1.** *F. anamalayana*; **2.** *F. dalhousiae*. **A.** Twig; **B.** Stipule; **C.** Leaf; **D.** Receptacles; **E.** Syconium; **F.** Male flower; **G.** Female flower; **H.** Gall flower.

mm long, pubescent, brown; inner bracts present, free, lanceovate, 1.0 mm long, glabrous, pale yellow. Male flowers near ostiole, 1.8 mm long, pedicellate; pedicel 0.5 mm long; tepals 3, free, 0.8 mm long, lanceolate, glabrous, white; stamen 1, anther 1.0 mm, filament 0.2 mm long. Female flowers scattered, 2.4 mm long, sessile; tepal 3, free, 1.0 mm long, lanceolate, glabrous, white; stigma 0.2 mm long; style 1.0 mm long; ovary 1.2 mm long, obovoid, glabrous, yellow to pale brown. Gall flowers scattered, 3.0 mm long, pedicellate; pedicel 1.2 mm, tepals 3, free, 1.0 mm long, lanceolate, glabrous, white; stigma short; style 0.2 mm long; ovary 1.5 mm long, obovoid, glabrous, pale brown. Achenes 1.0–1.5 mm, ovoid, brown.

Local names: *Kallal* (Mal.); *Pei-aal, Kal-aal* (Tam.)

Common names: Dalhousie fig.

Flowering and fruiting: November – April.

Distribution: Endemic to Southern Western Ghats.

Habitat: Semi evergreen and moist deciduous forests, usually found along rocky places.

IUCN status: Vulnerable (VU) (Bachan & Devika, 2022c).

Etymology: Supposed to be named after Lord Dalhousie, the Governor General of British India.

Uses: According to the comments of a local medical practitioner in Rama Rao (1914), the fruit is used in the treatment of heart diseases and to cure burns. Liver complaints are cured with the extracts of young leaves and crushed bark. Also, the plant is used as blood purifier.

Notes: Some of the collections of this species from Tamil Nadu were misidentified as specimens of *F. albipila.* The collection L 1605490 (Tamil

Nadu, Rasipuram Dist., Salem, 850 m, 01 August 1978, *N. Venugopal RHT15969*) were recorded as *F. albipila* and mentioned as a new record to India. The species shows close similarity with *F. anamalayana* in the morphological characters (Fig. 3.40) and the comparison of the characters is given in table 3.5.

Table 3.5. Comparison of characters between *F. dalhousiae* and *F. anamalayana.*

Character	***F. dalhousiae***	***F. anamalayana***
Aerial roots	Present	Usually absent
Stipules	2.8–7.0 x 1.2–1.8 cm, pale red to purple	2.8–3.4 x 1.0–1.2 cm, green
Petiole	3.0–8.0 cm	9.0–19.0 cm
Lamina	Lance-ovate to ovate	Ovate–widely ovate
Young leaves	Purple to pale red	Green
Waxy glands	On the base of the midrib	In the axils of the lateral nerves
Peduncle	0.5–1.0 cm long	0.7–0.9 cm long
Syconium	Obovoid to globose	Oblong to obovoid
Male flowers	1.8 mm, tepals free	3.0 mm, tepals fused
Gall flowers	Pedicellate	Sessile

Specimens examined: India, **Kerala,** Idukki District, Panamkutty, 254 m, 20 January 2020, *Sreehari S. Nair 12940* (MESAH). Kollam District, Swaranampillai Kadu, ariankavu, 29 November 1961, *K.N. Subramanian 77247* (BSI). Palakkad District, Near power house, Parali, 700 m, 25 June

1974, *E. Vajravelu 44960* (MH); Mukkali forest, 650 m, 25 April 1977 *E. Vajravelu 49775* (MH); *ibid*., 500 m, 06 April 1978, *N.C. Nair 56613* (MH); Dhoni hills, 27 June 1978, *C.R. Suresh & K.S. Manilal 21707* (CALI); Thiruvizhamkunnu, 100 m, 27 December 1969, *E. Vajravelu 33367* (MH); Below Mandampatti – Mukkali, 500 m, 06 April 1978, *N.C. Nair 56613* (MH); Nelliyampathi hills, 14 May 2019, *Sreehari S. Nair & K.H. Amitha Bachan 12913* (MESAH). Pathanamthitta District, Moozhiar forest, 500 m, 11 May 1989, *R. Chandrashekaran 89312* (MH). Thiruvananthapuram District, Klamala R. F., 225 m, 10 April 1973, *J. Joseph 44134* (MH); Klamala R. F., 226 m, 10 April 1974, *J. Joseph 44137* (MH). Thrissur District, Peechi, 65 m, 09 October 1979, *N. Sasidharan 797* (KFRI); Peechi, 09 October 1979, *N. Sasidharan 797* (CALI); Vazhachal, 250 m, 02 December 2008, *K.H. Amitha Bachan 117709* (CALI). **Tamil Nadu,** Coimbatore District, Anamalais, 2150 m, 19 March 1931, *V. Narayanaswamy 5448* (MH); Attakatti, 725 m, 20 February 1980, *M. Chandrabose 65863* (MH). Dindugal District, Sirumalais, 16 July 1960, *J. Pallithanam JP 6435* (BLAT); Vilpatti valley R. F., 1000 m, 18 October 1977, *M. Chandrabose 51375* (MH). Kanyakumari District, Lower Kodayar river side, 500 m, 28 March 1981, *A.N. Henry 70669* (MH). Nilgiri District, Way to Bhavanisagar view – Kunjapanai, 1250 m, 07 August 1970, *E. Vajravelu 35260* (MH); Kunjapanai slopes, 960 m, 01 February 1972, *E. Vajravelu 39725* (MH); Vagappanai, 1100 m, 19 February 1991, *V.B. Hosagoudar 95930* (MH). Salem District, Rasipuram, Kolli hills, Vatchukkal aaru, 850 m, 01 August 1978, *N. Venugopal 15969* (L). Tenkasi District, Vasudevanallur (Vasnderanallur) R. F., 300 m, 30 September 1971, *E. Vajravelu 38813* (MH). Theni District, Suruli falls, 475 m, 24 April 1960, *B.V. Shetty 10289* (MH); Suruli falls, 680 m, 27 August 1990, *V. Lakshamanan 94340* (MH). Thinnevelly District, upper dam to Kannikatti, 500 m, 11 July 1959, *K.M. Sebastine 8469* (MH); Karayar, 24

February 1999, *E.S. Santhosh Kumar & P.C. Suresh 40813* (TBGT); Anagagari foot of highway, 1500 ft, 13 September 1925, *K. Cherian Jacob 17705* (MH).

3.6.14. *Ficus drupacea* Thunb.

Ficus drupacea Thunb., *Ficus* 11. 1786; Vahl., Enum. Pl. 2: 193. 1805; H. Santapau, Fl. Khandala 256. 1953; G.L. Shah, Fl. Gujarat 644. 1978; Manilal & Sivar., Fl. Calicut 276. 1982; B.D. Sharma *et al.,* Fl. Karnataka: Analysis 259. 1984; C.J. Saldanha, Fl. Karnataka 116. 1984; R.S. Rao *et al.,* Fl. Goa Diu Daman Dadra & Nagar haveli 2: 408. 1986; V. Chithra in A.N. Henry *et al.,* Fl. Tamil Nadu Ind., Ser I: Analysis 2: 253. 1987; B.G. Kulkarni, Fl. Sindhudurg 418. 1988; N.P. Singh, Fl. Eastern Karnataka 2: 585. 1988; Kesh. Murthy & S. N. Yogan. Fl. Coorg 421. 1990; Vajr., Fl. Palghat Dist. 446. 1990; K.M. Matthew, Excur. Fl. Central Tamil Nadu 483. 1991; Lakshmin. & B.D. Sharma, Fl. Nasik Dist. 439. 1991; P.J. Parmar in B.V. Shetty & V. Singh, Fl. Rajasthan 2: 801. 1991; Kothari & Moorthy, Fl. Raigad Dist. 3: 376. 1993; Subram., Fl. Thenmala Div. 352. 1995; Sasidh. & Sivar., Fl. Pl. Thrissur Forest 428. 1996; Sivar. & Mathew, Fl. Nilambur 665. 1996; V. Mudgal *et al.,* Fl. Madhya Pradesh 2: 615. 1997; K.M. Matthew, Fl. Palni Hills 1180. 1999; N.P. Singh *et al.,* Fl. Maharashtra Dicot 2: 935. 2001; Mohanan & Sivadasan, Fl. Agasthyamala 631. 2002; K.G. Bhat, Fl. Udupi 593. 2003; Sasidh. & Sivar., Bio. Docu. Kerala part 6: Flow. Plant. 439. 2004; Berg & Corner in Nooteboom, Fl. Malesiana 17(2): 651. 2005; Anil Kumar *et al.,* Fl. Pathanamthitta 462. 2005; S.G. Pradhan *et al.,* Fl. Sanjay Gandhi National Park 3: 574. 2005; Sunil & Sivadasan, Fl. Alappuzha Dist. 661. 2009; Berg *et al.,* Fl. Thailand 10(4): 618. 2011; Mandar & Lakshmin., Fl. Bhagwan Mahavir 228. 2013; For. Plant. Nilgiris 46. 2015; T. Pullaiah, Fl. Telangana 2: 881.

2015; Sudhakar *et al.,* Figs of Eastern Ghats, India 48. 2017; Fl. Karnataka. A Check List 2: 508. 2019; Ficus sp. Madhya Pradesh 23. 2019; P. Lakshmin. *et al.,* Fl. West Bengal 649. 2019. *Urostigma drupaceum* (Thunb.) Miq. **Type:** South East Asia, Java, *s.loc., s.d., C. P. Thunberg s.n.* (Type: UPS, V-143597).

Ficus mysorensis Roth ex Roem. & Schult. Syst. Veg. 1: 508. 1817. *Ficus mysorensis* B. Heyne ex Roth Nov. Pl. Sp. 390. 1821; Kurz., For. Fl. Brit. Burma 2: 440. 1877; G. King in Hook.f., Fl. Brit. India 5: 500. 1888; J. Cameron, For. Trees of Mysore and Coorg 272. 1894; H. Trimen, Handb. Fl. Ceylon 4: 86. 1898; Talbot, Trees Bombay 2: 327. 1902; D. Prain, Bengal Plants 2: 979. 1903; Bourd., For. Trees Travancore 359. 1908; T. Cooke, Fl. Pres. Bombay 2: 646. 1908; Rama Rao, Fl. Pl. Travancore 380. 1914; Brandis, Indian Trees 601. 1921; U.N. Kanjilal *et al.,* Fl. Assam 4: 240. 1940. *Urostigma mysorense* (B. Heyne ex Roth) Miq., London J. Bot. 6: 574. 1847. *Ficus drupacea* var. *mysorensis* (B. Heyne ex Roth) M.R. Almeida, Fl. Maharashtra 4: 366. 2003. **Type:** India, *s.loc.,* 28 May 1808, *B. Heyne s.n.* (Type- E, E00288932!).

Ficus mysorensis B. Heyne ex Roth var. *pubescens* Roth, Roem. & Schult., Syst. Veg. 1: 508. 1817; *Ficus drupacea* Thunb. var. *pubescens* (Roth) Corner, Gard. Bull. Singapore 17: 381. 1960; 21: 13. 1965. **Type:** India, Mysore, 1808, *B. Heyne s.n.* (Type- E, E00288932!).

Ficus chrysocoma Blume, Bijdr. 443. 1825. *Ficus pilosa* var. *chrysocoma* (Blume) King, Ann. Roy. Bot. Gard. Calcutta 1: 21. 1887. **Type:** Indonesia, Java, *s.d., C.L. Blume 1088* (Type- L, L 0040226!).

Ficus pilosa Reinw. ex Blume, Bijdr. 446. 1825; H.N. Ridley, Fl. Malay Peninsula 3: 331. 1924. *Urostigma pilosum* (Blume) Miq., Zoll. Syst.

Verz. Ind. Archip. 90. 1854. **Type:** Indonesia, Java, *s.d., C.L. Blume s.n.* (Holotype- L, L 0040223!).

Urostigma dasycarpum Miq. London J. Bot. 6: 574. 1847. *Ficus mysorensis* f. *parvifolia* Miq. Ann. Mus. Bot. Lugd.-Bat. 3: 285. 1867. *Ficus mysorensis* var. *dasycarpa* (Miq.) M.F. Barrett, Amer. Midl. Naturalist 45: 166. 1951. **Type:** Sri Lanka, Ceylon, 1846, *C. Walker 128.* (Syntype- G; G00369742!).

Urostigma bicorne Miq., Pl. Jungh.: 47. 1851. **Type:** Indonesia, Java, *s.d., F.W. Junghuhn s.n.* (Isotype- U & L; U 0123072!; L 0040224!).

Urostigma chrysotrix Miq., H. Zollinger, Syst. Verz. Ind. Archip. 2: 90. 1854. **Type:** Indonesia, Java, *s.d.,* H. Zollinger *s.n*. (Isotype – L, L 0040224!).

Urostigma subcuspidatum Miq., H. Zollinger, Syst. Verz. Ind. Archip. 2: 91. 1854. **Type:** Indonesia, Java, *s.d.,* H. Zollinger H737 (Holotype – U, U 0073708!).

Ficus mysorensis var. *subrepanda* Wall. ex King, Ann. Roy. Bot. Gard. (Calcutta) 1: 20. 1887; P. Lakshmin. *et al.,* Fl. West Bengal 650. 2019. *Ficus subrepanda* Wall., Numer. List [Wallich] n. 4568 B. 1831. *Ficus drupacea* var. *subrepanda* (Wall. ex King) D. Basu J. Econ. Taxon. Bot. 20: 653. 1996. **Type:** Myanmar, Sagain, 1826, *N. Wallich Cat. No. 4568A*. (Type- K, K001039343!).

Ficus chrysochlamys K. Schum. & Lauterb., Fl. Deutsch. Südsee 274. 1901. **Type:** Papua New Guinea, Bismarck Geb., 300 m, 06 September 1896, *C.A.G. Lauterbach 2806.* (Type – B, B 10 0272340!).

Ficus aurantiicarpa Elmer, Leafl. Philipp. Bot. 9: 3454, anglice. 1937. **Type:** Philippines, Islands Plants. Island of Luzon, Province of Sorsogon,

Irosin (Mt. Bulusan), September 1916, *A.D.E. Elmer 17186* (Holotype-S, S07-8414!).

Fig. 3.41 – 3.43

Tree up to 30 m height, hemi epiphytic and later becoming independent, aerial roots present but not prominent; bark smooth, lenticellate, white to pale brown; young twigs terete, core solid, smooth, pubescent, pale brown; inter node 0.8–2.2 cm long; latex milky, white. Stipule caducous, widely ovate, 0.6–1.5 x 0.3–0.8 cm, margins entire, apex narrowly acute, base truncate, tomentose, red to brown. Petiole articulated, terete, canaliculate, 1.3–3.2 cm long, pubescent to tomentose when young and glabrous on maturity, pale brown. Leaves simple, alternate, spiral; lamina symmetric, elliptic to oblong, 12.8–28.5 x 6.4–14.2 cm, margins entire, acumen 0.7–1.2 cm long, apex shortly acuminate, base cordate to rounded, pubescent to tomentose when young, lamina glabrous and veins villous when mature, brown to pale green when young, dark green on maturity, coriaceous, venation brochidodromous; basal veins 3–4, lateral veins 8–14 pairs, waxy gland at the base of the midrib. Receptacles axillary, solitary or in pairs, monoecious, sessile; basal bracts present, persistent, 3, free, 4.0–5.0 mm long, widely ovate, pubescent, pale brown. Syconium 2.1–2.6 cm across, ellipsoid to sub globose, glabrous, pale green when young, orange to red when mature. Ostiole 3.0–4.0 mm; outer bracts present, free, widely ovate, 1.2 mm long, glabrous, yellow to pale brown; inner bracts present, free, lanceolate, 3.0 mm, glabrous, pale brown to yellow. Male flowers dispersed, 3.0 mm long, pedicellate; pedicel 2.0 mm long; tepals 3–4, free, 1.5 mm long, lanceolate, glabrous, pale brown; stamen 1, anther 0.5 mm, filament 0.2 mm long. Female flowers scattered, 3.5 mm long, pedicellate; pedicel 1.5 mm long; tepal 3–4, free, 1.5 mm long, lanceolate, glabrous, pale brown; stigma

bifid; style 0.5 mm long; ovary 1.2 mm long, obovoid, glabrous, pale brown. Gall flowers scattered, 3.0 mm long, pedicellate; pedicel 1.2 mm long; tepals 3–4, free, 1.5 mm long, lanceolate, glabrous, pale brown; stigma short; style 0.3 mm long; ovary 1.5 mm long, obovoid, glabrous, yellow. Achenes 1.0–1.5 mm, ovoid, pale brown.

Local names: *Chela, Kallal, Kattalu* (Mal.); *Bili goli, Changal* (Kan.); *kal- aal, Kozhi aalamaram* (Tam.); *Paras peepal* (Hin.).

Common names: Brown woolly fig, Drupe fig, Hairy fig, Red fig, Mysore fig.

Flowering and fruiting: Two to three times a year.

Distribution: India, China, Bangladesh, Sri Lanka, Malaysia, Philippines, Thailand and Vietnam. In India, the species is seen in Peninsular India as well as North East India.

Habitat: Often epiphytic found in the semi evergreen and moist deciduous forests in elevations up to 1400 m.

IUCN status: Least Concern (LC).

Etymology: The species produces drupe like figs and hence the name *'drupacea'* is given for the species epithet.

Uses: Figs are eaten by birds and monkeys. Wood is less durable but dried wood is good for fire wood. The milk sap is used in many native medicines. The mouth wash made from the bark of the tree cooked in water is used as a remedy to treat mouth ulcers. The ripen figs are used for making wine and jellies (Tiwary, 2016).

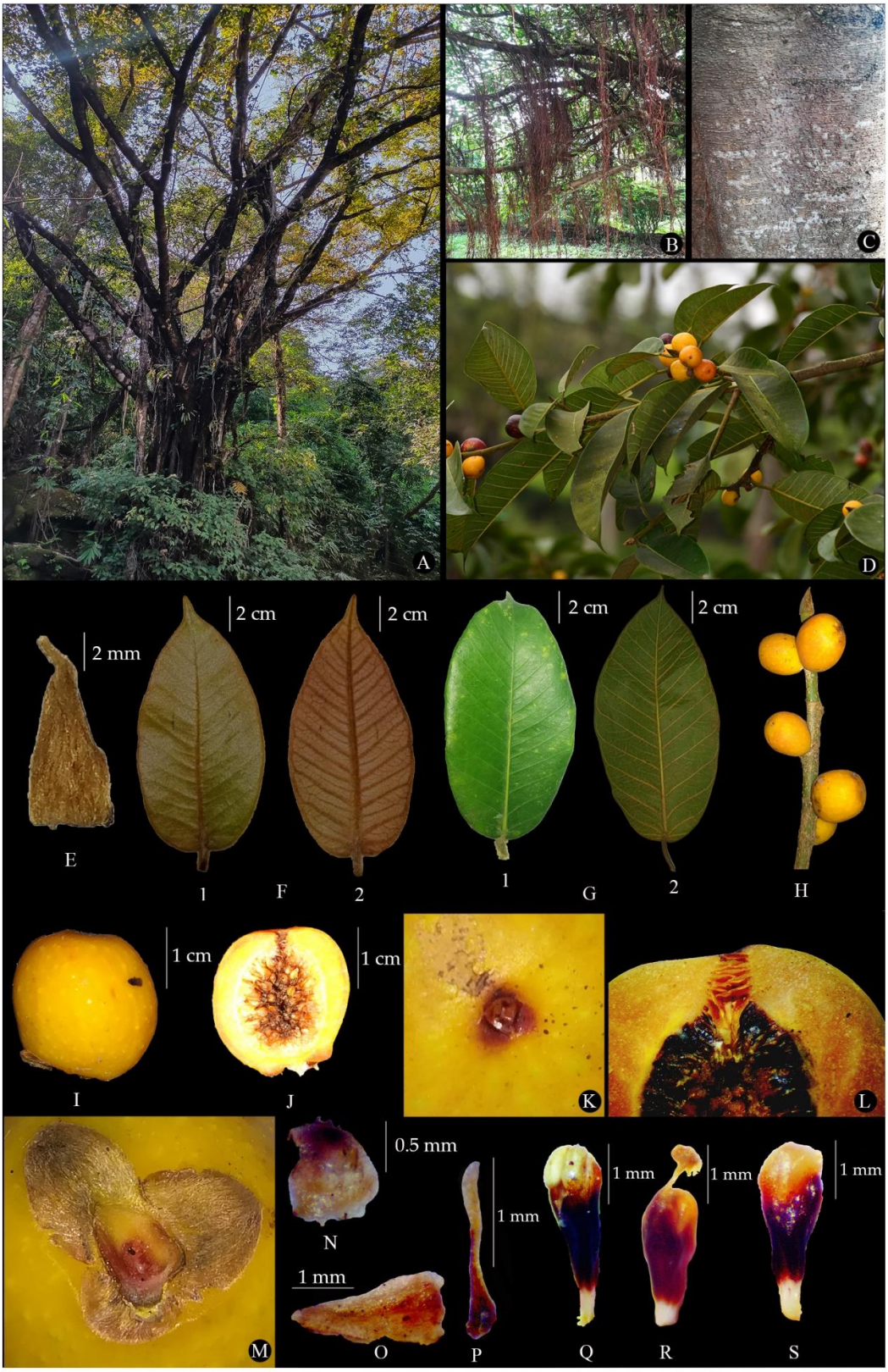


Fig. 3.41. ***Ficus drupacea*** Thunb.: **A.** Habit; **B.** Aerial roots; **C.** Bark; **D.** Twig; **E.** Stipule; **F.** Young leaf (1. Adaxial side; 2. Abaxial side); **G.** Mature leaf (1. Adaxial side; 2. Abaxial side); **H.** Receptacles; **I.** Syconium; **J.** Syconium L. S.; **K.** Ostiole; **L.** Ostiolar L. S.; **M.** Basal bract; **N.** Outer ostiolar bract; **O.** Inner ostiolar bracts; **P.** Tepal; **Q.** Male flower; **R.** Female flower; B Gall flower.

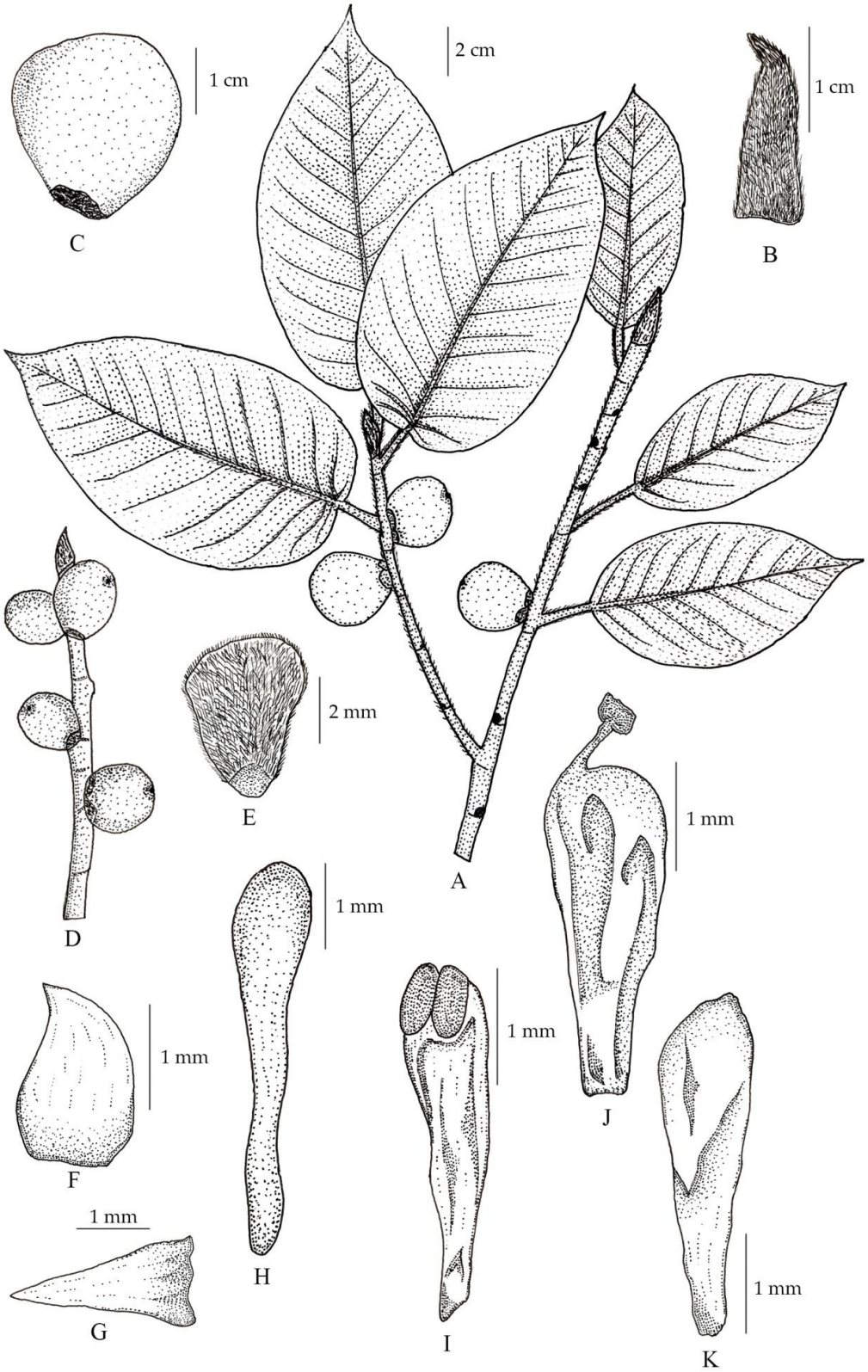


Fig. 3.42. ***Ficus drupacea*** Thunb.: **A.** Twig; **B.** Stipule; **C.** Syconium; **D.** Receptacles; **E.** Basal bract; **F.** Outer ostiolar bract; **G.** Inner ostiolar bract; **H.** Tepal; **I.** Male flower; **J.** Female flower; **K.** Gall flower.

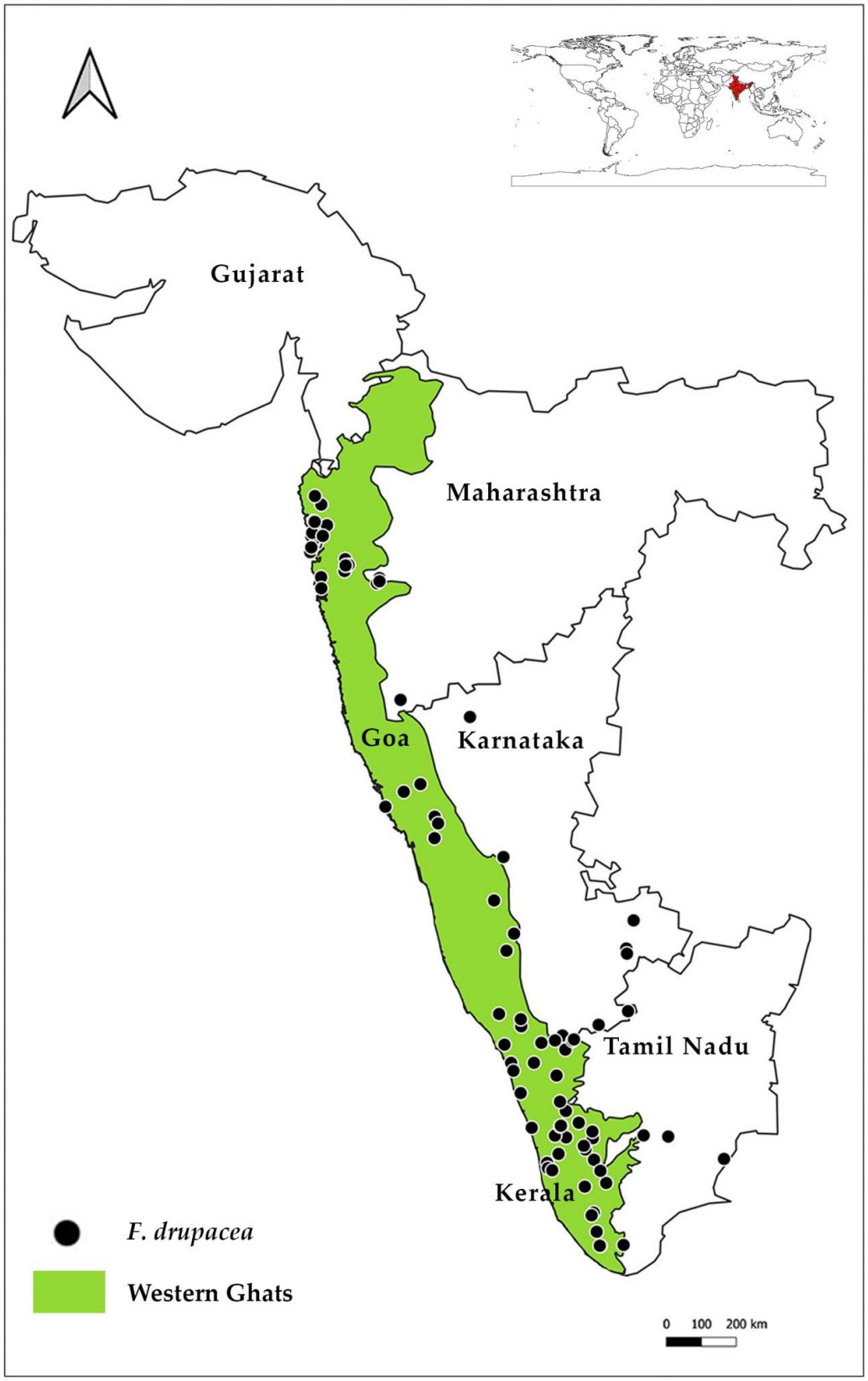


Fig. 3.43. *Ficus drupacea* Thunb. - Distribution map.

Notes: The species is a large strangler and exhibits a very common distribution. It is readily identified by the presence of the brown woolly hairs on the leaves and young stems. In the young stage the abaxial and the adaxial sides of the leaves are completely enveloped with shining brown hairs and on reaching maturity the adaxial side of the leaf becomes partially glabrous. Several varieties were proposed for the species and considering them as variations within species level, the varieties were merged under the species name (Berg & Corner, 2005) and is followed here. Santapau (1967), mentioned that aerial roots are absent in this species, even though not prominent like in *F. benghalensis,* we observed that the species produces aerial roots.

Specimens examined: India, **Goa,** South Goa District, Colem on way to Cananzol, 09 May 1963, *K.C. Kanodia 88506* (BSI); Nadquem, 27 April 1966, *John Cherian 109088* (BSI). **Karnataka,** Bangalore District: *s.loc.,* February 1918, *R.D.A B321* (MH); *s.loc.,* 1878, *G. King s.n.* (MH). Chamarajanagar District, Madeshwaramalai R. F., Kollegal Division, 733 m, 29 January 1984, B.*R. Ramesh & M. Deshayes HIFP BRR0756* (HIFP); Dhumanegathe, B. R. T. Wild Life Sanctuary, 03 April 2015, *J. Jayanthi 202848* (BSI); Bandipur, 950 m, 24 January 1965, *B.D. Naithani 23131* (MH); Kalhutty falls, 19 October 1974, *R. Sundara Raghavan 132511* (BSI). Coorg District, Kalhalla, 02 January 1959, *R.K. Arora 11983* (BSI). Hassan District, Sakleshpur (Saklaspur), 16 December 1903, *C.A. Barber 6201* (MH). Uttar Kannada District, Illore, April 1883, *W.A. Talbot 447* (BSI); Londa, forest bungalow, 20 April 1950, *H. Santapau 10802* (BLAT); Yellapur, 28 January 1954, *R.P. Patil 2729* (BSI); Yellapur, minor forest, 24 May 1954, *H. Santapau* 18703 (BLAT); *s.loc.,* 28 April 1905, *C.A. Barber 7073* (MH). **Kerala,** Alappuzha District: Olippuram, Sea level, 17 April 1977, *C.R. Suresh 22176* (CALI); Vandanam, Sea level, *C.N. Sunil 2577* (CALI).

Ernakulam District, Thattekad, 186 m, 03 November 2020, *Sreehari S. Nair & P.J. Ebin 12979* (MESAH). Idukki District. Meenmutty, 600 m, 14 February 1982, *C.N. Mohanan 73260* (MH); Erattayar, 15 October 1982, *C.N. Mohanan 74672* (MH); Adimaly, 20 March 1991, *A.E. Shannavas Khan 7534* (TBGT); Kokkara, P. T. R., 1160 m, 05 July 1993, *Jomy Augustine 12196* (KFRI). Kozhikode District, Muchukunnu kavu, Quilandy, 06 March 1994, *V. Sarojini Menon 12766* (TBGT). Malappuram District, Feroke, 30 August 1970, *V.V. Sivarajan 473* (CALI). Palakkad District, Mukkali Mannar ghat, 600 m, 26 April 1977, *E. Vajravelu 49778* (MH); below Mandampally forest, 300 m, 06 April 1978, *M.C. Nair 59906* (MH); *ibid.*, 550 m, 15 April 1978, *M.C. Nair 56836* (MH); Kaikatty, Nelliampathy, 825 m, 25 April 1984, *N. Sasidharan & Swarupand 3112* (KFRI); Mukkali forest, Silent Valley, 10 May 2019, *Sreehari S. Nair & K.H. Amitha Bachan 12905* (MESAH). Pathanamthitta District, Pookavanam, Plappally, 350 m, 29 February 1988, *N. Anil Kumar N542* (MH). Thiruvananthapuram District, Vallathodu kavu, 18 April 2015, *P. Suresh Kumar 8565* (KUBH). Thrissur District, Kapipatcha, Vaztiani, 250 m, 24 March 1988, *N. Sasidharan 5001* (KFRI); Sankukulangara Bhagavathy Kavu, Kodungallur, 13 May 1993, *A. Nazarudean 17481* (TBGT); Vazhachal forest, 180 m, 22 June 2008, *K.H. Amitha Bachan 123405* (CALI); *ibid.,* 180 m, 14 November 2009, *K.H. Amitha Bachan 117684* (CALI). Wayanad District, Nilambur, Vadapuram, 11 July 1982, *s.coll. 33421* (CALI). **Maharashtra,** Mumbai District, Victoria Garden, Bombay, February 1917, *s.coll. 15273* (BLAT); Tardeo, Bombay, March 1917, *s.coll. 15278* (BLAT); Victoria Garden, Bombay, April 1917, *s.coll 15299* (BLAT); Sion, Bombay, June 1918, *s.coll. 15271* (BLAT); National Park, Borivali, 12 February 1955, *P.S. Herbert SH540* (BLAT); Malad, Quarry hills, 06 June 1955, *G.L. Shah 4484* (BLAT); Malad, 09 June 1955, *G.L. Shah Shah4485* (BLAT); National Park, Borivali, 19 April 1956,

P.S. Herbert SH1629 (BLAT); Wadala, Bombay, 17 August 1956, *R.R. Fernandez R2594* (BLAT); *ibid.,* 17 August 1956, *R.R. Fernandez R2595* (BLAT); National Park, Borivali, 05 January 1958, *S.C. Tavakari T460* (BLAT); Near the tank, opposite to out post, 23 January 1958, *S.C. Tavakari T571* (BLAT); National Park, Borivali, 18 March 1958, *S.C. Tavakari T911* (BLAT); *ibid.,* 18 March 1958, *S.C. Tavakari T912* (BLAT); Near the tank, opposite to out post, 24 April 1958, *S.C. Tavakari T1133* (BLAT); *ibid.,* 24 April 1958, *S.C. Tavakari T1134* (BLAT); *ibid.,* 24 April 1958, *S.C. Tavakari T1135* (BLAT); *ibid.,* 24 April 1958, *S.C. Tavakari T1136* (BLAT); J. J. School of Arts, 05 November 1956, *R.R. Fernandez R3281* (BLAT); *ibid.,* 05 November 1956, *R.R. Fernandez R3282* (BLAT); Warden road, Bombay, October 1916, *s.coll. 1072* (BLAT); Vehar lake, Sabettle, *s.d., s.coll., 28884* (BLAT); Nashik District: Goregaon, 23 April 1954, *P.V. Bole s.n.* (BLAT). Pune District, College Garden, Pune, 09 May 1902, *L.D. Garade 92* (BSI); Karla, 30 April 1903, *G.A. Gammie 16229* (BSI); College Garden, Pune, 05 July 1910, *R.G. Jaualkar s.n*. (BSI); *s.loc.,* April 1917, *s.coll. 25469* (BLAT); Kate Pani Forest, Ambavane, Lonavla, 15 March 1964, *B. Venkata Reddi 96035* (BSI); *ibid.,* 25 March 1964, *B. Venkata Reddi 97698* (BSI); *ibid.,* 27 May 1964, *B. Venkata Reddi 97845* (BSI). Raigad District, Dadar, Bombay, 03 September 1957, *R.R. Fernandez R4298* (BLAT); *ibid.,* 03 September 1957, *R.R. Fernandez R4297* (BLAT). Ratnagiri District, Kerude forest, near Chikhali, 13 February 1970, *B.G. Kulkarni 12101* (BSI). Satara District, Khandala, St. Xavier's ravine, 21 March 1943, *H. Santapau 1748* (BLAT); *ibid.,* 11 June 1943, *H. Santapau 2166* (BLAT); *ibid.,* 17 April 1944, *H. Santapau 3986* (BLAT); *ibid.,* 17 April 1944, *H. Santapau 3988* (BLAT); *ibid.,* 17 April 1944, *H. Santapau 3987* (BLAT); *ibid.,*21 May1944, *H. Santapau 4270* (BLAT); *ibid.,* 21 May 1944, *H. Santapau 4271* (BLAT); Khandala, ravine below St. Xavier's villa, 13 April 1946, *H. Santapau 8809* (BLAT); Sativli forest, 13

May 1903, *G.K. Ryan 894* (BSI); Mumbra, 09 July 1954, *K.V. Shenoy KVS3727* (BLAT); *ibid.,* 23 September 1954, *K.V. Shenoy KVS534* (BLAT). **Tamil Nadu,** Anna District, Kodaikanal, Valley below Machur, 1000 m, 12 June 1987, *K.M Matthew 50113* (L). Coimbatore District, Kottady (Kottadi), 3500 ft, 14 March 1931, *K. Cherian Jacob 327* (MH). Dindugal District, Periaruvi R. F., Alagar Hills, 400 m, 13 June 1957, *K. Subramanyam 3476* (MH); Nilakkottai (Nillakotta), 1025 m, 10 April 1972, *K. Vivekananthan 40784* (MH); Madurai District, Lower camp to Kumily, 575 m, 23 June 1968, *D.B. Deb 30175* (MH). Nilgiri District, Mudumalai W. L. S., Benne Forest, Pattavayal, 1100 m, 18 July 1991, *D. Stephen 91389* (MH); Mudumalai W. L. S., Theppakadu (River side), 850 m, 18 December 1991, *D. Stephen 98100* (MH); Ayyar kolli forest, 900 m, 22 November 1972, *E. Vajravelu 42892* (MH); Moyar, November 1886, *J.S. Gamble V85* (MH). Ramanathapuram District, Vengapodai, Selur Hills, 500 m, 08 June 1979, *S. R. Srinivasan 61480* (MH). Tirunelveli District, Kalakad, Sengaltheri (Sengalltheri), 930 m, 26 January 1984, *N. Parthasarathy 661* (MH). Vellore District, on the way to Nellivasal, Singarapettai Hills, 03 April 1987, *M.B. Viswanathan 1397* (MH); Duphla Hills, 1874, J. L. Lister *s.n.* (MH); *s.loc.,* July 1889, *J.S. Gamble 20776* (MH); *s.loc.,* 28 May 1808, *Benjamin Heyne s.n.* (E).

3.6.15. *Ficus elastica* Roxb. ex Hornem.

Ficus elastica Roxb. ex Hornem., Hort. Bot. Hafn., Suppl. 7: 1819; Roxb., FI. Ind. 3: 541. 1832; Wight, Ic. Pl. Ind. Orient. 2: t. 663. 1843; Miq., Ann. Mus. Bot. Lugd.-Bat. 3: 265. 1867; Kurz., For. Fl. Brit. Burma. 444. 1877; King, Ann. Roy. Bot. Gard. (Calcutta) 1: 45, t. 54. 1887; Hook.f., Fl. Brit. lndia 5: 508. 1888; J. Cameron, For. Trees of Mysore and Coorg 276. 1894; T. Cooke, Fl. Pres. Bombay 2: 655. 1908; Rama Rao, Fl. Pl. Travancore 381. 1914; Brandis, Indian Trees 603. 1921; H.N. Ridley, Fl.

Malay Peninsula 334. 1924; U.N. Kanjilal *et al.,* Fl. Assam 4: 242. 1940; H. Santapau, Fl. Khandala 259. 1953; Corner, Gard. Bull. Singapore 21: 24. 1965; Corner in Dass. & Forsb., Rev. Handb. Fl. Ceylon 3: 261. 1981; R.S. Rao *et al.,* Fl. Goa Diu Daman Dadra & Nagar haveli 2: 411. 1986; V. Chithra in A.N. Henry *et al.,* Fl. Tamil Nadu Ind., Ser I: Analysis 2: 253. 1987; Kothari & Moorthy, Fl. Raigad Dist. 3: 379. 1993; N.P. Singh *et al.,* Fl. Mizoram 574. 2002; Singh *et al.,* Fl. Mizoram 574. 2002; T.K. Sarma & A.K. Sarkar, Fl. Palamau Dist. Jharkhand 576. 2002; K.G. Bhat, Fl. Udupi 595. 2003; Wu *et al.,* Fl. China 5: 41. 2003; Sasidh. & Sivar., Bio. Docu. Kerala part 6: Flow. Plant. 439. 2004; Berg & Corner in Nooteboom, Fl. Malesiana 17(2): 691. 2005; K.M. Chetty *et al.,* Fl. Pl. Chittoor Dist. 332. 2008; Berg *et al.,* Fl. Thailand 10(4): 621. 2011; Chaudhary *et al.,* Taiwania 57 (2): 212. 2012; T. Pullaiah, Fl. Telangana 2: 881. 2015; Sudhakar *et al.,* Figs of Eastern Ghats, India 115. 2017; Fl. Karnataka. A Check List 2: 508. 2019; S.S. Dash & A.A. Mao, Fl. Pl. India, 2: 540. 2020; R. Gogoi *et al.,* Fl. Sikkim 283. 2021. *Visiania elastica* (Roxb.) Gasp., Giorn. Bot. Ital. 2: 216. 1844. *Macrophthalmia elastica* (Roxb.) Gasp., Rendiconti Reale Accad. Sci. Fis. 25: 83. 1845; Ann. Sci. Nat. Bot., Sér. 3: 345. 1845. *Urostigma elasticum* (Roxb.) Miq., London J. Bot. 6: 578. 1847. *Stilpnophyllum elasticum* (Roxb.) Drury, Handb. Ind. Fl. 3: 225. 1869. **Type:** India, Roxburgh Icon. *No. 2141*. (CAL!).

Ficus elastica Roxb. var. *bengalica* Blume, Bijdr. 446. 1825. **Type:** Indonesia. Java, *s.d., Blume s.n.* (Isotype- L, L 0040045!).

Urostigma odoratum Miq., Pl. Jungh. 49. 1851; Fl. Ind. Bat. 1: 348, t. 24B. 1859. *Ficus elastica* Roxb. var. *odorata* (Miq.) Miq., Ann. Mus. Bot. Lugd.-Bat.

3: 265, 287. 1867. **Type:** Indonesia. Java, Bantam, *s.d., F.W. Junghuhn s.n.* (Isotype- L, L 0040046; U 0004610).

Urostigma circumscissum Miq., Pl. Jungh. 292. 1854; Fl. Ind. Bat. 1,2: 344. 1859. *Ficus elastica* Roxb. var. *minor* Miq., Ann. Mus. Bot. Lugd.-Bat. 3: 287. 1867. **Type:** Indonesia. Java, *s.d., F.W. Junghuhn s.n.* (Holotype- U, U 0004611!; L, L 0040044!).

Urostigma karet Miq., Fl. Ned. Ind. 1: 348. 1859. *Ficus elastica* Roxb. var. *karet* (Miq.) Miq., Ann. Mus. Bot. Lugd.-Bat. 3: 265. 1867. **Type** – Not found.

Ficus clusiifolia Summerh., J. Arnold Arbor. 10: 152. 1929, non Schott in Spreng. 1827. *Ficus skytinoderma* Summerh., J. Arnold Arbor. 14: 62. 1933; Diels, Bot. Jahrb. Syst. 67: 182. 1935. **Type:** Papua New Guinea, Sogeri, Papua, 16 November 1925, *L.J. Brass 641* (Holotype- K, K000871139!; Isotype- A, A00034671).

Fig. 3.44 – 3.46

Tree up to 15 m height, independent, aerial roots present; bark lenticellate, brown; young twigs terete, core solid, smooth, glabrous, pale green to brown; inter node 1.6–2.0 cm long; latex milky, white. Stipule caducous, lanceolate, 1.6–12.0 x 0.5–1.5 cm, margins entire, apex acute, base truncate, glabrous, purple to brown. Petiole articulated, terete, 1.3–4.2 cm long, glabrous, pale green to pale red. Leaves simple, alternate, spiral; lamina symmetric, lanceovate to ovate, 13.8–20.1 x 8.0–13.1 cm, margins entire, acumen 0.5–1.0 cm long, apex cuspidate, base obtuse to rounded, glabrous, pale green when young, dark green on maturity, coriaceous, venation brochidodromous; basal veins 3–4, lateral veins numerous, waxy gland at the base of the midrib. Receptacles axillary, paired, monoecious, sessile; basal bracts present, 1.0 mm, ovate, covered by bud covers when young,

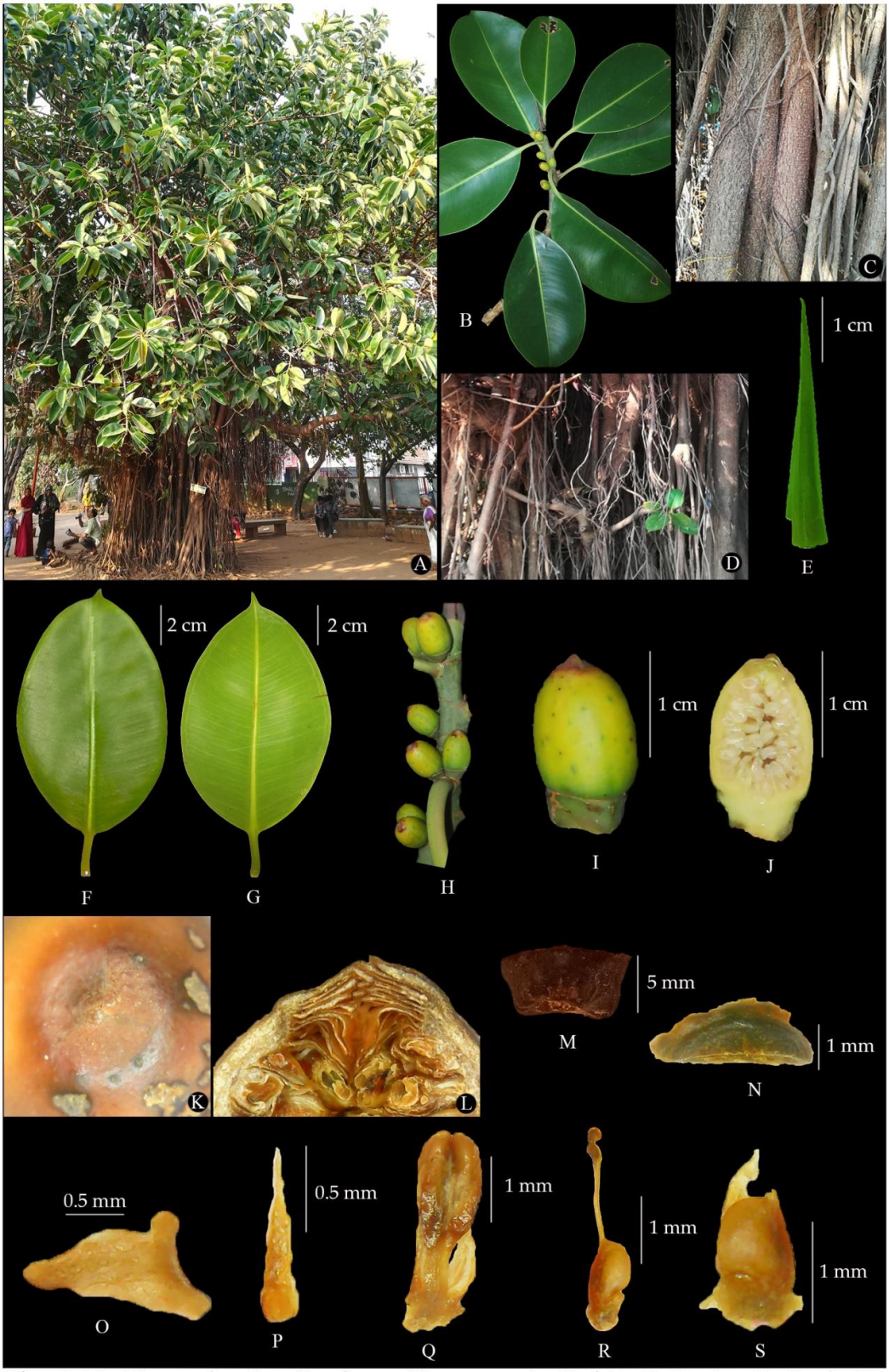


Fig. 3.44. ***Ficus elastica*** Roxb. ex Hornem: **A.** Habit; **B.** Twig; **C.** Bark; **D.** Aerial roots; **E.** Stipule; **F.** Leaf adaxial side; **G.** Leaf abaxial side; **H.** Receptacles; **I.** Syconium; **J.** Syconium L. S.; **K.** Ostiole; **L.** Ostiolar L. S.; **M.** Basal bract; **N.** Outer ostiolar bract; **O.** Inner ostiolar bract; **P.** Tepal; **Q.** Male flower; **R.** Female flower; **S.** Gall flower.

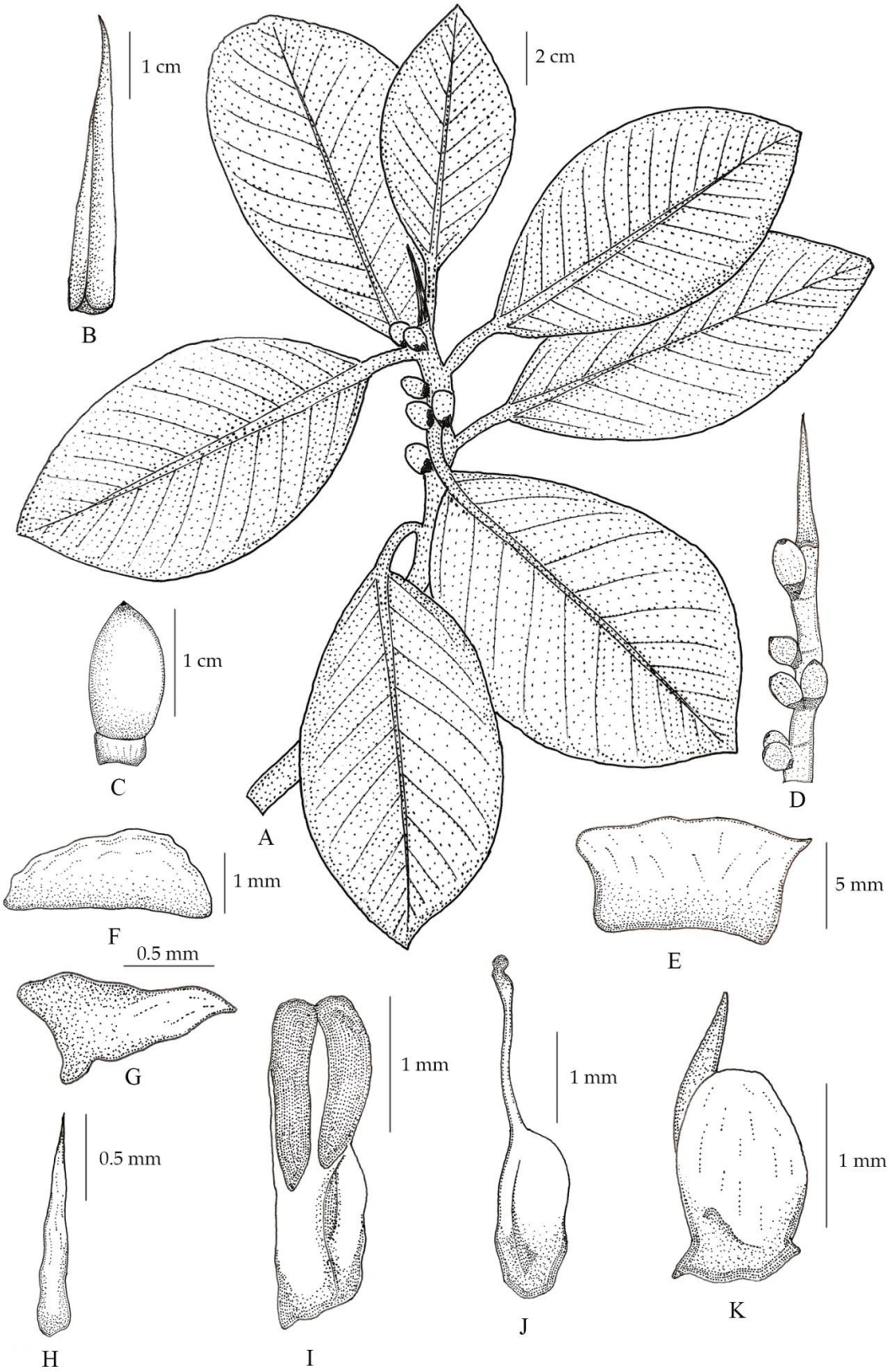


Fig. 3.45. ***Ficus elastica*** Roxb. ex Hornem: **A.** Twig; **B.** Stipule; **C.** Syconium; **D.** Receptacles; **E.** Basal bract; **F.** Outer ostiolar bract; **G.** Inner ostiolar bract; **H.** Tepal; **I.** Male flower; **J.** Female flower; **K.** Gall flower.

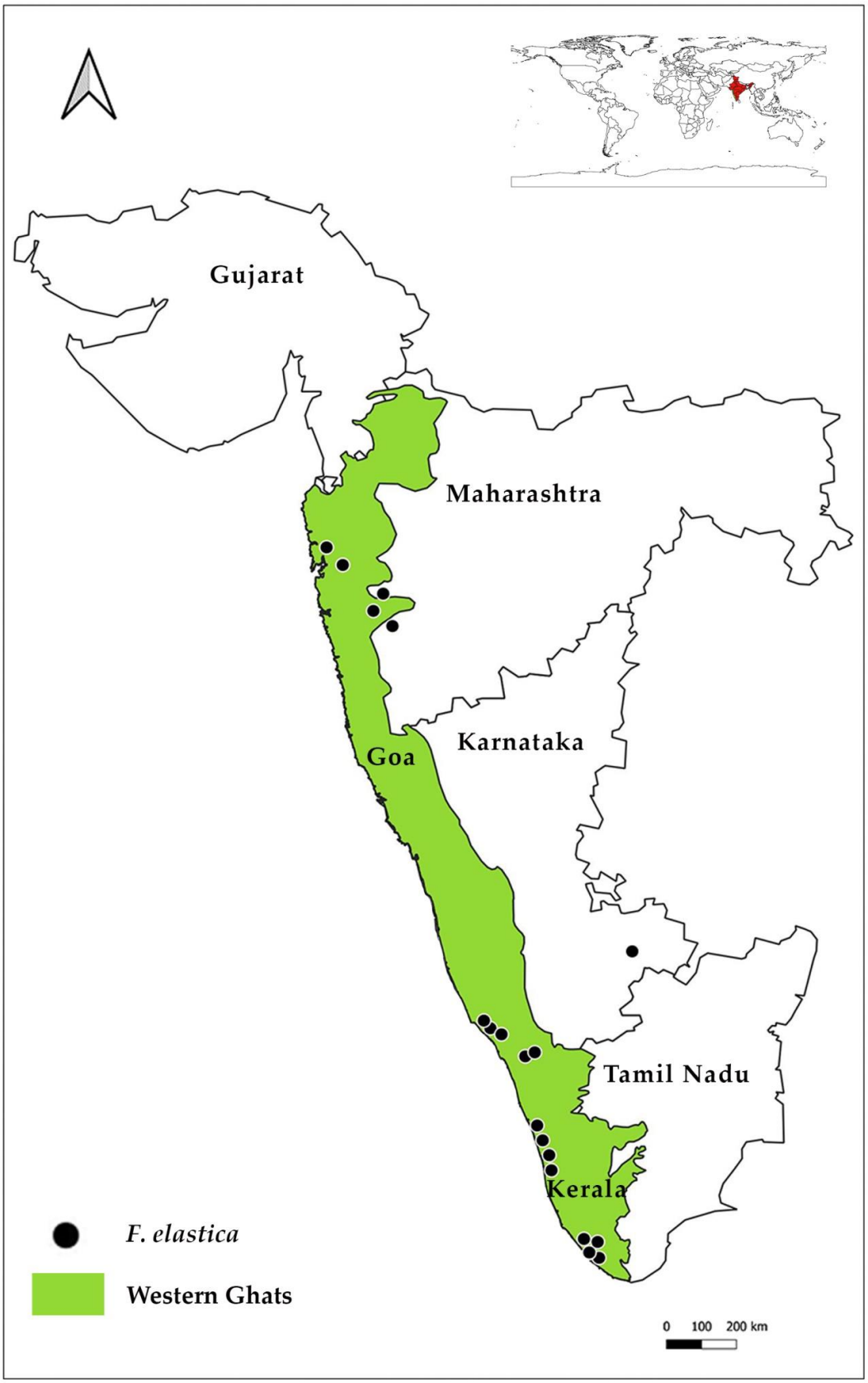


Fig. 3.46. *Ficus elastica* Roxb. ex Hornem - Distribution map.

forming a cup like structure when mature, glabrous, brown. Syconium 0.5–1.5 cm, oblong, glabrous, pale green when young, purple when mature. Ostiole 0.8–1.0 mm wide; outer bracts present, free, ovate, 4.0 mm long, glabrous, brown; inner bracts present, free, lanceovate, 1.2 mm long, glabrous, pale brown. Male flowers near the ostiole, 3.0 mm long, sessile; tepals 3–4, free, 1.5 mm long, lanceolate, glabrous, pale brown; stamen 1, anther 1.5 mm, filament 1.5 mm long. Female flowers scattered, few in number, 3.0 mm long, sessile; tepal 4, free, 1.5 mm long, lanceolate, glabrous, pale brown; stigma 0.5 mm; style 1.3 mm long; ovary 1.2 mm long, obovoid, glabrous, pale brown. Gall flowers scattered, 1.8 mm long, sessile; tepals 4, free, 1.0 mm long, lanceolate, glabrous, pale brown; stigma 0.2 mm; style 0.3 mm long; ovary 1.2 mm long, obovoid, glabrous, pale brown. Achenes 1.2–1.5 mm, trigonous, pale brown.

Local names: Nil.

Common names: Rubber fig, Indian rubber tree.

Flowering and fruiting: June – September.

Distribution: Native to North East India, Sikkim, Myanmar, Sumatra and Java. Cultivated in many parts of the world. In the study area, this species is commonly found cultivated or planted for avenue purposes.

Habitat: Found wild in the north eastern part of the country. Commonly planted as an ornamental tree.

IUCN status: Least Concern (LC).

Etymology: The milky latex produced by the plant gets solidified and becomes elastic like when exposed to air. Hence named '*elastica*'.

Uses: The plant is one of the sources of natural rubber (caoutchouc), which is obtained from the latex of the plant. Cultivated in Java and Assam since 1872 and 1874 for the commercial production of natural rubber. The bark of the tree is tapped to yield latex. And the tapping diminished after the introduction of the superior varieties of *Hevea brasiliensis*. The plant is considered to have medicinal properties used for the treatment of stomach problems and digestive disorders. Usually planted as ornamental tree.

Notes: This species seems to be native of the outer Himalayas, Assam and found naturally in the north eastern states of India. The plant shows variegated leaf pattern, along with the reddish-brown lamina being the most common. King (1887-1888; 1890) opined that even though a highly variable species, the plant can be easily distinguished by the close parallel venation pattern and the large sized stipules. In young stages the receptacles are covered by involucral hoods, that drops down as the receptacles mature leaving marks at the base.

Specimens examined: India, **Assam,** *s.loc., s.d., Masters s.n.* (L). **Kerala,** Kannur District, Taliparamba, 17 February 1913, *C.A. Barber 8770* (MH); Thalassery (Tellicherry), 75 m, 15 July 1978, *V.S. Ramachandran 57612* (MH); Near Municipal office, 75 m, 15 July 1978, *V.S. Ramachandran 57657* (MH). Thiruvananthapuram District, Vithura, 05 February 1997, *A. Nazarudean 21294* (TBGT); VSSC, Tumba, 18 March 2016, *Teema Joseph 87097* (TBGT); Kanakakkunnu, 07 February 2017, *Akhilesh S.V. Nair 9325* (KUBH). Thrissur District, Eriyad, Kodungallur, 21 April 2021, *Sreehari S. Nair 12157* (MESAH). **Maharashtra,** Mumbai District, Victoria Garden, Bombay, 01 January 1917, *s.coll. 15290* (BLAT); *ibid.,* 10 July 1956, *R.R. Fernandez R2396* (BLAT); *ibid.,* 10 July 1956, *R.R. Fernandez R2395* (BLAT). Pune District, College Garden, Pune, 07 April 1805, *L.D. Garade s.n.* (BSI). Raigad District, Matheran, along railway

line, 12 March 1959, *N.A. Irani NI3009* (BLAT); *ibid.,* 12 March 1959, *N.A. Irani NI3010* (BLAT); *ibid.,* 12 March 1959, *N.A. Irani NI3011* (BLAT). Satara District, Khandala, Khaud hotel, 06 July 1951, *H. Santapau 12871* (BLAT); *ibid.,* 06 July 1951, *H. Santapau 12872* (BLAT). **Tamil Nadu,** Madras District, *s.loc.,* December 1886, *J.S. Gamble 18509* (MH). Nilgiri District, Mavva Halla Estate, Bangalow, 1500 m, 04 December 1970, *G.V. Subba Rao 37459* (MH).

3.6.16. *Ficus exasperata* Vahl

Ficus exasperata Vahl, Enum. Pl. 2: 197. 1805; W.J. Hooker, London J. Bot. 231. 1848; Corner, Gard. Bull. Singapore 21: 74. 1965; Corner in Dass. & Forsb., Rev. Handb. Fl. Ceylon 3: 237. 1981; Manilal & Sivar., Fl. Calicut 275. 1982; A.K. Mukherjee, Fl. Pachmarhi & Bori Reserves 283. 1984; B.D. Sharma *et al.,* Fl. Karnataka: analysis 259. 1984; C.J. Saldanha, Fl. Karnataka 116. 1984; V. Chithra in A.N. Henry *et al.,* Fl. Tamil Nadu Ind., Ser I: Analysis 2: 253. 1987; B.G. Kulkarni, Fl. Sindhudurg 418. 1988; Manilal, Fl. Silent Valley 259. 1988; N.P. Singh, Fl. Eastern Karnataka 2: 585. 1988; V.S. Ramach. & V.J. Nair, Fl. Cannanore Dist. 432. 1988; Kesh. Murthy & S.N. Yogan. Fl. Coorg 421. 1990; Vajr., Fl. Palghat Dist. 447. 1990; K.M. Matthew, Excur. Fl. Central Tamil Nadu 483. 1991; Lakshmin. & B.D. Sharma, Fl. Nasik Dist. 440. 1991; Kothari & Moorthy, Fl. Raigad Dist. 3: 379. 1993; M. Mohanan & Henry, Fl. Thiruvanthapuram 432. 1994; D. Deshp. *et al.,* Fl. Mahabaleshwar and Adjoinings 2: 553. 1995; Subram., Fl. Thenmala Div. 352. 1995; Sasidh. & Sivar., Fl. Pl. Thrissur Forest 429. 1996; Sivar. & Mathew, Fl. Nilambur 665. 1996; T. Pullaiah & D.A. Moulali, Fl. Andhra Pradesh 2: 899. 1997; V. Mudgal *et al.,* Fl. Madhya Pradesh 2: 615. 1997; K.M. Matthew, Fl. Palni Hills 1181. 1999; N.P. Singh *et al.,* Fl. Maharashtra Dicot 2: 936. 2001; Mohanan & Sivadasan,

Fl. Agasthyamala 632. 2002; K.G. Bhat, Fl. Udupi 595. 2003; Sasidh. & Sivar., Bio. Docu. Kerala part 6: Flow. Plant. 439. 2004; Anil Kumar *et al.,* Fl. Pathanamthitta 464. 2005; S.G. Pradhan *et al.,* Fl. Sanjay Gandhi National Park 3: 574. 2005; Subba Rao & Kumari, Fl. Visakhapatnam Dist. 2: 217. 2008; Sunil & Sivadasan, Fl. Alappuzha Dist. 662. 2009; Mandar & Lakshmin., Fl. Bhagwan Mahavir 228. 2013; Bachan & Jisy, Meridian 5(1): 51. 2016; Sudhakar *et al.,* Figs of Eastern Ghats, India 52. 2017; Fl. Karnataka. A Check List 2: 508. 2019; Ficus sp. Madhya Pradesh 25. 2019; S.J. Britto, Fl. Central and North Tamil Nadu 972. 2019; S.S. Dash & A.A. Mao, Fl. Pl. India, 2: 540. 2020. **Type:** Ghana, Togo or Benin, 1785, *P.E. Isert s.n.* (Holotype- C, C10003859!).

Ficus serrata Forssk., Fl. Aegypt.-Arab. 179. 1775; Vahl., Enum. Pl. 2: 202. 1805; **Type:** Yemen, Bolghose, March 1763, P. Forsskal *s.n.* (Type- C, C10002284!).

Ficus scabra Willd., Mém. Acad. Roy. Sci. Hist. Berlin. t. 2. 1798. **Type:** Mozambique, Nhamacurra, 1909, *T.R. Sim 5644* (Holotype- PRE, PRE0371044-0!).

Ficus politoria Moon, Cat. Pl. Ceylon.74. 1824. **Type:** Not seen.

Ficus asperrima Roxb., Fl. Ind. 3: 554. 1832; King in Hook.f., Fl. Brit. India 5: 522. 1888; J. Cameron, For. Trees of Mysore and Coorg 286. 1894; H. Trimen, Handb. Fl. Ceylon 4: 94. 1898; Talbot, Trees Bombay 2: 330. 1902; Bourd., For. Trees Travancore 366. 1908; T. Cooke, Fl. Pres. Bombay 2: 653. 1908; Rama Rao, Fl. Pl. Travancore 383. 1914; H. Santapu, Fl. Khandala 258. 1953; Subramanian *et al.,* Fl. Palghat 123. 1987. **Type:** van Rheede 3: 79. t 60. 1682. Based on *F. asperrima.*

Ficus hispidissima Wight ex Miq., London J. Bot. 7: 229. 1848. **Type:** India, Peninsula Ind. Orientalis, Shewgherry hills, 1867, *R. Wight 2993* (Type- K, K000880218!).

Ficus punctifera Warb., Ann. Mus. Congo Belge, Bot., sér. 6, 1: 35. 1904. **Type:** Democratic Republic of the Congo, *s.loc., s.d., A. cabra 17* (Syntype- BR, BR0000006420239!).

Ficus silicea Sim., Forest Fl. Port. E. Afr. 102. 1909. **Type:** Mozambique, *s.loc.,* 1908, *T.R. Sim 5381* (Type- K, K000243363!).

Synoecia guillielmi-primi de Vriese, Synoecia Guillielmi I: 1. 1861. **Type:** Not seen.

Fig. 3.47 – 3.50

Medium tree up to 10 m height, independent, aerial roots absent; bark smooth, white to pale brown; young twigs terete, core solid, scabrous, brown; inter node 0.6–4.7 cm long; latex milky, white. Stipule caducous, lanceolate, 0.4–0.6 x 0.1–0.2 cm, margins entire, apex acute, base truncate, strigose on abaxial side, green to pale brown. Petiole articulated, terete, 1.1–2.9 cm long, strigose, pale green to pale brown. Leaves simple, alternate, spiral; lamina asymmetric or symmetric, lobed in young stages, highly variable, elliptic to lance ovate, 3.7–20.4 x 3.9–8.6 cm, margins serrate in young stages, entire on maturity, acumen 0.7–1.2 cm long, apex acute to acuminate, base obtuse when entire, scabrous, pale green when young, dark green on maturity, chartaceous, venation brochidodromous; basal veins 3, lateral veins 7–8 pairs, waxy glands on the axils of the lateral nerves beneath. Receptacles axillary, solitary, dioecious, pedunculate; peduncle 0.7-1.2 cm, scabrous, pale green to yellow; basal bracts absent. Syconium 1.3–2.2 cm across, globose, scabrous, green when young, red when mature; ostiole 0.5–

0.7 mm; outer bracts present, free, ovate, 0.8 mm long, strigose, pale brown; inner bracts present, free, lanceolate, 2.0 mm long, strigose, pale yellow to white. Male flowers near ostiole, 2.0 mm long, pedicellate; pedicel 0.5 mm long; tepals 3, free, 2.0 mm long, lanceolate, pubescent, white; stamen 1, anther 1.0 mm, filament 0.5 mm long. Female flowers at the base, 6.0 mm long, pedicellate; pedicel 2.5 mm, pubescent, white; tepals 6, free, 2.0 mm long, lanceolate, pubescent, white; stigma 0.2–0.3 mm long; style 0.5, mm long; ovary 1.5 mm long, obovoid, glabrous, white. Gall flowers scattered, 5.0 mm long, pedicellate; pedicel 2.5 mm, pubescent, white; tepals 6, free, 1.5 mm long, lanceolate, pubescent, white; stigma short; style 0.2 mm long; ovary 1.5 mm long, obovoid, glabrous, pale brown. Achenes 1.0–1.4 mm, oblong, pale yellow.

Local names: *Therakam* (Mal.); *Gargatti* (Kan.); *Irumbarattam* (Tam.); *Kharvat* (Mar.)

Common names: Sand paper tree.

Flowering and fruiting: February – May.

Distribution: The plant is native to Tropical Africa, Arabian Peninsula, India to Sri Lanka.

Habitat: Found in moist deciduous forests and also common in the plains.

IUCN status: Least Concern (LC).

Etymology: The species epithet probably denoted the rough texture of the leaves.

Uses: The leaves are rough in texture and were used for polishing wooden articles, ivory etc.

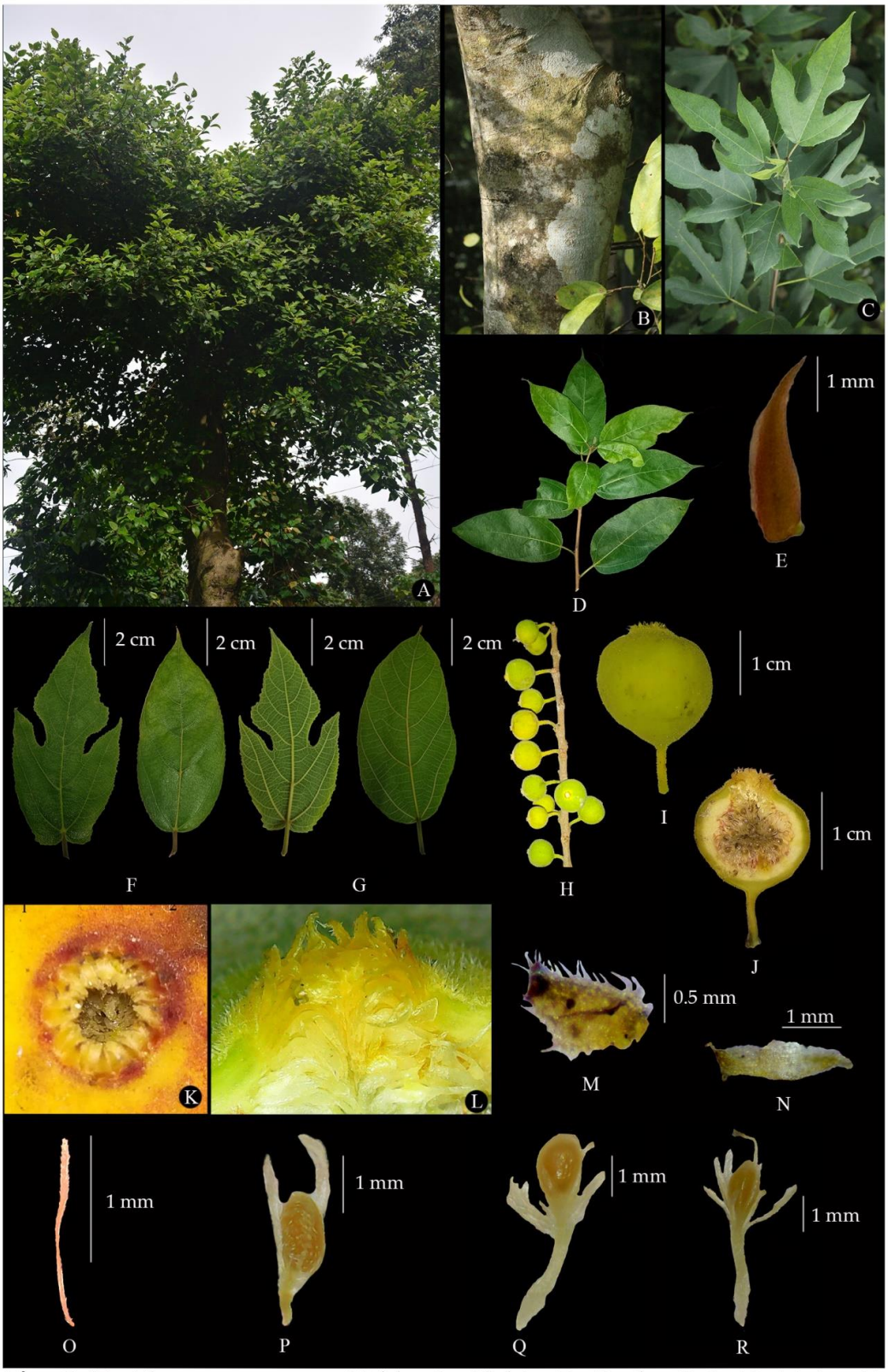


Fig. 3.47. ***Ficus exasperata*** Vahl.: **A.** Habit; **B.** Bark; **C & D.** Twig; **E.** Stipule; **F.** Leaf adaxial side; **G.** Leaf abaxial side; **H.** Receptacles; **I.** Syconium; **J.** Syconium L. S.; **K.** Ostiole; **L.** Ostiolar L. S.; **M.** Outer ostiolar bract; **N.** Inner ostiolar bract; **O.** Tepal; **P.** Male flower; **Q.** Female flower; **R.** Gall flower.

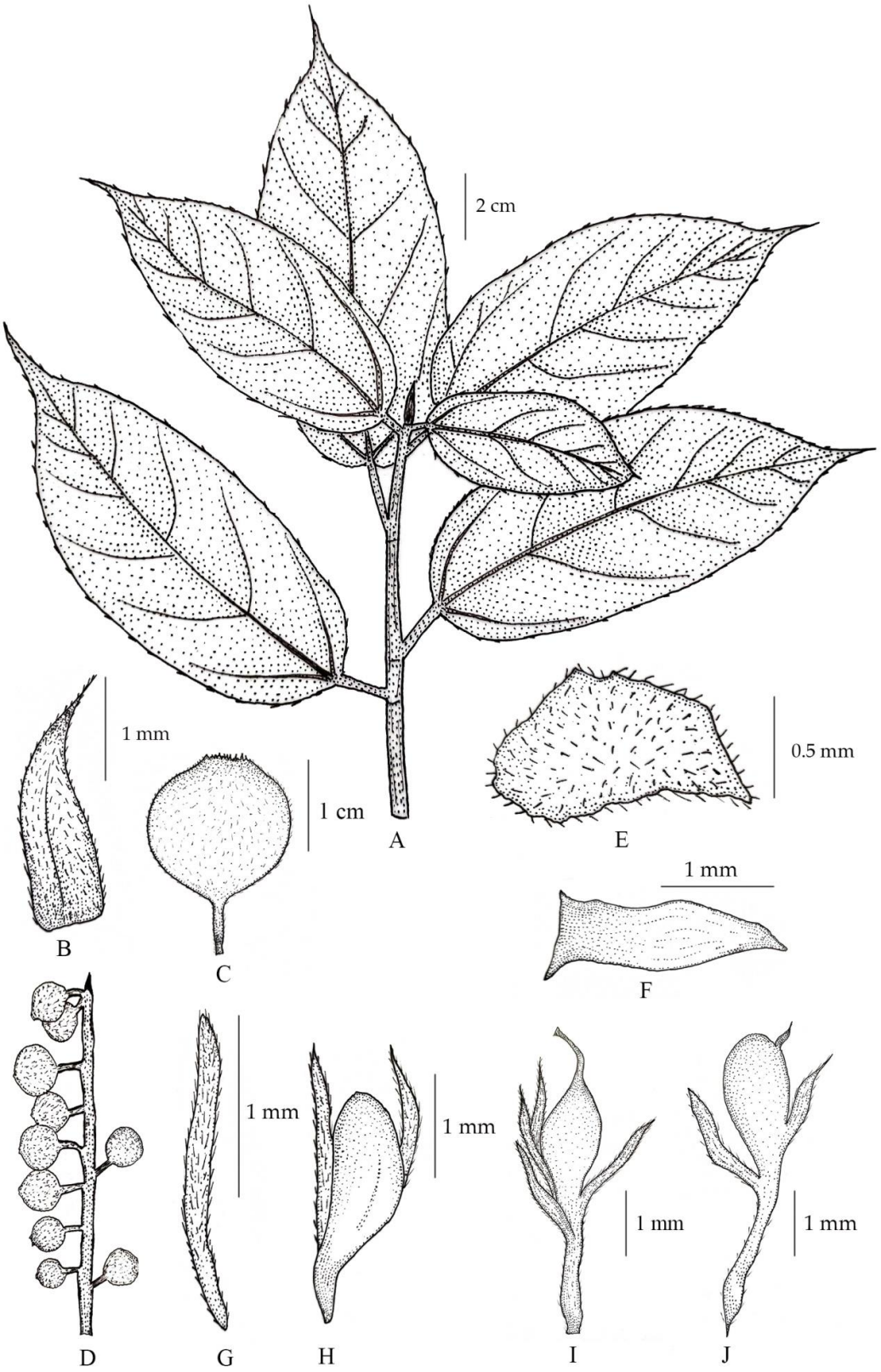


Fig. 3.48. ***Ficus exasperata*** Vahl.: **A.** Twig; **B.** Stipule; **C.** Syconium; **D.** Receptacles; **E.** Outer ostiolar bract; **F.** Inner ostiolar bract; **G.** Tepal; **H.** Male flower; **I.** Female flower; **J.** Gall flower.

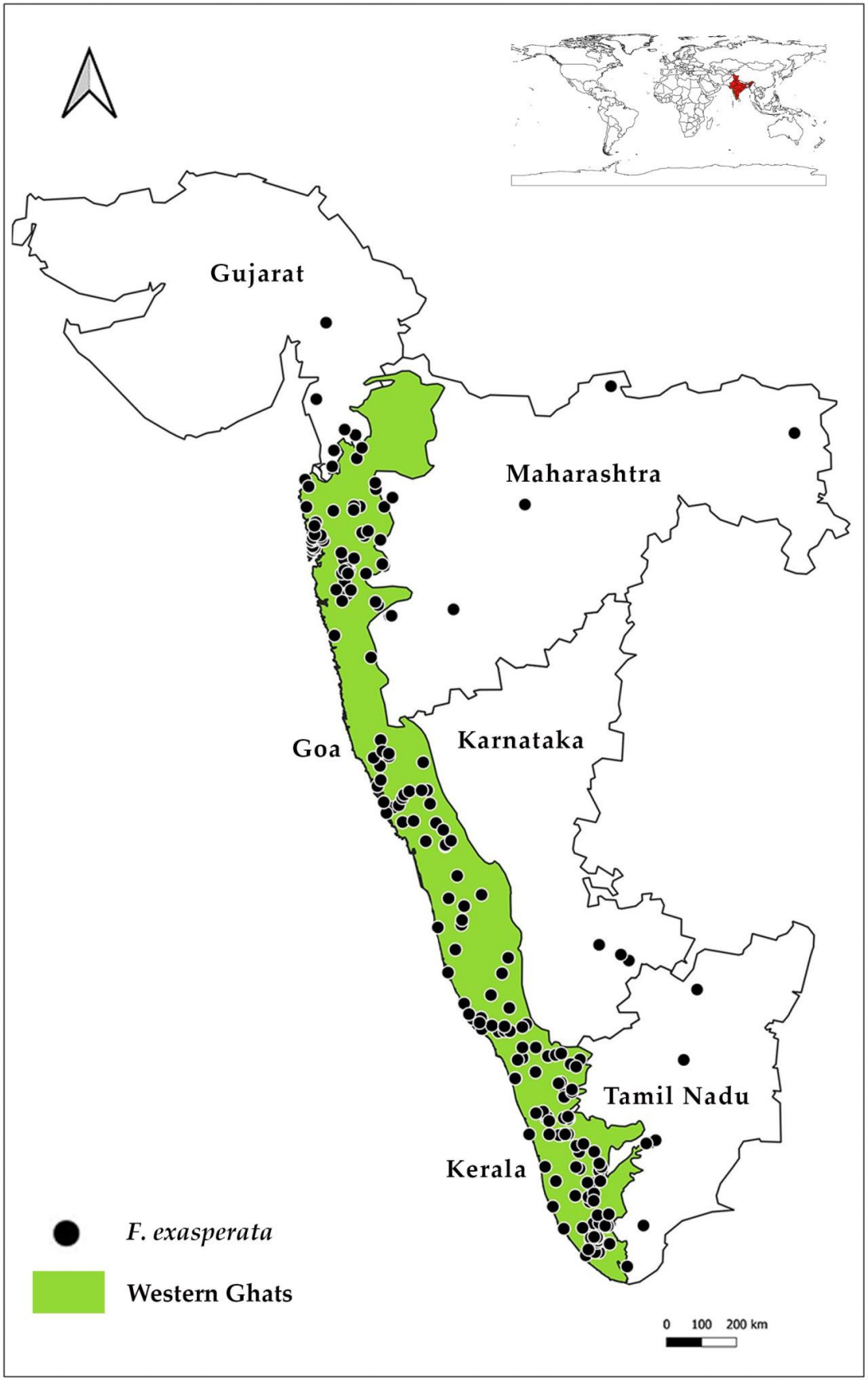


Fig. 3.49. *Ficus exasperata* Vahl. - Distribution map.

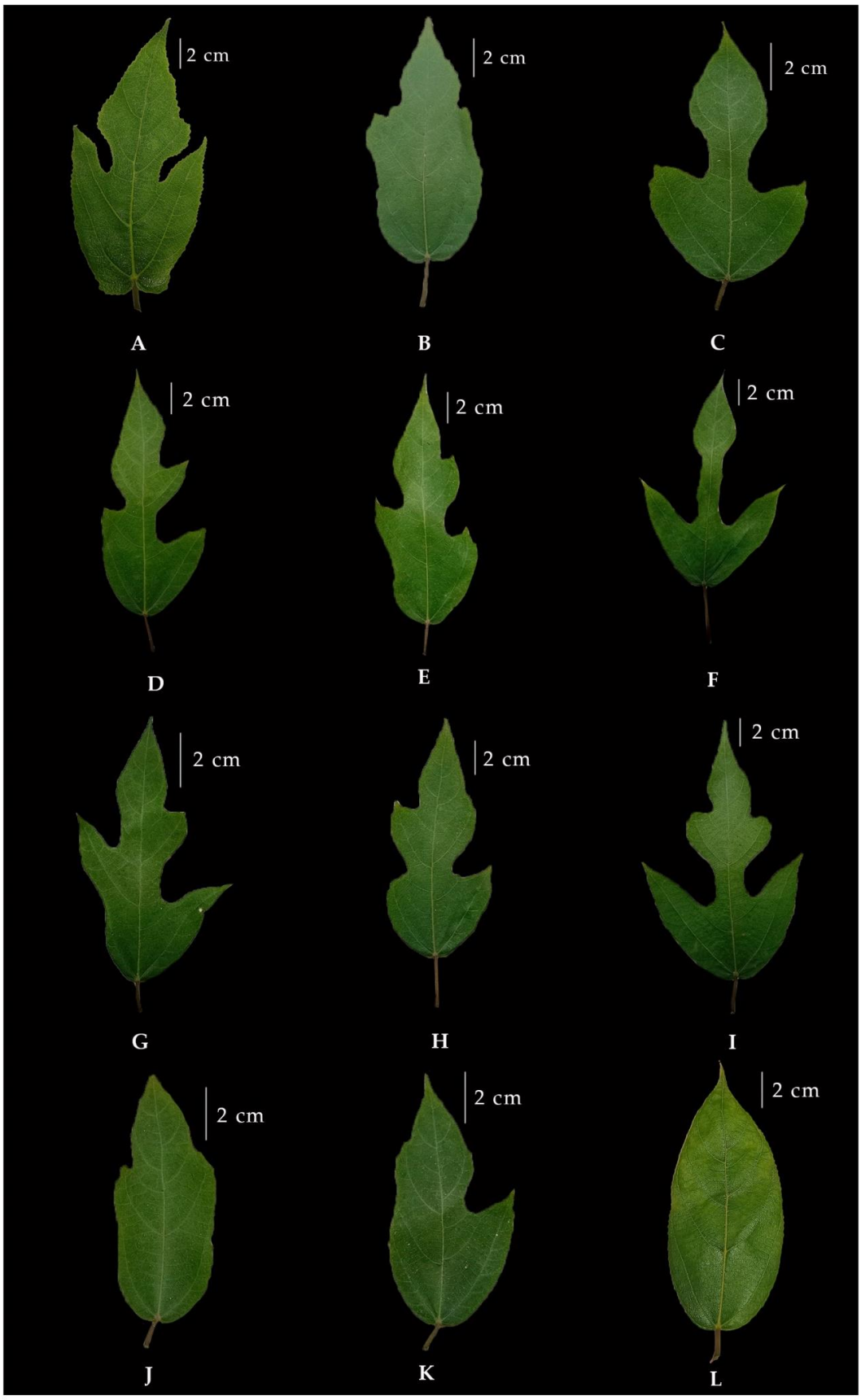


Fig. 3.50: A-L. Leaf variations in *Ficus exasperata* Vahl.

Notes: The plant produces lobed heteromorphic leaves in young twigs (Fig. 3.50). Corner (1981) mentioned the presence of opposite arrangement of leaves, but such a pattern is not observed in any of the plants of this species in our study. Cameron (1894) mentioned the tree as evergreen. But the tree sheds its leaves, especially during the fruiting stage. Male flowers were observed as sessile (Corner, 1981) while, in the present study the male flowers were found to be pedicellate.

Specimens examined: India, **Andhra Pradesh**, Alluri Sitharama Raju District, Towards Chinturu, 500 m, 15 February 1994, *M. Mohanan 101210* (BSID). East Godavari District, Maredumilli (Marudumilli), 501 m, 21 June 1965, *G.V. Subba Rao 24236* (MH); Maredumilli (Marudumilli), 500 m, 19 May 1966, *G.V. Subba Rao 27264* (MH); Puttagondhi lanka, Near Tadepalli, 450 m, 28 February 1987, *D. Narasimhan 85533* (BSID); Near Aadamanirhi gondi, Tadepalli, 10 April 1988, *N. Rama Rao & T. Ravi Shankar 86124* (BSID); Maredumilli (Marudumilli), towards Chintairu, 15 February 1994, *M. Mohanan 101210* (MH). Guntur District, Near Aadamanishi Gondi Tadepalle (Tedepalli), 10 April 1988, *N. Rama Rao & T. Ravisankar 86124* (MH); Amudarlanka (Mudurlanka), 600 m, 17 February 1994, *M. Mohanan 101246* (BSID & MH). Srikakulam District, Near Sawaraguda stream, between Gummada and Seetham peta, 16 May 1979, *G.V. Subba Rao 62444* (MH). Visakhapatnam District, near Dharkonda, Dharalamma Gudi, 1000 m, 21 April 1976, *G.V. Subba Rao 47410* (MH); *s.loc.*, 2000 ft, February 1885, *J.S. Gamble 16011* (MH). **Goa**, Dadra and Nagar Haveli District, Nana Randha, 08 November 1970, *M.Y. Ansari 122104* (BSI); Carchond forests, 13 November 1970, *M.Y. Ansari 126969* (BSI). North Goa District, Kuntal, 16 April 1966, *John Cherian 107139* (BSI). South Goa District, Foot of the hill Patini, Sanquem, 14 November 1962, *Seshagiri Rao Rolla 84766* (BSI); Tudal Valley,

Chalnimalo, 21 April 1963, *K.C. Kanodia 88182* (BSI); Nandore village side, 03 May 1963, *K.C. Kanodia 88377* (BSI); Pahad, near Nadquem, 15 March 1964, *K.C. Kanodia 96278* (BSI); Before Badsane village, 17 March 1964, *K.C. Kanodia 96345* (BSI); Mollem, 02 February 2003, *M.N.D 176993* (BSI). **Gujarat**, Anand District, Vasad soil conservation farm, 13 June 1958, *S.K. Jain 38672* (BSI). Dang District, Waghai, 30 December 1941, *H. Santapau 818* (BLAT); Unai, northwards along Ambika River, 31 October 1953, *H. Santapau 17044* (BLAT); Unai to Kalakaukra Hill, 01 November 1953, *H. Santapau 17134* (BLAT); Unai, eastwards, Dang Forest, 08 March 1954, *H. Santapau 18220* (BLAT); Unai, northwards to the river, Dang Forest, 09 March 1954, *H. Santapau 18269* (BLAT). Surat District, Velanja beat, 04 February 1983, *P.L. Narasimhan 165330* (BSI). Valsad District, Tapti, December 1916, *s.coll. 25386* (BLAT); Tali Forest, Dharamapur, 15 June 1958, *P.S. Toor 39178* (BSI). **Karnataka,** Belgaum District, Devarayi, September 1918, *s.coll. 30893* (BLAT). Chikkamagaluru District, Kalera, 28 October 1974, *R.S. Raghavan 134238* (BSI). Dakshina Kannada District, Moodbidri (Mudabidri), 15 March 1915, *s.coll. 11947* (MH). Hassan District, Bisle, 23 April 1958, *S.D. Mahajan 34839* (BSI); Sakleshpur (Saklaspur), Barguai, 18 December 1903, *C.A. Barber 6290* (MH); Barguai Estate, 28 April 1905, *C.A. Barber 7059* (MH). Kodagu District, Virajpet - Makut road, 07 January 1959, *R.K. Arora 46313* (BSI); Kalera, 15 May 1959, *R.K. Arora 55115* (BSI); Bhagamandala, 10 March 1960, *R.K. Arora 61562* (BSI). Nammakal District, Kolli hills, Semmedu, 25 March 2016, *Raja K. Swamy, Arun Singh, Navendu Page & K. Sankara Rao 658* (JCB). Shimoga District, Agumbe forests, 17 May 1960, *R. Sundara Raghavan 62589* (BSI); Ghat road, Agumbe, 20 May 1960, *R. Sundara Raghavan 62756* (BSI); Ghat road, Agumbe, 06 February 1961, *R. Sundara Raghavan 69385* (BSI); Agumbe, Someshwar ghat area, 18 June 1961, *R. Sundara Raghavan 74153* (BSI); Kundadgudda,

Agumbe, 15 May 1962, *R. Sundara Raghavan 80630* (BSI); Hulikal, Agumbe, 23 May 1962, *R. Sundara Raghavan 80916* (BSI); Kavaledurga, 11 February 1963, *R. Sundara Raghavan 86033* (BSI); Hulikal, 25 August 1963, *R. Sundara Raghavan 90222* (BSI); Kavaledurga, 17 March 1964, *R. Sundara Raghavan 96955* (BSI). Shivamogga District, Sagara, Kyasanur forest, 14 June 1961, *R. Sundara Raghavan 74066* (BSI). Udupi District, Nadugani forest, Mookambika W. L. S., 17 March 2007, *P.G. Diwakar & R.K.R. Singh 184215* (BSI). Uttar Kannada District, Yellapur road side, 02 July 1953, *R.P. Patil 2555* (BSI); Yekkambi, 24 April 1956, *G.S. Puri 1056* (BSI); Sirsi - Kumta road, 02 May 1956, *G.S. Puri 1738* (BSI); Kurkarni evergreen forest, 06 May 1956, *G.S. Puri 2030* (BSI); Yellapur, 16 November 1959, *S.K. Jain 3487* (BSI); Chipgi forest, Sirsi, 20 November 1959, *S. K. Jain 29079A* (BSI); Patwardhan garden, Sirsi, 20 November 1959, *S.K. Jain 29096A* (BSI); Kolabe, near P. W. D, 14 February 1962, *R. Sundara Raghavan 79412* (BSI); Anshi, *s.d., W.A. Talbot 2742* (BSI); Anmod Ghat, *s.d., W.A. Talbot 1811* (BSI); Devaurdue ghat, 17 March 1949, *J. Fernandez JF176* (BLAT); Londa, 10 November 1949, *J. Fernandez JF690* (BLAT); Londa, forest bungalow, 20 March 1950, *H. Santapau 10811* (BLAT); Manchikere, 30 May 1950, *J. Fernandez JF1611* (BLAT). **Kerala,** Alappuzha District, Panavally, Sea level, *C.N. Sunil 1585* (CALI). Idukki District, Cardamom hills, Travancore, 22 May 1952, *J. Fernandez s.n.* (BLAT); *ibid.,* 18 March 1953, *J. Fernandez JF310* (BLAT); *ibid.,* 23 March 1953, *J. Fernandez JF346* (BLAT); Kumily, 825 m, 24 December 1974, *K. Vivekananthan 45687* (MH); Kuttikanam, 1050 m, 19 November 1976, *K. Vivekananthan 46726* (MH); Way to Moolamattom, 700 m, 18 February 1982, *C.N. Mohanan 73347* (MH); Valara water falls, 1800 m, 19 March 1982, *R. Rajan 73076* (MH); Meenmutty, 600 m, 30 May 1982, *C.N. Mohanan 7407* (MH); Puliyanmala, 25 December 1983, *A. G. Pandurangan 66482* (MH); near I. B compound shed, Pindimedu,

Pooyamkutty, 50 m, 06 July 1988, *P. Bhargavan 87394* (MH); Way yo Anakulam, 100 m, 12 November 1991, *P. Bhargavan 98474* (BSID); Kurishumala, P. T. R., 1180 m, 15 January 1994, *Jomy Augustine 13053* (CALI & KFRI); Vallakkadavu, P. T. R., 800 m, 21 March 1994, *Jomy Augustine 13467* (KFRI); Forest near Pallivasal, 1225 m, 23 April 1964, *K.M. Sebastine 18389* (MH). Kannur District, Thaliparamba farm, 03 January 1900, *C.A. Barber 7885* (MH); *ibid.*, 13 June 1905, *C.A. Barber 7362* (MH); *ibid*., 19 May 1906, *C.A. Barber 7732* (MH); *ibid.*, 13 February 1913, *C.A. Barber 8674* (MH); Kannothumchal (Kannoth), 10 December 1913, *s.coll. 9557* (MH); Chandanathode, 920 m, 25 June 1965, *J.L. Ellis 25154* (MH); Way to Kannoth-Chandanathode, 575 m, 08 December 1967, *J.L. Ellis 29539* (MH); Cardamom Hills, 21 June 1976, *C.E. Ridsddale 208* (MH); Tellicherry, 75 m, 15 July 1978, *V.S. Ramachandran 57672* (MH); Kannoth R. F., 200 m, 18 June 1979, *V.S. Ramachandran 62662* (MH); Chandanathode, 840 m, 24 February 1979, *V.S. Ramachandran 61349* (MH); Kalliasseri, 125 m, 22 June 1980, *R. Ansari 64991* (MH); Madayippara slope, Near fort, 14 June 2012, *C. Pramod 133503* (CALI). Kasaragod District, Neeleswaram (Nileshwar), 50 m, 30 June 1980, *R. Ansari 67934* (MH). Kollam District, Tenmalai, 16 February 1959, *M.Y. Ansari 50002* (BSI); Cardamom reserve, 10 May 1959, *M.Y. Ansari 50850* (BSI); Thenmalai, 15 June 1960, *K.N. Subramanian 63071* (BSI); Thenmalai, Elderslay estate, 21 June 1960, *K.N. Subramanian 63305* (BSI); Ayyappankavu, Arienkavu reserve, 06 February 1961, *K.N. Subramanian 70308* (BSI); Rosemala, *s.d., Deepthi & V.S. Usha 76213* (TBGT). Kottayam District, Palliparai to Peruvanthanam, 525 m, 22 May 1965, *K. Vivekananthan 23974* (MH); *ibid.*, 525 m, 22 May 1965, *K. Vivekananthan 46841* (MH). Kozhikode District, Kommeri, 150 m, 22 August 1980, *V.S. Ramachandran 68246* (MH); Manjeshwar, 100 m, 30 December 1980, *R. Ansari 70067* (MH). Malappuram District, University Campus, 15

February 1971, *V.V. Sivarajan 987* (CALI); *ibid.,* 50 m, 27 October 1974, *Sumathy Kutty Amma CU5870* (CALI); *ibid.,* 50 m, 22 November 1975, *C.R. Suresh 10186* (CALI); Calicut Botany Garden, 05 February 1976, *E. Indira 11721* (CALI); University Campus, 50 m, 05 February1976, Mary Cherian CU12512 (CALI); *ibid.,*50 m, 05 February 1976, *Agnes Richard CU12097* (CALI); *ibid.,* 30 October 1986, *K. Laxmana 3502* (CALI); Nilambur, Nadkanichuram, 700 m, 30 October 1986, *T.G. Jaisonlal 4242* (CALI); Calicut University Campus, 50 m, 06 February 1989, *P. Elsie Ouseph 43373* (CALI). Palakkad District, Dhoni. R. F., 100 m, 27 May 1964, *E. Vajravelu 19095* (MH); Bhavani riverside 550 m, 20 July 1969, *E. Vajravelu 32202* (MH); Nelliampathy, 950 m, 05 January 1983, *Renuka & Mukesh 2696* (KFRI); Valiyaparatode, Silent Valley, 16 March 1983, *K.S. Prasanna Kumar 11169* (CALI); Nelliampathy, 04 February 1996, *K. Radhakrishnan 28101* (TBGT); Kathirampathy, 210 m, 04 January 2003, *M.K. Hari Narayanan HN210* (CALI); Way to Sappal hill, Dhoni R. F., 100 m, 27 May 1964, *E. Vajravelu 19095* (MH); Mukkali forest, 250 m, 29 May 1966, *E. Vajravelu 27719* (MH); Kaikatty orange farm area, 1000 m, 22 November 1973, *E. Vajravelu 44748* (MH); near Marappalam, Pothundy to Kaikatty, 525 m, 25 February 1975, *E. Vajravelu 45738* (MH); Muthukulam forest, 850 m, 29 April 1979, *E. Vajravelu 62981* (MH); Nelliampathy hills, 09 March 2020, *Sreehari S. Nair 12958* (MESAH). Pathanamthitta District, Moozhiar, 400 m, 10 January 1988, *Anil Kumar 298* (MH); Kullar river, Goodrical Range, 1000 m, 06 May 1988, *R. Chandrasekaran 88427* (MH); Pamba Valley, 250 m, 18 March 1989, *Anil Kumar 1619* (MH); Gurunathan mannu, 17 April 1991, *S. Binu 2188* (TBGT); Moozhiar, 07 May 1991, *R. Chandrasekaran 88446* (MH); Muringamangalam, Ranni R. F., 90 m, 19 November 1976, *s.coll. 49124* (MH); Moozhiar, 600 m, 20 March 1978, *C.N. Mohanan 54310* (MH); Achankovil R. F., Shenkatth Road, 22 April 1984, *E.*

Vajravelu 80569 (MH). Thiruvananthapuram District, Poovachal, 21 February 1957, *G.S. Puri 15753* (BSI); Ponmudi, 19 February 1959, *M.Y. Ansari 50208* (BSI); Forest near Neyyar dam, 175 m, 16 April 1973, *J. Joseph 44170* (MH); near over bridge junction, Thiruvananthapuram, 125 m, 20 March 1978, *M. Mohanan 54724* (MH); Way to Merchiston, 900 m, 25 May 1979, *M. Mohanan 63266* (MH); Palode, 10 May 1986, *N. Mohanan 3430* (TBGT); Bonaccord, 500 m, 17 October 1988, *N. Mohanan 4459* (CALI); *ibid.*, 500 m, 22 December 1988, *N. Mohanan 7927* (CALI & TBGT); Palode, 21 April 1992, *A. Nazarudean 14143* (TBGT); Bonaccord, 28 April 1993, *A. Nazarudean 17149* (TBGT); Brimore, 09 November 1995, *P. Deepthy Das 26287* (TBGT); Chippanchira, 28 February 1996, *s.coll. 27987* (TBGT); Bonaccord, 03 March 1997, *M. Sibi 32674* (TBGT); Kallar, 04 April 1998, *M. Abdul Jabbar 41287* (TBGT); Bonaccord, *s.d., N. Mohanan 4459* (TBGT). Thrissur District, Peechi, 60 m, 06 February 1979, *N. Sasidharan 499* (CALI & KFRI); Vazhachal, 230 m, 14 November 2009, *K.H. Amitha Bachan 117685* (CALI); Kuthiram R. F., Peechi range, 150 m, 18 May 1966, *K.M. Sebastine 27603* (MH); Kannankuzhi, 100 m, 12 September 1976, *K. Ramamurthy 48464* (MH); Near Vazhani dam, 100 m, 10 April 1977, *K. Ramamurthy 49285* (MH); Athirapilly Water Falls (Adirapilly), 350 m, 17 March 1982, *R. Rajan 73044* (MH); Sholayar R. F., 1000 m, 05 February 1984, *K. Ramamurthy 72782* (MH). Wayanad District, Thamarassery (Tambracheri Ghats), 21 January 1903, *C.A. Barber 5703* (MH); Tolpetty, 800 m, 09 July 1978, *V.S. Ramachandran 57502* (MH); Chandanathode, 28 January 1987, *T. Balakrishnan 42742* (CALI); Thirunelly, 18 January 1995, *K. Radhakrishnan 23750* (TBGT); Meenangadi, 26 October 2020, *Sreehari S. Nair & P.J. Ebin 12975* (MESAH). **Maharashtra,** Amravathi District, Samadoh, 25 July 1978, *M.Y. Ansari 149378* (BSI). Beed District, Rajwadi, 22 July 1967, *John Cherian 111288* (BSI). Mumbai District, Malad, Quary hill point, 25 January 1955, *G.L.*

Shah Shah1579 (BLAT); Malad, Quary hills, 25 January 1955, *G.L. Shah Shah1578* (BLAT); *ibid.,* 25 January 1955, *G.L. Shah Shah1578* (BLAT); Borivali National Park, 22 February 1955, *P.S. Herbert SH570* (BLAT); Malad, Quary hills, 27 February 1955, *G.L. Shah Shah1775* (BLAT); *ibid.,* 27 February 1955, *G.L. Shah Shah1776* (BLAT); Manol - Vehar lake, 13 March 1955, *P.V. Bole Bole1345A* (BLAT); Malad, Quary hills, 06 June 1955, *G.L. Shah Shah4460* (BLAT); Borivali National Park, 29 October 1955, *P.S. Herbert SH859* (BLAT); Borivali National Park, 02 February 1956, *P.S. Herbert SH1342* (BLAT); *ibid.,* 02 February 1956, *P.S. Herbert SH1341* (BLAT); Malad, Quary hills, 03 February 1957, *G.L. Shah Shah8602* (BLAT); Madh Island, Bombay, 22 December 1957, *G. L. Shah Shah9644* (BLAT); Malad hills, 25 December 1957, *G.L. Shah Shah9668* (BLAT); *ibid.,* 25 December 1957, *G.L. Shah Shah9669* (BLAT); *ibid.,* 02 February 1958, *G.L. Shah Shah9715* (BLAT); Station to U12, 23 March 1958, *S.C. Tavakari T922* (BLAT); Central dairy, Borivali road via U7, 27 March 1958, *S.C. Tavakari T969* (BLAT); Central dairy to Goot guest house, 02 April 1958, *S.C. Tavakari T1019* (BLAT); Central dairy to cattle rearing unit, 07 April 1958, *S.C. Tavakari T1050* (BLAT); Madh Island, Bombay, 10 May 1958, *G.L. Shah Shah9823* (BLAT); Malad, Quary hills, 10 May 1958, *G.L. Shah Shah9822* (BLAT); *ibid.,* 26 September 1958, *G.L. Shah Shah9982* (BLAT); Madh Island, Bombay, 22 December 1958, *G.L. Shah Shah9645* (BLAT); Central dairy, Borivali road via U8, 27 March 1959, *S.C. Tavakari T970* (BLAT); Borivali National Park, 30 June 1961, *M.Y. Ansari 32722* (BSI); *ibid.,* 22 July 1961, *G.L. Shah Shah10355* (BLAT); Sion wood, Bombay, December 1915, *s.coll. 15630* (BLAT); Sion, Bombay, December 1915, *s.coll. 15287* (BLAT); *ibid.,* February 1917, *s.coll. 16701* (BLAT); *ibid.,* July 1917, *s.coll. 15300* (BLAT); Kanheri caves. November 1918, *s.coll. 28692* (BLAT); *s.loc., s.d., S.C. Tavakari T727* (BLAT). Nashik District, Utawada foot hill, Vihigaon range, 20 October

1967, *K.V. Billore 112966* (BSI); Thul ghat tunnel No. 5, Vihigaon range, 03 June 1968, *K.V. Billore 116139* (BSI); Bavandagad, 11 February 1983, *P.L. Narasimhan 165424* (BSI); Sowarna point, 11 May 1983, *P.L. Narasimhan 163949* (BSI); Boargad, 16 May 1983, *P.L. Narasimhan 163960* (BSI); Barhe, 08 August 1983, *P.L. Narasimhan 165228* (BSI); Palghar District: Chandip, 19 February 1961, *N.Y. Das NYD3108* (BLAT); *ibid.*,19 February 1961, *N.Y. Das NYD3112* (BLAT); *ibid.,* 19 February 1962, *N.Y. Das NYD3111* (BLAT); *ibid.,* 19 February 1963, *N.Y. Das NYD 3110* (BLAT); *ibid.,* 19 February 1964, *N.Y. Das NYD 3109* (BLAT). Palghar District, Khumava range forest, Bordi range, 11 January 1968, *K.V. Billore 113456* (BSI); *ibid.,* 11 January 1968, *K.V. Billore 113452* (BSI); Pune District: Lonavli, 03 May 1903, *G.A. Gammie 16248* (BSI); Thangaon, 15 February 1958, *Mahajan 32112* (BSI); Durga, Vhamal, near Gadwad, Khed Taluka, 06 December 1961, *K.P. Janardhanan 76327* (BSI); Sindoli hill, Khed Taluka, 25 December 1961, *K.P. Janardhanan 70195* (BSI); Kune village, 08 March 1962, *Seshagiri Rao Rolla 77862* (BSI); Saltar forest, Ambavane, 25 December 1963, *B. Venkata Reddi 93461* (BSI); Forest at base of fort, Ambavane, Lonavla, 31 January 1964, *B. Venkata Reddi 95823* (BSI); Sakanpathas Plateau, at turning point to INS Shivaji, Ambavane, Lonavla, 29 February 1964, *B. Venkata Reddi 96131* (BSI); Forest near rest house, Ambavane, 31 March 1964, B. *Venkata Reddi 97678* (BSI); Bhivade khund, Durga khilla, Junnar, 15 May 1964, *K. Hemadri 89925* (BSI); On road side at Ghusalgaon village, Lonavla, 25 July 1964, *B. Venkata Reddi 99280* (BSI); Forest above Burhi lake, Pune, 29 July 1964, *B. Venkata Reddi 97980* (BSI); Bhivadikhurol, Durga Khilla, Junnar, *s.d., K. Hemadri 89925* (BSI). Raigad District, Karjat, 05 August 1950, *H. Santapau 11082* (BLAT); Neral, Jummapatti, 29 July 1959, *N.A. Irani NI4280* (BLAT). Ratnagiri District, Way to Amboli ghat via Kumbheshwar, 18 May 1965, *R.D. Pantankar 105219* (BSI);

Banda, Jamboli road – Sawdntwadi, 02 July 1965, *John Cherian 105536* (BSI); Parwadwadi, 3 km from Ghotge, 11 February 1966, *B.G. Kulkarni 107854* (BSI); 1 KM west of Akeri, 15 February 1966, *B.G. Kulkarni 107787* (BSI); Lingasakhal, 8 KM from Chankul, 30 April 1966, *B.G. Kulkarni 108574* (BSI); Dirbagachi range, Naradave,17 February 1970, *B.G. Kulkarni 120157* (BSI); Ramghat, Bhedshi, 25 April 1971, *B.G. Kulkarni 129322* (BSI); Damoli, January 1922, *R.D. Aclaud ACK1151* (BLAT). Satara District, Khandala, 17 May 1942, *H. Santapau 389* (BLAT); *ibid.,* 27 May 1942, *H. Santapau 484* (BLAT); Khandala, St. Xavier's villa, 29 December 1942, *H. Santapau 14443* (BLAT); *ibid.,* 29 December 1942, *P.S. Herbert 1444* (BLAT); *ibid.,* 29 December 1942, *H. Santapau 14442* (BLAT); Khandala, Kuve stream and fields, 05 November 1943, *H. Santapau 3053* (BLAT); Khandala, Convalu House, 13 March 1944, *H. Santapau 3732* (BLAT); Khandala ecopoint, 17 June 1944, *H. Santapau 4533* (BLAT); Khandala, 12 August 1956, *N.A. Irani NI 2100* (BLAT); Koyna, 07 September 1978, *R.K. Kochhar 154109* (BSI); Nawaja. 14 April 2008, *M.P. Nayar 153138* (BSI); Khandala, April 1941, *H. Santapau 77(2)A* (BLAT); *ibid.,* July 1916, *s.coll. 25523* (BLAT); *ibid.,* March 1917, *s.coll. 25478* (BLAT); *ibid.,* March 1917, *s.coll. 25354* (BLAT); *ibid.,* May 1917, *s.coll. 25448* (BLAT); *ibid.,* October 1918, *H. Santapau 27497* (BLAT); Khandala, Tiger's leap jungle, October 1918, *H. Santapau 27539* (BLAT). Sindhudurg District, Dukanwad, 05 June 1970, *B.G. Kulkarni 121047* (BSI). Thane District, Shelta forests, 29 January 1903, *G.A. Ryan 375* (BSI); Khandi, 28 February 1903, *s.coll. 792* (BSI); Moroshi, 31 March 1943, *H. Santapau 1804* (BLAT); Ghodbunder, 23 January 1954, *H. Santapau 17923* (BLAT); Mumbra, 12 November 1954, *K.V. Shenoy KVS5371* (BLAT); Belpoda, Murbad range, 09 June 1967, *K.V. Billore 110878* (BSI); Nane ghat, Tokawada range, 625 m, 13 June 1967, *K.V. Billore 119029* (BSI); *ibid.,* 725 m, 14 June 1967, *K.V. Billore 110942* (BSI); Chahad Khind,

Palghar range, 15 January 1968, *K.V. Billore 113597* (BSI); Panchami Plateau, Tokawada range, 19 November 1968, *K.V. Billore 115722* (BSI); *ibid.,* 19 November 1968, *K.V. Billore 115823* (BSI); Forest behind nursery, 03 June 1978, *R.K. Kochhar 153521* (BSI); Dungani Pada, 11 December 1996, *N. Bhanumathi 35* (TBGT); Kasara, October 1917, *s.coll. 25368* (BLAT); *ibid.,* October 1918, *s.coll. 25367* (BLAT). **Odisha**, Dhenkanal District, Kapilas Hill, 27 March 1975, *s.coll. 11182* (BSID). Ganjam District, Mahendragiri R. F., 03 January 1900, *J.S. Gamble 13933* (MH). **Tamil Nadu**, Coimbatore District, Udumanparai, Anamalais, 13 May 1903, *C.A. Barber 5876* (MH); Siruvani, 26 February 1957, *C.A. Barber 2447* (MH); Mylon's Banglow to Siruvani adivaram foot path, 900 m, 30 May 1957, *K. Subramanyam 3078* (MH); Cardamom plantation, Valparai, 575 m, 18 April 1963, *J. Joseph 16206* (MH); Nedungundra Velomie, Valparai, 1000 m, 23 March 1990, *V.B. Hosagoudar 92437* (MH). Dindugal District, Kodaikanal Ghats, 02 July 1901, *Bourne 2083* (MH); Sirumalais, *s.d., J. Pallithanam JP4751* (BLAT). Kanchepuram District, Nedungundram (Nedungundra), Anamalai, 1000 m, 23 December 1990, *V.B. Hosagoudar 94523* (MH). Kanyakumari District, Balannore to M. K. Vayal, 600 m, 18 January 1978, *A.N. Henry 52411* (MH); way to valve house from Chinnakuttiyar dam, upper Kodayar, 1300 m, 28 March 1984, *R. Gopalan 81471* (MH). Madurai District, Way to Kumily, 950 m, 23 April 1960, *B.V. Shetty 10261* (MH). Nilgiri District, Gudallur, 875 m, 11 March 1969, *D.B. Deb 31663* (MH); Kotagiri to Tultapallam, 1300 m, 18 May 1971, *E. Vajravelu 38439* (MH); way to Barham Ouchterlony Valley, 1075 m, 31 May 1971, *J.E. Ellis 38562* (MH); Nilakottai (Nillakotta), 1025 m, 10 April 1972, *K. Vivekananthan 40782* (MH); Gudalluer, Cherambadi, 860 m, 22 July 1972, *E. Vajravelu 41759* (MH); Devala, Pandalur forest, 925 m, 25 November 1972, *E. Vajravelu 43479* (MH); *ibid.,* 875 m, 22 February 1973, *E. Vajravelu 43673* (MH). Tenkasi

District, Courtallam, 27 June 1901, *C.A. Barber 3318* (MH); *ibid.,* 29 June 1901, *C.A. Barber 3317* (MH); Kallimalai Estate, Sivagiri Hills, 1000 m, 28 September 1991, *S.R. Srinivasan 98307* (BSID); Courtallum, Plantation above village, 800 m, 06 June 1976, *C.E. Ridsddale 31* (MH); Forest above five falls, Courtallum, 17 April 1984, *E. Vajravelu 80514* (MH). Tirunelveli District, Kollimalai, 01 November 1914, *s.coll. 11379* (MH); Kudaynallur, 25 September 1917, *s.coll. 15193* (MH); Kudirai katti, Panagudi, 760 m, 12 February 1972, *S. Karthikeyan 40091* (MH); Cardamom Hills, Munnar-Periyar road, 21 June 1976, *C.E. Ridsdale RHL CER208* (HIFP); Karayar, 15 June 1988, *N. Mohanan 4978* (TBGT); Kallimala estate, Sivagiri hills, 1000 m, 28 September 1991, *S.R. Srinivasan 98307* (MH); Mayilodai estate, 700 m, 08 January 2003, *C. Murugan 116006* (MH).

3.6.17. *Ficus fergusonii* (King) T. B. Worth. ex Corner

Ficus fergusonii (King) T. B. Worth. ex Corner, Dassan. & Fosberg, Rev. Handb. Fl. Ceylon 3: 253.1981; Priyadarsanan, J. Bombay Nat. Hist. Soc. 96 (3): 492. 1999; Sasidh., Biodiv. Doc. Kerala 6. Fl. Pl.: 439. 2004; Chaudhary *et al.,* Taiwania 57 (2): 212. 2012; N.C.M. Reddy *et al.,* Indian J. For. 43(2): 143. 2020; S.S. Dash & A.A. Mao, Fl. Pl. India, 2: 540. 2020. *Ficus altissima* Blume var. *fergusonii* King, Ann. Roy. Bot. Gard. (Calcutta) 1: 31, t. 31. 1887; Trimen, Handb. Fl. Ceylon 4: 87. 1898. **Type:** Sri Lanka, *s.loc.,* 1854, *C.P. Thwaites 2221* (Type- CAL, CAL0000014340!).

Fig. 3.51 – 3.53

Tree up to 20 m height, hemi epiphytic and later becoming independent, aerial roots present; bark lenticellate, pale brown; young twigs terete, core solid, smooth, glabrous, brown; inter node 0.6–1.0 cm long; latex milky,

white. Stipule caducous, ovate, 1.5–2.1 x 0.7–1.1 cm, margins entire, apex narrowly acute, base truncate, puberulent, green. Petiole articulated, terete, canaliculate, 2.0–6.2 cm long, glabrous, pale green. Leaves simple, alternate, spiral; lamina symmetric, elliptic to lanceovate, 8.0–20.7 x 4.1–12.2 cm, margins entire, acumen 0.3–0.7 cm long, apex acute, base obtuse, glabrous, pale green when young, dark green on maturity, subcoriaceous, venation brochidodromous; basal veins 3–4, lateral veins 9–11 pairs, waxy glands on the base of the midrib. Receptacles axillary, solitary or in pairs, monoecious, sessile; basal bracts present, persistent, 3, free, 3.0–5.0 mm long, ovate, glabrous, pale brown. Syconium 0.8–1.5 cm across, globose, puberulous, green when young, red when mature. Ostiole 0.5–1.0 mm; outer bracts present, free, ovate, 1.0–1.5 mm long, glabrous, pale yellow; inner bracts present, free, lanceolate, 1.2–1.5 mm long, glabrous, pale brown to yellow. Male flowers scattered, 4.0 mm long, pedicellate; pedicel 1.0 mm long; tepals 3–4, free, 1.5 mm long, ovate, glabrous, yellow to pale brown; stamen 1, anther 2.0 mm, filament 0.5 mm long. Female flowers scattered, 3.0 mm long, sessile; tepal 3–4, free, 2.0 mm long, lanceolate, glabrous, pale brown; stigma simple, 0.8 mm long; style 1.2 mm long; ovary 1.0 mm long, ovoid, glabrous, pale yellow. Gall flowers scattered, 3.0 mm long, pedicellate; pedicel 0.7 mm long; tepals 3, fused, 1.4 mm long, lanceolate, glabrous, yellow; stigma simple; style 0.6 mm long; ovary 1.2 mm long, obovoid, glabrous, yellow. Achenes 1.0–1.2 mm, ovoid, white or brown.

Local names: Nil.

Common names: Nil.

Flowering and fruiting: September to February.

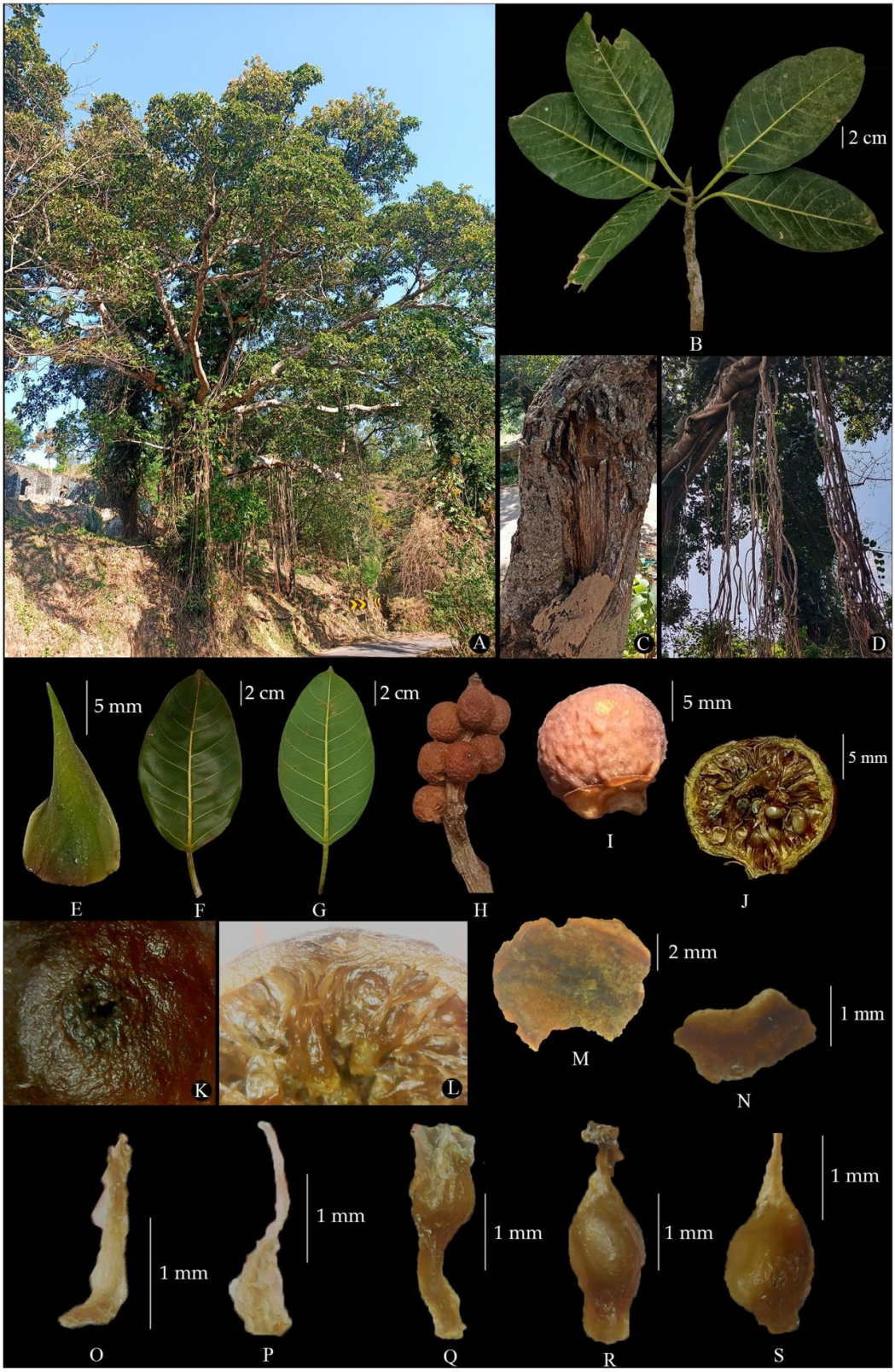


Fig. 3.51. ***Ficus fergusonii*** (King) T. B. Worth. ex Corner: **A.** Habit; **B.** Twig; **C.** Bark; **D.** Aerial roots; **E.** Stipule; **F.** Leaf adaxial side; **G.** Leaf abaxial side; **H.** Receptacles; **I.** Syconium; **J.** Syconium L. S.; **K.** Ostiole; **L.** Ostiolar L. S.; **M.** Basal bract; **N.** Outer ostiolar bract; **O.** Inner ostiolar bract; **P.** Tepal; **Q.** Male flower; **R.** Female flower; **S.** Gall flower.

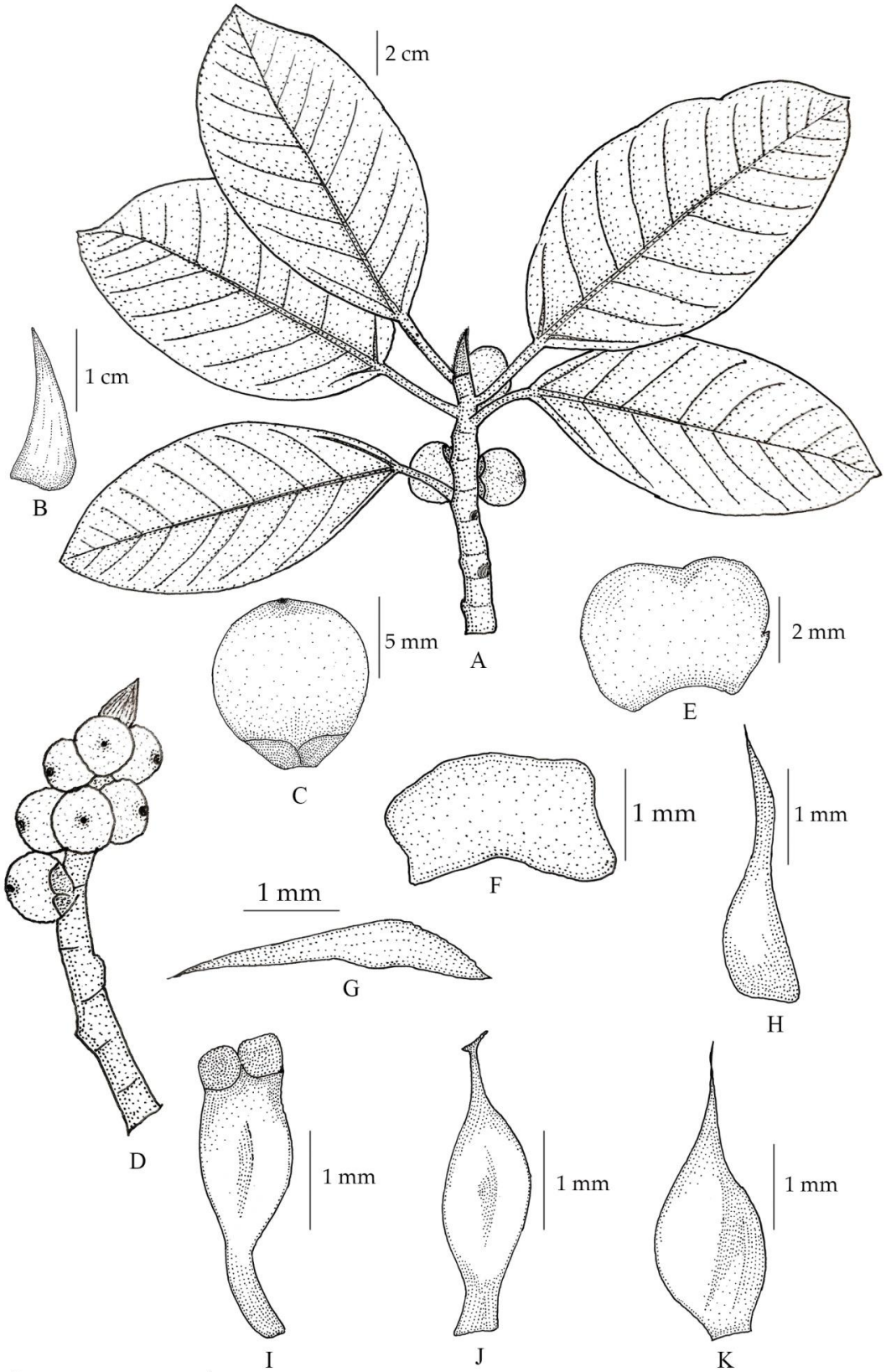


Fig. 3.52. ***Ficus fergusonii*** (King) T. B. Worth. ex Corner: **A.** Twig; **B.** Stipule; **C.** Syconium; **D.** Receptacles; **E.** Basal bract; **F.** Outer ostiolar bract; **G.** Inner ostiolar bract; **H.** Tepal; **I.** Male flower; **J.** Female flower; **K.** Gall flower.

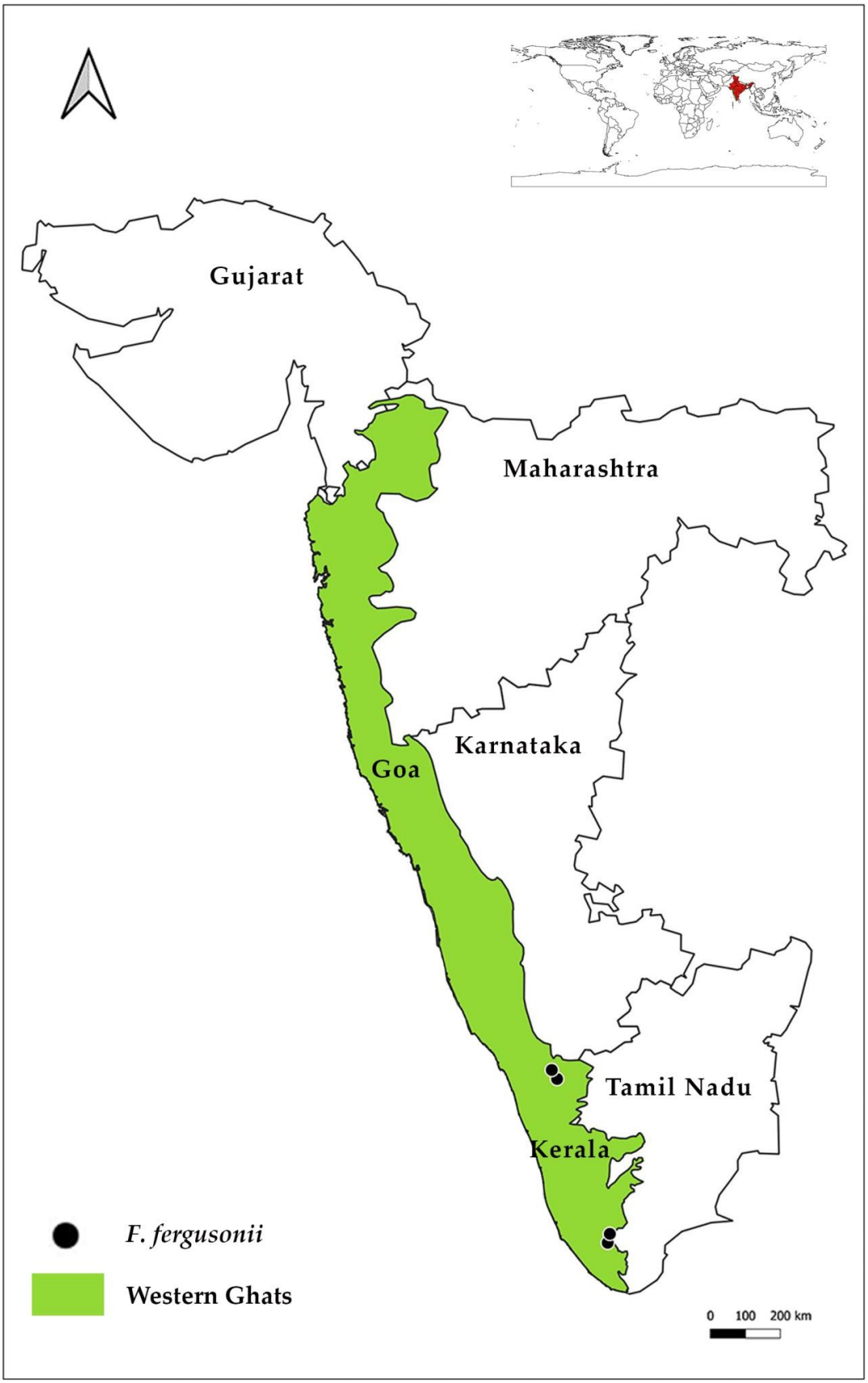


Fig. 3.53. *Ficus fergusonii* (King) T. B. Worth. ex Corner - Distribution map.

Distribution: Native to Sri Lanka, an Indo-Sri Lankan endemic species (Reddy *et al*., 2020). In India the species is so far reported from the states of Kerala and Tamil Nadu only.

Habitat: Deciduous and semi evergreen forests.

IUCN status: Not Evaluated (NE).

Etymology: Mr. W. Fergusson was an eminent botanist from Sri Lanka and a friend of G. King. So, G. King named this plant in honour of his friend W. Fergusson.

Uses: No uses have been reported for the species so far.

Notes: The species was first published as a variety of *F. altissima* in 1888 by G. King. As the plant shows significant variations in the characters, it was raised to species rank by Worthington (1959), but being an invalid name, it was corrected by Corner (1981). This species was first reported from India by Priyadarsanan (1999a) based on his collections from Ponmudi, Thiruvananthapuram District, Kerala and the species was supposed to be distributed only in Kerala. The species was later collected from Nadugani hills of Nilgiris (Reddy *et al*., 2020) thereby confirming extended distribution of the species to Tamil Nadu. The present collection of the species is from Ponmudi, Thiruvananthapuram from where the plant was reported first from India. The collections of this plant from India accounts to the collection by Dr. J. V. Sudhakar, but they could not be traced from the sheets deposited in MH. 5–10 pairs of lateral nerves were recorded by Reddy *et al.* (2020), but 9–11 pairs of lateral nerves were observed in the present study.

Specimens examined: India, **Kerala,** Thiruvananthapuram District, Ponmudi, 685 m, 22 December 2021, *Sreehari S. Nair 12167* (MESAH); *ibid.,* 685 m, 09 March 2023, *Sreehari S. Nair 12234* (MESAH). Sri Lanka, Kandy

District, Central province, near mile post 23, 1260 m, 17 November 1974, *G. Davidse 8471* (L); Loolecandara, 2 miles South of Deltota, Hewawisse Korale Adm, at upper edge of plantation, 4600 m, 22 December 1978, *F.R. Fosberg 57923* (L). Madulkelle District, Above Lebauon Estate, 700 m, December 1978, *Kostermans 27177* (L). Matale District, Dikpatana, Laggala, 700 m, 21 September 1974, *Jayasuriya 1831* (L); *s.loc.,* 14 November 1978, *Kostermans 27086* (L).

3.6.18. *Ficus guttata* (Wight) Wight ex King

Ficus guttata (Wight) Wight ex King, Ann. Roy. Bot. Gard. Calcutta 1: 167, t. 209. 1888 & in Hook. f., Fl. Brit. India 5: 534. 1888; Brandis, Indian Trees: 610. 1906; Rama Rao, Fl. Pl. Travancore: 384. 1914; C.E.C. Fisch. in Gamble, Fl. Madras: 1365. 1928; Fyson, Fl. South Ind. Hill Stat. 1: 542. 1932; Govind. & Masil., Proc. Indian Acad. Sci. (Pl. Sci.) 91: 118. 1982; Chithra in A.N. Henry *et al*., Fl. Tamil Nadu 2: 254. 1987; Kesh. Murthy & Yogan., Fl. Coorg: 422. 1990; Sasidh., Biodiv. Doc. Kerala 6: Fl. Pl.: 439. 2004; T.S. Nayar *et al*., Fl. Pl. Kerala: 435. 2006; Chaudhary *et al*., Taiwania 57: 204. 2012; P. Singh *et al*., Endemic Vasc. Pl. India: 207. 2015. *Covellia guttata* Wight, Icon. Pl. Ind. Orient. 6: 8, t. 1966. 1853. **Type:** India, Nilgiri and Pulney Hills, 1866, *R. Wight s.n.* (Type-K, K000880203!).

Fig 3.54 – 3.56

Scandent climber, aerial roots absent; bark, lenticellate, brown; young twigs terete, core solid, pubescent to tomentulose, brown; inter node 2.2–2.7 cm long; latex milky, white. Stipule caducous, ovate, 1.2–2.1 x 0.4–1.1 cm, margins entire, apex acute, base truncate, pubescent, brown. Petiole articulated, terete, 2.0–3.5 cm long, tomentose, brown. Leaves simple, alternate, spiral;



Fig. 3.54. ***Ficus guttata*** (Wight) Wight ex King: **A.** Habit; **B.** Twig; **C.** Roots; **D.** Sipule; **E.** Leaf adaxial side; **F.** Leaf abaxial side; **G.** Indumentum in stipule; **H.** Indumentum in petiole; **I.** Indumentum in young stem; **J.** Indumentum in leaf veins; **K.** Indumentum in abaxial side of leaf.

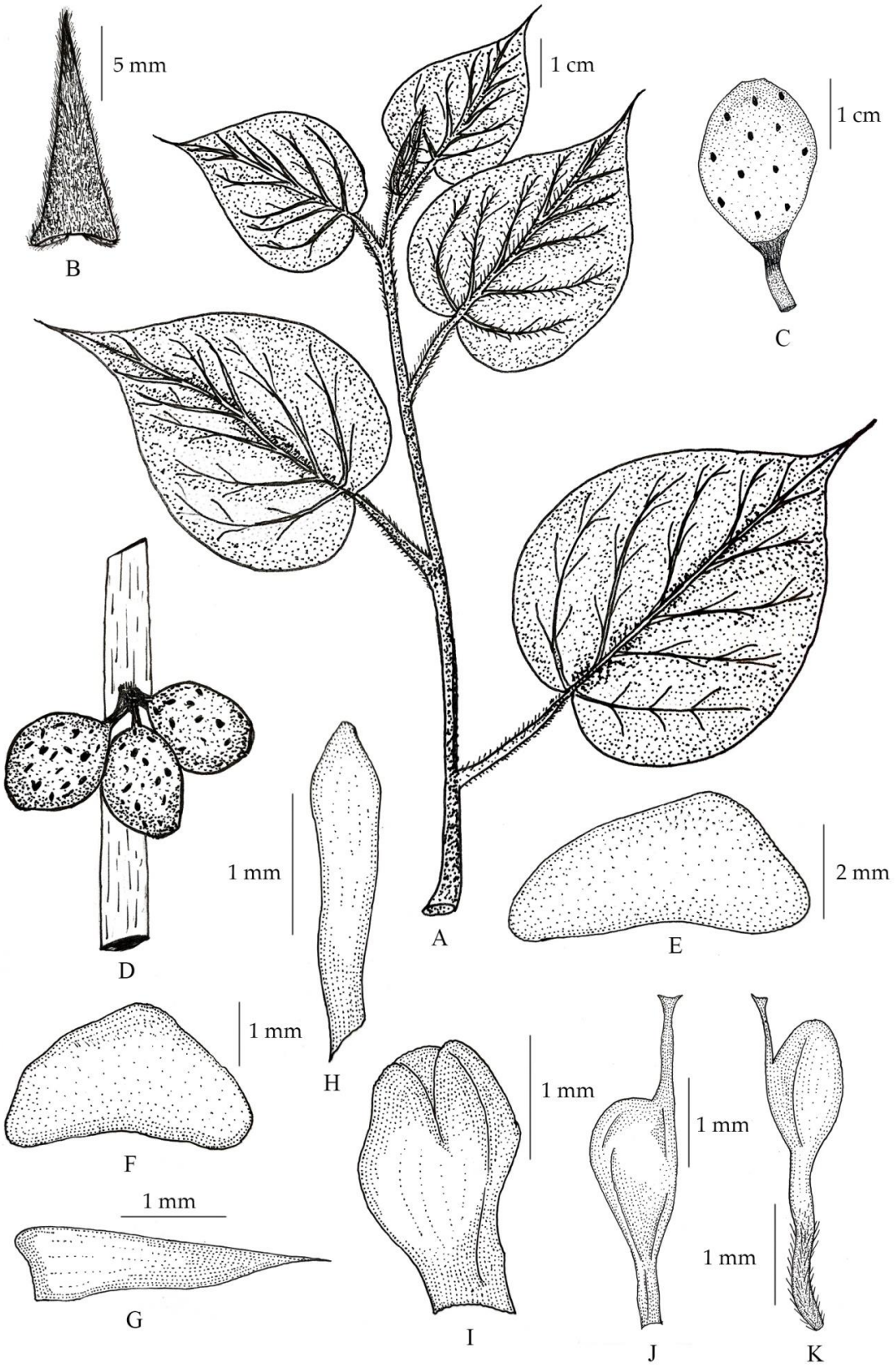


Fig. 3.55. ***Ficus guttata*** (Wight) Wight ex King: **A.** Twig; **B.** Stipule; **C.** Syconium; **D.** Receptacles; **E.** Basal bract;**F.** Outer ostiolar bract; **G.** Inner ostiolar bract; **H.** Tepal; **I.** Male flower; **J.** Female flower; **K.** Gall flower.

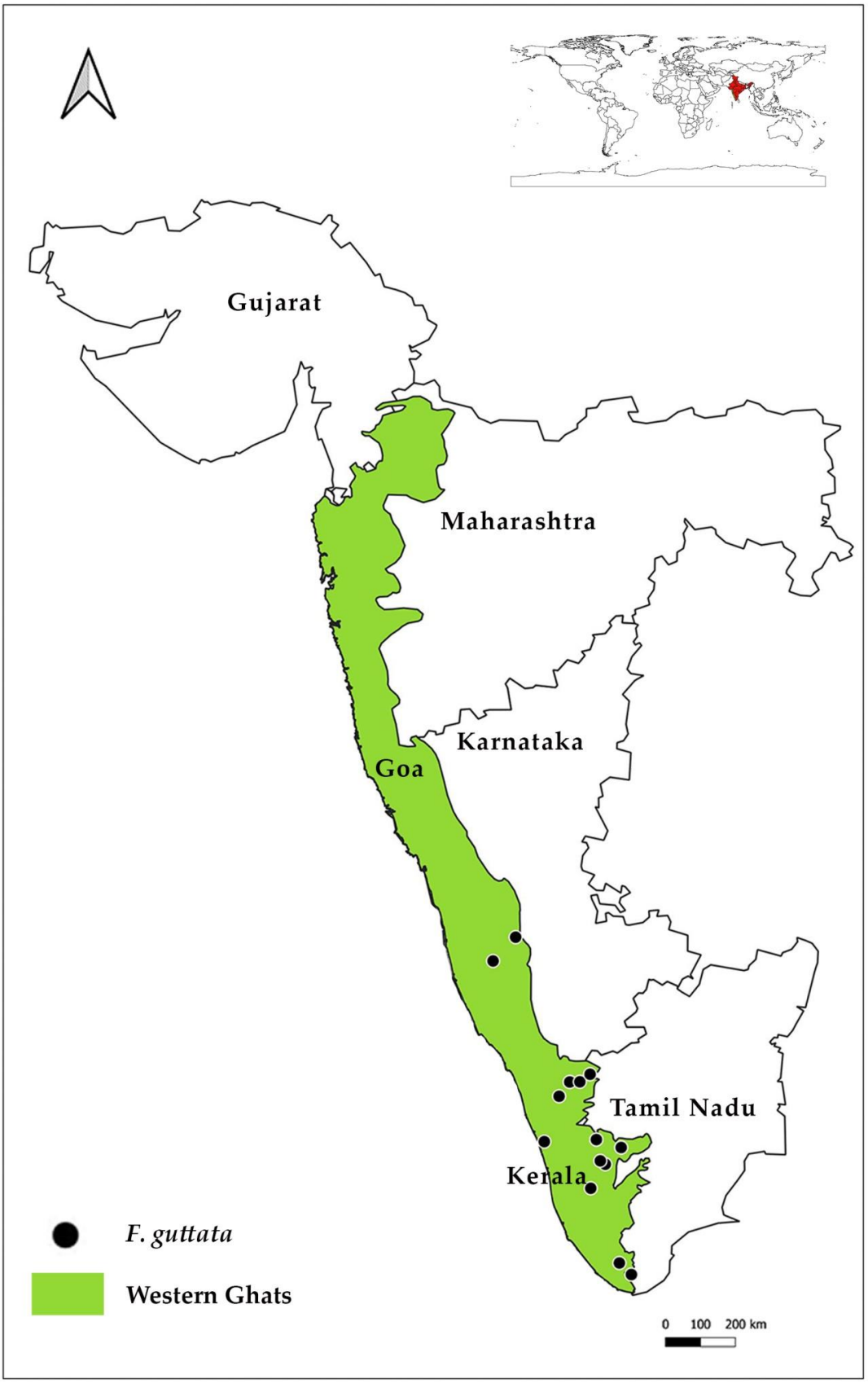


Fig. 3.56. *Ficus guttata* (Wight) Wight ex King - Distribution map.

lamina symmetric, widely ovate, 8.6–12.4 x 5.7–7.8 cm, margins entire, acumen 1.2–1.8 cm long, apex acute, base cordate to sub cordate, glabrous above and pubescent beneath, pale green when young, dark green on maturity, subcoriaceous, venation brochidodromous; basal veins 3–4, lateral veins 4–5 pairs, waxy glands on the axils of the basal lateral nerves. Receptacles cauliflorous, clustered, dioecious, pedunculate; peduncle 2.0–3.0 cm long, terete, glabrous, pale brown; basal bracts present, persistent, 3, free, 0.9–1.2 cm long, widely ovate, pubescent, pale brown. Syconium 2.5–3.5 cm across, globose, pubescent, green when young, red with spots when mature. Ostiole 0.5–1.0 cm; outer bracts present, free, ovate, 5.0 mm long, pubescent, pale brown; inner bracts present, free, lanceolate, 3.0 mm long, glabrous, pale yellow. Male flowers near ostiole, 2.0 mm long, sessile; tepals 4, free, 2.0 mm long, lanceolate, glabrous, pale brown; stamen 2, anther 1.5 mm, filament 0.5 mm long. Female flowers scattered, 3.0 mm long, pedicellate; pedicel 1.0 mm long, pubescent along the base; tepal 5–6, free, 2.0 mm long, lanceolate, glabrous, pale red; stigma 0.7 mm long; style 1.2 mm long; ovary 1.5 mm long, obovoid, glabrous, pale brown. Gall flowers scattered, 5.0 mm long, pedicellate; pedicel 2.5 mm long, pubescent along the base; tepals 6, free, 2.5 mm long, lanceolate, glabrous, yellow; stigma short; style 0.5 mm long; ovary 2.0 mm long, globose, glabrous, yellow. Achenes 1.0 mm, obovoid, pale brown.

Local names: Nil.

Common names: Nil.

Flowering and fruiting: August – January.

Distribution: Endemic to Southern Western Ghats.

Habitat: Shola forests.

IUCN status: Not Evaluated (NE).

Etymology: This species produces oozes of resin from the syconium on maturity. The species epithet mostly denotes this condition.

Uses: No uses so far reported for this species.

Notes: According to Sudhakar and Murthy (2016a) the species is treated as Endangered. This species is badly represented in the herbarium collections.

Specimens examined: India, **Karnataka**, Chikkamagaluru District, Ballatarayandurga top, 08 February 1963, *A.S. Rao 85332* (BSI); Bababuden Hills, 6000 ft, *s.d., W.A. Talbot 3123* (BSI). **Kerala,** Idukki District, Munnar to Bodi road, 1800 m, 25 March 1980, *K. Ramamurthy 66373* (MH); Munnar – Bodi Mettu road, 1360 m, 11 April 2022, *Sreehari S. Nair & P.J. Ebin 12199* (MESAH). Kottayam District: Lock heart gap, 1700 m, 20 April 1964, *K.M. Sebastine 18343* (MH); Devicolam, 1875 m, 05 February 1970, *B.V. Shetty 33421* (MH); Vagamon hills, 1820 m, 14 August 2021, *Sreehari S. Nair & P.J. Ebin 12160* (MESAH). Palakkad District, Silent Valley, 950 m, 11 October 1965, *E. Vajravelu 26131* (MH). Thiruvananthapuram District, Chemuji, 22 March 2001, *G. Raj Kumar 45629* (TBGT). **Tamil Nadu,** Coimbatore District, Surrounding Waverly estate, 1333 m, 10 March 1961, *J. Joseph 12312* (MH). Kanyakumari District, upper Kodayar, 1300 m, 16 February 1983, *A.N. Henry 7700* (MH). Namakkal District, Akkalampatti, 07 June 1897, *Bourne 327* (MH). Nilgiri District, Coonoor, 10 July 1896, *Bourne s.n.* (MH); *ibid.*, November 1889, *J.S. Gamble 22541* (MH); Shola near Curigan estate, 1925 m, 22 July 1970, *E. Vajravelu 35010* (MH); Kukal shola, 1500 m, 03 December 1970, *G.V. Subba Rao 37442* (MH); Avalanche trout, 2000 m, 27 December 1970, *B.V. Shetty 37613* (MH); Carrington estste, 1975 m, 03 January 1971, *B.V. Shetty 37690* (MH); Konakarai R. F., 1600 m, 15 May 1971, *E. Vajravelu 38400*

(MH); Shola near Currgon estate, 1925 m, 22 July 1990, *E. Vajravelu 35010* (MH). Tirunelveli (Tinnevely) District, Mahendragiri R. F., 17 September 1916, *s.coll. 13154* (MH); Nataikal to Sangaltai, 26 September 1916, *s.coll. 13648* (MH); Valayar forest, 1000 m, 13 July 1976, *P. Bhargavan 47487* (MH); Way to Nalumukku, Upper Kodayar, 1300 m, 18 March 1981, *A.N. Henry 70325* (MH); left flame saddle no 2, Lower kodayar, 1300 m, 16 February 1983, *A.N. Henry 77008* (MH).

3.6.19. *Ficus heterophylla* L.f.

Ficus heterophylla L.f., Suppl. Pl. (1782) 442; Vahl, Enum. Pl. 2: 203. 1805; Hook.f., Fl. Brit. India 5: 518. 1888; Roxb., Fl. Ind. 3: 532. 1832; Wight, Icon. Pl. Ind. Orient. 2: t. 659. 1843; W.J. Hooker, London J. Bot. 231. 1848; Miq., Ann. Mus. Bot. Lugd.-Bat. 3: 271. 1867; H. Drury, Handb. Ind. Fl. 3: 229. 1869; Kurz., For. Fl. Brit. Burma 456. 1877; King, Ann. Roy. Bot. Gard. (Calcutta) 1: 75. t. 94. 1888; H. Trimen, Handb. Fl. Ceylon 4: 93. 1898; Talbot, Trees Bombay 2: 330. 1902; T. Cooke, Fl. Pres. Bombay 2: 65. 1908; J.F. Duthie, Fl. Upper Gang. Plain, 154. 1915; Brandis, Indian Trees 606. 1921; H.N. Ridley, Fl. Malay Peninsula 3: 339. 1924; C.E.C. Fisch. in Gamble, Fl. Madras 1366. 1928; U.N. Kanjilal *et al.,* Fl. Assam 4: 251. 1940; Corner, Gard. Bull. Singapore 21: 73. 1965; G.L. Shah, Fl. Gujarat 645. 1978; S.K. Varma, Fl. Bhagalpur 362. 1981; B.D. Sharma *et al.,* Fl. Karnataka: analysis 259. 1984; D.N.G. Bakshi, Fl. Murshidabad Dist. 301. 1984; H.J. Chowdhery & B.M. Madhwa, Fl. Himachal Pradesh Analysis 2: 661. 1984; D.M. Verma *et al.,* Fl. Raipur, Durg & Rajnandgaon 357. 1985; R. S. Rao, Fl. Goa 409. 1986; R.S. Rao *et al.,* Fl. Goa Diu Daman Dadra & Nagar haveli 2: 409. 1986; V. Chithra in A.N. Henry *et al.,* Fl. Tamil Nadu Ind., Ser I: Analysis 2: 254. 1987; B.G. Kulkarni, Fl. Sindhudurg 419. 1988; N.P.

Singh, Fl. Eastern Karnataka 2: 586. 1988; Kesh. Murthy & S.N. Yogan. Fl. Coorg 422. 1990; K.M. Matthew, Excur. Fl. Central Tamil Nadu 484. 1991; Kothari & Moorthy, Fl. Raigad Dist. 3: 378. 1993; Subram., Fl. Thenmala Div. 351. 1995; Sivar. & Mathew, Fl. Nilambur 666. 1996; T. Pullaiah & D. A. Moulali, Fl. Andhra Pradesh 2: 889. 1997; V. Mudgal *et al.,* Fl. Madhya Pradesh 2: 616. 1997; P.K. Bhattacharyya & K. Sarkar, Fl. West Champaran, Bihar 64. 1998; N.P. Singh *et al.,* Fl. Maharashtra Dicot 2: 937. 2001; Singh *et al.,* Fl. Mizoram 578. 2002; Wu *et al.,* Fl. China 5: 64. 2003; K.G. Bhat, Fl. Udupi 595. 2003; Sasidh. & Sivar., Bio. Docu. Kerala part 6: Flow. Plant. 440. 2004; Berg & Corner in Nooteboom, Fl. Malesiana 17(2): 231. 2005; Anil Kumar *et al.,* Fl. Pathanamthitta 464. 2005; Sunil & Sivadasan, Fl. Alappuzha Dist. 663. 2009; Berg *et al.,* Fl. Thailand 10(4): 544. 2011; Chaudhary *et al.,* Taiwania 57(2): 201. 2012; Mandar & Lakshmin., Fl. Bhagwan Mahavir 229. 2013; T. Pulliah, Fl. Telangana, 2: 882. 2015; Sudhakar *et al.,* Figs of Eastern Ghats, India 59. 2017. Ficus sp. Madhya Pradesh. 28. 2019; Fl. Karnataka. A Check List 2: 508. 2019; P. Lakshmin. *et al.,* Fl. West Bengal 652. 2019; S.S. Dash & A.A. Mao, Fl. Pl. India, 2: 542. 2020; G.P. Sinha & A.N. Shukla, Fl. Uttar Pradesh 2: 474. 2020. **Type:** India, *Linnaeus,* 1240.14 (Holotype-LINN, LINN 1240.14!).

Ficus cannabina Lour., Fl. Coch. 2: 668. 1790; Miq., London J. Bot. 7: 227. 1848; Ann. Mus. Bot. Lugd.-Bat. 3: 290. 1867. **Type:** Habitat in Cochinchina.

Ficus denticulata Vahl, Symb. Bot. 1: 83. 1790; Enum. Pl. 2: 202. 1805; Blume, Bijdr. 472. 1825; Buch.-Ham., Trans. Linn. Soc. 15: 144. 1826. **Type:** Ind. Orientalis (Holotype- C, C10006715!).

Ficus truncata Vahl, Symb. Bot. 1: 83. 1790; Enum. Pl. 2: 201. 1805; Ann. Sci. Nat. Bot., Sér. 3, 7: 254. 1847. **Type:** Ind. Orientalis (Holotype- C, C10006717!).

Ficus rufescens Vahl, Enum. Pl. 2: 203. 1805. **Type:** *s.loc., s. d, J.P. Rottler 633* (Syntype- C, C10006718!).

Ficus aquatica J. König ex Willd., Sp. Pl. 4: 1133. 1806. **Type:** Ind. Orientalis (Type- B, B -W 19281 -01 0!).

Ficus biglandula Blume, Bijdr. (1825) 475. 1825; Fl. Ind. Bat. 1, 2: 298. 1859. **Type:** Indonesia, Jakarta, Java, Batavia, *s.d., s.coll. s.n.* (Type- L, L 0040117!).

Ficus scabrella Roxb., Fl. Ind., ed. Carey 3: 532. 1832; Wight, Ic. Pl. Ind. Orient. 2: t. 661. 1843; Miq., London J. Bot. 7: 229. 1848; Ann. Mus. Bot. Lugd.-Bat. 3: 291. 1867; Kurz, Forest Fl. Burma 2: 455. 1877; King, Fl. Brit. India 5: 519. 1888. *Ficus heterophylla* L.f. var. *scabrella* (Roxb.) King, Sp. Ficus 2: 76, t. 94, f. 3, 4. 1888. **Type:** Not seen.

Ficus acutiloba Miq., London J. Bot. 7: 227, t. 5A. 1847; Ann. Mus. Bot. Lugd.-Bat. 3: 290. 1867. **Type:** Not seen.

Ficus elongata Miq., London J. Bot. 7: 231. 1848; *Ficus heterophylla* L.f. var. *elongata* (Miq.) Miq., Ann. Mus. Bot. Lugd.-Bat. 3: 291. 1867. **Type:** India, Peninsular Ind. Orientalis, 1837, *R. Wight 2995* (Type- E, E00288930!).

Ficus subpanduriformis Miq., London J. Bot. 7: 235. 1848; Ann. Mus. Bot. Lugd.-Bat. 3: 292. 1867. *Ficus grossularioides* Burm.f. var. *subpanduriformis* (Miq.) Kuntze, Rev. Gen. Pl. 1: 626. 1891. **Type:** India, Assam, *s.d., s.coll. 558* (Type- K, K000880209!)

Fig. 3.57 – 3.59

Shrub up to 2 m height, independent, aerial roots absent; bark lenticellate, pale brown; young twigs terete, core solid, scabrous, brown; inter node 0.9–6.6 cm long; latex milky, white. Stipule caducous, lanceolate, 0.3–1.2 x 0.2–0.3 cm, margins entire, apex acute, base truncate, glabrous, pale green. Petiole articulated, terete, 1.3–2.1 cm long, scabrous, green to pale brown. Leaves simple, alternate, spiral; lamina asymmetric, highly variable, mostly lobed, lanceolate to lanceovate, 11.4–20.0 x 3.6–6.1 cm, margins serrate, acumen 0.6–1.0 cm long, apex acuminate, base subcordate to rounded, scabrous above, puberulent beneath, pale green when young, dark green on maturity, chartaceous, venation brochidodromous; basal veins 3–4, lateral veins 6–7 pairs, on the axils of the lateral nerves beneath. Receptacles axillary, solitary, dioecious pedunculate; peduncle 0.6–1.6 cm, pubescent, green to pale brown; basal bracts absent. Syconium 1.2–2.1 cm across, obovoid, glabrous with scars, pale green when young, yellow to purple when mature. Ostiole 1.0–2.0 mm wide; outer bracts present, free, widely ovate, 1.5 mm long, scabrous, pale brown; inner bracts present, free, widely ovate, 2.0 mm long, pubescent, yellow. Male flowers near ostiole, 5.0 mm long, pedicellate; pedicel 2.0 mm long; tepals 3-4, free, 5.0 mm long, lanceolate, glabrous, white; stamen 1, anther 2.0 mm, filament 1.0 mm long. Female flowers scattered, 4.0 mm long, pedicellate; pedicel 2.0 mm long; tepal 6, fused, 2.0 mm long, lanceolate, glabrous, white; stigma 0.3 mm; style 0.5 mm long; ovary 1.2 mm long, globose, glabrous, pale brown. Gall flowers scattered, 2.0 mm long, pedicellate; pedicel 0.8 mm long; tepals 4, free, 2.0 mm long, lanceolate, glabrous, white; stigma 0.1 mm; style 0.2 mm long; ovary 1.2 mm long, obovoid, glabrous, pale brown. Achenes 1.0–1.5 mm, ellipsoid, pale brown.

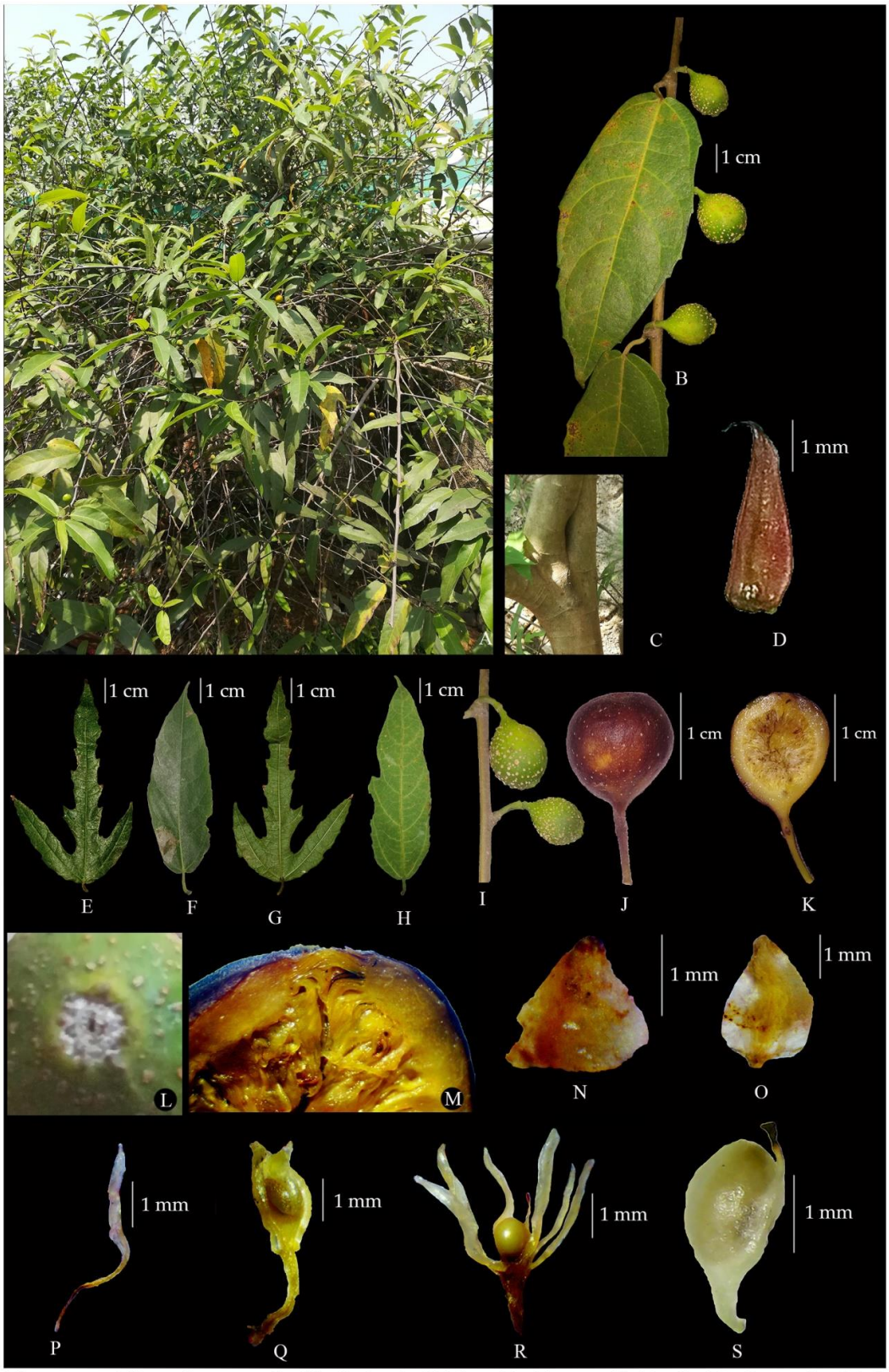


Fig. 3.57. ***Ficus heterophylla*** L.f.: **A.** Habit; **B.** Twig; **C.** Bark; **D.** Stipule; **E & F.** Leaf adaxial side; **G & H.** Leaf abaxial side; **I.** Receptacles; **J.** Syconium; **K.** Syconium L. S.; **L.** Ostiole; **M.** Ostiolar L. S.; **N.** Outer ostiolar bract; **O.** Inner ostiolar bract; **P.** Tepal; **Q.** Male flower; **R.** Female flower; **S.** Gall flower.

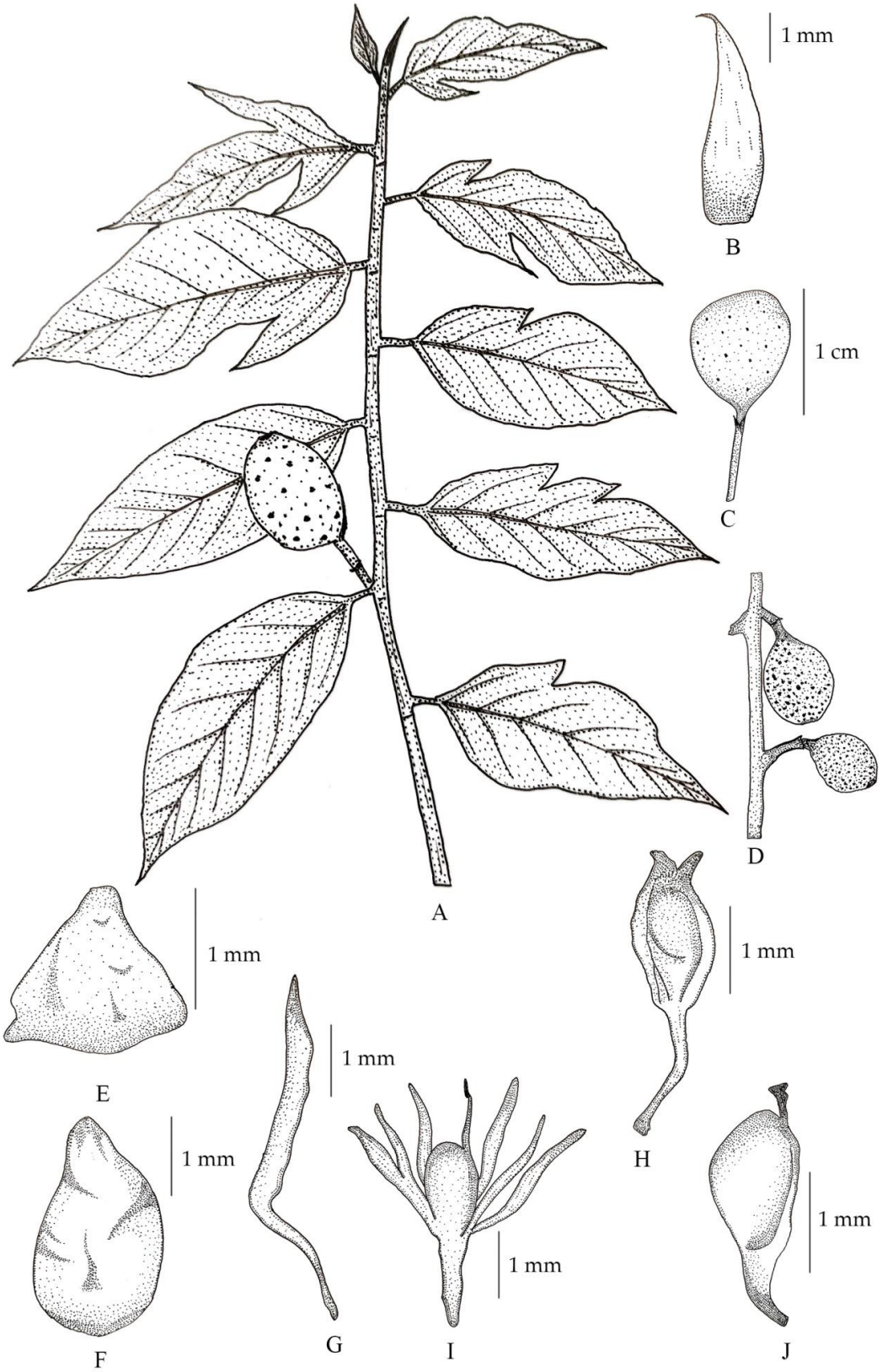


Fig. 3.58. ***Ficus heterophylla*** L.f.: **A.** Twig; **B.** Stipule; **C.** Syconium; **D.** Receptacles; **E.** Outer ostiolar bract; **F.** Inner ostiolar bract; **G.** Tepal; **H.** Male flower; **I.** Female flower; **J.** Gall flower.

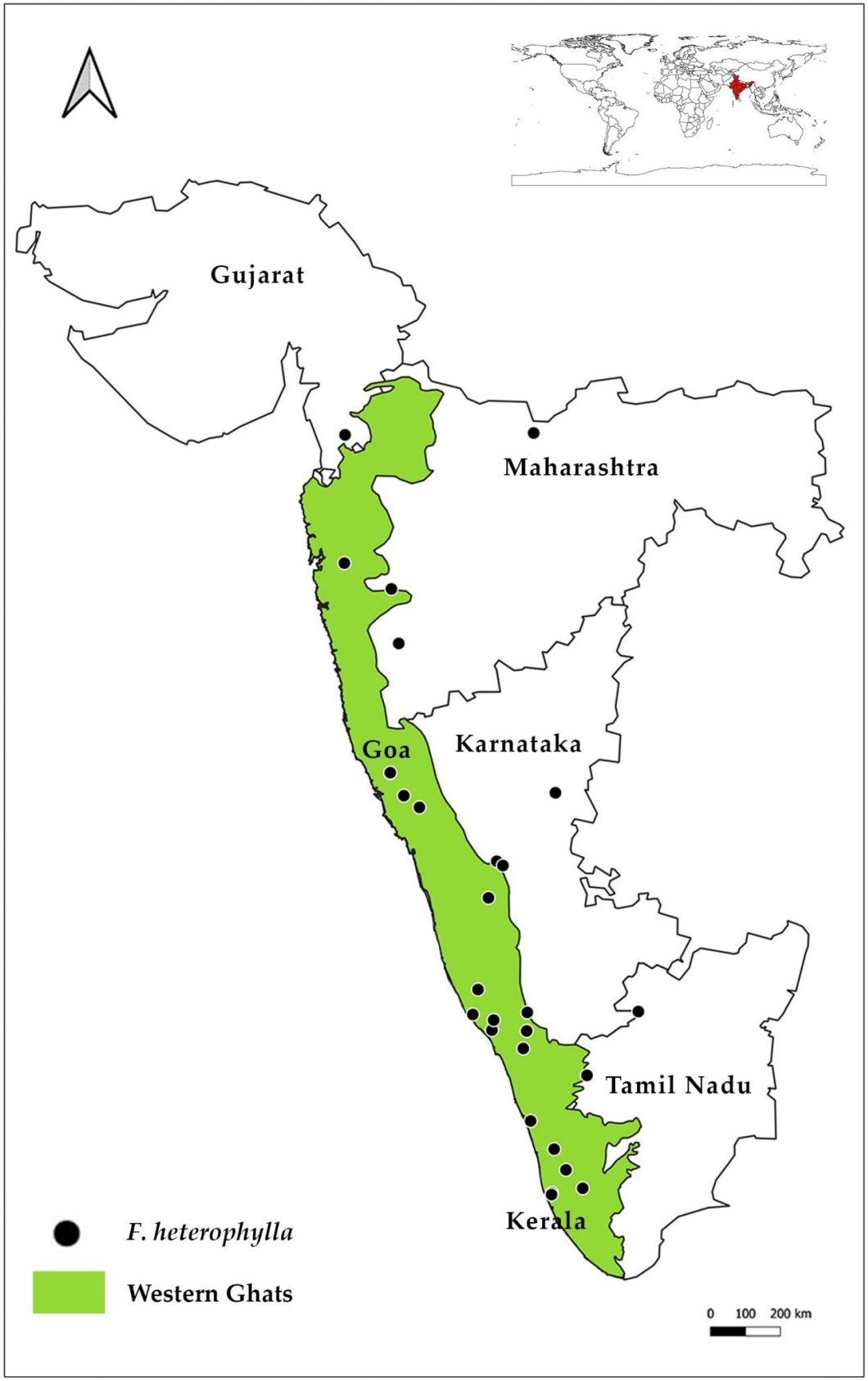


Fig. 3.59. *Ficus heterophylla* L.f - Distribution map.

Local names: *Vallitherakam* (Mal.); *Kodi Atthi* (Tam.); *Adavibende* (Kan.); *Kharvamtivel* (Mar.).

Common names: Nil.

Flowering and fruiting: December – May.

Distribution: India, Sri Lanka, Myanmar, S. China to Java. In India the species is distributed throughout the hotter regions.

Habitat: Usually found along the marshy areas.

IUCN status: Not Evaluated (NE).

Etymology: The species is named '*heterophylla'*, in response to the presence of hetero morphic lamina of the plant.

Uses: The leaves are rough in texture and were used as substitute of sand papers. The plant is used in the treatment of dysentery, cough and asthma (Tiwari, 2016).

Notes: Rama Rao (1914) has mentioned the species in his book Flowering Plants of Travancore, but he has mentioned the image of *F. repens*, a synonym of *F. assamica* (t. 636) instead of *F. heterophylla*. The plant is sometimes misidentified with *F. exasperata* due to the presence of heterophyllus leaves. Some of the specimens of *F. exasperata* in M H were previously identified as *F. heterophylla.* Both can be easily distinguished by the shrubby habit found in marshy areas, obovoid syconium in *F. heterophylla* while, *F. exasperata* are usually trees found in plains and waste lands with globose syconium. The lamina of *F. exasperata* usually becomes entire as the plant reaches maturity. Kanjilal *et al.,* (1940) mentioned that the plant flowers in the cold season and produces fruits in the hot season.

Specimens examined: India, **Andhra Pradesh,** Godavari District, *s.loc.,* 500 ft, February 1885, *J.S. Gamble 15850* (MH). **Chattisgarh,** Surguja District, Ramanujganj, 07 October 1947, *W.N. Koelz 19227* (MICH); *ibid.,* 30 September 1947, *W.N. Koelz 19123* (MICH). **Goa,** South Goa District, Mollem, 13 February 2003, *Mandar N. Datar 187580* (BSI). **Gujarat,** Dang District, Unai, northwards along Ambika River, 31 October 1953, *H. Santapau 17043* (BLAT); Unai, nothwards to the river, Dang Forest, 09 March 1954, *H. Santapau 18294* (BLAT); *ibid.,* 09 March 1954, *H. Santapau 18295* (BLAT). **Karnataka,** Koppal District, Gangavathi, 06 May 1977, *N.P. Singh 147000* (BSI). Mysore District, Sakrebailu (Sakrabila), 25 April 1905, *C.A. Barber 7029* (MH). Uttar Kannada District, Supa, 19April1885, *W.A. Talbot 1176* (BSI). **Kerala,** Alappuzha District, Edathuva, Sea level, *C.N. Sunil 2206* (CALI); Edathuva, 1 m, 28 December 2019, *Sreehari S. Nair 12936* (MESAH). Kannur District, Kuthuparamba, 19 Septemner 1913, *s.coll. 9260* (MH); Panathur, 250 m, 29 June 1980, *R. Ansari 67894* (MH); Madayippara, Juthakulam, 09 May 2012, *C. Pramod 133130* (CALI). Ernakulam District, Airapuram, 3 m, 27 October 2020, *Sreehari S. Nair & P.J. Ebin 12990* (MESAH). Kottayam District, Mookkenpetty, Erumely, 11 March 1994, *E.S. Santhosh Kumar 15737* (TBGT). Thrissur District, Triprayar, 10 m, 08 September 1946, *K. Ramamurthy 48411* (MH). Wayanad District, Vythiri, 24 May 1922, *s.coll. s.n.* (MH); Baveli, Kuruva Island, 25 April 1986, *R.T. Balakrishnan 42002* (CALI); Kuruwadweep, 08 December 1994, *E.S. Santhosh Kumar & C.M. Unnithan 23255* (TBGT); *s.loc.,* 17 June 2017, *Aswathi 152275* (CALI). **Maharashtra,** Buldhana District, Malkapur along the river, 06 May 1904, *R.K. Bhide s.n.* (BSI). Pune District, Bhima, Koregaon, 20 December 1905, *W.A. Talbot s.n.* (BSI); Deccan, along bank of river Mutha, 20 February 1906, *W.A. Talbot 4758* (BSI). Raigad District, Karjat, 20 November 1953, *H. Santapau 17434* (BLAT). Sindhudurg

District, Ainoda, Bhedshi, 28 April 1971, *B.G. Kulkarni 129372* (BSI); Koral R. F., Bhedshi, 30 April 1971, *B. G. Kulkarni 129434* (BSI). **Tamil Nadu,** Coimbatore District, 12 May 1914, *Sivasundram 10425* (MH). Dharmapuri District, Hogenakkal (Hoganakkal), 800 m, 13 February 1927, *K. Cherian Jacob 18004* (MH). **Telangana,** Bhadradri Kothagudem District, Bhadrachalam, 250 m, 23 November 1993, *R. Chandrasekaran 98952* (MH).

3.6.20. *Ficus hispida* L.f.

Ficus hispida L.f., Suppl. Pl. 442. 1782; Vahl., Enum. Pl. 2: 198. 1805; Miq., Ann. Mus. Bot. Lugd.-Bat. 3. 282. 1867; D. Brandis, For. Fl. North-West and Central Ind. 423. 1874; Kurz., For. Fl. Brit. Burma 460. 1877; A.K. Nairne, Fl. Pl. Western Ind. 307. 1894; J. Cameron, For. Trees of Mysore and Coorg 287. 1894; Hook.f., Fl. Brit. India 5: 522. 1898; H. Trimen, Handb. Fl. Ceylon 4: 94. 1898; Talbot, Trees Bombay 2: 330. 1902; D. Prain, Bengal Plants 2: 981. 1903; T. Cooke, Fl. Pres. Bombay 2: 653. 1908; Bourd., For. Trees Travancore 367. 1908; Rama Rao, Fl. Pl. Travancore 383. 1914; J.F. Duthie, Fl. Upper Gang. Plain 155. 1915; Brandis, Indian Trees 606. 1921; H.N. Ridley, Fl. Malay Peninsula 3: 342. 1924; U.N. Kanjilal *et al.,* Fl. Assam 4: 252. 1940; H. Santapu, Fl. Khandala 258. 1953; Corner, Gard. Bull. Singapore 21: 89. 1965; G.L. Shah, Fl. Gujarat 645. 1978; S.K. Varma, Fl. Bhagalpur 362. 1981; Manilal & Sivar., Fl. Calicut 275. 1982; V. Singh, Fl. Banswara Dist. 3: 215. 1983; A.K. Mukherjee, Fl. Pachmarhi & Bori Reserves 283. 1984; B.D. Sharma *et al.,* Fl. Karnataka: analysis 259. 1984; C.J. Saldanha, Fl. Karnataka 117. 1984; H.J. Chowdhery & B. M. Madhwa, Fl. Himachal Pradesh Analysis 2: 661. 1984; D.N. G. Bakshi, Fl. Murshidabad Dist. 302. 1984; B.D. Naithani, Fl. Chamoli 2: 580. 1985; D.M. Verma *et al.,* Fl. Raipur, Durg & Rajnandgaon 357. 1985; K.K.N. Nair & M.P. Nayar,

Fl. Courtallum 1: 41. 1986; N.R. Ugemuge, Fl. Nagpur Dist, Maharashtra 339. 1986; R.S. Rao *et al.,* Fl. West Godavari Dist. 375. 1986; R.S. Rao *et al.,* Fl. Goa, Diu Daman Dadra & Nagar haveli 2: 409. 1986; Subramanian *et al.,* Fl. Palghat 123. 1987; V. Chithra in A.N. Henry *et al.,* Fl. Tamil Nadu Ind., Ser I: Analysis 2: 254. 1987; B.G. Kulkarni, Fl. Sindhudurg 419. 1988; Kamble & S.G. Pradan, Fl. Akola Dist. 212. 1988; Manilal, Fl. Silent Valley 259. 1988; N.P. Singh, Fl. Eastern Karnataka 2: 586. 1988; J. L. Ellis, Fl. Nallamalais 2: 377. 1990; Kesh. Murthy & S.N. Yogan. Fl. Coorg 420. 1990; Vajr., Fl. Palghat Dist. 447. 1990; K.M. Matthew, Excur. Fl. Central Tamil Nadu 484. 1991; Lakshmin. & B.D. Sharma, Fl. Nasik Dist. 440. 1991; P.J. Parmar in B.V. Shetty & V. Singh, Fl. Rajasthan 2: 802. 1991; G.P. Roy & B.K. Shukla, Fl. Madhya Pradesh 408. 1992; Kothari & Moorthy, Fl. Raigad Dist. 3: 379. 1993; S. Karthikeyan & A. Kumar, Fl. Yavatmal Dist. Maharashtra 232. 1993; M. Mohanan & A.N. Henry, Fl. Thiruvanthapuram 433. 1994; D. Deshp. *et al.,* Fl. Mahabaleshwar and Adjoinings 2: 554. 1995; Subram., Fl. Thenmala Div. 351. 1995; T. Pullaiah & B.R.P. Rao, Fl. Nizamabad 321. 1995; V. Raju & T. Pullaiah, Fl. Kurnool 435. 1995; Sasidh. & Sivar., Fl. Pl. Thrissur Forest 429. 1996; Sivar. & Mathew, Fl. Nilambur 667. 1996; T. Pullaiah & D.A. Moulali, Fl. Andhra Pradesh 2: 899. 1997; V. Mudgal *et al.,* Fl. Madhya Pradesh 2: 616. 1997; P.K. Bhattacharyya & K. Sarkar, Fl. West Champaran, Bihar 65. 1998; K.M. Matthew, Fl. Palni Hills 1181. 1999; S.K. Murthi & Panigrahi, Fl. Bilaspur Dist. 2: 567. 1999; N.D. Paria & S.P. Chattopadhyay, Fl. Hazaribagh Dist. 1: 85. 2000; N.P. Singh *et al.,* Fl. Maharashtra Dicot 2: 937. 2001; Mohanan & Sivadasan, Fl. Agasthyamala 633. 2002; N.P. Singh *et al.,* Fl. Mizoram 580. 2002; T.K.

Sarma & A.K. Sarkar, Fl. Palamau Dist. Jharkhand 577. 2002; K.G. Bhat, Fl. Udupi. 595. 2003; Sasidh. & Sivar., Bio. Docu. Kerala part 6: Flow. Plant. 440. 2004; Berg & Corner in Nooteboom, Fl. Malesiana 17(2): 426. 2005; Anil Kumar *et al.,* Fl. Pathanamthitta 464. 2005; S.G. Pradhan *et al.,* Fl. Sanjay Gandhi National Park 3: 574. 2005; K.M. Chetty *et al.,* Fl. Pl. Chittoor Dist. 332. 2008; Sunil & Sivadasan, Fl. Alappuzha Dist. 663. 2009; Berg *et al.,* Fl. Thailand 10(4): 566. 2011; Mandar & Lakshmin., Fl. Bhagwan Mahavir 229. 2013; T. Pullaiah, Fl. Telangana 2: 882. 2015; For. Plant. Nilgiris 47. 2015; Sudhakar *et al.,* Figs of Eastern Ghats, India 61. 2017; Fl. Karnataka. A Check List 2: 508. 2019; Ficus sp. Madhya Pradesh 33. 2019; P. Lakshmin. *et al.,* Fl. West Bengal 654. 2019; G.P. Sinha & A.N. Shukla, Fl. Uttar Pradesh 2: 474. 2020; S.S. Dash & A.A. Mao, Fl. Pl. India, 2: 543. 2020; R. Gogoi *et al.,* Fl. Sikkim 283. 2021. *Gonosuke hispida* Raf. Sylva Tellur. 58. 1838. *Covellia hispida* Miq., London J. Bot. 7: 462. 1848. **Type:** *s.loc., s.d. s.coll. s.n.* (Type- LINN, LINN 1240.13!).

Ficus scabra Jacq., Pl. Rar. Hort. Schoenbr. 3: 36. 1798. *Gonosuke scaber* Raf. Sylva Tellur. 58. 1838. **Type:** Not seen.

Ficus mollis Willd., Mem. Acad. Berl. 103. 1798. **Type:** Not seen.

Ficus oppositifolia Roxb., Pl. Coromandel 2(1): 14. t. 124. 1799. *Sycomorphe roxburghii* Miq., Ann. Sci. Nat., Bot. ser. 3, 1: 35. 1844. *Covellia oppositifolia* Gasp., Nov. Gen. Fic. 85. 1844; H. Drury, Handb. Ind. Fl. 3: 222. 1869. **Type:** India, Ind. Orientalis.

Ficus daemonum J. Koenig ex Vahl., Enum. Pl. 2: 198. 1805. *Gonosuke demonum* Raf. Sylva Tellur. 58. 1838. *Covellia daemonum* Miq. London J. Bot. 7: 462. 1848. **Type:** *s. loc., s. d., J. G. Konig s.n.* (Syntype- C, C10006720!).

Ficus fecunda Blume, Cat. Gew. Buitenzorg (Blume) 36. 1823. **Type:** Not seen.

Ficus prominens Wall. & Miq., London J. Bot. 7: 236. 1848. **Type:** India, Ind. Orientalis, 1826, *N. Wallich 4537* (Isotype- G, G00369746!).

Covellia setulosa Miq., London J. Bot. 7: 462. 1848. **Type:** India, Ind. Orientalis, *s.d.*, *R. Wight 17* (Isotype- E, E00288923!).

Covellia courtallensis Miq., London J. Bot. 7: 463. 1848. *Ficus courtallensis* Baill., Hist. Pl. (Baillon) 6: 176. 1875. **Type:** India, Tamil Nadu, Courtallum, 1836, *R. Wight 944* (Holotype- U, U 0043292!; Isotype- E, E00288926!).

Covellia wightiana Miq., London J. Bot. 7: 463. 1848. **Type:** India, *s.loc.*, *s.d.*, *R. Wight 25* (Type- E, E00288928!).

Covellia assamica Miq., London J. Bot. 7: 464. 1848. **Type:** India, Assam, *s.d.*, *s.coll. s.n* (Type- CAL, CAL0000025727!; K, K000880244!).

Covellia dasycarpa Miq., London J. Bot. 7: 465. 1848. **Type:** India, *s.loc.*, *s.d.*, *R. Wight s.n.* (Type- K, K000880234!).

Ficus hispida var. *incana* Kuntze, Revis. Gen. Pl. 2: 627. 1891. **Type:** Not seen.

Ficus hispida var. *viridis* Kuntze, Revis. Gen. Pl. 2: 627. 1891. **Type:** Not seen.

Ficus letaqui H.Lév. & Vaniot, Repert. Spec. Nov. Regni Veg. 8: 550. 1910. **Type:** China, Kouy-Tchéou, Lofou, March 1903, *J. Cavalerie 3599* (Holotype- E, E00275257!).

Ficus sambucixylon H. Lév., Repert. Spec. Nov. Regni Veg. 9: 444. 1911. **Type:** China, Riviere Lo-Fou, 600 m, September 1910, *J. Esquirol 2217* (Type- E, E00275255!).

Ficus hispidioides S. Moore, Journ. Bot., 61: Suppl. 51. 1923. **Type:** Africa, Botswana, Central, 1885-86, *H. O. Forbes s.n.* (Type- BM, BM000573832!).

Ficus poilanei Gagnep., Notul. Syst. (Paris) 4: 93. 1927. **Type:** Vietnam, Annam, Massif de Dông co Pat, prov. Quang Tri, 05 July 1924, *E. Poilane 11210* (Type- P, P00710586!; Isotype- P, P00710587!).

Fig. 3.60 – 3.62

Shrub to small tree up to 5 m height, independent, aerial roots absent; bark lenticellate, brown; young twigs terete, core hollow, strigose, brown; inter node 1.5–5.2 cm long; latex milky, white. Stipule caducous, lanceolate, 2.0–4.1 x 0.7–1.2 cm, margins entire, apex acute, base truncate, strigose on abaxial side, pale green. Petiole articulated, terete, 1.0–10.0 cm long, strigose, green. Leaves simple, opposite, decussate; lamina symmetric, elliptic to lance ovate, 19.0–42.0 x 9.0–18.0 cm, margins serrate, acumen 0.7–2.0 cm long, apex acuminate, base obtuse, pilose on the lamina, strigose on the veins, pale green when young, dark green on maturity, chartaceous, venation brochidodromous; basal veins 3, lateral veins 6–7 pairs, waxy glands on the base of the lateral nerves beneath. Receptacles axillary or cauliflorous, solitary or clustered, dioecious, pedunculate; peduncle 0.8-1.1 cm, strigose, green; basal bracts present, persistent, widely ovate, 3, free, 2.0–2.25 mm, hispid, pale green to yellow. Syconium 1.0–2.2 cm across, globose, hispid, green when young, yellow when mature; ostiole 0.5–1.0 mm; outer bracts present, free, ovate, 3.0 mm long, glabrous, pale brown; inner bracts present, free, lanceolate, 3.0 mm long, glabrous, pale yellow to white. Male flowers near ostiole, 4.5 mm long, pedicellate; pedicel 3.5 mm long; tepals 3, free, 2.5 mm long, lanceolate, glabrous, white; stamen 1, anther 0.5 mm, filament 0.5 mm long. Female flowers scattered, 3.0 mm long, pedicellate; pedicel 1.0 mm, glabrous, white; tepal 3, free, 2.5 mm long, lanceolate, glabrous, white; stigma 0.1–0.2 mm long; style 1.0 mm long; ovary 1.0 mm long, obovoid, glabrous, pale brown. Gall flowers scattered, 5.0 mm long,

pedicellate; pedicel 2.0–2.5 mm, glabrous, white; tepals 3, free, 2.5 mm long, lanceolate, glabrous, white; stigma short; style 0.2 mm long; ovary 2.0 mm long, obovoid, glabrous, pale brown. Achenes ovoid, 1.0–1.5 mm, brown.

Local names: *Erumanakku, Kattatthi, Parakam, Thonditherakam* (Mal.); *Peyathi, Chona Atthi* (Tam.); *Olapatha, Medi* (kan.); *Kalaumbar, Kharvoti* (Mar.); *Dhedumera* (Guj.); *Kala Umbar* (*Hin.*).

Common names: Devil fig, Hairy fig, Rough-leaved fig, Opposite-leaved fig-tree.

Flowering and fruiting: Two to three times a year.

Distribution: China, India, Nepal, Australia, Sri Lanka, Sumathra, Thailand etc. The species is distributed all throughout India.

Habitat: Found in semi evergreen and moist deciduous forests. Also seen in plains and in waste lands.

IUCN status: Least Concern (LC).

Etymology: The plant is covered with hispid like hairs and the plant is named 'hispida' with reference to the rough indumentum present on the plant parts.

Uses: Leaves are used as fodder for cattle. Young receptacles are cooked and eaten. Bark of the plant is used for making rope. Wood is of poor economic value and is sometimes used for making match boxes. Bark is used in the treatment of cough (Lansky & Paavilainen, 2011) and fruits are used to cure stomach disorders, ulcers and jaundice (Tiwari, 2016).

Notes: The plant is typically identified by opposite leaves. King (1887-1888) mentioned that the leaves are opposite in most of the cases but mentioned the presence of scattered leaves which have no tendency to become opposite.

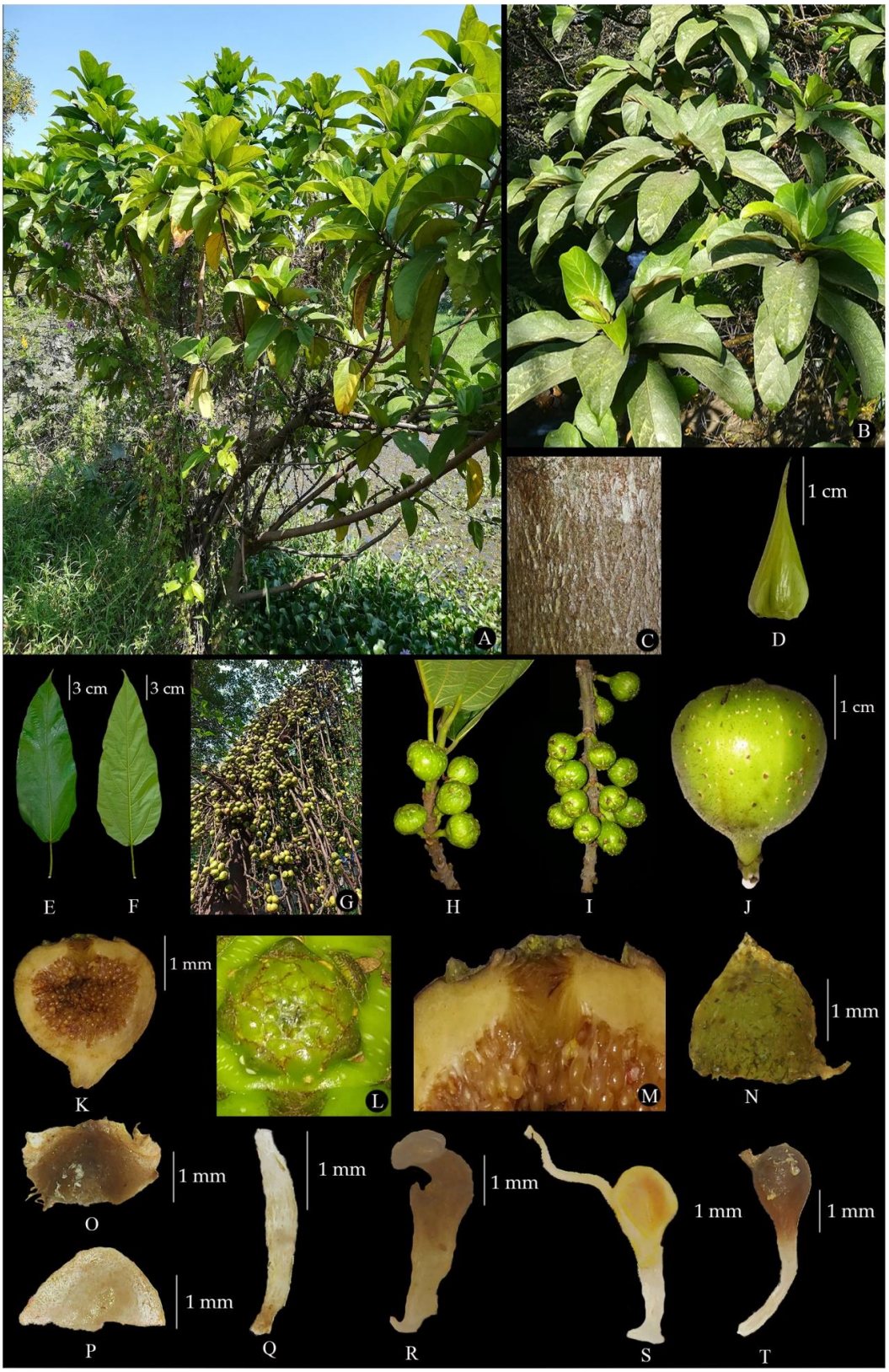


Fig. 3.60. ***Ficus hispida*** L.f.: **A.** Habit; **B.** Twig; **C.** Bark; **D.** Stipule; **E.** Leaf adaxial side; **F.** Leaf abaxial side; **G, H & I.** Receptacles; **J.** Syconium; **K.** Syconium L. S.; **L.** Ostiole; **M.** Ostiolar L. S.; **N.** Basal bract; **O.** Outer ostiolar bract; **P.** Inner ostiolar bract; **Q.** Tepal; **R.** Male flower; **S.** Female flower; **T.** Gall flower.

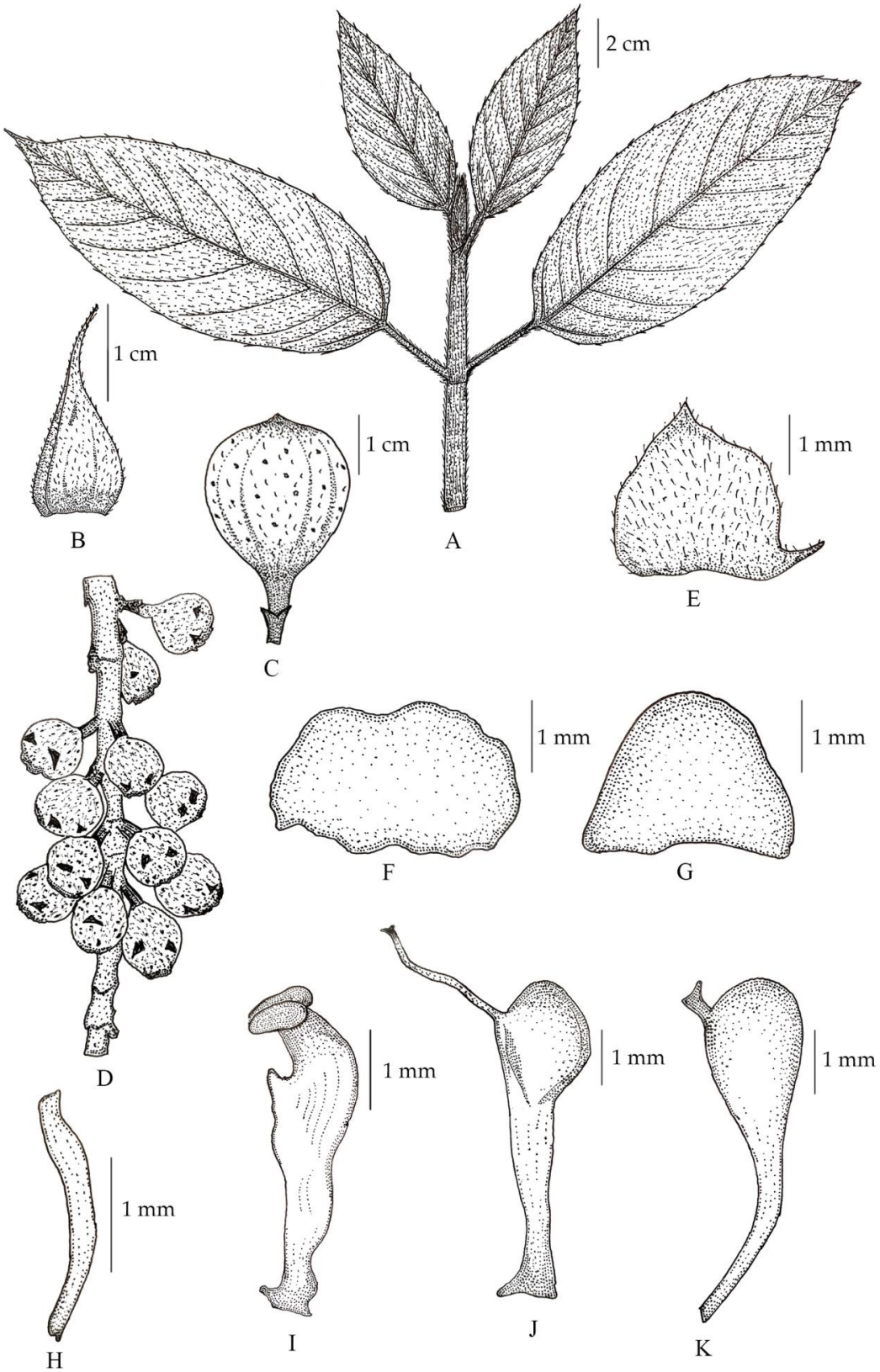


Fig. 3.61. ***Ficus hispida*** L.f.: **A.** Twig; **B.** Stipule; **C.** Syconium; **D.** Receptacles; **E.** Basal bract; **F.** Outer ostiolar bract; **G.** Inner ostiolar bract; **H.** Tepal; **I.** Male flower; **J.** Female flower; **K.** Gall flower.

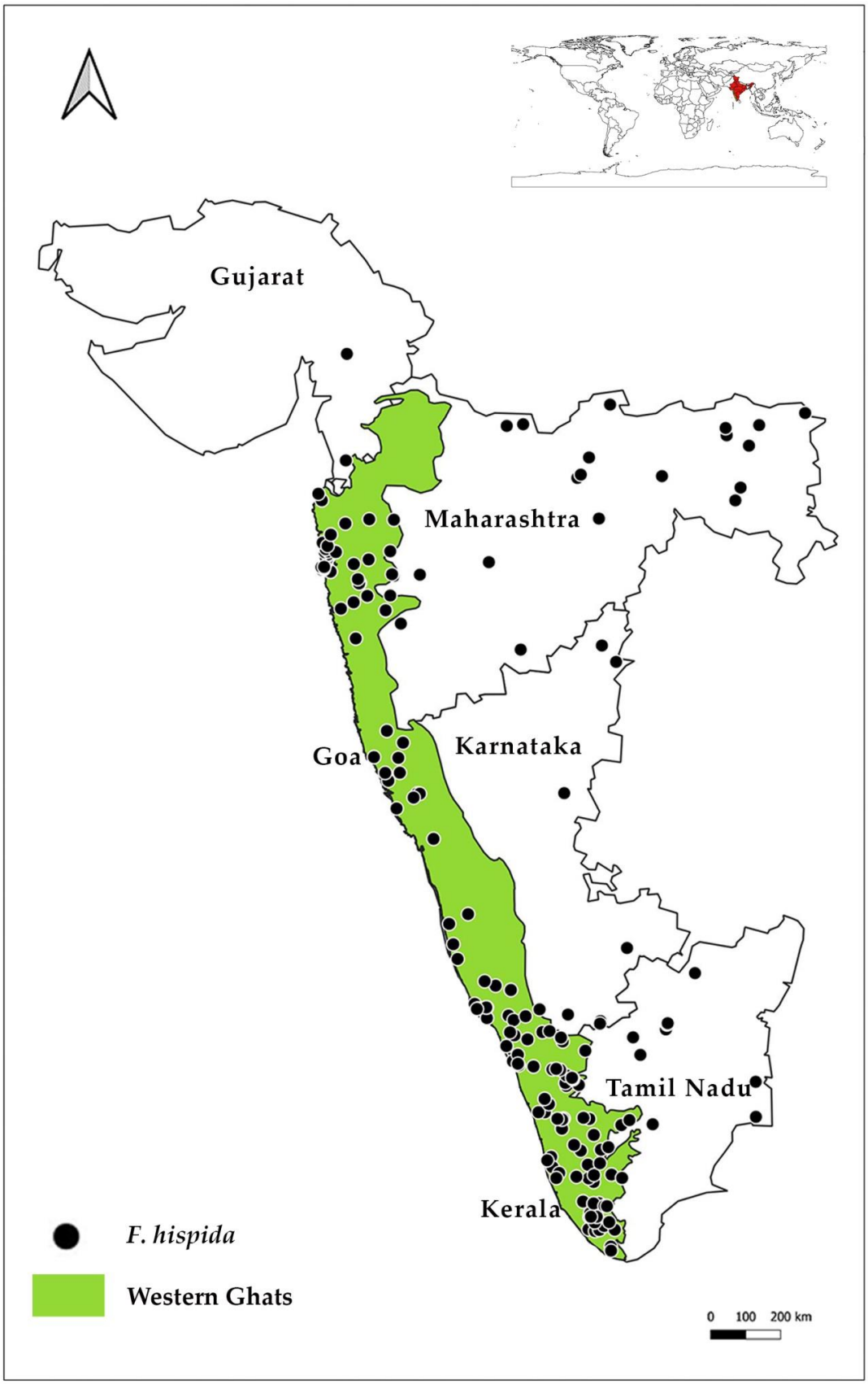


Fig. 3.62. *Ficus hispida* L.f. - Distribution map.

No such individual with alternate leaves were observed either in live form or as preserved specimen were observed in the present study. The figs are usually cauliflorous, borne on long spur like branches arising from the stem, while figs are borne axillary also.

Specimens examined: India, **Andaman and Nicobar Islands,** North and Middle Andaman District, Andamans, long island, 10 m, 22 January 1959, *K. Thothathri 9110* (MH); Andamans, 10 m, 14 April 1964, *J.L. Ellis & K. Ramamurthy 18813* (MH); North Andamans, Mayabunder, 2 m, 30 July 1974, *N. Bhargava 1931* (PBL); Middle Andamans, Bakultala, 06 November 1977, *N. Bhargava 6418* (PBL); North Nicobars, Malacca, sea level, 11 August 1973, *N.P. Balakrishnan 447* (PBL); *ibid.,* sea level, 11 August 1973, *N.P. Balakrishnan 441* (PBL); *ibid.,* sea level, 01 March 1974, *N.G. Nair 901* (PBL); North Nicobars, Katchal Island, sea level, 21 April 1974, *P. Chakraborty 1116* (PBL); North Nicobars, Kamorta Island, 25 m, 22 May 1977, *N. Bhargava 5024* (PBL). South Andaman District, Mount Harriet, 390 m, 11 March 1973, *N.P. Balakrishnan 48* (PBL); Brookesabad, 50 m, 20 April 1973, *N.P. Balakrishnan 105* (PBL); Namunghar, 50 m, 15 June 1973, *N.P. Balakrishnan 252* (PBL); Viper Islands, 50 m, 21 March 1974, *N.P. Balakrishnan 986* (PBL); Hut Bay, sea level, 28 April 1975, *N. Bhargava 2307* (PBL); *ibid.,* sea level, 02 May 1975, *N. Bhargava 2354* (PBL); Near Forest Nursery, Hut Bay, sea level, 08 May 1975, *N. Bhargava 2411* (PBL); Hut Bay, sea level, 18 August 1976, *N. Bhargava 4149* (PBL); Dugong Creek, sea level, 01 September 1976, *N. Bhargava 4327* (PBL); Camp No. III, Havelock Island, 1 m, 01 September 1977, *R.K. Premanath 6104* (PBL); Near Bamboonalla village, just on the way, Baratang, 20 m, 29 January 1978, *P. Basu 6860* (PBL); No. 1 forest, Neil Island, 14 November 1978, *P. Basu 7005* (PBL); Havelock Island, 5 m, 11 October 1985, *Barin Ghosh 11555* (PBL); Rutland, Bada Khadi, 07 May 2003, *K. Karthikeyan 19502* (PBL); Great

Nicobar, Jhow Nalla, 16 January 2004, *J. Jayanthi 19932* (PBL); Kala Pathar, R.F., Ferrargunj, 507 m, 13 May 2006, *R.P. Pandey 26015* (PBL); Bechdera, R.F., Ferrargunj, 100 ft, 14 May 2006, *R.P. Pandey 26074* (PBL); Port Blair, Chatham Island, 29 March 2008, *S. Kumar 26388* (PBL); Port Blair, Marine Hill, 27 August 2008, *S. Kumar 27685* (PBL); Jhinga Nala, R.F., Ferrargunj, 285 ft, 03 November 2008, *R.P. Pandey 26238* (PBL); Brookshabad, Inland forests, 50 m, *N.P. Balakrishnan 105* (MH). South Nicobar District, Pulobaha, Galathea River Bank, 28 March 1966, *Thothathri 11541* (PBL); Campbell Bay, Great Nicobar, 25 m, 16 August 1975, *N.P. Balakrishnan 2752* (PBL). **Andhra Pradesh,** Anantapur District, Bollapalli, 31 August 1924, *s.coll. 17426* (MH). Chittoor District, Thumbura Theertham, 290 m, 09 December 2003, *J.H. Franklin Benjamin 117453* (BSID); Talakona Sacred Groove, 09 January 2016, *J. Swamy & S. Nagaraju 7472* (BSID). East Godavari District, Rampachodavaram, 300 m, 29 June 1965, *G.V. Subba Rao 24480* (MH); Alauddin bridge, near Erra Konda, 350 m, 27 September 1980, *G.V. Subba Rao 68614* (MH); *s.loc.,* 550 m, 23 December 1993, *M. Mohanan 100894* (MH); Valamuru, 550 m, 23 December 1993, *M. Mohanan 100894* (BSID); Madurlanka, 550 m, 17 February 1994, *M. Mohanan 101245* (BSID). Godavari District, Balabuthrapuram, 26 December 1901, *Bourne 3237* (MH); Srivaka, 02 January 1902, *Bourne 3367* (MH). Gundur District, Amudarlanka (Mudurlanka), 550 m, 17 February 1994, *M. Mohanan 101245* (MH). Kadapa District, Near the river Kodur, 210 m, 23 July 1962, *J.L. Ellis 14337* (MH). Karimnagar District, Narsingapur, 250 m, 01 April 1999, *R.K. Premnath 110863* (MH). Komaram Bheem District, Savathula Gundam, 29 March 1988, *N.R. Rao & T. Ravisankar 86559* (MH). Krishna District, Krishnapuram, June 1900, *C.A. Barber 1927* (MH); D. M. Bhavi, 06 April 1984, *P. Venkanna 5015* (MH); Vijayawada, 06 August 1985, *P. Venkanna 5654* (MH). Kurnool District,

Phaladhara, Panchadhara, Srisailam, 490 m, 15 July 1963, *J.E. Ellis 16886* (MH); Near Hatakeshwaram, 700 m, 24 April 1986, *N. Rama Rao & V.B. Husagoudar 83744* (MH & BSID). Nellore District, Atmakur (Athmkur), 21 September 1937, *s. coll. 383* (MH); Kalwai, on way to Somasila Dam, 01 November 1998, *P. Venu 110200* (BSID); Penchala Kona, 241 m, 13 July 2013, *J. Swamy & S. Nagaraju 8183* (BSID). Saugor District, Dhana, May 1853, *s.coll. 25617* (BLAT). Srikakulam District, Jamparakota, 15 December 1923, *K. Cherian Jacob 17243* (MH); Between Subukota and Singupuram, 200 m, 07 May 1979, *G.V. Subba Rao 62329* (MH); Gangaram, 250 m, 19 February 2000, *R.K. Premnath 110896* (MH). Tirupati District, Satyavedu to Ambakam, 125 m, 03 October 1974, *M. Chandrabose 45224* (MH). Visakhapatnam District, Lakshmipuram, May 1900, *C.A. Barber 1749* (MH); Forest near Sunkarimetta, 1075 m, 30 August 1960, *N.P. Balakrishnan 10946* (MH); Eastern slope of the hill, Simhachalam, 150 m, 05 May 1964, *G.V. Subba Rao 19333* (MH); Mukunuru, 03 April 1987, *T. Ravisankar 85176* (MH); West Godavari, Sirivaka near Koruturu, 108 m, 14 February 1987, *D. Narasimhan 84246* (BSID). **Assam,** Dima Hasao District, Halflong hill, May 1918, *s.coll. 29199* (BLAT). **Goa,** North Goa District, Tamboriem, Pernem, 10 November 1962, *Seshagiri Rao Rolla 84589* (BSI); Chapora, Kaisuva fort, 05 September 1965, *John Cherian 88569* (BSI); Moira, March 1965, *J. Pallithanam G97* (BSI). South Goa District, Colem on way to Cananzol old station, 09 May 1963, *K.C. Kanodia 88509* (BSI); Velim, 20 April 1966, *John Cherian 109001* (BSI). **Gujarat,** Vadodara District, Vadodara, Indira Avenue Road to main railway line, 22 March 1955, *G.L. Shah Shah1953* (BLAT). **Himachal Pradesh,** Kangra District, Bhadwar, 2001 ft, 13.5.1933, *W.N. Koelz 4443* (MICH). **Karnataka,** Bangalore District, *s.loc.,* 29 January 1990, *s.coll. 473* (MH). Bellary District, Kampli, 06 May 1977, *N.P. Singh 146999* (BSI). Bidar District, Chincholi - Sulephet road, 7th mile,

11 February 1975, *N.P. Singh 128670* (BSI); Chinkholi range forest, 20 January 1976, *N.P. Singh 142678* (BSI). Chamarajanagar District, Kere Dimba Podu, B. R. T. Wild Life Sanctuary, 02 April 2015, *J. Jayanthi 202838* (BSI); Havarai, Bedguli, 15 April 1962, *A.S. Rao 79887* (BSI); Koteghar, Sunkasale, on way to Ballatrayan Durga, 08 February 1963, *A.S. Rao 85327* (BSI). Kodagu District, Makut, 10 March 1958, *G.S. Puri 32415* (BSI); *ibid.*, 07 January 1959, *R.K. Arora 46369* (BSI); *ibid.*, 08 January 1959, *R.K. Arora 47158* (BSI). Mysore District, Nagarahole, 06 January 1959, *R.K. Arora 11666* (BSI); Govt. silk farm, Biligirirangan, 28 April 1962, *A.S. Rao 80433* (BSI). Raigad District, Kerike road, Bagmandla, 15 May 1959, *R.K. Arora 55115* (BSI). Shimoga District, Barakana, Agumbe, 19 June 1961, *R. Sundara Raghavan 74192* (BSI); Konagal gudda, Thirthahalli, 28 May 1962, *R. Sundara Raghavan 81046* (BSI). Uttara Kannada District, Devimave ghat, October 1919, *Hall & Mecaum 34503* (BLAT). **Kerala,** Alappuzha District, R. Block, Vembanad Lake, 19 April 1988, *M.S. Swaminathan 88256* (MH); Mayithra, sea level, *C.N. Sunil 1853* (CALI). Idukki District, Thenkanchi, 850 m, 23 September 1972, *B.D. Sharma 40869* (MH); Meenmutty, 700 m, 18 February 1982, *C.N. Mohanan 73337* (MH); Kurishumala, 2100 m, 01 June 1998, *S.D. Biju 38047* (TBGT). Kannur District, Kannothumchal (Kannoth), 27 March 1905, *s.coll. 9435* (MH); Taliparamba farm, 12 June 1905, *C.A. Barber 7355* (MH); Taliparamba, 12 October 1905, *C.A. Barber 7132* (MH); *ibid.*, 19 May 1906, *C.A. Barber 7733* (MH); Taliparamba farm, 13 February 1913, *C.A. Barber 8677* (MH); Chandanathode, 800 m, 24 February 1979, *V.S. Ramachandran 61357* (MH); Kannothumchal (Kannoth), 140 m, 25 February 1979, *V.S. Ramachandran 61399* (MH); Begur R. F., 825 m, 24 November 1979, *V.S. Ramachandran 52338* (MH); Karimbam, 175 m, 23 June 1980, *R. Ansari 67807* (MH); Panathur, 250 m, 29 June 1981, *R. Ansari 67908* (MH); Taliparamba, 150 m, 17 July 1981, *R.*

Ansari 70915 (MH); Karimbam, 175 m, 18 July 1981, *R. Ansari 70936* (MH); Madayippara, Water fall, 16 April 2012, *C. Pramod 122090* (CALI); *ibid.*, 16 April 2012, *C. Pramod 133088* (CALI). Kasargod District, Ezhimalai, 200 m, 14 May 1982, *V. J. Nair 73890* (MH). Kollam District, Thenmalai - Trivandrum road side in forests, 07 February 1961, *K.N. Subramanian 70311* (BSI); Vandalodu, Thenmalai Forest Division, 12 February 1961, *K.N. Subramanian 70600* (BSI); Aryankavu - Shenkottai road, 09 May 1961, *K.N. Subramanian 71539* (BSI); Thenmalai - Kazhuthuruthy road, 18 November 1961, *K.N. Subramanian 76916* (BSI); Thenmalai - Shenkottai railway, 20 November 1961, *K.N. Subramanian 77017* (BSI); Thenmalai, Mytanmoodu, Kulathupuzha, 10 March 1980, *C.E. Risdale 556* (CALI); Thenmala, 380 m, 18 May 1978, *M. Mohanan 54877* (MH); near Madathara, 125 m, 20 May 1978, *C.N. Mohanan 55713* (MH); Mylammoodu, Kulathupuzha, 750 m, 10 March 1980, *K. Vivekananthan 66179* (MH). Kottayam District, near Pallivasal, 1225 m, 23 April 1964, *K.M. Sebastine 18387* (MH); Kuttikanam, 1100, 21 September 1964, *K. Vivekananthan 20343* (MH); Changanassey, below 10 m, 28 April 1984, *V.T. Antony 422* (MH); Udayanapuram, Vaikom, 29 May 2020, *Sreehari S. Nair 12965* (MESAH). Kozhikode District, Sulthan Bathery, 900 m, 11 February 1964, *J.L. Ellis 18679* (MH); Kuttiyadi, Submergible area, 190 m, 25 June 1965, *B. D. Naithani 24623* (MH); Kunnamagalam, 14 February 1971, *V.V. Sivarajan 968* (CALI); Muchukunnukavu, Quilandy, 10 March 1993, *A. Nazarudean 16560* (TBGT); IISR Peruvannamuzhy, 20 m, 27 June 1996, *James Philip 55382* (CALI). Malappuram District, Manjeri, 125 m, 24 February 1970, *J.L. Ellis 33559* (MH); Idimuzhikkal, 25 April 1971, *V.V. Sivarajan 1104* (CALI); University Campus, 50 m, 28 June 1976, *C.R. Suresh 22092* (CALI). Palakkad District, Walayar forest, 125 m, 09 July 1963, *J. Joseph 17040* (MH); Dhoni R. F., 125 m, 18 July 1963, *J. Joseph 17200* (MH); Walayar forest, 75 m, 22 May

1964, *E. Vajravelu 19038* (MH); Silent Valley R. F., 850 m, 12 October 1965, *E. Vajravelu 26177* (MH); Mukkali, 500 m, 14 July 1969, *E. Vajravelu 32075* (MH); Vattaparai forest, 650 m, 28 May 1979, *E. Vajravelu 62854* (MH); Panthanthode, 725 m, 02 May 1980, *V.J. Nair 62442* (MH); Aruvapara, Silent Valley, 21 August 1982, *T. Sabu 10694* (CALI); Siruvani, 750 m, 23 September 2003, *M.K. Hari Narayanan HN348* (CALI). Pathanamthitta District, Pamba, 1025 m, 27 June 1968, *D.B. Deb 30436* (MH); Ranni, 350 m, 31 August 1977, *N.C. Nair 50737* (MH); Angamoozhy forest, 150 m, 09 May 1988, *R. Chandrasekaran 88487* (MH); Muzhiar, 08 February 1994, *A. Nazarudean 19289* (TBGT). Thiruvananthapuram District, Poovachal, 21 February 1957, *G.S. Puri 15754* (BSI); Ponmudi, 19 February 1959, *M.Y. Ansari 50229* (BSI); Kottur R. F., 175 m, 03 April 1973, *J. Joseph 43981* (MH); Kottur R. F., 175 m, 05 April 1973, *J. Joseph 44044* (MH); *ibid.*, 175 m, 08 April 1973, *J. Joseph 44093* (MH); Athirumala, 15 May 1988, *N. Mohanan 9816* (TBGT); Ponmudi, 16 December 1992, *A. Nazarudean 15052* (TBGT); ex colony, 02 November 1995, *Deepthy Das 26264* (TBGT); Ponmudi, 24 July 1997, *s.coll. 41242* (TBGT); Vithura, 27 July 2001, *G. Valsaladevi s.n.* (KUBH); Echilattu kulam, 22 May 2015, *P. Suresh Kumar 8763* (KUBH). Thrissur District, Vazhachal, Travancore, 06 January 1953, *J. Fernandez JF113* (BLAT); Machadmala reserve, 06 April 1977, *K. Ramamurthy 49230* (MH); Machad Mala Reserve, 150 m, 06 April 1977, *K. Ramamurthy 49230* (MH); Peechi, 65 m, 12 March 1980, *N. Sasidharan 1142* (KFRI); Athirapilly, 350 m, 17 March 1982, *R. Rajan 73041* (MH); Athirapilly (Adirapilly), 300 m, 23 January 1982, *K. Ramamurthy 72932* (MH); *ibid.*, 350 m, 17 March 1982, *R. Rajan 7304* (MH); Vettilappara to Athirapilly R. F., 350 m, 27 November 1982, *K. Ramamurthy 75577* (MH); Vazhachal, 230 m, 14 November 2009, *K.H. Amitha Bachan 117682* (CALI). Wayanad District, Tirunelli R. F., 700 m, 06 March 1979, *V.S. Ramachandran 62155* (MH);

Pookod, 740 m, 10 April 2001, *A.K. Pradeep 70558* (CALI); Muthanga, *s.d., M.K. Ratheesh Narayanan s.n.* (CALI). **Madhya Pradesh,** Alirajpur District, Gir forest, 08 September 1957, *G.S. Puri 26114* (BSI). Bastar District, way to Thirathgarh falls, 560 m, 09 February 1961, *A.N. Henry 12025* (MH). Hoshangabad District, Bori R. F., 550 m, 29 April 1961, *J. Joseph 12452* (MH). Rewa District, Khatauli near Rewa, 425 m, 26 April 1960, *K.M. Sebastine 10054* (MH). **Maharashtra,** Akola District, Karla, near Patur, 18 February 1978, *S.Y. Kamble 152503* (BSI); Chikhalwal, 03 July 1978, *S.Y. Kamble 154042* (BSI); Rhishi lake, Karanga, 27 November 1979, *S.Y. Kamble 160867* (BSI). Amravathi District, Samadoh, 26 July 1978, *M.Y. Ansari 149396* (BSI). Bhandara District, Penganga felling, Kharbi, 23 December 1976, *S. Karthikeyan 148542* (BSI); Penganga felling, Kharbi, 13 February 1977, *S. Karthikeyan 149040* (BSI); Around Bhandara, 16 February 1977, *S.K. Malhotra 145055* (BSI); Amgaon side, 24 February 1977, *S.K. Malhotra 149653* (BSI); Nawegaon forest area, 13 December 1977, *S.K. Malhotra 151349* (BSI). Burhanpur District, Khandesh, December 1916, *s.coll. 25488* (BLAT). Chandrapur District, Chanda-Allapalli Road, forest before Pippini village, 09 September 1963, *Seshagiri Rao Rolla 91420* (BSI); Bhamragarh Forest Rest house surroundings, 27 April 1964, *Seshagiri Rao Rolla 96585* (BSI); Hirdinale, 17 March 1971, *B.M. Wedhwa 133955* (BSI); Panchdhotra camp no 92, 29 March 1974, *B.G. Kulkarni 137351* (BSI). Hingoli District, Chalavi R. F., Sawa range, 27 October 1967, *K.V. Billore 113090* (BSI). Jalgaon District, Raver, 13 March 1957, *S.D. Mahajan 13254* (BSI); Yawal, 15 March 1957, *S. D. Mahajan 13187* (BSI); *ibid.,* 09 July 1957, *S.D. Mahajan 20209* (BSI). Mumbai District, Vehar Lake, 26 June 1954, *H. Santapau 18835* (BLAT); National Park, Borivali, 15 January 1955, *P. S. Herbert SH453* (BLAT); *ibid.,* 20 January 1955, *P.S. Herbert SH463* (BLAT); *ibid.,* 30 January 1955, *P. S. Herbert SH484* (BLAT);

Manol - Vehar Lake, 13 March 1955, *P.V. Bole Bole1345* (BLAT); Wadala, 17 August 1956, *R.R. Fernandez R2588* (BLAT); *ibid.,* 17 August 1956, *R.R. Fernandez R2589* (BLAT); *ibid.,* 17 August 1956, *R. R. Fernandez R2590* (BLAT); Malad, on hills, 14 December 1957, *G.L. Shah Shah9626* (BLAT); Near government guest house, 20 January 1958, *S.C. Tavakari T537* (BLAT); Malad hills, 02 February 1958, *G.L. Shah Shah9719* (BLAT); Malad hill point, 02 February 1958, *G.L. Shah Shah9711* (BLAT); Station to U12 via U9, U10 and U11, 23 March 1958, *S.C. Tavakari T942* (BLAT); Uran, 02 February 1960, *P. Divakar PD471* (BLAT); *ibid.,* 03 July 1961, *P. Divakar PD 2380* (BLAT); *ibid.,* 03 February 1962, *P. Divakar PD3765* (BLAT); *ibid.,* 21 August 1962, *P. Divakar PD4838* (BLAT); Nepean sea road, Bombay, August 1916, *s.coll. 17065* (BLAT); Pansik hill, Salsettle, December 1918, *s.coll. 28929* (BLAT); Bombay, January 1917, *s.coll. 15289* (BLAT); Colaba, March 1917, *s.coll. 25404* (BLAT); Sion, Bombay, March 1917, *s.coll. 15276* (BLAT); Walkeshwar, Bombay, October 1916, *s.coll. 17077* (BLAT); Bishop's lodge, Bombay, October 1932, *R.D. Aclaud ACK 1144* (BLAT). Nagpur District, Pular - Parsori belt, near Saleshri camp, 21 September 1970, *S. Moorling 129909* (BSI). Nashik District, Thangaon, 2500 ft, 18 February 1958, *S.D. Mahajan 32093* (BSI); Jamanpada forest, 11 November 1970, *M.Y. Ansari 126856* (BSI); Rakshas Shuwan, 30 March 1984, *P.L. Narasimhan 166392* (BSI); Igatpuri, January 1917, *s.coll. 25408* (BLAT). Palghar District, Bassein fort, 09 July 1949, *H. Santapau 10101* (BLAT); Khunvada R. F., Bordi range, 11 January 1968, *K.V. Billore 113452A* (BSI). Pune District, College garden, Pune, 09 May 1902, *L.D. Garade 115* (BSI); Bhimashankar, 19 March 1907, *G.M. Ryan 1810* (BSI); Mulshi, 26 April 1956, *S.K. Jain 738* (BSI); Ramling, 24 July 1957, *S.K. Jain 20751* (BSI); Karla, 23 September 1957, *S.K. Jain 18784* (BSI); Thangaon, 15 February 1958, *S.D. Mahajan 32091* (BSI); Durga Vhamal, Khed Taluka, 06 December 1961, *K.P.*

Janardhanan 76318 (BSI); Koraikhilfa forest near Ambavane, Lonavla, 12 December 1963, *B. Venkata Reddi 93312* (BSI); Ambavene forest facing Kolaba, Lonavla, 04 February 1964, *B. Venkata Reddi 95961* (BSI); Bhivadi khund, Durga Khilla, 17 -18 miles west of Junnar, 15 May 1964, *K. Hemadri 89909* (BSI). Raigad District, Water pipe- Jummapatti, 19 March 1959, *N.A. Irani NI3065* (BLAT). Ratnagiri District, Palgadh, 05 April 1959, *P.S. Toor 51814* (BSI); Sakha Pathar-Amboli Road, 08 March 1962, *Seshagiri Rao Rolla 77713* (BSI); Gavata, 5 Km from Bhedshi, 18 February 1966, *M.Y. Ansari 106477* (BSI); Madgaon, 9 Km from Akeri, 14 June 1966, *M.Y. Ansari 107763* (BSI); Phonda ghat, 24 October 1969, *B.G. Kulkarni 118903* (BSI). Sangli District, Nandoli, 27 February 1996, *A.N. Londhe 175360* (BSI). Satara District, Khandala, ravine under St. Xaviers, 21 May 1942, *H. Santapau 431* (BLAT); Khandala, 02 August 1942, *H. Santapau 662* (BLAT); Khandala Eco point, 27 September 1942, *H. Santapau 1082* (BLAT); Khandala, top of sausages, 12 May 1948, *H. Santapau 8911* (BLAT); Shirshinge, Koyna, 28 December 1978, *R.K. Kochhar 158069* (BSI); Khandala, July 1916, *s.coll. 26665* (BLAT); Khandala, May 1917, *s.coll. 25444* (BLAT); Khandala, Tiger's leap jungle, October 1918, *H. Santapau 27578* (BLAT). Solapur District, Balicol forest, 19 November 1959, *S.K. Jain 3471A* (BSI). Thane District, Ghodbunder, 09 April 1951, *S.K. Jain 14572* (BSI); Mumbra, 18 February 1954, *K.V. Shenoy KVS 2154* (BLAT); Mandvi, 28 August 1960, *N.Y. Das NYD1914* (BLAT); *ibid.*, 10 December 1960, *N.Y. Das NYD 2902* (BLAT); *ibid.*, 10 December 1960, *N.Y. Das NYD2903* (BLAT); Parol, 29 December 1961, *N.Y. Das NYD5445* (BLAT); *ibid.*, 29 December 1961, *N.Y. Das NYD5446* (BLAT); Mandvi, 20 February 1962, *N.Y. Das NYD7085* (BLAT); *ibid.*, 20 February 1962, *N.Y. Das NYD7086* (BLAT); *ibid.*, 20 February 1962, *N.Y. Das NYD7087* (BLAT); Ghodbunder, November 1924, *s.coll. s.n.* (BLAT). Yavatmal District, On the way to Mohroli

from Wani, 20 February 1977, *S. Karthikeyan 149161* (BSI). **Manipur**, Senapati District, Karong, 3500 ft, 16 November 1950, *Thakur Rup Chand 4027* (MICH). **Meghalaya**, East Khasi Hills, Cherrapunjee, 4000 ft, 28 July 1952 *Thakur Rup Chand 6300A* (MICH); Khasi Hills, Nongpoh, 2000 ft, 24 April 1949, *W.N. Koelz 22550* (MICH); Khasi Hills, Nongpoh, 02 May 1949, *Thakur Rup Chand 1476* (MICH); *ibid.,* about 2000 ft, 02 May 1949, *Thakur Rup Chand 1433* (MICH); West Garo Hills, Near Nokrek, 09 March 1950, *Thakur Rup Chand 2787* (MICH); West Garo Hills, Phulbari, 11 April 1950, *W.N. Koelz 25067* (MICH); West Khasi Hills, Sonapahar, 3500 ft, 01 March 1952, *Thakur Rup Chand 5272* (MICH). **Odisha,** Ganjam District, Gunduribadi to Daringbadi, 02 February 1900, *s.coll. 1337* (MH). Poducherry District, Thavalkuppam, Sea level, 06 July 1989, *R. Rajan 91404* (MH). **Rajasthan,** Jaipur District, Kota - Sitabari, 30 October 1957, *S.K. Jain 29104* (BSI). **Tamil Nadu,** Chengalpattu District, Vedanthangal Water Bird Sanctuary, 125 m, 29 September 1974, *A.N. Henry 45504* (MH). Coimbatore District, Sadivayal, 06 August 1960, *A.N. Henry ANH 61* (BLAT); Anamalais, 2200 ft, 20 March 1931, *V. Narayana Swami 5487* (MH); Siruvani, 967 m, 26 February 1957, *K. Subramanyam 2448* (MH); Vellingiri hills, 666 m, 06 March 1957, *K. M. Sebastine 2490* (MH); Sadivayal, 400 m, 06 August 1960, *A.N. Henry 77* (MH); Poonachi, Anamalais, 1100 m, 24 October 1961, *J. Joseph 13250* (MH); Aliyar submergible area, 350 m, 13 February 1963, *K.M. Sebastine 15630* (MH); Sholayar Submergible area, 1100 m, 27 July 1963, *K.M. Sebastine 17239* (MH). Dindugal District, Lower Pulney, 04 June 1897, *Bourne 618* (MH); Sirumalais, April 1955, *J. Pallithanam JP185* (BLAT). Kamarajar District, Nagariyar estate, 1300 m, 24 September 1991, *S. R. Srinivasan 96806* (MH); Deviyar Estate, 1300 m, 28 February 1992, *S.R. Srinivasan 99145* (MH); Nagariyar to Kurathividuthi Estate, 24 September 1991, *S.R. Srinivasan 96800* (BSID). Kanyakumari District, Kalikesan river

side, 600 m, 30 August 1979, *A.N. Henry 48144* (MH); Kuttiyar river bank, Upper Kodayar, 110 m, 25 May 1988, *R. Gopalan 88643* (MH); Vellimalai, 1500 m, 22 August 1990, *V. Lakshamanan 93687* (MH). Madurai District, way to Kumili, 800 m, 23 April 1960, *B.V. Shetty 10258* (MH); Pannaikadi to Ganguvarpatti, 1300 m, 20 September 1968, *D.B. Deb 31042* (MH). Nilgiri District, Kargudi, 1000 m, 24 June 1970, *B.V. Shetty 34398* (MH); Way to Sundapatti, Kunjapanai, 1500 m, 04 August 1970, *E. Vajravelu 35203* (MH); Ghantha river banks, Ulliyur, 425 m, 07 November 1970, *E. Vajravelu 36749* (MH); Way to Barham Ouchterlony Valley, 1075 m, 31 May 1971, *J.L. Ellis 38560* (MH); Kargudi, 950 m, 12 April 1972, *K. Vivekananthan 40795* (MH). Ramanathapuram District, Alagar koil forest, 340 m, 25 July 1965, *E. Vajravelu 24897* (MH). Salem District, Vellakkadi road, near Vayalapatti estate, Yercaud, 1260 m, 18 April 1966, *A.V.N. Rao 27476* (MH); way to Manjakuttai, Yercaud, 1200 m, 15 February 1969, *D.B. Deb 31392* (MH). Tenkasi District, on the way to five falls, Courtallam, 367 m, 25 April 1957, *K. Subramanyam 2925* (MH); Five falls, Courtallam, 200 m, 22 March 1958, *K. Subramanyam 5627* (MH); Courtallam, 20 August 1963, *K.C. Kanodia 89372* (BSI). Thanjavur District, Nannilam to Aduthurai, 75 m, 28 January 1978, *K. Ramamurthy 53649* (MH); Muthupet, 10 m, 19 September 1965, *K. Ramamurthy 25851* (MH); Manganipillayar Thope, sea level, 12 August 1960, *K.M. Sebastine 10688* (MH). Theni District, Kombai, 350 m, 14 June 1961, *K.M. Sebastine 12586* (MH). Thiruvarur District, Muthupet, 40 m, 20 May 1978, *V.J. Nair 56585* (MH). Tiruchi District, Srirangam, Mukkombu, 14 November 1975, *K.M Matthew 92* (L). Tiruchirappalli District, Lalgudi, 23 August 1947, *S.N. Chandrasekhara 93189* (MH); Ayyanarkovil forest, 250 m, 17 March 1970, *E. Vajravelu 33857* (MH); Ayyanarkoil river bank, 300 m, 22 September 1971, *E. Vajravelu 38684* (MH). Tirunelveli District, Kalliankettu Their, 900 m, 26

April 1992, *R. Gopalan 99409* (MH); Sengaltheri (Sengalteri), 25 September 1910, *s.coll. 13591* (MH); Mancholai, 1300 m, 12 October 1957, *K.M. Sebastine 4397* (MH); Upper dam to Kannikatti, 400 m, 13 July 1959, *K.M. Sebastine 8540* (MH). Viluppuram District, Tiruvennnainallur, 150 m, 12 September 1977, *K. Ramamurthy 51176* (MH). **Telangana,** Kamarajiar District, Yenkur, 07 January 1997, *R. Rajan 108560* (BSID). Khammam District, Manuguru forest, 200 m, 23 August 1995, *R. Chandrasekaran 104254* (BSID); Madisagutta temple, 23 October 1995, *R. Rajan 106057* (BSID); Kinnarsani Forest area, 25 January 2002, *R. Rajan 112685* (BSID). Nalgonda District, Pothunur, 290 m, 09 August 2012, *A. Baleeshwar Reddy 5236* (BSID). Warangal District, Pakhal West, 295 m, 27 February 1963, *A.N. Henry 15946* (MH); Way to Gangaram, 08 August 1986, *P.V. Sreekumar 84037* (BSID); Hanmakonda, 250 m, 20 September 1995, *R.K. Premanath 105383* (BSID); Pakhal, 25 January 2001, *R.K. Premanath 111597* (BSID). Jagtial District, Kodimial, 400 m, 18 July 1964, *G.V. Subba Rao 20133* (MH). Hanmakonda District, Hanmakonda, 250 m, 25 March 1999, *R.K. Premanath 108265* (MH). Jayashankar Bhupalpally District, Mahadevpur, 12 February 1988, *M.R. Rajendra Prasad 826* (MH).

3.6.21. *Ficus krishnae* C. DC.

Ficus krishnae C. DC., Curtis Bot. Mag. 132: t. 8092. 1906; Tiwari *et al*., Phytotaxa 192(3): 169-180. 2015; Sudhakar *et al*., Figs of Eastern Ghats, India 118. 2017; S.S. Dash & A.A. Mao, Fl. Pl. India, 2: 543. 2020; Mahima *et al*., PhytoKeys 186. 121-138. 2021. **Type:** India, West Bengal, Sibpur, 1941, *s.coll. s.n.* (Type- BM, BM000951763!).

Ficus benghalensis var. *krishnae* (C. DC.) Corner, Gard. Bull. Singapore 21 (1): 14. 1965; Corner in Dass. & Forsb., Rev. Handb. Fl. Ceylon 3: 253. 1981; V. Chithra in A.N. Henry *et al.,* Fl. Tamil Nadu Ind., Ser I: Analysis 2: 252. 1987; B.K. Misra & B.K. Verma, Fl. Allahabad Dist.

Uttar Pradesh 346. 1992; K.M. Chetty *et al.,* Fl. Pl. Chittoor Dist. 332. 2008; T. Pullaiah, Fl. Telangana 2: 880. 2015; G.P. Sinha & A.N. Shukla, Fl. Uttar Pradesh 2: 473. 2020.

Fig. 3.63 – 3.66

Small to medium sized tree, 15 m, tall, aerial roots present; bark smooth, lenticellate, pale brown; young twigs terete, core solid, glabrous or pubescent, brown; inter node 2.0–3.0 cm long; latex milky, white. Stipule caducous, ovate, 2.5–6.0 x 1.0–1.5 cm, margins entire, apex acute, base truncate, pubescent, pale green. Petiole articulated, terete, canaliculate, 3.5–7.0 cm long, puberulous, pale green. Leaves simple, alternate, spiral; cup shaped at the base on the dorsal side, with or without leafy appendages, lamina symmetric, elliptic to ovate, 8.6–18.0 x 5.7–9.0 cm, margins entire, acumen 0.4–0.8 cm long, apex obtuse, base cuneate to acute, glabrous above and puberulous beneath, pale green when young, dark green on maturity, subcoriaceous, venation brochidodromous; basal veins 3–4, lateral veins 3–8 pairs; waxy glands on the base of the midrib beneath. Leafy appendages obovate, 1.0–8.0 x 0.5–3.0 cm, margins entire, apex obtuse, base cuneate to acute, puberulous, lateral veins 3–4 pairs. Receptacles axillary, paired, monoecious, sessile; basal bracts present, persistent, 3, free, 0.2–0.7 cm long, widely ovate, puberulous along the margins, glabrous inside, pale brown. Syconium 1.5–2.0 cm across, globose, puberulous, green when young, orange to red when mature. Ostiole 0.5–1.5 mm; outer bracts present, free, ovate, 1.5–2.0 mm long, glabrous to puberulous, pale yellow; inner bracts present, free, lanceolate, 1.5–2.0 mm long, glabrous, pale yellow. Male flowers numerous, scattered, 4.0 mm long, pedicellate; pedicel 1.0–1.25 mm long; tepals 3–4, free, 1.0 mm long, lanceolate, glabrous, white; stamen 1, anther 0.75 mm, filament 0.5 mm long. Female flowers scattered, 4.0 mm

long, pedicellate; pedicel 0.5 mm long; tepal 3–4, free, 2.0 mm long, lanceolate, glabrous, pale brown to yellow; stigma 0.5 mm long; style 1.5 mm long; ovary 1.0 mm long, ovoid, glabrous, pale brown. Gall flowers scattered, 3.0–4.0 mm long, pedicellate; pedicel 1.5 mm long; tepals 3, free, 1.5 mm long, lanceolate, glabrous, pale red; stigma short; style 1.0–1.2 mm long; ovary 1.0 mm long, obovoid, glabrous, yellow. Achene 1.0 mm, ovoid, pale yellow.

Local names: *Krishnan aal* (Mal.); *Krishna badh* (Hin.)

Common names: Krishna fig tree, Krishna's butter cup tree.

Flowering and fruiting: Two to three times a year.

Distribution: Found cultivated throughout India.

Habitat: Cultivated. Seen in gardens.

IUCN status: Not Evaluated (NE).

Etymology: The base of the leaf in the shape of a cup which resembles the butter cup of Lord Krishna. Hence, called Krishna fig tree.

Uses: The plant is usually planted in gardens. It is considered to be sacred and used in various religious ceremonies (Sudhakar *et al*., 2017).

Notes: *F. krishnae* is always considered sacred and peculiar with its cup shaped leaves. The variation on the leaf characters were considered due to mutations and the species was treated as a variety of *F. benghalensis* (Corner, 1965a; Chaudhary *et al*., 2012). Priyadarsanan (1999b) described a new species of fig wasp that pollinates *F. krishnae.* Considering that the figs are species specific in pollination and *F. benghalensis* being pollinated by another wasp, he suggested that *F. krishnae* should be given a sperate rank than treating it as a variety of *F. benghalensis*. Later the species was merged under

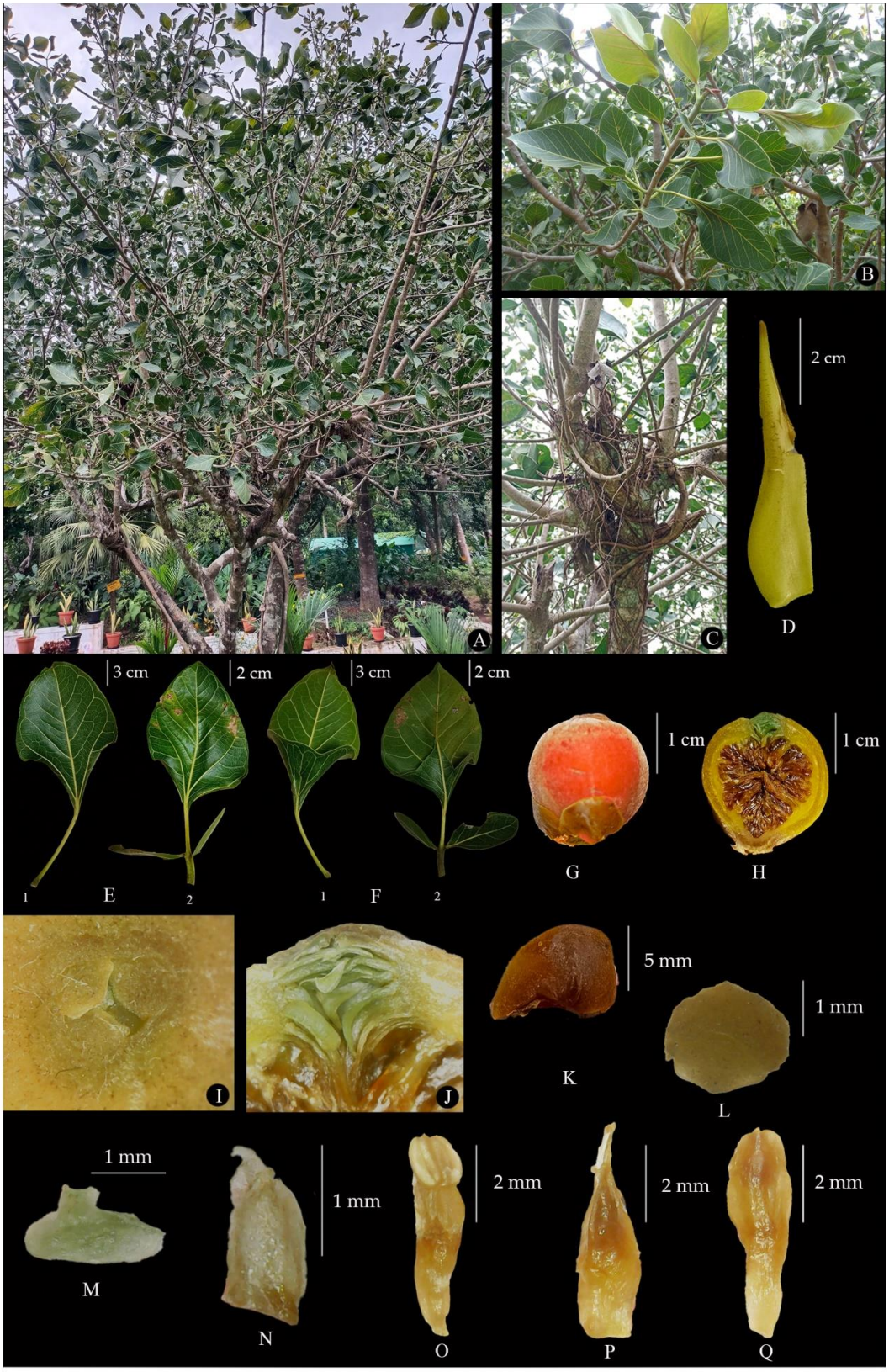


Fig. 3.63. ***Ficus krishnae*** C.DC.: **A.** Habit; **B.** Twig; **C.** Aerial roots; **D.** Stipule; **E(1&2).** Leaf adaxial side; **F(1&2).** Leaf abaxial side; **G.** Syconium; **H.** Syconium L. S.; **I.** Ostiole; **J.** Ostiolar L. S.; **K.** Basal bract; **L.** Outer ostiolar bract; **M.** Inner ostiolar bract; **N.** Tepal; **O.** Male flower; **P.** Female flower; **Q.** Gall flower.

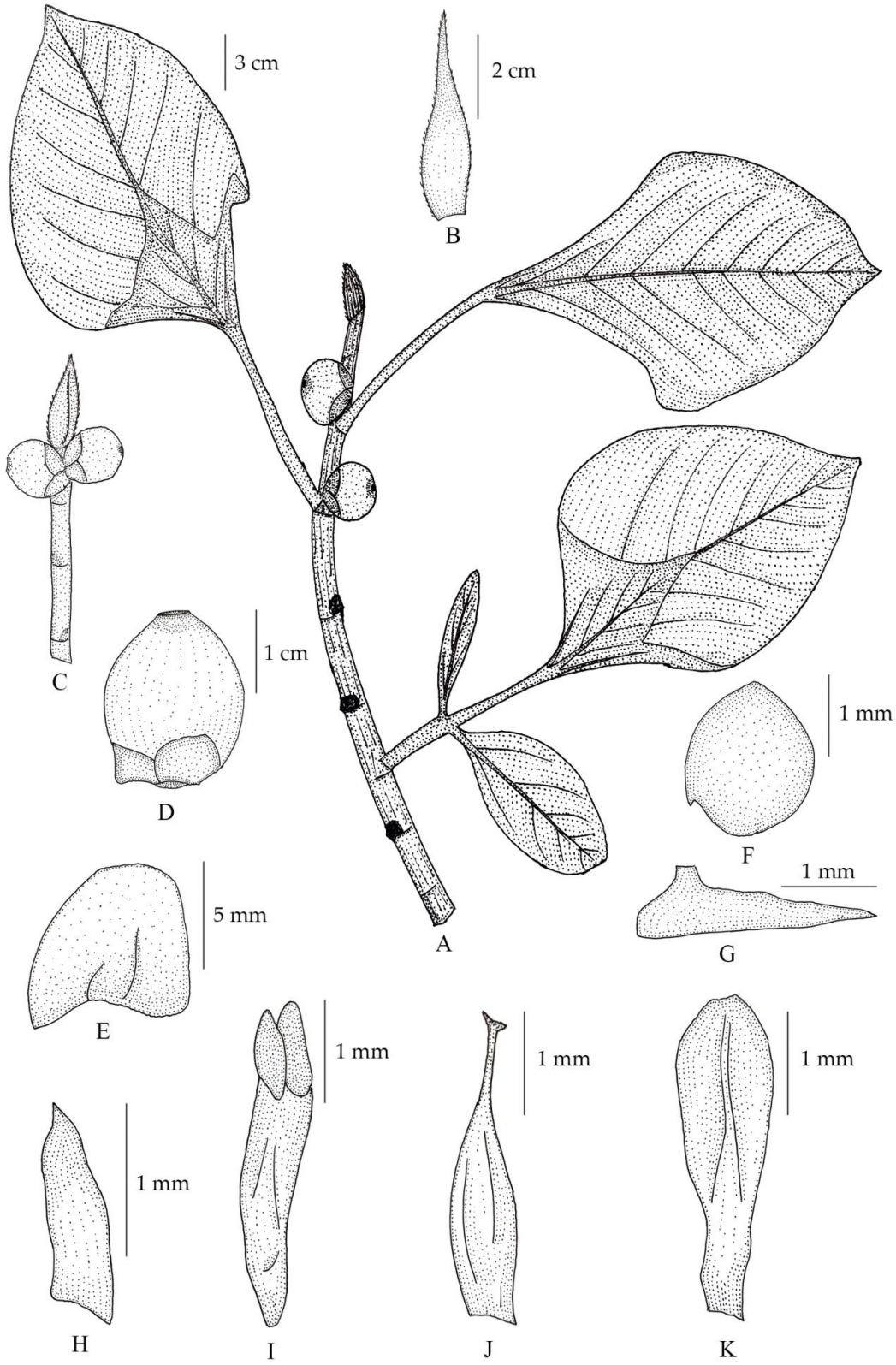


Fig. 3.64. ***Ficus krishnae*** C.DC.: **A.** Twig; **B.** Stipule; **C.** Receptacles; **D.** Syconium; **E.** Basal bract; **F.** Outer ostiolar bract; **G.** Inner ostiolar bract; **H.** Tepal; **I.** Male flower; **J.** Female flower; **K.** Gall flower.

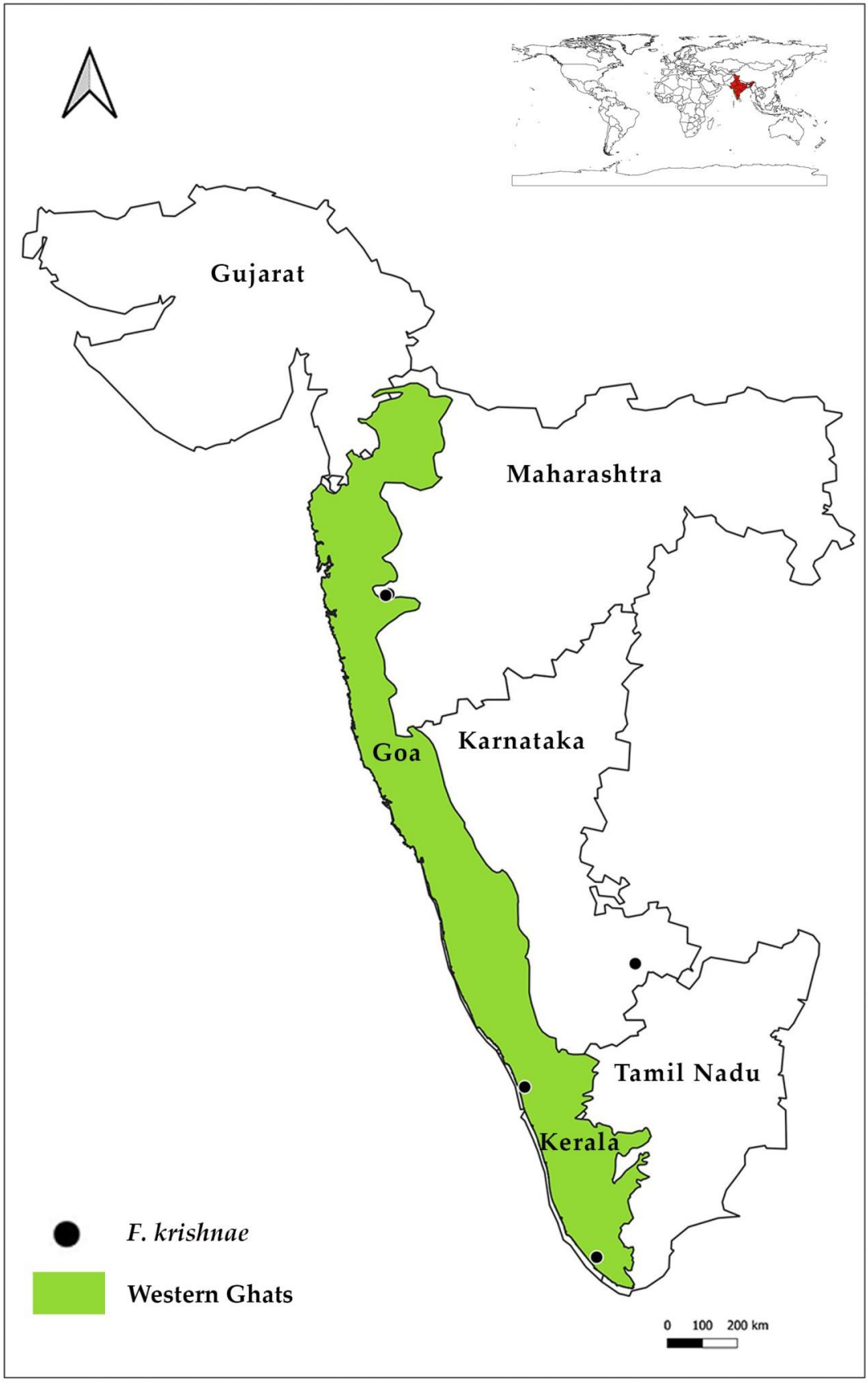


Fig. 3.65. *Ficus krishnae* C.DC. - Distribution map.

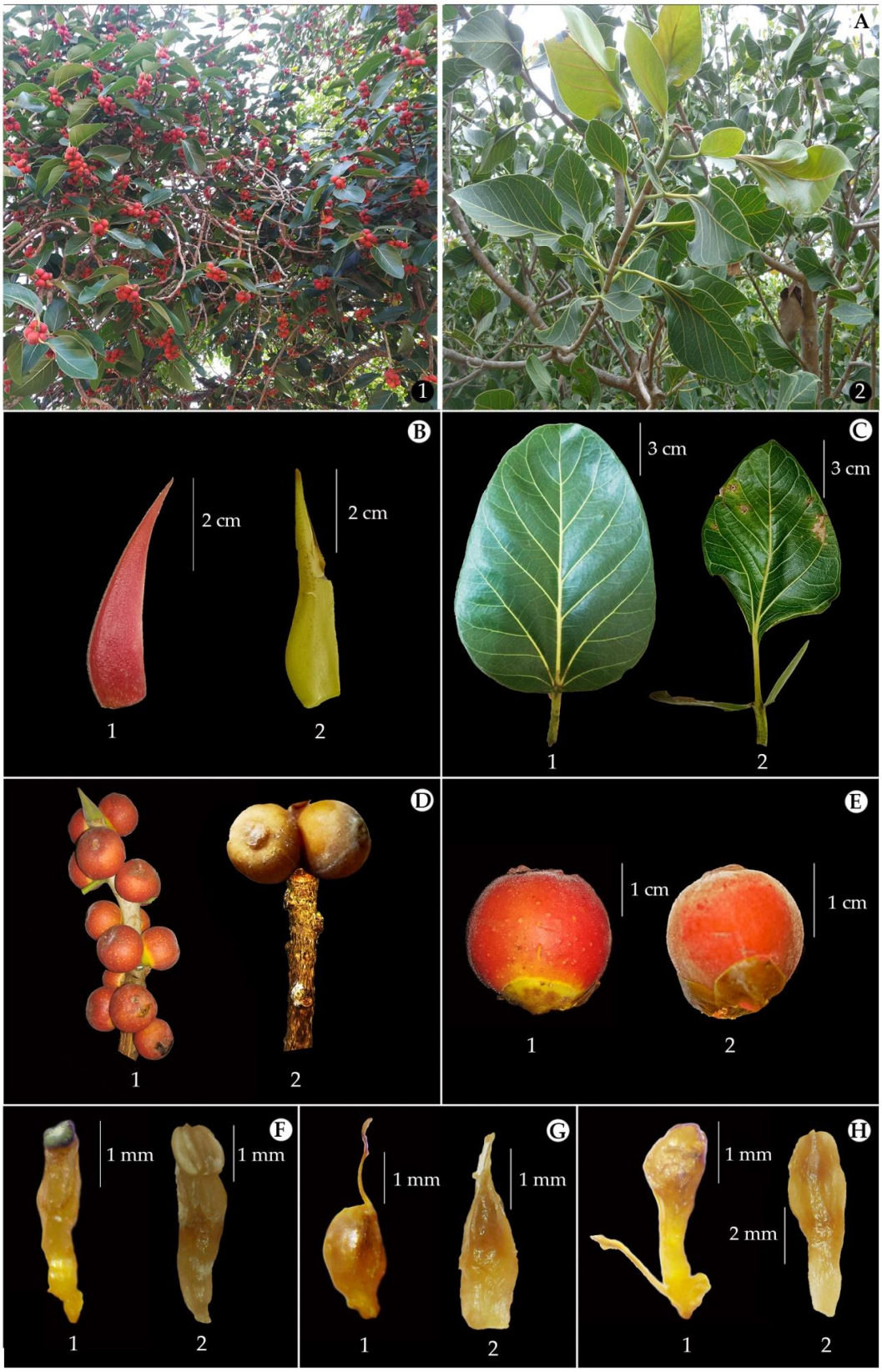


Fig. 3.66. Comparison between *Ficus benghalensis* and *Ficus krishnae*. **1.** *F. benghalensis*; **2.** *F. krishnae*. **A.** Twig; **B.** Stipule; **C.** Leaf; **D.** Receptacles; **E.** Syconium; **F.** Male flower; **G.** Female flower; **H.** Gall flower.

F. benghalensis by Berg and Corner (2005). Detailed works on the taxon was done (Tiwari *et al.*, 2015) to reinstate the species rank. Mahima *et al.* (2021), concluded that the *F. krishnae* and *F. benghalensis* can be treated as distinct species based on molecular evidences.

Specimens examined: India, **Gujarat,** Vadodara District, Vadodara, 13 May 2023, *Mahesh Utekar & Sreehari S. Nair 12233* (MESAH). **Karnataka,** Bangalore District, January 1951, *H. Santapau s.n*. (BLAT). **Kerala,** Malappuram District, Botanical Garden, University of Calicut, 22 July 2022, *Sreehari S. Nair 12232* (MESAH). **Maharashtra,** Mumbai District, Victoria Garden, August 1916, *s.coll. 15295* (BLAT); *ibid.,* 28 May 1957, *R.R. Fernandez R4146* (BLAT). **Tamil Nadu,** Madras District, Madras, 12 January 1958, *S. K. Wagh SKW7223* (BLAT).

3.6.22. *Ficus microcarpa* L.f.

Ficus microcarpa L.f., Suppl. Pl. 442. 1782; Vahl. Enum. Pl. 2: 188. 1805; H. Santapau, Fl. Khandala 257. 1953; Corner, Gard. Bull. Singapore 17: 397. 1960; 21: 22. 1965; G. L. Shah, Fl. Gujarat 646. 1978; Corner in Dass. & Forsb., Rev. Handb. Fl. Ceylon 3: 258. 1981; Manilal & Sivar., Fl. Calicut 276. 1982; V. Singh, Fl. Banswara Dist. 3: 215. 1983; A.K. Mukherjee, Fl. Pachmarhi & Bori Reserves 283. 1984; B.D. Sharma *et al.,* Fl. Karnataka: Analysis 259. 1984; C.J. Saldanha, Fl. Karnataka 118. 1984; D.M. Verma *et al.,* Fl. Raipur, Durg & Rajnandgaon 357. 1985; R.S. Rao *et al.,* Fl. West Godavari Dist. 375. 1986; R.S. Rao *et al.,* Fl. Goa Diu Daman Dadra & Nagar haveli 2: 409. 1986; V. Chithra in A.N. Henry *et al.,* Fl. Tamil Nadu Ind., Ser I: Analysis 2: 254. 1987; Bole & J.M. Pathak, Fl. Saurashtra 2: 294. 1988; B.G. Kulkarni, Fl. Sindhudurg 419. 1988; N.P. Singh, Fl. Eastern Karnataka 2: 586. 1988; T. Pullaiah & N. Yesoda, Fl. Anantapur Dist. 231. 1989; L. Ellis, Fl. Nallamalais 2:

378. 1990; Kesh. Murthy & S.N. Yogan. Fl. Coorg 421. 1990; Vajr., Fl. Palghat Dist. 448. 1990; K.M. Matthew, Excur. Fl. Central Tamil Nadu 484. 1991; Lakshmin. & B.D. Sharma, Fl. Nasik Dist. 440. 1991; P.J. Parmar in B.V. Shetty & V. Singh, Fl. Rajasthan 2: 802. 1991; G.P. Roy & B. K. Shukla, Fl. Madhya Pradesh 408. 1992; Kothari & Moorthy, Fl. Raigad Dist. 3: 376. 1993; D. Deshp. *et al.,* Fl. Mahabaleshwar and Adjoinings 2: 554. 1995; V. Raju & T. Pullaiah, Fl. Kurnool 435. 1995; Sasidh. & Sivar., Fl. Pl. Thrissur For. 429. 1996; T. Pullaiah & D.A. Moulali, Fl. Andhra Pradesh 2: 900. 1997; V. Mudgal *et al.,* Fl. Madhya Pradesh 2: 618. 1997; P.K. Bhattacharyya & K. Sarkar, Fl. West Champaran, Bihar 65. 1998; K.M. Matthew, Fl. Palni Hills 1182. 1999; S. K. Murthi & Panigrahi, Fl. Bilaspur Dist. 2: 567. 1999; T. Pullaiah *et al.,* Fl. Guntur Dist. 325. 2000; N.P. Singh *et al.,* Fl. Maharashtra Dicot 2: 938. 2001; Mohanan & Sivad., Fl. Agasthyamala 634. 2002; Singh *et al.,* Fl. Mizoram 582. 2002; K.G. Bhat, Fl. Udupi 596. 2003; Wu *et al.,* Fl. China 5: 44. 2003; Sasidh. & Sivar., Bio. Docu. Kerala part 6: Flow. Plant. 440. 2004; Anil Kumar *et al.,* Fl. Pathanamthitta 465. 2005; Berg & Corner in Nooteboom, Fl. Malesiana 17(2): 666. 2005; K.M. Chetty *et al.,* Fl. Pl. Chittoor Dist. 332. 2008; Subba Rao & Kumari, Fl. Visakhapatnam Dist. 2: 218. 2008; Sunil & Sivadasan, Fl. Alappuzha Dist. 664. 2009; Berg *et al.,* Fl. Thailand 10(4): 632. 2011; Chaudhary *et al.,* Taiwania 57(2): 212. 2012; Mandar & Lakshmin., Fl. Bhagwan Mahavir 229. 2013; For. Plant. Nilgiris 48. 2015; T. Pullaiah, Fl. Telangana 2: 883. 2015; Bachan & Jisy, Meridian 5(1): 51. 2016; Sudhakar *et al.,* Figs of Eastern Ghats, India 64. 2017; Fl. Karnataka A Check List 2: 508. 2019; Ficus sp. Madhya Pradesh 44. 2019; P. Lakshmin. *et al.,* Fl. West Bengal 656. 2019; S.J. Britto, Fl. Central and

North Tamil Nadu 974. 2019; G.P. Sinha & A.N. Shukla, Fl. Uttar Pradesh 2: 475. 2020; S.S. Dash & A.A. Mao, Fl. Pl. India, 2: 544. 2020; R. Gogoi *et al.,* Fl. Sikkim 283. 2021. *Urostigma microcarpum* Miq., London J. Bot. 6: 583. 1847; Fl. Ind. Bat. 1, 2: 346. 1859. (Itti-arealou in van Rheede, Hort. Mal. 3: 69, t. 55. 1682). **Type:** Indonesia, Habitat in Java, *Thunberg s.n.* (Lectotype- LINN, LINN 1240.19!).

Ficus rubra Roth, Nov. Pl. Sp. 391. 1821. **Type:** Not seen.

Ficus condaravia Buch.-Ham., Trans. Linn. Soc. 15: 131. 1827. **Type:** Habitat in South India.

Ficus littoralis Blume, Bijdr. 455. 1825; Rumphia 1: 19. 1836. *Urostigma littorale* (Blume) Miq. in Zoll., Syst. Verz. 2: 91. 1854. **Type:** Philippines, Java, Nusae Kambangae, *s.d., C. L. Blume s.n.* (Type- P, P06755683!).

Urostigma amblyphyllum Miq., London J. Bot. 6: 569. 1847. *Ficus amblyphylla* (Miq.) Miq., Ann. Mus. Bot. Lugd.-Bat. 3: 286. 1867. **Type:** India Orientalis (K).

Urostigma pisiferum Miq., London J. Bot. 6: 580. 1847. *Ficus retusa* L. var. *pisifera* (Miq.). Miq., Ann. Mus. Bot. Lugd.-Bat. 3: 288. 1867. **Type:** Habitat in Bengaliam, Assam (K).

Urostigma accedens Miq. var. *latifolia* Miq., Fl. Ind. Bat. 1(2): 347. 1859. *Ficus dilatata* Miq., Ann. Mus. Bot. Lugd.-Bat. 3: 218, 288. 1867. *Ficus microcarpa* L.f. var. *latifolia* (Miq.) Corner, Gard. Bull. Singapore 17:398.1960. **Type:** Indonesia, Moluccas, Halmahera, *s.d., C.G.C. Reinwardt s.n.* (Isotype- U, U 0122297!).

Ficus dyctiophleba F. Muell. ex Miq., Ann. Mus. Bot. Lugd.-Bat. 3: 218, 288. 1867. **Type:** Australia, Queensland, Three isles between Cape Bedford

and Cape Flattery, August 1855, *F. Mueller s.n.* (Type- MEL, MEL277811!).

Ficus naumannii Engl., Bot. Jahrb. Syst. 7: 451. 1886. *Ficus microcarpa* L.f. var. *naumannii* (Engl.) Corner, Gard. Bull. Singapore 17: 398. 1960. **Type:** Bismarck Archipelago, Neu-Irland, Carteret-Hafen, S.O. ende, Hohe Waldgebrige, 18 July 1875, *Naumann s.n.* (Type- K, K000871101!).

Ficus retusa var. *nitida* (Thunb.) King, Ann. Roy. Bot. Gard. (Calcutta) 1: 51, tt. 62, 82. 1887. **Type:** Not seen.

Ficus thynneana F.M. Bailey, Queensl. Agr. J. 1: 231. 1897. **Type:** Australia, Queensland, Cairns, August 1897, *E. Cowley s.n.* (Type- MEL, MEL277809!).

Ficus dahlii K. Schum., Notizbl. Bot. Gart. Berlin-Dahlem 2: 111. 1898. **Type:** Papua New Guinea, Bismarck Archipelago, Ralum, strand nach Herberts-hohe, Neu Pommern, 02 February 1897, *F. O. Dahl s.n.* (Type- K, K000871100!).

Ficus cairnsii Warb., Feddes Repert. Spec. Nov. Regni Veg. 1: 73. 1905. **Type:** Australia, Queensland, 2 m, 30 May 1902, *F.L.E. Diels 8425* (Type- B, B 10 0294169!).

Ficus retusiformis H. Lev. & Vaniot, Feddes Repert. Spec. Nov. Regni Veg. 8: 549. 1910; Rehder, J. Arnold Arbor. 17: 74. 1936. **Type:** China, *s.loc,* March 1909, *J. Cavalerie 3601* (Holotype- E, E00275251!).

Ficus regnans Diels, Bot. Jahrb. Syst. 67: 182. 1935. **Type:** Not seen.

Ficus retusa var. *crassifolia* W.C. Shieh, Quart. J. Taiwan Mus.16. 190. 1963. *Ficus microcarpa* var. *crassifolia* (Shieh) J. C. Liao. Forest. Ser. 62: 7. 1974. **Type:** Not seen.

Ficus microcarpa var. *fuyuensis* J. C. Liao, Quart. J. Exp. Forest. 3(4): 84. 1989. **Type:** Not seen.

Ficus microcarpa var. *oluangpiensis* J. C. Liao Quart. J. Exp. Forest. 3(4): 85. 1989. **Type:** Not seen.

Ficus microcarpa var. *pusillifolia* J. C. Liao Quart. J. Exp. Forest. 3(4): 85. 1989. **Type:** Not seen.

Fig. 3.67 – 3.69

Large tree up to 25 m height, hemi epiphytic, aerial roots present; bark lenticellate, white to pale brown; young twigs terete, core solid, glabrous, pale brown; inter node 0.6–1.2 cm long; latex milky, white. Stipule caducous, lanceolate, 0.5–0.7 x 0.3–0.4 cm, margins entire, apex acute, base truncate, glabrous, pale green. Petiole articulated, terete, canaliculate, 0.8–1.0 cm long, glabrous, pale green. Leaves simple, alternate, spiral; lamina symmetric, lanceovate to elliptic to ovate, 4.1–6.4 x 2.9–3.4 cm, margins entire, acumen 0.1–0.3 cm long, apex obtuse to cuspidate, base obtuse, glabrous, pale green when young, dark green on maturity, coriaceous, venation brochidodromous; basal veins 3–4, lateral veins numerous, closely pinnate, waxy glands on the base of the midrib. Receptacles axillary, clustered, monoecious, sessile; basal bracts 3, free, 2.0–2.5 mm long, widely ovate, pubescent above and glabrous beneath, pale brown. Syconium 0.8–1.0 cm across, globose, glabrous, pale green when young, yellow to orange when mature. Ostiole 0.6–1.0 mm wide; outer bracts present, free, widely ovate, 1.7 mm long, glabrous, yellow to pale brown; inner bracts present, free, lanceovate, 1.0 mm long, glabrous, pale brown. Male flowers near ostiole and scattered, 2.0 mm long, pedicellate; pedicel 0.3 mm long; tepals 3, free, 1.5 mm long, lanceolate, glabrous, white; stamen 1, anther 0.5 mm, filament

0.5 mm long. Female flowers scattered, 2.25 mm long, sessile; tepal 4, free, 1.5 mm long, lanceolate, glabrous, white; stigma bifid, 0.3 mm; style 1.25 mm long; ovary 1.0 mm long, globose, glabrous, white. Gall flowers scattered, 1.75 mm long, pedicellate; pedicel 0.50 mm long; tepals 4, free, 1.0 mm long, lanceolate, glabrous, yellow to pale brown; stigma short; style 0.25 mm long; ovary 1.0 mm long, obovoid, glabrous, pale brown. Achenes 1.0–1.4 mm, obovoid, white or pale yellow.

Local names: *Ithi, Ithiyal, Kallithi* (Mal.); *Pilal* (Kan.); *Kamarup* (Hin.); *Kal-ichchi* (Tam.).

Common names: Indian Laurel Fig, Indian laurel, Chinese Banyan, Malay Banyan, Curtain fig, Laurel Fig.

Flowering and fruiting: Two to three times a year.

Distribution: India, Sri Lanka, South China, Australia, Japan etc. The India, the species is distributed throughout.

Habitat: Found in evergreen, semi evergreen and moist deciduous forests.

IUCN status: Least Concern (LC).

Etymology: The species epithet '*microcarpa*' denotes the small size of the fruits.

Uses: Found common as ornamental plants and bonsai.

Notes: It is a highly variable species with respect to the shape of the leaf. We have observed lanceovate to elliptic to ovate shapes of leaves in our study. Several literatures mentioned the number of lateral veins ranging from 4 to 13 pairs. As the veins are not prominently raised and are pinnate, we considered the number of lateral veins as numerous. The species is noted by the presence of numerous slender aerial roots that hangs from the main branches, which later develop into pillar like trunks.

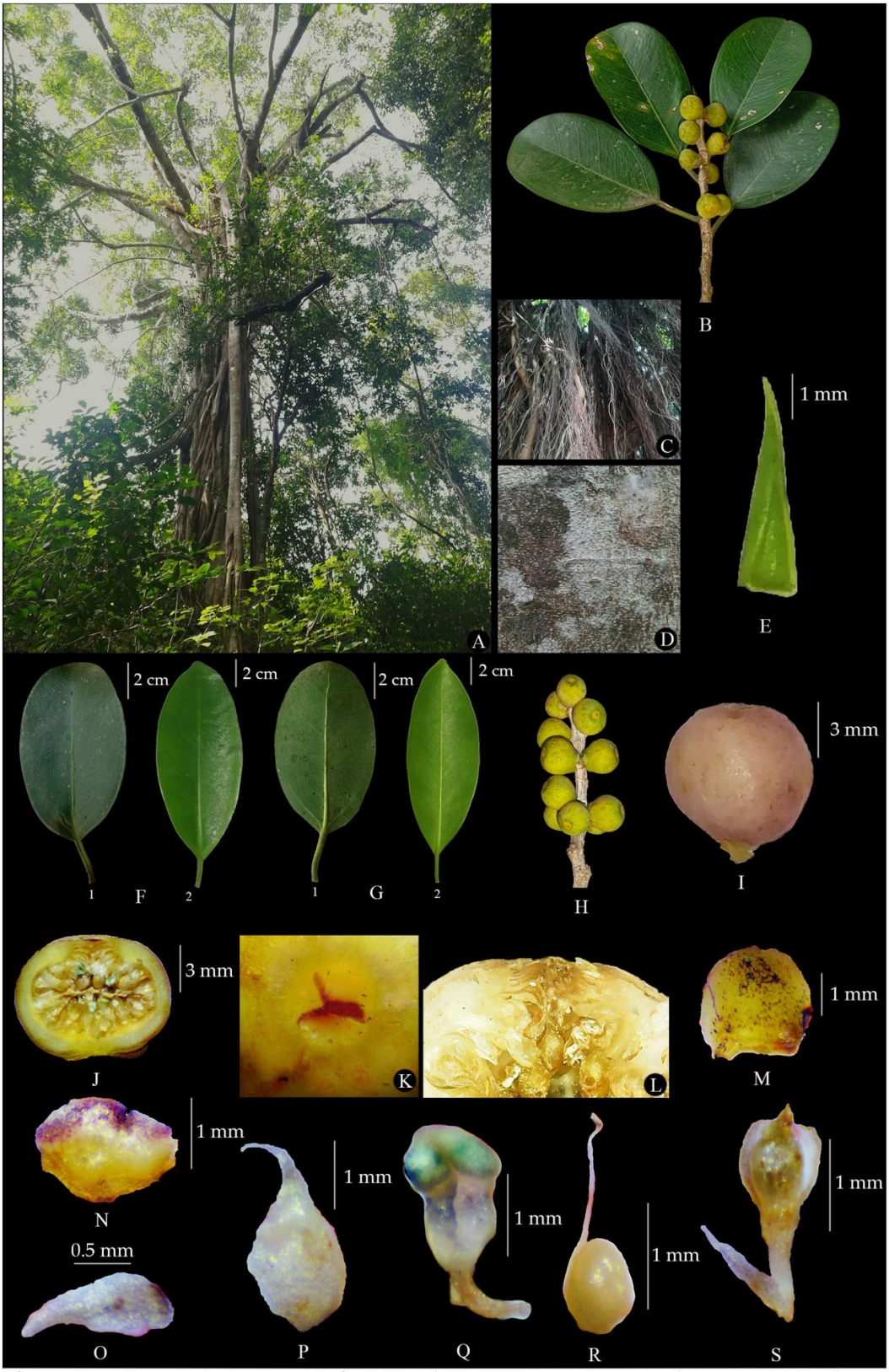


Fig. 3.67. ***Ficus microcarpa*** L.f.: **A.** Habit; **B.** Twig; **C.** Aerial roots; **D.** Bark; **E.** Stipule; **F(1&2).** Leaf adaxial side; **G(1&2).** Leaf abaxial side; **H.** Receptacles; **I.** Syconium; **J.** Syconium L. S.; **K.** Ostiole; **L.** Ostiolar L. S.; **M.** Basal bract; **N.** Outer ostiolar bract; **O.** Inner ostiolar bract; **P.** Tepal; **Q.** Male flower; **R.** Female flower; **S.** Gall flower.

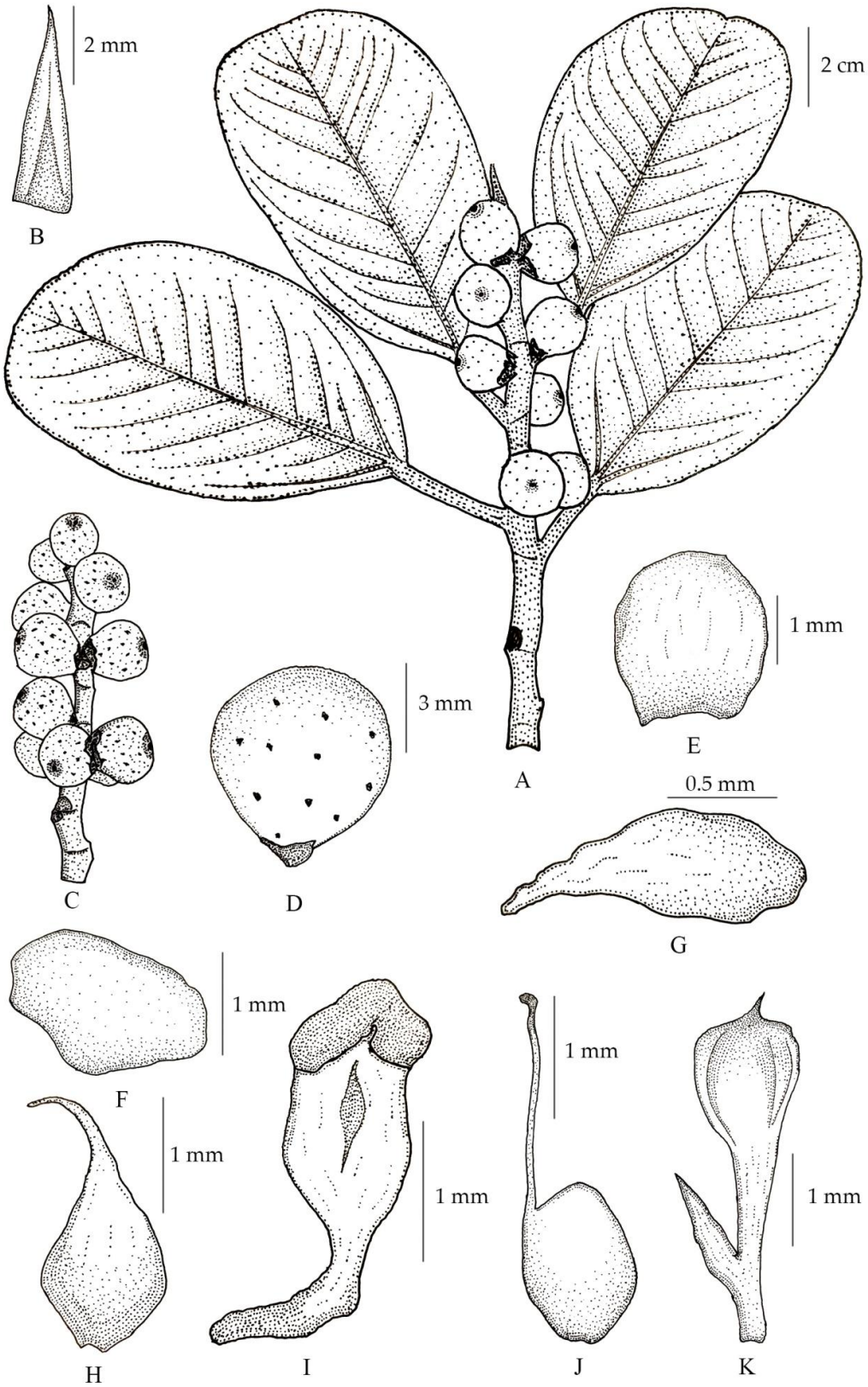


Fig. 3.68. ***Ficus microcarpa*** L.f.: **A.** Twig; **B.** Stipule; **C.** Receptacles; **D.** Syconium; **E.** Basal bract; **F.** Outer ostiolar bract; **G.** Inner ostiolar bract; **H.** Tepal; **I.** Male flower; **J.** Female flower; **K.** Gall flower.

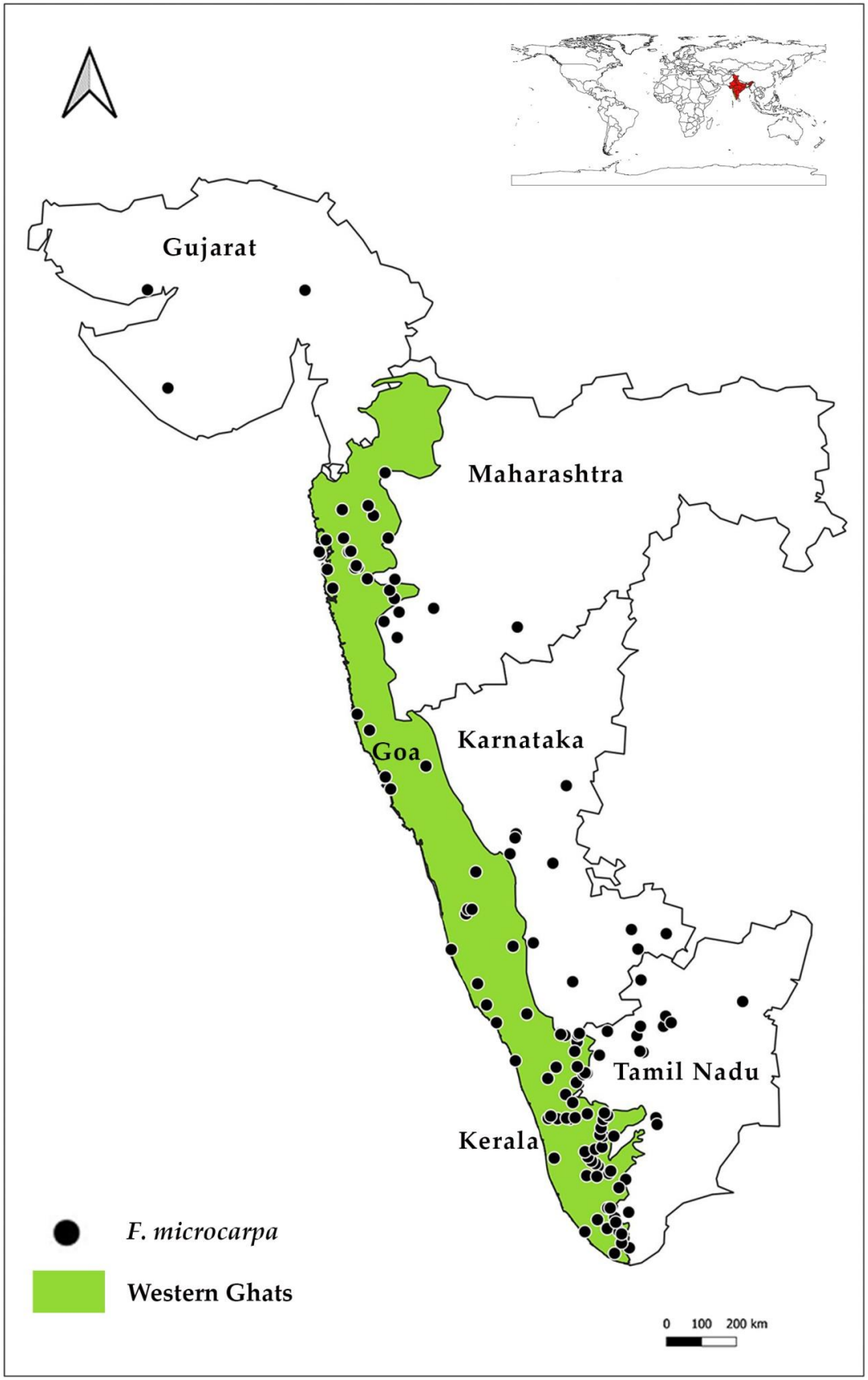


Fig. 3.69. *Ficus microcarpa* L.f. - Distribution map.

Specimens examined: India, **Andaman and Nicobar Islands**, North Andaman District, Mayabunder, Parangada, 20 January 1998, *G.S. Lakra & M. Tigga 16987* (PBL). South Andaman District, Colinpur, 8 m, 15 March 1959, *K. Thothathri 9295* (MH); Herbertabad, sea level, 31 May 1973, *N.P. Balakrishnan 209* (PBL); Tarmugli, 30 November 2002, *K. Karthigeyan 19228* (PBL). South Nicobar District, Great Nicobar, Navy Dera, 10 June 2001, *J. Jayanthi 18340* (PBL); *ibid.,* 17 February 2003, *J. Jayanthi 18372* (PBL). **Andhra Pradesh,** Alluri Sitharama Raju District, from Ramavaram to Mulakamaddi, 525 m, 30 May 1966, *G.V. Subba Rao 27447* (MH). Anantapur District, Gundumala R. F., 10 March 1983, *N. Yesoda 1247* (MH); Durgam, 350 ft, 06 August 1999, *P. Venu 111146* (BSID). Annamayya District, Horsley hills, 4500 ft, 31 May 1987, *D. Ranga Charyulu 1431* (MH); Allitopu, Horsley hills, 3480 ft, 04 July 1999, *G.V.S. Murthy 110465* (BSID); Guntamadi, Horsley hill, 750 m, 12 November 2000, *G.V.S. Murthy 111932* (BSID). Chittoor District, Tirumalai hills, 10 February 1957, *S.K. Wagh SKW5618* (BLAT); Thumbu Theertham Sacred Groove, 339 m, 08 January 2016, *J. Swamy & S. Nagaraju 7418* (BSID); Talakona Sacred Groove, 699 m, 09 January 2016, *J. Swamy & S. Nagaraju 7460* (BSID). East Godavari District, Maredumilli, 500 m, 21 December 1993, *M. Mohanan 100804* (MH). Guntu District, near Puttagandhikanka, Tadepalli, 470 m, 14 October 1986, *N. Rama Rao & D. Narasimhan 84356* (MH). Kadapa District, Guvvalcheruvu, along the stream, 985 m, 22 August 1958, *K. Subramanyam 6401* (MH). Krishna District, D. M. Bhavi, 06 April 1984, *P. Venkanna 5041* (MH); *s.loc.,* 10 November 1985, *P. Venkanna 5882* (MH); Papavinasanam, 680 m, 09 December 2003, *J.H. Franklin Benjamin 117434* (BSID). Kurnool District, Way to Ramanapenta, Nallamalais, 780 m, 31 March 1965, *J.L. Ellis 23825* (MH); Upper Atholilam, 425 m, 29 August 1965, *J.L. Ellis 25584* (MH); Mahanandi, Nallamalais, 240

m, 10 December 1969, *J.L. Ellis 32736* (MH); Mahanandi, 350 m, 23 August 1972, *J.L. Ellis 42342* (MH); Gumitham, 13 March 2013, *L. Rasingam & M. Sankara Rao 3140* (BSID). Nellore District, Penchala Kona, 14 February 1998, *P. Venu 109956* (BSID); *ibid.,* 182 m, 13 July 2016, *J. Swamy & S. Nagaraju 8174* (BSID). NTR District, Kondapalli, 25 August 1956, *S.K. Wagh SKW3316* (BLAT); *ibid.,* 25 August 1956, *S.K. Wagh SKW3317* (BLAT). Prakasam District, Ankireddy palli, 250 m, 21 December 1982, T. Pualliah 962 (MH); Near Peddarutia stream, 600 m, 15 April 1986, *N. Rama Rao & V.B. Hosagoudar 83761*(MH); *ibid.,* 650 m, 23 June 1987, *V. B. Hosagoudar 84941* (BSID); *ibid.,* 651 m, 23 June 1988, *V.B. Hosagoudar 84938* (BSID). Srikakulam District, Near Gumada (Gummada), 425 m, 16 May 1979, *G.V. Subba Rao 62441* (MH). Vikarabad District, Anantagiri, 950 m, 19 October 1964, *G.V. Subba Rao 21781* (MH). Visakhapatnam District, Lammasingi - Chintapalli Road, 21 May 1956, *H. Santapau 20797* (BLAT); *ibid.,* 21 May 1956, *S.K. Wagh SKW2833* (BLAT); *ibid.,* 21 May 1956, *H. Santapau 20777* (BLAT); Along the road side of West Inspection bungalow, 910 m, 12 May 1964, *G.V. Subba Rao 19535* (MH); West Godavari, Umamaheswaram, 28 February 2014, *L. Rasingam 4613* (BSID); *ibid.,* 500 ft, February 1886, *J.S. Gamble 15009* (MH). **Goa**, North Goa District, Porvorim, 20 November 1962, *Seshagiri Rao Rolla 84957* (BSI); Porvorim, G. S. I. Bungalow, 07 November 1963, *Seshagiri Rao Rolla 92848* (BSI). South Goa District, Verna village along road side, 19 August 1963, *K.C. Kanodia 89348* (BSI). **Gujarat,** Kutch District, Kandla, near PWD rest house, 25 December 1962, *Seshagiri Rao Rolla 83497* (BSI). **Karnataka,** Belgaum District, Mattiga near Yedur, 17 October 1964, *R. Sundara Raghavan 97421* (BSI); Bellary District, Temple Forest, 13 January 1976, *N.P. Singh 142408* (BSI). Chitradurga District, Jogimath R. F., 10 January 1976, *N.P. Singh 142262* (BSI); *ibid.,* 10 January 1976, *N.P. Singh*

142265 (BSI). Hassan District, Sakleshpur (Saklaspur), 16 December 1903, *C.A. Barber 6221* (MH). Kolar District, Narsimhadevi belta S. F., 07 January 1976, *N.P. Singh 142161* (BSI). Manglore District, *s.loc.*, January 1851, *R.F. Hohenacker 844* (L). Mysore District, Hassen to Manguai, 27 April 1905, *C.A. Barber 7040* (MH). Shimoga District, Someshwan ghat, Agumbe, 06 February 1961, *R. Sundara Raghavan 69424* (BSI); Gudikane, Agumbe, 07 February 1961, *R. Sundara Raghavan 66449* (BSI); Malandur, Agumbe, 08 February 1961, *N.P. Singh 62475* (BSI); Balehalli, Agumbe, 30 March 1964, *R. Sundara Raghavan 97325* (BSI); Sarathi Davanagere, *s.d., B. S. Ahuja 47465* (BSI). Uttar Kannada District, Katgali, 26 November 1895, *W.A. Talbot 3522* (BSI); Ganesh Gudi, 86 m, 17 March 2007, *N. Ayyappan & B.R. Ramesh HIFP BTWG310* (HIFP); *s.loc.,* 20 February 1905, *G. King s.n.* (MH). **Kerala.** Idukki District, Cardammom Hills, 25 Km from Munnar, on Munnar Periyar road, 20 June 1976, *C.E. Ridsdale 190* (MH & L); near Kamashi, 950 m, 23 August 1977, *K. Vivekananthan 50504* (MH); Cherivanoor, 28 July 1978, *C.R. Suresh 21710* (CALI); Periakanal Estate, 2300 m, 27 March 1980, *K. Ramamurthy 66526* (MH); Kulamavu, 700 m, 01 June 1982, *C.N. Mohanan 74137* (MH); Swamikkayam, P. T. R., 1070 m, 29 September 1993, *Jomy Augustine & N. Sasidharan 12488* (KFRI); Umikuppam, 1100 m, 22 October 1993, *Jomy Augustine 12647* (CALI & KFRI); Lakshmippara, P. T. R., 1100 m, 12 February 1994, *Jomy Augustine 13305* (KFRI); Chinnar, 22 April 1994, *A. Nazarudean 20751* (TBGT); Kalvarimala, P. T. R., 1750 m, 18 August 1994, *N. Sasidharan & Jomy Augustine 13859* (KFRI); Melmala, P. T. R., 1790 m, 26 December 1994, *Jomy Augustine 14462* (KFRI); Thayanankkudy, C. W. S., 700 m, 09 February 1995, *N. Sasidharan & K. K. Sajeev 1186* (KFRI); Munnar, Devikulam, 13 March 1995, *A.E. Shannavas Khan 23367* (TBGT); Alampetty, C. W. S., 700 m, 16 March 1995, *N. Sasidharan & K.K. Sajeev 11976* (KFRI); Kottamala, 1700 m,

26 April 1995, *Jomy Augustine 15359* (CALI); Vallakkadavu, 800 m, 06 June 1995, *Jomy Augustine 15416* (CALI). Kannur District, Thiruvangad, 20 December 1970, *V.V. Sivarajan 807* (CALI); Parappa, 225 m, 24 January 1979, *V.J. Nair 59853* (MH); Taliparamba, 370 m, 22 May 1983, *R. Gopalan 88631* (MH). Malappuram District, Thiruvangod, 80 ft, 06 April 1976, *C.R. Suresh 12972* (CALI). Palakkad District, Bank of Kunthipuzha, 850 m, 04 December 1980, *M.C. Nair 69108* (MH); Dam site, Silent Valley, 900 m, 05 April 1981, *B.K. Nayar & K. Rajappan K10355* (CALI); Nelliyampathi hills, 09 March 2020, *Sreehari S. Nair 12956* (MESAH). Pathanamthitta District, Pamba dam, 1000 m, 24 March 1978, *C.N. Mohanan 54366* (MH). Thiruvananthapuram District, way to Primoor estate, 850 m,16 September 1977, *M.C. Nair 49860* (MH); Athirumala, 01 April 1989, *N. Mohanan 5512* (CALI & TBGT); Dept. of Botany, 15 February 2015, *P. Suresh Kumar 8480* (KUBH). Thrissur District, Thumbormuzhi, 200 m, 18 March 1982, *R. Rajan 73057* (MH); Chalakkudy Mala route, 75 m, 10 February 1984, *K. Ramamurthy 80446* (MH); Vazhachal, 350 m, 20 January 1989, *N. Sasidharan 5295* (KFRI); Orukombankootty, 500 m, 13 March 2006, *K.H. Amitha Bachan 117760* (CALI); Nulayakad kavu, Kadakarappally, 650 m, *C.N. Sunil 1372* (CALI). Wayanad District, Thirunelly temple surrounding, 24 July 1984, *R.T. Balakrishnan 40329* (CALI); Thirunelly, 25 November 1995, *K. Radhakrishnan 26504* (TBGT); Sivasailam 70 m, 16 October 1985, *N.G. Nair 4129* (KFRI). **Madhya Pradesh**, Bastar District, Way to Tirathgarh (Thirathgarh), 600 m, 09 February 1961, *N.P. Balajrishnan & A.N. Henry 12032* (MH). Chhindwara District, Pagara, Central provience, 01 April 1905, *s.coll. 8615* (BLAT). Hoshangabad District, Bori R. F., 550 m, 29 April 1961, *J. Joseph 12444* (MH). Indore District, Patalpani, near Mhow, 20 April 1963, *A.R.K. Shashtry 84289* (BSI). Sagar District, Near the river, 560 m, 06 March 1960, *K. Subramanyam 10200* (MH). Dhule District, Ambe, 18 July

1966, *P.J. Cherian 109366* (BSI). Mumbai District, Mahalakshmi, Bombay, 06 September 1956, *R.R. Fernandez R2770* (BLAT); *ibid.,* 06 September 1956, *R.R. Fernandez R2757* (BLAT); Cumballa hill, Pedda road, 30 April 1957, *R.R. Fernandez R4050* (BLAT); *ibid.,* 30 April 1957, *R.R. Fernandez R4051* (BLAT); Mahalakshmi, Bombay, 04 September 1957, *R.R. Fernandez R4314* (BLAT); *ibid.,* 04 September 1957, *R.R. Fernandez R4315* (BLAT); Bombay fort, 07 September 1957, *R.R. Fernandez R4331* (BLAT); *ibid.,* 07 September 1957, *R.R. Fernandez R4333* (BLAT). Nashik District, Dindori, June 1920, *Almedia A13* (BLAT). Pune District, Sakar Puttlen, Lonavla, 21 May 1902, *G.A. Gammie 15164* (BSI); Saswad to Purandhar, 03 October 1959, *J.A. Merchant 1373* (BLAT); Wagjoi forest, Ambavane, 30 March 1964, *B. Venkata Reddi 97656* (BSI); Atkarwadi, Sinhagad, 06 May 1964, *M.Y. Ansari 88076* (BSI); near temple, Ambavane, Lonavla, 27 May 1964, *B. Venkata Reddi 97856* (BSI); Inglun, 13 miles west of Junnar, 14 January 1965, *K. Hemadri 104469* (BSI); Narayangaon, Junnar, 10 October 1965, *K. Hemadri 106959* (BSI). Raigad District, Matheran, North of bungalow along road, 28 January 1957, *G.S. Puri 10935* (BSI); Dadar, Bombay, 03 September 1957, *R.R. Fernandez R4304* (BLAT); Jummapatti, 29 November 1958, *N.A. Irani NI2582* (BLAT); Matheran, 10 January 1959, *N.A. Irani NI2792* (BLAT); *ibid.,* 10 January 1959, *N.A. Irani NI2793* (BLAT); Jummapatti, 31 January 1959, *N.A. Irani NI2862* (BLAT); *ibid.,* 31 January 1959, *N.A. Irani NI2863* (BLAT); Matheran, 12 February 1959, *N.A. Irani NI2886* (BLAT); Parsi sanatorium, Matheran, 23 October 1960, *N.A. Irani NI5666* (BLAT); Matheran to Parsi port, 30 July 1966, *B.M. Wedhwa 109911* (BSI). Satara District, Khandala, June 1899, *s.coll. 25466* (BLAT); *ibid*, April 1908, *s.coll. 25468* (BLAT); *ibid.,* November 1916, *s.coll. 25465* (BLAT); *ibid.,* March 1917, *s.coll. 25403* (BLAT); *ibid.,* May 1919, *s.coll. A10* (BLAT); Panchgani, February 1923, *Almedia A5* (BLAT); Khandala, St.

Xavier's villa, 20 April 1944, *H. Santapau 4038* (BLAT); Khandala, Battery hill plateau, 13 June 1944, *H. Santapau 4486* (BLAT); Khandala, 30 January 1954, *H. Santapau 17967* (BLAT); *ibid.,* 25 February 1956, *N.A. Irani NI1732* (BLAT); *ibid.,* 25 February 1956, *P.S. Herbert SH1458* (BLAT); *s.loc.*, 07 November 1956, *A.M. Patwardhar 9700* (BSI); Khandala, 30 December 1956, *G.S. Puri 9116* (BSI); Koyna, 11 September 1978, *R.K. Kochhar 154163* (BSI); Ambeghar, Koyna, 09 February 1979, *R.K. Kochhar 158290* (BSI). Sindhudurg District, Ramghatwadi, Bhadoshi, 31 May 1970, *B.G. Kulkarni 120982* (BSI). Solapur District, Karamba, near Nannaj, 01 August 2011, *J. Jayanthi & S.C. Yadhav 199272* (BSI). **Meghalaya,** East Khasi Hills, Cherrapunjee, 20 May 1952, *W.N. Koelz 30017* (MICH & L). **Odisha,** Ganjam District, *s.loc.*, 05 February 1900, *C.A. Barber 1419* (MH); Kapilas hill, on way to temple, along the footsteps, 29 March 1975, *s.coll. 11235* (BSID); Tulka, 358 m, 10 May 2016, *M.C. Mohan & Swamy 7687* (BSID). **Tamil Nadu,** Chennai District, Theosophical society, Adyar, 2 m, 27 October 1983, *T. Ravi Sankar & D. Narasimhan 60* (MH). Coimbatore District, Anamalis, between Poonachi and Monica, 31 May 1903, *C.A. Barber 6018* (MH); Jamarakanai, 15 August 1929, *V. Narayana Swami 18960* (MH); Pattithovai, 3000 ft, 09 February 1930, *V. Narayana Swami 19737* (MH); Kuduivai malai, 3200 ft, 29 July 1930, *V. Narayana Swami 3938* (MH); Kottady (Kottadi), 3800 ft, 14 March 1931, *K. Cherian Jacob 324* (MH); Dhiuban, 3500 ft, 07 February 1937, *S.R. Raju 346* (MH); Vellimalai hills, 667 m, 22 February 1957, *K.M. Sebastine 2402* (MH); Water falls, 900 m, 10 July 1961, *J. Joseph 12804* (MH); Slopes of Karuppu, 645 m, 27 April 1963, *C.P. Sreemadhavan CPS595* (MH); Top of Konamalai, 24 September 1963, *C.P. Sreemadhavan 863* (MH); Poosaripalayam, 468 m, 27 September 1964, *M. Chandrabose 28541* (MH); Palamalai, Ramgasami kovil, 560 m, 05 September 1969, *M.V. Viswanathan MVV 128* (MH); *ibid.,* 2250 ft, *S.R Rajan & Naganathan*

4875 (MH). Darmapuri District, Kakannamduvu, 16 February 1990, *T. Ravisankar 84110* (MH). Dindugal District, Sirumalais, 10 May 1958, *J. Pallithanam JP316* (BLAT). Erode District, Congi falls, Hasanur (Hassamur), 3000 ft, 09 March 1931, *K. Cherian Jacob 178* (MH); Satyamangalam Forest Division, Arepalayam, Kollegal road, 1160 m, 19 September 2007, *P. Satyanarayana 125254* (MH); Satyamangalam Forest Division, Dimbam-Bannari, 1000 m, 21 September 2007, *P. Satyanarayana 125101* (MH); Satyamangalam Forest Division, Koothampalayam, 540 m, 19 March 2009, *P. Satyanarayana 122474* (MH); Satyamangalam Forest Division, Dimbam – Thalamala, 1100 m, 25 March 2009, *P. Satyanarayana 122541* (MH). Kanniyakumari District, Kannupulicadu, 375 m, 05 February 1972, *B.D. Sharma 39960* (MH); River bank, Mahendragiri R. F., 600 m, 23 January 1978, *A.N. Henry 53237* (MH); Mothiramalai (Modiramalai), Lower Kodayar, 400 m, 24 March 1979, *A.N. Henry 61542* (MH); Vellimalai, 11 July 1991, *V. Lakshamanan 95227* (MH). Krishnagiri District, Kundhukottai R. F., 725 m, 23 July 1978, *E. Vajravelu 57926* (MH). Madurai District, Nupuraganaga, 433 m, 19 September 1957, *K. Subramanyan 4267* (MH); Hospital Valley, 1470 m, 22 January 1988, *V. Lakshamanan 87732* (MH); Koolthevar forest, 1650 m, 17 November 1990, *V. Lakshamanan 94395* (MH). Nilgiri District, Moyar bank, 550 m, 19 April 1917, *N.C. Rathakrishnan 37966* (MH); Ebanad stream, 900 m, 29 August 1970, *G. V. Subba Rao 36393* (MH); Ebanad stream, 1000 m, 29 August 1970, *G.V. Subba Rao 36402* (MH); Marappalam, Burliar, 1000 m, 02 March 1972, *B.D. Sharma 40372* (MH); Anaikatty and surrounding, 800 m, 15 March 1972, *G.V. Subba Rao 40241* (MH); Theppakadu, 850 m, 09 April 1972, *K. Vivekananthan 40763* (MH); Mudumalai W. L. S., Bohhapuram, 1000 m, 10 March 1991, *E. Vajravelu 96118* (MH); Mudumalai W. L. S., Avrihalla river side, 1000 m, 23 July 1991, *D. Stephen 96178* (MH); Mudumalai W. L. S.,

Movanbetta, 1200 m, 15 December 1991, *D. Stephen 98033* (MH); Mudumalai W. L. S., Thaemparai, Doddagatti, 13 December 1991, *D. Stephen 97995* (MH). Ramanatahpuram District, Mudaliarthu to Viruradi, 18 February 1973, *N.C. Nair 60977* (MH); Alagar koil forest, 300 m, 27 July 1965, *E. Vajravelu 25299* (MH); on the way to Deviyar Estate, 800 m, 10 June 1979, *S.R. Srinivasan 61494* (MH). Salem District, 15th – 16th curve, Ghat road, 1140 m, 20 January 1966, *S. Karthikeyan 26893* (MH). Tenkasi District, Courtallam falls, 467 m, 21 April 1957, *K. Subramanyam 2823* (MH); Tiger falls, Way to Manchola, 300 m, 30 June 1957, *K.M. Sebastine 3727* (MH); on the way to Five falls in the out skirts, 05 October 1975, *K.K.N. Nair 1417* (CALI); Honey falls, 27 February 1976, *K.K.N. Nair 1455* (CALI); Five falls along the sides of huge rocks, 06 March 1976, *K.K.N. Nair 5362* (CALI). Theni District, Bodi R. F., 467 m, 15 September 1961, *K.M. Sebastine 12897* (MH). Tiruchi District, Thuraiyur, Kannimar Shola, 950 m, 09 April 1980, *K.M Matthew 27383* (L). Tiruchirappalli District, Kollimalai, 31 January 1914, *s.coll. 11374* (MH); Near Uppiliyapuram, 233 m, 11 August 1958, *K.M. Sebastine 6275* (MH); Ayyanarkoil, 275 m, 24 February 1979, *N.C. Nair 61428* (MH). Tirunelveli District, Sengalteri, 24 September 1915, *s.coll.* 12439 (MH); Way to lower dam, Papanasam, 133 m, 05 July 1959, *K.M. Sebastine 8314* (MH); Kottamalai river side, Vasudevanallur R. F., 400 m, 21 March 1970, *E. Vajravelu 33913* (MH); Vasnderanallur R. F., 375 m, 03 October 1971, *E. Vajravelu 38841* (MH); Way to Kandakki estate, Panagudi, 400 m, 04 February 1972, *B.D. Sharma 39931* (MH); Mahendragiri R. F., 300 m, 24 April 1989, *R. Gopalan 90157* (MH); Way to Kodamadi (Kodamady), 350 m, 19 October 1989, *R. Gopalan 91622* (MH); Vellore District: Melpat, 28 September 1899, *C.A. Barber 1055* (MH); Returning from Poongulam, 660 m, 30 January 1986, *M.B. Viswanathan 1007* (MH); Eggwi via Gingarpettai hills, 06 April 1987, *M.B. Viswanathan*

1419 (MH); Viluppuram District: Gomuki - Vellamalai Ghat section, 200 m, 06 February 1983, *K. Ramamurthy 77330* (MH); 6th Block, Kallimalai Estate, 1400 m, 17 October 1992, *S.R. Srinivasan 100084* (BSID). **Telangana,** Mulugu District, Eturnagaram (Etturangaram), 250 m, 30 March 1999, *P.K. Premanath 110842* (MH). West Godavari District, Bison Hills, 06 December 1902, *C.A. Barber 5160* (MH).

3.6.23. *Ficus middletonii* Chantaras.

Ficus middletonii Chantaras., Syst. Bot. 38(3): 669. 2013; J.V. Sudhakar & G.V.S. Murthy, Indian J. For. 39(3): 255-261. 2016; L. Paramesh *et al.,* Nelumbo 64(1): 329-331. 2022. **Type:** Thailand, Khao Sam Roi Yot National Park, Trail from Tham Sai to Tham Phra Yanakhon, 18 August 2002, *Middleton, Suddee, Davies & Hemrat 1178* (Holoype- L, L 0940367!; Isotype- L, L 0940366!, E, E00360119!).

Fig. 3.70 – 3.72

Tree up to 15 m height, hemi epiphytic attached to rocks and later becoming independent, aerial roots absent; bark smooth, white to pale yellow; young twigs terete, core solid, smooth, pubescent, pale brown; inter node 0.5–1.2 cm long; latex milky, white. Stipule persistent, lanceolate, 0.6–1.2 x 0.4–0.8 cm, margins entire, apex narrowly acute, base truncate, pubescent, pale green. Petiole articulated, terete, canaliculate, 3.7–8.0 cm long, glabrous, pale green. Leaves simple, alternate, spiral; lamina symmetric, ovate to widely ovate, 6.7–14.0 x 3.5–9.0 cm, margins entire, acumen 0.5–1.0 cm long, apex acute to acuminate, base obtuse to rounded, glabrous, red to pale green when young, dark green above and pale green beneath on maturity, subcoriaceous, venation brochidodromous; basal veins 3–4, lateral veins 7–10 pairs; waxy glands on the base of the midrib. Receptacles axillary, paired,

monoecious, pedunculate; peduncle 2.0–3.0 mm long, pubescent, green; basal bracts present, persistent, 3, free, 2.0–4.0 mm long, ovate, puberulous, pale brown. Syconium 0.6–1.2 cm across, globose, pubescent when young, glabrous on maturity, pale yellow with spots when mature. Ostiole 2.0–3.0 mm; outer bracts present, free, ovate, 1.0–2.0 mm long, glabrous, yellow–pale brown; inner bracts present, free, oblong, 1.5 mm long, glabrous, white to pale brown. Male flowers few, near ostiole, 0.7–1.0 mm long, sessile; tepals 3–4, free, 1.0 mm long, lanceolate, glabrous, white–pale brown; stamen 1, anther 0.6–0.8 mm, filament 0.1–0.2 mm long. Female flowers scattered, 1.8–2.0 mm long, sessile; tepal 4, free, 1.5 mm long, lanceolate, glabrous, white to pale brown; stigma 0.5 mm long; style 0.75–1.0 mm long; ovary 0.75 mm long, obovoid, glabrous, white. Gall flowers scattered, 2.0 mm long, pedicellate; pedicel 0.5 mm long; tepals 4, free, 1.5 mm long, lanceolate, glabrous, white to pale brown; stigma short; style 0.2–0.3 mm long; ovary 1.0 mm long, obovoid, glabrous, white to pale brown. Achene 1.2–1.4 mm, ovoid, yellow to pale brown, smooth.

Local names: Nil.

Common names: Nil.

Flowering and fruiting: December to May.

Distribution: India (Andhra Pradesh, Telangana and Tamil Nadu), Thailand.

Habitat: In semi-evergreen and deciduous forests.

IUCN status: Not Evaluated (NE).

Etymology: Denoted in honour of Middleton. The type specimen of the species was collected by D. J. Middleton in 2002 from Thailand.

Uses: No use so far reported for the species.

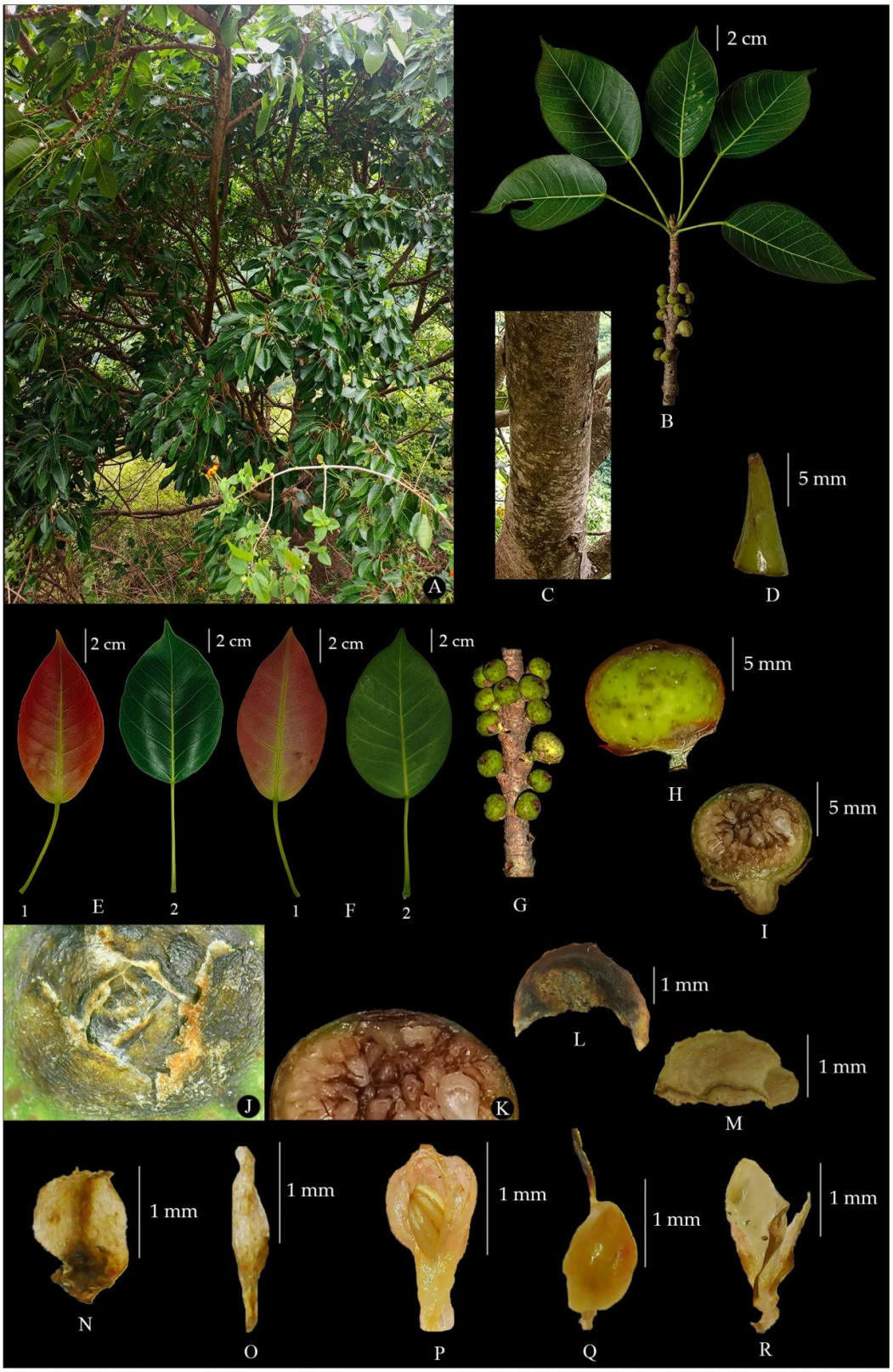


Fig. 3.70. ***Ficus middletonii*** Chantaras.: **A.** Habit; **B.** Twig; **C.** Bark; **D.** Stipule; **E(1&2).** Leaf adaxial side; **F(1&2).** Leaf abaxial side; **G.** Receptacles; **H.** Syconium; **I.** Syconium L. S.; **J.** Ostiole; **K.** Ostiolar L. S.; **L.** Basal bract; **M.** Outer ostiolar bract; **N.** Inner ostiolar bract; **O.** Tepal; **P.** Male flower; **Q.** Female flower; **R.** Gall flower.

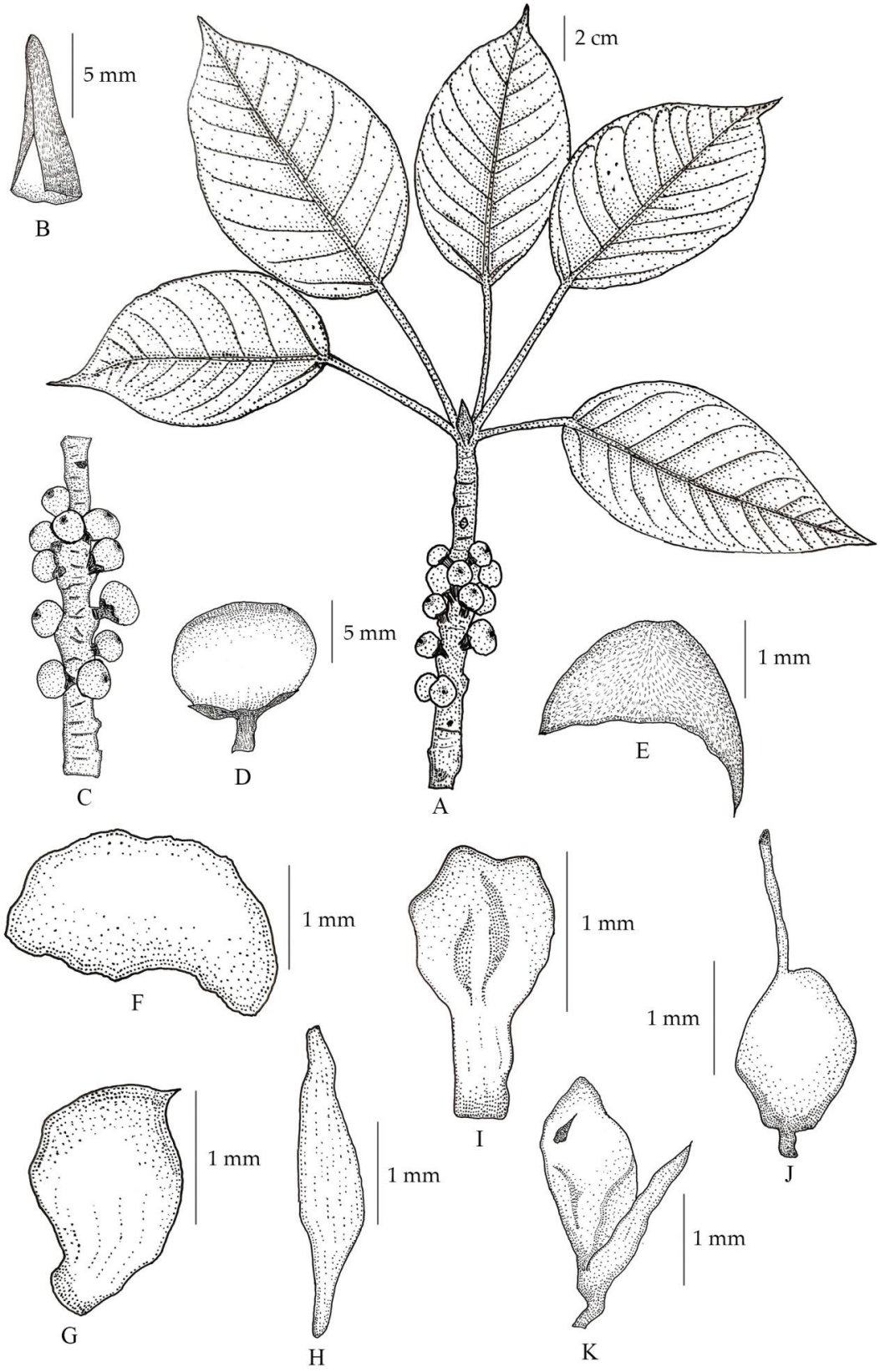


Fig. 3.71. ***Ficus middletonii*** Chantaras.: **A.** Twig; **B.** Stipule; **C.** Receptacles; **D.** Syconium; **E.** Basal bract; **F.** Outer ostiolar bract; **G.** Inner ostiolar bract; **H.** Tepal; **I.** Male flower; **J.** Female flower; **K.** Gall flower.

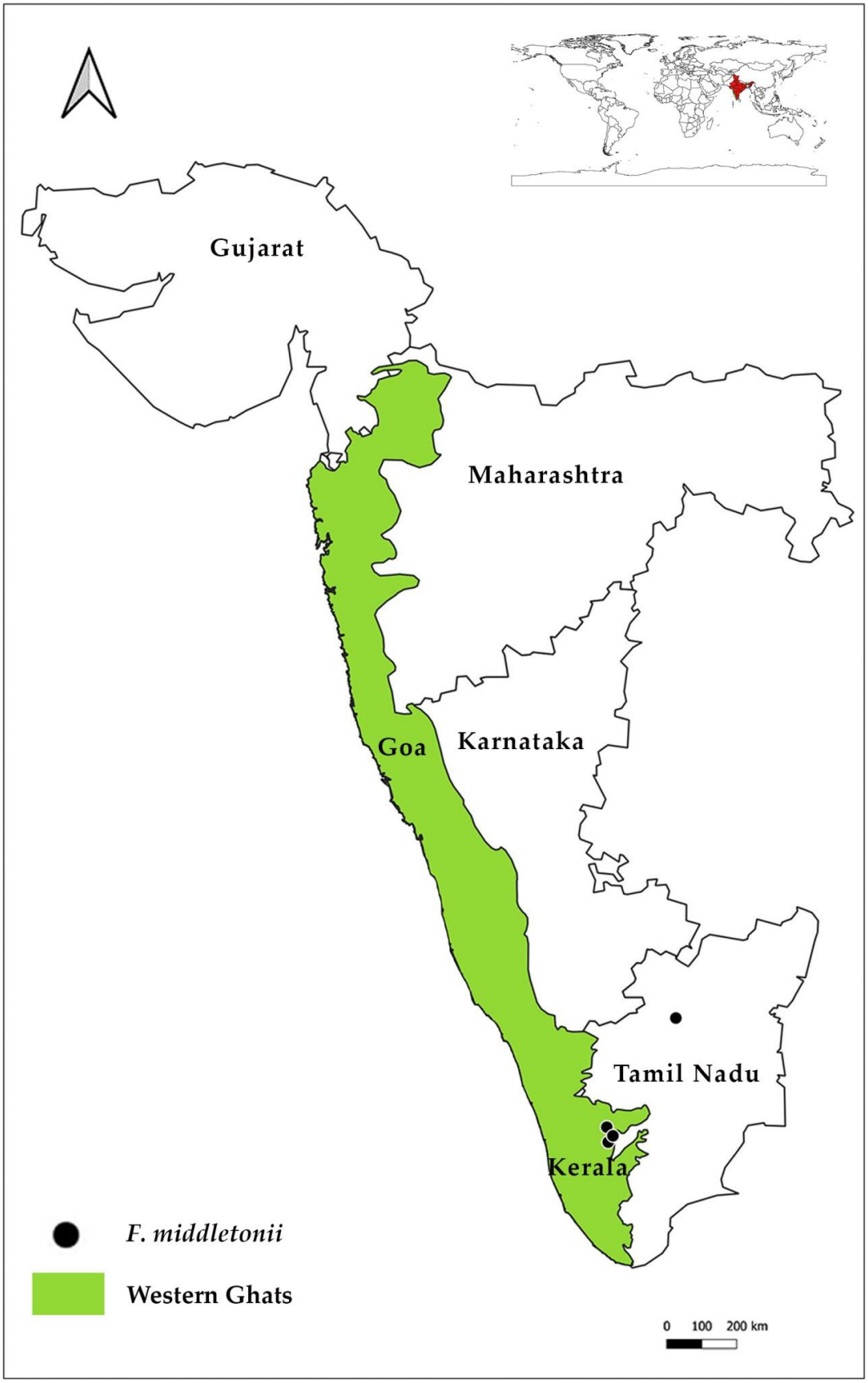


Fig. 3.72. *Ficus middletonii* Chantaras. - Distribution map.

Notes: This species was described by Chantarasuwan (2013) from Thailand. He mentioned the collections of K.M. Matthew from Tamil Nadu as paratypes of the species. Sudhakar (2016b) and Paramesh *et al.,* (2022) reported them as extended distribution of the species to the state of Andhra Pradesh and Telangana respectively.

Specimens examined: Thailand, South-Western, Thailand, Prachuap Kiri Khan, Bangpu temple, Kuiburi, 05 October 2010, *B. Chantarasuwan 051010-1* (L); *ibid.,* 05 October 2010, *B. Chantarasuwan 051010-2* (L); *ibid.,* 05 October 2010, *B. Chantarasuwan 051010-3* (L). **India, Tamil Nadu,** Salem District, Yercaud, Servarayans, Yercaud Ghat road, Hair Pin Bend 10, 02 July 1979, *K.M. Mathew 23476* (L). Theni district, Bodimettu, 11 April 2022, *Sreehari S. Nair & P.J. Ebin 12200* (MESAH); *ibid.,* 04 October 2022, *Sreehari S. Nair & P.J. Ebin 12219* (MESAH).

3.6.24. *Ficus mollis* Vahl

Ficus mollis Vahl, Symb. Bot. 1: 82. 1790; Vahl., Enum. Pl. 2: 192. 1805; Corner, Gard. Bull. Singapore 21: 14. 1965; Corner in Dass. & Forsb., Rev. Handb. Fl. Ceylon 3: 249. 1981; B.D. Sharma *et al.,* Fl. Karnataka: Analysis 259. 1984; D.M. Verma *et al.,* Fl. Raipur, Durg & Rajnandgaon 357. 1985; K.K.N. Nair & M.P. Nayar, Fl. Courtallum 1: 41. 1986; R.S. Rao *et al.,* Fl. West Godavari Dist. 375. 1986; V. Chithra in A.N. Henry *et al.,* Fl. Tamil Nadu Ind., Ser I: Analysis 2: 254. 1987; N.P. Singh, Fl. Eastern Karnataka 2: 586. 1988; K.M. Matthew, Excur. Fl. Central Tamil Nadu 484. 1991; P.J. Parmar in B.V. Shetty & V. Singh, Fl. Rajasthan 2: 803. 1991; G.P. Roy & B.K. Shukla, Fl. Madhya Pradesh 408. 1992; T. Pullaiah & B.R.P. Rao, Fl. Nizamabad 321. 1995; V. Raju & T. Pullaiah, Fl. Kurnool 436. 1995; T. Pullaiah & D.A. Moulali, Fl. Andhra Pradesh 2: 900. 1997; V. Mudgal *et al.,* Fl. Madhya Pradesh 2:

618. 1997; K.M. Matthew, Fl. Palni Hills 1183. 1999; Sasidh., Fl. Chinnar W. L. S. 298. 1999; S.K. Murthi & Panigrahi, Fl. Bilaspur Dist. 2: 570. 1999; N.P. Singh *et al.,* Fl. Maharashtra Dicot 2: 938. 2001; Sasidh. & Sivar., Bio. Docu. Kerala part 6: Flow. Plant. 440. 2004; K.M. Chetty *et al.,* Fl. Pl. Chittoor Dist. 333. 2008; Chaudhary *et al.,* Taiwania 57(2): 212. 2012; T. Pullaiah, Fl. Telangana 2: 883. 2015; Sudhakar *et al.,* Figs of Eastern Ghats, India 67. 2017; Fl. Karnataka. A Check List 2: 508. 2019; Ficus sp. Madhya Pradesh 46. 2019; P. Lakshmin. *et al.,* Fl. West Bengal 657. 2019; G.P. Sinha & A.N. Shukla, Fl. Uttar Pradesh 2: 475. 2020; S.S. Dash & A.A. Mao, Fl. Pl. India, 2: 545. 2020. **Type:** India, *s.loc., s.d., J.G. Koing EDM VII. 9. 1949* (Holotype- C, C10006727!).

Ficus tomentosa Roxb. ex Willd. Sp. Pl., ed. 4, 4: 1136. 1806; Roxb., FI. Ind. 3: 550. 1832; D. Brandis, For. Fl. North-West and Central Ind., 414. 1874; King in Hook.f., Fl. Brit. India 5: 501. 1888; H. Trimen, Handb. Fl. Ceylon 4: 87. 1898; Talbot, Trees Bombay 2: 327. 1902; Bourd., For. Trees Travancore 360. 1908; T. Cooke, Fl. Pres. Bombay 2: 646. 1908; Rama Rao, Fl. Pl. Travancore 380. 1914; J.F. Duthie, Fl. Upper Gang. Plain 148. 1915; A.K. Mukherjee, Fl. Pachmarhi & Bori Reserves 284. 1984. *Urostigma tomentosum* (Roxb. ex Willd.) Miq., London J. Bot. 6: 573. 1847. **Type:** Ind. Orientalis *758* (Type- B, B -W 19285 -01 0!).

Urostigma obversum Miq., London J. Bot. 6: 573. 847. **Type:** *Ficus asinina* Buch.-Ham. India, Rishikund, 1820, *N. Wallich 4497* (Type- K, K001039164!).

Urostigma connivens Miq., London J. Bot. 6: 573. 1847. **Type:** Ind. Orientalis, *s.loc., s.d., R. Wight 2645* (Type- E, E00301039!).

Fig. 3.73 – 3.75

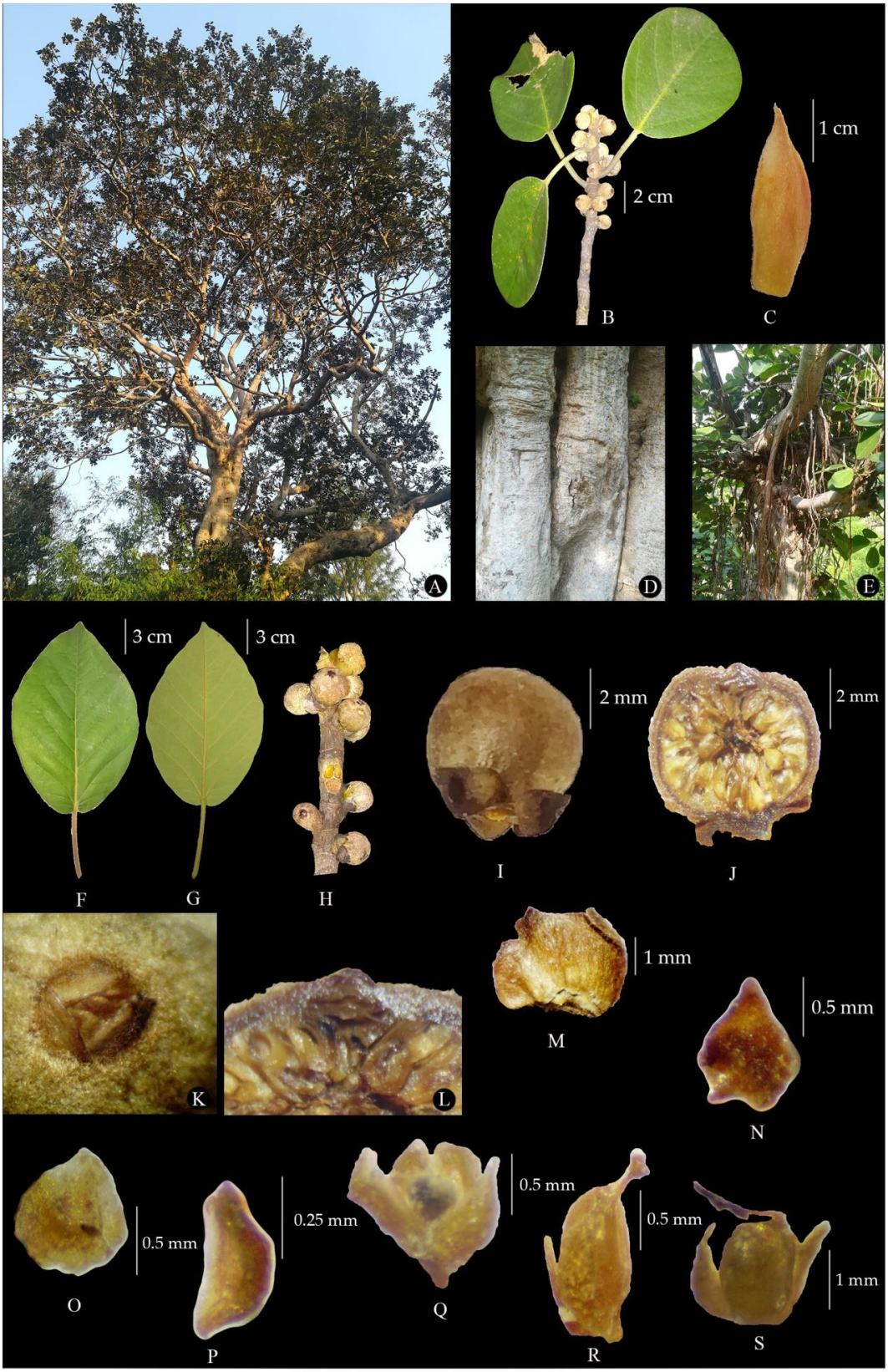


Fig. 3.73. ***Ficus mollis*** Vahl.: **A.** Habit; **B.** Twig; **C.** Stipule; **D.** Bark; **E.** Aerial roots; **F.** Leaf adaxial side; **G.** Leaf abaxial side; **H.** Receptacles; **I.** Syconium; **J.** Syconium L. S.; **K.** Ostiole; **L.** Ostiolar L. S.; **M.** Basal bract; **N.** Outer ostiolar bract; **O.** Inner ostiolar bract; **P.** Tepal; **Q.** Male flower; **R.** Female flower; **S.** Gall flower.

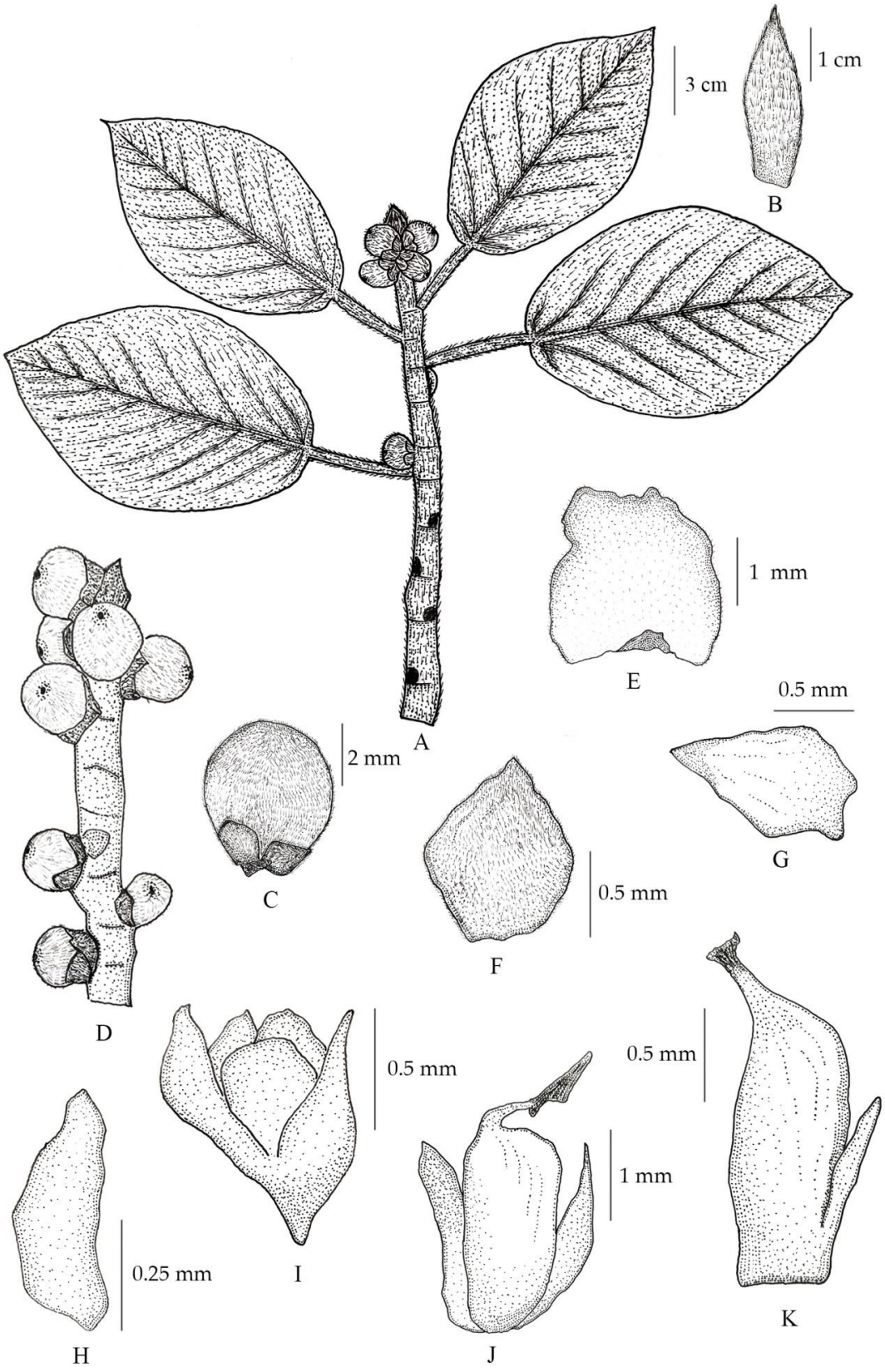


Fig. 3.74. ***Ficus mollis*** Vahl: **A.** Twig; **B.** Stipule; **C.** Syconium; **D.** Receptacles; **E.** Basal bract; **F.** Outer ostiolar bract; **G.** Inner ostiolar bract; **H.** Tepal; **I.** Male flower; **J.** Female flower; **K.** Gall flower.

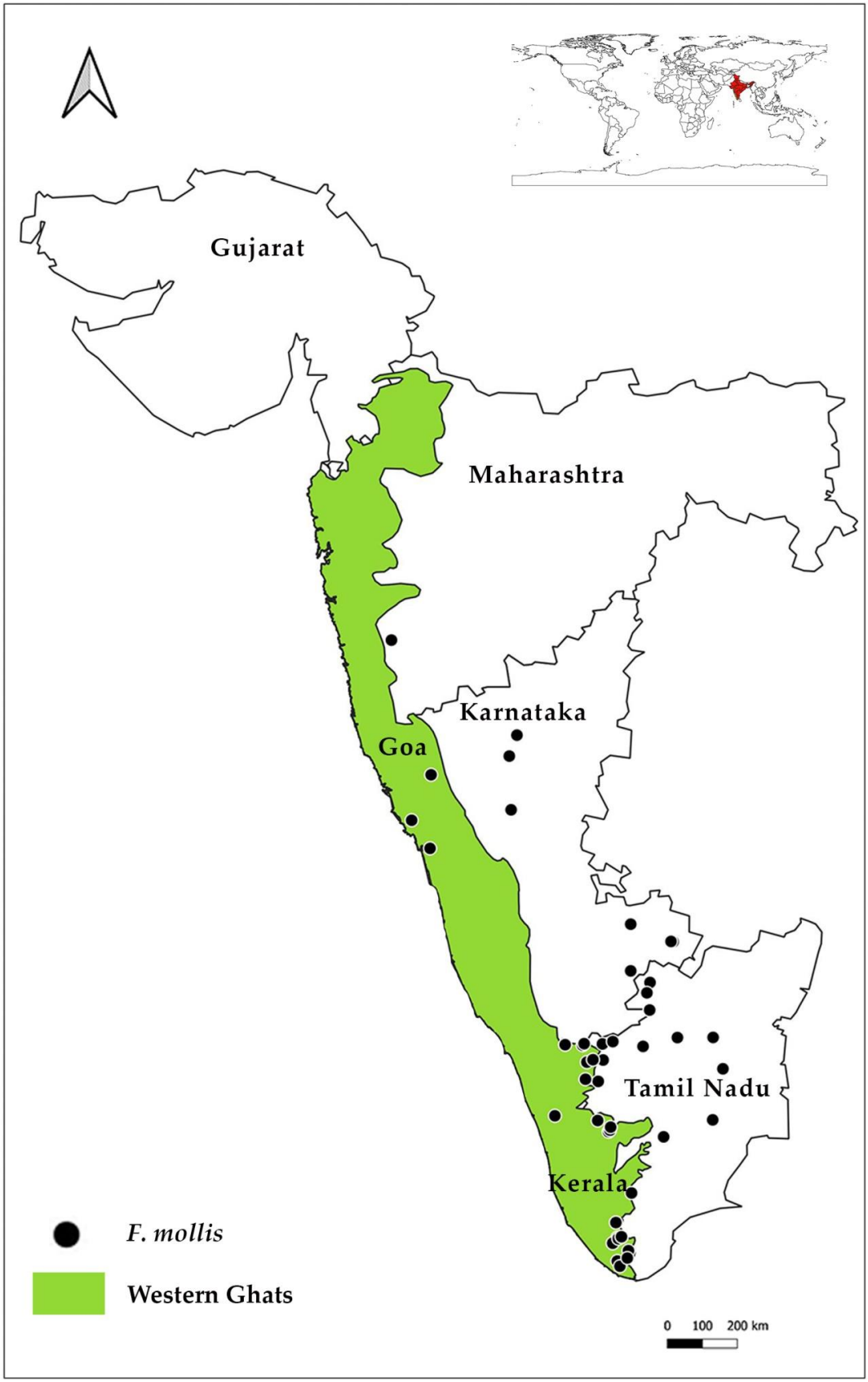


Fig. 3.75. *Ficus mollis* Vahl - Distribution map.

Tree up to 10 m height, independent, aerial roots few; bark smooth, white to pale yellow; young twigs terete, core solid, smooth, tomentose, pale brown; inter node 0.4–8.5 cm long; latex milky, white. Stipule caducous, lanceolate, 2.6–3.2 x 1.4–1.6 cm, margins entire, apex acute, base truncate, tomentose, yellow to pale brown. Petiole articulated, terete, canaliculate, 1.8–5.2 cm long, tomentose when young, glabrous on maturity, pale brown. Leaves simple, alternate, spiral; lamina symmetric, elliptic to ovate, 5.8–14.4 x 3.8–8.6 cm, margins entire, acumen 0.2–0.4 cm long, apex rounded to acute, base subcordate to cordate, tomentose when young, pubescent on maturity, pale green when young, dark green on maturity, coriaceous, venation brochidodromous; basal veins 3–4, lateral veins 5–8 pairs, waxy glands on the base of the midrib beneath. Receptacles axillary, clustered, monoecious, sessile; basal bracts present, persistent, 3, free, 3.0–4.0 mm long, widely ovate, pubescent to tomentose, pale brown. Syconium 0.6–0.9 cm across, globose, tomentose, pale green when young, pale brown when mature. Ostiole 0.5–1.0 mm wide; outer bracts present, free, ovate, 1.5 mm long, pubescent to villose, pale brown; inner bracts present, free, ovate, 1.0 mm long, glabrous, pale brown. Male flowers few, near the ostiole, 1.0 mm long, pedicellate; pedicel 0.25 mm; tepals 4, free, 0.5 mm long, lanceolate, glabrous, pale brown; stamen 1, anther 0.75 mm, filament short. Female flowers near the base, 1.25 mm long, sessile; tepal 3, free, 0.75 mm long, lanceolate, glabrous, pale yellow; stigma bifid, 0.3 mm; style 0.25 mm long; ovary 1.0 mm long, obovoid, glabrous, pale brown. Gall flowers scattered, 0.8 mm long, sessile; tepals 4, free, 0.5 mm long, lanceolate, glabrous, pale brown; stigma 0.2 mm; style 0.2 mm long; ovary 0.6 mm long, globose, glabrous, pale brown. Achene 0.8–1.0 mm, ovoid, pale yellow.

Local names: *Itchi* (Mal.); *kal-ichchi, Kaattarasu* (Tam.); *Kallatthi* (Kan.).

Common names: Soft fig.

Flowering and fruiting: December to May.

Distribution: Native to India, Sri Lanka, Bangladesh and Nicobar Islands. The species is distributed in the Central and Southern provinces of India.

Habitat: Commonly found in dry deciduous forests.

IUCN status: Not Evaluated (NE).

Etymology: The species epithet denotes the tomentose hairs present on the plant parts.

Uses: Young branches and leaves are used as fodder for cattle (Sudhakar *et al.*, 2017).

Notes: This is a common species in the deciduous forests, easily identified by the smooth indumentum, especially in the leaves and receptacles.

Specimens examined: India, **Andhra Pradesh,** Adilabad District, Kuntala Tank bund, 29 January 1987, *T. Ravi Shankar 85144* (MH). Alluri Sitharama Raju District, Rampachodavaram, 300 m, 28 June 1965, *G.V. Subba Rao 24471* (MH); *ibid.*, 400 m, 22 February 1994, *M. Mohanan 101338* (MH). Anantapur District, Gundumala R. F., 10 March 1983, *N. Yesoda 1234* (MH); Katam, Chillavaripalli, 361 m, 04 October 2016, *J. Swamy & S. Nagaraju 7957* (BSID). Ananthagiri District, Kakarapadu, 275 m, 30 September 1980, *G.V. Subba Rao 68648* (MH). Ashoknagar District, Bhonagandhi chervu, 363 m, 10 November 2014, *M. Sankara Rao 5521* (BSID). Chittoor District, Near Komati Cheruvu (Komativari cheruvu), 375 m, 28 December 1975, *G.V. Subba Rao 46814* (MH); Bhakarapet, 12 March 1957, *S.K. Wagh SKW5697* (BLAT); *ibid.*, 12 March 1957, *S.K. Wagh SKW5699* (BLAT). East Godavari District, Near Billa palem, 225 m,

12 October 1972, *G.V. Subba Rao 42545* (MH); Maredumilli, Way to Maredumilli from Rampachodavaram, 450 m, 26 October 1994, *M. Mohanan 102686* (MH); Gandhi nagar, Amalapuram, 350 m, 25 August 1995, *M. Mohanan 105115* (MH). Eluru District, Polavaram, 26 November 1902, *C.A. Barber 4913* (MH). Godavari District, River Godavari, Tummilenu, 10 December 1902, *C.A. Barber 5288* (MH). Guntur District, Nagarjuna Konda Sacred Groove, 208 m, 13 October 2015, *J. Swamy & S. Nagaraju 7258* (BSID). Kadapa District, Guvualcheruvu, along the stream, 985 m, 22 August 1958, *K. Subramanyam 6400* (MH); Rachakuntapalle, 24 November 2009, *K. Raja Kullai Swamy & S. Sandhya Rani 39015* (BSID); Kalasamudram R. F., 21 June 2010, *K. Raja Kullai Swamy & B. Sadasivaiah 39522* (BSID); Ekaladaribanda, Maddimadugu west beat, 307.6 m, 01 August 2013, *K. Prasanna & M. Sankara Rao 3356* (BSID); Topudu Vanka, Vempalli, 508 m, 15 November 2014, *M. Sankara Rao 5578* (BSID); Agasthyeswarakona, Lingapuram, 287 m, 05 October 2016, *J. Swamy & S. Nagaraju 7988* (BSID). Karimnagar District, Rechapally, 300 m, 22 December 1964, *G.V. Subba Rao 22248* (MH). Krishna District, Kondapalli fort, 19 February 1986, *P. Venkanna 6026* (MH); Kondapalli Sacred Grove, 268 m, 09 October 2015, *J. Swamy & S. Nagaraju 6388* (BSID). Kurnool District, way to pathalganga, 225 m, 20 October 1964, *J.L. Ellis 22097* (MH); way to Sunnipenta, Nallamalais, 500 m, 05 December 1969, *J.L. Ellis 32706* (MH); Sri Kolanu Bharathi, Shivopuram, 352 m, 27 October 2016, *J. Swamy 9171* (BSID). Nagarkurnool District, Uma Maheswaram, 28 February 2014, *L. Rasingam 4624* (BSID); Mallela Theertham, 03 March 2014, *L. Rasingam 4674* (BSID). Nandyal District, Srisailam, 460 m, 13 July 1963, *J.L. Ellis 16844* (MH); Near Forest Guest House Srisailam, 04 December 2012, *L. Rasingam & M. Sankara Rao 10001* (BSID); Srisailam, 541 m, 05 June 2015, *L. Rasingam & S. Nagaraju 6636*

(BSID). Nellore District, Venkatagiri, 21 February 1998, *P. Venu 110017* (BSID); Bairagula Kona, Penchala Kona, 163 m, 14 July 2016, *J. Swamy & S. Nagaraju 7810* (BSID); Siddulaiah Kona, Sydapuram, 123 m, 16 July 2016, *J. Swamy & S. Nagaraju 7888* (BSID); Narasimha Konda, 144 m, 17 July 2016, *J. Swamy & S. Nagaraju 7894* (BSID). Parvathipuram District, Manyam, Palakona near stream, 349 m, 03 September 2014, *PVP, MSR, KP & TT 4544* (BSID). Siddipet District, Annamaiah Project, Renuntala Beat, 201 m, 12 March 2016, *S. Nagaraju 6991* (BSID). Tirupati District, Chandragiri, 26 February 1914, *s.coll. 10074* (MH); Tirumala, 2nd ghat Road 7 Km milestone, 14 February 2014, *P.V. Prasanna & M. Sankara Rao 3845* (BSID); Chandragiri (Chaudragiri), 250 m, 04 March 1987, *D. Ranga Charyulu 2269A* (MH). **Karnataka,** Bagalkote District, Badami, 17 October1890, *W.A. Talbot 2774* (BSI). Belgavi District, Khanapur - Range, Khanapur – Beat, 278 m, 04 November 2014, *P.S. Annamma 4939* (BSID). Bellary District, Hadgalli, 31 December 1975, *N.P. Singh 141890* (BSI). Bijapur District, Kadlimatti, 17 January 1976, *N.P. Singh 142570* (BSI). Kolar District, Narasimhadevar belta,07 January 1976, *N.P. Singh 142162* (BSI). Uttar Kannada District, near sea shore, 04 March 1889, *W.A. Talbot s.n.* (BSI); Karwar, May 1920, *T. R. Bell s.n*. (BLAT). **Kerala,** Idukki District, Alampetty, C. W. S., 850 m, 28 November 1979, *Nambiar 1074* (KFRI); Churullipetty, C. W. S., 475 m, 06 January 1995, *N. Sasidharan & K.K. Sajeev 11656* (KFRI); Amampetty, C. W. S, 781 m, 30 January 2021. *Sreehari S. Nair & K. H. Amitha Bachan 12113* (MESAH). Thiruvananthapuram District, Athirumala, 1000 m, *01 April 1989, N. Mohanan 5517* (CALI & TBGT). Thrissur District, Peechi, 65 m, 12 March 1980, *N. Sasidharan 1144* (KFRI). **Madhya Pradesh,** Sagar District, Near Bhaikunda falls, Rahatgarh, 500 m, 03 November 1960, *N.P. Balajrishnan 11463* (MH); Near Banda R. F., 30 October 1960, *N.P. Balajrishnan 11368*

(MH); Jhukehi forest, 500 m, 02 May 1960, *K M. Sebastine 10073* (MH). **Maharashtra,** Gondia District, Tower, 17 November 2002, *D.M. Patil 182817* (BSI). **Odisha,** Dhenkanal District, Kapilas hill, 29 March 1975, *s.coll. 11234* (BSID). Ganjam District, Buguda, 238 m, 30 September 2016, *K.C. Mohan 8347* (BSID). **Tamil Nadu,** Chengalpattu District, Pasamur hillock near Vednthangal, 120 m, 28 January 1976, *A.N. Henry 47107* (MH). Coimbatore District, Ethuva kanada, 13 August 1929, *V. Narayana Swami 18707* (MH); Anthargange (Antharaganga), 3500 ft, 10 February 1930, *V. Narayana Swami 19798* (MH); Navamalai, 350 m, 26 June 1962, *J. Joseph 14190* (MH); Slope of Othimalai (Grattimalai), 720 m, 25 February 1963, *C.P. Sreemadhavan CPS447* (MH); Aliyar Nagar foothill, 350 m, 30 October 1964, *K.M. Sebastine 22390* (MH); Pathangilipuri, Near Mangarai (Mangrai), 500 m, 11 December 1986, *M.K. Janarthanam 83046* (MH). Cuddalore District, Konakuppam (Kornakuppam), Tiruttani taluk, 60 m, 16 September 1983, *D. Narasimhan 26* (MH). Dharmapuri District, Hogenakkal river side (Hogainakkal river side), 275 m, 13 July 1964, *E. Vajravelu 20609* (MH); Hogenakkal (Hogainakkal), 250 m, 12 March 1965, *E. Vajravelu 23533* (MH); Denkanikotta, Manjakkondappalli, Sokkabetta Hill, 18 December 1978, *K.M. Matthew 20451* (L). Dindugal District, Sirumalais, 11 September 1957, *J. Pallithanam JP2810* (BLAT). Erode District, Satyamangalam Forest Division, Koothamangalam stream, 540 m, 19 March 2009, *P. Satyanarayana 122472* (MH). Kallakurichi District, Gomukanadhi, MHEP areas, Kalvarayan Hills (Kalrayans), 210 m, 27 June 1989, *K. Ramamurthy 77585* (MH). Kamarajar District, way to Nagariyar estate, 450 m, 09 November 1989, *S.R. Srinivasan 86927* (MH). Kanyakumari District, Way to sengamali Estate, 350 m, 27 July 1966, *B. V. Shetty 27997* (MH); Kandakki Estate, Panagudi, 250 m, 04 February 1972, *B. D. Sharma 39912* (MH); Kulasekharam, 20 June 2012, T. Shaju 74005 (TBGT).

krishnagiri District, Anchetty – Kunthukottai, 750 m, 21 July 1978, *E. Vajravelu 57902* (MH). Madurai District, Gandhi Hills, Arapalayam, 2300 ft, 03 July 1930, *V. Narayana Swami 3412* (MH); Alagarkoil forest, 300 m, 27 July 1965, *E. Vajravelu 25289* (MH). Nilgiri District, Poonachi Ghats, Anamalais, November 1901, *C.A. Barber 3998* (MH); Kunjapanai slopes, 625 m, 10 August 1970, *E. Vajravelu 35275* (MH); Moyar, 900 m, 17 August 1970, *B.D. Sharma 35556* (MH); Near Kunjapanai, 970 m, 01 February 1972, *E. Vajravelu 39723* (MH); Burliar, Kaloor (Kallor), 600 m, 02 March 1972, *B.D. Sharma 40377* (MH); Parali Forest, 500 m, 29 June 1974, *E. Vajravelu 45029* (MH); Mudumalai W. L. S., Moyar Falls, 900 m, 24 October 1990, *D. Stephen 92185* (MH); Mudumalai W. L. S, Moyar R. F., 950 m, 25 October 1990, *D. Stephen 94107* (MH); Mudumalai W. L. S., Moyar temple, 950 m, 12 March 1991, *E. Vajravelu 96173* (MH); Mudumalai W. L. S. , Moyar R. F., way to Segur Hills, 950 m, 12 December 1991, *D. Stephen 97966* (MH); Perambalur, Sathamur Dam Forest, 200 m, 26 November 1977, *E. Vajravelu 52083* (MH); Pudukottai Sittannavasal (Sithannavasai), 100 m, 24 June 1965, *K. Ramamurthy 24936* (MH); Tenkasi around Chittarur, 29 September 1975, *K.K.N. Nair 1231* (CALI); above Tiger falls, 01 March 1976, *K.K.N. Nair 5228* (CALI). Theni District, Vellimalai slope, 450 m, 21 October 1983, *K. Ramamurthy 79634* (MH); Bodimettu, 11 April 2022, *Sreehari S. Nair & P.J. Ebin 12197* (MESAH). Tiruchirappalli District, Ayyanar koil, 275 m, 23 December 1971, *E. Vajravelu 39544* (MH). Tirunelveli District, on the way to Puliyaruvi (Piliyaruvi), 467 m, 27 July 1957, *K. Subramanyam 3872* (MH); Near Tiger Falls, 333 m, 04 March 1958, *K.M. Sebastine 5508* (MH); Near upper dam, Papanasam, 333 m, 13 July 1959, *K.M. Sebastine 8530* (MH); Forest surrounding, Agasthiar falls, Lower camp, 150 m, 15 November 1959, *K.M. Sebastine 9684* (MH); Mahendragiri R. F., 300 m, 24 April 1989, *R. Gopalan 90155* (MH);

Mundanthurai R. F., 200 m, 08 October 1992, *R. Gopalan 99427* (MH). Viluppuram District, Gingee, ca. 200 m, 07 January 1927, *S.R. Raju & Naparathara 17952* (MH); Pakamalai R. F., Gingee, 525 m, 22 January 1978, *K. Ramamurthy 53540* (MH). Virudhunagar District, Marudhamalai beat, Puduppatti, 210 m, 08 December 1971, *E. Vajravelu 39319* (MH); Senbagathopu R. F., (Senbagatope), Srivilliputhur, 200 m, 08 March 1980, *S. R. Srinivasan 63615* (MH). **Telangana,** Mahaboob District, Nagar Umamaheshwaram, Rangapur, 695 m, 22 October 2016, *J. Swamy & L. Rasingam 9116* (BSID). Medak District, Hamsanpally extension, Rampur, 550 m, 16 May 1995, *R. Gopalan 104075* (BSID); Nagsanpally R. F., 500 m, 19 May 1995, *R. Gopalan 104192* (BSID). Nalgonda District, Vaddepally, 285 m, 08 March 2012, *A. Baleeshwar Reddy 1195* (BSID). Peddapalli District, Manthani, 16 December 1986, *M.R. Rajendra Prasad 104* (MH). Warangal District, Pakhal, 290 m, 10 August 1961, *K.M. Sebastine 13154* (MH); Ramappa Temple area, 250 m, 19 September 1995, *R.K. Premanath 105346* (MH).

3.6.25. *Ficus nervosa* Roth

Ficus nervosa Roth, Syst. Veg., ed. 15 bis (Roemer & Schultes) 1: 513. 1817; Kurz., For. Fl. Brit. Burma 453. 1877; King in Hook.f., Fl. Brit. India 5: 512. 1888; J. Cameron, For. Trees of Mysore and Coorg 280. 1894; H. Trimen, Handb. Fl. Ceylon 4: 89. 1898; W.A. Talbot, Trees Bombay 328. 1902; Bourd., For. Trees Travancore 362. 1908; T. Cooke, Fl. Pres. Bombay 2: 647. 1908; Rama. Rao, Fl. Pl. Travancore 381. 1914; Brandis, Indian Trees 600. 1921; H. Santapau, Fl. Khandala 257. 1953; Corner in Dass. & Forsb., Rev. Handb. Fl. Ceylon 3: 264. 1981; B.D. Sharma *et al.,* Fl. Karnataka: Analysis 259. 1984; C.J. Saldanha, Fl. Karnataka 1: 118. 1984; V. Chithra in A.N. Henry *et al.,* Fl. Tamil Nadu Ind., Ser I: Analysis 2: 254. 1987; Subramanian *et al.,* Fl. Palghat 124. 1987; Vajr.,

Fl. Palghat Dist. 448. 1990; K.M. Matthew, Excur. Fl. Central Tamil Nadu 484. 1991; Kothari & Moorthy, Fl. Raigad Dist. 3: 376. 1993; D. Deshp. *et al.,* Fl. Mahabaleshwar and Adjoinings 2: 554. 1995; Sivar. & Mathew, Fl. Nilambur 668. 1996; Sasidh. & Sivar., Fl. Pl. Thrissur Forest 429. 1996; T. Pullaiah & D.A. Moulali, Fl. Andhra Pradesh 2: 901. 1997; V. Mudgal *et al.,* Fl. Madhya Pradesh 2: 619. 1997; V.S. Ramach. & V.J. Nair, Fl. Cannanore Dist. 432. 1988; K.M. Matthew, Fl. Palni Hills 1183. 1999; N.P. Singh *et al.,* Fl. Maharashtra Dicot 2: 939. 2001; Mohanan & Sivadasan, Fl. Agasthyamala 634. 2002; N.P. Singh *et al.,* Fl. Mizoram 583. 2002; K.G. Bhat, Fl. Udupi 596. 2003; Sasidh. & Sivar., Bio. Docu. Kerala part 6: Flow. Plant. 440. 2004; K.M. Chetty *et al.,* Fl. Pl. Chittoor Dist. 333. 2008; Mandar & Lakshmin., Fl. Bhagwan Mahavir 229. 2013; Fl. Karnataka. A Check List 2: 509. 2019; P. Lakshmin. *et al.,* Fl. West Bengal 658. 2019; S.J. Britto, Fl. Central and North Tamil Nadu 976. 2019; S.S. Dash & A.A. Mao, Fl. Pl. India, 2: 545. 2020; R. Gogoi *et al.,* Fl. Sikkim 283. 2021. *Urostigma nervosum* (Roth) Miq., London J. Bot. 6: 585. 1847. **Type:** India, Ind. Orientalis, 27 February 1799, *B. Heyne s.n.* (Holotype- B, B 10 0004437!).

Ficus blinii H. Lév. & Vaniot, Repert. Spec. Nov. Regni Veg. 8: 550. 1910. **Type:** China, Lo- Faou, March 1909, *J. Cavalerie 3595* (Type- E, E00275300!).

Ficus nervosa var. *longifolia* Sata, Contr. Hort. Inst. Taihoku Imp. Univ. 32: 83. 1944. **Type:** Not seen.

Ficus undulata Buch.-Ham., Trans. Linn. Soc. London 15: 133. 1827. **Type:** Not seen.

Urostigma modestum Miq., London J. Bot. 6: 586. 1847. *Ficus modesta* (Miq.) Miq., Ann. Mus. Bot. Lugduno-Batavi 3: 263. 1867. **Type:** Not seen.

Fig. 3.76 – 3.78

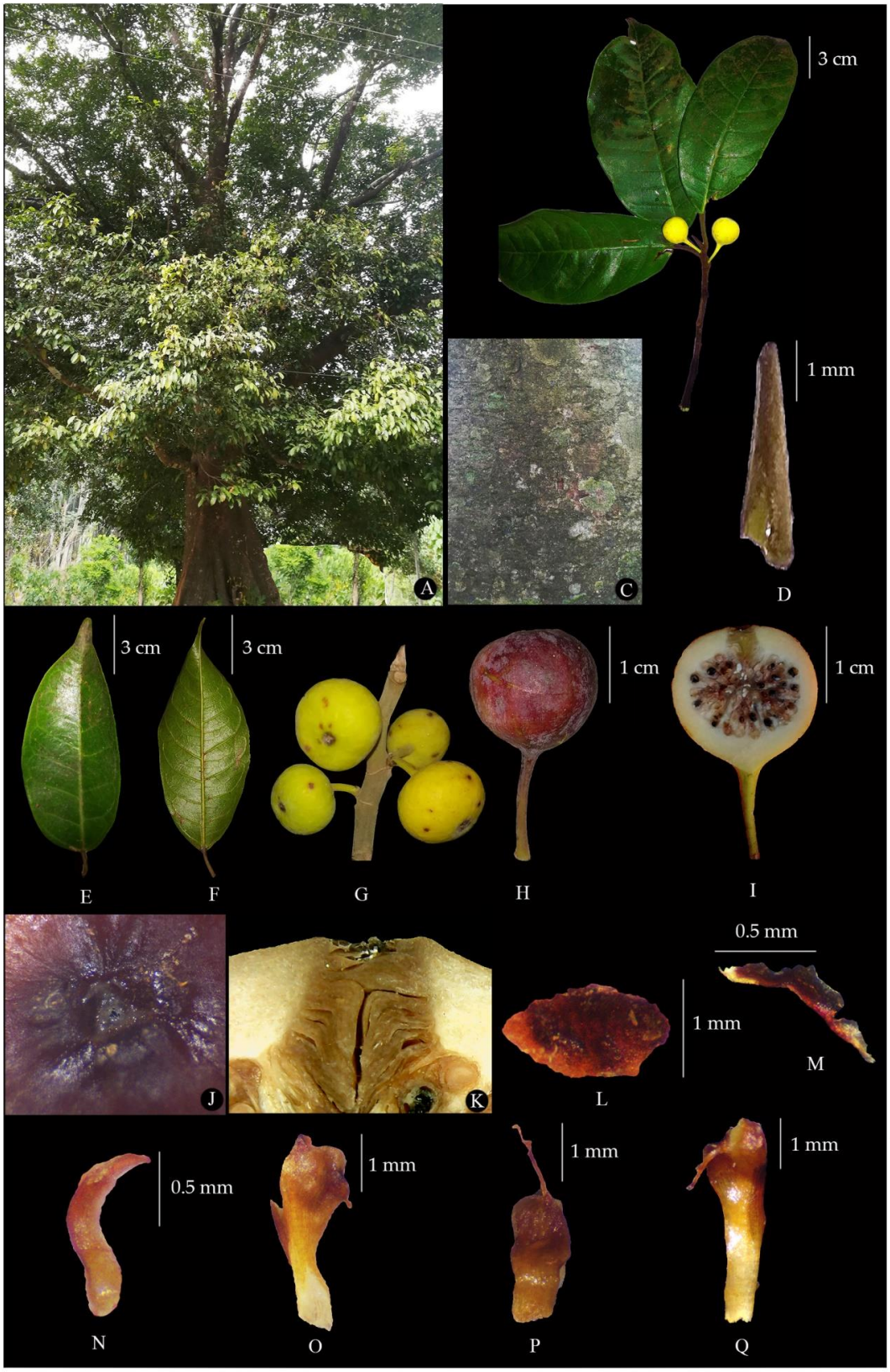


Fig. 3.76. ***Ficus nervosa*** Roth.: **A.** Habit; **B.** Twig; **C.** Bark; **D.** Stipule; **E.** Leaf adaxial side; **F.** Leaf abaxial side; **G.** Receptacles; **H.** Syconium; **I.** Syconium L. S.; **J.** Ostiole; **K.** Ostiolar L. S.; **L.** Outer ostiolar bract; **M.** Inner ostiolar bract; **N.** Tepal; **O.** Male flower; **P.** Female flower; **Q.** Gall flower.

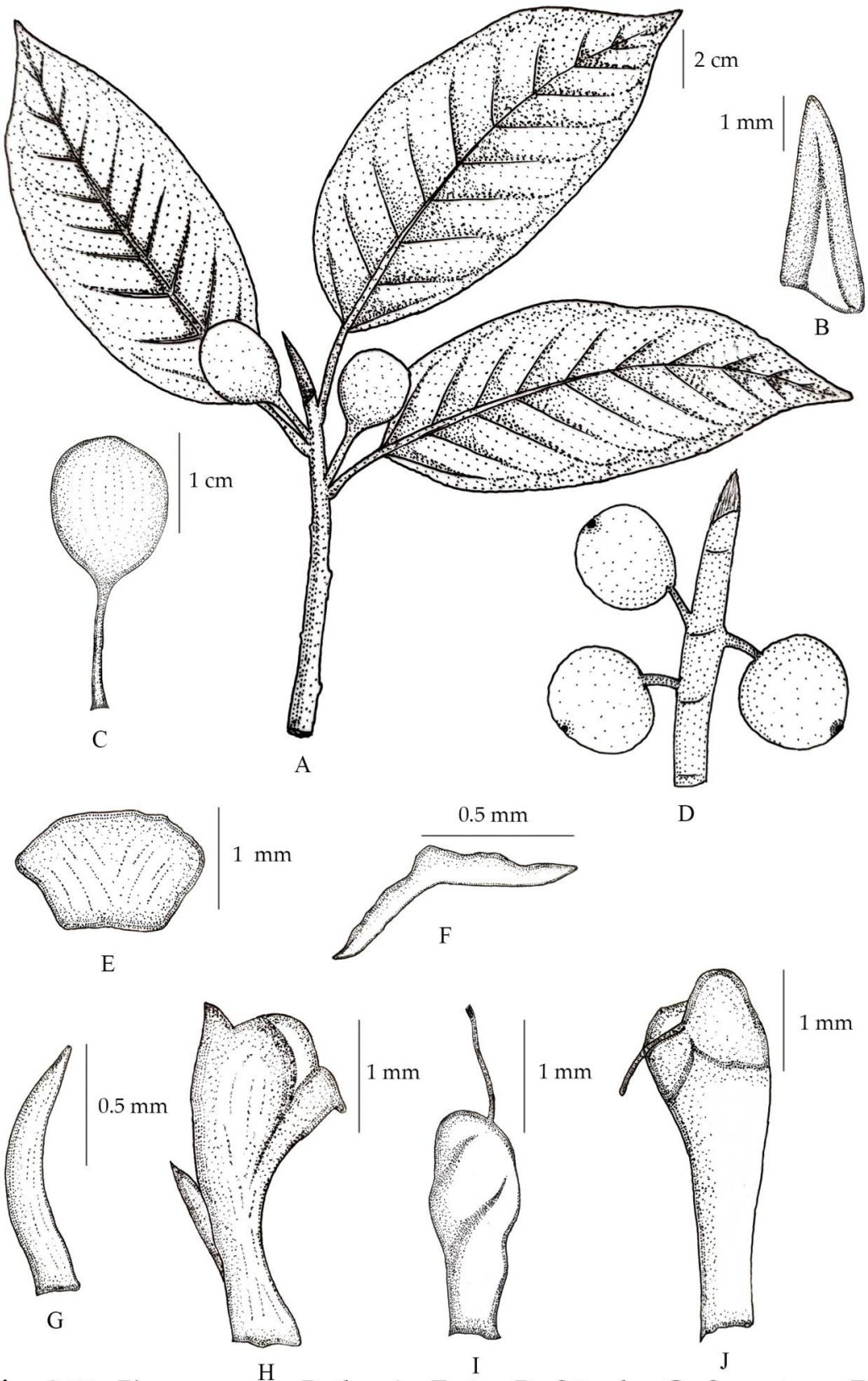


Fig. 3.77. ***Ficus nervosa*** Roth.: **A.** Twig; **B.** Stipule; **C.** Syconium; **D.** Receptacles; **E.** Outer ostiolar bract; **F.** Inner ostiolar bract; **G.** Tepal; **H.** Male flower; **I.** Female flower; **J.** Gall flower.

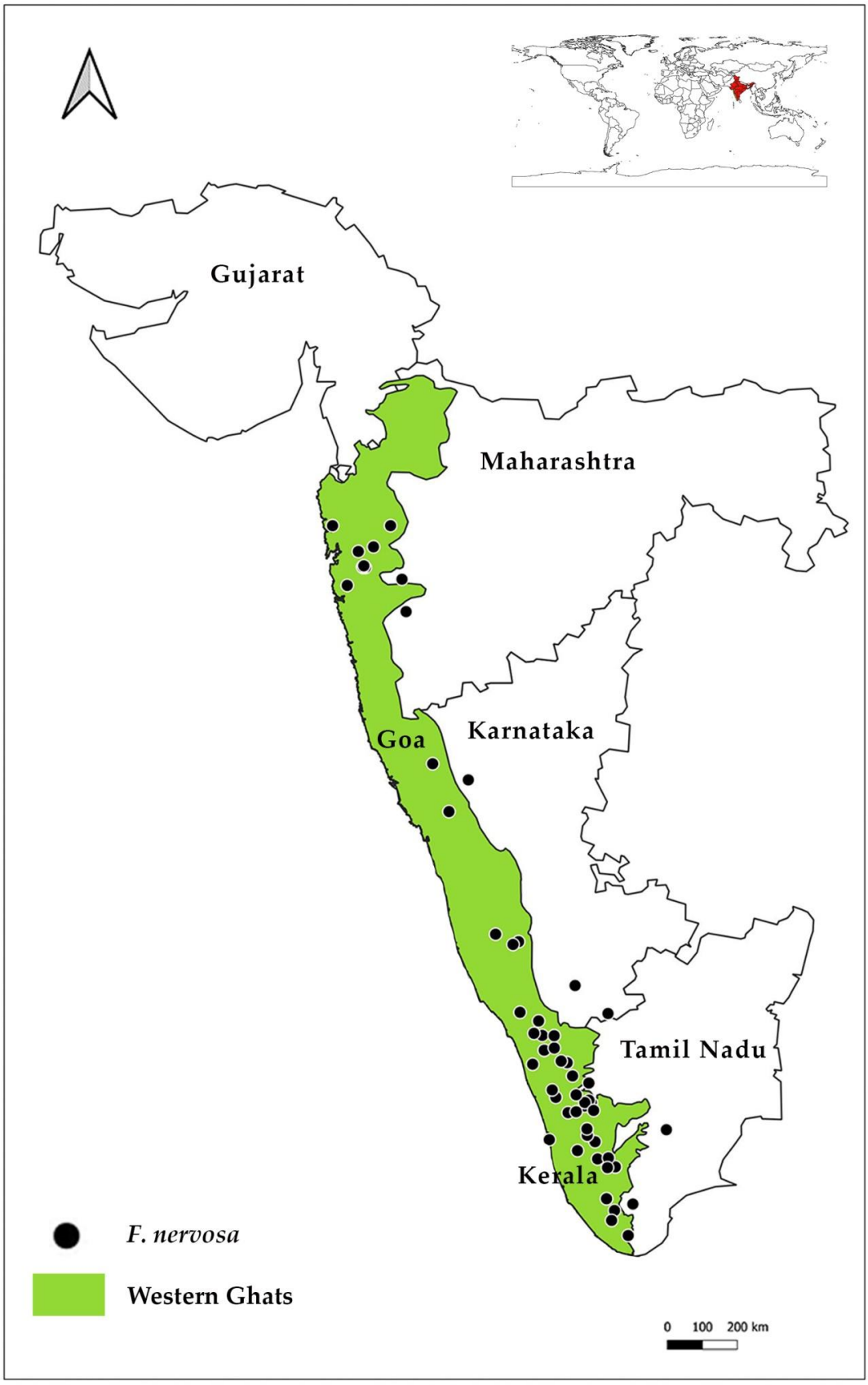


Fig. 3.78. *Ficus nervosa* Roth. - Distribution map.

Large independent tree up to 30 m height, without aerial roots. Bark lenticellate, brown to black. Young twigs terete, smooth, core solid, tomentose, pale brown. Inter node 2.1–3.2 cm long; latex milky, white. Stipules caducous, lanceolate, margins entire, 0.5–2.5 x 0.3–1.2 cm, apex narrowly acute, base truncate, puberulous, pale brown. Petiole articulated, terete, 0.8–2.3 cm long, pubescent, pale brown. Leaves simple, alternate, spiral; lamina symmetric, lanceolate, 10.0–16.4 x 5.1–6.0 cm, margins entire, acumen 0.6–1.1 cm long, apex acuminate, base obtuse, lamina glabrous, veins pubescent, pale green to red when young, dark green when mature, dark brown when dry, subcoriaceous, brochidodromous venation, lateral veins 9–12 pairs, waxy glands in the axils of the basal lateral nerves. Receptacles axillary, paired, monoecious, pedunculate; peduncle 2.0–3.0 cm long, glabrous, pale brown; basal bracts absent. Syconium 1.4–1.8 cm across, globose, glabrous, green to yellow when mature and purple on ripening. Ostiole 1.0–2.0 mm, outer bracts present, free, ovate, 1.5–2.0 mm long, glabrous, pale brown; inner bracts present, free, lanceolate, 1.0–2.0 mm long, glabrous, brown. Male flowers prominent near the ostiole, 4.0 mm long, pedicellate; pedicel 1.5 mm long; tepals 3–4, free, 1.0 mm, lanceolate, glabrous, pale brown; stamen 1, anther 1.5 mm long, filament 1.0 mm long. Female flowers at the base, 3.5 mm long, pedicellate; pedicel 1.5 mm long; tepals 3, free, 3.0 mm, lanceolate, pale brown; stigma bifid, style 0.75 mm long, ovary 1.25 mm long, obovoid, glabrous, pale brown. Gall flowers scattered, 2.5 mm long, pedicellate; pedicel 0.5 mm long; tepals 3–4, free, 3.0 mm long, lanceolate, glabrous, pale brown; stigma short, style 0.5mm long, ovary 1.5 mm long, obovoid, glabrous, pale brown. Achenes 1.0mm, ovoid, white.

Local names: *Karimaravu* (Mal.)

Common names: Nil.

Flowering and fruiting: September – May.

Distribution: India, China, Bangladesh, Thailand, Sri Lanka. Distributed in the Peninsular region in India.

Habitat: Evergreen and semi evergreen forests.

IUCN status: Least Concern (LC).

Etymology: Named so based on the arrangement of the nerves. The primary nerves are upstretched below and the tertiary nerves are dejected.

Uses: The fruits are used as food (Khan, 2017) and wood is used as fire food (Tiwari, 2016).

Notes: The figs were noted as sessile or subsessile (Berg *et al.,* 2011), but the species has pedunculate figs. Also, Berg *et al.* (2011) mentioned the presence of three basal bracts while, basal bracts are absent in the species. Only minute bract like appendages is seen on the base of the peduncle. Basal bracts are completely absent on the base of the syconium.

Specimens examined: India, **Andaman and Nicobar Islands,** South Andaman District, 10 km towards north from Poona Nallah, 100 - 150 m, 25 July 1976, *N. Bhargava 4236* (PBL); Port Blair, 3 m, 13 April 1964, *J.L. Ellis & K. Ramamurthy 18771* (MH). **Assam,** Dima Hasao District, Halflong hill, May 1918, *s.coll. 29172* (BLAT). **Karnataka,** Chamarajanagar District, Bedguli, B. R. T. Wild Life Sanctuary, 10 September 2015, *J. Jayanthi 203443* (BSI); Gombegallu, B. R. T. Wild Life Sanctuary, 10 March 2017, *J. Jayanthi 207026* (BSI). Chikkamagaluru District, Charmadi, 500 ft, 23 November 1927, *S.R. Raju 18151* (MH). Dharwad District, *s.loc.,* 10 July 1891, *W.A. Talbot 2505*

(BSI). Hassan District, Sakleshpur, 22 December 1903, *s.coll. CAB6381* (MH). Mysore District, Barguai, 16 December 1903, *C.A. Barber 6205* (MH). South Kanara District, Shiradi border, 27 December 1978, *C.J. Saldanha, P. Prakash & S. B. Manohar 5524* (JCB). Uttar Kannada District, Yellapur, 29 June 1953, *R. P. Patil 2538* (BSI); Katgal, *s.d., W.A. Talbot 1143* (BSI); *s.loc.,* 15 February 1905 *Beddome s.n.* (MH). **Kerala,** Idukki District, Peerumade, 18 February 1957, *G.S. Puri 15309* (BSI); Valara R. F., 1800 m, 26 January 1982, *K. Ramamurthy 72991* (MH); Chenthamara, P. T. R., 560 m, 16 March 1994, *Jomy Augustine 13457* (KFRI); Kokkara, P. T. R., 900 m, 04 April 1994, *Jomy Augustine 13526* (KFRI & CALI); Rock wood, P. T. R., 901 m, 10 November 1994, *Sasidharan 11231* (KFRI); Arjunankotta, P. T. R., 800 m, 13 April 1995, *Jomy Augustine 15080* (KFRI & CALI). Kannur District, Chandanathode, 920 m, 27 June 1965, *J.L. Ellis 25208* (MH). Kollam District, Palaruvi, 24 July 2013, *G. Raj Kumar 77140* (TBGT); *ibid.,* 25 July 2013, *G. Raj Kumar 77115* (TBGT). Palakkad District, Parambikulam, November 1909, *A. Meelbod 12403* (BSI); Dhoni R. F., 200 m, 27 May 1964, *E. Vajravelu 19097* (MH); Mukkali forest, 250 m, 29 May 1966, *E. Vajravelu 27718* (MH); Mukkali forest, 525 m, 23 December 1969, *E. Vajravelu 33321* (MH); below Silent valley Dam, 850 m, 10 April 1978, *M.C. Nair 56745* (MH); Pothekkal forest, 550 m, 24 January 1980, *P. Bhargavan 65684* (MH); Anthenthode (Panthenthode), 850 m, 03 April 1983, *M.C. Nair 77288* (MH). Thiruvananthapuram District, Athirumala, 1000 m, 15 May 1988, *N. Mohanan 12649* (TBGT); Ponmudi, 800 m, 22 December 2021, *Sreehari S. Nair 12181* (MESAH). Thrissur District, Vellanimala, 250 m, 10 May 1985, *N. Sasidharan 3480* (KFRI); Vazhani, 300 m, 15 March 1986, *N. Sasidharan 3825* (KFRI); Peechi, 65 m, 14 April 1987, *N. Sasidharan 3960* (KFRI); Sholayar, 900 m, 16 February 2008, *K.H. Amitha Bachan 99084* (CALI); Poringal, 27 January 2022, *Sreehari S. Nair 12187* (MESAH). Wayanad District, Laccadi, 17 April

1976, *C.R. Suresh 12994* (CALI); Nedumkayam, 06 March 1981, *Philip Mathew 25755* (CALI); Nilambur, Edacode, 26 March 1982, *s.coll. 33380* (CALI); *ibid.*, 26 March 1982, *s.coll. 33113* (CALI); *s.loc.*, 600 m, 17 January 2001, *Rathesh Narayanan 1748* (CALI). **Maharashtra,** Pune District, Blumashunkur, 05 December 1906, *W.A. Talbot 5011* (BSI); Lonavla, April 1919, *s.coll. 25614* (BLAT); Wagioi forest, Nandgaon, Ambavane, Lonavla, 29 July 1964, *B. Venkata Reddi 99367* (BSI). Satara District, Khandala, 20 July 1941, *H. Santapau 810* (BLAT); Khandala, Meroli plateau, 20 April 1943, *H. Santapau 1893* (BLAT); Khandala, Urvoli plateau, 19 August 1944, *H. Santapau 4685* (BLAT); Khandala, slopes below Elphine plateau, 13 April 1946, *H. Santapau 8795* (BLAT); Khandala slopes, 13 April 1946, *H. Santapau 8794* (BLAT); Khandala, 06 June 1959, *J.A. Merchant 1098* (BLAT); *ibid.,* 06 June 1959, *J.A. Merchant 1095* (BLAT). **Odisha,** Anugul District, Kwadoli, raigoda, 396 m, 20 September 2015, *K.C. Mohan 6713* (BSID). **Tamil Nadu,** Coimbatore District, Parali to Valparai, Anamalais, 04 November 1901, *C.A. Barber 3945* (MH); Udumpanparai, Anamalais, 22 November 1901, *C.A. Barber 4107* (MH). Kanyakumari District, Mahendra Giri R. F., 18 September 1913, *s.coll. 13224* (MH); *ibid.,* 01 March 1989, *N. Mohanan 8049* (TBGT). Nilgiri District, Carcon Ghat, 10 January 1900, *J.S. Gamble 18272* (MH); Pandalur – Devala Forest, 825 m, 22 June 1974, *E. Vajravelu 44909* (MH); Kottamalai R. F., 925 m, 04 August 1975, *E. Vajravelu 46447* (MH). Ramanathapuram District, Ethur hills, 1250 m, 14 March 1980, *S.R. Srinivasan 65954* (MH). Tirunelveli (Ramanathapuram) District, Way to Netaikal, 22 September 1916, *s.coll. 13425* (MH); Nagarear Estate, Sethur hills, 1250 m, 14 March 1980, *S.R. Srinivasan 65954* (MH). Vellore District, Serpadi (Syerpadi), Anamalais, 25 October 1901, *C.A. Barber 3850* (MH).

3.6.26. *Ficus pumila* L.

Ficus pumila L., Sp. Pl. 1060. 1753; Vahl., Enum. Pl. 2: 190. 1805; J. Cameron, For. Trees of Mysore and Coorg 286. 1894; Corner, Gard. Bull. Singapore 21: 52. 1965; Corner in Dass. & Forsb., Rev. Handb. Fl. Ceylon 3: 268. 1981; H.J. Chowdhery & B.M. Madhwa, Fl. Himachal Pradesh Analysis 2: 662. 1984; V. Chithra in A.N. Henry *et al.,* Fl. Tamil Nadu Ind., Ser I: Analysis 2: 255. 1987; K.M. Matthew, Excur. Fl. Central Tamil Nadu 485. 1991; K.M. Matthew, Fl. Palni Hills 1184. 1999; K.G. Bhat, Fl. Udupi. 596. 2003; Wu *et al.,* Fl. China 5: 65. 2003; Berg & Corner in Nooteboom, Fl. Malesiana 17(2): 518. 2005; Berg *et al.,* Fl. Thailand 10(4): 587. 2011; T. Pullaiah, Fl. Telangana 2: 884. 2015; Sudhakar *et al.,* Figs of Eastern Ghats, India 124. 2017; R. Gogoi *et al.,* Fl. Sikkim 283. 2021. *Plagiostigma pumila* (L.) Zucc. Abh. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. 4(3): 154. 1846. **Type:** [illustration] ["Inu Itabu"] in Kaempfer, Amoen. Exot. Fasc.: 804. 1712.

Ficus hanceana Maxim., Bull. Acad. Imp. Sci. Saint-Pétersbourg 27: 553. 1881. **Type:** Macao, June 1863, *H.F. Hance 1457* (Syntype- P, P06846603!).

Ficus stipulata Thunb., Diss. Fic. 8. 1786; Miq., London J. Bot. 7: 439. 1848. **Type:** Japan, *s.loc., s.d., C.P. Thunberg s.n.* (Type- LD, 1755699!).

Ficus scandens Lam., Encycl. 2: 498. 1788; Vahl, Enum. PI. 2: 184.1805. **Type:** Not seen.

Ficus vestita Desf. in Tabl. École Bot., ed. 3: 346. 1829. **Type:** Not seen.

Fig. 3.79 – 3.81

Climber, epiphytic; aerial roots absent; bark lenticellate, brown. Young twigs terete, smooth, puberulent, pale brown. Inter node 0.7–2.1 cm long; latex milky, white. Stipules caducous, lanceolate, 0.5–1.2 x 0.6–1.0 cm, margins

entire, apex acute, base truncate, tomentose above and glabrous beneath, pale brown. Bathyphylls: petiole articulated, terete, 3.0–7.0 mm long, pubescent, pale brown. Leaves simple, alternate, spiral; lamina asymmetric, ovate, 1.7–3.4 x 1.2–2.4 cm, margins entire, acumen 0.2–0.3 cm long, apex obtuse, base cordate, glabrous, pale red to pale green when young, dark green on maturity, subcoriaceous, venation brochidodromous; basal veins 3–4, lateral veins 4–5 pairs, waxy glands on the axils of the basal lateral veins. Acrophylls: petiole articulated, terete, canaliculate, 0.7–2.0 cm long, glabrous to pubescent, pale brown. Leaves simple, alternate, spiral; lamina lance-ovate to ovate, 4.5–7.2 x 2.5–4.4 cm, margins entire, acumen 0.2–0.5 cm long, apex acute, base cordate, glabrous above and pubescent beneath, pale green when young, dark green on maturity, subcoriaceous, venation brochidodromous; basal veins 3–4, lateral veins 3–5 pairs; waxy glands on the basal lateral veins. Receptacles axillary, solitary, dioecious, pedunculate; peduncle 1.8–2.6 cm long, pubescent, green; basal bracts present, persistent, 3, free, 5.0–7.0 mm long, ovate, sericeous above and glabrous beneath, pale brown above and yellow beneath. Syconium 5.0–5.2 x 3.2–3.8 cm, obovoid to turbinate, puberulent, pale green when young, pale yellow when mature. Ostiole 4.0–5.0 mm; outer bracts present, free, ovate, 2.0 mm long, pubescent to tomentose, pale brown; inner bracts present, free, lanceovate, 3.0–4.0 mm long, glabrous, white. Male flowers near ostiole, 1.5 mm long; shortly pedicellate; pedicel 0.5 mm long; tepals 3–4, free, 1.2 mm long, lanceolate, glabrous, white; stamen 1, anther 0.8 mm, filament 0.2 mm long. Female flowers scattered, 1.0 mm long, sessile; tepals 3–4, free, 1.2 mm long, lanceolate, glabrous, white; stigma 0.2 mm long; style 0.2 mm long; ovary 0.6 mm long, obovoid, glabrous, pale brown. Gall flowers scattered, 1.0 mm long, pedicellate; pedicel 0.4 mm; tepals 3–4, free, 1.2 mm long, lanceolate,

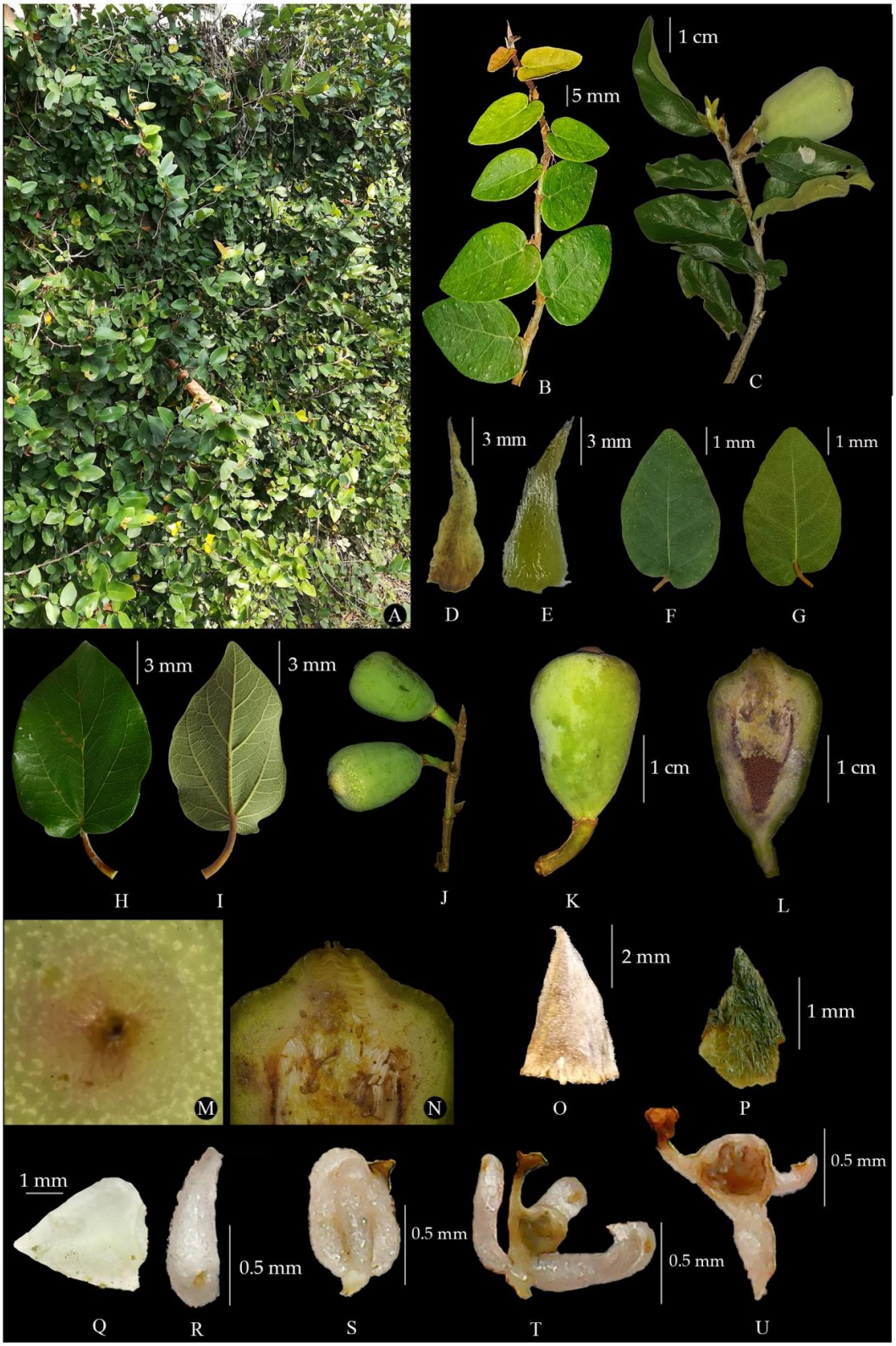


Fig. 3.79. ***Ficus pumila*** L.: **A.** Habit; **B.** Bathyphyllous twig; **C.** Acrophyllous twig; **D & E.** Stipule; **F.** Bathyphyllous leaf- adaxial side; **G.** Bathyphyllous leaf- abaxial side; **H.** Acroyphyllous leaf- adaxial side; **I.** Acrophyllous leaf- abaxial side; **J.** Receptacles; **K.** Syconium; **L.** Syconium L. S.; **M.** Ostiole; **N.** Ostiolar L. S.; **O.** Basal bract: **P.** Outer ostiolar bract; **Q.** Inner ostiolar bract; **R.** Tepal; **S.** Male flower; **T.** Female flower; **U.** Gall flower.

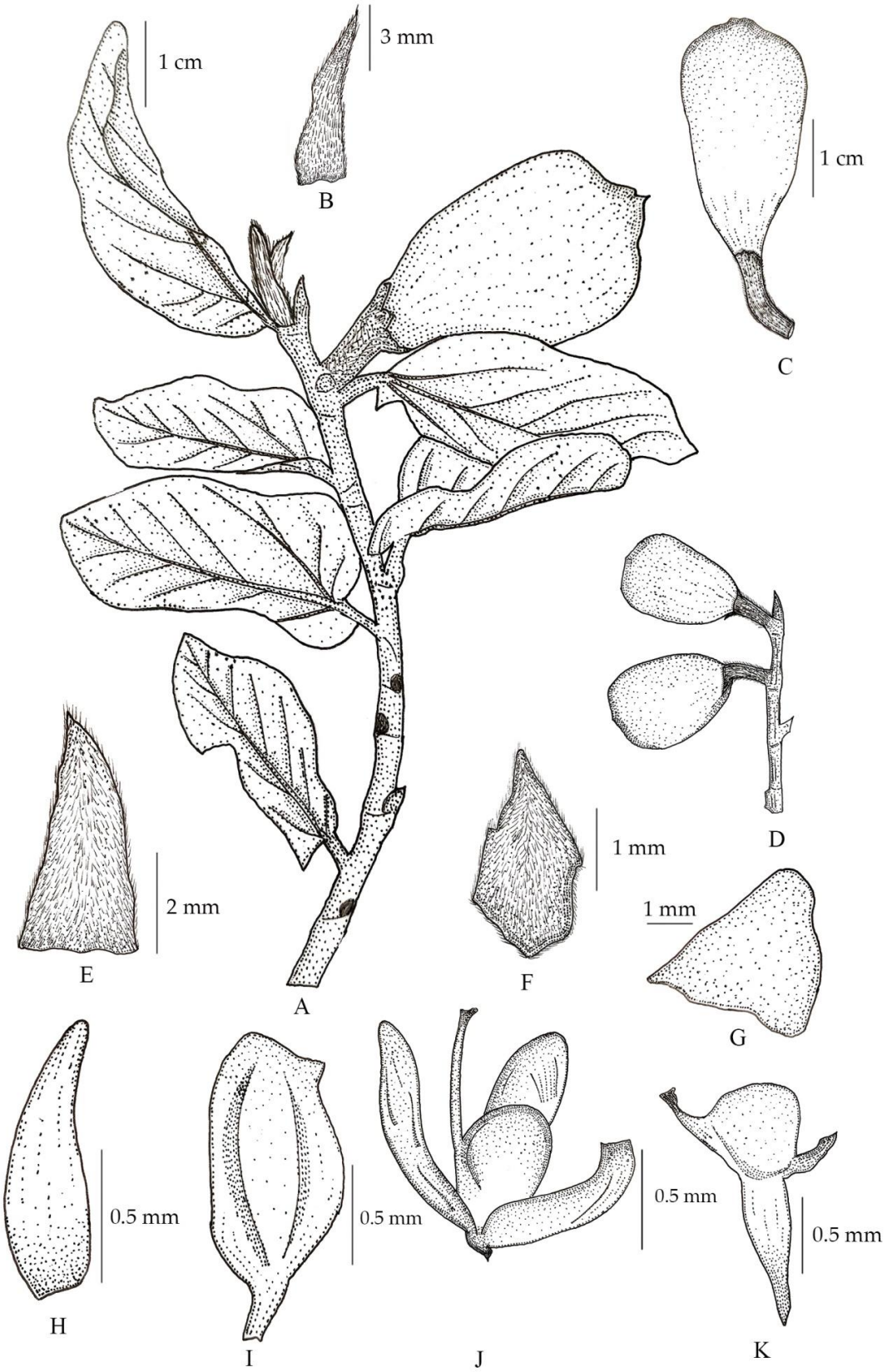


Fig. 3.80. ***Ficus pumila*** L.: **A.** Twig; **B.** Stipule; **C.** Syconium; **D.** Receptacles; **E.** Basal bract; **F.** Outer ostiolar bract; **G.** Inner ostiolar bract; **H.** Tepal; **I.** Male flower; **J.** Female flower; **K.** Gall flower.

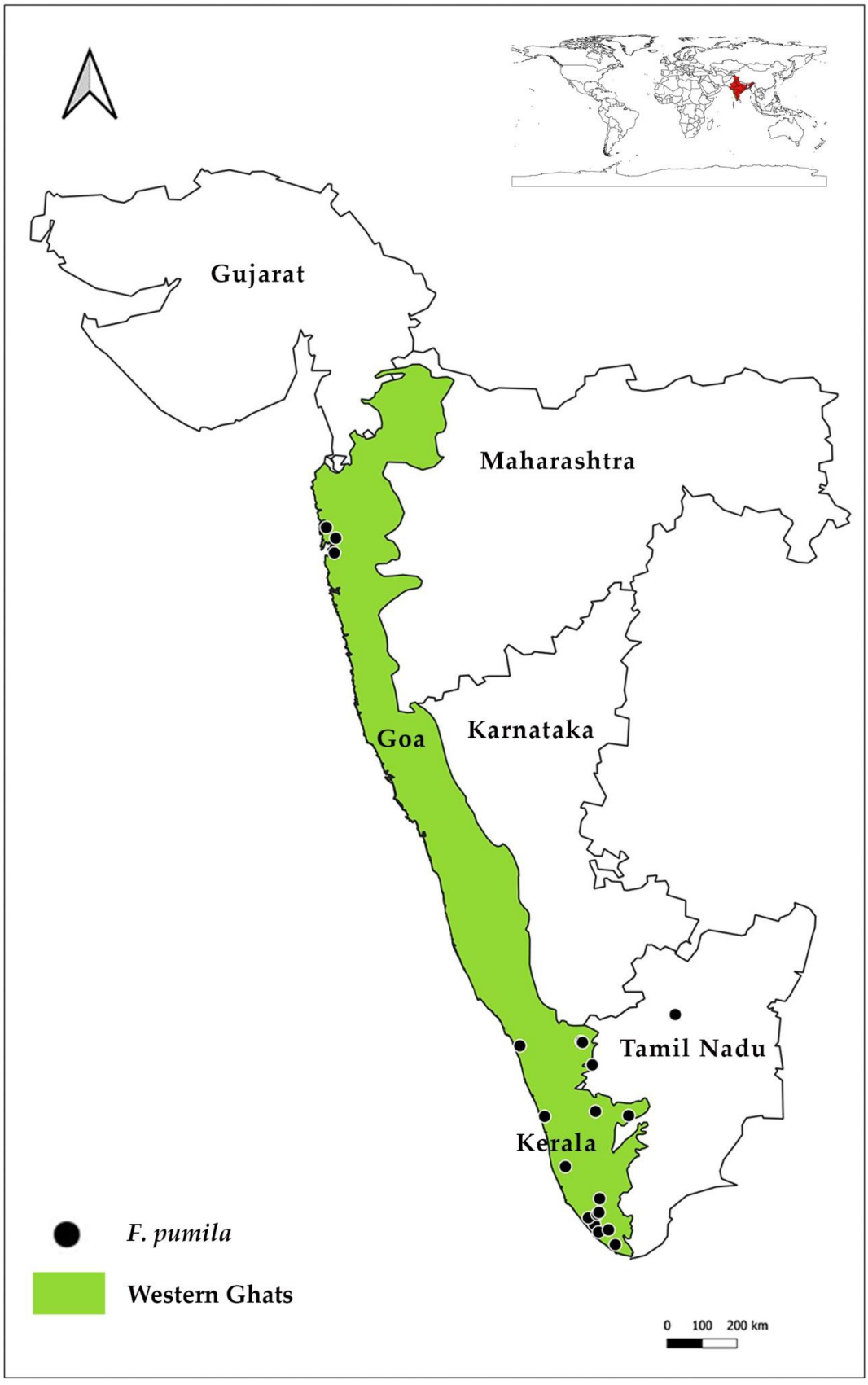


Fig. 3.81. *Ficus pumila* L.- Distribution map.

glabrous, white; stigma short; style 0.2 mm long; ovary 0.5 mm long, obovoid, glabrous, pale brown. Achenes 1.0–1.2 mm, globose, pale brown.

Local names: Nil.

Common names: Climbing fig, Creeping fig, Fig vine.

Flowering and fruiting: November to May.

Distribution: The plant is native to China, East Asia and Indo China. The plant is cultivated in many other parts of the world.

Habitat: The plant is climber usually found climbing on the walls. The plant is commonly planted for ornamental purposes.

IUCN status: Not Evaluated (NE).

Etymology: The bathyphylls of the plant is small in size. The species epithet 'pumila' refers to the small sized leaves, derived from the Latin word 'pumilus' meaning small.

Uses: Commonly used for ornamental purposes.

Notes: The species is commonly seen along the walls of buildings, where it might have planted for ornamental purposes. Not seen wild in the study area.

Specimens examined: India, **Kerala,** Ernakulam District, Maliankara, 4 m, 13 April 2021, *Sreehari S. Nair 12151* (MESAH). Kottayam District, S. B. College Botanical Garden, 12 April 1984, *V.T. Antony 376* (MH); near private bus stand, Eattumanoor, 4 m, 16 August 2022, *Sreehari S. Nair 12210* (MESAH). Thiruvananthapuram District, TBGT Forest, 13 October 1995, *Jayendra Chauhan 26323* (TBGT); Palode, 04 February 2004, *Usha & Deepthy 37898* (TBGT). **Maharashtra,** Bandra District, Mr. Husain Ali's Garden, Pali hill, 04 May 1967, *P.V. Bole s.n.* (BLAT). Mumbai District, Bombay, March

1918, *s.coll. 15310* (BLAT); University Garden, Bombay, 17 July 1956, *R.R. Fernandez R2497* (BLAT); *ibid*., 17 July 1956, *R.R. Fernandez R2498* (BLAT); Sirohi, Mount Abu, Rajaputra, November 1919, *s.coll. 25262* (BLAT). **Tamil Nadu,** Coimbatore District, Anamalais, 3800 ft, 02 October 1929, *J. Sankaram Rao s.n.* (MH); R. S. Puram, 467 m, 16 November 1967, *M. Chandrabose 29042* (MH). Dindugal District, Shembaganur, Kodaikanal, 07 February 1961, *K.M. Matthew KMM2191* (BLAT). Madurai District, Vasantha estate, Vellimala, 1100 m, 23 August 1990, *V. Lakshmanan 93690* (MH). Nilgiri District, Coonoor, 17 May 1980, *D. Daniel Sundaraj s.n.* (MH). Salem District, Yercaud, 03 June 1974, *A.V.N. Rao 39284* (MH); Shevaroys, Yercaud, 1400 m, 13 May 1978, *V. Alphonse Amalraj 13841* (MH).

3.6.27. *Ficus racemosa* L.

Ficus racemosa L., Sp. Pl. 1060. 1753; Vahl., Enum. Pl. 2: 188. 1805; H. Santapu, Fl. Khandala 259. 1953; Corner, Gard. Bull. Singapore 21: 34. 1965; G.L. Shah, Fl. Gujarat 646. 1978; N.C. Nair, Fl. Punjab Plains, Haryana and Punjab states 11(1): 243. 1978; S.K. Varma, Fl. Bhagalpur 362. 1981; Manilal & Sivar., Fl. Calicut 275. 1982; V. Singh, Fl. Banswara Dist. 3: 216. 1983; C.J. Saldanha, Fl. Karnataka 119. 1984; A.K. Mukherjee, Fl. Pachmarhi & Bori Reserves 284. 1984; B.D. Sharma *et al*., Fl. Karnataka: analysis 259. 1984; D.N.G. Bakshi, Fl. Murshidabad Dist. 302. 1984; A.K. Sharma & J.S. Dhakre Fl. Agra Dist. 255. 1995; D.M. Verma *et al.,* Fl. Raipur, Durg & Rajnandgaon 358. 1985; K.K.N. Nair & M.P. Nayar, Fl. Courtallum 1: 42. 1986; N.R. Ugemuge, Fl. Nagpur Dist, Maharashtra 339. 1986; P.C. Pant, Fl. Corbet N. P. 149. 1986; R.S. Rao *et al.,* Fl. Goa, Diu Daman Dadra & Nagar haveli 2: 409. 1986; V. Chithra in A.N. Henry *et al.,* Fl. Tamil Nadu Ind., Ser I: Analysis 2: 255. 1987; Subramanian *et al.,* Fl. Palghat 124. 1987; Bole &

J.M. Pathak, Fl. Saurashtra 2: 294. 1988; B.G. Kulkarni, Fl. Sindhudurg 420. 1988; Kamble & S.G. Pradan, Fl. Akola Dist. 213. 1988; N.P. Singh, Fl. Eastern Karnataka 2: 587. 1988; V.S. Ramach. & V.J. Nair, Fl. Cannanore Dist. 433. 1988; T. Pullaiah & N. Yesoda, Fl. Anantapur Dist. 232. 1989; J.L. Ellis, Fl. Nallamalais 2: 378. 1990; Kesh. Murthy & S.N. Yogan. Fl. Coorg 423. 1990; Vajr., Fl. Palghat Dist. 448. 1990; K.M. Matthew, Excur. Fl. Central Tamil Nadu 485. 1991; Lakshmin. & B.D. Sharma, Fl. Nasik Dist. 441. 1991; P.J. Parmar in B.V. Shetty & V. Singh, Fl. Rajasthan 2: 804. 1991; B.K. Misra & B.K. Verma, Fl. Allahabad Dist. Uttar Pradesh 346. 1992; Kothari & Moorthy, Fl. Raigad Dist. 3: 378. 1993; S. Karthikeyan & A. Kumar, Fl. Yavatmal Dist. Maharashtra 233. 1993; D. Deshp. *et al.,* Fl. Mahabaleshwar and Adjoinings 2: 555. 1995; T. Pullaiah & B.R.P. Rao, Fl. Nizamabad 322. 1995; Subram., Fl. Thenmala Div. 353. 1995; V. Raju & T. Pullaiah, Fl. Kurnool 436. 1995; Sivar. & Mathew, Fl. Nilambur 668. 1996; Sasidh. & Sivar., Fl. Pl. Thrissur Forest 430. 1996; V. Mudgal *et al.,* Fl. Madhya Pradesh 2: 620. 1997; T. Pullaiah & D.A. Moulali, Fl. Andhra Pradesh 2: 902. 1997; P.K. Bhattacharyya & K. Sarkar, Fl. West Champaran, Bihar 66. 1998; K.M. Matthew, Fl. Palni Hills 1184. 1999; S.K. Murthi & Panigrahi, Fl. Bilaspur Dist. 2: 568. 1999; P.G. Diwakar & B.D. Sharma Fl. Buldhana Dist. Maharashtra State 294. 2000; T. Pullaiah *et al.,* Fl. Guntur Dist. 325. 2000; N.P. Singh *et al.,* Fl. Maharashtra Dicot 2: 939. 2001; Mohanan & Sivadasan, Fl. Agasthyamala 635. 2002; N.P. Singh *et al.,* Fl. Mizoram 585. 2002; T.K. Sarma & A.K. Sarkar, Fl. Palamau Dist. Jharkhand 579. 2002; Chaudhary *et al.,* Taiwania, 57(2): 203. 2012; K.G. Bhat, Fl. Udupi. 596. 2003; H. Kaur & M. Sharma, Fl. Sirmaur 589. 2004; Sasidh. & Sivar., Bio. Docu. Kerala part 6: Flow. Plant. 440. 2004;

Berg & Corner in Nooteboom, Fl. Malesiana 17(2): 339. 2005; S.G. Pradhan *et al.,* Fl. Sanjay Gandhi National Park 3: 575. 2005; K.M. Chetty *et al.,* Fl. Pl. Chittoor Dist. 333. 2008; Subba Rao & Kumari, Fl. Visakhapatnam Dist. 2: 221. 2008; Sunil & Sivadasan, Fl. Alappuzha Dist. 664. 2009; Berg *et al.,* Fl. Thailand 10(4): 569. 2011; Mandar & Lakshmin., Fl. Bhagwan Mahavir 230. 2013; For. Plant. Nilgiris 49. 2015; T. Pullaiah, Fl. Telangana 2: 884. 2015; Bachan & Jisy, Meridian 5(1): 52. 2016; Sudhakar *et al.,* Figs of Eastern Ghats, India 75. 2017; Ficus sp. Madhya Pradesh 50. 2019; Fl. Karnataka. A Check List 2: 509. 2019; P. Lakshmin. *et al.,* Fl. West Bengal 661. 2019; S.J. Britto, Fl. Central and North Tamil Nadu 977. 2019; G.P. Sinha & A.N. Shukla, Fl. Uttar Pradesh 2: 476. 2020; S.S. Dash & A.A. Mao, Fl. Pl. India, 2: 547. 2020; R. Gogoi *et al.,* Fl. Sikkim 283. 2021. **Type:** India, Kerala, Kannur District, Kasaragod, 125m, 26 January 1979, *V. J. Nair 59923* (Epitype- CAL, CAL0000006985!).

Ficus glomerata Roxb., Pl. Coromandel 2(1): 13, t. 123. 1799; Roxb., FI. Ind. 3: 558. 1832; D. Brandis, For. Fl. North-West and Central Ind., 422. 1874; Kurz., For. Fl. Brit. Burma 488. 1877; King in Hook.f., Fl. Brit. India 5: 535. 1888; A.K. Nairne, Fl. Pl. Western Ind. 307. 1894; J. Cameron, For. Trees of Mysore and Coorg 289. 1894; H. Trimen, Handb. Fl. Ceylon 4: 96. 1898; Talbot, Trees Bombay 331. 1902; D. Prain, Bengal Plants 2: 984. 1903; Bourd., For. Trees Travancore 367. 1908; T. Cooke, Fl. Pres. Bombay 2: 654. 1908; Rama Rao, Fl. Pl. Travancore 384. 1914; J.F. Duthie, Fl. Upper Gang. Plain 160. 1915; Brandis, Indian Trees 609. 1921; U.N. Kanjilal *et al.,* Fl. Assam 4: 264. 1940. *Covellia glomerata* Miq., London J. Bot. 7: 465. 1848; H. Drury, Handb. Ind. Fl. 3: 223.

1869. **Type:** India, *s.loc., s.d., W. Roxburgh s.n.* (Type- BR, BR0000005296408!).

Ficus lucescens Blume Bijdr. 444. 1825. *Urostigma lucescens* (Blume) Miq. Fl. Ned. Ind. 1(2): 341. 1859. **Type:** Not seen.

Ficus lanceolata Buch.-Ham. ex Roxb., Hort. Bengal. 66; Fl. Ind. iii. 557. 1832; *Covellia lanceolata* Miq., London J. Bot. 7: 465. 1848. **Type:** India, 03 December 1814, *Buchanan-Hamilton 2420* (Type- E, E00301033!).

Urostigma leucocarpum Miq., London J. Bot. 6: 576. 1847. **Type:** India, *s.d., R. Wight 1914* (Type- E, E00301032!).

Covellia mollis Miq., London J. Bot. 7: 466. 1848. *Ficus glomerata* var. *mollis* (Miq.) King, Ann. Roy. Bot. Gard. Calcutta 1: 174. 1888. *Ficus racemosa* var. *mollis* (Miq.) Barrett, Bull. Torr. Bot. Club 73: 323. 1946. **Type:** Indonesia, Java, *s.d., H. Zollinger 573* (Type- P, P06879291!; Isotype- U, U 0122723!).

Ficus chittagonga Miq., Ann. Mus. Bot. Lugd. Bat. 3: 228. 1867. *Ficus glomerata* var. *chittagonga* (Miq.) King, Ann. Roy. Bot. Gard. Calcutta. 1: 174. 1888. **Type:** Bangladesh, Chittagong, *s.d., J.D. Hooker s.n.* (Holotype- U, U 0043221!).

Ficus glomerata var. *elongata* King, Ann. Roy. Bot. Gard. Calcutta. 1: 174. 1888. *Ficus racemosa* var. *elongata* (King) M.F. Barrett, Bull. Torr. Bot. Club 73: 323. 1946. **Type:** Bangladesh, Chittagong, 1876, *J.L. Lister 11* (Type- CAL, CAL0000014409!).

Ficus glomerata var. *miquelii* King, Ann. Roy. Bot. Gard. (Calcutta) 1: 174. 1888. *Ficus racemosa* var. *miquelii* (King) Corner, Gard. Bull. Singapore 21: 34. 1965. **Type:** India, Mysore and Carnatic, March 1845 *G. Thomson 275* (Type- CAL, CAL0000025716!).

Ficus henrici King, Ann. Roy. Bot. Gard. (Calcutta) 1: 174, t. 220. 1888. **Type:** Indonesia, Sumatra, September 1872, *O. Beccari 854* (Type- FI, FI013380!).

Ficus acidula King, Ann. Bot. Gard. 1: 176, t. 223. 1888. **Type:** Malaysia, Ragiato di Sarawak, November 1886, *O. Beccari 2832* (Type- FI, FI013381!).

Fig. 3.82 – 3.84

Tree up to 30 m height, independent, aerial roots absent; bark lenticellate, pale brown; young twigs terete, core solid, smooth, glabrous, pale red to pale brown; inter node 1.2–5.0 cm long; latex milky, white. Stipule caducous, lanceolate, 0.5–3.0 x 0.2–0.8 cm, margins entire, apex narrowly acute, base truncate, glabrous to puberulous, pale red to pale green. Petiole articulated, terete, canaliculate, 2.3–4.8 cm long, glabrous, pale brown. Leaves simple, alternate, spiral; lamina symmetric, lanceolate to lanceovate, 10.0–18.0 x 3.2–8.0 cm, margins entire, acumen 0.3–0.8 cm long, apex acute, base obtuse, glabrous, pale green when young, dark green on maturity, subcoriaceous, venation brochidodromous; basal veins 3–4, lateral veins 9–12 pairs; waxy glands in the axil of the basal nerves. Receptacles cauliflorous on trunks and main branches or rarely axillary, clustered or solitary (if axillary), monoecious, pedunculate; peduncle 0.6–1.1 cm long, terete, puberulous, pale brown; basal bracts present, caducous, 3, free, 3.0–4.0 mm long, widely ovate, pubescent, pale brown. Syconium 1.4–3.6 cm across, globose, pubescent, green when young, red with when mature. Ostiole 2.0–3.0 mm; outer bracts present, free, widely ovate, 2.0–2.5 mm long, pubescent, pale brown; inner bracts present, free, lanceolate, 3.0 mm long, glabrous, white. Male flowers near ostiole, 5.0 mm long, pedicellate; pedicel 2.0 mm long; tepals 3-4, free, 3.0 mm long, lanceolate, glabrous, yellow to pale brown;

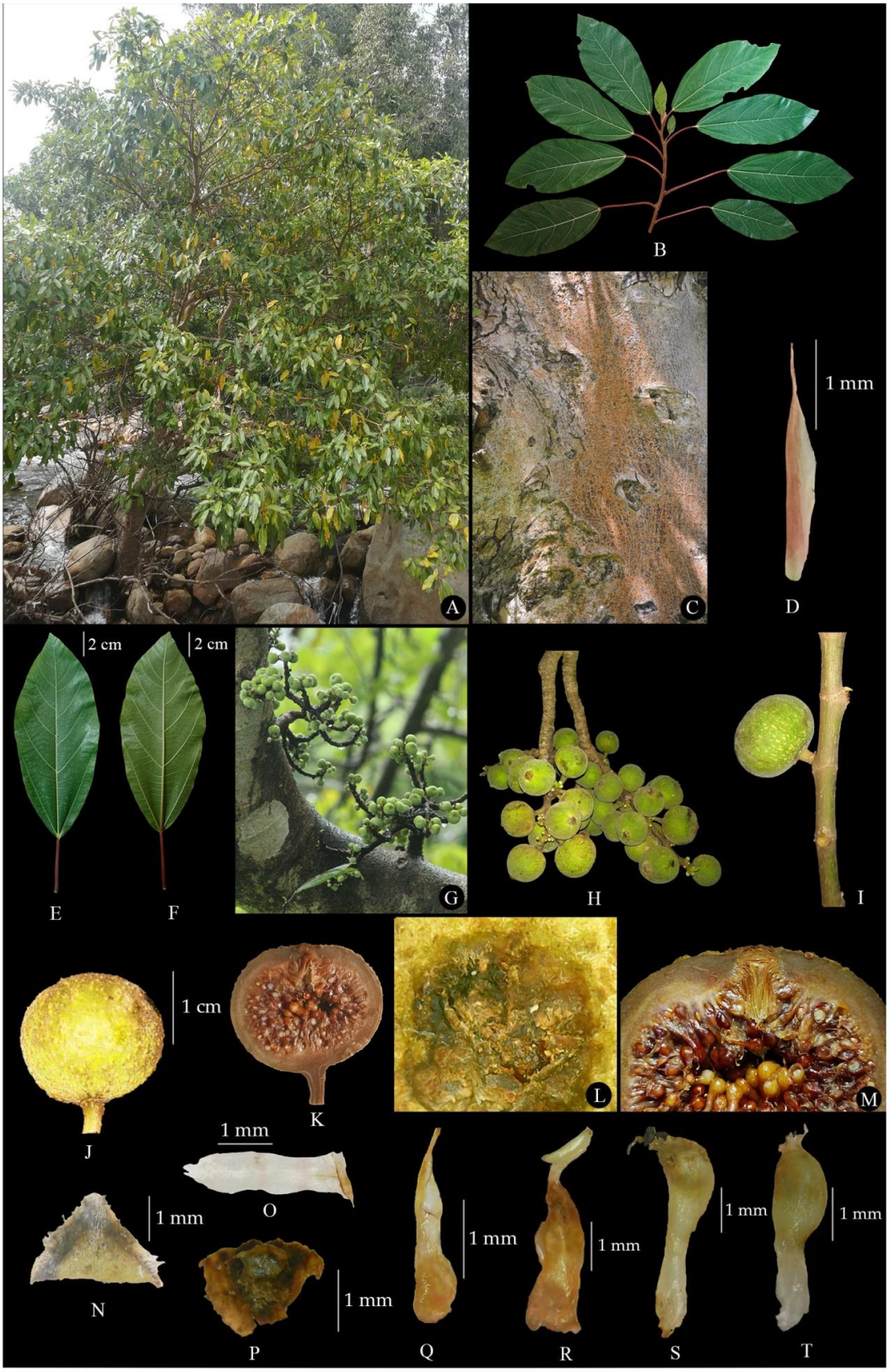


Fig. 3.82. ***Ficus racemosa*** L.: **A.** Habit; **B.** Twig; **C.** Bark; **D.** Stipule; **E.** Leaf adaxial side; **F.** Leaf abaxial side; **G, H & I.** Receptacles; **J.** Syconium; **K.** Syconium L. S.; **L.** Ostiole; **M.** Ostiolar L. S.; **N.** Basal bract; **O.** Inner ostiolar bract; **P.** Outer ostiolar bract; **Q.** Tepal; **R.** Male flower; **S.** Female flower; **T.** Gall flower.

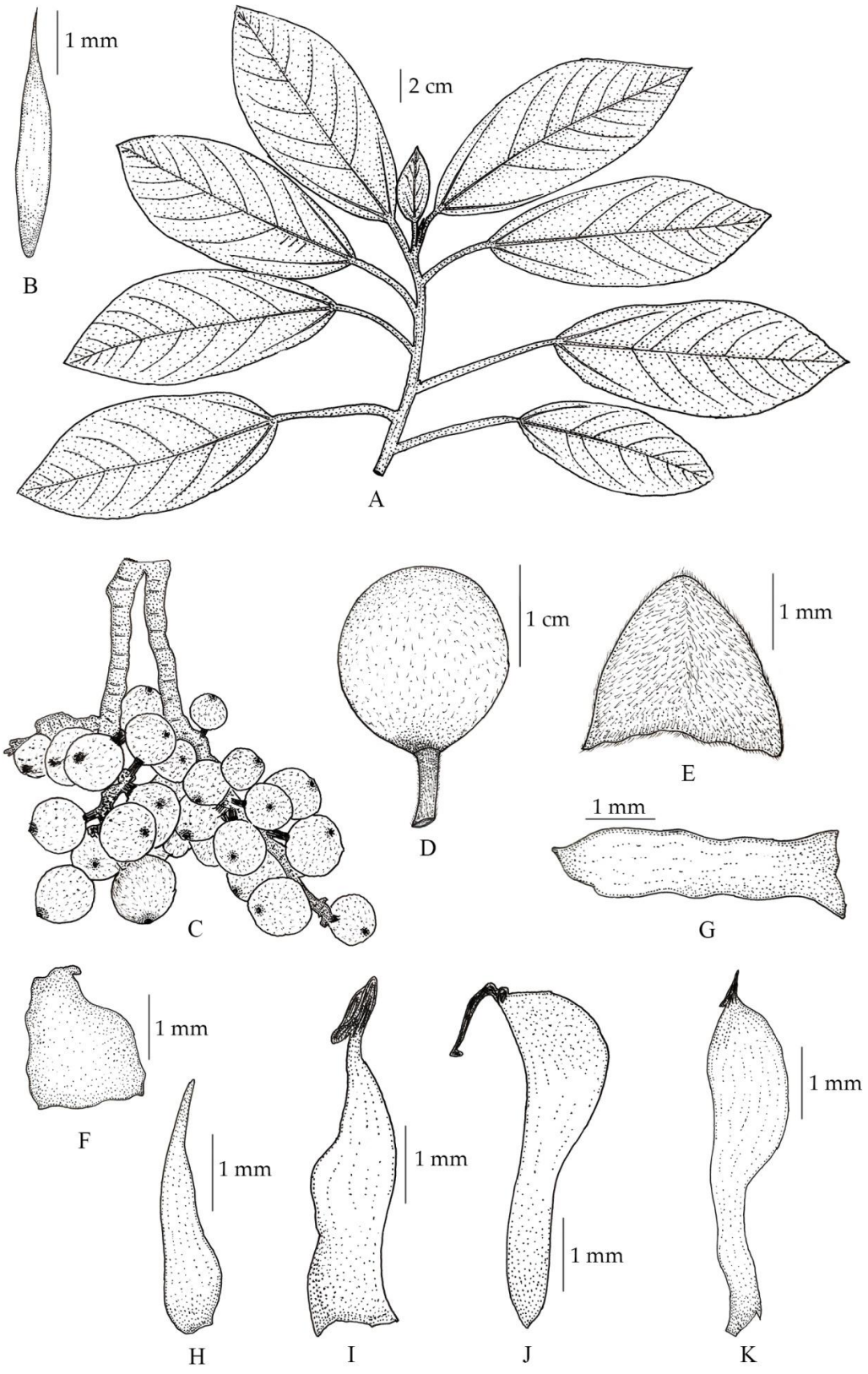


Fig. 3.83. ***Ficus racemosa*** L.: **A.** Twig; **B.** Stipule; **C.** Receptacles; **D.** Syconium; **E.** Basal bract; **F.** Outer ostiolar bract; **G.** Inner ostiolar bract; **H.** Tepal; **I.** Male flower; **J.** Female flower; **K.** Gall flower.

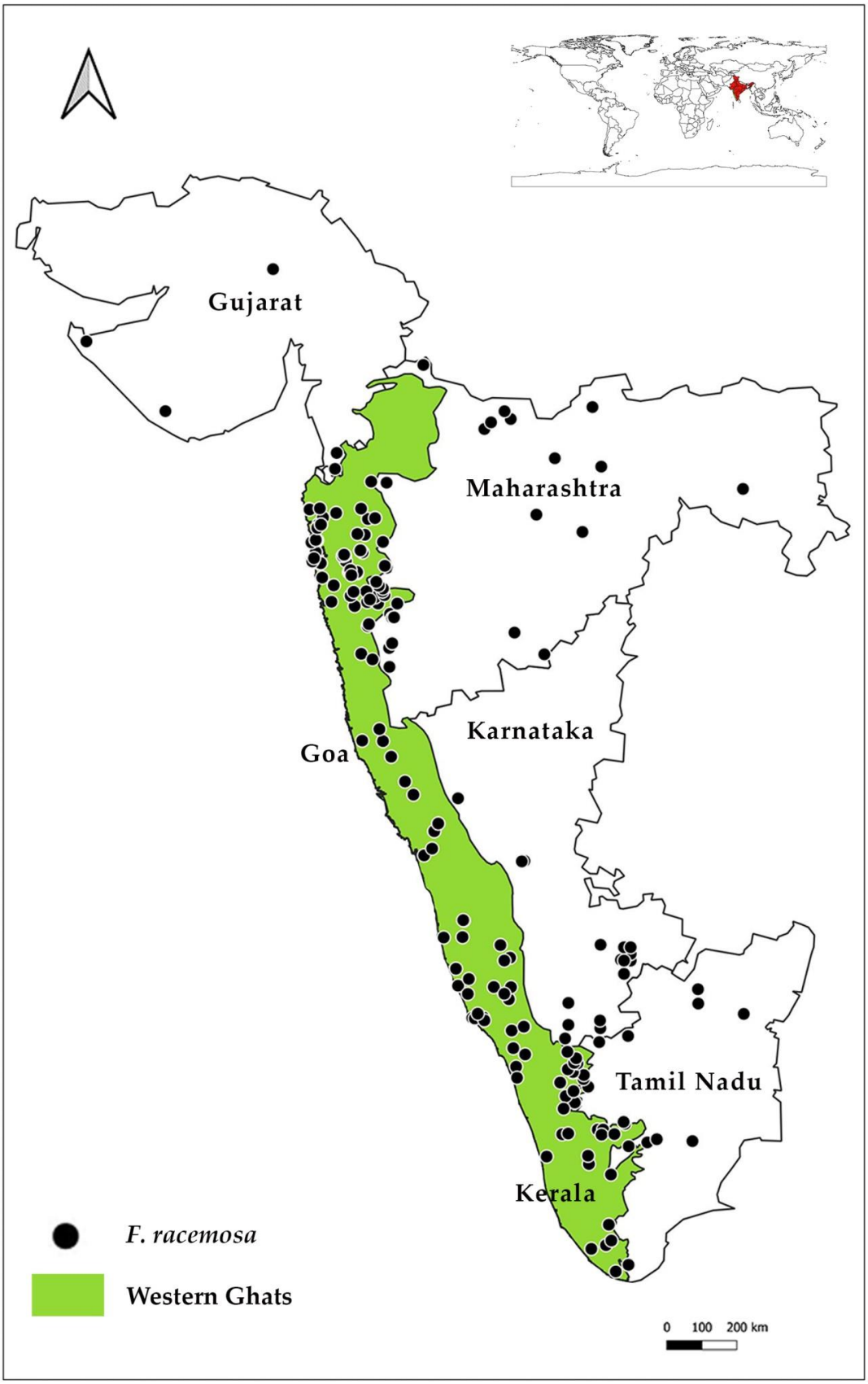


Fig. 3.84. *Ficus racemosa* L. - Distribution map.

stamen 1 or 2, anther 2.0 mm, filament 1.0 mm long. Female flowers scattered, 4.5 mm long pedicellate; pedicel 3.0 mm long; tepal 3, free, 3.0 mm long, lanceolate, glabrous, yellow to pale brown; stigma 0.2 mm long; style 1.5 mm long; ovary 1.2 mm long, obovoid, glabrous, pale brown. Gall flowers scattered, 4.5 mm long pedicellate; pedicel 2.0 mm long; tepals 3, free, 3.0 mm long, lanceolate, glabrous, yellow to pale brown; stigma short; style 0.2 mm long; ovary 2.0 mm long, obovoid, glabrous, yellow. Achenes 1.0–1.5 mm, ellipsoid to ovoid, white.

Local names: *Atthi* (Mal.); *Goolar* (Hin.); *Atthi mara* (Kan.); *Nalla Atthi, Vellai Atthi* (Tam.) *Bodda* (Tel.)

Common names: Cluster fig, Country fig, Red wood fig,

Flowering and fruiting: Two to three times in a year.

Distribution: India, Bangladesh, China, Sri Lanka, Myanmar, Australia. This species is distributed throughout India.

Habitat: A species common in mostly all forest type including evergreen, semi evergreen and deciduous forests. A common tree along the river banks. The species is also seen in the plains and waste lands.

IUCN status: Least Concern (LC).

Etymology: The plant produces cauliflorous figs on the trunks. The species epithet is derived from this raceme like nature of the figs.

Uses: The plant is highly medicinal and is used in the treatment of various diseases including visceral obstruction, dysentery, diabetes, leprosy, ulcers etc. Leaves are used as fodder for cattle and elephants. Young shoots are given to cows to increase the milk production. The ripe fruits are usually

eaten. The durability of the wood increases when treated under water (Lansky & Paavilainen, 2011; Tiwari, 2016; Khan, 2017).

Notes: *F. racemosa* is the only monoecious species in the subgenus *Sycomorus* from the study area. The species is one of the cosmopolitan species of *Ficus* found in both new world and old-world countries. Some literatures suggest that the male flowers are pedicellate, while some others mention them as sessile. We have observed only pedicellate male flowers in this present study. King (1887-1888) mentioned four varieties for the species. They were considered as morphological variations of the species only and were merged in the later works. The same is followed in this present study.

Specimens examined: India, **Andhra Pradesh,** Adilabad District, Way to Chittaguda, 07 April 1985, *P.V. Sreekumar 79554* (MH). Chittoor District, Mamandur, 15 March 1957, *S.K. Wagh SKW5817* (BLAT); *ibid.*, 15 March 1957, *S.K. Wagh SKW5819* (BLAT); Tirumalai, 925 m, 18 June 1969, *G.V. Subba Rao 31927* (MH); Tumbura Theertham, 800 m, 28 November 1986, *D. Ranga Charyulu 953* (MH); Thumbura Theertham Sacred Groove, 331 m, 08 January 2016, *J. Swamy & S. Nagaraju 7285* (BSID). East Godavari District, Maredumilli, 500 m, 23 June 1965, *G.V. Subba Rao 24288* (MH); Stream near Devaramadugula, 250 m, 26 September 1980, *G.V. Subba Rao 68574* (MH); Puttagondhi lanka, Near Tadepalli, 450 m, 28 February 1987, *D. Narasimhan 85532* (BSID). Guntur District, Mobbuchintapalli, 25 March 2009, *T. Pullaiah & Sandhya Rani 33659* (BSID). Karimbam District, on the way to Javapuram peak from Mudugula, 400 m, 09 April 1976, *G.V. Subba Rao 47266* (MH). Karimnagar District, on the way to Kankunuru, 07 April 1987, *T. Ravisankar 85200* (MH). Krishna District, Kolavennu near Vijayawada, 12 February 1986, *s.coll. 5961* (MH). Kurnool District, Near the tank, Chelama, 300 m, 10 December 1963, *J.L. Ellis 18050* (MH); near railway station, Chelama, 380 m,

23 March 1965, *J.L. Ellis 23748* (MH); Krishna Nandi, 250 m, 21 October 1987, *V. B. Hosagoudar 86695* (BSID); Umamaheshewaram, 28 February 2014, *L. Rasingam 4619* (BSID); Sri Kolanu Bharathi, Shivopuram, 350 m, 27 October 2016, *J. Swamy 9165* (BSID); *s loc., s.d., J.S. Gamble 1886* (MH). Medak District, Narapur forest, north end, 720 m, 23 April 1959, *K.M. Sebastine 7959* (MH). Nellore District, Near Dekkili, near road bridge, 11 March 2004, *P. Venu 118163* (BSID). Prakasam District, Diguvametta, 440 m, 07 August 1972, *J.L. Ellis 42169* (MH); Palanka Veerabhadra Swamy temple, Palanka, 239 m, 06 February 2016, *J. Swamy, L. Rasingam & S.N.R 14356* (BSID); Nemaligundla Ranga Swamy temple, G. B. W. L. S., 313 m, 07 February 2016, *J. Swamy & L. Rasingam 7564* (BSID); Isukagundalu, G. B. W. L. S, 302 m, 08 February 2016, *J. Swamy & L. Rasingam 7582* (BSID). Rayachoti District, Balapalle West Beat, 237 m, 24 April 2004, *J.H. Franklin Benjamin 118220* (BSID). Srikakulam District, On the way to Vangara, Kedaripuram, 10 March 1985, *N. Rama Rao & R. Aashokan Nair 79468* (BSID). Tiruchirappalli District, Puliyancholai, 333 m, 06 August 1958, *K.M. Sebastine 6183* (MH); *ibid.,* 233 m, 29 October 1958, *K.M. Sebastine 7052* (MH). Tirunelveli District, Forest surrounding hope lake, 300 m, 12 November 1959, *K.M. Sebastine 9642* (MH); by the side of stream Kodamadi, 220 m, 04 September 1969, *B.V. Shetty 32234* (MH); Ambasamudram, 23 May 1899, *C.A. Barber 277* (MH). Visakhapatnam District, Slope of Punyagiri hills, 175 m, 09 May 1964, *G.V. Subba Rao 19426* (MH). Warangal District, Pakhal, 290 m, 10 August 1961, *K.M. Sebastine 13168* (MH); on the banks of Sileru, 550 m, 22 April 1976, *G.V. Subba Rao 47414* (MH). **Goa,** Dadra and Nagar Haveli District, Nana Randha, 08 November 1970, *M.Y. Ansari 122077* (BSI). North Goa District, river near Amvachegol after Codal, 24 March 1964, *K.C. Kanodia 96468* (BSI). **Gujarat,** Jamnagar District, Pindara – Arnua, 17 February 1959, *S.K. Jain 47958* (BSI).

Junagadh District, Sasan Gir, 24 December 1959, *M.Y. Ansari 61038* (BSI). Surat District, Haripura, 16 March 1957, *S.D. Mahajan 13485* (BSI). Valsad District, Tali Forest, Dharamapur, 13 June 1958, *P.S. Toor 39007* (BSI); Arura, Dharmapur, 16 June 1958, *P. S. Toor 39346* (BSI). **Karnataka,** Chamarajanagar District, Attikan estate, B. R. T. Wild Life Sanctuary, 03 June 2014, *J. Jayanthi 195740* (BSI). Chikkamagaluru District, Mudigere, *s. d., S.D. Mahajan 34392* (BSI). Dharwad District, Jodalli, 25 April 1956, *S.D. Mahajan 1158* (BSI). Hassan District, Saklaspur (Sakleshpura), 16 December 1903, *C.A. Barber 6208* (MH). Kodagu District, Makut, 08 January 1959, *R.K. Arora 47193* (BSI); Sampaje, 05 March 1959, *B.M. Wedhwa 48868* (BSI). Mysore District, Bible Forest, 21 February 1958, *S.D. Mahajan 19853* (BSI); Gopalaswamy hill, Bandipur, 1400 m, 24 April 1965, *B.D. Naithani 23905* (MH); B. R. Hills, 1225 m, 30 June 1991, *V.B. Hosagoudar 122517* (MH). Ratnagiri District, Dirbagachi range, Naradave, 17 February 1970, *B.G. Kulkarni 120158* (BSI). S. Kamara District, Kerwashe, 19 February 1940, *S.R. Raju 19922* (MH). Shimoga District, Vanake - Abbi, Agumbe, 01 February 1961, *R. Sundara Raghavan 69531* (BSI); Min hole, Agumbe, 11 February 1961, *R. Sundara Raghavan 69584* (BSI); Hulikal, 23 May 1962, *R. Sundara Raghavan 80917* (BSI); Hulikal ghat, 15 February 1963, *R. Sundara Raghavan 86269* (BSI); *ibid.,* 23 March 1964, *R. Sundara Raghavan 97115* (BSI). Uttar Kannada District, Yellapur, 27 February 1955, *R.P. Patil 2983* (BSI); Yesle, 02 May 1956, *S.D. Mahajan 1805* (BSI); Arbail, 12 March 1957, *S.K. Jain 16440* (BSI); Castle rock, 15 November 1957, *S.K. Jain 29186* (BSI); Airatari forest, Katgal, 17 November 1957, *S.K. Jain 2499B* (BSI); Yellapur - Mundgod road, 13 April 1958, *R.K. Arora 33641* (BSI). **Kerala,** Idukki District, Lower Periyar, 375 m, 28 January 1983, *A.G. Pandurangan 76659* (MH); panamkutty, 400 m, 22 February 1983, *N. Mohanan 77323* (MH); Chenthamara, P. T. R., 500 m, 16 March 1994, *Jomy Augustine*

13450 (KFRI); Marayur – Kanthallur, 21 April 1994, *A. Nazarudean 20716* (TBGT). Kannur District, Chandanathode, 825 m, 18 April 1966, *J.L. Ellis 27130* (MH); Kannoth R. F., 200 m, 18 February 1976, *V.S. Ramachandran 54069* (MH); *s.loc.,* 125 m, 26 January 1979, *V.S. Ramachandran 59266* (MH); Begur R. F., 800 m, 03 March 1979, *V.S. Ramachandran 62033* (MH); Manjeshwar, 30 m, 30 December 1980, *R. Ansari 70076* (MH); Madayippara, Keeyachal, 14 May 2014, *C. Pramod 138283* (CALI). Kasaragod District, Kasaragod, 125 m, 26 January 1979, *V.J. Nair 59923* (MH); Ezhimalai, 200 m, 14 May 1982, *R. Ansari 73887* (MH). Kozhikode District, Kunnamagalam, 14 February 1971, *V.V. Sivarajan 966* (CALI); Adivaram, 16 April 1993, *A. Nazarudean 16459* (TBGT). Malappuram District, Taliparamba farm, May 1906, *C.A. Barber 7757* (MH); University Campus, 50 m, 12 October 1976, *C.R. Suresh 1972* (CALI). Palakkad District, near Dhoni River, 100 m, 26 May 1964, *E. Vajravelu 19081* (MH); Mukkali, 150 m, 05 October 1965, E. Vajravelu 26275 (MH); *ibid.,* 352 m, 14 July 1969, *E. Vajravelu 32110* (MH); Mulli, 02 July 1987, *N. Mohanan 8312* (TBGT); Mankarayamman Kavu, Elapully, 12 May 1993, *A. Nazarudean 17453* (TBGT); Kathirampathy, 22 February 2003, *M.K. Hari Narayanan HN268* (CALI). Thiruvananthapuram District, Athirumala, 820 m, 15 May 1988, *N. Mohanan 9747* (CALI & TBGT). Thrissur District, Peechi, 65 m, 12 March 1980, *N. Sasidharan 1144* (CALI); Athirapilly (Adirappally), 300 m, 23 January 1982, *K. Ramamurthy 72933* (MH); Orukombankootty, 450 m, 07 February 2001, *K.H. Amitha Bachan 72036* (CALI). Wayanad District, Kanjirakadavu, 15 January 1981, *Philip Mathew 25710* (CALI); Thirunelly, 16 February 1987, *R.T. Balakrishnan 42830* (CALI); *ibid.,* 800 m, 18 April 1993, *A. Nazarudean 16480* (TBGT); *ibid.*, 25 October 2020, *Sreehari S. Nair & P.J. Ebin 12986* (MESAH). **Madhya Pradesh,** Bastar District, Bedmakot, 500 m, 16 February 1961, *N.P. Balakrishnan & A.N. Henry 12156* (MH). Hoshangabad

District, Tawa River bank, 300 m, 01 October 1960, *J. Joseph 11185* (MH). Indore District, Gunjara village, Kolakund, 19 April 1963, *A.R.K. Shashtry 84274* (BSI). Jabalpur District, Road to Bagroji, 472 m, 10 March 1962, *K.M. Sebastine 13908* (MH). Mandla District, South Mandla, 10 February 1961, *J. Joseph 12263* (MH). Rewa District, near Goghar river, 400 m, 23 April 1960, *K.M. Sebastine 10015* (MH). Sagar District, Timorda, near Hirapur, 410 m, 03 March 1960, *K. Subramanyam 10172* (MH). **Maharashtra,** Akola District, Shahanur, 25 June 1978, *S.V. Kamble 15386* (BSI); Kinhiraja, 30 August 1978, *S.Y. Kamble 150251* (BSI). Buldhana District, on the way to Mehekar, near Undri, 24 June 1982, *P.G. Diwakar 162944* (BSI). Burhanpur District, Bori, Khandesh, December 1916, *s.coll. 25417* (BLAT); Khandesh, December 1916, *s.coll. 25326* (BLAT); Turaumal, Khandesh, December 1918, *s.coll. 26832* (BLAT). Chandrapur District, Jasi, 11 October 1972, *B.M. Wedhwa 129232* (BSI); Chanda Road, Opposite camp no 167, 168, 23 August 1973, *B.G. Kulkarni 137496A* (BSI). Dakshina Kannada District, Jambri forest, 23 February 1977, *S.K. Malhotra 149619* (BSI). Dhulia District, East of lake Toranmal, 08 May 1964, *Seshagiri Rao Rolla 96696* (BSI); West of lake Toranmal, 08 May 1965, *Seshagiri Rao Rolla 96721A* (BSI). Jalgaon District, Yawal, 15 March 1957, *S.D. Mahajan 13305* (BSI); Bhusaval, January 1917, *s.coll. 25390* (BLAT). Mumbai District, Reela nation, Bombay, 12 April 1944, *H. Santapau 3938* (BLAT); Borivili National Park, 06 February 1955, *P.S. Herbert SH524* (BLAT); *ibid.,* 06 November 1955, *P.S. Herbert SH913* (BLAT); Marve-Madh Road, Malad, 31 December 1955, *P.L. Shah Shah6683* (BLAT); Madh Island, Bombay, 07 April 1957, *G.L. Shah Shah8786* (BLAT); Borivili National Park, 04 September 1957, *P.S. Herbert SH2817* (BLAT); Uran, 03 October 1961, *P. Divakar PD2688* (BLAT); *ibid.,* 18 February 1962, *P. Divakar 3908* (BLAT); Danda – Uran, 07 March 1962, *P. Divakar PD4005* (BLAT); Uran,

03 May 1962, *P. Divakar PD4206* (BLAT); Borivali National Park, Tunnipada, 12 February 1985, *B.D. Sharma 167420* (BSI); Nepean sea road, Bombay, August 1916, *s.coll. 17066* (BLAT); Grant road, Bombay, November 1915, *s.coll. 15307* (BLAT); *ibid.,* November 1915, *s.coll. 15288* (BLAT); Sion creek, Bombay, October 1916, *s.coll. 17071* (BLAT). Nashik District, Tondwal, 12 July 1967, *John Cherian 111154* (BSI); Utawada hill, Vihigaon village, 20 October 1967, *K.V. Billore 112968* (BSI); Ozar, Hansul, 01 August 1983, *P.L. Narasimhan 165168* (BSI); Igatpuri, October 1917, *s.coll. 25383* (BLAT). Palghar District, Dandia, 29 May 1957, *S.K. Jain 13633* (BSI); Jhanjroli, 05 April 1959, *P. S. Toor 51775* (BSI); Chandip, 25 January 1961, *N.Y. Das NYD3071* (BLAT); *ibid.,* 25 January 1961, *N.Y. Das NYD3072* (BLAT); *ibid.,* 25 January 1961, *N.Y. Das NYD3073* (BLAT); *ibid.,* 06 August 1961, *N.Y. Das NYD3456* (BLAT); Tunga hill, Mandvi range, 23 January 1968, *K.V. Billore 113806* (BSI); Vaitarna range, 25 August 1969, *K.V. Billore 110497* (BSI). Pune District, Purandhar, December 1917, *s.coll. 25375* (BLAT); Katraj, August 1956, *G.S. Puri 2956* (BSI); Matheram landscape point, 28 January 1957, *G. S. Puri 10943* (BSI); Bhimashankar, 30 March 1957, *G.S. Puri 12604* (BSI); Vandor wadi, Velhe, 14 February 1958, *Mahajan 32017* (BSI); Bhovargiri, along the river bed, 24 December 1960, *K.P. Janardhanan 70077* (BSI); Top of Kondeswar hill, Khed Taluka, 26 January 1961, *s.coll. 70266* (BSI); Sambar Hil, Khed taluka, 21 February 1961, *K.P. Janardhanan 69112* (BSI); Hanuman Talao, Bhimashankar, 24 February 1961, *K.P. Janardhanan 69228* (BSI); Bhimashankar, Permanent preservation forest, 25 February 1961, *K.P. Janardhanan 69294* (BSI); Near Bhimashankar temple, 25 February 1961, *K.P. Janardhanan 69275* (BSI); Pune - Bhimashankar road, 73rd mile, 26 February 1961, *K.P. Janardhanan 69634* (BSI); Bhovargiri - Bhimashankar road, 21 April 1961, *K.P. Janardhanan 72093* (BSI); Foot of Chirakhad hill, Bhimashankar, 22 April 1961, *K.P. Janardhanan*

72125 (BSI); Rai jungle, Bhimashankar, 23 April 1961, *K.P. Janardhanan 72147* (BSI); Nimbgaoon, Khed Taluka, 06 August 1961, *s.coll.* 71921 (BSI); Southern slope of Shinga hill. Khed Taluka, 27 November 1961, *K.P. Janardhanan 75896* (BSI); Top of Rasa Cha Mal, Near Gadad, Khed, 05 December 1961, *K.P. Janardhanan 76296* (BSI); Near Ravi Verma press, Malavli, 05 March 1962, *R.S. Rao 33089* (BSI); Top of hill, Malavli village, 06 March 1962, *R.S. Rao 77628* (BSI); Sakanpathar, 25 December 1962, *Seshagiri Rao Rolla 85248* (BSI); on the bank of the river Mutha, 20 March 1963, *Seshagiri Rao Rolla 87274* (BSI); Hill near Wanak village, Mulshi, 21 March 1963, *Seshagiri Rao Rolla 87323* (BSI); Sinhagad Fort, 13 June 1963, *M.Y. Ansari 78191* (BSI); Purandar, top portions of the Vazingad, 20 July 1963, *S.R. Rolla 88669* (BSI); Forest near Lonavla to Ambavane, 21 December 1963, *B. Venkata Reddi 93266* (BSI); R. H. Compound, Ambavane, Lonavla, 22 December 1963, *B. Venkata Reddi 93274* (BSI); Sakanpathar plateau, slope above INS, Shivaji, Lonavla, 24 April 1964, *B. Venkata Reddi 77728* (BSI); Atkarwadi, Sinhagad, 06 May 1964, *M.Y. Ansari 88086* (BSI); Bhivadikhund, Durga Khilla, 18 miles from Junnar, 15 May 1964, *K. Hemadri 89946* (BSI); 6 miles west of Junnar, 28 June 1964, *K. Hemadri 94374* (BSI); Open forest of Masgaon facing Dangorwada of Ambavane, 04 December 1964, *B. Venkata Reddi 95988* (BSI); Masla R. F., Mumbad range, 09 June 1967, *K.V. Billore 110872* (BSI); Near to Sardar Patel Hospital, 10 May 2011, *S C. Yadav 200669* (BSI). Raigad District, Matheran, March 1918, *D. Almedia A9* (BLAT); Bhisegaon village, Kajrat, 21 January 1949, *J. Fernandez JF41* (BLAT); Matheran landscape point, 28 January 1957, *G.S. Puri 10943* (BSI); Kolaba, Alibag, 22 May 1958, *S.K. Jain 34299* (BSI); Neral - Water pipe, 17 November 1958, *N.A. Irani NI2404* (BLAT); Water pipe- Jummapatti, 29 November 1958, *N.A. Irani NI2537* (BLAT); Nagoetnae, 27 March 1960, *B. Balamani BB600* (BLAT); Echo point, 07 March 1962, Seshagiri Rao Rolla

78828 (BSI). Ratnagiri District, Khedri, 12 May 1963, *S. R. Rolla 89254* (BSI); Kumbhavde road, Sangwad, 14 April 1971, *B.G. Kulkarni 128706* (BSI); Nanapani towards Amboli Ghat, 04 May 1971, *R.D. Pantankar 105449* (BSI); Phonda Ghat, 04 May 1971, *B.G. Kulkarni 129494* (BSI). Satara District, Satara, April 1919, *s.coll. 25399* (BLAT); Khandala, May 1919, *s.coll. 27458* (BLAT); Khandala, St. Xavier's villa, 17 May 1942, *H. Santapau 386* (BLAT); *ibid.,* 15 June 1942, *H. Santapau 511* (BLAT); Khandala, St. Xavier's riverine, 15 March 1944, *H. Santapau 3783* (BLAT); Khandala, 25 February 1956, *P.S. Herbert SH1446* (BLAT); Khandala, Forb's tank, 22 October 1958, *S.C. Tavakari T1973* (BLAT); Near old Mahabaleshwar temple, 03 June 1960, *R. S. Rao 62358* (BSI); At the foot of Sherewadi hill, 22 December 1960, *K.P. Janardhanan 70033* (BSI); Lingmala water fall, road side, Mahabaleshwar, 06 May 1961, *Seshagiri Rao Rolla 71616* (BSI); Khandala, Battery hills, 07 March 1962, *Seshagiri Rao Rolla 69726* (BSI); *ibid.,* 07 March 1962, *Seshagiri Rao Rolla 69750* (BSI); on the way from Khandala over bridge, 07 March 1962, *Seshagiri Rao Rolla 77684* (BSI); Echo point, 07 March 1962, *Seshagiri Rao Rolla 78828* (BSI); Khandala, 07 March 1962, *Seshagiri Rao Rolla 69750* (BSI); North slope of Bhoma hill, 08 March 1962, *Seshagiri Rao Rolla 78846* (BSI); Khandala, 27 November 1962, *R.S. Raghavan 85131* (BSI); Koyna, 27 December 1978, *R.K. Kochhar 158024* (BSI); *ibid.,* 08 February 1979, *R.K. Kochhar 158258* (BSI). Sindhudurg District, Shivaji Sagar Lake, Nauja, 14 April 1978, *M.P. Nayar 153129* (BSI). Solapur District, Nannaj, 29 July 2011, *J. Jayanthi 199250* (BSI). Thane District, Manor, 10 August 1957, *G.S. Puri 22889* (BSI); Parol, 25 December 1957, *G.L. Shah Shah9658* (BLAT); Kolaba, Ambivali, 26 May 1958, *S.K. Jain 34104* (BSI); Sativli, 27 November 1960, *N.Y. Das NYD2688* (BLAT); *ibid.,* 27 November 1960, *N.Y. Das NYD2699* (BLAT); Mandvi, 10 December 1960, *N.Y. Das NYD2937* (BLAT); Parol, 11 January 1962, *N.Y. Das NYD 5521* (BLAT); *ibid.,*

11 January 1962, *N.Y. Das NYD5522* (BLAT); *ibid.*, 11 January 1962, *N.Y. Das NYD5523* (BLAT); Parol, 06 March 1962, *N.Y. Das NYD7271* (BLAT); Kalu river bed, near Bapsai village, 07 June 1967, *K.V. Billore 110826* (BSI); Kelve temple, Palghai range, 13 January 1968, *K.V. Billore 113507* (BSI); Near Kelvadi, Tokawada range, 17 April 1968, *K.V. Billore 113948* (BSI); Pavchuai plateau, Tokawada range, 11 November 1968, *K.V. Billore 115733* (BSI); *s.loc.*, 11 October 1972, *B. M. Wedhwa 129232* (BSI). **Odisha,** Ganjam District, Pachidya, 23 August 1931, *V. Narayana Swami 6033* (MH). Khurda District, Ajnav river bank, 23 April 1963, *A.R.K. Shashtry 87580* (BSI). Kendujhar District, Raigoda, 418 m, 12 May 2016, *K.C. Mohan & Swamy 7729* (BSID). **Rajasthan,** Jaipur District, Ramgarh, 19 March 1959, *S.K. Jain 49603* (BSI); Khandamal, Kalighati, 08 October 1962, *K.C. Kanodia 82415* (BSI). Pali District, Sadri, 09 February 1959, *S.K. Jain 48437* (BSI). Sirohi District, Mount Abu, Rajaputra, April 1916, *s.coll. A4* (BLAT); Mount Abu, Shergaum, October 1916, *s.coll. 25421* (BLAT). **Tamil Nadu,** Chengalpattu District, Pasamur near Vedanthangal, 120 m, 28 January 1976, *A.N. Henry 47710* (MH); Subba Reddy Palayam near Minjur, 3 m, 27 June 1984, *D. Narasimhan 561* (MH). Coimbatore District, Kottadi, 3500 ft, 11 March 1931, *K.Cherian Jacob 286* (MH); Hassanur, 3000 ft, 08 February 1937, *S.R. Raju 362* (MH); Kuridimalai northern slope, 700 m, 27 September 1956, *K. Subramanyam 874* (MH); Vellingiri hills, 665 m, 11 February 1957, *K.M. Sebastine 2268* (MH); *ibid.*, 666 m, 06 March 1957, *K. M. Sebastine 2492* (MH); Vellingiri hills, 667 m, 06 March 1958, *K. M. Sebastine 2495* (MH); Way to Siruvani Adivaram, 13 August 1960, *A.N. Henry ANH170* (BLAT); Saolivayal to Siruvani, 13 August 1960, *A.N. Henry 171* (MH); Vellapathy, 20 September 1960, *A.N. Henry ANH602* (BLAT); Siruvani adivaram, 450 m, 20 September 1960, *A.N. Henry 603* (MH); slope of Konnamali, 20 February 1963, *C.P. Sreemadhavan 425*

(MH); Siruvani, 900 m, 24 October 1968, *D. B. Deb 31070* (MH); Manguli, Pasumani, 850 m, 13 May 1970, *M.V. Viswanathan 598* (MH); Stanes mill compound, 467 m, 07 September 1971, *M. Chandrabose 39239* (MH); Athikkadu, 510 m, 07 September 1985, *N.C. Rathakrishnan 82328* (MH). Dindugal District, Sirumalais, 21 May 1958, *J. Pallithanam JP 3377* (BLAT); Nilakottai (Nillakotta), 1025 m, 10 April 1972, *K. Vivekananthan 40783* (MH). Erode District, Dodasarihalla, Biligiriangan, 06 September 1961, *Seshagiri Rao Rolla 73729* (BSI); Thamaraikarai (Thamaraikarei), 940 m, 10 March 2008, *P. Satyanarayana 125548* (MH). Kamarajar District, on the way to Pachiyar estate, Bothaimetlaaru, 500 m, 23 February 1992, *S.R. Srinivasan 98346* (MH). Kanyakumari District, Kulasekharam, 200 m, 27 January 1978, *A.N. Henry 53320* (MH); Mankavilai, 28 January 2019, *S. Mary Sheeja 93997* (TBGT). Krishnagiri District, Singarapettai, 06 April 1987, *M.B. Viswanathan 1417* (MH). Madurai District, Kambam, May 1917, *s.coll. A6* (BLAT); way to Nupuraganga, 467 m, 11 June 1957, *K.M. Sebastine 3403* (MH); Palani, 400 m, 01 August 1965, *K. M. Sebastine 25047* (MH); Velancombai, Plani, 400 m, 01 August 1965, *K.M. Sebastine 25047* (MH); Ganguvurpatti, 1000 m, 20 September 1968, *D.B. Deb 31048* (MH). Nilgiri District, Coonoor Ghat, 05 July1889, *s.coll. s.n.* (MH); Kundha Reserve, 2000 m, 31 August 1957, *K.M. Sebastine 3977* (MH); Bokkapuram R. F., 1100 m, 13 August 1970, *B.D. Sharma 35455* (MH); Kailas Pillai estate to Sirur, 450 m, 06 September 1970, *G.V. Subba Rao 36526* (MH); Near Kukal Thorai, 1450 m, 03 December 1970, *G V. Subba Rao 37444* (MH); Kambatti, 1700 m, 29 March 1972, *G.V. Subba Rao 40519* (MH); Kateri - Kundha road, 1500 m, 01 August 1972, *E. Vajravelu 41931* (MH); Vellanikombe, 1100 m, 24 July 1990, *V.B. Hosagoudar 93858* (MH). Ramanathapuram District, Malattar river, 275 m, 24 February 1929, *N.C. Nair 61412* (MH); Kansapuram beat, Srivilliputhur R. F., 290 m, 18 July

1965, *E. Vajravelu 24747* (MH); Srivilliputhur R. F., 550 m, 16 March 1970, *E. Vajravelu 33841* (MH). Theni District, Kumbakkari, 400 m, 15 June 1961, *K.M. Sebastine 12591* (MH). Tirunelveli District, Therkumalai by the side of the stream, 800 m, 24 April 1957, *K. Subramanyam 2911* (MH); Mundenthurai, 300 m, 10 July 1959, *K.M. Sebastine 8443* (MH); Upper dam to Kannikatti, 400 m, 13 July 1959, *K.M. Sebastine 8535* (MH); near Kalyanapara, way to Kallimalai estate, Sivagiri hills, 600 m, 20 April 1983, *S.R. Srinivasan 89522* (MH); Panagudi, 270 m, 08 September 1969, *B.V. Shetty 32280* (MH); *ibid.,* 325 m, 05 February 1972, *B.D. Sharma 39968* (MH).

3.6.28. *Ficus religiosa* L.

Ficus religiosa L., Sp. Pl. 1059. 1753; Vahl., Enum. Pl. 2: 181. 1805; Roxb., FI. Ind. 3: 547. 1832; D. Brandis, For. Fl. North-West and Central Ind., 415. 1874; Kurz., For. Fl. Brit. Burma 448. 1877; J. Cameron, For. Trees of Mysore and Coorg 281. 1894; Hook.f., Fl. Brit. India 5: 513. 1898; W.A. Talbot, Trees Bombay 2: 328. 1902; D. Prain, Bengal Plants 2: 980. 1903; T. Cooke, Fl. Pres. Bombay 2: 649. 1908; Bourd., For. Trees Travancore 363. 1908; Rama Rao, Fl. Pl. Travancore 382. 1914; J.F. Duthie, Fl. Upper Gang. Plain 150. 1915; Brandis, Indian Trees 601. 1921; H.N. Ridley, Fl. Malay Peninsula 3: 337. 1924; U.N. Kanjilal *et al.,* Fl. Assam 4: 246. 1940; H. Santapu, Fl. Khandala 256. 1957; Corner, Gard. Bull. Singapore 21: 6. 1965; N.C. Nair, Fl. Punjab Plains, Haryana and Punjab states 11(1): 244. 1978; Corner in Dass. & Forsb., Rev. Handb. Fl. Ceylon 3: 236. 1981; S.K. Varma, Fl. Bhagalpur 361. 1981; Manilal & Sivar., Fl. Calicut 277. 1982; G.L. Shah, Fl. Gujarat 646. 1978; B.V. Shetty & R.P. Pandey, Fl. Tonk Dist. 181. 1983; V. Singh, Fl. Banswara Dist. 3: 216. 1983; V. Singh, Fl. Banswara Dist. 3: 216. 1983; A.K. Mukherjee, Fl. Pachmarhi & Bori Reserves 284. 1984; B.D. Sharma *et*

al., Fl. Karnataka: analysis 260. 1984; C.J. Saldanha, Fl. Karnataka 119. 1984; D.N.G. Bakshi, Fl. Murshidabad Dist. 303. 1984; H.J. Chowdhery & B.M. Madhwa, Fl. Himachal Pradesh Analysis 2: 662. 1984; B.D. Naithani, Fl. Chamoli 2: 581. 1985; D.M. Verma *et al.,* Fl. Raipur, Durg & Rajnandgaon 358. 1985; N.R. Ugemuge, Fl. Nagpur Dist, Maharashtra 339. 1986; R.S. Rao *et al.,* Fl. Goa, Diu Daman Dadra & Nagar haveli 2: 411. 1986; R.S. Rao *et al.,* Fl. West Godavari Dist. 376. 1986; V. Chithra in A.N. Henry *et al.,* Fl. Tamil Nadu Ind., Ser I: Analysis 2: 255. 1987; Bole & J.M. Pathak, Fl. Saurashtra 2: 295. 1988; B.G. Kulkarni, Fl. Sindhudurg 420. 1988; Kamble & S.G. Pradan, Fl. Akola Dist. 213. 1988; V.S. Ramach. & V. J. Nair, Fl. Cannanore Dist. 434. 1988; T. Pullaiah & N. Yesoda, Fl. Anantapur Dist. 232. 1989; Kesh. Murthy & S.N. Yogan. Fl. Coorg 424. 1990; K.M. Matthew, Excur. Fl. Central Tamil Nadu 485. 1991; P.J. Parmar in B.V. Shetty & V. Singh, Fl. Rajasthan 2: 804. 1991; B.K. Misra & B.K. Verma, Fl. Allahabad Dist. Uttar Pradesh 347. 1992; G.P. Roy & B.K. Shukla, Fl. Madhya Pradesh 410. 1992; Kothari & Moorthy, Fl. Raigad Dist. 3: 379. 1993; M. Mohanan & Henry, Fl. Thiruvanthapuram 433. 1994; A.K. Sharma & J.S. Dhakre, Fl. Agra Dist. 255. 1995; T. Pullaiah & B.R.P. Rao, Fl. Nizamabad 322. 1995; V. Raju & T. Pullaiah, Fl. Kurnool 436. 1995; T. Pullaiah & D.A. Moulali, Fl. Andhra Pradesh 2: 902. 1997; V. Mudgal *et al.,* Fl. Madhya Pradesh 2: 620. 1997; P.K. Bhattacharyya & K. Sarkar, Fl. West Champaran, Bihar 66. 1998; K.M. Matthew, Fl. Palni Hills 1184. 1999; N.D. Paria & S.P. Chattopadhyay, Fl. Hazaribagh Dist. 1: 86. 2000; P.G. Diwakar & B.D. Sharma Fl. Buldhana Dist. Maharashtra State 295. 2000; T. Pullaiah *et al.,* Fl. Guntur Dist. 325. 2000; N. P. Singh *et al.,* Fl. Maharashtra Dicot 2: 940.

2001; Singh *et al.,* Fl. Mizoram 585. 2002; K.G. Bhat, Fl. Udupi. 597. 2003; H. Kaur & M. Sharma, Fl. Sirmaur 590. 2004; Sasidh. & Sivar., Bio. Docu. Kerala part 6: Flow. Plant. 441. 2004; Berg & Corner in Nooteboom, Fl. Malesiana 17(2): 608. 2005; Anil Kumar *et al.,* Fl. Pathanamthitta 465. 2005; S.G. Pradhan *et al.,* Fl. Sanjay Gandhi National Park 3: 576. 2005; K.M. Chetty *et al.,* Fl. Pl. Chittoor Dist. 333. 2008; Sunil & Sivadasan, Fl. Alappuzha Dist. 665. 2009; Berg *et al.,* Fl. Thailand 10(4): 637. 2011; Chantaras. *et al.,* Syst. Bot. 38(3): 673. 2013; For. Plant. Nilgiris 50. 2015; T. Pullaiah, Fl. Telangana 2: 885. 2015; Sudhakar *et al.,* Figs of Eastern Ghats, India 78. 2017; Fl. Karnataka. A Check List 2: 509. 2019; P. Lakshmin. *et al.,* Fl. West Bengal 681. 2019; Ficus sp. Madhya Pradesh 52. 2019; S. J. Britto, Fl. Central and North Tamil Nadu 978. 2019; G.P. Sinha & A.N. Shukla, Fl. Uttar Pradesh 2: 477. 2020; S.S. Dash & A.A. Mao, Fl. Pl. India, 2: 547. 2020; R. Gogoi *et al.,* Fl. Sikkim 283. 2021. *Urostigma religiosum* (L.) Gasp. Ric. Caprifico. 82. 1845. **Type:** Sri Lanka, *s.loc., s.d., P. Hermann 372.* (Lectotype- BM, BM000628185!).

Ficus caudata Stokes, Bot. Mat. Med. 4: 358. 1812. **Type:** Not seen.

Ficus rhynchophylla Steud, Nomencl. Bot., (2)1: 637. 1840. *Ficus religiosa* var. *rhynchophylla* Miq., Ann. Mus. Bot. Lugduno-Batavi 3: 287. 1867. **Type:** India, *s.loc.,* 1831, *N. Wallich, 4487* (Holotype- BR, BR0000013486785!; Isotype- G, G00369749!).

Urostigma affine Miq., London J. Bot. 6: 564. 1847. **Type:** India, West Bengal, *s.d., s.coll., s.n.* (Type- CAL, CAL0000025724!).

Ficus peepul Griff., Notul. 4: 393. 1854. **Type:** India, Assam, Tezpoor.

Ficus religiosa var. *cordata* Miq., Ann. Mus. Bot. Lugduno-Batavi 3: 287. 1867. **Type:** *s.loc., s.d., s.coll. 4487* (Type- K, K001039128!).

Ficus superstitiosa Link, Enum. Hort. Berol. Alt. 2: 449. 1822. **Type:** Not seen (Possibly destroyed).

Fig. 3.85 – 3.87

Tree up to 30 m height, hemi epiphytic, aerial roots absent; bark lenticellate, pale brown; young twigs terete, core solid, glabrous, pale green; inter node 1.6–6.4 cm long; latex milky, white. Stipule caducous, lanceolate, 2.9–5.6 x 0.2–0.3 cm, margins entire, apex acute, base truncate, glabrous, pale green. Petiole articulated, terete, 5.2–8.6 cm long, glabrous, pale green. Leaves simple, alternate, spiral; lamina symmetric, ovate to widely ovate, 6.4–18.0 x 3.8–12.4 cm, margins entire, acumen 0.6–3.0 cm long, apex acuminate, base cordate to truncate, glabrous, pale red to pale green when young, dark green on maturity, subcoriaceous, venation brochidodromous; basal veins 3–4, lateral veins 7–9 pairs; waxy gland at the base of the midrib. Receptacles axillary, solitary or paired, monoecious, sessile; basal bracts present, persistent, 3, free, 4.0 mm long, widely ovate, glabrous, pale brown. Syconium 0.8–1.2 cm across, globose, glabrous, pale green when young, reddish brown when mature. Ostiole 1.0–2.0 mm wide; outer bracts present, free, widely ovate, 2.0 mm long, glabrous, pale brown; inner bracts present, free, lanceolate, 1.0 mm long, glabrous, pale brown. Male flowers around ostiole, 1.0 mm long, sessile; tepals 4, free, 0.75 mm long, lanceolate, glabrous, yellow to pale brown; stamen 1, anther 0.3 mm, filament stout. Female flowers scattered, 2.5 mm long, sessile; tepal 4, free, 1.5 mm long, lanceolate, glabrous, white; stigma 0.1 mm; style 1.0 mm long; ovary 1.5 mm long, obovoid, glabrous, pale brown. Gall flowers scattered, 2.5 mm long, pedicellate; pedicel 1.0 mm long; tepals 3–4, free, 1.0 mm long, lanceolate,

glabrous, pale brown; stigma stout; style 0.2 mm long; ovary 1.25 mm long, obovoid, glabrous, pale brown. Achenes 0.8– 1.2 mm, ovoid, pale brown.

Local names: *Arayaal, Aal maram* (Mal.); *Pimpal* (Mar.); *Arasu* (Tam.); *Arali* (Kan.).

Common names: Bodhi Tree, Peepul Tree, Sacred Fig.

Flowering and fruiting: November to May.

Distribution: Native to India, Assam, Bangladesh, Myanmar, Nepal and Pakistan. In India, the species is found wild in the sub-Himalayan regions (Chaudhary *et al,* 2012) and found cultivated throughout.

Habitat: Found in deciduous, semi evergreen and evergreen forests. Usually planted in the temple premises.

IUCN status: Least Concern (LC).

Etymology: This species is one among the tree considered as sacred. And due to this religious significance, the species is named '*religiosa*'.

Uses: Root is used in the treatment of Malaria and dried fruits are used as remedy for tuberculosis (Lansky & Paavilainen, 2011). The bark of the plant is rich in alkaloids, flavonoids, phenols, tannins, steroids and Vitamin K (Khan, 2017).

Notes: One of the most commonly seen species of *Ficus.* King (1890) mentioned the presence of 5–7 nerves in the leaves. We have observed 7–9 pairs of lateral nerves in our study. Basal bracts were recorded as puberulous (Berg & Corner, 2005) but, basal bracts were found to be glabrous in our study.

Specimens examined: India, **Andhra Pradesh,** Anantapur District, S. K. University Campus, 350 m, 24 May 1982, *N. Yesoda 515* (MH); Vankarakunta

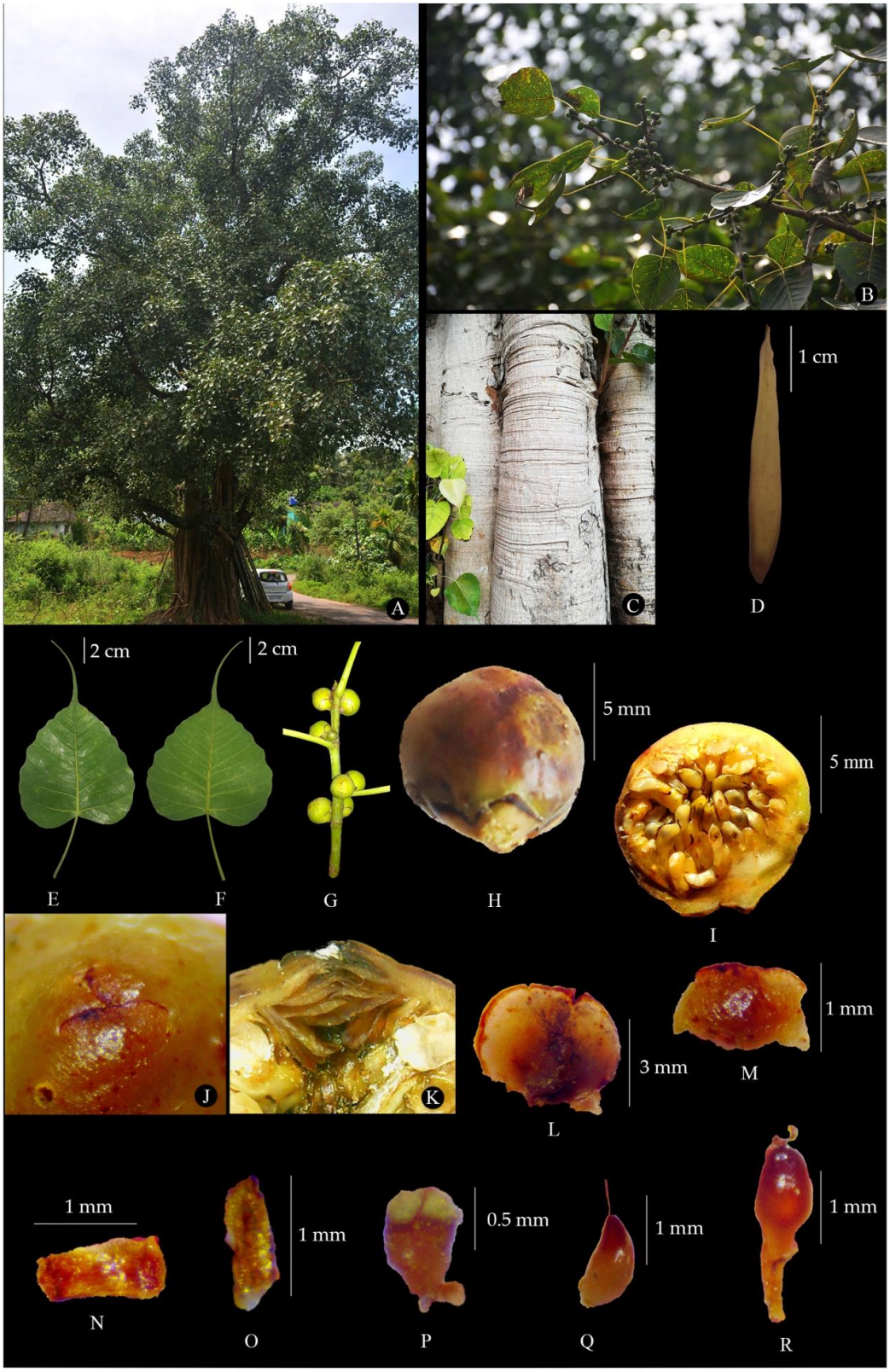


Fig. 3.85. ***Ficus religiosa*** L.: **A.** Habit; **B.** Twig; **C.** Bark; **D.** Stipule; **E.** Leaf adaxial side; **F.** Leaf abaxial side; **G.** Receptacles; **H.** Syconium; **I.** Syconium L. S.; **J.** Ostiole; **K.** Ostiolar L. S.; **L.** Basal bract; **M.** Outer ostiolar bract; **N.** Inner ostiolar bract; **O.** Tepal; **P.** Male flower; **Q.** Female flower; **R.** Gall flower.

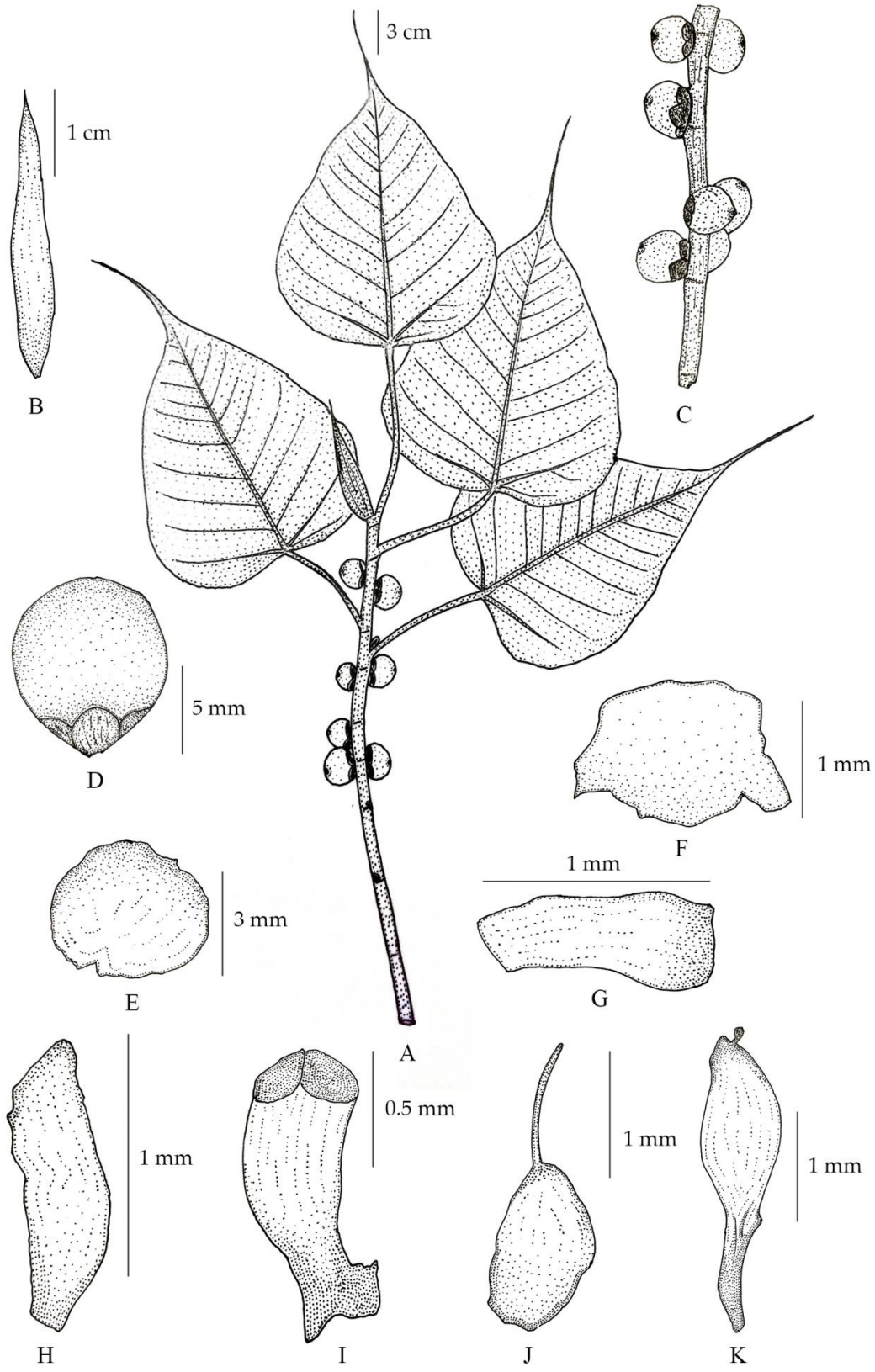


Fig. 3.86. ***Ficus religiosa*** L.: **A.** Twig; **B.** Stipule; **C.** Receptacles; **D.** Syconium; **E.** Basal bract; **F.** Outer ostiolar bract; **G.** Inner ostiolar bract; **H.** Tepal; **I.** Male flower; **J.** Female flower; **K.** Gall flower.

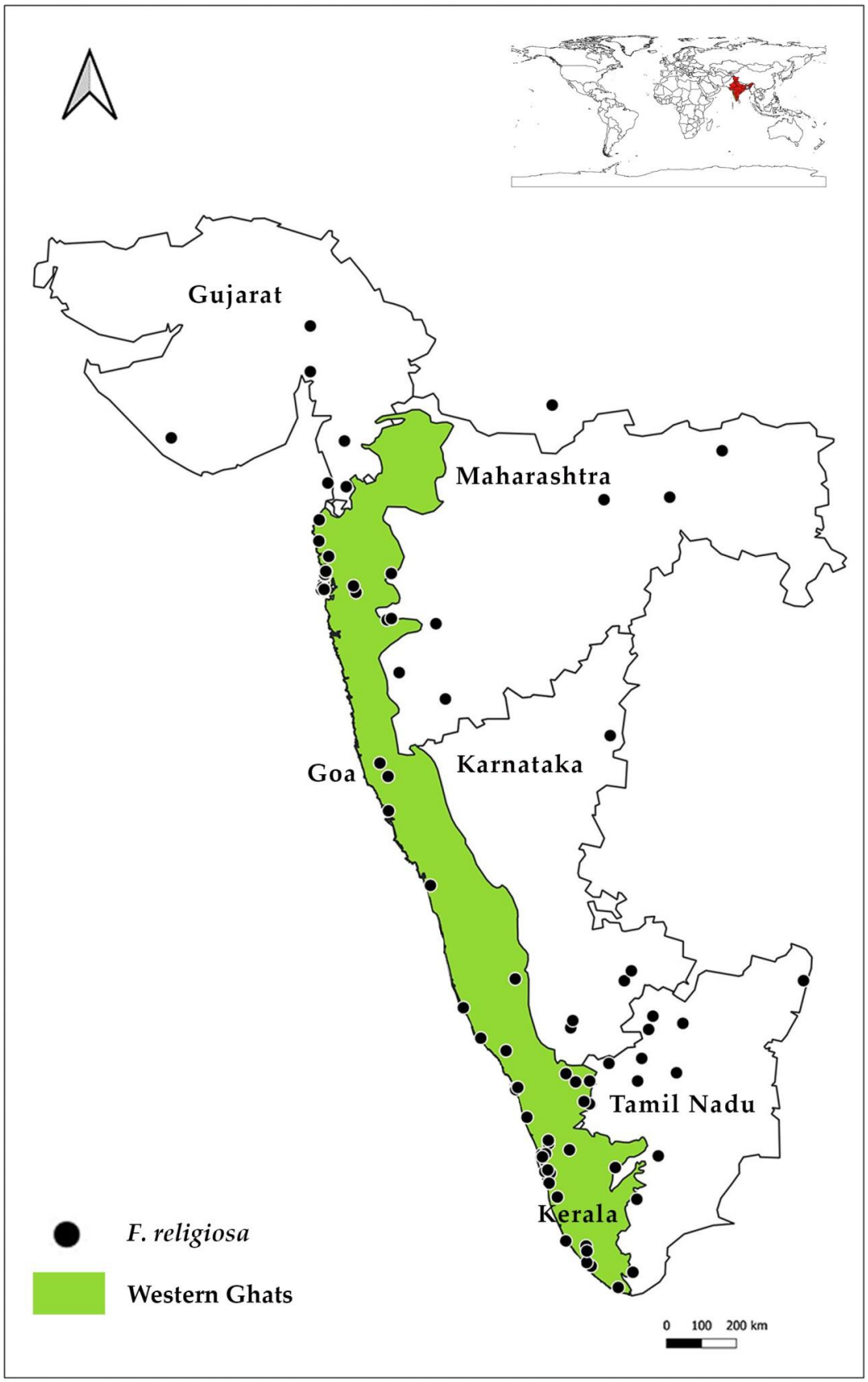


Fig. 3.87. *Ficus religiosa* L. - Distribution map.

Ashram, 580 m, 03 October 2016, *J. Swamy & S. Nagaraju 7938* (BSID). Chittoor District, Horsley hill, 3800 ft, 06 July 1999, *G.V.S. Murthy 110560* (BSID); Papavinasanam Sacred Groove, 707 m, 10 January 2016, *J. Swamy & S. Nagaraju 7517* (BSID). Guntur District, Kotappakonda Sacred Groove, 256 m, 12 October 2015, *J. Swamy & S. Nagaraju 14140* (BSID); Nagarjuna Konda Sacred Groove, 191 m, 13 October 2015, *J. Swamy & S. Nagaraju 7229* (BSID). Hyderabad District, Parana pul, 833 m, 27 June 1958, *K.M. Sebastine 5994* (MH). Krishna District, Sri Peddinti Ammavari, Kolleti Kota, 32 m, 10 October 2015, *J. Swamy & S. Nagaraju 14046* (BSID); Sri Kanaka Durga temple, Vijayawada, 105 m, 11 October 2015, *J. Swamy & S. Nagaraju 14081* (BSID); *s.loc., s.d., J.S. Gamble 1887* (MH). Kurnool District, Umamaheswaram Temple to Rangapur, 550 m, 08 February 1998, *S.R. Srinivasan 109158* (BSID). Medak District, Narsapur, north end, 710 m, 23 April 1959, *K.M. Sebastine 7957* (MH). **Bihar,** Ranka District, *s.loc.,* 25 September 1947, *W.N. Koelz 18963* (MICH). **Goa,** North Goa District, Parvorim, 10 November 1963, *Seshagiri Rao Rolla 92940* (BSI). **Gujarat,** Anand District, Khambhat, 11 May 1957, *S.K. Jain 17930* (BSI). Tapti District, Tapti, December 1916, *s.coll., 25441* (BLAT). Valsad District, Dharampur, 14 June 1958, *P.S. Toor 39149* (BSI); Tital beach, 07 April 1959, *G.S. Puri 50712* (BSI). **Himachal Pradesh,** Kangra District, Bhadwar, 30 April 1933, *W.N. Koelz 4362* (MICH). **Karnataka,** Hassan District, Sakleshpur, 16 December 1903, *C.A. Barber 6222* (MH). Mysore District, Kharaji lake, 19 August 1957, *S.D. Mahajan 23014* (BSI); Byrapura, 07 April 1972, *T.P. Ramamoorthy & K.N. Gandhi 2801* (JCB). Uttar Kannada District, Chandavur, *s.d., W. A. Talbot 3518* (BSI). **Kerala,** Alappuzha District, Kuthyathode, sea level, *C.N. Sunil 2578* (CALI). Kannur District, Tellicherry, 75 m, 15 July 1978, *V.S. Ramachandran 57656* (MH); Madayippara, Madayikkavu, 18 June 2012, *C. Pramod 133555* (CALI). Kasargod District,

s.loc., 100 m, 05 July 1980, *R. Ansari 67985* (MH). Kozhikode District, Calicut, 05 May 1971, *V.V. Sivarajan 1130* (CALI); Kallai, sea level, 29 March 1977, *C.R. Suresh 22163* (CALI). Kottayam District, near Udayanapuram Sree Subramanya temple, 4 m, 03 March 2020, *Sreehari S. Nair 12962* (MESAH). Pathanamthitta District, Nilamel, 100 m, 25 May 1978, *C.N. Mohanan 55790* (MH). Thiruvananthapuram District, Pulimath, 125 m, 18 March 1980, *M. Mohanan 66679* (MH); Kanakakkunnu, 07 February 2017, *Akhilesh S.V. Nair 9326* (KUBH); Karyavattom campus, 29 April 2017, *Suresh Kumar. P 8600* (KUBH). Thrissur District, Vazhachal, 230 m, 24 November 2009, *K.H. Amitha Bachan 117707* (CALI). **Lakshadweep,** Kavarathy, 20 February 1959, *B.M. Wedhwa 45487* (BSI); Minicoy Island, 26 November 1960, *B.M. Wedhwa 69839* (BSI). **Madhya Pradesh,** Hoshangabad District, Bori R. F., 550 m, 30 April 1961, *J. Joseph 12466* (MH). Jabalpur District, Kundwara, 472 m, 09 March 1962, *K.M. Sebastine 13886* (MH). Panna District, Ghatari village, 25 March 1982, *P.G. Diwakar 162972* (BSI). Rewa District, near Bichiya river, 400 m, 14 September 1959, *K.M. Sebastine 8736* (MH). **Maharashtra,** Burhanpur District, Chanoeli hill, Khandesh, December 1918, *s.coll.* 27007 (BLAT); Turaumal, Khandesh, December 1918, *s.coll. 26808* (BLAT). Mumbai District, Chami, Marine Line railway station, November 1915, *s.coll. 15309* (BLAT); Nepean sea road, Bombay, August 1916, *s.coll. 17064* (BLAT); Worli hill, Bombay, September 1916, *s.coll. 17062* (BLAT); Bishop's lodge, Bombay, June 1932, *R.D. Aclaud ACK1140* (BLAT); Borivali National Park, 22 February 1955, *P.S. Herbert SH586* (BLAT); National Park, Borivali, 22 February 1955, *P.S. Herbert SH580* (BLAT); *ibid.,* 17 March 1956, *P.S. Herbert SH1493* (BLAT); *ibid.,* 17 March 1956, *P.S. Herbert SH1492* (BLAT); *ibid.,* 17 March 1956, *P.S. Herbert SH1491* (BLAT); *ibid.,* 02 October 1956, *P. S. Herbert SH2437* (BLAT); *ibid.,* 02 October 1956, *P.S. Herbert SH2438* (BLAT); Near Goregoan, 09 February 1958,

S.C. Tavakari T703 (BLAT); Malad, Daftary road, 15 September 1958, *G. L. Shah Shah9965* (BLAT); Malad, near pond, 05 October 1958, *G.L. Shah Shah10030* (BLAT); *ibid.,* 05 October 1958, *G.L. Shah Shah10029* (BLAT). Palghar District, Chandip, 20 July 1961, *N.Y. Das NYD3420* (BLAT); *ibid.,* 20 July 1961, *N.Y. Das NYD3421* (BLAT); *ibid.,* 20 July 1961, *N.Y. Das NYD3422* (BLAT); Pathandi round, Jawahai range, 01 September 1967, *K.V. Billore 111673A* (BSI); Near to Pulgats, 10 May 2011, *S.C. Yadav 200670* (BSI). Pune District, College of Science, garden, 12 April 1903, *L.D. Garade s.n.* (BSI); Heaven Garden, 8 miles east of Junnar, 26 October 1964, *K. Hemadri 99766* (BSI). Raigad District, Karjat, 29 January 1949, *J. Fernandez JF65* (BLAT); Neral - Water pipe, 17 October 1958, *N.A. Irani NI2416* (BLAT). Sangli District, Vita Khanapur Tal, 18 February 1996, *A.N. Londhe 175251* (BSI). Sindhudurg District, Bhimde jungle, Kankavli, 12 April 1971, *B.G. Kulkarni 12177* (BSI); Narur, Dukanwood, 17 April 1971, *B. G. Kulkarni 128778* (BSI). Thane District, Mandvi, 20 February 1962, *N.Y. Das NYD7054* (BLAT); *ibid.,* 20 February 1962, *N.Y. Das NYD7055* (BLAT); *ibid.,* 20 February 1962, *N. Y. Das NYD7056* (BLAT); *ibid.,* 20 February 1962, *N.Y. Das NYD7057* (BLAT). Washim District, Kinhiraja, 31 August 1978, *S.Y. Kamble 150291* (BSI). **Rajasthan,** Banswara District, near Ghatol, on way from Bhongre, 02 October 1961, *K.C. Kanodia 75464* (BSI). Jaipur District, Forest Nursery, Galta, 360 m, 24 December 1996, *R.P. Pandey 1217* (TBGT). Jaisalmer District, Mahakosh, 09 August 1958, *S K. Jain 40643* (BSI). **Tamil Nadu,** Chengalpattu District, Vedanthangal water bird sanctuary, 120 m, 25 September 1974, *A.N. Henry 45404* (MH). Chennai District, *s.loc.,* 07 February 1905, *J.S. Gamble s.n.* (MH). Coimbatore District, way to Goddesal, 3500 ft, 14 March 1931, *K. Cherian Jacob 330* (MH); Kwaidimalai, 767 m, 23 February 1957, *K. Subramanyam 2432* (MH); R. S. Puram, 468 m, 28 April 1967, *M. Chandrabose*

25957 (MH); Botanical Garden Agricultural University, 468 m, 11 June 1968, *M. Chandrabose 30219* (MH); Palmalai, 860 m, 31 March 1970, *M.V. Viswanathan 491* (MH). Dharmapuri District, Woddapatti R. F., 260 m, 17 March 1965, *E. Vajravelu 23585* (MH). Dindugal District, Sirumalais, 16 July 1960, *J. Pallithanam JP6433* (BLAT). Erode District, Satyamangalam Forest Division, Dimbam – Thalamala, 1100 m, 25 March 2009, *P. Satyanarayana 122549* (MH). Krishnagiri District, Mukkaugara, Bettamugilalam, 20 February 1990, *T. Ravisankar 84148* (MH); Ananthur cut road, 02 January 1968, *V. Balasubramaniam 1564* (MH). Madurai District, Bodi Range, 467 m, 15 September 1961, *K.M. Sebastine 12891* (MH). Nilgiri District, Naduvattam, Gudalur road, 1460 m, 18 January 1961, *B.V. Shetty 11904* (MH); Kunjapini, 975 m, 12 May 1971, *E. Vajravelu 38368* (MH). Pudukottai District, Manamelkudi (Monamalkudi), 5 m, 20 November 1986, *C. Arulappan 807* (MH). Ramanathapuram District, *s.loc.,* 11 January 1900, *J. Sankaram Rao 96382* (MH). Sivaganga District, Pudupatti, 210 m, 19 July 1965, *E. Vajravelu 24806* (MH). Thanjavur District, Vaduvur to Thanjavur, 50 m, 18 September 1977, *K. Ramamurthy 51309* (MH). Theni District, Bodi range, 467 m, 15 September 1961, *K.M. Sebastine 12891* (MH). Tiruchirappalli District, on the bank of Puliyancholai river, 233 m, 29 October 1958, *K.M. Sebastine 7058* (MH). Vellore District, Foot of Konnamalai, 570 m, 27 May 1963, *C.P. Sreemadhavan 688* (MH); Adi Tiruvannamalai Temple area, 175 m, 24 November 1977, *E. Vajravelu 52046* (MH). **Telangana,** Adilabad District, Indhanpalli – Range, 210 m, 02 August 2014, *P.S. Annamma 5381* (BSID). Nalgonda District, Mailapuram, 245 m, 22 December 2012, *A. Baleeshwar Reddy 5281* (BSID). **Uttar Pradesh**, Prayagraj District, Aklaspur, 200 m, 27 July 1964, *G.V. Subba Rao 20232* (MH).

3.6.29. *Ficus superba* (Miq.) Miq.

Ficus superba (Miq.) Miq., Ann. Mus. Bot. Lugduno-Batavi 2: 200. 1866; Miq., Ann. Mus. Bot. Lugd.-Bat. 3. 264. 1867; Priyadarsanan, J. Bombay Nat. Hist. Soc. 93(3): 492–493. 1999; Sasidh. & Sivar., Bio. Docu. Kerala part 6: Flow. Plant. 441. 2004; Berg & Corner, in Nooteboom, Fl. Malesiana 17(2): 612. 2005; C.C. Berg *et al.*, Fl. Thailand 10(4): 646. 2011; Chantaras., Syst. Bot. 38(3): 677. 2013; J.V. Sudhakar & G.V.S. Murthy, Indian J. For. 39(3): 255-261. 2016; S.S. Dash & A.A. Mao, Fl. Pl. India, 2: 549. 2020. *Urostigma superbum* Miq., Pl. Jungh.: 46. 1851. **Type:** Indonesia, Java, *s.d., Junghuhn s.n.* (Isotype- U, U 0184537!).

Ficus tenuipes S. Moore, J. Bot. 63 (Suppl.): 107. 1925. **Type:** Indonesia, Timor, Kailakuk, 1882-3, *H.O. Forbes 3771* (Type- BM, BM000951767!).

Ficus timorensis Decne., Nouv. Ann. Mus. Hist. Nat. 3: 495. 1834. **Type:** Indonesia, Lesser Sunda Islands, Timor, 14 October 69, *Metzner 9* (Type- L, L 1620811!).

Urostigma accedens Miq., Fl. Ned. Ind. 1(2): 347. 1859. **Type:** Indonesia (Not seen).

Fig. 3.88 – 3.90

Large tree, 30 m tall, usually epiphytic when young, aerial roots absent; bark smooth, pale yellow to pale brown; young twigs terete, solid, puberulous, pale brown; internode 0.5–4.0 cm long; latex milky, white. Stipule caducous, lanceolate, 0.5–1.0 x 0.3–0.7 cm, margins entire, apex acute, base truncate, puberulous, pale brown. Petiole articulated, terete, canaliculate, 4.0–10.0 cm long, glabrous, pale green. Leaves simple, alternate, spiral; lamina symmetric, elliptic to oblong, 10.2–15.2 x 4.0–7.6 cm, margins entire, wavy, acumen 0.7–1.1 cm long, apex acuminate, base rounded to obtuse, glabrous,

pale red when young, green on maturity, subcoriaceous, venation brochidodromous; basal veins 3–4, lateral veins 6–10 pairs, waxy glands at the base of the midrib. Receptacles axillary, clustered, monoecious, pedunculate; peduncle 4.0–5.0 mm long, glabrous, pale green; basal bracts present, persistent, 3, free, 3.0–4.0 mm long, widely ovate, pubescent, pale brown. Syconium 0.5–0.8 cm across, globose, glabrous, green when young, purple when mature. Ostiole 2.0–3.0 mm; outer bracts present, free, ovate, 1.5–2.0 mm long, glabrous, pale brown; inner bracts present, free, lanceolate, 1.0 mm long, glabrous, pale brown. Male flowers near ostiole, 2.5 mm long, pedicellate; pedicel 0.5 mm; tepals 3, free, 1.5 mm long, lanceolate, pale yellow, glabrous; stamen 1, anther 0.5 mm long, filament 1.0 mm long. Female flowers scattered, 2.0 mm long, sessile; tepals 3, free, 1.5 mm long, lanceolate, pale yellow, glabrous; stigma simple, 0.1–0.2 mm long; style 0.8 mm long; ovary 1.0 mm long, obovoid, glabrous, pale-yellow. Gall flowers scattered, 2.0 mm long; sessile or short pedicellate; tepals 3, free, 1.5 mm long, lanceolate, pale yellow; stigma 0.1 mm long; style 0.2 mm long; ovary 1.2 mm long, obovoid, glabrous, pale-brown. Achenes 1.0 mm, ovoid, pale brown.

Local names: Nil

Common names: Nil

Flowering and fruiting: December to May.

Distribution: The species is distributed in South India, Indo China, Thailand and Malaysia.

Habitat: Found in evergreen and deciduous forests.

IUCN status: Not Evaluated (NE).

Etymology: Mostly refers to the figs positioned over the old leaves.

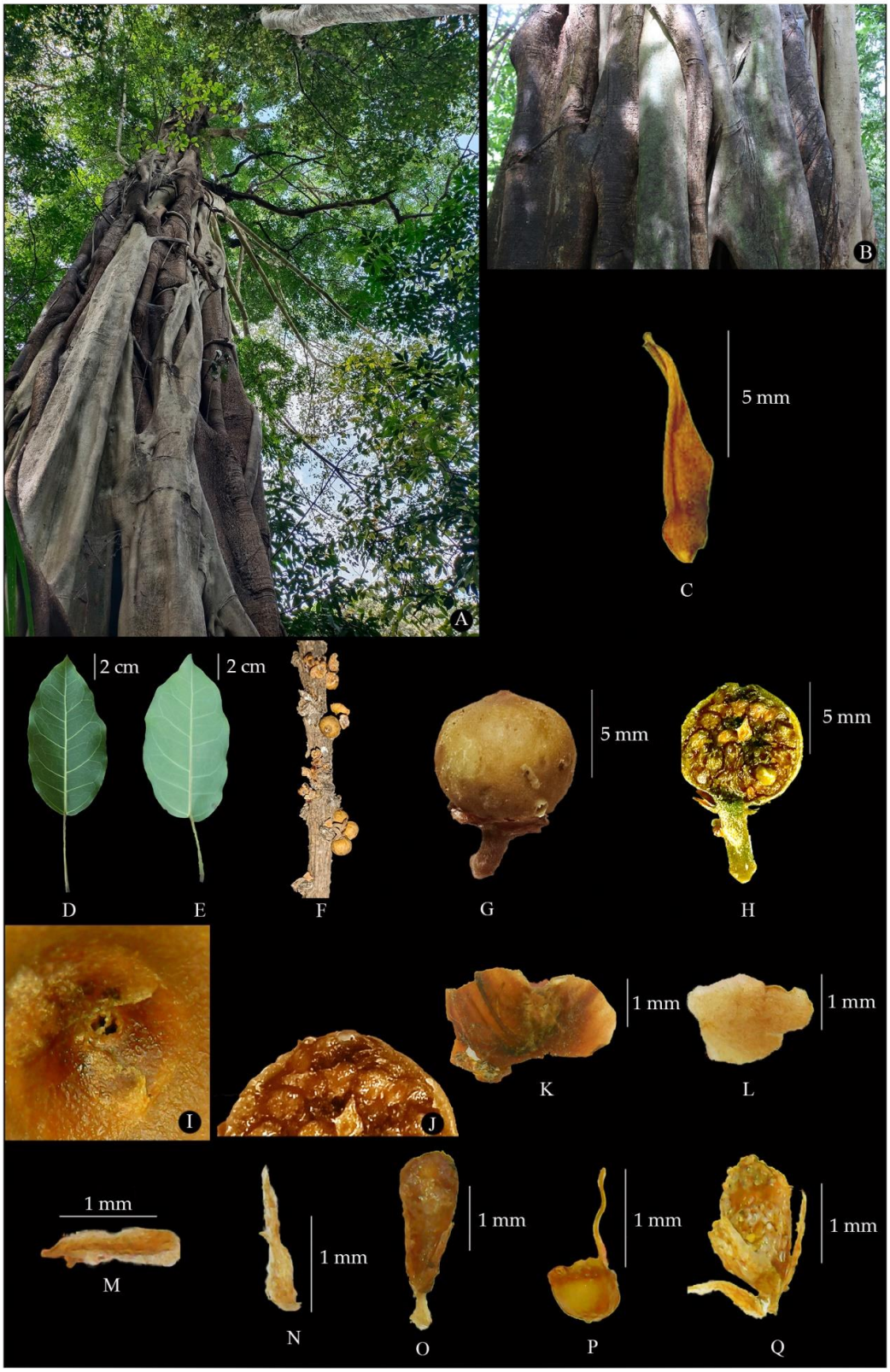


Fig. 3.88. ***Ficus superba*** (Miq.)Miq.: **A.** Habit; **B.** Bark; **C.** Stipule; **D.** Leaf adaxial side; **E.** Leaf abaxial side; **F.** Receptacles; **G.** Syconium; **H.** Syconium L. S.; **I.** Ostiole; **J.** Ostiolar L. S.; **K.** Basal bract; **L.** Outer ostiolar bract; **M.** Inner ostiolar bract; **N.** Tepal; **O.** Male flower; **P.** Female flower; **Q.** Gall flower.

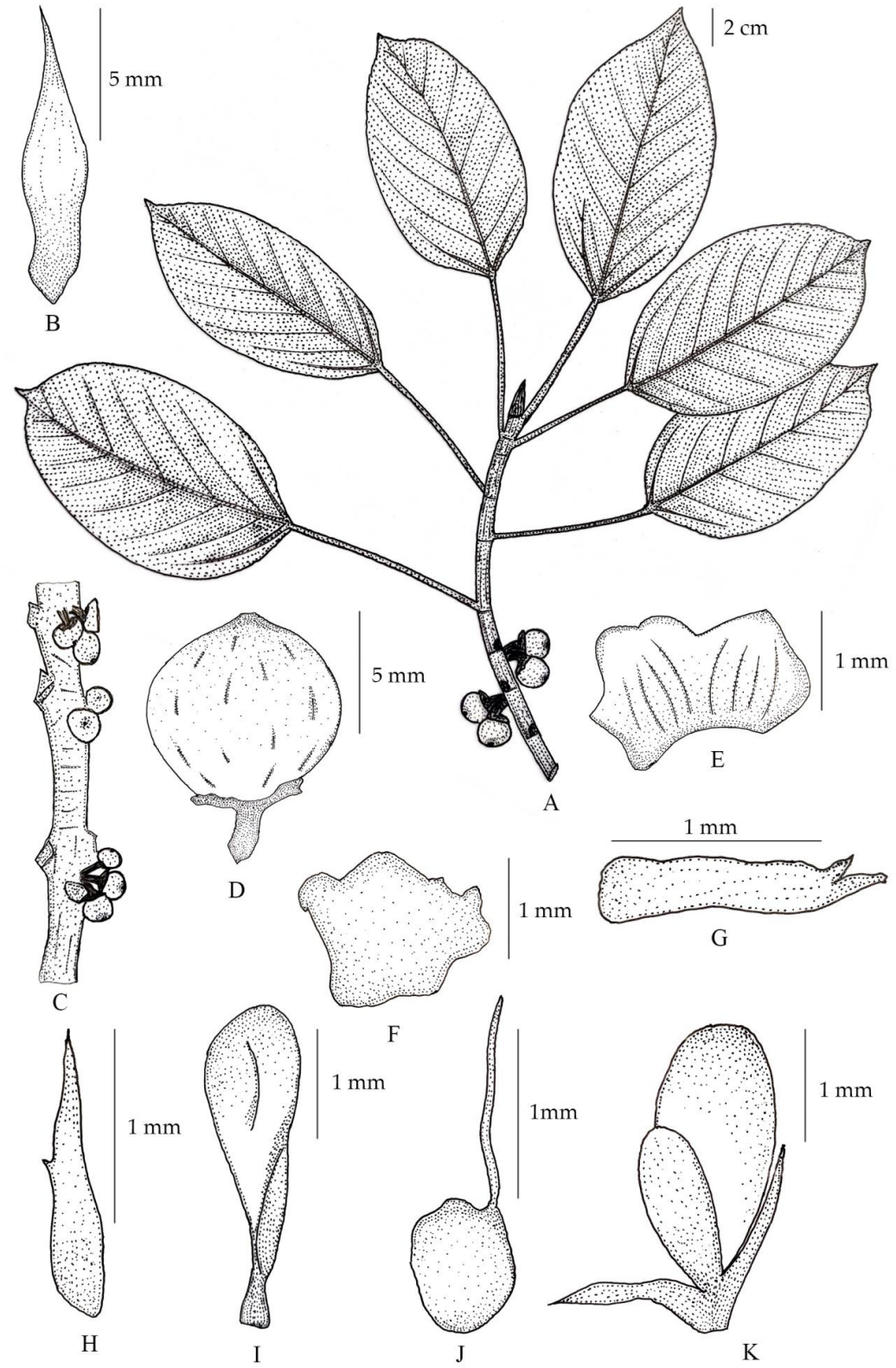


Fig. 3.89. ***Ficus superba*** (Miq.)Miq.: **A.** Twig; **B.** Stipule; **C.** Receptacles; **D.** Syconium; **E.** Basal bract; **F.** Outer ostiolar bract; **G.** Inner ostiolar bract; **H.** Tepal; **I.** Male flower; **J.** Female flower; **K.** Gall flower.

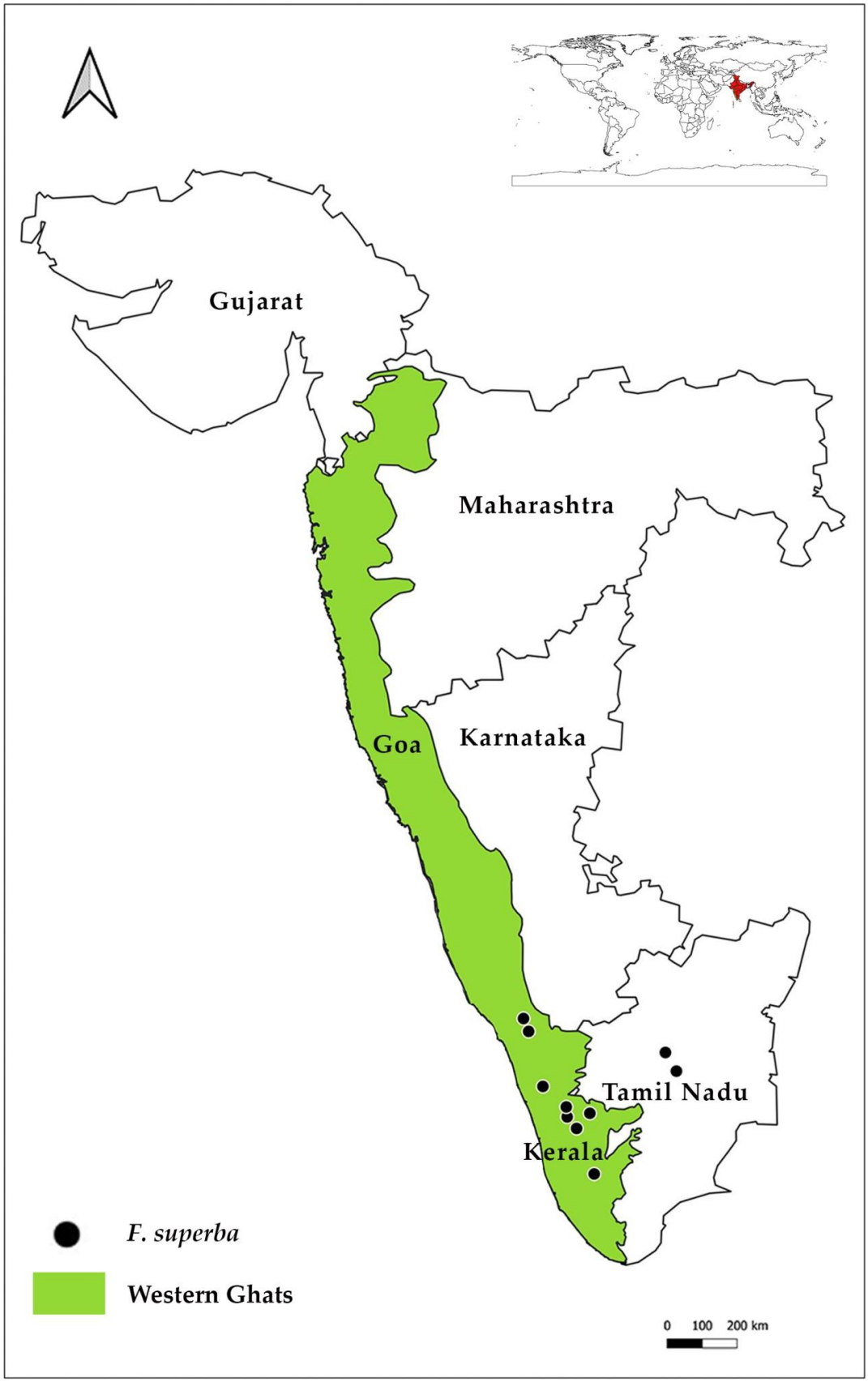


Fig. 3.90. *Ficus superba* (Miq.)Miq. - Distribution map.

Uses: No uses so far reported for this species.

Notes: From India, this species is reported from Southern area and is poorly represented in the herbarium sheets from India. The peduncles were mentioned as puberulous and measured up to 1.5 cm (Berg & Corner, 2005) but, based on our observation the peduncle was glabrous and measured up to 0.5 cm only.

Specimens examined: India, **Kerala,** Thrissur District, Poringal, 22 February 1957, *G.S. Puri 15901* (BSI); *ibid.,* 27 January 2022, *Sreehari S. Nair 12186* (MESAH). **Indonesia,** Java, Sulawesi, Celebes, 21 May 1913, *Docters van Leeuwen 1725* (L); Java, Noorf Wachter Island, 08 September 1921, *C.A. Backer & Van df Slooten 35036* (U); Java, Lesser Sunda Islands, 03 July 1974, *J.A. J. Vrheijen 3474* (L); *ibid.,* 30 July 1974, *J.A. J. Vrheijen 4185* (L); Java, Savannah, 30 October 1994, *P.J.A. Kessler 714* (L); Java, January 1857, *W. H. Vriese s.n*; Java, *s.d, F.W. Junghuhn 52095A* (L); Java, *s.d, C.G.C. Reinwardt s.n* (U); Java, Pekalongan province, *s.d, S.H. Koorders 11644* (L); *ibid., s.d, S.H. Koorders 13521* (L); Java, Semarang Province, *s.d, S.H. Koorders 25320* (L); *ibid., s.d., S.H. Koorders 9215* (L); *ibid., s.d., S.H. Koorders 9275* (L); Java, Lesser Sunda Islands, *s.d., J.J. Afriastini 1573a* (L); Java, Bogor, *s.d., C.G.C. Reinwardt s.n* (L); Java, Semarang Province, *s.d, S. H. Koorders 25409* (L); Java, Besoeki Province, *s.d, S.H. Koorders 30249* (L); Java, Semarang Province, *s.d, S. H. Koorders 9192* (L); *ibid*., s.d, *S.H. Koorders 9194* (L); *ibid., s.d, S.H. Koorders 9190* (L); Java, Besoeki Province, *s.d, S.H. Koorders 9321* (L); Java, Semarang Province, *s.d., S. H. Koorders 25315* (L); Java, Besoeki Province, *s.d., S.H. Koorders 10095* (L); Java, Semarang Province, *s.d., S. H. Koorders 9216* (L); **Malaysia.** Malay Peninsula, Pulau, 12 June 1932, *E. J. H. Corner 25759* (L); Pahang, Pulau Tulai, 24 April 1962, *Noor Kadim 663* (L); Pulau Tinggi, Mersing, Johore, Rocky coast, 16 April 1967, *F.S.P. Ng 5047* (L); Pahang Kuantan, Telok Chempedak,

Rocky headland, 14 May 1967, *T.C. Whitmore 3695* (L); Cape Rachado Jungle Reserve, Sea side, 20 January 1970, *K.M. Kochummen 2483* (L); Langkawi Islands, South west side of Pulau Bumbon Besar, Rocky granite coast, 03 November 1979, *S.C. Chin & L.T. Chia 2139* (L); *s.loc.,* 16 July 1994, *A. Zainudin, S. Muzni, Z.Mohd & T.Sherif 5138* (L); **Thailand.** Chiang Mai, District: Muang, Doi Sutep, east side, above Pah Laht, 24 November 1987, *J.F. Maxwell 1505* (L); Lampang, District: Muang Bahn (Pan), Jae Sawn National Park, headquarters, 01 August 1996, *J.F. Maxwell 96-33* (L); South-Western Thailand, Prachuap Khiri Khan, Amphoe Pran Buri, Khao Sam Roi Yot National Park, Trail from Tham Sai to Tham Phra Yanokhon, 18 August 2002, *D.J. Middleton, S. Suddee, S.J. Davies & C. Hemrat 1190* (L); Nakorn Sawan, District: Muang, Rachapat University, Nakorn Sawan, 24 January 2005, *J.F. Maxwell 05-68* (L); South-Eastern, Tala Namdang junction, Klaeng, Rayong, 12 September 2010, *B. Chantarasuwan 120910-2* (L); South-Eastern; None Kor, 12 September 2010, *B. Chantarasuwan 120910-1* (L); Suanphueng, Ratburi, 14 September 2010, *B. Chantarasuwan 140910* (L).

3.6.30. *Ficus talbotii* King

Ficus talbotii King, Ann. Bot. Gard. Calc. 1: 51, t. 63. 1888; Hook.f., Fl. Brit. India 5: 512. 1888; J. Cameron, For. Trees of Mysore and Coorg 280. 1894; Talbot, Trees Bombay 2: 328. 1902; T. Cooke, Fl. Pres. Bombay 2: 647. 1908; Bourd., For. Trees Travancore 362. 1908; Rama Rao, Fl. Pl. Travancore 381. 1914; Brandis, Indian Trees 603. 1921; Corner, Gard. Bull. Singapore 21: 19. 1965; Corner in Dass. & Forsb., Rev. Handb. Fl. Ceylon 3: 254. 1981; Manilal & Sivar., Fl. Calicut 277. 1982; B.D. Sharma *et al.,* Fl. Karnataka: analysis 260. 1984; C.J. Saldanha, Fl. Karnataka 119. 1984; R.S. Rao *et al.,* Fl. Goa Diu Daman Dadra & Nagar haveli 2: 410. 1986; V. Chithra in A.N. Henry *et al.,* Fl. Tamil

Nadu Ind., Ser I: Analysis 2: 255. 1987; V.S. Ramach. & V.J. Nair, Fl. Cannanore Dist. 433. 1988; T. Pullaiah & N. Yesoda, Fl. Anantapur Dist. 232. 1989; Kesh. Murthy & S.N. Yogan. Fl. Coorg 424. 1990; K.M. Matthew, Excur. Fl. Central Tamil Nadu 485. 1991; K.M. Matthew, Fl. Palni Hills 1185. 1999; N.P. Singh *et al.,* Fl. Maharashtra Dicot 2: 941. 2001; Sasidh. & Sivar., Bio. Docu. Kerala part 6: Flow. Plant. 441. 2004; Anil Kumar *et al.,* Fl. Pathanamthitta 465. 2005; Berg *et al.,* Fl. Thailand 10(4): 647. 2011; T. Pullaiah, Fl. Telangana 2: 885. 2015; Sudhakar *et al.,* Figs of Eastern Ghats, India 87. 2017; Fl. Karnataka. A Check List 2: 509. 2019; Ficus sp. Madhya Pradesh 58. 2019; S. J. Britto, Fl. Central and North Tamil Nadu 978. 2019; S.S. Dash & A.A. Mao, Fl. Pl. India, 2: 549. 2020. **Type:** India, Karnataka, North Canara, *s.d., W.A. Talbot 1100* (Holotype- CAL, CAL0000014388!).

Ficus pierrei Gagnep, Notul. Syst. (Paris) 4: 93. 1927. **Type:** Cambodia, Habitat in Montibus Kéréev, province Sonrong Tong, 1870, *L. Pierre 1676* (Holotype- P, P00710822!).

Fig. 3.91 – 3.93

Tree up to 15 m height, epiphytic, aerial roots absent; bark smooth, white to pale yellow; young twigs terete, core solid, brown, glabrous; inter node 0.9–2.4 cm long; latex milky, pale yellow. Stipule caducous, ovate, 0.5–0.7 x 0.2–0.4 cm, margins entire, apex acute, base truncate, sericeous, pale brown. Petiole articulated, canaliculate, 1.5–3.1 cm long, glabrous, pale green. Leaves simple, alternate, spiral; lamina symmetric, lanceovate to ovate, 7.6–14.5 x 3.4–6.8 cm, margins entire, acumen 0.6–1.3 cm long, apex caudate, base obtuse, glabrous, pale green when young, dark green on maturity, subcoriaceous, venation brochidodromous; basal veins 3–4, lateral veins 11–16 pairs; waxy gland at the base of the midrib. Receptacles axillary, clustered,

monoecious, sessile; basal bracts 3, persistent, free, 2.5 mm long, widely ovate, pubescent, brown. Syconium 0.4–0.6 cm across, globose, glabrous with scars, pale green when young, reddish brown when mature. Ostiole 1.5 mm wide; outer bracts present, free, widely ovate, 0.8–1.0 mm long, pubescent, yellow to pale brown; inner bracts present, free, widely ovate, 1.0 mm long, glabrous, pale brown. Male flowers near ostiole, 1.5 mm long, pedicellate; pedicel 0.6 mm long; tepals 3, free, 1.0 mm long, lanceolate, glabrous, white; stamen 1, anther 0.5 mm, filament 0.4 mm long. Female flowers scattered, 2.5 mm long, sessile; tepal 3, free, 1.0 mm long, lanceolate, glabrous, pale yellow; stigma bifid, 0.3 mm; style 1.5 mm long; ovary 1.0 mm long, globose, glabrous, pale brown. Gall flowers scattered, 2.5 mm long, pedicellate; pedicel 1.25 mm long; tepals 3, united, 1.5 mm long, lanceolate, glabrous, white to pale yellow; stigma 0.1 mm; style 0.25 mm long; ovary 1.0 mm long, obovoid, pale brown. Achenes 0.4–1.0 mm, ovoid, white.

Local names: *Vellal* (Mal.); *Itthi, Kal-ithi* (Tam.); *Atti-mara* (Kan.)

Common names: Nil.

Flowering and fruiting: September to March.

Distribution: Native to India and Indo China regions. The species is found only from the peninsular regions of the country.

Habitat: Semi evergreen forests.

IUCN status: Not Evaluated (NE).

Etymology: This species is named *'Talbotii'* in honour of the Irish botanist and former Conservator of Forests, Bombay Presidency, W. A. Talbot. King described this species based on the collection of W. A. Talbot from the forests of Canara.

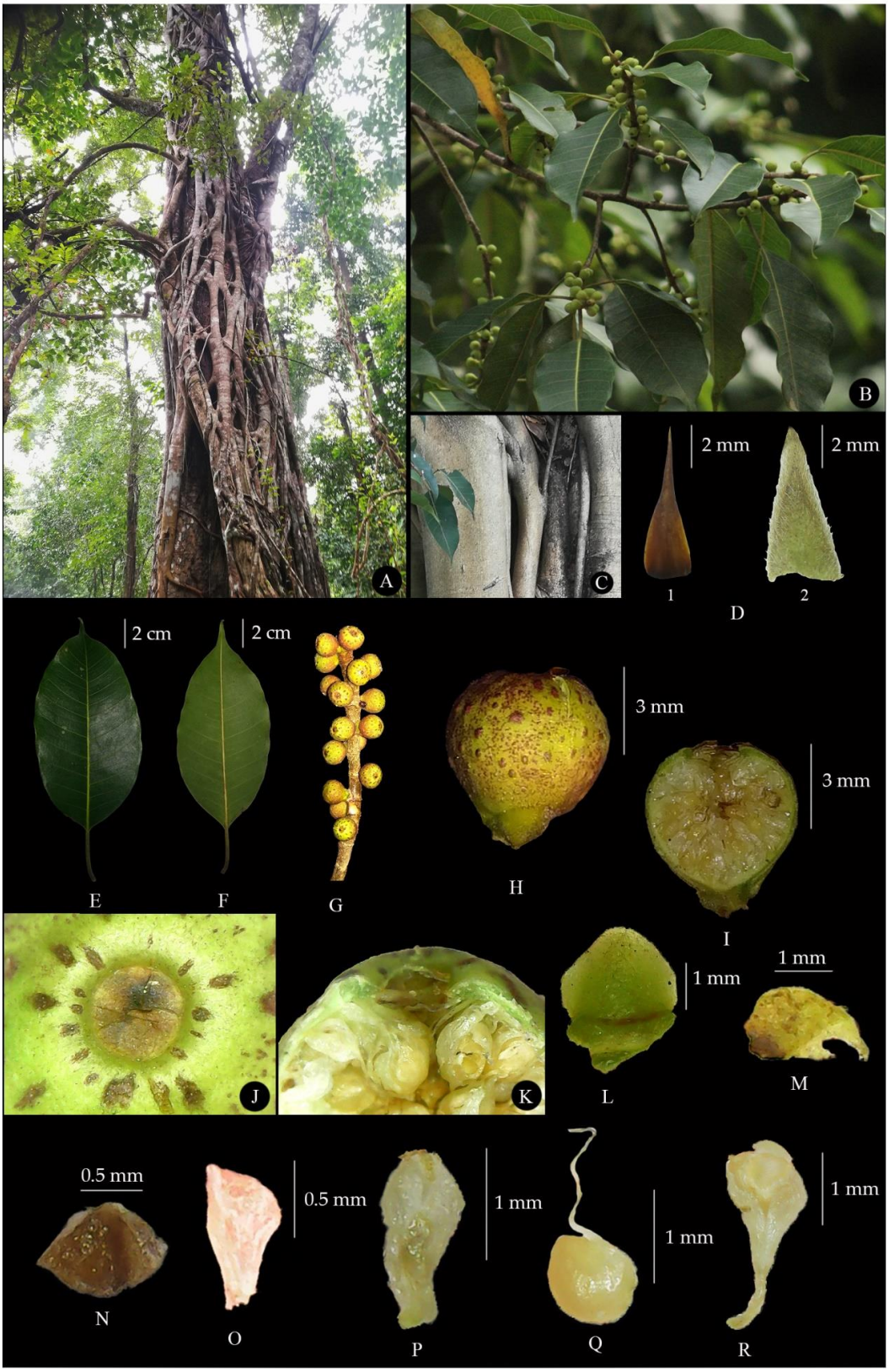


Fig. 3.91. ***Ficus talbotii*** King: **A.** Habit; **B.** Twig; **C.** Bark; **D(1&2).** Stipule; **E.** Leaf adaxial side; **F.** Leaf abaxial side; **G.** Receptacles; **H.** Syconium; **I.** Syconium L. S.; **J.** Ostiole; **K.** Ostiolar L. S.; **L.** Basal bract; **M.** Outer ostiolar bract; **N.** Inner ostiolar bract; **O.** Tepal; **P.** Male flower; **Q.** Female flower; **R.** Gall flower.

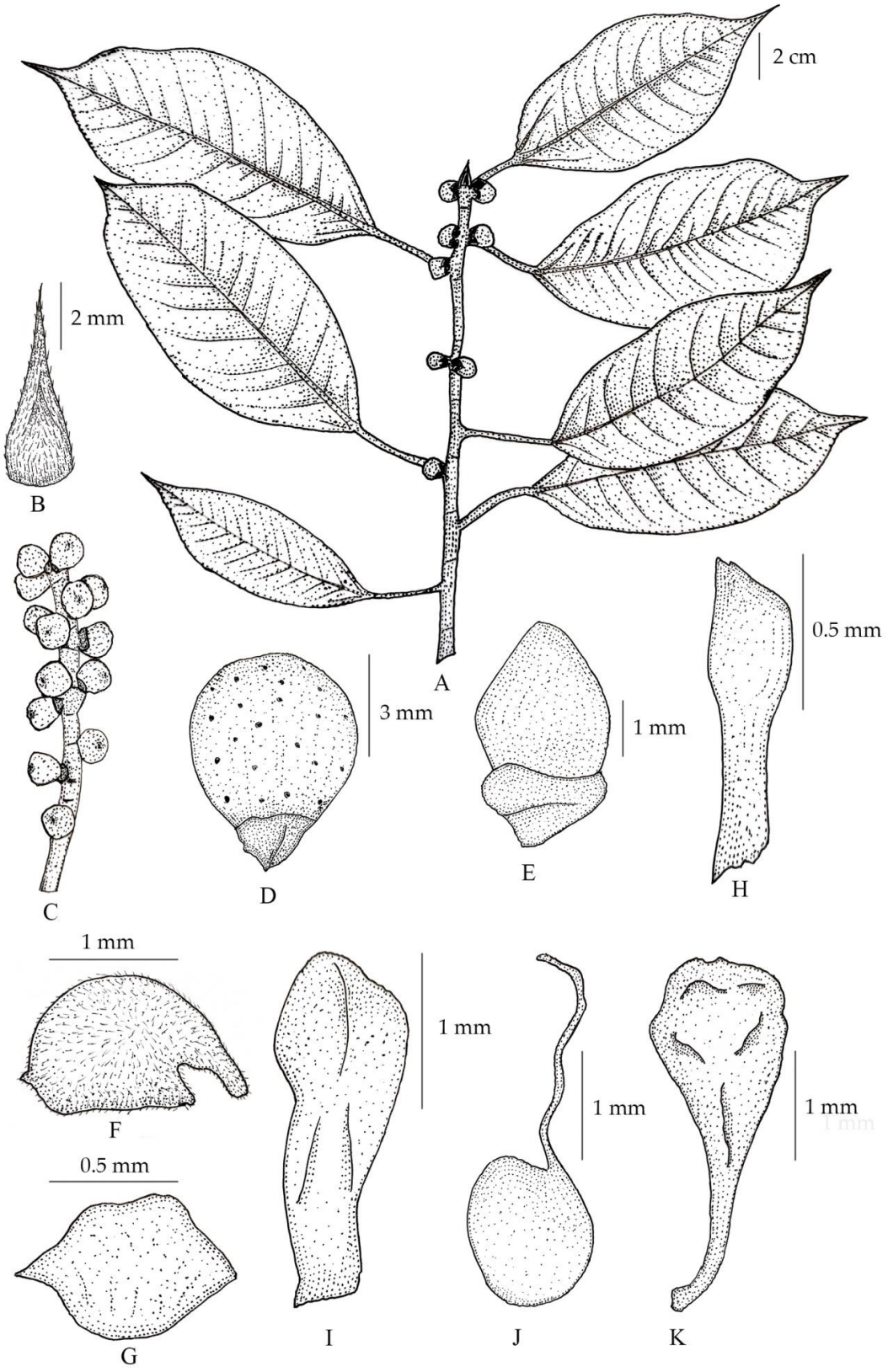


Fig. 3.92. ***Ficus talbotii*** King: **A.** Twig; **B.** Stipule; **C.** Receptacles; **D.** Syconium; **E.** Basal bract; **F.** Outer ostiolar bract; **G.** Inner ostiolar bract; **H.** Tepal; **I.** Male flower; **J.** Female flower; **K.** Gall flower.

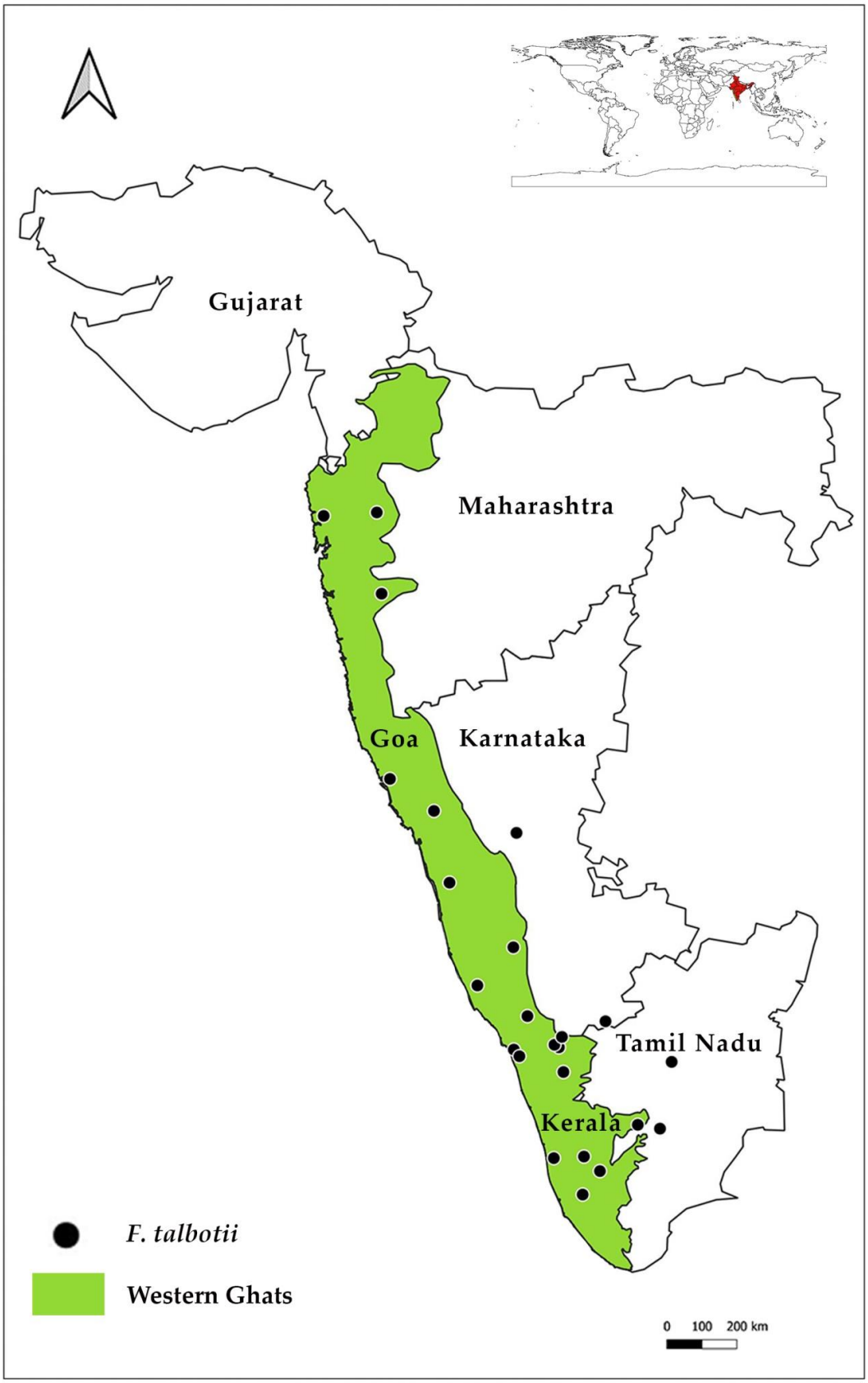


Fig. 3.93. *Ficus talbotii* King - Distribution map.

Uses: The decoction or powder of bark is used for the treatment of various diseases. The decoction is taken with honey for the treatment of phlegm, ulcers, burning sensations, diarrhoea etc. (Rama Rao, 1914).

Notes: The species is so far reported from the southern parts of India only. Sudhakar and Murthy (2017) reported the species from the Andaman and Nicobar Islands. King (1890) mentioned the number of lateral veins between 6–9 pairs. In the present study the number of veins is recorded as 11–16 pairs. Similarly, all parts of the plant were noted glabrous (King, 1890), as per our observation the stipules were found to be sericeous. Male flowers were recorded sessile in few literatures (King, 1890; Sudhakar & Murthy, 2017) they were found to be pedicellate in the present study.

Specimens examined: India, **Andaman and Nicobar Islands,** North Andaman District, Digilpur Forest Division, way to Kalpang Hydroelectric Dam site, 215 m, 15 March 2016, *J.V. Sudhakar 120050* (MH). **Karnataka,** Belagavi District, Gubbia, near Yadur, 21 May 1962, *R. Sundara Raghavan 80853* (BSI). Chamarajanagar District, Nirdurfi road, B. R. T. Wild Life Sanctuary, 17 December 2016, *J. Jayanthi 203589* (BSI). Hassan District, Sakleshpur, 28 April 1905, *C.A. Barber 7071* (MH). Shimoga District, Kargal, 25 November 1895, *W.A. Talbot 3519* (BSI). Uttar Kannada District, Sambam, 05 January 1893, *W.A. Talbot 2863* (BSI); *s.loc.*, 25 November 1895, *s.coll. 3519* (BSI). **Kerala,** Idukki District, Moolamattom, 125 m, 18 February 1982, *C.N. Mohanan 73358* (MH); Karadikkavala, P. T. R., 1200 m, 19 August 1994, *Jomy Augustine 13915* (KFRI); Vellapara, C. W. S., 1100 m, 03 January 1996, *K.K. Sajeev 17233* (KFRI). Kannur District, Thirunelli R. F., 825 m, 09 August 1979, *V.S. Ramachandran 62772* (MH). Kasaragod District, Parappa, 300 m, 08 May 1982, *V.J. Nair 71089* (MH). Kottayam District, Udayanapuram, 09 October 2019, *Sreehari S. Nair 12922* (MESAH). Kozhikode District, Pattarpalam, 18

September 1978, *C.R. Suresh & K.S. Manilal 21737* (CALI); Kunnamagalam, *s.d., V.V. Sivarajan 1609* (CALI). Palakkad District, Mukkali forest, 322 m, 27 November 1973, *E. Vajravelu BSI(SC) 44847* (HIFP); Mukkali, 675 m, 08 May 1982, *E. Vajravelu 44847* (MH & HIFP). Wayanad District, Kuppadi, 24 October 2020, *Sreehari S. Nair & P.J. Ebin 12967* (MESAH). **Maharashtra,** Pune District, Ambavane to Saltan, on way side near Madagaon, 27 March 1964, *B. Venkata Reddi 96089* (BSI). **Tami Nadu**, Namakkal District, Namakkal Taluk, Kolli Hills, Ghat road, Hair pin bend 68, 21 December 1979, *K.M Matthew 25340* (L). Dindugal District, Sirumalais, 29 August 1959, *J. Pallithanam JP 4970* (BLAT). Madurai District, Thandikudi, 1500 m, 30 July 1965, *K.M. Sebastine 25035* (MH). Nilgiri District, Arottuparai, near Hope estate, 30 July 1970, *J.L. Ellis 34875* (MH); Nadukani, 825 m, 20 November 1972, *E. Vajravelu 42868* (MH); Mudumalai W. L. S., Nellikarai, 1000 m, 18 December 1991, *D. Stephen 98060* (MH). Vellore District, Mangalam R. F., Yelagiri Hills, 1025 m, 10 December 1984, *M.B. Viswanathan 622* (MH). **Uttar Pradesh,** Firozabad District, Tundla, 23 April 1963, *K.C. Kanodia 88228* (BSI). Shahjahanpur District: Astoli, 1897, *W.A. Talbot 3825* (BSI).

3.6.31. *Ficus tinctoria* G. Forst.

Ficus tinctoria G. Forst., Prod. Fl. Austr. 76. 1786; Willd., Sp. Pl. 4: 1142. 1806; Miq., London J. Bot. 7: 436. 1848, t. 6-B; Ann. Mus. Bot. Lugd.- Bat. 3: 293. 1867; Elmer, Leafl. Philipp. Bot. 4: 1314. 1911; Corner, Gard. Bull. Singapore 17: 475. 1960; 21: 74. 1965.

3.6.31a. *Ficus tinctoria* subsp. *gibbosa* (Blume) Corner.

Ficus tinctoria G. Forst. subsp. *gibbosa* (Blume) Corner, Gard. Bull. Singapore 17: 476. 1960; B.D. Sharma *et al.,* Fl. Karnataka: Analysis 260. 1984; V. Chithra in A.N. Henry *et al.,* Fl. Tamil Nadu Ind., Ser I: Analysis 2:

255. 1987; M. Mohanan & A. N. Henry, Fl. Thiruvanthapuram 433. 1994; V. Mudgal *et al.,* Fl. Madhya Pradesh 2: 624. 1997; Wu *et al.,* Fl. China 5: 60. 2003; Sasidh. & Sivar., Bio. Docu. Kerala part 6: Flow. Plant. 441. 2004; Fl. Karnataka. A Check List 2: 509. 2019. *Ficus gibbosa* Blume, Bijdr. 466. 1825; Ann. Mus. Bot. Lugd.-Bat. 3: 276. 1867; Fl. Brit. India 5: 496. 1888; Corner, Gard. Bull. Singapore 21: 74. 1965. *Ficus reticulata* Thunb., Diss. Fic. 6: 12. 1786. **Type:** Indonesia, Java, *s.d. C.P. Thunberg s.n.* (Type- UPS, V-143622).

Ficus cuneata Blume, Bijdr. 465. 1825, non Hoffmanns 1826. *Ficus gibbosa* Blume var. *cuneata* (Blume) Miq., Fl. Ind. Bat. 1, 2: 308. 1859; Ann. Mus. Bot. Lugd.-Bat. 3: 276. 1867. **Type:** Indonesia, Java, *s.n. C. L. Blume 2040d* (Type- L, L 0040085!).

Ficus rigida Blume, Bijdr. 465. 1825, non Jack 1822. *Ficus gibbosa* Blume var. *rigida* (Blume) Miq., Ann. Mus. Bot. Lugd.-Bat. 3: 276. 1867. *Ficus gibbosa* Blume var. *rigida* (Blume) Valeton in Koord. & Valeton, Bijdr. Boomsoort. Java 11: 171. 1906, nom. homon., illeg.; Koord., Atlas Baumart. Java 4. 1918. t. 757. *Ficus tinctoria* G. Forst. subsp. *gibbosa* (Blume) Corner var. *rigida* (Miq.) Corner, Gard. Bull. Singapore 17. 476. 1960. **Type:** Indonesia, Java, *s.d. C. L. Blume s.n.* (Type- L, L 0040347!).

Ficus ampelos J. König ex Roxb., Fl. Ind. 3: 553. 1832, non Burm.f. 1768; King, Sp. Ficus 1: 6. 1887. **Type:** Not found.

Ficus tuberculata Roxb., Fl. Ind. 3: 554. 1832; Miq., London J. Bot. 7: 434. 1848; Ann. Mus. Bot. Lugd.-Bat. 3: 293. 1867. *Ficus gibbosa* Blume var. *tuberculata* (Miq.) King, Sp. Ficus 1: 6, t. 2b. 1887. **Type:** Not found.

Ficus irregularis Steud., Nomencl. Bot. ed. 2,1: 636. 1840. **Type:** Not found.

Ficus pereng Steud., Nomencl. Bot. ed. 2,1: 637. 1840. **Type:** Not found.

Urostigma volubile Dalzell in Dalzell & A. Gibson, Bombay Fl. (1861) 242. — *Ficus volubilis* (Dalzell) King, Sp. Ficus 2 (1888) 185. **Type:** Not found.

Ficus rhomboidalis H. Lév. & Vaniot, Mem. Real Acad. Ci. Barcelona 6: 153. 1907, non Vahl 1805. **Type:** China, Guizhou Province:Environs de Hoang Ko Chou, 22 February 1899, *L. Martin 2560* (Type- E, E00275222!).

Ficus angustata Miq., London J. Bot. 7: 434. 1848; Ann. Mus. Bot. Lugd.-Bat. 3: 293. 1867. **Type:** India, Ind. Orient., *s.n. R. wight 860* (Type- U, U 0122259!).

Ficus gibbosa Blume var. *unigibba* Miq., Fl. Ind. Bat., Suppl. (1861) 430. **Type:** Indonesia; Sumatra; Padang, *s.d., s.coll. HB795* (Syntype- U, U 0122260!).

Fig. 3.94 – 3.96

Small tree, 3–5 m tall, usually epiphytic on rocks, aerial roots absent or few; bark smooth, pale yellow to pale brown; young twigs terete, solid, glabrous, pale brown; internode 1.1–3.4 cm long; latex milky, white. Stipule caducous, lanceolate, 0.4–0.6 x 0.1–0.2 cm, margins entire, apex narrowly acute, base truncate, glabrous, pale green. Petiole articulated, terete, canaliculate, 0.3–0.8 cm long, glabrous, pale green. Leaves simple, alternate, spiral; lamina asymmetric, lanceovate, 3.6–8.4 x 1.3–2.6 cm, margins entire, acumen 0.4–0.9 cm long, apex acuminate, base oblique to cuneate, glabrous, pale green when young, green on maturity, subcoriaceous, venation brochidodromous; basal veins 3–4, lateral veins 3–4 pairs, wax glands on the axil of the basal lateral nerves. Receptacles axillary, paired, dioecious, pedunculate; peduncle 0.5–0.9 cm long, strigulose, pale green to yellow; basal bracts absent.

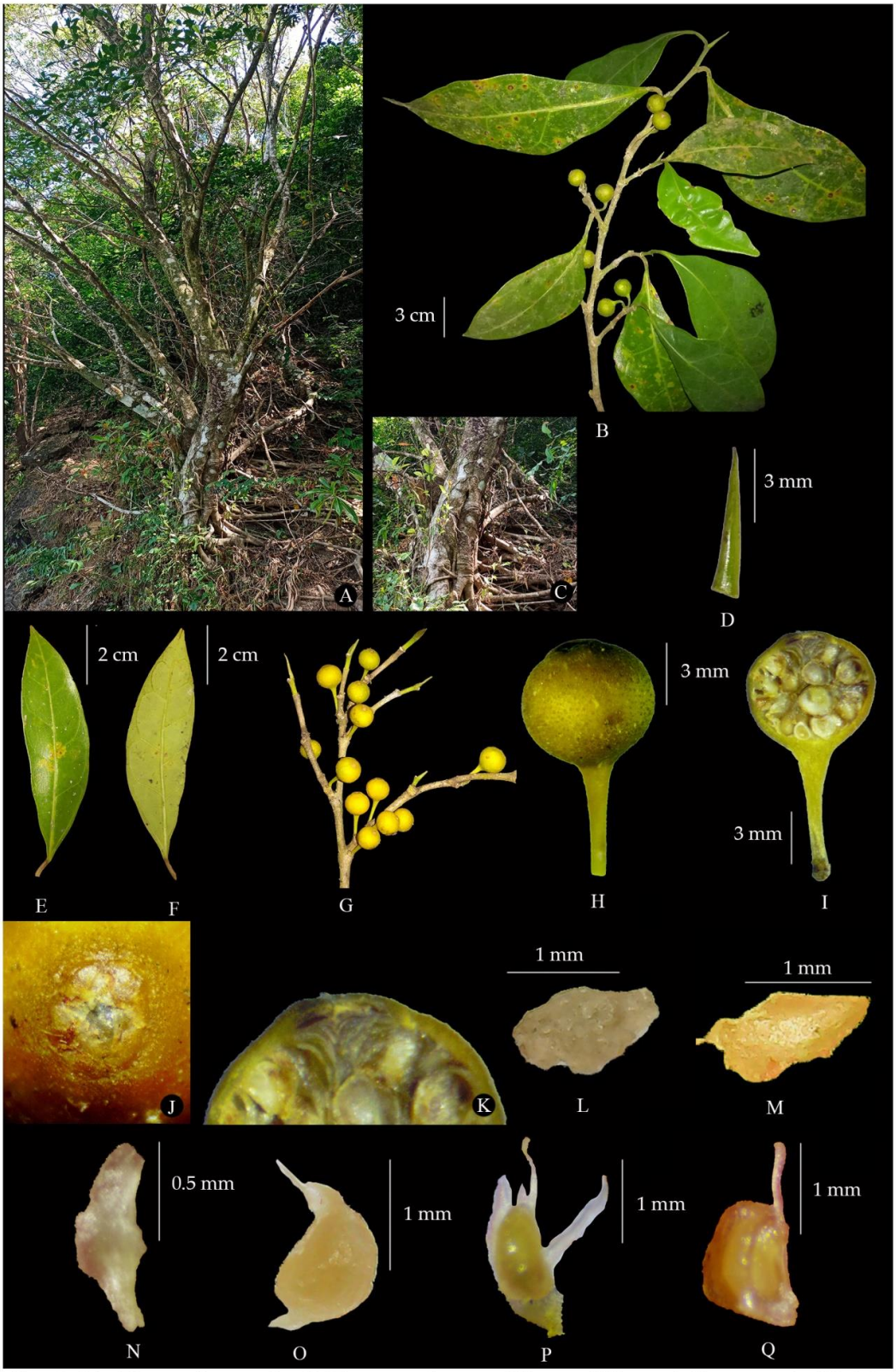


Fig. 3.94. ***Ficus tinctoria*** G. Forst. subsp. ***gibbosa*** (Blume) Corner: **A.** Habit; **B.** Twig; **C.** Bark; **D.** Stipule; **E.** Leaf adaxial side; **F.** Leaf abaxial side; **G.** Receptacles; **H.** Syconium; **I.** Syconium L. S.; **J.** Ostiole; **K.** Ostiolar L. S.; **L.** Outer ostiolar bract; **M.** Inner ostiolar bract; **N.** Tepal; **O.** Male flower; **P.** Female flower; **Q.** Gall flower.

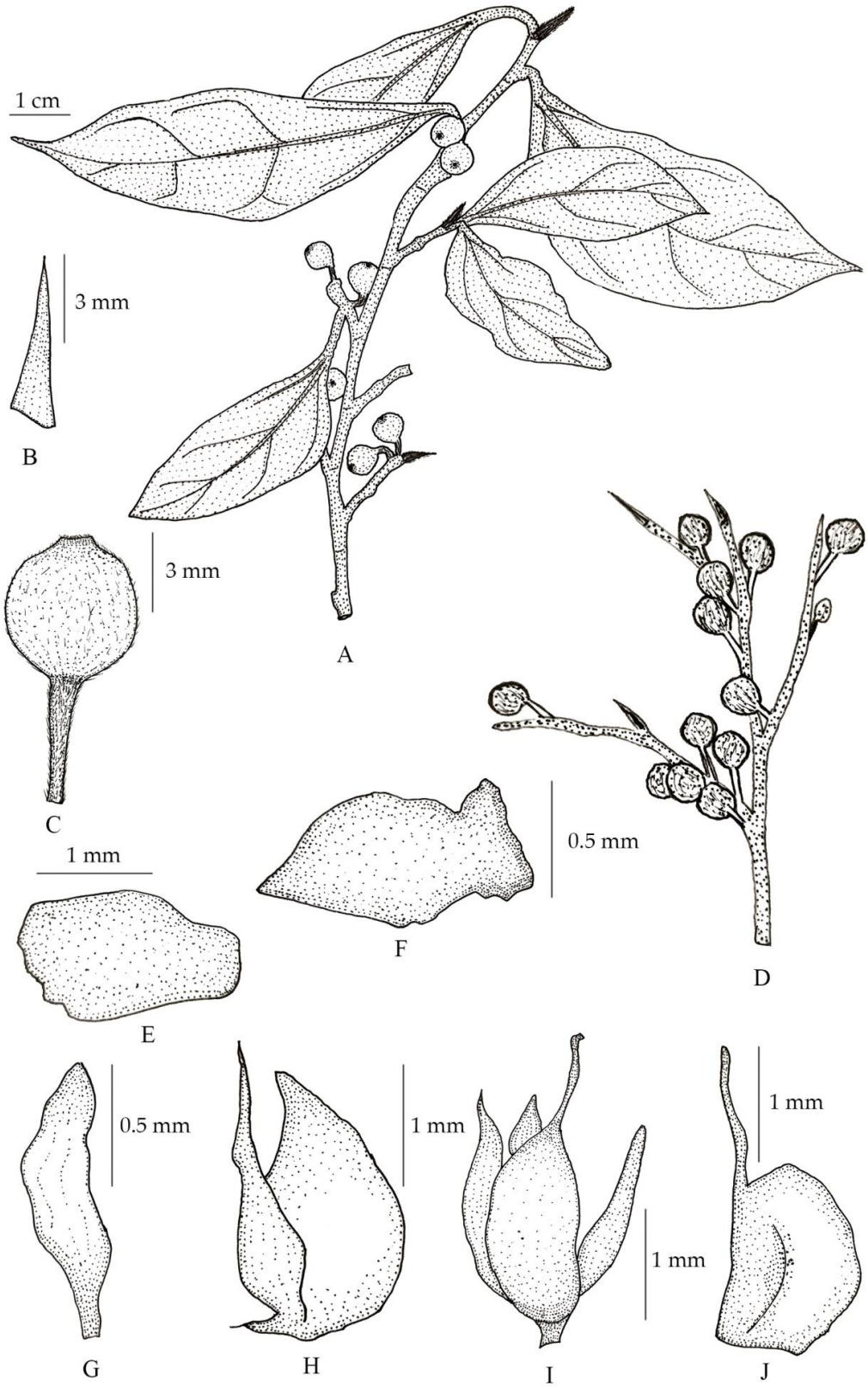


Fig. 3.95. ***Ficus tinctoria*** G. Forst. subsp. ***gibbosa*** (Blume) Corner: **A.** Twig; **B.** Stipule; **C.** Syconium; **D.** Receptacles; **E.** Outer ostiolar bract; **F.** Inner ostiolar bract; **G.** Tepal; **H.** Male flower; **I.** Female flower; **J.** Gall flower.

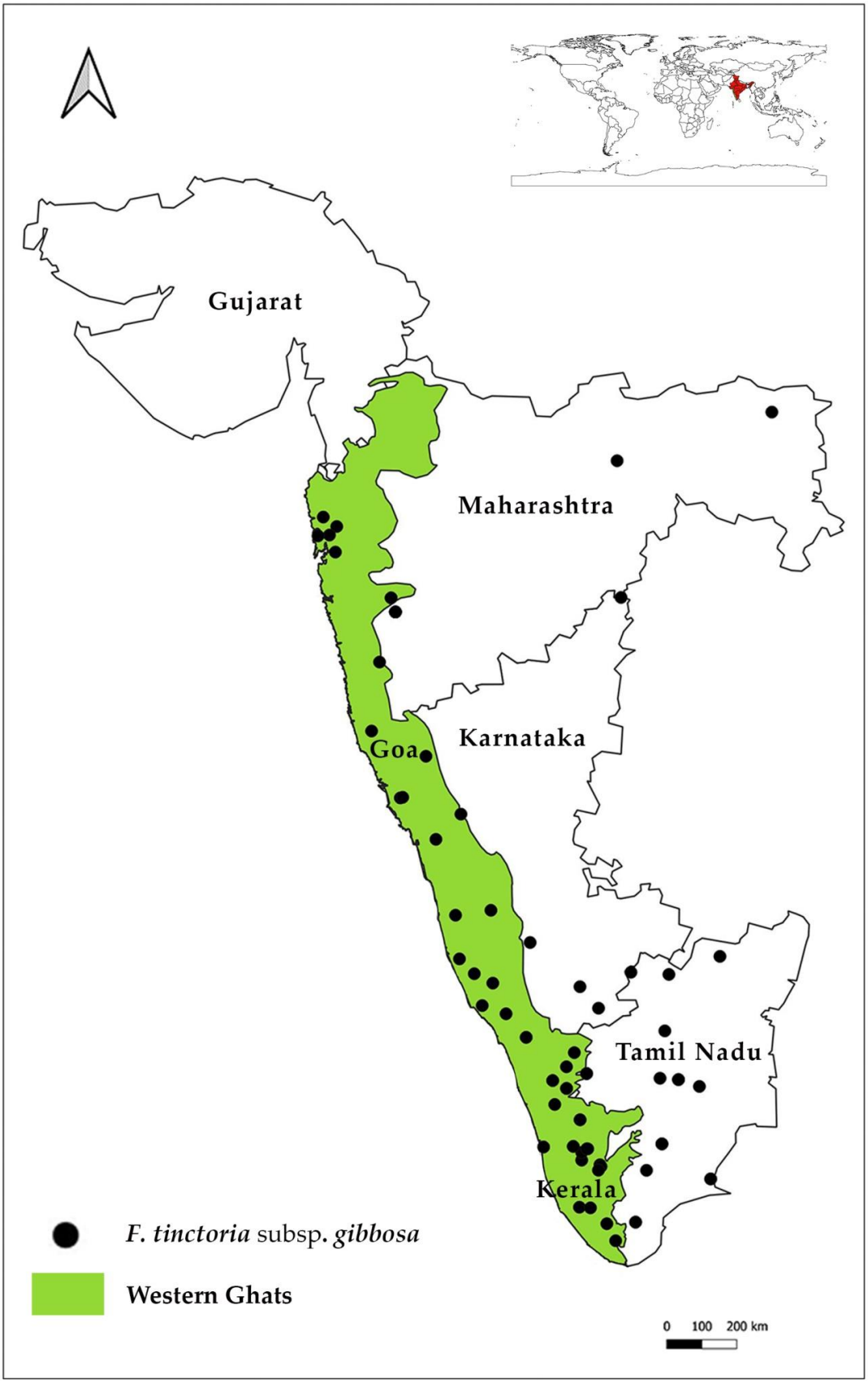


Fig. 3.96. *Ficus tinctoria* G. Forst. subsp. *gibbosa* (Blume) Corner- Distribution map.

Syconium 0.5–0.7 cm across, globose, scabrous, green when young, yellow when mature. Ostiole 0.5–1.0 mm; outer ostiolar bracts present, free, widely ovate, 1.0–1.2 mm long, glabrous, pale-yellow; inner ostiolar bracts present, free, lanceolate, 1.0 mm long, glabrous, pale-yellow. Male flowers near ostiole, 1.5 mm long, sessile; tepals 3–4, free, 1.0 mm long, lanceolate, white, glabrous; stamen 1, anther 1.0 mm long, filament 0.5 mm long. Female flowers near the base, 2.0 mm long, sessile; tepals 4–6, free, 1.5 mm long, lanceolate, glabrous, white; stigma short, 0.1–0.2 mm long; style 0.5 mm long; ovary 1.2 mm long, obovoid, glabrous, yellow. Gall flowers 2.0 mm long; sessile; tepals 4–6, free, 1.5 mm long, lanceolate, glabrous, white; stigma blunt, 0.1 mm long; style 0.5 mm long; ovary 1.2 mm long, obovoid, glabrous, pale-yellow. Achenes 0.6–1.0 mm, ellipsoid, pale yellow.

Local names: *Itthi* (Mal.); *Gudumittemara* (kan.); *Kaliatthi* (Tam.)

Common names: Dye fig.

Flowering and fruiting: Two to three times a year.

Distribution: India, China, Indonesia, Sri Lanka, Philippines.

Habitat: Evergreen to moist deciduous forests.

IUCN status: Least Concern (LC).

Etymology: The species might have named 'tinctoria' as it is called 'dye fig'. The leaves are bulged in nature and the epithet 'gibbosa' mostly refers to this condition of the leaves.

Uses: The leaves are used as fodder for animals (Sudhakar *et al.,* 2017). Leaves are used in the treatment of jaundice and diarrhoea (Lansky and Paavilainen, 2011).

Notes: This is a highly variable species and one of the most widely distributed species of *Ficus.* Corner (1960a) opined that the subspecies within *F. tinctoria* are highly mixed in their distribution pattern. As the differences are confusing, these subspecies tend to follow a continuous series. Identification keys were provided for the taxa up to variety level (Corner, 1965a). Considering the character differences as only variations, a large number of taxa were merged under *F. tinctoria* subsp. *gibbosa* (Berg & Corner, 2005).

Urostigma excelsum Miq., was treated as a synonym of *F. tinctoria* subsp. *gibbosa* (Berg & Corner, 2005). On observing the protologue and the type specimen it was found that the taxa have sessile figs. The figs in *F. tinctoria* are pedunculate. Hence, *Urostigma excelsum* Miq. is not considered here as a synonym of *F. tinctoria* subsp. *gibbosa.*

Specimens examined: India, **Andhra Pradesh,** Alluri Sitharama Raju District, Paderu, 24 March 1956, *S.K. Wagh SKW 2274* (BLAT). Guntur District, Lottasila, Rekularam Beat, 387 m, 03 February 1916, *L. Rasingam, J. Swamy & S. Nagaraju 6658* (BSID). Kadapa District, Nityapooja Kona, Vanthotipalli, 305 m, 07 October 1916, *J. Swamy & S. Nagaraju 9020* (BSID). **Goa,** South Goa District, Sidh Forest, near Bhati, *19 March 1964, K.C. Kanodia* 96352 (BSI); Talouli Sanguem, *21 April 1966, John Cherian* 109021 (BSI). **Karnataka,** Belgaum District, Yadsur, Kavaledurga, 11 February 1963, *R. Sundara Raghavan 86021* (BSI). Yedur District, 22 March 1964, *R. Sundara Raghavan 97094* (BSI). Chikkamagaluru District, Kesarike road, 15 May 1959, *R.K. Arora 55178* (BSI). Hassan District, Bisle ghat, 08 January 1958, *S.D. Mahajan 34824* (BSI). Kodagu District, Bhagamandala, 10 March 1960, *R.K. Arora 61559* (BSI). Mysore District, Bannur, 02 June 1958, *G.S. Puri 37655* (BSI). Shimoga District, Thirthahalli, towards Shimoga road, 22 June 1961, *R.*

Sundara Raghavan 74280 (BSI). Uttar Kannada District, Mundgod, 1883, *s.coll. s.n.* (BSI); Kumta, Mirzan, 13 March 1957, *S.K. Jain 16568* (BSI). **Kerala**, Alappuzha District, Aroor, sea level, 07 May 1993, *C.N. Sunil 1586* (CALI). Idukki District, Thekkady, 850 m, 28 September 1972, *B.D. Sharma 42087* (MH); Anjurili, 875m, 05 October 1972, *B.D. Sharma 73265* (MH); Anjurilii – Thekkady, 875 m, 05 October 1972, *B.D. Sharma 42417* (MH); Mullakudy, 850 m, 14 March 1973 ,*B.D. Sharma 43849* (MH); Kumily, 825 m, 24 December 1974, *K. Vivekananthan 45680* (MH); Meenmutty, 600 m, 15 February 1982, *C.N. Mohanan 73265* (MH); Thekkady, 900 m, 20 October 1993, *Jomy Augustine & N Sasidharan 12544* (KFRI & CALI); Mlappara, P. T. R., 1000 m, 24 October 1993, *Jomy Augustine 12612* (KFRI); Vagamon, 1680 m, 14 August 2021, *Sreehari S. Nair 12159* (MESAH). Kannur District, kumbala, 50 m, 03 June 1980, *R. Ansari 67966* (MH); Bekalam, 125 m, 20 December 1980, *R. Ansari 69920* (MH); Thaliparambu, 125m, 20 December 1980, *R. Ansari 69926* (MH). Kollam District, Choodal, Shenduruny W. L. S., 200 m, 10 January 1993, *Sasidharan 10200* (KFRI). Kottayam District, Peerumade, 1000 m, 24 January 1965, *K. Vivekananthan 22992* (MH). Palakkad District, Ayyappan Kovil, 950 m, 04 March 1975, *E. Vajravelu 46177* (MH); Kallamalai Area, 575 m, 13 March 1975, *E. Vajravelu 46291* (MH); way to Varadymalai (Varadimalai), 950 m, 19 April 1978, *P. Bhargavan 56916* (MH); below Ayyappan Kovil, 875 m, 13 February 1979, *E. Vajravelu 60415* (MH); Agali forest, 575 m, 17 October 1965, *E. Vajravelu 26298* (MH); Anthathode; 700 m, 19 December 1969, *E. Vajravelu 33141* (MH). Thiruvananthapuram District, Bonaccord, 700 m, 22 May 1979, *M. Mohanan 63213* (MH); Ponmudi, 803 m, 22 December 2021, *Sreehari S. Nair 12166* (MESAH). Thrissur District, Sholayar, 725 m, 17 April 1989, *Sasidharan 5414* (KFRI); *ibid.*, 650 m, 16 January 2008, *K.H. Amitha Bachan 117755* (CALI); Ambalappara, Sholayar, 16

February 2021, *Sreehari S. Nair 12136* (MESAH). Wayanad District: Appapara, 17 April 1993, *A. Nazarudean 16470* (TBGT); Vythiri, 650 m, 05 February 2001, *M.K. Ratheesh Narayanan 1416* (CALI). **Maharashtra**, Bhandara District, Ringapar, 07 December 1977, *S.K. Malhotra 151094* (BSI). Mumbai District, Borivali to Kavery caves, 31 January 1942, *H. Santapau 825* (BLAT); *ibid.,* 31 January 1942, *H. Santapau 826* (BLAT); Borivali National Park, 02 August 1952, *Bhargavi BA966* (BLAT); *ibid*, 03 November 1954, *P.S. Herbert SH275* (BLAT); *ibid.,* 08 November 1954, *P.S. Herbert SH301* (BLAT); Malad, 04 March 1955, *G.L. Shah Shah1800* (BLAT); Borivali National Park, 05 April 1955, *P.S. Herbert SH701* (BLAT); Worli hill, Bombay, 29 May 1956, *R.R. Fernandez R2702* (BLAT); Borivali National Park, 31 August 1956, *R.R. Fernandez R2710* (BLAT); *ibid.,* 27 October 1956, *P.S. Herbert SH2599* (BLAT); Malad hills, 19 October 1957, *G. L. Shah Shah9334* (BLAT); near U7, towards Borivali road, 27 November 1957, *S.C. Tavakari T 236* (BLAT); Malad, Quary hills, 26 September 1958, *G.L. Shah Shah9991* (BLAT). Pune District, Purandar, top of Vazirgael, 20 July 1963, *Seshagiri Rao Rolla 88644* (BSI); Purandhar, December 1917, *s.coll. 25413* (BLAT); *ibid.,* January 1918, *s.coll. 25374* (BLAT). Ratnagiri District, Khadi, January 1922, *R.D. Aclaud ACK1150* (BLAT). Satara District, Khandala, 24 January 1943, *H. Santapau 1566* (BLAT); Khandala, Forbay slopes, 03 November 1944, *H. Santapau 5482* (BLAT); Khandala and neighbourhood, 21 November 1948, *H. Santapau 9612* (BLAT); *ibid.,* 21 November 1948, *H. Santapau 9613* (BLAT); *ibid.,* 27 December 1949; *H. Santapau 10615* (BLAT); *ibid.,* 27 December 1949, *H. Santapau 10609* (BLAT); *ibid.,* 27 December 1949, *H. Santapau 10610* (BLAT); *ibid.,* 27 December 1949, *H. Santapau 10611* (BLAT); *ibid.,* 27 December 1949, *H. Santapau 10612* (BLAT); *ibid.,* 27 December 1949, *H. Santapau 10613* (BLAT); *ibid.,* 27 December 1949, *H. Santapau 10614* (BLAT); *ibid.,* 27 December 1949,

H. Santapau 10616 (BLAT); near Khandala tank, 09 March 1962, *Seshagiri Rao Rolla 78903* (BSI); Khandala, March 1917, *s.coll. 25431* (BLAT). Thane District, Ghodbunder, 23 January 1954, *H. Santapau 17924* (BLAT); Mandvi, 10 December 1960, *N.Y. Das NYD2932* (BLAT). **Odisha,** Anugul District, Tulka section, 163 m, 14 October 1914, *K.C. Mohan 5652* (BSID). **Tamil Nadu,** Coimbatore District, Udumpanparai, Anamalais, 22 November 1901, *C.A. Barber 4089* (MH); *s.loc.*, 3500 ft, 29 July 1930, *V. Narayana Swami 3921* (MH); Kottady (Kottadi), 3500 ft, 11 March 1931, *K. Cherian Jacob 285* (MH); Foot of Ezhuvari, on the way to Kozhukumalai, 640 m, 27 March 1963, *C.P. Sreemadhavan CPS493* (MH). Coonoor District, Coonoor to Burliyar (Barlyar), 30 December 1902, *C.A. Barber 5399* (MH). Kanyakumari District, Forest near Kalikesan river, Balamore, 700 m, 30 August 1976, *A.N. Henry 48139* (MH). Karur District, Devarmalai – Elachipalayam, 810 m, 06 June 2008, *P. Satyanarayana 125430* (MH). Krishnagiri District, Kodagarai, Poojari hamlet, 16 February 1990, *T. Ravi Shankar 84120* (MH & BSID). Madurai District, on the way to highway mountain near check post, 13 July 1991, *V. Lakshamanan 95249* (MH); Aruna Estate, 1500 m, 28 April 1960, *B.V. Shetty 10322* (MH). Nilgiri district, Kallar (Kullar), 1500 ft, September 1883, *J. S. Gamble 12764* (MH); Athipalli (Tehipalli), 2800 Ft, 13 August 1929, *V. Narayana Swami 18787* (MH); Sholur, 1700 m, 23 April 1971, *N.C. Rathakrishnan 38038* (MH). Ramanathapuram District, Nagarear Estate, Seithur hills, 1200 m, 14 March 1980, *S.R. Srinivasan 65940* (MH); Kudupudi (Kuduvapodai), Seithur hills, 600 m, 17 March 1980, *S.R. Srinivasan 65975* (MH). Salem District, Valavanthi Road, 1310 m, 06 May 1965, *S. Karthikeyan 26836* (MH). Tiruchirappalli District, Kollimalai, 31 October 1914, *s.coll. 11363* (MH). Tirunelveli District, Thirukkurungudi, Trulukkamparai, 525 m, 16 February 1972, *S. Karthikeyan 40135* (MH); Near Agastyar peedam, 950 m, 26 April 1992, *R. Gopalan 99404*

(MH); Between the boundary of Sivagiri and Sethur Hills, down to Kallimalai Estate, 900 m, 24 April 1989, *S.R. Srinivasan 89572* (MH & (BSID). Vellore District, Slope of Konamalai, 670 m, 25 April 1963, *C.P. Sreemadhavan CPS566* (MH). Virudhunagar District, Chinnapachaiyar Estate, 1150 m, 24 February 1992, *S.R. Srinivasan 98386* (MH & (BSID).

3.6.31b. *Ficus tinctoria* subsp. *parasitica* (Willd.) Corner

Ficus tinctoria subsp. *parasitica* (Willd.) Corner, Gard. Bull. Singapore 17: 476. 1960; 21: 75. 1965. *Ficus parasitica* J. König ex Willd., Mém. Acad. Roy. Sci. Hist. (Berlin) 2: 102, t.3. 1801; Vahl, Enum. Pl. 2: 188. 1805; Miq., London J. Bot. 7: 433. 1848; Ann. Mus. Bot. Lugd.- Bat 3: 276, 292. 1867. *Ficus gibbosa* Blume var. *parasitica* (Willd.) King, Sp. Ficus 1: 6, t. 2b. 1887; H. Santapau, Fl. Khandala 256. 1953; Corner in Dass. & Forsb., Rev. Handb. Fl. Ceylon 3: 276. 1981; Manilal & Sivar., Fl. Calicut 276. 1982; A. K. Mukherjee, Fl. Pachmarhi & Bori Reserves 284. 1984; B.D. Sharma *et al.,* Fl. Karnataka: Analysis 260. 1984; C.J. Saldanha, Fl. Karnataka 1: 120. 1984; D.M. Verma *et al.,* Fl. Raipur, Durg & Rajnandgaon 359. 1985; R. S. Rao *et al.,* Fl. Goa, Diu Daman Dadra & Nagar haveli 2: 410. 1986; V. Chithra in A.N. Henry *et al.,* Fl. Tamil Nadu Ind., Ser I: Analysis 2: 255. 1987; B.G. Kulkarni, Fl. Sindhudurg 420. 1988; N.P. Singh, Fl. Eastern Karnataka 2: 588. 1988; Lakshmin. & B.D. Sharma, Fl. Nasik Dist. 441. 1991; Sasidh. & Sivar. Fl. Pl. Thrissur For. 430. 1996; Sivar. & Mathew, Fl. Nilambur 669. 1996; V. Mudgal *et al.,* Fl. Madhya Pradesh 2: 624. 1997; S.K. Murthi & Panigrahi, Fl. Bilaspur Dist. 2: 569. 1999; N.D. Paria & S.P. Chattopadhyay, Fl. Hazaribagh Dist. 1: 87. 2000; N.P. Singh *et al.,* Fl. Maharashtra Dicot 2: 942. 2001; T.K. Sarma & A.K. Sarkar, Fl. Palamau Dist. Jharkhand 581. 2002; Mohanan & Sivadasan, Fl. Agasthyamala

636. 2002; K.G. Bhat, Fl. Udupi 597. 2003; Sasidh. & Sivar., Bio. Docu. Kerala part 6: Flow. Plant. 441. 2004; Anil Kumar *et al.,* Fl. Pathanamthitta 466. 2005; Sunil & Sivadasan, Fl. Alappuzha Dist. 666. 2009; Mandar & Lakshmin., Fl. Bhagwan Mahavir 230. 2013; S. G. Pradhan *et al.,* Fl. Sanjay Gandhi National Park 3: 576. 2005; K.M. Chetty *et al.,* Fl. Pl. Chittoor Dist. 334. 2008; Ficus sp. Madhya Pradesh 61. 2019; P. Lakshmin. *et al.,* Fl. West Bengal 665. 2019. **Type:** India, *s.loc.* 1795, *Koeing sn.* (Type-B, B -W 19305 -01 0!).

Ficus excelsa Vahl, Enum. Pl. 2: 195. 1805. **Type:** India*, s.d., J.G. König s.n.* (Type- C, C10006725!).

Ficus rhomboidalis Vahl, Enum. Pl. 2: 199. 1805. **Type:** India, Tamil Nadu, *s.d. J. P. Rottler s.n.* (Type- C, C10006726!).

Ficus paradoxa Blume, Bijdr. 467. 1825. *Ficus gibbosa* Blume var. *latifolia* Miq., Ann. Mus. Bot. Lugd.-Bat. 3: 276. 1867. **Type:** Philippines, Java, *s.d., C.L. Blume s.n*. (Type- P, P06828535!).

Ficus sclerophylla Roxb., Fl. Ind. 3: 546. 1832; Miq., London J. Bot. 7: 434. 1848. **Type:** Not seen.

Ficus pervia Miq., London J. Bot. 7: 433. 1848; Ann. Mus. Bot. Lugd.-Bat. 3: 293. 1867. **Type:** Not seen.

Ficus cuspidifera Miq., London J. Bot. 7: 434. 1848; Ann. Mus. Bot. Lugd.-Bat. 3. 293. 1867. *Ficus gibbosa* Blume var. *cuspidifera* (Miq.) King, Sp. Ficus 1: 6, t. 2a. 1887. **Type:** Not seen.

Ficus subobliqua Miq., Ann. Mus. Bot. Lugd.-Bat. 3: 225. 1867. **Type:** Indonesia, Borneo, *s.d., P.W. Korthals s.n.* (Type- L 0040083!).

Ficus subobliqua Miq. var. *latiuscula* Miq., Ann. Mus. Bot. Lugd.-Bat. 3: 226. 1867. **Type:** Indonesia, Java, 1859, *J.E. Teijsmann s.n.* (Type- L, L 004008!).

Ficus clarkei King, Hook.f., Fl. Brit. India 5: 536. 1888; Ficus 2: 175, t. 221. 1888; Corner, Gard. Bull. Singapore 21: 98. 1965. **Type:** India, Meghalaya, Burney Hat, Khasia, 09 May 1885, *C.B. Clarke 38096B* (Type- CAL, CAL0000025697!).

Ficus pseudobotryoides H. Lév. & Vaniot, Feddes Repert. Spec. Nov. Regni Veg. 4: 67. 1907. **Type:** China, Guizhou Province:Lo-Fou, 01 April 1906, *P. Cavalerie 2734* (Type- E, E00275221!).

Fig. 3.97 – 3.99

Tree, 10–15 m tall, usually epiphytic on trees, aerial roots present; bark smooth, pale brown; young twigs terete, solid, pubescent, green–pale brown; internode 1.9–5.5 cm long; latex milky white. Stipule caducous, lanceolate, 1.2–2.0 x 0.2–0.4 cm, margins entire, apex narrowly acute, base truncate, strigulose, pale brown. Petiole articulated, canaliculate, terete, 1.0–3.0 cm, pubescent to hispid, green. Leaves simple, alternate, spiral; lamina asymmetric, lanceovate to elliptic, 5.0–11.9 x 2.9–6.0 cm, margins entire, sometimes dentate when young, acumen 0.3–0.7 cm long, apex acuminate, base oblique, hirtellous above and hispid below, pale green when young, green on maturity, subcoriaceous, venation brochidodromous; basal veins 3–4, lateral veins 5–7 pairs, wax glands at the axil of the basal lateral nerves. Receptacles axillary, paired or clustered, dioecious, pedunculate; peduncle 0.4–1.0 cm long, puberulent, pale green to yellow. Basal bracts present, persistent, 3, free, 1.0–1.2 mm long, ovate, pubescent, brown. Syconium 0.6–1.5 cm across, globose, pubescent, green when young, yellow when mature.

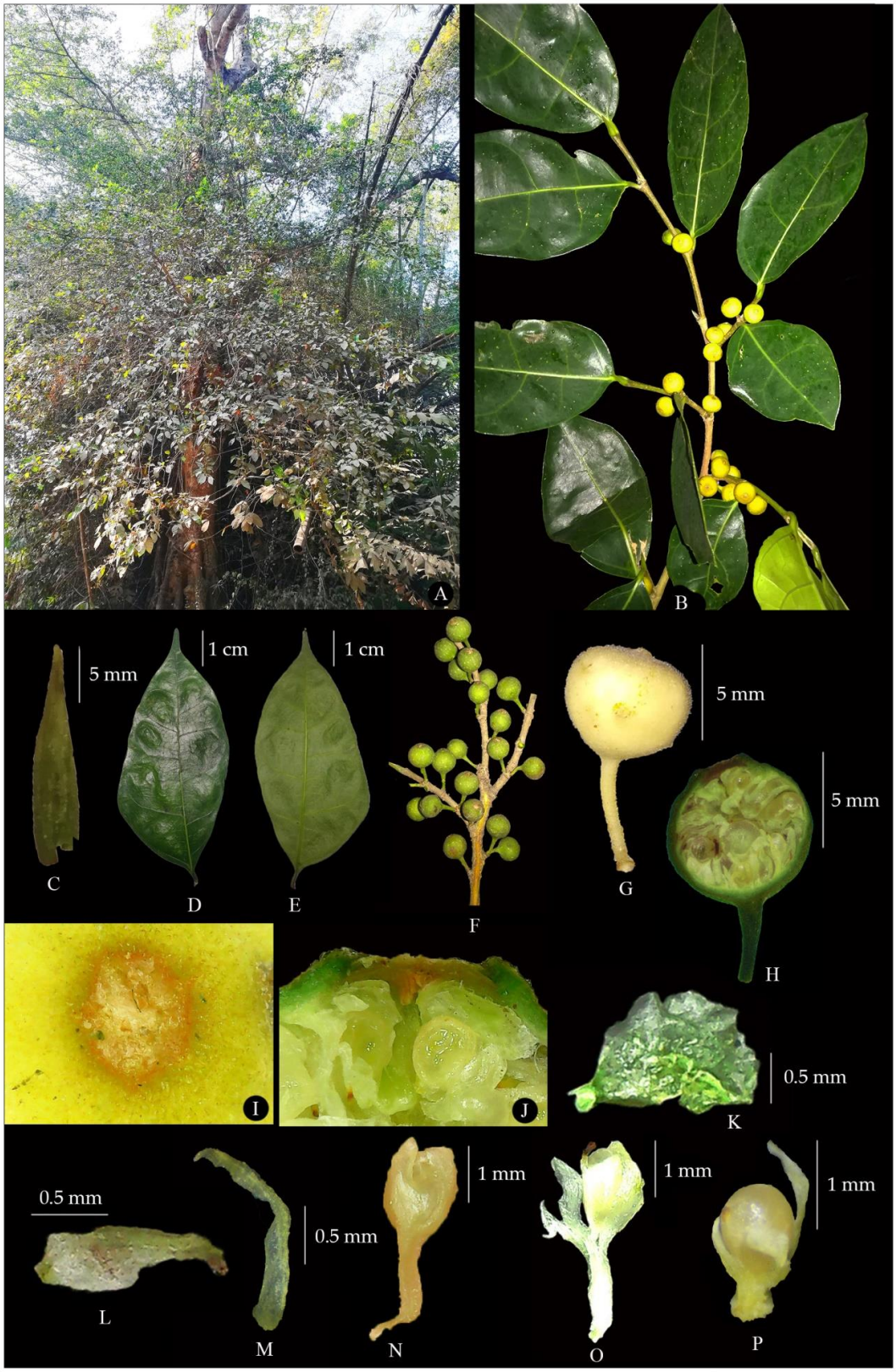


Fig. 3.97. ***Ficus tinctoria*** G. Forst. subsp. ***parasitica*** (Willd.) Corner: **A.** Habit; **B.** Twig; **C.** Stipule; **D.** Leaf adaxial side; **E.** Leaf abaxial side; **F.** Receptacles; **G.** Syconium; **H.** Syconium L. S.; **I.** Ostiole; **J.** Ostiolar L. S.; **K.** Outer ostiolar bract; **L.** Inner ostiolar bract; **M.** Tepal; **N.** Male flower; **O.** Female flower; **P.** Gall flower.

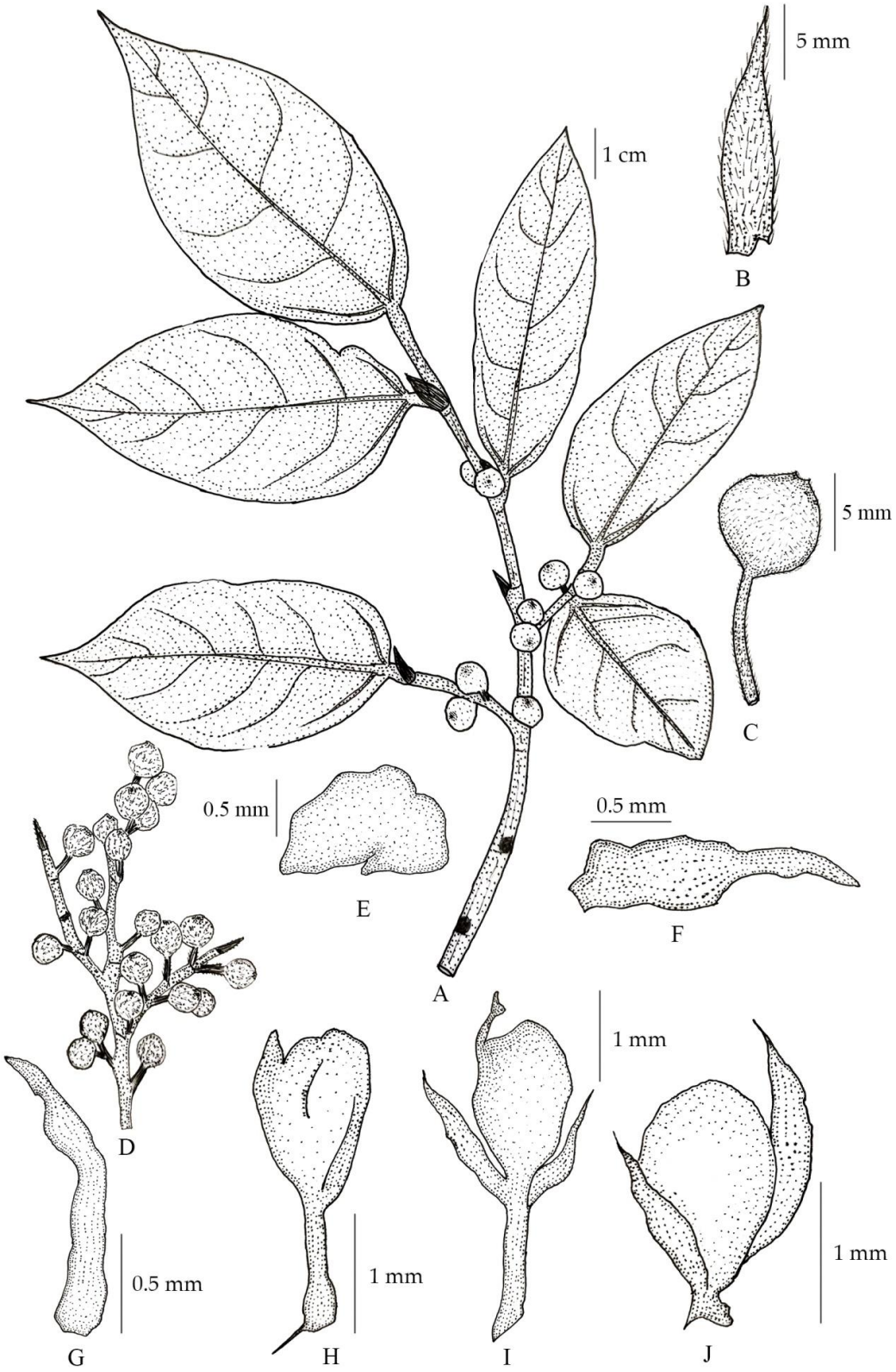


Fig. 3.98. ***Ficus tinctoria*** G. Forst. subsp. ***parasitica*** (Willd.) Corner: **A.** Twig; **B.** Stipule; **C.** Syconium; **D.** Receptacles; **E.** Outer ostiolar bract; **F.** Inner ostiolar bract; **G.** Tepal; **H.** Male flower; **I.** Female flower; **J.** Gall flower.

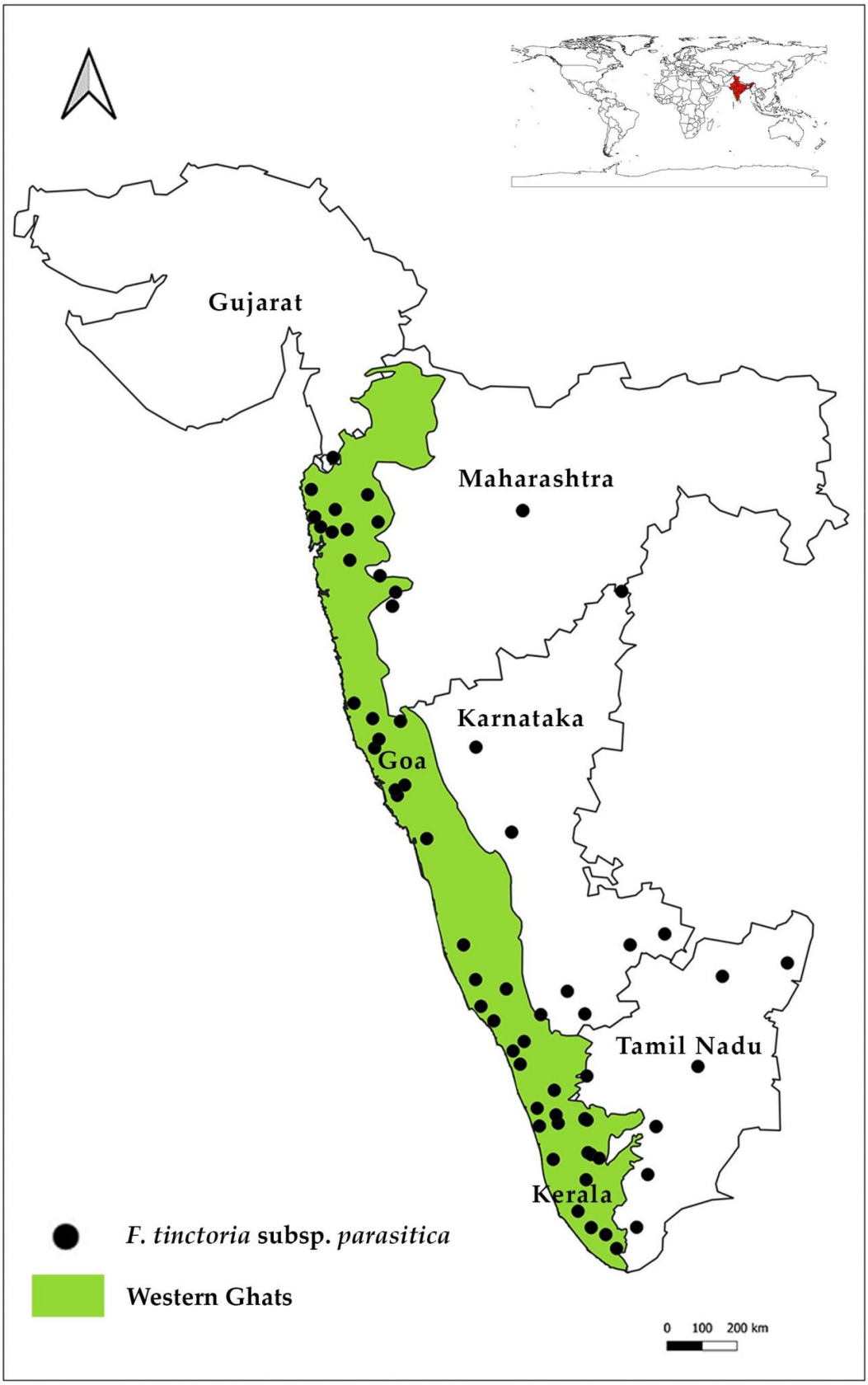


Fig. 3.99. *Ficus tinctoria* G. Forst. subsp. ***parasitica*** (Willd.) Corner: Distribution map.

Ostiole 1.0–3 mm; outer bracts present, free, widely ovate, 1–1.2 mm long, glabrous, yellow; inner bracts present, free, lanceolate, 1.5 mm long, glabrous, pale yellow. Male flowers near ostiole, 3 mm long, pedicellate; pedicel, 1.5 mm long; tepals 3, free, 1.5 mm long, lanceolate, glabrous, white to pale yellow; stamen 1, anther 1.2 mm long, filament 0.8 mm long. Female flowers near the base, 3 mm long, pedicellate; pedicel 1.8 mm; tepals 3, free, 1.5 mm long, lanceolate, glabrous, white to pale yellow; stigma bifid, 0.1–0.2 mm long; style 0.4 mm long; ovary 1.2 mm long, obovoid, glabrous, pale-yellow. Gall flowers 2 mm long, pedicellate; pedicel 0.5 mm long; tepals 3, free, 1.5 mm long, lanceolate, glabrous, white to pale yellow; stigma 0.1 mm long; style 0.3 mm long; ovary 1.5 mm long, obovoid, glabrous, pale-yellow. Achenes 1.0–1.2 mm, obovoid, pale yellow.

Local names: *Kallathi* (Mal.)

Common names: Dye fig.

Flowering and fruiting: Two to three times a year.

Distribution: Indo Malaysian regions.

Habitat: Semi evergreen and moist deciduous forests.

IUCN status: Least Concern (LC).

Etymology: The epithet 'parasitica' mostly denotes the epiphytic nature of the plant.

Uses: The leaves are used as fodder for cattle.

Notes: The taxon was of taxonomic complexity. It was treated as a synonym under *F. tinctoria* subsp. *gibbosa* (Berg & Corner, 2005). The taxon was suggested for detailed study in the previous literatures (Chaudhary *et al.*, 2012). Both *F. tinctoria* subsp. *gibbosa* and *F. tinctoria* subsp. *parasitica* were

recommended as separate taxa (Mahima, 2020). The characters were found to be consistently different in both the taxa according to the present study and is well supported with molecular evidences. Hence, both the taxa are presented here as distinct. The differential characters (Fig. 3.100) of both the taxa are presented in table 3.6.

Table 3.6. Comparison of characters of *F. tinctoria* subsp. *gibbosa* and *F. tinctoria* subsp. *parasitica*

Characters	*F. tinctoria* subsp. *gibbosa*	*F. tinctoria* subsp. *parasitica*
Habit	3–5 m height	10–15 m height
Aerial roots	Absent or few	Present
Young twigs	Glabrous	Pubescent
Internode	1.1–3.4 cm long	1.9–5.5 cm long
Stipule	Glabrous	Strigulose
Petiole length	0.3–0.8 cm long	1.0–3.0 cm long
Petiole indumentum	Glabrous	pubescent to hispid
No. of lateral veins	3–4 pairs	5–7 pairs
Syconium size	0.5–0.7 cm	0.6–1.5 cm
Male flowers	1.5 mm, sessile	3.0 mm, pedicellate
Female flowers	Sessile	Pedicellate

Specimens examined: India, **Andaman and Nicobar Islands,** South Andamans District, Little Andaman, East Coast, 3 m, 10 March 1959, *K. Thothathri 9272* (MH); Homfreyganj, 10 m, 14 April 1964, *J.L. Ellis 18788* (MH). **Andhra Pradesh**, Alluri Sitharama Raju District, Rampachodavaram,

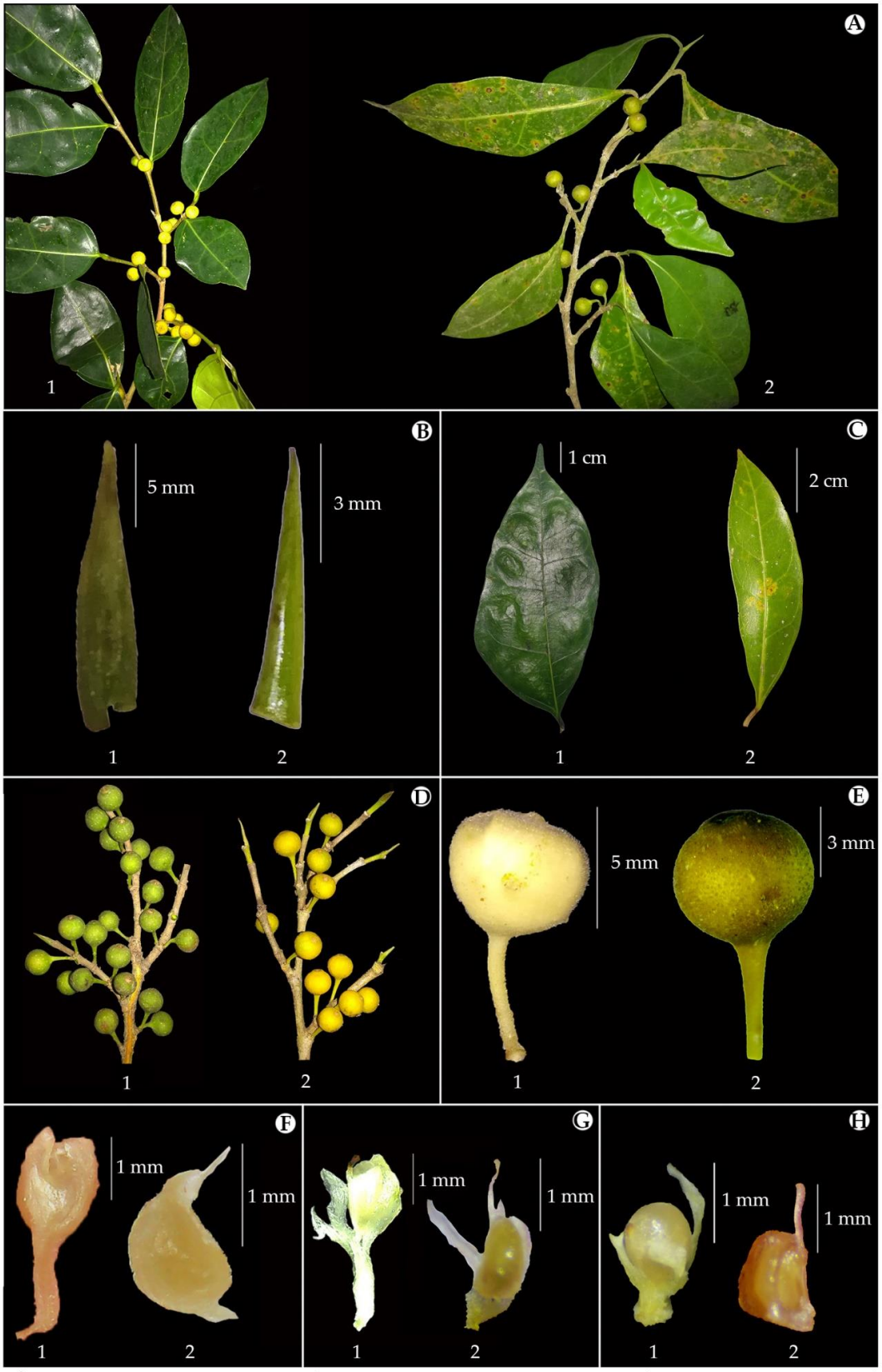


Fig. 3.100. Comparison between *Ficus tinctoria* subsp. *parasitica* and *Ficus tinctoria* subsp. *gibbosa*. **1.** *F. Ficus tinctoria* subsp. *parasitica*; **2.** *Ficus tinctoria* subsp. *gibbosa*. **A.** Twig; **B.** Stipule; **C.** Leaf; **D.** Receptacles; **E.** Syconium; **F.** Male flower; **G.** Female flower; **H.** Gall flower.

300 m, 28 June 1965, *G.V. Subba Rao 24473* (MH). Chittoor District, Eethakayala, Mandapam, 1050 m, 31 December 1975, *G.V. Subba Rao 46899* (MH); Bheematheertham, Tirumala hills, 700 m, 10 February 1987, *D. Ranga Charyulu 1173* (MH); Chamalmadugu, Thirumala, 800 m, 13 February 1987, *D. Ranga Charyulu 1241* (MH); Chillamimidi, B. Kota R. F., 490 m, 11 November 2000, *G.V.S. Murthy 111076* (BSID). East Godavari District, Maredumilli, Bodalur, 600 m, 17 December 1993, *M. Mohanan 100766* (MH & (BSID); Maredumilli, Mudurlanka, 600 m, 17 February 1994, *M. Mohanan 101251* (MH & (BSID); *ibid.*, 600 m, 17 February 1995, *M. Mohanan 101253* (MH & (BSID). Mahaboob Nagar District, Saleshwaram, 02 March 2014, *L. Rasingam 4663* (BSID). Prakasam District, Bommilingam, 778 m, 30 January 2009, *S. Khadar Basha & B. Sadasivaiah 32688* (BSID). Srikakulam District, Elwinpeta, 15 May 1957, *S.K. Wagh SKW6995* (BLAT); *ibid*, 15 May 1957, *S.K. Wagh SKW6996* (BLAT); *ibid.,* 15 May 1957, *S.K. Wagh SKW 6997* (BLAT); Visakhapatnam District, Cheru Konda, 1000 m 09 June 1968, *G.V. Subba Rao 301014* (MH); S kota towards Pinyagiri, 200 m, 23 December 1969, *G.V. Subba Rao 32778* (MH); Duggeru Forest, 250 m, 25 May 1979, *G.V. Subba Rao 62513* (MH). **Chattisgarh,** Dantewada District, Dantewada, 400 m, 30 August 1959, *K. Subramanyam 8709* (MH). **Goa,** Dadra and Nagar Haveli District, Nana Randha, 08 November 1970, *M.Y. Ansari 122096* (BSI). South Goa District, Ordaford, Canacano road, 19 April 1963, *K.C. Kanodia 88149* (BSI); Nadquem, 27 April 1966, *John Cherian 109083* (BSI); Mollem, 19 May 2002, *Mandar N. Datar 186321* (BSI). **Gujarat,** Dang District, Unai, northwards along Ambika River, Dang, 03 November 1953, *H. Santapau 17273* (BLAT). **Karnataka,** Belgaum District, Ramdurg, 15 February 1917, *s.coll.* 14387 (MH). Chamarajanagar District, Top of the hill - Hanumat Koil, Bandipur, 900 m, 26 January 1965, *B.D. Naithani* 23170 (MH). Hassan District, Sakleshpura, 16

December 1903, *C.A. Barber 6244* (MH); Kolar District, Ittikaldurg S. F., Bagepale, 06 January 1976, *N.P. Singh 142116* (BSI). Tumkur District, Nidgal S. F., Paragad, 09 January 1976, *N.P. Singh 142223* (BSI); **Kerala,** Alappuzha District, Thirunallur, 12 November 2020, *Sreehari S. Nair 12992* (MESAH). Ernakulam District, Cherai, Sea level, 21 August 1977, *C.R. Suresh & K.S. Manilal* 32824 (CALI). Idukki District, Pulianmala, 25 December 1983, *A.G. Pandurangan 66481* (MH); Calvary Mount, 12 February 1984, *A.G. Pandurangan 78062* (MH); Olikudy, C. W. S., 1050 m, 11 May 1995, *K.K. Sajeev 15669* (KFRI). Kannur District, Kurunnathur, Near Taliparamba, 11 March 1915, *s.coll. 11901* (MH); Kuthuparambu, 100 m, 20 February 1978, *V.S. Ramachandran 54094* (MH); Near Tellicherry, 10 m, 15 July 1978, *V.S. Ramachandran 57655* (MH); Kalliasseri, 125 m, 22 June 1980, *R. Ansari 64944* (MH); Madayippara slope, near fort, 14 December 2011, *C. Pramod 126937* (CALI); Madayippara, near S. N. School, 01 March 2014, *C. Pramod 138253* (CALI); *ibid.*, 01 March 2014, *C. Pramod 138255* (CALI). Kollam District, Punalur road, Ranni, 150 m, 28 November 1976, *M. Chandrabose 49220* (MH). Kottayam District, Vaikom, 29 December 1990, *M.S. Swaminathan 95667* (MH). Malappuram District, Chelari, sea level, 21 August 1977, *C.R. Suresh & K.S. Manilal 32824* (CALI). Palakkad District, Vattaparai forest, 650 m, 28 May 1979, *E. Vajravelu 62857* (MH); Karivara, 550 m, 25 January 1980, *P. Bhargavan 65694* (MH); Pothundy, Nelliyampathy, 09 March 2020, *Sreehari S. Nair 12947* (MESAH). Thiruvananthapuram District, Palode, 31 January 1985, *N. Mohanan 917* (TBGT); Athirumala, 1000 m, 15 May 1988, *N. Mohanan 9747* (TBGT); Chemungi, 800 m, 25 January 1994, *N. Mohanan 11659* (TBGT); Bonaccord, 700 m, 25 January 1994, *N. Mohanan 12412* (TBGT). Thrissur District, Peechi, 80 m, 28 October 1986, *N. Sasidharan 3874* (KFRI); Athirapilly, 120 m, 16 September 2006, *K.H. Amitha Bachan 11762* (CALI).

Wayanad District, Lakkidi, 11 January 1986, *R.T. Balakrishnan 41828* (CALI). **Madhya Pradesh,** Chhindwara District, Pagara, September 1918, *J. Fernandez 31683* (BLAT). Hoshangabad District, Bori R. F., 550 m, 29 April 1961, *J. Joseph 12451* (MH); Banglapore, 600 m, 24 July 1961, *J. Joseph 12867* (MH). Jabalpur District, in a stream, Kundwara, 472 m, 09 March 1962, *K.M. Sebastine 13883* (KFRI & MH). Mandla District, Khari R. F., 675 m, 28 November 1961, *J. Joseph 13450* (MH). **Maharashtra**, Mumbai District, Bhandup, Salsettle, January 1917, *s.coll. 28894* (BLAT); Borivili National Park, 25 November 1954, *P.S. Herbert SH385* (BLAT); *ibid.,* 30 January 1955, *P.S. Herbert SH485* (BLAT); *ibid.,* 06 February 1955, *P.S. Herbert SH515* (BLAT); *ibid.,* 06 November 1955, *P. S. Herbert SH907* (BLAT); *ibid.,* 31 July 1957, *Y.A. Marchaut 78* (BLAT); Malad hills, 03 November 1957, *G.L. Shah Shah9430* (BLAT); Malad, Quary hills, 03 December 1957, *G.L. Shah Shah9560* (BLAT). Nashik District, Igatpuri, October 1917, *s.coll. 25882* (BLAT). Pune District, Purandhar, 01 January 1945, *H. Santapau 5778* (BLAT); Northern slope of Vahagaor hills, 10 December 1961, *K.P. Janardhanan 76458* (BSI); Moluste forest, Ambavane, 21 December 1963, *B. Venkata Reddi 93226* (BSI); Kotri forest, at the starting point of Mula river, 23 December 1963, *B. Venkata Reddi 93363* (BSI); Bhanpa forest, Ambavane, 14 metres of Lonavla, 30 January 1964, *B. Venkata Reddi 95815* (BSI); Forest near Tiskani to Ambavane, 05 February 1964, *B. Venkata Reddi 96118* (BSI); Bhivadakhund Durga Khilla, 17 - 18 miles west of Junnar, 11 January 1965, *K. Hemadri 104378* (BSI). Ratnagiri District, Math Forest, 12 KM from Akeri, 15 November 1965, *B. G. Kulkarni 106462* (BSI); Vraad, 15 KM from Kudal, 19 November 1965, *B.G. Kulkarni 107631* (BSI); Achrd road, Kankavli, 19 October 1970, *B.G. Kulkarni 121764* (BSI). Satara District, Khandala, October 1918, *H. Santapau 28462*; Khandala stream, 07 November 1942, *H. Santapau 1254* (BLAT); Khandala, Kune stream, 14 March 1943, *H.*

Santapau 1704 (BLAT); *ibid.*, 27 November 1962, *R. Sundara Raghavan 85125* (BSI); *ibid., s.d, s. coll. 25618* (BLAT). Thane District, Sativli, 27 November 1960, *N.Y. Das NYD2700* (BLAT); Devighat, Washala range, 31 May 1968, *K.V. Billore 116084* (BSI); **Odisha,** Ganjam District, Gallatty, 400 ft, 01 January 1900, *J.S. Gamble 13690* (MH); Telkapally to Linepada, 23 January 1900, *C.A. Barber 1181* (MH). **Tamil Nadu**, Coimbatore District, Near Attakatti, 875 m, 27 January 1963, *J. Joseph 15607* (MH); Perumalmalai, 1010 m, 21 April 2007, *M.V. Viswanathan MVV547* (MH). Dindugal District, Sirumalais, 14 April 1956, *J. Pallithanam JP1888* (BLAT); *ibid.,* 12 May 1956, *J. Pallithanam JP3262* (BLAT); Perumal Mudi, 1010 m, 21 April 1970, *M. Viswanathan MVV547* (MH). N. Arcot District, Near Komattiyur Tank, 700 m, 14 December 1958, *K. Subramanyam 4780* (MH). Tirunelveli District, between the boundary of Sivagiri and Sethur Hills, down to Kallimalai Estate, 900 m, 24 April 1989, *S.R. Srinivasan 89572* (MH & (BSID). Virudhunagar District, Mathana Kedai, Srivilliputhur R. F., 550 m, 16 March 1970, *E. Vajravelu 33843* (MH).

3.6.32. *Ficus travancorica* King

Ficus travancorica King, Ann. Roy. Bot. Gard. (Calcutta) 1:28, t. 26. 1887 & in Hook.f., Fl. Brit. India 5: 503. 1888; Brandis, Indian Trees: 600. 1906; Rama Rao, Fl. Pl. Travancore: 380. 1914; CEC. Fisch. in Gamble, Fl. Madras: 1363. 1928; Vajr., J. Econ. Taxon. Bot.12: 66.1988; K.K.N. Nair, J. Econ. Taxon. Bot.16: 608. 1992; Anil Kumar *et al.,* Fl. Pathanamthitta 466. 2005; S.S. Dash & A.A. Mao, Fl. Pl. India, 2: 537. 2020. **Type:** India, Kerala, West Coast, Hills of North Travancore, 3 - 500 ft., October 1880, *R.H. Beddome s.n.* (Holotype- K, K000880033! & Isotype- CAL, CAL0000025726!).

Ficus glaberrima Blume var. *bracteata sensu* Chithra in A.N. Henry *et al*., Fl. Tamil Nadu 2: 253. 1987 non Corner 1960; Manilal & Raveendra Kumar, Rheedea 8 (2): 207. 1998.

Ficus rigida Jacq. var. *bracteata sensu* Vajr. & Bhargavan, J. Econ. Taxon. Bot. 5 (2): 424. 1984 non (Corner) Bennet, 1982; Vajr., Fl. Palghat: 449. 1990; Pandurangan & Nair, J. Econ. Taxon. Bot. 17 (1): 178. 1993; N. Mohanan & M. Sivadasan, Fl. Agasthyamala 636. 2002; Sasidh., Biodiv. Doc. Kerala 6. Fl. Pl.: 441. 2004; T.S. Nayar *et al.,* Fl. Pl. Kerala: 436. 2006; Chaudhary *et al*., Taiwania 57 (2): 208. 2012.

Fig. 3.101 – 3.103

Scandent shrub or climber, up to 10 m, epiphytic, aerial roots present; bark smooth, brown; young twigs terete, core solid, smooth, glabrous, pale brown; inter node 1.3–3.4 cm long; latex milky, white. Stipule caducous, lanceolate, 8.4–14.1 x 0.3–1.2 cm, margins entire, apex narrowly acute, base truncate, glabrous, pale red to pale green. Petiole articulated, terete, canaliculate, 1.3–3.2 cm long, glabrous, pale green. Leaves simple, alternate, spiral; lamina symmetric, lance ovate to elliptic, 11.2–25.6 x 3.5–6.6 cm, margins entire, acumen 0.4–0.8 cm long, apex acuminate, base cuneate, glabrous, pale red to pale green when young, dark green on maturity, coriaceous, venation brochidodromous; basal veins 3–4, lateral veins 14–16 pairs; waxy glands on the base of the midrib. Receptacles axillary, solitary or paired, monoecious, pedunculate; peduncle 0.5–0.8 cm long, terete, glabrous, pale green; basal bracts present, persistent, 3, free, 0.5–1.2 cm long, ovate, glabrous, pale green. Syconium 1.0–1.5 cm across, globose, glabrous, pale green when young, green when mature. Ostiole 0.5–1.0 mm, prominently raised above; outer bracts present, free, ovate, 3.0–4.0 mm long, glabrous, pale-brown; inner bracts present, free, lanceolate, 2.0 mm long, glabrous,

pale brown. Male flowers prominent near ostiole, 4.0 mm long, pedicellate; pedicel, 1.5 mm long; tepals 4, free, 1.5 mm long, lanceolate, glabrous, pale brown; stamen 1, anther 1.0 mm, filament 0.5 mm long. Female flowers scattered, 3.0 mm long, sessile; tepal 4, free, 2.0 mm long, lanceolate, glabrous, pale yellow; stigma 0.5 mm long; style 1.5 mm long; ovary 1.0 mm long, ovoid, glabrous, pale brown. Gall flowers scattered, 2.5 mm long, pedicellate; pedicel 1.0 mm, tepals 4, free, 2.0 mm long, lanceolate, glabrous, pale brown; stigma short; style 0.5 mm long; ovary 1.0 mm long, obovoid, glabrous, pale brown. Achenes 1.5–2.0 mm, ovoid, pale brown.

Local name: *Vilmaravu* (Mal.).

Common name: Nil.

Flowering and fruiting: March to July.

Distribution: Endemic to Southern Western Ghats. Distributed in Kerala, Tamil Nadu and Karnataka.

Habitat: In evergreen and semi evergreen forests.

IUCN Status: Data Deficient (DD).

Etymology: The species name 'travancorica' refers to the type locality Travancore.

Uses: No medicinal used reported so far for this species.

Notes: King (1887-1888; 1890) mentioned that the stipules are 1 inch (2.5 cm) in length, but the stipules were up to 14 cm in the present study. Also, the male flowers were recorded sessile. Similar to the observations of Reddy *et al.*, (2020), the male flowers were found to be pedicellate in the present study. The species was of nomenclatural confusion and was previously treated under *F. glaberrima* Blume var. *bracteata* Corner. Detailed studies reinstated the taxon with the name *F. travancorica* King (Reddy *et al.*, 2020).

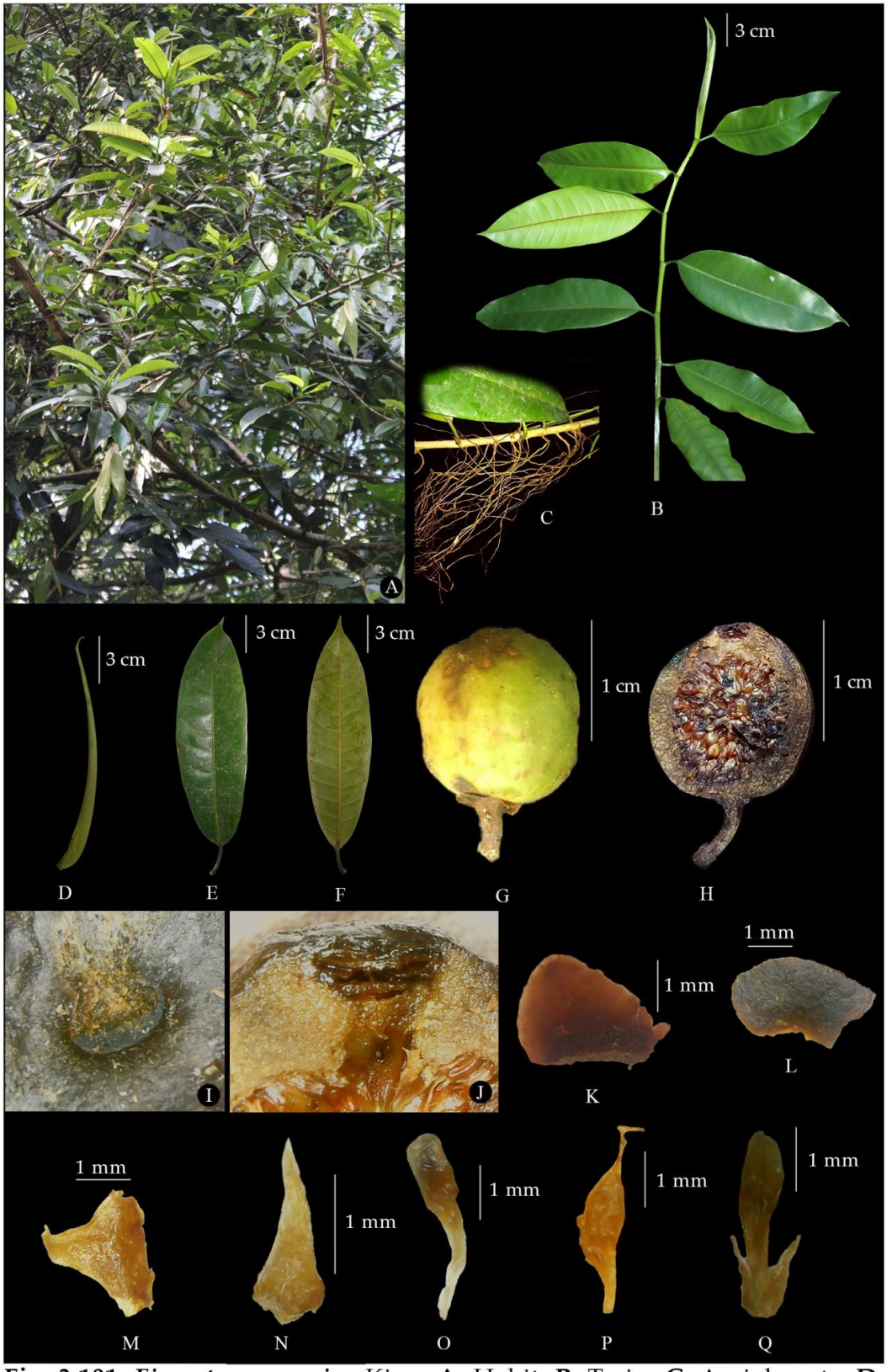


Fig. 3.101. ***Ficus travancorica*** King: **A.** Habit; **B.** Twig; **C.** Aerial roots; **D.** Stipule; **E.** Leaf adaxial side; **F.** Leaf abaxial side; **G.** Syconium; **H.** Syconium L. S.; **I.** Ostiole; **J.** Ostiolar L. S.; **K.** Basal bract; **L.** Outer ostiolar bract; **M.** Inner ostiolar bract; **N.** Tepal; **O.** Male flower; **P.** Female flower; **Q.** Gall flower.

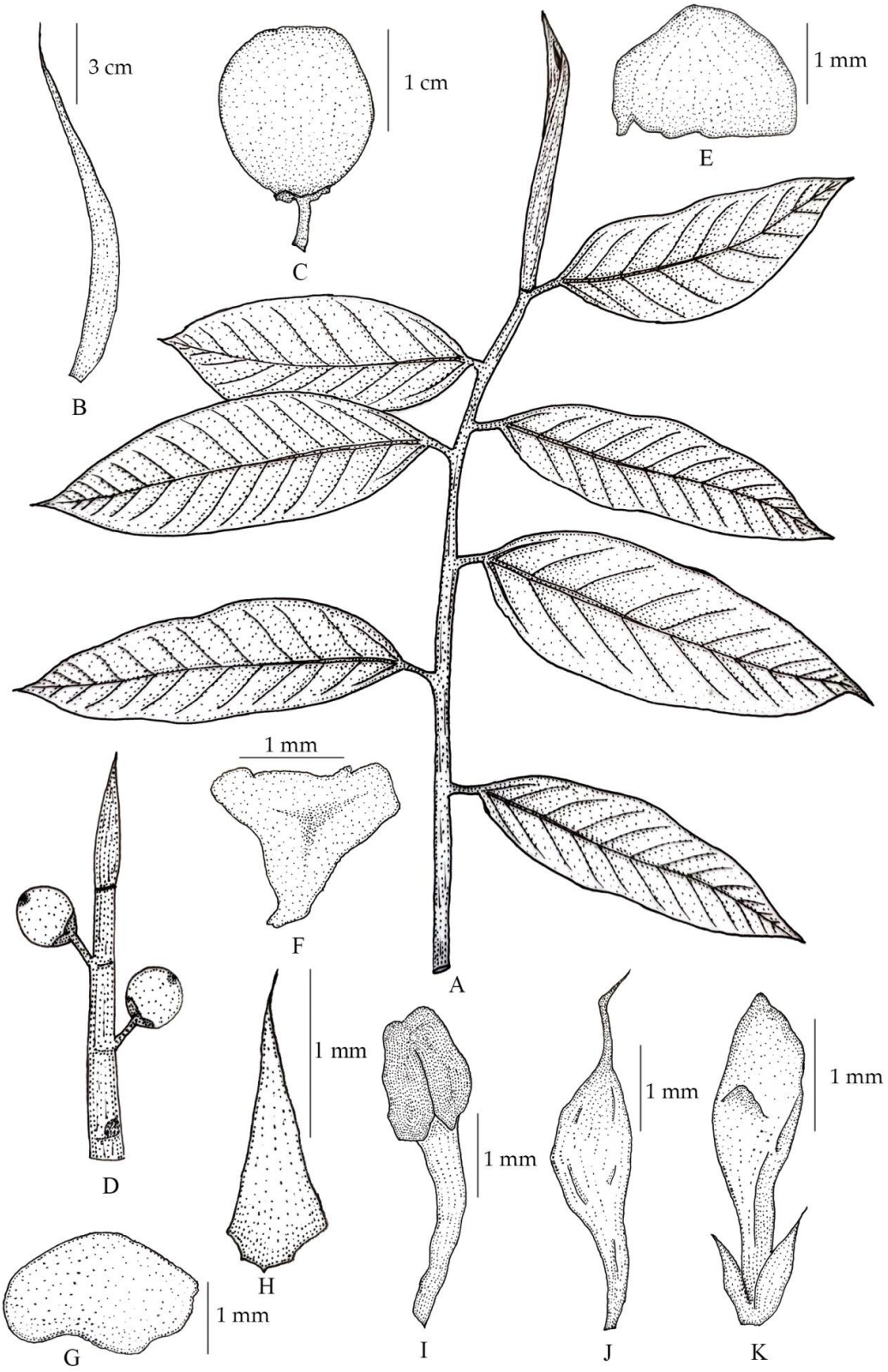


Fig. 3.102. ***Ficus travancorica*** King: **A.** Twig; **B.** Stipule; **C.** Syconium; **D.** Receptacles; **E.** Basal bract; **F.** Inner ostiolar bract; **G.** Outer ostiolar bract; **H.** Tepal; **I.** Male flower; **J.** Female flower; **K.** Gall flower.

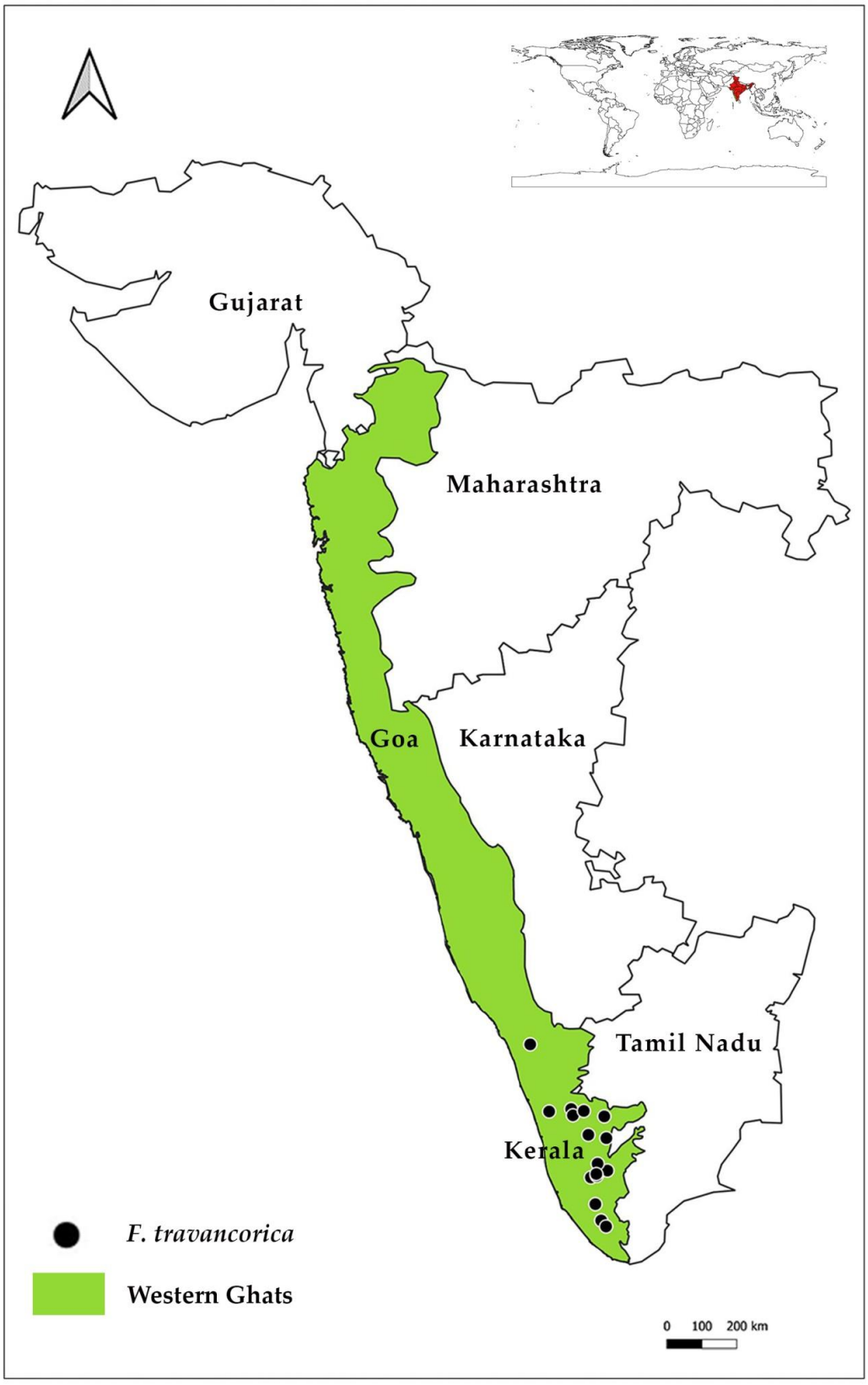


Fig. 3.103. *Ficus travancorica* King- Distribution map.

Specimens examined: India, **Kerala,** Ernakulam District, Urulanthanni, 160 m, 03 November 2020, *Sreehari S. Nair & P.J. Ebin 12983* (MESAH). Idukki District, Santhanpara, December 1909, *A. Meelbod 13121* (BSI); Pamba dam, Vandiperiyar, 1000 m, 12 March 1980, *K. Vivekananthan 66197* (MH); Meenmutty, 600 m, 30 May 1982, *C.N. Mohanan 74092* (MH); *ibid.,* 700 m, 13 December 1982, *C.N. Mohanan 76047* (MH); *ibid.,* 700 m, 19 February 1983, *C.N. Mohanan 76240* (MH); Tolanada to Kurishumudi, 13 May 1986, *K. K.N. Nair 4409* (KFRI); Adimaly, 20 February 1991, *A.E. Shannavas Khan 7536* (TBGT); Methaganam, 1300 m, 28 October 1993, *Jomy Augustine 12639* (CALI); Olikudy, CWS110, 30 October 1996, *N. Sasidharan & K.K. Sajeev 17493* (KFRI). Kollam District, Kallar, Shenduruny W. L. S., 800 m, 14 January 1994, *N. Sasidharan 10789* (KFRI). Kozhikode District, Udumbanpara, Vattachira, 20 July 1994, *A. Nazarudean 22708* (TBGT). Palakkad District, Karapara river side, 850 m, 01 March 1975, *E. Vajravelu 46121* (MH). Pathanamthitta District, Thriveni River bank, Pamba, 24 April 1984, *E. Vajravelu 80574* (MH); Near Chalakkayam, 650 m, 14 August 1988, *R. Chandrasekaran 89215* (MH); Way to church, Angamoozhy, 150 m, 22 October 1989, *R. Chandrasekaran 89381* (MH). Thiruvananthapuram District, Attayar, 700 m, 16 June 1992, *N. Mohanan 11099* (CALI & TBGT). Thrissur District, Sholayar, 700 m, 18 November 2008, *K.H. Amitha Bachan 117739* (CALI); Poringal, 27 January 2022, *Sreehari S. Nair 12189* (MESAH). **Tamil Nadu,** Kanyakumari District, Maramallai road side, Keeripara, 400 m, 19 March 1979, *A.N. Henry 60775* (MH); Vallachithode, Lower kodayar, 600 m, 28 March 1981, *A.N. Henry 70657* (MH).

3.6.33. *Ficus tsjakela* Burm.f.

Ficus tsjakela Burm.f., Fl. Indica 227. 1768; Hook.f., Fl. Brit. India 5: 514. 1888; J. Cameron, For. Trees of Mysore and Coorg 284. 1894; H. Trimen,

Handb. Fl. Ceylon 4: 91. 1898; Talbot, Trees Bombay 2: 329. 1902; T. Cooke, Fl. Pres. Bombay 2: 650. 1908; Bourd., For. Trees Travancore 364. 1908; Brandis, Indian Trees 603. 1921; Rama Rao, Fl. Pl. Travancore 382. 1914; Corner in Dass. & Forsb., Rev. Handb. Fl. Ceylon 3: 274. 1981; Manilal & Sivar., Fl. Calicut 277. 1982; B.D. Sharma *et al.,* Fl. Karnataka: analysis 260. 1984; C.J. Saldanha, Fl. Karnataka 120. 1984; K.K.N. Nair & M. P. Nayar, Fl. Courtallum 1: 42. 1986; R.S. Rao *et al.,* Fl. Goa, Diu Daman Dadra & Nagar haveli 2: 410. 1986; V. Chithra in A.N. Henry *et al.,* Fl. Tamil Nadu Ind., Ser I: Analysis 2: 256. 1987; B.G. Kulkarni, Fl. Sindhudurg 421. 1988; N.P. Singh, Fl. Eastern Karnataka 2: 588. 1988; V.S. Ramach. & V.J. Nair, Fl. Cannanore Dist. 434. 1988; Kesh. Murthy & S.N. Yogan. Fl. Coorg 425. 1990; Vajr., Fl. Palghat Dist. 450. 1990; K.M. Matthew, Excur. Fl. Central Tamil Nadu 485. 1991; P.J. Parmar in B.V. Shetty & V. Singh, Fl. Rajasthan 2: 805. 1991; M. Mohanan & Henry, Fl. Thiruvanthapuram 434. 1994; D. Deshp. *et al.,* Fl. Mahabaleshwar and Adjoinings 2: 555. 1995; Subram., Fl. Thenmala Div. 353. 1995; Sivar. & Mathew, Fl. Nilambur 671. 1996; Sasidh. & Sivar., Fl. Pl. Thrissur Forest 430. 1996; K.M. Matthew, Fl. Palni Hills 1185. 1999; S.K. Murthi & Panigrahi, Fl. Bilaspur Dist. 2: 570. 1999; N.P. Singh *et al.,* Fl. Maharashtra Dicot 2: 942. 2001; Mohanan & Sivadasan, Fl. Agasthyamala 637. 2002; K.G. Bhat, Fl. Udupi. 597. 2003; Sasidh. & Sivar., Bio. Docu. Kerala part 6: Flow. Plant. 441. 2004; S.G. Pradhan *et al.,* Fl. Sanjay Gandhi National Park 3: 576. 2005; Anil Kumar *et al.,* Fl. Pathanamthitta 466. 2005; Fl. Pl. Chittoor Dist. 334. 2008; Sunil, Fl. Alappuzha Dist. 666. 2009; Chantaras. *et al.,* Syst. Bot. 38(3): 677. 2013; Mandar & Lakshmin., Fl. Bhagwan Mahavir 230. 2013; T. Pullaiah, Fl. Telangana, 2: 886. 2015;

Sudhakar *et al.,* Figs of Eastern Ghats, India 92. 2017; Ficus sp. Madhya Pradesh 62. 2019; Fl. Karnataka. A Check List 2: 509. 2019. **Type:** van Rheede 3: 87. t. 64. 1682. Based on *F. tsjakela* Rheede. (Lectotype- G, G00302067!).

Urostigma caulobotryum Miq., London J. Bot. 6: 568. 1847. *Ficus caulobotrya* (Miq.) Miq., Ann. Mus. Bot. Lugduno-Batavi 3: 287. 1867. **Type:** India. Peninsula Ind. Orientalis, *s.d. R. Wight 2638* (= no. 26) (Holotype- E, E00301022!).

Urostigma ceylonense Miq., London J. Bot. 6: 570. 1847. **Type:** Sri Lanka, Columbo, Kiribella vel Kiripaella Cingal, 07 April 1796, *R. Wight 2640* (Holotype- E, E00301024!).

Ficus infectoria Willd., Sp. Pl., ed. 4, 4(2): 1137. 1806. **Type:** Not found.

Fig. 3.104 – 3.106

Tree up to 20 m height, epiphytic, aerial roots absent; bark lenticellate, pale brown; young twigs terete, core solid, pale brown, smooth, glabrous; inter node 2.2–3.5 cm long; latex milky, white. Stipule caducous, lanceolate, 0.8–6.5 x 0.3–1.2 cm, margins entire, apex narrowly acute, base truncate, glabrous, pale red. Petiole not articulated, terete, canaliculate, 4.2–9.6 cm long, glabrous, pale green. Leaves simple, alternate, spiral; lamina symmetric, lanceolate to lance-ovate, 7.0–22.5 x 3.8–12.0 cm, margins entire, acumen 1.1–1.4 cm long, apex cuspidate, base cordate, glabrous, pale red to pale green when young, dark green on maturity, subcoriaceous, venation brochidodromous; basal veins 3–4, lateral veins 7–10 pairs; waxy glands on the axil of the basal lateral nerves. Receptacles axillary, paired or clustered, monoecious, sessile; basal bracts present, persistent, 3, free, 2.5–3.5 cm long, widely ovate, glabrous, green to brown. Syconium 0.5–0.8 cm across,

globose, glabrous, pale green when young, pale yellow when mature. Ostiole 0.8–1.1 mm wide; outer bracts present, free, ovate, 1.0 mm long, glabrous, pale green; inner bracts present, free, lanceolate, 0.5 mm long, glabrous, pale yellow. Male flowers few near ostiole, 1.5 mm long, sessile; tepals 4, free, 1.5 mm long, lanceolate, glabrous, white to yellow; stamen 1, anther 1.0 mm, filament 0.5 mm long. Female flowers near the base, 1.5 mm long, sessile; tepal 3–4, free, 0.5 mm long, lanceolate, glabrous, pale brown; stigma bifid; style 0.75 mm long; ovary 0.5 mm long, obovoid, glabrous, pale brown. Gall flowers scattered, 2.0 mm long, sessile; tepals 4, free, 0.5 mm long, lanceolate, glabrous, pale brown; stigma short; style 0.5 mm long; ovary 1.5 mm long, obovoid, glabrous, yellow. Achenes 1.0 mm, ovoid, white.

Local names: *Chela* (Mal.); *Kal-aal* (Tam.); *Kel* (Mar.); *Biviyamara* (Kan.); *Pilkhan* (Hin.).

Common names: Nil.

Flowering and fruiting: Two to three times a year.

Distribution: The plant is native to India, Myanmar, Pakistan, Sri Lanka and Vietnam.

Habitat: Common in moist deciduous and semi evergreen forests.

IUCN status: Not Evaluated (NE).

Etymology: The plant is called '*chela*' in Malabar region of India. The species epithet might have been given in accordance with this name.

Uses: No medicinal properties reported yet.

Notes: Sudhakar *et al,* (2014), mentioned that *U. caulobotryum* is lectotypified and made the collection E00301022 as the lectotype. But according to

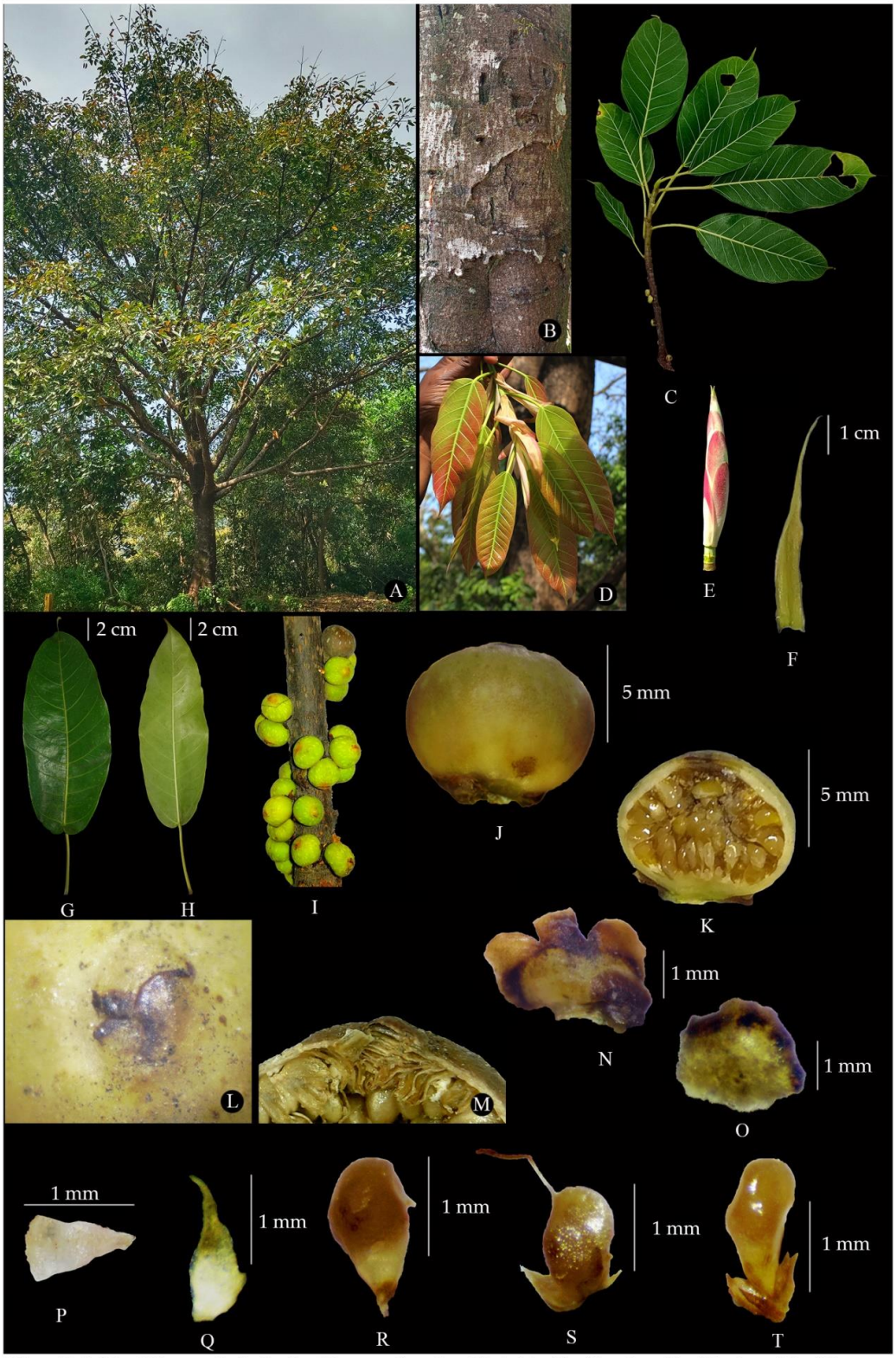


Fig. 3.104. ***Ficus tsjakela*** Burm.f.: **A.** Habit; **B.** Bark; **C.** Twig; **D.** Young leaves; **E.&F.** Stipules; **G.** Leaf adaxial side; **H.** Leaf abaxial side; **I.** Receptacles; **J.** Syconium; **K.** Syconium L. S.; **L.** Ostiole; **M.** Ostiolar L. S.; **N.** Basal bract; **O.** Outer ostiolar bract; **P.** Inner ostiolar bract; **Q.** Tepal; **R.** Male flower; **S.** Female flower; **T.** Gall flower.

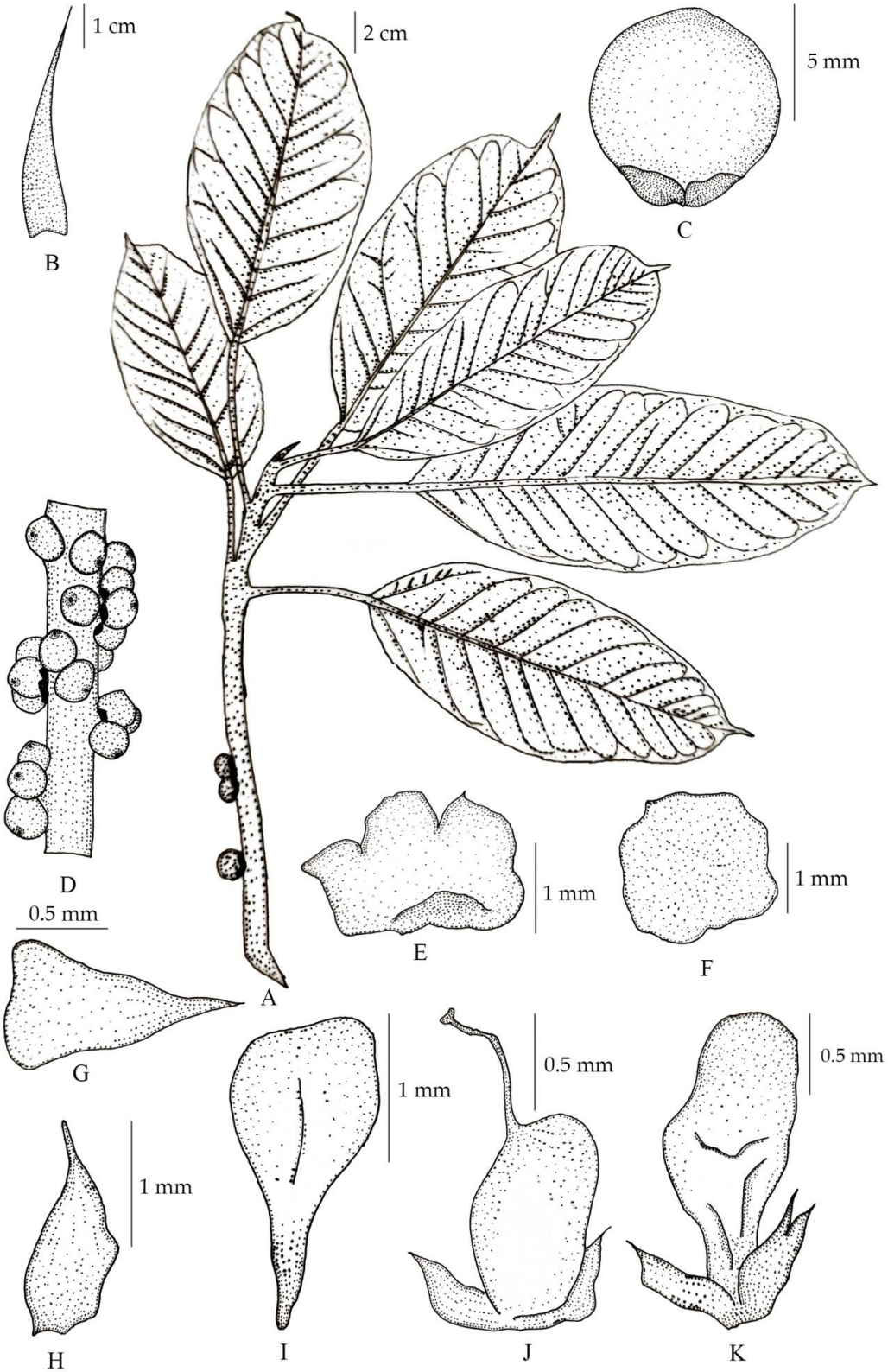


Fig. 3.105. ***Ficus tsjakela*** Burm.f: **A.** Twig; **B.** Stipule; **C.** Syconium; **D.** Receptacles; **E.** Basal bract; **F.** Outer ostiolar bract; **G.** Inner ostiolar bract; **H.** Tepal; **I.** Male flower; **J.** Female flower; **K.** Gall flower.

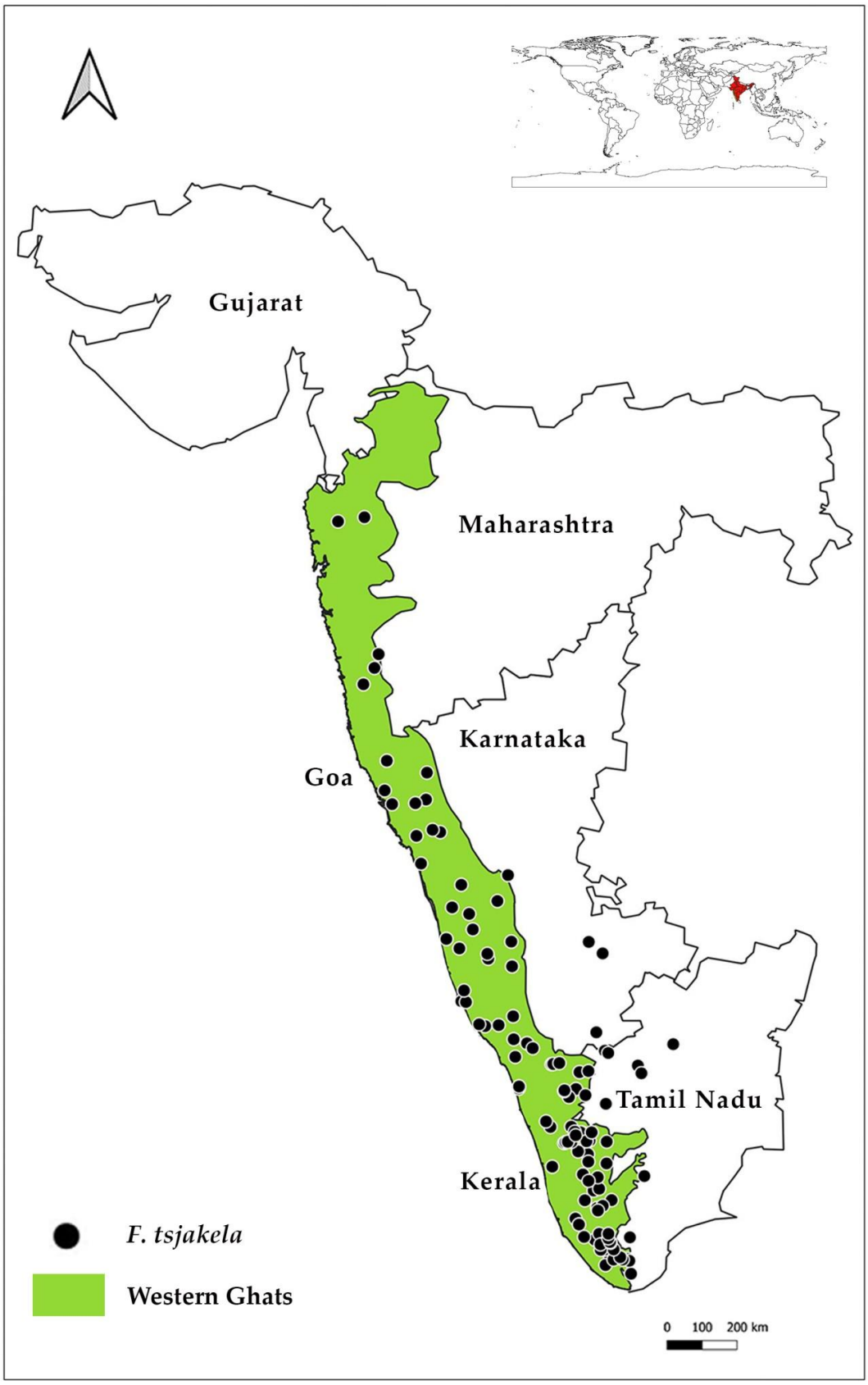


Fig. 3.106. *Ficus tsjakela* Burm.f.- Distribution map.

Chantarasuwan *et al.* (2013), the same collection is mentioned as the holotype of the species. Hence the typification by Sudhakar *et al.* (2014) seems inadequate. Chantarasuwan *et al.* (2013) stated that type material of *U. ceylonense* is not found. The collection form E (E00301024!) is found as the type material and is cited here. A collection from Geneva Conservatory and Botanical Gardens (G) G00302067, is mentioned as the lectotype of *F. tsjakela* by Turner (2013). The material is a collection by L. Garcin from Malabar, India. King (1890) mentioned that the stipules are small. The stipules appear to be quite long in the opening shoots. The species is closely alligned with *F. caulocarpa* but differs easily in the sessile nature of the figs.

Specimens examined: India, **Andhra Pradesh,** Chittoor District, Tirumalai hills, 31 January 1958, S.*K. Wagh SKW8258* (BLAT); *ibid.,* 31 January 1958, *S.K. Wagh SKW8259* (BLAT). **Goa,** North Goa District, Talaulim, 26 April 1966, *John Cherian 109012* (BSI); Aldona, 1500 ft, 14 October 1976, *N.P. Singh 125415* (BSI). South Goa District, Nadquem, 26 January 1963, *K.C. Kanodia 88292* (BSI). **Karnataka,** Belagavi District, Londa, 02 November 1902, *G.A. Gammie 15832* (BSI). Belgaum District, Belgaum, 14 February 1938, *W.N. Koelz 13298* (MICH). Chikkamagaluru District, Sultanpet, Ballatrayandurga, 27 February 1963, *R. Sundara Raghavan 86808* (BSI); Ballatarayandurga, 02 April 1964, *R.S. Raghavan 97391* (BSI); Charmudi Ghat, 27 October 1974, *R. Sundara Raghavan 124174* (BSI). Coorg District, Virajpet, 3000 ft, 17 March 1938, *K. Cherian Jacob 532* (MH). Hassan District, Sakleshpur, 16 December 1903, *C. A. Barber 6202* (MH); *ibid.,* 28 April 1905, *C.A. Barber 7057* (MH). Mysore District, along stepped path to Yelandur, Bilgirirangam, 26 April 1962, *A. S. Rao 80335* (BSI); Gubbia, 13 February 1963, *R. Sundara Raghavan 86223* (BSI). Shivamogga District, Begar, Agumbe, 23 May 1960, *R. Sundara Raghavan 62867* (BSI); Sagara, Kyasanur forest, 14 June 1961, *R.S. Raghavan 74074* (BSI); Hulikal,

Ulikoppa, 25 May 1962, *R. Sundara Raghavan 80986* (BSI); Kimmane, 29 May 1962, *R.S. Raghavan 81087* (BSI); Thunga falls, Thirthahalli, 01 October 1962, *R. Sundara Raghavan 82874* (BSI); *ibid.,* 18 March 1964, *R. Sundara Raghavan 96980* (BSI). Udupi District, Karkal, 17 March 1915, *s.coll. 11983* (MH); Karkal, 17 March 1915, *s.coll.* 11990 (MH); Mudur Forest, 19 March 2007, *P.G. Diwakar & R.K.R. Singh 184271* (BSI); Manmanttara forest, Mookambika W. L. S., 19 December 2007, *P.G. Diwakar & R.K.R. Singh 193713* (BSI). Uttar Kannada District, *s.loc.,* 10 February 1889, *W.A. Talbot s.n.* (BSI); Castle rock, 16 April 1909, *R.K. Bhide s.n.* (BSI); Mirjan, October 1919, *Hall & Mecaum 34527* (BLAT); Kadra, 04 March 1951, *J. Fernandez JF2222* (BLAT); Yellapur, Telgerikam, 08 August 1953, *R.P. Patil 2564* (BSI); Castle rock, 18 May 1981, *M.R. Almedia MRA1393* (BLAT). **Kerala,** Alappuzha District, Vandanam, sea level, *s.d., C.N. Sunil 1878* (CALI). Ernakulam District, Pooyamkutty, 50 m, 19 December 1988, *P. Bhargavan 90014* (MH). Idukki District, Peerumade, 24 May 1965, *K. Vivekananthan 24312* (MH); Anjuruli -Thekkady, 900 m, 04 October 1972, *B.D. Sharma 42410* (MH); Thekkadi, 825 m, 23 December 1974, *K. Vivekananthan 45654* (MH); Karippalangadu (Kariapalakad), 700 m, 21 August 1977, *K. Vivekananthan 50463* (MH); Mlappara, P. T. R., 1100 m, 20 October 1993, *Jomy Augustine & N. Sasidharan 12574* (KFRI & CALI); Mavelikudi, C. W. L. S., 1300 m, 29 October 1996, *K.K. Sajeev 17468* (KFRI). Kannur District, Taliparamba, February 1915, *C.A. Barber 8749* (MH); Chandanathode, 800 m, 24 April 1966, *J.L. Ellis 27164* (MH); Bekal, 125 m, 20 December 1980, R. Ansari 69917 (MH); Payyavur, 125 m, 19 July 1981, R. Ansari 70939 (MH). Kasaragod District, Periya, 830 m, 23 March 1980, *V.S. Ramachandran 66866* (MH); Peradala, 200 m, 07 May 1982, *V.J. Nair 71037* (MH); Periyaram, 200 m, 14 May 1982, *V.J. Nair 73870* (MH). Kollam District, Arippa, Kulathupuzha Range, 200 m, 19 December 1980, *Sasidharan 1415*

(KFRI); Kattalappara, Shenduruny W. L. S., 150 m, 29 March 1993, *Sasidharan 10337* (KFRI); Chadayamangalam, 25 November 2004, *Geetha Kumary 55383* (TBGT). Malappuram District, University Campus, 45 m, 26 February 1972, *E. Nadeesa 362* (CALI); *ibid.*, 45 m, 26 February 1972, *V. Rosely Ignatius 104* (CALI); Chelari, 50 m, 20 March 1972, *P. C. Devassy 2085* (CALI); University Campus, 45 m, 11 September 1976, *M. Ramesh 9590* (CALI); *ibid., s.d., V.V. Sivarajan 1820* (CALI). Palakkad District, Attapadi, 525 m, 31 May 1966, *E. Vajravelu 27744* (MH); Bhavani bank, Attapadi R. F., 525 m, 31 May 1966, *E. Vajravelu 27744* (MH); Anamalai, 1100 m, 30 October 1976, *E. Vajravelu 48762* (MH); Panthenthode, S. V. R. F., 850 m, 16 April 1978, *N.C. Nair 56849* (MH); Below Ayyappan Koil, Nelliyampathy, 900 m, 13 February 1979, *E. Vajravelu 60419* (MH); Valiyaparathode, Silent Valley, 27 March 1982, *T. Sabu 10446* (CALI). Pathanamthitta District, Moozhiar, 850 m, 10 September 1987, *Anil Kumar 33* (MH); Maniyar, 75 m, 23 April 1988, *Anil Kumar 573* (MH); Chathanthara, 100 m, 17 March 1989, *Anil Kumar 1615* (MH); Adoor, 125 m, 01 April 1978, *C.N. Mohanan 54945* (MH); Anathode forest, 1100 m, 13 June 1990, *R. Chandrasekaran 94046* (MH). Thiruvananthapuram District, Forest near Bonacord estate, 525 m, 04 October 1973, *J. Joseph 44548* (MH); Ponmudi, 900 m, 25 May 1979, *M. Mohanan 63258* (MH); Bonaccord, 15 May 1988, *N. Mohanan 9888* (CALI &TBGT); Agasthyamala, 03 November 1994, *N. Mohanan & T. Shaju 16023* (TBGT); Ponmudi, 816 m, 22 December 2021, *Sreehari S. Nair 12163* (MESAH) . Thrissur District, Parambikulam, 607 m, 05 April 1963, *K. Ramamurthy 16081* (MH); Athirapilly (Adirapilly), 607 m, 19 March 1966, *K. Ramamurthy 27007* (MH); Machad Mala Reserve, 225 m, 06 April 1977, *K. Ramamurthy 49243* (MH); Vazhachal R. F., 300 m, 24 January 1982, *K. Ramamurthy 72967* (MH); Peechi, 80 m, 18 February 1986, *Sasidharan 3752* (KFRI); Vazhachal, 20 m, 27 June 1996, *A.G. Pandurangan 30621* (TBGT);

Sholayar, 650 m, 16 January 2008, *K.H. Amitha Bachan 117756* (CALI). Wayanad District, Mananthavady (Manantoddy), 800 m, 21 June 1979, *V.S. Ramachandran 62691* (MH); Kanjirakadavu, 15 January 1981, *s.coll. 25708* (CALI); Mananthavady, 26 March 1996, *K. Radhakrishnan 28189* (TBGT); Kalladi River Side, 740 m, 19 February 2000, *C. Pramod 81763* (CALI); Kalladi River Side, 19 February 2002, *C. Sunanda Kumari 82438* (CALI); *ibid.,* 19 February 2002, *Seetal J. Thattil 82779* (CALI); *s.loc., s.d., M.K. Ratheesh Narayanan 2146* (CALI). **Maharashtra,** Ratnagiri District, Ramghat base, 28 October 1969, *B.G. Kulkarni 119136* (BSI). Satara District, Vasota, 13 April 1978, *M. P. Nayar 153100* (BSI); Shirshinge, Koyna, 08 February 1979, *R.K. Kochhar 158274* (BSI). Sindhudurg District, Dukanwad, 14 February 1970, *B.G. Kulkarni 120108* (BSI); *ibid.,* 04 June 1970, *B.G. Kulkarni 121022* (BSI); Nawaja, 15 April 1978, *M. P. Nayar 1531456* (BSI). **Tamil Nadu,** Coimbatore District, Athipatti (Enothipatti), 15 August 1929, *V. Narayana Swami 18920* (MH); Mavalam, on the way to Yeddesal, 3000 ft, 14 March 1931, *K. Cherian Jacob 333* (MH); Vellinigiri Hills, 833 m, 11 February 1957, *K.M. Sebastine 2279* (MH); *ibid.,* 563 m, 22 February 1957, *K.M. Sebastine 2420* (MH); Attakatti, 1000 m, 06 July 1961, *J. Joseph 12726* (MH); Around Attakatti, 900 m, 25 January 1962, *J. Joseph 13549* (MH); Sholayar Submergible area, 1040 m, 26 December 1963, *K. Ramamurthy 18119* (MH); Idigarai (Idukarai), Mandalare R. F., 1650 m, 16 May 1971, *E. Vajravelu 38405* (MH); Pachaiyar Estate, 1200 m, 11 October 1992, *S. R. Srinivasan 99278* (MH). Erode District, Bhavani, 200 ft, February 1885, *J.S. Gamble 16754* (BSI); Satyamangalam R. F., Mavanattam, 1180 m, 25 March 2009, *P. Satyanarayana 122556* (MH). Kanyakumari District, Mothiramalai river side, Lower kodayar, 08 October 1980, *A.N. Henry 68947* (MH); Muthukuzhi to Balamore pathway, 1000 m, 22 February 1983, *A.N. Henry 77123* (MH); Vellimalai, Sabarigiri river side, 12 July 1991, *V.*

Lakshamanan 95245 (MH). Nilgiri District, Marapalam, 1500 m, 23 March 1957, *K.M. Sebastine 2580* (MH); Coonoor - Mettupalayam road, 1425 m, 06 September 1970, *B.D. Sharma 36067* (MH); Marapalam, 1350 m, 29 April 1971, *N.C. Rathakrishnan 38123* (MH); Coonoor – Mettupalayam, 1400 m, 03 December 1971, *N.C. Rathakrishnan 39121* (MH); Kunjapani R. F., 1000 m, 08 February 1972, *E. Vajravelu 39794* (MH); Way to Kotamalai, 800 m, 26 July 1972, *E. Vajravelu 41827* (MH); Gudalur (Gudalluer) -Devar Shola forest, 1000 m, 18 November 1972, *E. Vajravelu 42820* (MH); Devala - Nadugani forest, 875 m, 22 February 1973, *E. Vajravelu 43667* (MH); Nadugani, 880 m, 02 August 1973, *J.L. Ellis 35341* (MH). Ramanathapuram District, Nagari River Bank, 200 m, 25 February 1979, *N.C. Nair 61454* (MH). Salem District, Church hill road, Yercaud, 02 May 1965, *S. Karthikeyan 26805* (MH). Thiruvannamalai District, Melpattu, 484 m, 20 December 1984, *B. R. Ramesh HIFP BRR1110* (HIFP); Way to Melpattu, Javadi hills, 960 m, 01 February 1986, *M.B. Viswanathan 1034* (MH). Tirunelveli District, Way to Nataikal, 23 September 1916, *s.coll. 13518* (MH); Sengalteri, 26 September 1916, 13679 (MH); Mancholai (Macholai)-Singampatti, 833 m, 28 February 1958, *K.M. Sebastine 5419* (MH); Mundanthurai R. F., 300 m, 13 July 1959, *K.M. Sebastine 8541* (MH); Beyond Sengumal Estate, Panagudi, 700 m, 09 February 1972, *B.D. Sharma 40056* (MH); Kalakad, Sengaltheri, 1000 m, 21 May 1983, *N. Parthasarathy 511* (MH); Kattamalai Estate to Kannikatty, 360 m, 20 May 1988, *R. Gopalan 88610* (MH). Viluppuram District, Melpat, 28 September 1899, *s.coll. 1054* (MH).

3.6.34. *Ficus virens* Aiton

F. virens Aiton, Hort. Kew. 3: 451. 1789; H. Santapau, Fl. Khandala 258. 1953; Corner, Gard. Bull. Singapore 21: 9. 1965; G.L. Shah, Fl. Gujarat 647. 1978; Corner in Dass. & Forsb., Rev. Handb. Fl. Ceylon 3: 238. 1981;

S.K. Varma, Fl. Bhagalpur 361. 1981; B.V. Shetty & R.P. Pandey, Fl. Tonk Dist. 181. 1983; A.K. Mukherjee, Fl. Pachmarhi & Bori Reserves 285. 1984; B.D. Sharma *et al.,* Fl. Karnataka: Analysis 260. 1984; C.J. Saldanha, Fl. Karnataka 1: 120. 1984; H.J. Chowdhery & B.M. Madhwa, Fl. Himachal Pradesh Analysis 2: 663. 1984; D.M. Verma *et al.,* Fl. Raipur, Durg & Rajnandgaon 360. 1985; P.C. Pant, Fl. Corbet N.P. 149. 1986; R.S. Rao *et al.,* Fl. Goa, Diu Daman Dadra & Nagar haveli 2: 410. 1986; V. Chithra in A.N. Henry *et al.,* Fl. Tamil Nadu Ind., Ser I: Analysis 2: 256. 1987; Bole & J.M. Pathak, Fl. Saurashtra 2: 296. 1988; N. P. Singh, Fl. Eastern Karnataka 2: 588. 1988; J.L. Ellis, Fl. Nallamalais 2: 377. 1990; Kesh. Murthy & S.N. Yogan. Fl. Coorg 425. 1990; K.M. Matthew, Excur. Fl. Central Tamil Nadu 486. 1991; Lakshmin. & B.D. Sharma, Fl. Nasik Dist. 441. 1991; P.J. Parmar in B.V. Shetty & V. Singh, Fl. Rajasthan 2: 805. 1991; G.P. Roy & B.K. Shukla, Fl. Madhya Pradesh 410. 1992; B.K. Misra & B.K. Verma, Fl. Allahabad Dist. Uttar Pradesh 347. 1992; Kothari & Moorthy, Fl. Raigad Dist. 3: 377. 1993; A.K. Sharma & J.S. Dhakre Fl. Agra Dist. 255. 1995; D. Deshp. *et al.,* Fl. Mahabaleshwar and Adjoinings 2: 555. 1995; T. Pullaiah & B.R.P. Rao, Fl. Nizamabad 322. 1995; V. Raju & T. Pullaiah, Fl. Kurnool 437. 1995; Sivar. & Mathew, Fl. Nilambur 671. 1996; V. Mudgal *et al.,* Fl. Madhya Pradesh 2: 625. 1997; P.K. Bhattacharyya & K. Sarkar, Fl. West Champaran, Bihar 68. 1998; K.M. Matthew, Fl. Palni Hills 1185. 1999; N.D. Paria & S.P. Chattopadhyay, Fl. Hazaribagh Dist. 1: 88. 2000; N.P. Singh *et al.,* Fl. Maharashtra Dicot 2: 943. 2001; T.K. Sarma & A.K. Sarkar, Fl. Palamau Dist. Jharkhand 582. 2002; K.G. Bhat, Fl. Udupi 597. 2003; Wu *et al.,* Fl. China 5: 40. 2003; Sasidh. & Sivar., Bio. Docu. Kerala part 6: Flow. Plant. 442. 2004; Berg

& Corner in Nooteboom, Fl. Malesiana 17(2): 614. 2005; S.G. Pradhan *et al.,* Fl. Sanjay Gandhi National Park 3: 576. 2005; K.M. Chetty *et al.,* Fl. Pl. Chittoor Dist. 334. 2008; Subba Rao & Kumari, Fl. Visakhapatnam Dist. 2: 225. 2008; Berg *et al.,* Fl. Thailand 10(4): 649. 2011; Chantaras. *et al.,* Syst. Bot. 38(3): 679. 2013; T. Pullaiah, Fl. Telangana 2: 885. 2015; Sudhakar *et al.,* Figs of Eastern Ghats, India 98. 2017; Fl. Karnataka. A Check List 2: 509. 2019; Ficus sp. Madhya Pradesh 67. 2019; P. Lakshmin. *et al.,* Fl. West Bengal 665. 2019; S.J. Britto, Fl. Central and North Tamil Nadu 969. 2019; G. P. Sinha & A.N. Shukla, Fl. Uttar Pradesh 2: 478. 2020; R. Gogoi *et al.,* Fl. Sikkim 283. 2021. **Type:** Europe, 1775, *s.coll. s.n.* (Type- BM, BM000848531!). Introduced to Kew by James Gordon in 1762.

Ficus infrafoliacea Buch.-Ham. ex Sm., Rees, Cycl. 14: n. 31. 1810. **Type:** Not seen.

Ficus terminalis B. Heyne ex Roth, Roem. and Schult., Syst. Veg. 1: 513. 1817. **Type:** India. Ind. orientalis, 1814, B. Heyne *s.n.* (Isotype- L, L 0040339!).

Ficus scandens Buch.-Ham., Trans. Linn. Soc. London 15: 149. 1827. **Type:** Not found.

Urostigma cunninghamii Miq., London J. Bot. 6: 560. 1847. *Ficus cunninghamii* (Miq.) Miq., Ann. Mus. Bot. Lugduno-Batavi 3: 286. 1867. *Ficus infectoria* var. *cunninghamii* (Miq.) Domin, Biblioth. Bot. 22(89): 8. 1921. *Ficus lacor* var. *cunninghamii* (Miq.) M.F. Barrett, Amer. Midl. Naturalist 34: 36. 1946. **Type:** Australia, Queensland Brisbane River, 1825, *A. Cunningham 89* (Type- K, K001050924!).

Urostigma fraseri Miq., London J. Bot. 6: 561. 1847. *Ficus fraseri* (Miq.) F.Muell., Fragm. 6: 195. 1868. *Ficus infectoria* var. *fraseri* (Miq.) Domin, Biblioth. Bot. 22(89): 8. 1921. **Type:** Australia, Queensland, Bremer River, 1829, *C. Fraser 104* (Type- K, K001050922!; Isotype- U, U 0004621!).

Urostigma psychotriifolium Miq., London J. Bot. 6: 561. 1847. *Ficus psychotriifolia* (Miq.) Miq., Ann. Mus. Bot. Lugduno-Batavi 3: 286. 1876. *Ficus infectoria* var. *psychotriifolium* (Miq.) Domin, Biblioth. Bot. 22(89): 8. 1921. **Type:** Australia, Queensland, Brisbane River, 1829, *Fraser 73* (Type- K, K001050920!).

Urostigma aegeirophyllum Miq., London J. Bot. 6: 565. 1847. *Ficus infectoria* var. *aegeirophylla* (Miq.) Miq., Ann. Mus. Bot. Lugduno-Batavi 3: 286. 1867. **Type:** India, Bengal, Bengalen, *s.d. J.D. Hooker s.n.* (Isotype- U, U 0124151!)

Urostigma lambertianum Miq., London J. Bot. 6: 565. 1847. *Ficus lambertiana* (Miq.) Miq., Ann. Mus. Bot. Lugduno-Batavi 3: 286. 1867. *Ficus infectoria* var. *lambertiana* (Miq.) King, Ann. Roy. Bot. Gard. (Calcutta) 1: 60. 1887. *Ficus lacor* var. *lambertiana* (Miq.) M.F. Barrett, Amer. Midl. Naturalist 45: 153. 1951. **Type:** India, Maharashtra, Bombay, 1867, *Lambert s.n.* (Type- K, K000880014!).

Urostigma wightianum Miq., London J. Bot. 6: 566. 1847. *Ficus wightiana* (Miq.) Benth. Fl. Hongk.: 327. 1861. *Ficus infectoria* var. *wightiana* (Miq.) King, Ann. Roy. Bot. Gard. (Calcutta) 1: 60. 1887. *Ficus virens* var. *Wightiana* (Miq.) Chithra, A.N. Henry *et al.*, Fl. Tamil Nadu Ind., Ser I: Analysis 2: 256. 1987. **Type:** India, Karnataka, Bangalore, *s.d., R. Wight 4540* (Type- K, K000880016!).

Urostigma perseifolium Miq., London J. Bot. 6: 567. 1847. **Type:** India, Tamil Nadu, Pulney Mountains, September 1836, *R. Wight 2635* (Type- E, E00301019!).

Urostigma timorense Miq., London J. Bot. 6: 569. 1847. *Ficus timorensis* (Miq.) Miq., Ann. Mus. Bot. Lugduno-Batavi 3: 286. 1867. **Type:** Indonesia, *s.loc., s.d. Timor s.n.* (Type- K, K001050393!).

Urostigma apiculatum Miq., London J. Bot. 6: 570. 1847. *Ficus apiculata* (Miq.) Miq., Ann. Mus. Bot. Lugduno-Batavi 3: 286. 1867. **Type:** India, Peninsular India Orientalis, *s.d., R. Wight 1916* (Syntype- E, E00301016!).

Urostigma canaliculatum Miq., London J. Bot. 6: 579. 1847. **Type:** Malaysia, *s.loc., s.d. s.coll. s.n.* (Isotype- E, E00301014!).

Ficus terminalioides Griff., Itin. Pl. Khasyah Mts. 101. 1848. **Type:** K (not found).

Urostigma moritzianum Miq., H.Zollinger, Syst. Verz. Ind. Archip. 2: 91. 1854. **Type:** Indonesia, Java, *s.d., H. Zollinger 851* (Type- U, U 0123291!).

Urostigma nesophilum Miq., J. Bot. Néerl. 1: 237. 1861. *Ficus nesophila* (Miq.) F. Muell., Austral. Veg.: 26. 1867. *Ficus glabella* var. *nesophila* (Miq.) K. Schum., K.M. Schumann & C.A.G. Lauterbach, Fl. Schutzgeb. Südsee: 273. 1900. **Type:** Australia, Quail Island, *s.d. Mueller s.n.* (Type- K, K001050925!)

Ficus monticola Miq., Ann. Mus. Bot. Lugduno-Batavi 3: 216. 1867. **Type:** India, Meghalaya, Khasia, 4000 ft., *s.d., J.D. Hooker and T. Thomson 121* (Type- P, P00690007!; Isotype- L, L 0040386!).

Ficus saxophila var. *sublanceolata* Miq., Ann. Mus. Bot. Lugduno-Batavi 3: 260. 1867. *Ficus virens* var. *sublanceolata* (Miq.) Corner, Gard. Bull. Singapore 17: 377. 1960. **Type:** Indonesia, Sumatera, 1859, *W. H. de Vriese and J. E. Teijsman s.n.* (Type- K, K001050392!; Isotype- L, L0040148!).

Ficus glabella f. *grandifolia* (Miq.) Miq., Ann. Mus. Bot. Lugduno-Batavi 3: 267. 1867. **Type:** Indonesia, Sumatra, Beroewas, 1857, *W.H. de Vriese 5* (Type- L, L0040389!).

Ficus infectoria var. *forbesii* King, Ann. Roy. Bot. Gard. (Calcutta) 1: 63. 1887. **Type:** Indonesia, Sumatra, Saling, 1881, *H.O. Forbes 2701* (Type- L, L0040390!).

Ficus carolinensis Warb., K.M. Schumann & C.A.G. Lauterbach, Fl. Schutzgeb. Südsee, Nachtr.: 242. 1905. *Ficus prolixa* var. *carolinensis* (Warb.) Fosberg, Phytologia 5: 289. 1955. **Type:** Micronesia, Yap, 21 December 1899, *Volkens 263* (Type- B, B 10 0294239!).

Ficus nitentifolia S. Moore, J. Bot. 63(Suppl.): 107. 1925. **Type:** Indonesia, Timor, 1882, *H.O. Forbes 3618* (Type- BM, BM000951768!).

3.6.34a. *Ficus virens* var. *virens*

Tree up to 30 m height, hemi epiphytic and later becoming independent, aerial roots absent; bark smooth, brown; young twigs terete, core solid, pale brown, smooth, pubescent; inter node 0.4–3.8 cm long; latex milky, white. Stipule caducous, lanceolate, 0.25–1.5 x 0.2–0.4 cm, margins entire, apex narrowly acute, base truncate, glabrous, pale brown. Petiole articulated, terete, canaliculate, 1.6–6.1 cm long, glabrous, pale green. Leaves simple, alternate, spiral; lamina symmetric, ovate to elliptic to lanceolate to obovate, 5.2–18.5 x 2.5–8.5 cm, margins entire, acumen 0.4–1.0 cm long, apex

acute, base rounded to truncate, glabrous, red to pale green when young, green on abaxial, dark green on adaxial on maturity, subcoriaceous, venation brochidodromous; basal veins 3, lateral veins 8–12 pairs, waxy gland at the base of the midrib. Receptacles axillary or below the leaves, clustered, monoecious, pedunculate; peduncle 2.0–3.0 cm long, glabrous, green; basal bracts present, persistent, 3, free, 2.5–3.0 mm long, widely ovate, pubescent, pale brown. Syconium 1.0–1.6 cm across, globose, glabrous or minutely puberulous, pale green when young, purple when mature; ostiole 2.0–4.0 mm; outer bracts present, free, widely ovate, 2.5 mm long, glabrous, brown; inner bracts present, free, lanceolate, 2.0 mm long, glabrous, pale brown. Male flowers near ostiole, 1.0–1.5 mm long, pedicel short or sessile; tepals 3-4, fused, 0.75 mm long, lanceolate, glabrous, pale brown; stamen 1, anther 0.75 mm, filament 0.75 mm long. Female flowers at the base, 2.0 mm long; pedicel short or sessile; tepal 3, fused, 0.75 mm long, lanceolate, glabrous, pale brown; stigma 0.25 mm long; style 0.75 mm long; ovary 1.0 mm long, obovoid, glabrous, pale brown. Gall flowers scattered, 2.0 mm long; pedicellate; pedicel 2.0 mm long; tepals 4, fused, 0.75 mm long, lanceolate, glabrous, pale brown; stigma short; style 0.5 mm long; ovary 1.0 mm long, obovoid, glabrous, pale brown. Achenes 0.8–1.5 mm, ovoid, pale yellow.

Fig. 3.107 – 3.109

Local names: *Vellal* (Mal.); *Basarimara* (Kan.); *Malai-ichchi, Kurugatti* (Tam.)

Common names: Grey fig.

Flowering and fruiting: September to March.

Distribution: One of the globally wide spread species in the world. Distributed all throughout the country.

Habitat: Evergreen, semi evergreen and moist deciduous forest.

IUCN status: Least Concern (LC).

Etymology: The species epithet mostly refers to the green nature of the leaves.

Uses: Dried fruits are used to treat diabetics (Lansky & Paavilainen, 2011). Decoction prepared form the bark is used in the treatment of ulcers (Khan, 2017).

Notes: This is the most common variety of *F. virens.* The taxon is highly variable with respect to its vegetative characters.

Specimens examined: India, **Andhra Pradesh,** Alluri Sitharama Raju District, Rampachodavaram, 300 m, 17 May 1966, *G.V. Subba Rao 27248* (MH). Chittoor District, Peecheruvu, 520 m, 21 September 2014, *L. Rasingam & M. Sankara Rao 5748* (BSID). East Godavari District, Maredumilli, 550 m, 23 February 1994, *M. Mohanan 101363* (BSID); *ibid.,* 450 m, 26 October 1994, *M. Mohanan 102671* (BSID). Kurnool District, Phaladhara – Phanjadara, 05 March 2014, *L. Rasingam & M. Sankara Rao 4715* (BSID); Baladhara panchadara, 510 m, 06 June 2015, *L. Rasingam & M. Sankara Rao 6651* (BSID). Tirupati District, Talakona - Chamla range, 768.9 m, 17 February 2014, *P.V. Prasanna & M. Sankara Rao 3896* (BSID). **Goa,** Dadra and Nagar Haveli District, Mandoni, 09 May 1963, *S.R. Rolla 89135* (BSI). **Gujarat,** Sabar Kantha District, Bavandgadh, 11 February 1983, *P.L. Narasimhan 165422* (BSI). **Karnataka,** Chamarajanagar District, Havarai, Bedguli, 15 April 1962, *A.S. Rao 79897* (BSI); B. R. Temple-Bedguli, 735 m, 24 January 1984, *B. R. Ramesh & M. Deshayes BRR0586* (HIFP); B. R. Hills, 700 m, 26 March 2004, *C. Murugan 117672* (MH); Jenumanaella, B. R. T. Wild Life Sanctuary, 29 May 2014, *J. Jayanthi 195983* (BSI); Doddasampige, 1202 m, 23 December 2016,

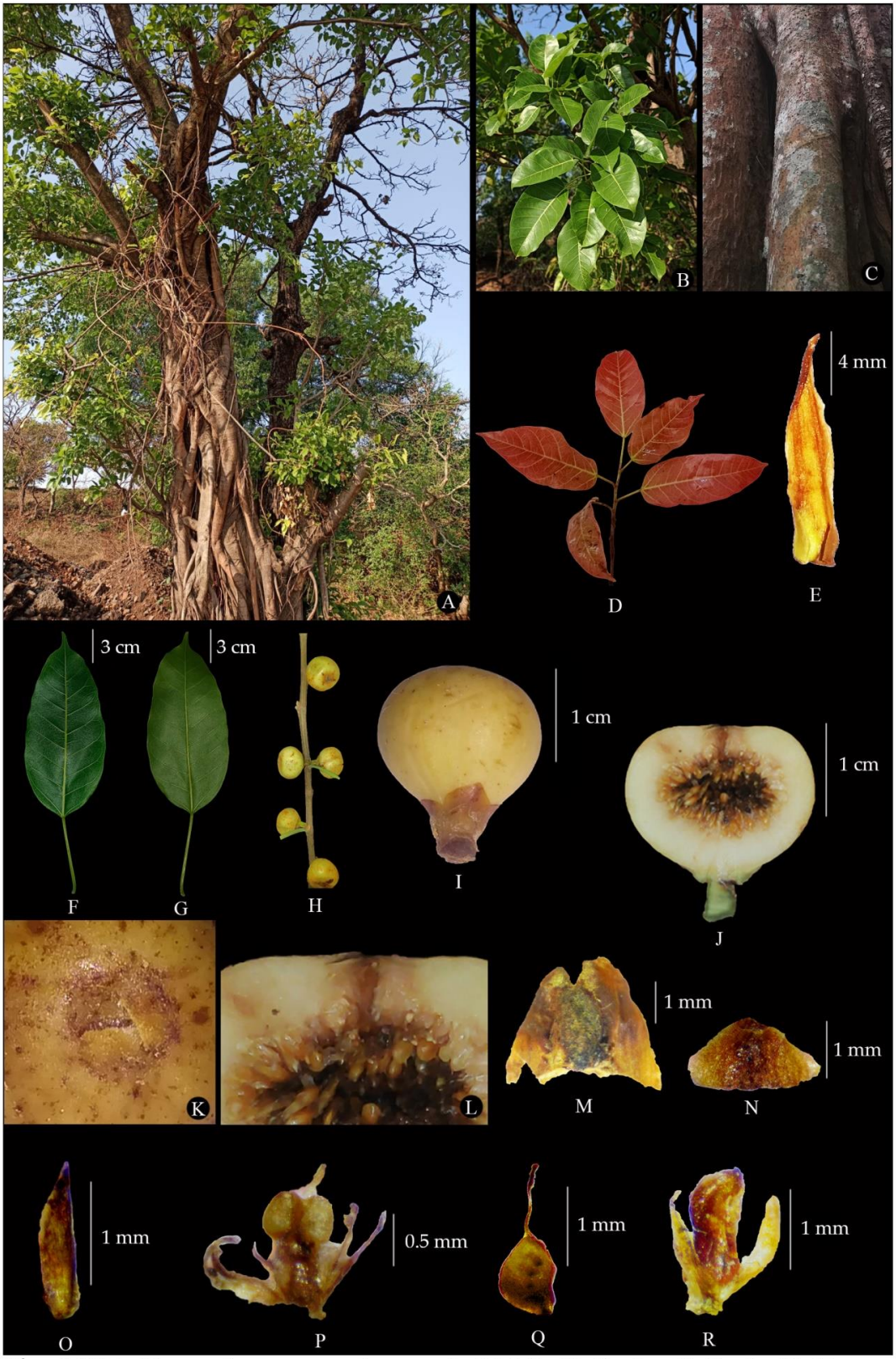


Fig. 3.107. ***Ficus virens*** var. ***virens***.: **A.** Habit; **B.** Twig; **C.** Bark; **D.** Young leaves; **E.** Stipule; **F.** Leaf adamxial side; **G.** Leaf abaxial side; **H.** Receptacles; **I.** Syconium; **J.** Syconium L. S.; **K.** Ostiole; **L.** Ostiolar L. S.; **M.** Basal bract; **N.** Outer ostiolar bract; **O.** Tepal; **P.** Male flower; **Q.** Female flower; **R.** Gall flower.

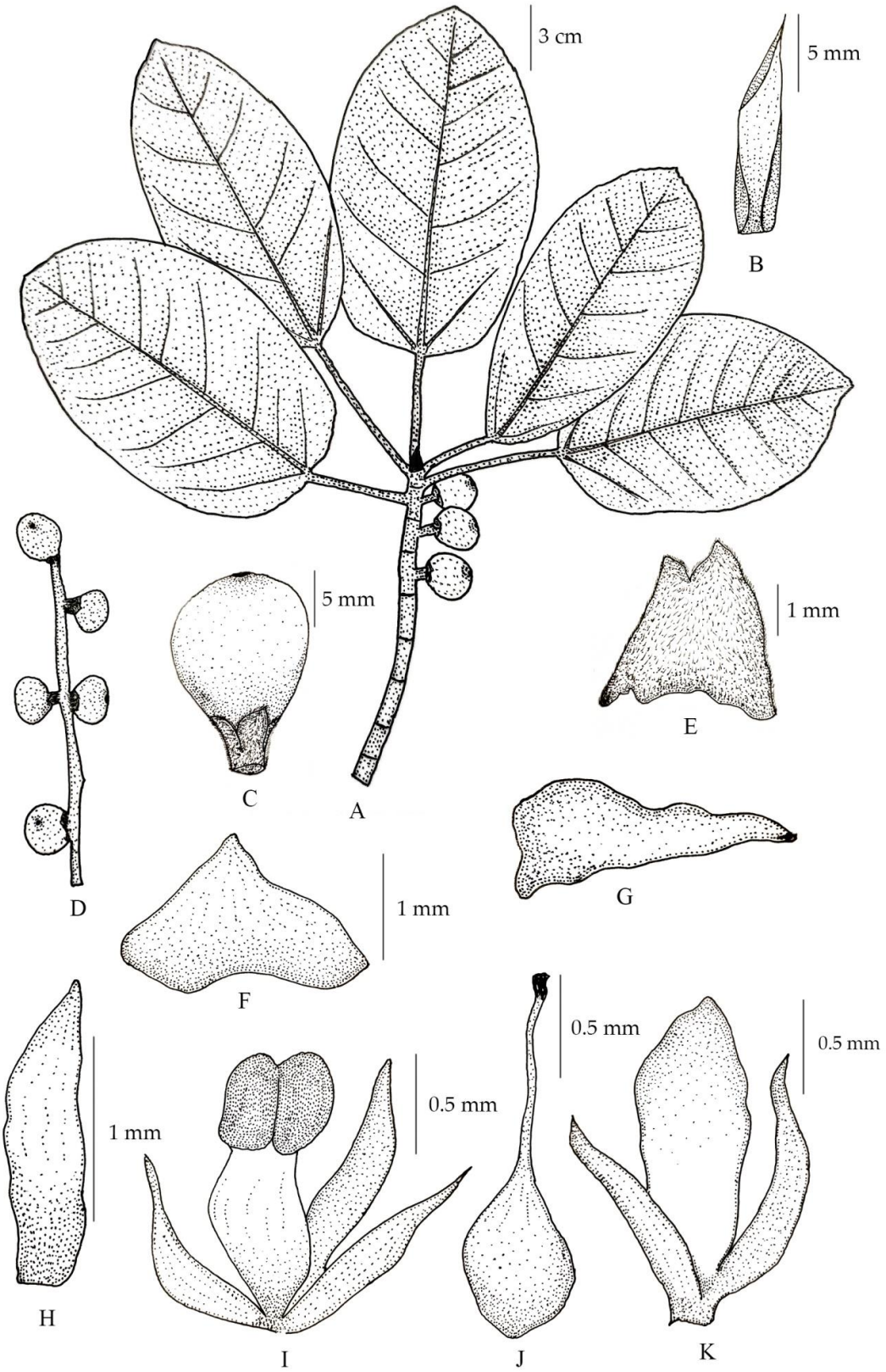


Fig. 3.108. ***Ficus virens*** var. ***virens***.: **A.** Twig; **B.** Stipule; **C.** Syconium; **D.** Receptacles; **E.** Basal bract; **F.** Outer ostiolar bract; **G.** Inner ostiolar bract; **H.** Tepal; **I.** Male flower; **J.** Female flower; **K.** Gall flower.

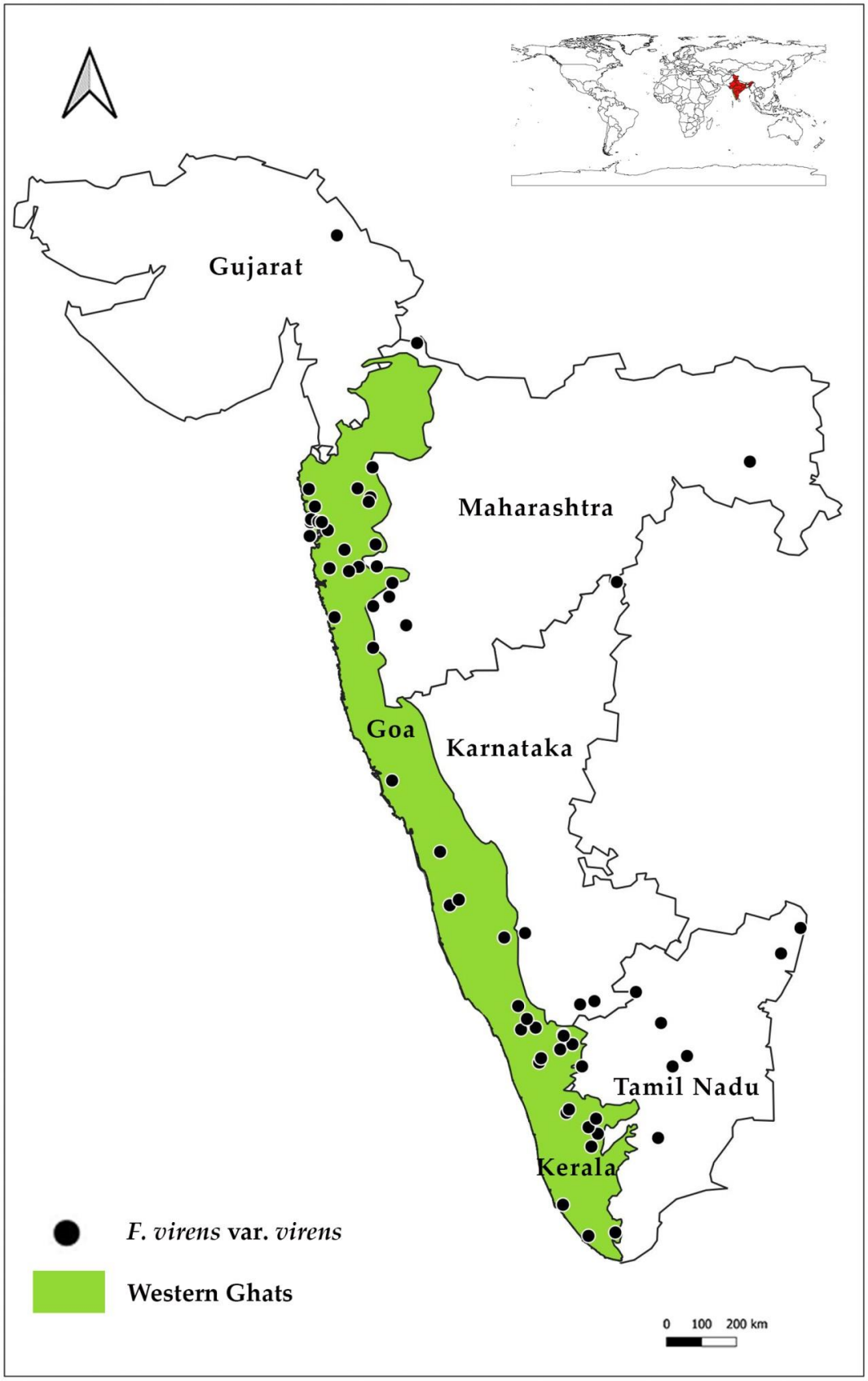


Fig. 3.109. *Ficus virens* var. *virens*. - Distribution map.

J. Jayanthi 206589 (BSI). Hassan District, Saklaspur (Sakleshpura), 16 December 1903, *C.A. Barber 6210* (MH); Barguai, 16 December 1903, *C.A. Barber 6220* (MH); Saklaspur (Sakleshpura), 28 April 1905, *C.A. Barber 7066* (MH); Road to Magge, 05 February 1970, *C.J. Saldanha 16265* (JCB). Shimoga District, Agumbe, Koppa road, 30 October 1960, *R.S. Raghavan 67961* (BSI); Thirthahalli, 29 August 1962, *R. Sundara Raghavan 82785* (BSI); Yedur, 22 August 1963, *R. Sundara Raghavan 90138* (BSI); Tenginkuppa, Thirthahalli, 19 March 1964, *R. Sundara Raghavan 97021* (BSI). Uttara Kannada District, Kattalekan Forest-Jog falls, 86 m, 20 March 2006, *N. Ayyappan & B.R. Ramesh BTWG132* (HIFP). **Kerala,** Idukki District, Munnar to Bodi road, 26 March 1980, *K.M. Matthew 66517* (MH); Erattayar, 1025 m, 28 September 1981, *C.N. Mohanan 72153* (MH). Kannur District, Thirunelli R. F., 780 m, 06 May 1979, *V.S. Ramachandran 62286* (MH). Kollam District, Olappara R. F., 650 m, 09 September 1977, *N.C. Nair 50948* (MH); Vilakkumaram, Shenduruny W. L. S., 09 December 1993, *Sasidharan 10687* (KFRI). Malappuram District, Karuvarakundu, 16 June 1982, *s.coll. 33369* (CALI); *ibid.,* 16 June 1982, *s.coll. 33372* (CALI). Thiruvananthapuram District, Peringammala, 19 June 1984, *N. Mohanan 174* (TBGT). Trissur District, Ambalappara, 17 February 2021, *Sreehari S. Nair 12139* (MESAH). Wayanad District, Bhramagiri, on the way to Pakshipathalam, 15 January 1986, *R.T. Balakrishnan 41869* (CALI); Vythiri, 900 m, 15 May 2000, *Rathesh Narayanan 2547* (CALI). **Madhya Pradesh,** Chhindwara District, Pagara, *s.d., s.coll.* 8604 (BLAT). Hoshangabad District, Bori R. F., 1000 m, 06 October 1960, *J. Joseph 11295* (MH). Neemuch District, Manda, Khari R. F., 650 m, 04 April 1962, *J. Joseph 14004* (MH). **Maharashtra**, Burhanpur District, Western slopes below Bori village, 27 April 1960, *N.A. Irani NI4962* (BLAT); *ibid.*, 27 April 1960, *N.A. Irani NI4953* (BLAT); before Anoda, Khandesh, December 1918, *s.coll. 27110* (BLAT); Turaumal,

Khandesh, December 1918, *s.coll. 26840* (BLAT); *ibid.,* December 1918, *s.coll. 27282* (BLAT); *ibid.,* December 1918, *s.coll. 26804* (BLAT); *ibid.,* December 1918, *s.coll. 27294* (BLAT). Chandrapur District, Kalambe, 14 March 1971, *B.M. Wedhwa 133850* (BSI). Mumbai District, Fort, Bombay, 14 April 1942, *B.S. Nazareth 834* (BLAT); National Park, Borivali, 29 September 1954, *P.S. Herbert SH115* (BLAT); *ibid.,* 14 October 1954, *P.S. Herbert SH159* (BLAT); *ibid.,* 06 February 1955, *P.S. Herbert SH514* (BLAT); *ibid.,* 22 February 1955, *P.S. Herbert SH573* (BLAT); Malad, along main road, 27 February 1955, *G.L. Shah Shah1775A* (BLAT); National Park, Borivali, 06 March 1955, *P.S. Herbert SH597* (BLAT); Malad, Quarry hills, 29 July 1955, *G.L. Shah Shah4727* (BLAT); *ibid.,* 29 July 1955, *G.L. Shah Shah 4730* (BLAT); *ibid.,* 16 October 1955 *G.L. Shah Shah6143* (BLAT); *ibid.,* 16 October 1955, *G.L. Shah Shah6144* (BLAT); National Park, Borivali, 12 January 1956, *P.S. Herbert SH1252* (BLAT); Borivali, Kavary caves, 17 March 1956, *N.A. Irani NI1776* (BLAT); National Park, Borivali, 26 March 1956, *P.S. Herbert SH1526* (BLAT); Victoria garden, Bombay, 20 September 1956, *R.R. Fernandez R2813* (BLAT); *ibid.,* 20 September 1956, *R.R. Fernandez R2814* (BLAT); National Park, Borivali, 24 October 1956, *P.S. Herbert SH2500* (BLAT); *ibid.,* 24 October 1956, *P.S. Herbert SH2501* (BLAT); 24 October 1956, *P.S. Herbert SH2502* (BLAT); Chami road, Bombay, 12 July 1957, *R.R. Fernandez R4181* (BLAT); Chami road, Bombay, 12 July 1957, *R.R. Fernandez R4182* (BLAT); Malad hills, 03 November 1957, *G.L. Shah Shah9424* (BLAT); Near U7 and U4, 25 February 1958, *S.C. Tavakari T776* (BLAT); *ibid.,* 25 February 1958, *S.C. Tavakari T774* (BLAT); Near U7, 25 February 1958, *S.C. Tavakari T777* (BLAT); Central dairy along Borvali road via U7, 27 March 1958, *S.C. Tavakari T958* (BLAT); *ibid.,* 27 March 1958, *S.C. Tavakari T957* (BLAT); *ibid.,* 13 April 1958, *S.C. Tavakari T1088* (BLAT); Central dairy to U5, U12, U13, U23 and U24, 10 February 1959, *S.C. Tavakari T2185*

(BLAT); Victoria Garden, Bombay, February 1917, *s.coll. 15302* (BLAT); *ibid.,* January 1917, *s.coll. 15272* (BLAT); Kavery caves, Salsettle, November 1918, *s.coll. 28628* (BLAT), *ibid.,* November 1918, *s.coll. 28626* (BLAT); *ibid.,* November 1918, *s.coll. 28680* (BLAT). Nandurbar District, Toranmal, 05 May 1907, *W.A. Talbot 4984* (BSI). Nashik District, Tondwal, 13 July 1967, *John Cherian 111159* (BSI); *ibid.,* 13 July 1967, *John Cherian 111182* (BSI); Sawarna, 17 July 1967, *John Cherian 111239* (BSI); Borichi bari point, 20 July 1967, *John Cherian 111266* (BSI); Saural ghat, 05 August 1983, *P.L. Narasimhan 165209* (BSI); Kalsubai Forest, Igatpuri, 24 March 1984, *P.L. Narasimhan 166359* (BSI). Palghar District, Tali Forest, Dharamapur, 15 June 1958, *P.S. Toor 39181* (BSI); Tunga hill, western slope of Golani Naka range, 23 January 1968, *K.V. Billore 113789* (BSI). Pune District, Purandhar, November 1917, *s.coll. 25398* (BLAT); Jayedhi hill, Bhovangiri, Khed taluka, 03 April 1962, *K.P. Janardhanan 76555* (BSI); Hill near Wanak village, Mulshi, 21 March 1963, *Seshagiri Rao Rolla 87310* (BSI); Ambavane forest, 24 December 1963, *B. Venkata Reddi 93423* (BSI); Ambavane, Anuran forest, Lonavla, 04 February 1964, *B. Venkata Reddi 95973* (BSI); Nirthiga ghat, on the way to Madgaon, Ambavane, Lonavla, 24 March 1964, *B. Venkata Reddi 96189* (BSI); Saltan, open forest at extreme end of hill, Ambavane, Lonavla, 27 March 1964, *B. Venkata Reddi 97602* (BSI); Polarahwada, near Jiskari, 27 October 1964, *B. Venkata Reddi 101035* (BSI); Bhivadi khund, Durga Khilla, 17 -18 miles west of Junnar, 11 January 1965, *K. Hemadri 104381* (BSI); *ibid.,* 11 November 1965, *K. Hemadri 104379* (BSI). Raigad District, Way to Kayat, Karjat, March 1917, *s.coll. 25451* (BLAT); Matheran, Alexandra point, 30 January 1957, *G.S. Puri 14028* (BSI); Matheran, Garburd point, 31 January 1957, *G.S. Puri 14066* (BSI). Ratnagiri District, Dapoli, March, 1917, *s.coll. 25303* (BLAT); Ramghat, 09 February 1970, *B. G. Kulkarni 119583* (BSI). Satara District, Panchagni to

Mahabaleshwar, 18 November 1902, *R. K. Bhide 1115* (BSI); Khandala, March 1917, *s.coll. 25408* (BLAT); Panchgani, October 1919, *s.coll. 25407* (BLAT); Khandala, April 1919, *s.coll. 25475* (BLAT); Turaumal, Khandesh, December 1918, *s.coll. 27293* (BLAT); December1918, *s. coll. 26812* (BLAT); Khandala, April 1941, *H. Santapau H86* (BLAT); Khandala, Eco point ravine, 24 October 1942, *H. Santapau 1219* (BLAT); Khandala, plateau west of Battery hill, 31 December 1942, *H. Santapau 1474* (BLAT); Khandala, St. Xavier's ravine, 23 January 1943, *H. Santapau 1525* (BLAT); Khandala, Battery hill slope, 20 May 1944, *H. Santapau 4268* (BLAT); Khandala, Battery hill plateau, 20 May 1944, *H. Santapau 4266* (BLAT); *ibid.,* 20 May 1944, *H. Santapau 4267* (BLAT); Khandala Eco point, 17 June 1944, *H. Santapau 4532* (BLAT); Khandala, ravine under Eco point, 03 October 1945, *H. Santapau 7445* (BLAT); Khandala, St. Xavier's ravine, 26 November 1945, *H. Santapau 8085* (BLAT); *ibid.,* 26 November 1945, *H. Santapau 8086* (BLAT); Khandala, 16 June 1946, *H. Santapau 9200* (BLAT); *ibid.,* 07 April 1956, *R.R. Fernandez R2290* (BLAT); 4 miles from Mahabaleshwar, 08 May 1961, *Seshagiri Rao Rolla 71703* (BSI). Thane District, Wada, 28 January 1903, *s.coll. 788* (BSI); Mumbra, 23 December 1953, *K.V. Shenoy KVS1791* (BLAT); *ibid,* 23 December 1953, *K.V. Shenoy KVS1792* (BLAT); *ibid,* 23 December 1953, *K.V. Shenoy KVS1795* (BLAT); *ibid,* 23 December 1953, *K.V. Shenoy KVS1793* (BLAT); *ibid,* 28 August 1954, *K.V. Shenoy KVS4173* (BLAT); *ibid,* 28 August 1954, *K.V. Shenoy KVS4177* (BLAT); ibid, 28 August 1954, *K.V. Shenoy KVS4187* (BLAT); *ibid,* 28 August 1954, *K.V. Shenoy KVS4196* (BLAT); *s.loc., s.d., s.coll. 25445* (BLAT); *s.loc., s.d., s.coll. 25432* (BLAT). **Rajasthan,** Jaipur District, Jaipur, 19 March 1959, *S.K. Jain 49631* (BSI). Sirohi District, Mount Abu, Rajaputra, April 1916, *s.coll. 25474* (BLAT); Mount Abu, Shergaum, May 1916, *s.coll. 25428* (BLAT); Mount Abu, Rajaputra, May 1916, *s.coll. 25472* (BLAT); Mount Abu, October 1916,

s.coll. A12 (BLAT); Mount Abu, Rajaputra, October 1916, *s.coll. 25424* (BLAT); *ibid.,* October 1916, *s.coll.* 25455 (BLAT); *ibid.,* October 1916, *s.coll. 25258* (BLAT); Mount Abu, Shergaum, October 1918, *s.coll. 25473* (BLAT); Mount Abu, 1 mile on the way to Gomukh, 09 November 1959, *S.K. Jain 48190* (BSI); **Tamil Nadu,** Coimbatore District, Udumanparai, Anamalais, 22 October 1901, *C. A. Barber 4096* (MH); Erathippatti, 15 August 1929, *V. Narayana Swami 18931* (MH); North Talamalis, 2100 ft, 23 August 1929, *V. Narayana Swami 19130* (MH); Girimalami, 3000 ft, 18 March 1931, *K. Cherian Jacob 421* (MH); Kuridimalai, 800 m, 17 November 1968, *J.L. Ellis & S. Karthikeyan 31324* (MH); Perumal mudi, 1110 m, 21 April 1970, *M.V. Viswanathan MVV560* (MH); *ibid.,* 1010 m, 22 July 1970, *M.V. Viswanathan MVV709* (MH). Dharmapuri District, Hogainakkal, 275 m, 28 May 1965, *E. Vajravelu 24147* (MH); Foot hills of Guthirayan, 21 December 1990, *T. Ravisankar 95507* (MH). Dindugal District, Madurai, 1700 m, 26 April 1965, *K. Ramamurthy 23484* (MH); Thandikudi – Kodaikanal, 1500 m, 30 July 1965, *K.M. Sebastine 25032* (MH); Thandikudi – Kodaikanal, 1500 m, 30 July 1965, *K.M. Sebastine 25032* (MH); Sirumalais, *s.d., J. Pallithanam JP3347* (BLAT). N. Arcot District, Kottaiyur R.F., 1000 m, 15 January 1985, *M.B. Viswanathan 783* (MH). Nilgiri District, Madras, August 1884, *J.S. Gamble 14230* (BSI); Kengarai Range Forest, 1650 m, 04 May 1917, *E. Vajravelu 38248* (MH); Marapalam, 1500 m, 23 March 1957, *K.M. Sebastine 2595* (MH); Upper Tiger shola, 1750 m, 25 March 1957, *K. M. Sebastine 2665* (MH); Kundha Reserve, 2000 m, 31 August 1957, *K. M. Sebastine 3975* (MH); Kallipalam, 1325 m, 21 January 1961, *B.V. Shetty 11967* (MH); Kulivayal R. F., 960 m, 25 July 1962, *E. Vajravelu 41808* (MH); Near Kunjapanai, 1450 m, 06 August 1970, *E. Vajravelu 35241* (MH); Kalhatti, 1900 m, 20 August 1970, *B. D. Sharma 35662* (MH); Madanad, 1425 m, 15 November 1970, *E. Vajravelu 36918* (MH); Marappalam, Burliar road, 1225 m,

29 April 1971, *N.C. Rathakrishnan 318128* (MH); Kolikari, 950 m, 04 February 1972, *E. Vajravelu 39764* (MH); Kalhalti - Masinagudi road, 1450 m, 18 February 1972, *B.D. Sharma 39844* (MH); Slopes of Segur peak, 1050 m, 13 March 1972, *G.V. Subba Rao 40201* (MH); *ibid.,* 1050 m, 13 March 1972, *G.V. Subba Rao 40211* (MH); *ibid.,* 1050m, 13 March 1972, *G.V. Subba Rao 40196* (MH); *ibid.,* 1075 m, 13 May 1972, *G.V. Subba Rao 40211* (MH); from Ebanad to Sirur, 1550 m, 28 July 1972, *G.V. Subba Rao 41573* (MH). Salem District, Orchidarium, Yercaud, 1380 m, 08 February 1965, *S. Karthikeyan 23624* (MH); Church hill road, Yercaud, 1410 m, 02 May 1965, *S. Karthikeyan 26803* (MH). Tirunelveli District, Mahandragiri R. F., 18 September 1916, *s.coll. 13213* (MH); Vasnderanallur R. F., 250 m, 01 October 1971, *E. Vajravelu 38825* (MH); Balmadies Estate, Yercaud, 1666m, 20 December 1965, *K. Subramanyam 7557* (MH); Yercaud, 1000 m, 16 December 1969, *D.B. Deb 31448* (MH); Ullarur near Thulukkam mottai, 700 m, 12 February 1989, *s.coll. 90140* (MH); Ullar, 24 February 1999, *P.C. Suresh Kumar 40876* (TBGT); Agasthiyar falls, 03 November 2000, *P. Venu 111812* (BSID). **Telangana**, Mahabubnagar District, Uskavagu Road, Mannanur Beat, 550 m, 24 February 1996, *S.R. Srinivasan 107441* (BSID); Uskavagu, Mannanur, 650 m, 26 March 1997, *S.R. Srinivasan 108901* (BSID); Farhabad New Road, 748 m, 16 December 2014, *L. Rasingam & M. Sankara Rao 4772* (BSID). Wrangal District: Pakhal, 250 m, 24 March 1999, *R.K. Premnath 108256* (MH & BSID); Gangaram, 250 m, 19 February 2000, *R.K. Premnath 110910* (MH & BSID); Thakharam, 250 - 300 m, 26 January 2001, *R.K. Premnath 112720* (MH & BSID). **Uttarakhand.** Chamoli District, Kumaun, 31 July 1962, *P.V. Bole 5007* (BLAT).

3.6.34b. *Ficus virens* var. *dispersa* Chantaras.

Ficus virens Aiton var. *dispersa* Chantaras. Syst. Bot. 38(3): 681. 2013; Nair *et al.,* Biodiv. Res. Conserv. 63: 41-47. 2021**. Type:** Papua New Guinea.

New Britain: West Nakanai, Rapuri village near Cape Hoskins, 5 Aug 1954, *A. Floyd NGF 6457* (Holotype- L, L 0940363!; isotypes- K, K001089720!).

Fig. 3. 110 – 3.112

Tree up to 15 m height, hemi epiphytic, aerial roots absent; bark lenticellate, brown coloured; young twigs terete, core solid, smooth, glabrous, brown; inter node 0.4–1.2 cm long; latex milky, white. Stipule caducous, ovate, 0.4–1.2 x 0.2–0.6 cm, margins entire, apex acute, base truncate, glabrous, pale green. Petiole articulated, terete, 2.6–4.8 cm long, glabrous, pale green. Leaves simple, alternate, spiral; lamina symmetric, ovate to lanceolate, 5.9–11.8 x 3.6–5.8 cm, margins entire, acumen 0.6–1.2 cm long, apex cuspidate, base rounded to obtuse to cuneate, glabrous, pale red to pale green when young, green on abaxial, dark green on adaxial on maturity, subcoriaceous, venation brochidodromous; basal veins 3, lateral veins 7–9 pairs, waxy glands on the base of the midrib. Receptacles axillary or below the leaves, solitary or in pairs, monoecious, pedunculate; peduncle 3.0–4.0 mm long, glabrous, green; basal bracts present, persistent, 3, free, 0.7–1.1 cm long, widely ovate, puberulous, pale brown. Syconium 0.7–1.1 cm across, globose, glabrous, pale green when young, purple on maturity; ostiole 1.0–2.0 mm; outer bracts present, free, ovate, 1.0 mm long, glabrous, pale brown; inner bracts present, free, lanceolate, 2.0 mm long, glabrous, pale red to brown. Male flowers dispersed, 1.2 mm long, sessile; tepals 4, fused, 0.75 mm long, lanceolate, glabrous, pale red; stamen 1, anther 0.5 mm, filament 0.5 mm long. Female flowers at the base, 2.5 mm long, sessile; tepal 3, free, 2.0 mm long, lanceolate, glabrous, pale red; stigma 0.25 mm long; style 0.75 mm long; ovary 1.5 mm long, obovoid, glabrous, pale brown. Gall flowers scattered, 2.0 mm long; pedicellate, 2.0 mm long; tepals 3, fused, 1.5 mm

long, lanceolate, glabrous, pale ped; stigma short; style 0.25 mm long; ovary 1.5 mm long, obovoid, glabrous, pale brown. Achenes 1.0 mm, globose, pale brown.

Local names: Nil.

Common names: Nil.

Flowering and fruiting: November – February.

Distribution: This variety of *F. virens* is reported from Malaysia, Indonesia, Papua New Guinea and East Australia.

Habitat: Semi evergreen and moist deciduous forest.

IUCN status: Not Evaluated (NE).

Etymology: The male flowers are arranged dispersed within the receptacle and mostly this variety might be named '*dispersa*' due to this dispersed nature of the male flowers.

Uses: No use of this species is reported so far for this species.

Notes: Nair *et al.* (2021c) reported this taxon as a new record to floral wealth of India. This variety is distinct from *F. virens* var. *virens* in both vegetative and floral characters. A detailed comparison of the characters is provided in table 3.7.

Specimens examined: India, **Kerala,** Idukki District, Karimutty, Chinnar W. L. S., 942 m, 30 January 2021, *Sreehari S. Nair & K.H. Amitha Bachan 12121* (MESAH). Papua New Guinea. West Nakanai, Rapuri village near Cape Hoskins, 05-08-1954, A. Floyd NGF 6457 (L & K).

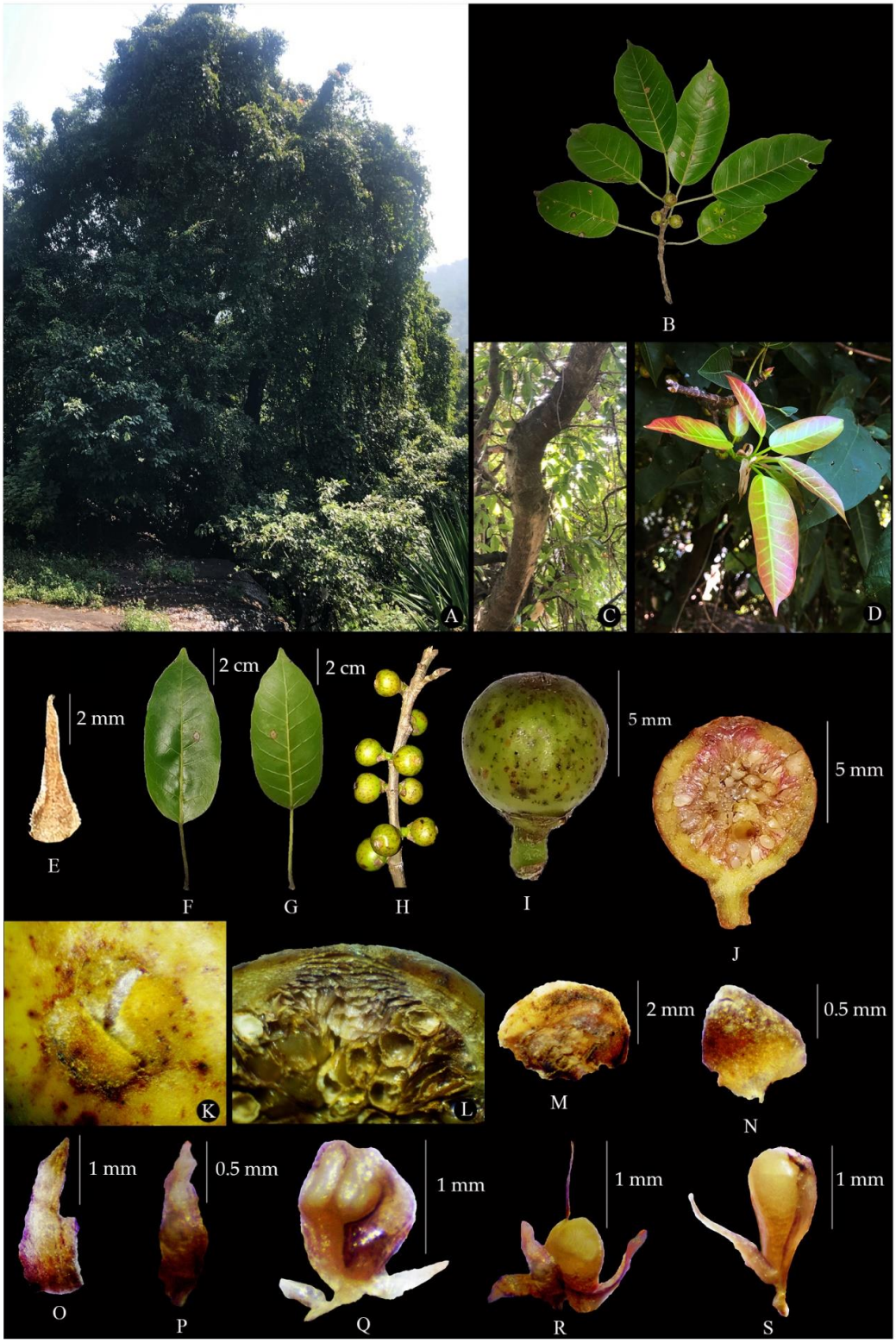


Fig. 3.110. ***Ficus virens*** Aiton var. ***dispersa*** Chantaras.: **A.** Habit; **B.** Twig; **C.** Bark; **D.** Young leaves; **E.** Stipule; **F.** Leaf adamxial side; **G.** Leaf abaxial side; **H.** Receptacles; **I.** Syconium; **J.** Syconium L. S.; **K.** Ostiole; **L.** Ostiolar L. S.; **M.** Basal bract; **N.** Outer ostiolar bract; **O.** Inner ostiolar bract; **P.** Tepal; **Q.** Male flower; **R.** Female flower; **S.** Gall flower.

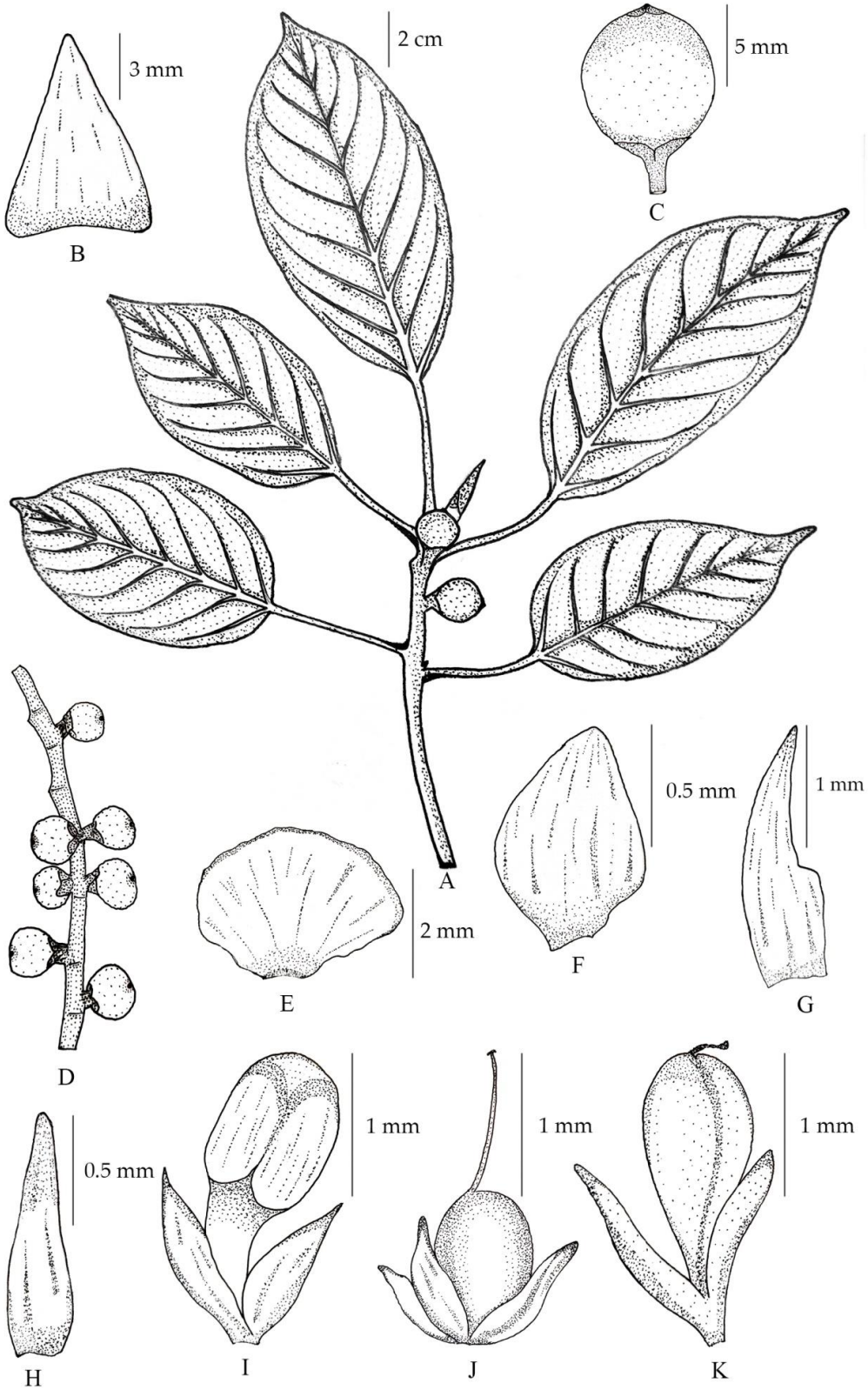


Fig. 3.111. ***Ficus virens*** Aiton var. ***dispersa*** Chantaras.: **A.** Twig; **B.** Stipule; **C.** Syconium; **D.** Receptacles; **E.** Basal bract; **F.** Outer ostiolar bract; **G.** Inner ostiolar bract; **H.** Tepal; **I.** Male flower; **J.** Female flower; **K.** Gall flower.

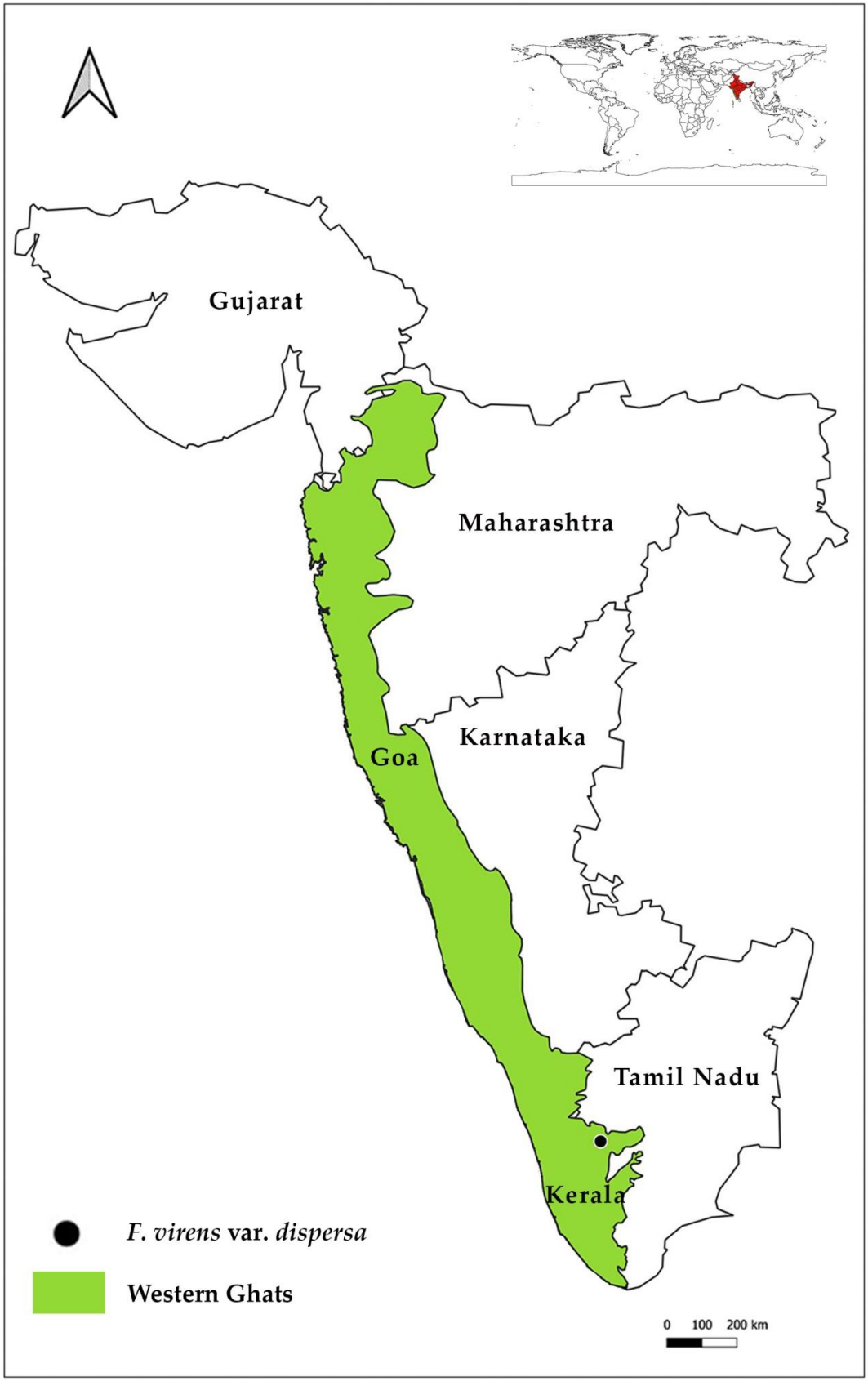


Fig. 3.112. *Ficus virens* Aiton var. *dispersa* Chantars.- Distribution map.

3.6.34c. *Ficus virens* var. *matthewii* Chantaras.

Ficus virens Aiton var. *matthewii* Chantaras. Syst. Bot. 38(3): 683. 2013; Nair *et al.,* Species. 22(69): 21-28. 2021**. Type:** India, Tamil Nadu, Dindugal District, Anna, Pachalur, below village, 01 November 1987 *K.M. Matthew RHT50937* (Holotype- L, L 0736226!).

Fig. 3.113 – 3.115

Tree up to 30 m height, hemi epiphytic and later becoming independent, aerial roots absent; bark lenticellate, brown; young twigs terete, core solid, smooth, pubescent, pale brown; inter node 0.6–4.0 cm long; latex milky, white. Stipule caducous, lanceolate, 0.7–1.5 x 0.6–1.2 cm, margins entire, apex acute, base truncate, tomentose, pale brown. Petiole articulated, terete, canaliculate, 1.5–11.2 cm long, glabrous, pale green. Leaves simple, alternate, spiral; lamina symmetric, lanceolate to elliptic to lance ovate to ovate, 5.8–20.5 x 3.1–7.2 cm, margins entire, acumen 0.4–0.9 cm long, apex acute to acuminate to obtuse, base attenuate to cuneate to obtuse to rounded to truncate, glabrous, pale green on abaxial, dark green on adaxial on maturity, subcoriaceous, venation brochidodromous; basal veins 3, lateral veins 10–12 pairs, waxy glands on the midrib beneath. Receptacles axillary or below the leaves, clustered, monoecious, pedunculate; peduncle 2.0–3.0 mm long, glabrous, pale green; basal bracts present, persistent, 3, fused at the base, 3.0–5.0 mm long, widely ovate, puberulous, yellow to pale brown. Syconium 0.4–2.2 cm across, obovoid, glabrous, pale green when young, purple when mature; ostiole 3.0–4.0 mm; outer bracts present, free, ovate, 2.0 mm long, puberulous, pale brown; inner bracts present, free, lanceolate, 1.2 mm long, glabrous, pale brown. Male flowers near ostiole, 1.0–1.1 mm long, pedicel short or sessile; tepals 3-4, fused, 1.0 mm long, lanceolate, glabrous, pale brown; stamen 1, anther 0.75 mm, filament 0.75 mm long. Female flowers at

the base, 3.0 mm long; pedicellate, 3.0 mm long; tepal 3, fused, 1.5 mm long, lanceolate, glabrous, pale brown; stigma 0.4 mm long; style 0.75 mm long; ovary 2.0 mm long, obovoid, glabrous, pale brown. Gall flowers scattered, 2.5 mm long; pedicellate, 2.0 mm long; tepals 4, fused, 2.0 mm long, lanceolate, glabrous, pale brown; stigma short; style 0.5 mm long; ovary 1.0 mm long, obovoid, glabrous, pale brown. Achenes 1.0 mm, obovoid, pale brown.

Local names: Nil.

Common names: Nil.

Flowering and fruiting: October to March.

Distribution: South India and Sri Lanka.

Habitat: Evergreen forests.

IUCN status: Not Evaluated (NE).

Etymology: The variety is named 'Matthewii' in honour of K M who collected the specimen for the first time in 1987.

Uses: No uses reported so far.

Notes: Nair *et al.* (2021b) reported this variety as a new distribution record to the Kerala state. The major difference in the characters between the varieties of *F. virens* from Western Ghats is provided in table 3.7. A comparison of the three varieties of *F. virens* is given in Fig. 3.116.

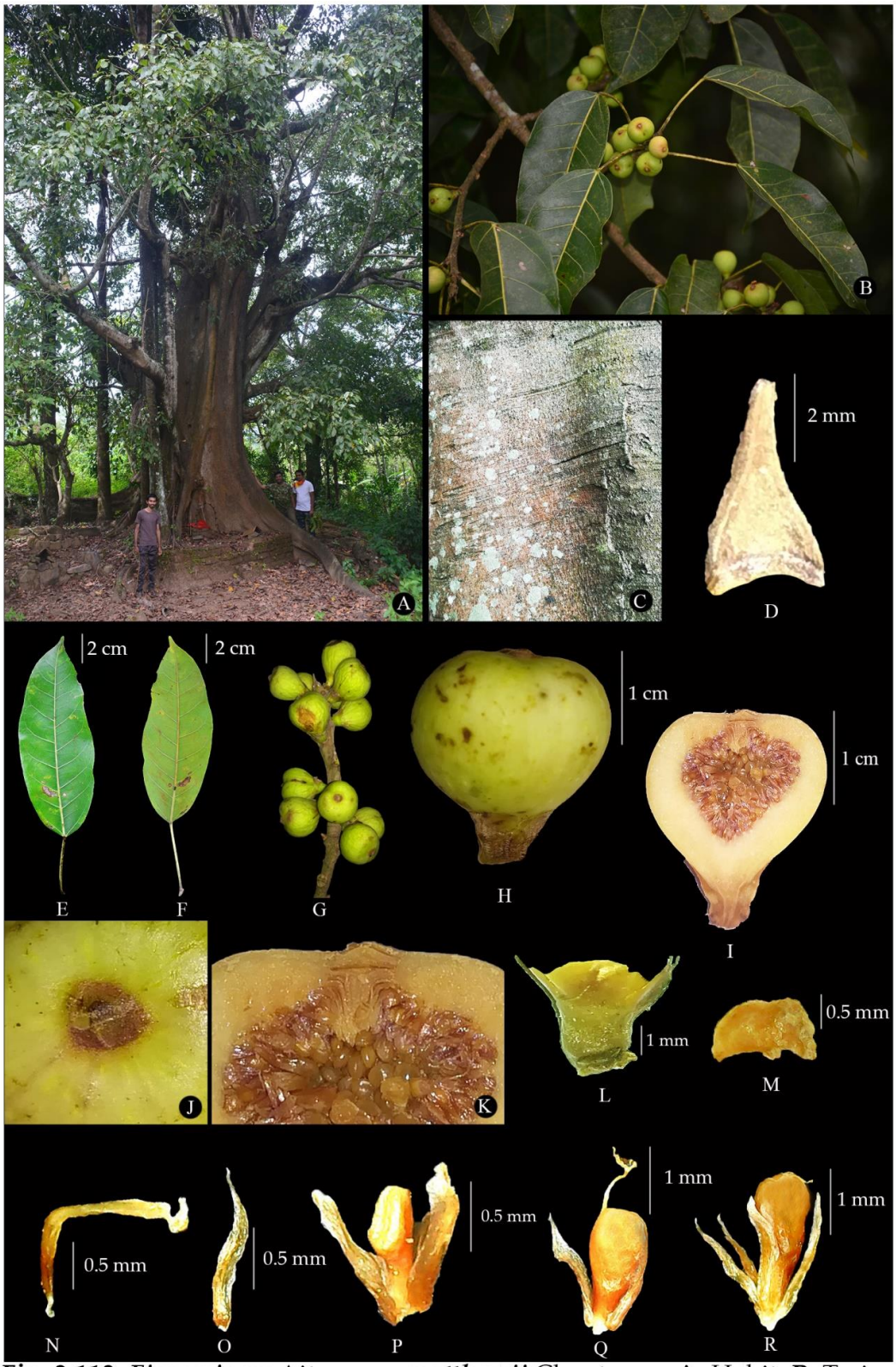


Fig. 3.113. ***Ficus virens*** Aiton var. ***matthewii*** Chantaras.: **A.** Habit; **B.** Twig; **C.** Bark; **D.** Stipule; **E.** Leaf adamxial side; **F.** Leaf abaxial side; **G.** Receptacles; **H.** Syconium; **I.** Syconium L. S.; **J.** Ostiole; **K.** Ostiolar L. S.; **L.** Basal bract; **M.** Outer ostiolar bract; **N.** Inner ostiolar bract; **O.** Tepal; **P.** Male flower; **Q.** Female flower; **R.** Gall flower.

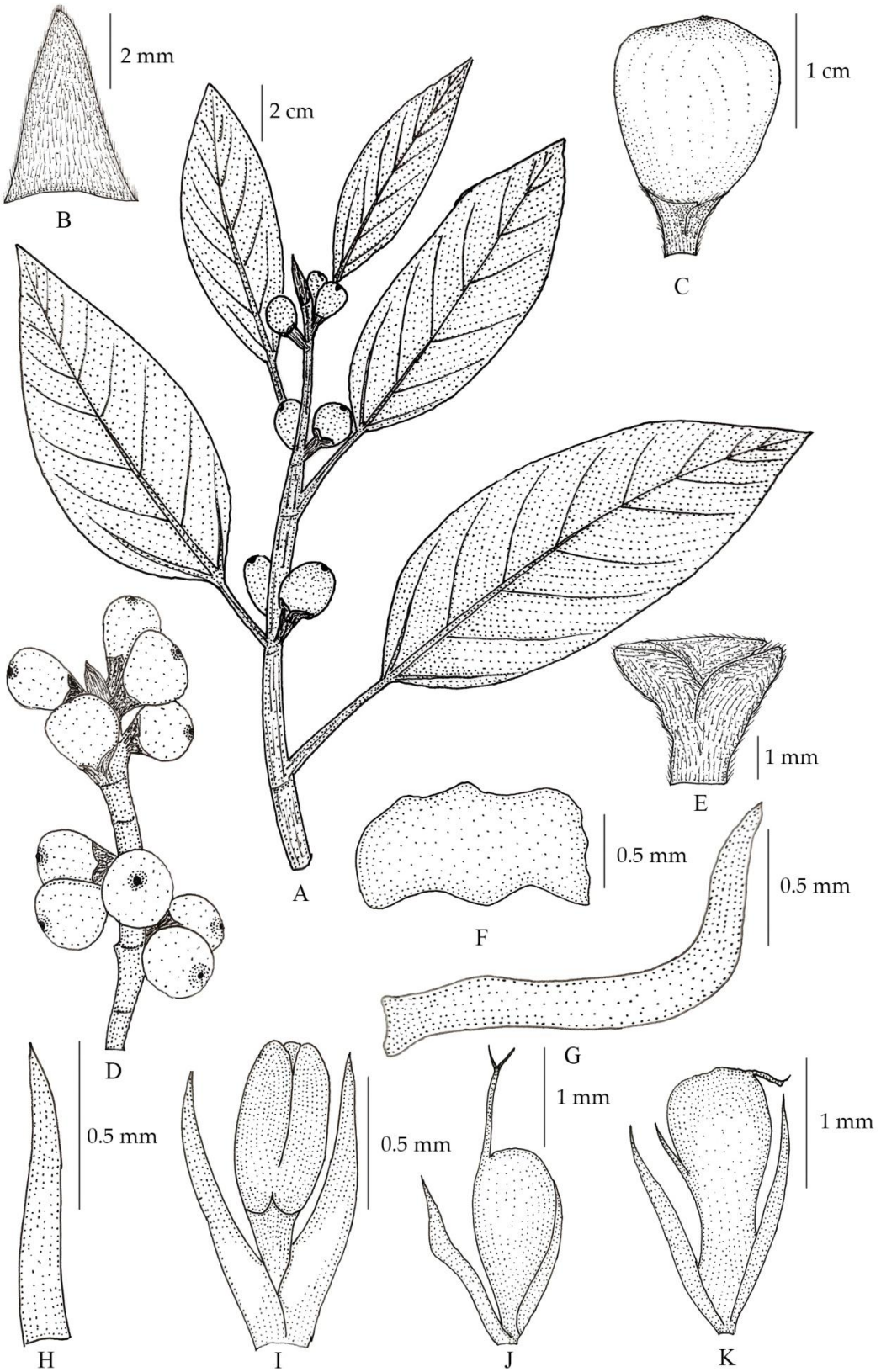


Fig. 3.114. ***Ficus virens*** Aiton var. ***Matthewii*** Chantaras.: **A.** Twig; **B.** Stipule; **C.** Syconium; **D.** Receptacles; **E.** Basal bract; **F.** Outer ostiolar bract; **G.** Inner ostiolar bract; **H.** Tepal; **I.** Male flower; **J.** Female flower; **K.** Gall flower.

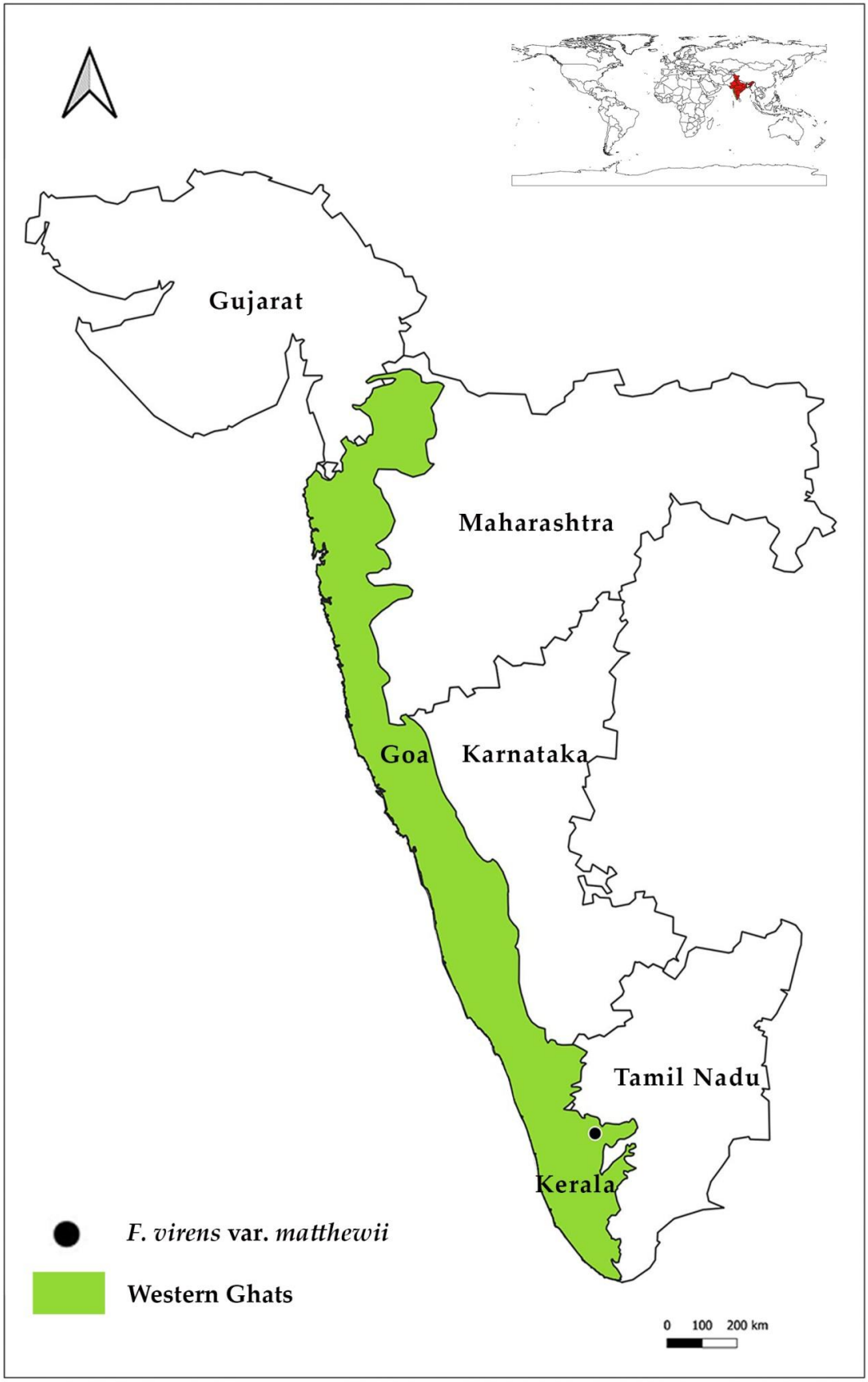


Fig. 3.115. *Ficus virens* Aiton var. *matthewii* Chantars.- Distribution map.

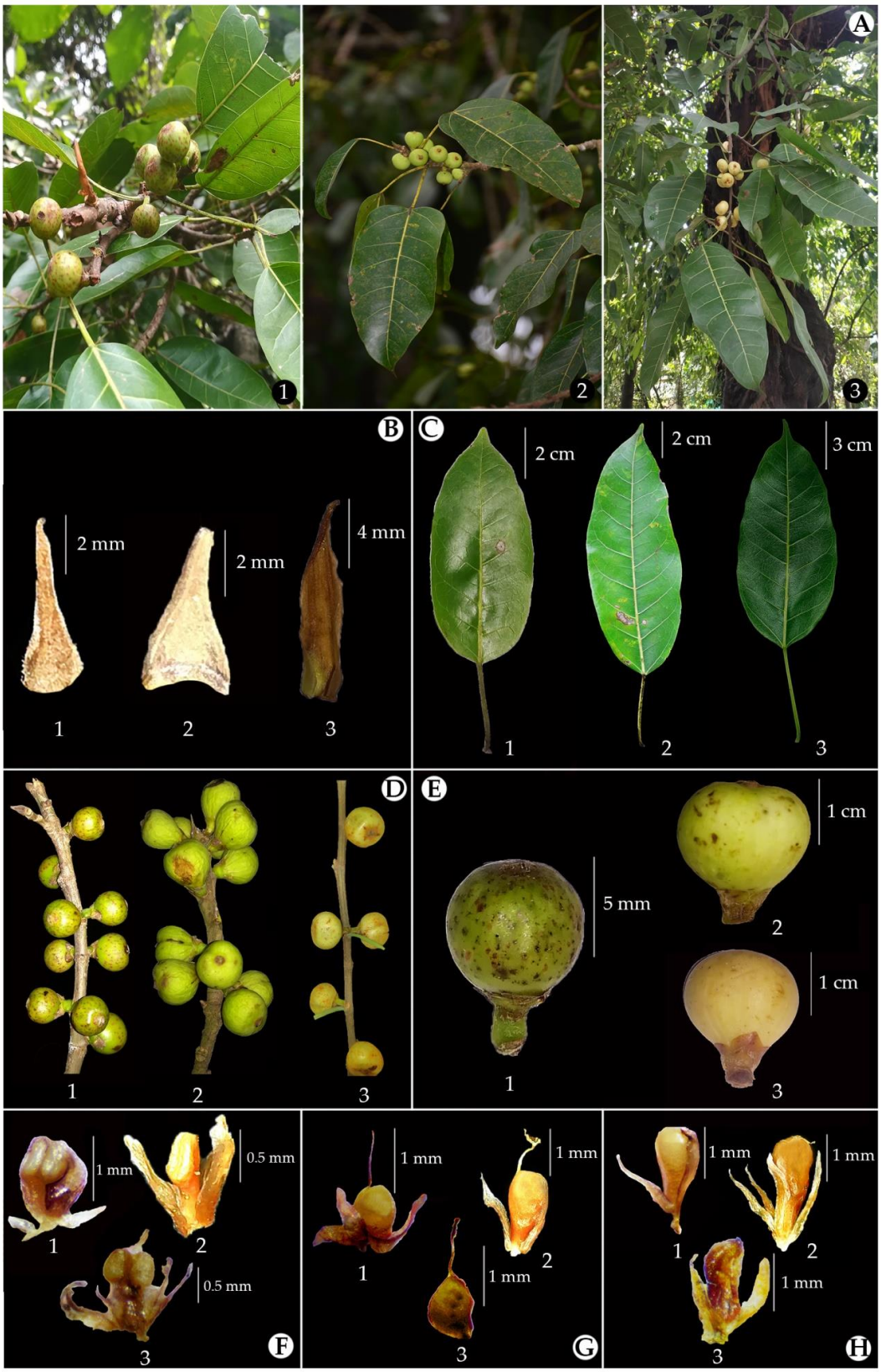


Fig. 3.116. Comparison between varieties of *Ficus virens*.
1. *F. virens* var. *dispersa*; **2.** *F. virens* var. *matthewii*; **3.** *F. virens* var. *virens*. **A.** Twig; **B.** Stipule; **C.** Leaf; **D.** Receptacles; **E.** Syconium; **F.** Male flower; **G.** Female flower; **H.** Gall flower.

Table 3.7. Comparison of characters between *F. virens* var. *dispersa*, *F. virens* var. *virens* and *F. virens* var. *matthewii*.

Character	*Ficus virens* var. *dispersa*	*Ficus virens* var. *virens*	*Ficus virens* var. *matthewii*
Habit	Tree up to 15 m	Tree up to 35 m	Tree up to 35 m
Stipule size	0.4–0.8 cm	0.25–1.5 cm	0.7–1.5 cm
Indumentum of stipule	Glabrous	Glabrous or puberulous	Tomentose
Petiole Size	2.6–4.8 cm	1.6–6.1 cm	1.5–11.2 cm
Leaf shape	Ovate - lanceolate	ovate to elliptic to lanceolate to obovate	lanceolate - elliptic - lance ovate - ovate
Leaf size	5.9–11.8 x 3.6 –5.8 cm	5.2–18.5 x 2.5 –8.5 cm	5.8–20.5 x 3.1–7.2 cm
Apex	Cuspidate to acuminate	Sub acuminate–acute–obtuse	acute – acuminate - obtuse
Base	Round–obtuse–cuneate	Cuneate–cordate–obtuse–sub attenuate	attenuate – cuneate – obtuse – rounded–truncate
No of lateral veins	7–9 pairs	8–12 pairs	10–12 pairs
Vein branching	Unbranched	Branched or unbranched	Unbranched
Peduncle size	3–4 mm	2.5 mm	2–3 mm
Basal bracts size	3–3.5 mm	1.5–4 mm	3–5 mm
Indumentum of basal bracts	Glabrous	Glabrous or minutely puberulous	Glabrous
Syconium size	0.7–1.1 cm when	0.4–1.5 cm when	0.4–2.2 cm

Character	*Ficus virens* var. *dispersa*	*Ficus virens* var. *virens*	*Ficus virens* var. *matthewii*
	fresh	dry	when fresh
Syconium shape	Globose	Sub globose	Obovoid
Indumentum of syconium	Glabrous	Glabrous or minutely puberulous	Glabrous
Ostiole size	1.5–2.5 mm	2–4 mm	3–4 mm
Position of male flowers	abundant around the ostiole and a few dispersed	Near ostiole or dispersed	Few near ostiole
No of tepals	4	3–4	3–4
Nature of female flowers	Pedicellate	Sessile or pedicellate	Sessile

Specimens examined: India, **Kerala,** Wayanad District, Thirunelly, 25 October 2020, *Sreehari S. Nair & P.J. Ebin 12968* (MESAH). Palakkad District, Noorady junction, Nelliyampathi hills, 09 March 2020, *Sreehari S. Nair 12960* (MESAH).

3.7 Discussion

Habit

Majority of the species in the genus *Ficus* are large sized trees reaching height up to 30 m as in *F. drupacea*, *F. nervosa, F. superba etc.* while, *F. heterophylla* is a shrub attaining about 2 m height. *F. hispida* is a small tree and *F. exasperata* is a medium sized tree. Species like *F. amplocarpa, F. guttata, F. pumila* and *F. travancorica* are scandent climbers. The genus exhibits various life forms including independent trees (*F. callosa, F. nervosa*), hemi-

epiphytes (*F. amplissima, F. drupacea etc.*) and lithophytes (*F. arnottiana, F. microcarpa etc.*) Fig. 3.117 & 3.118.

Aerial roots

The presence of aerial roots is generally considered as a characteristic feature of *Ficus.* Usually, the members of the subg. *Urostigma* have aerial roots, while *F. amplissima, F. arnottiana, F. religiosa* and *F. tsjakela* are species under the subg. *Urostigma* which are devoid of aerial roots. Species like *F. auriculata, F. racemosa* (subg. Sycomorus); F. *callosa, F. nervosa* (subg. Pharmacosycea) F. *exasperata* (subg. *Sycidium*) etc. do not produce aerial roots. Thus, the presence and absence of aerial roots is not a key characteristic of the genus *Ficus* (Fig. 3.119).

Latex

Latex is a general feature of the family Moraceae. With in the genus, all the members produce latex and are white and milky. *F. talbotii* produce pale yellow coloured latex as an exception.

Stipules

Stipules in all the species were found to be caducous. The shape of the stipule varied from ovate to widely ovate to lanceolate to lanceovate. The size of the stipule was less than 1.0 cm in species like *F. microcarpa, F. talbotii etc.* and it ranged up to 14.0 cm in the species *F. travancorica.* The indumentum of the stipules showed great diversity. The most common type of the indumentum was glabrous. *F. amplocarpa, F. benghalensis, F. guttata, F. krishnae* and *F. middletonii* showed pubescent indumentum. The species *F. auriculata, F. caulocarpa, F. costata, F. nervosa* and *F. superba* showed puberulous nature of indumentum. *F. callosa* and *F. fergusonii* exhibited puberulent indumentum. Stipules with tomentose pattern of hairs were

shown by *F. drupacea, F. mollis, F. pumila* and *F. virens* var. *matthewii.* Strigose indumentum was shown by *F. exasperata* and *F. hispida,* while *F. tinctoria* subsp. *parasitica* had strigulose indumentum. Sericeous pattern of indumentum was found only in the species *F. talbotii.* The most common colour shown by the stipules were either green or pale green. Other colours like pale red, red, purple and brown were also seen in some species like *F. arnottiana, F. benghalensis, F. costata, F. dalhousiae, F. racemosa etc.* (Fig. 3.120).

Leaves

The petioles of the leaves were either articulated or non-articulated. Petioles were less than 1.0 cm in species like *F. microcarpa* and *F. tinctoria* subsp. *gibbosa.* In *F. anamalayana* the length measured up to 19.0 cm. Petioles were glabrous in most of the species. Tomentose indumentum in petiole was observed for the species *F. amplocarpa, F. drupacea, F. guttata* and *F. mollis.* The indumentum was puberulous for *F. auriculata* and *F. krishnae.* Pubescent pattern of indumentum in petiole was noted for *F. benghalensis, F. drupacea, F. nervosa* and *F. pumila.* For the petioles of *F. exasperata* and *F. hispida* the nature of indumentum was strigose and was scabrous for *F. heterophylla.*

All other species of *Ficus* except *F. exasperata, F. heterophylla, F. pumila* and *F. tinctoria* had symmetric lamina, while for these species the lamina was asymmetric. The shape of the lamina varied from lanceolate to lanceovate to ovate to widely ovate to elliptic to widely elliptic to oblong. Lobed lamina was seen in the species *F. exasperata, F. heterophylla* and sometimes in the juvenile stages of *F. callosa.* The indumentum of lamina was glabrous for most of the species and was pubescent in *F. guttata, F. mollis* and in the young stages of *F. benghalensis.* Tomentose indumentum was seen in *F. drupacea* and puberulous in *F. krishnae.* The number of lateral veins were between 3 – 5 pairs in species like *F. amplocarpa, F. guttata* and *F. pumila.* 14 –

16 pairs were seen in *F. anamalayana, F. binnendijkii* and *F. talbotii.* Numerous pairs of veins were noted in *F. benjamina* and *F. microcarpa*. Wax glands were positioned either at the base of the midrib beneath or on the axils of the basal lateral nerves (Fig. 3.121 & 3.122).

Receptacles

The receptacles of *Ficus* showed diversity in various characters. The major variations were observed in the features like position, clustering pattern, sexuality and attachment of the receptacles (Fig. 3.123 & 3.124). The variation between the species in these characters are presented in table 3.8.

Table 3.8. Character variations of receptacles in *Ficus.*

Sl. No.	Taxa	Position	Clustering pattern	Sexuality	Attachment
1	*F. amplissima*	Axillary	Clustered	Monoecious	Sessile
2	*F. amplocarpa*	Cauliflorous	Clustered	Dioecious	Pedunculate
3	*F. anamalayana*	Axillary	Paired	Monoecious	Pedunculate
4	*F. arnottiana*	Axillary	Clustered	Monoecious	Pedunculate
5	*F. auriculata*	Cauliflorous	Clustered	Dioecious	Pedunculate
6	*F. beddomei*	Axillary	Solitary/ paired	Monoecious	Pedunculate
7	*F. benghalensis*	Axillary	Clustered	Monoecious	Sessile
8	*F. benjamina*	Axillary	Paired	Monoecious	Sessile
9	*F. binnendijkii*	Axillary	Paired	Monoecious	Sessile
10	*F. callosa*	Axillary	Solitary	Monoecious	Pedunculate
11	*F. caulocarpa*	Axillary	Clustered	Monoecious	Pedunculate
12	*F. costata*	Axillary	Paired	Monoecious	Pedunculate

13	*F. dalhousiae*	Axillary	Paired/ Clustered	Monoecious	Pedunculate
14	*F. drupacea*	Axillary	Solitary/ Paired	Monoecious	Sessile
15	*F. elastica*	Axillary	Paired	Monoecious	Sessile
16	*F. exasperata*	Axillary	Solitary	Dioecious	Pedunculate
17	*F. fergusonii*	Axillary	Solitary/ Paired	Monoecious	Sessile
18	*F. guttata*	Cauliflorous	Clustered	Dioecious	Pedunculate
19	*F. heterophylla*	Axillary	Solitary	Dioecious	Pedunculate
20	*F. hispida*	Cauliflorous/ Axillary	Clustered/ Solitary	Dioecious	Pedunculate
21	*F. krishnae*	Axillary	Paired	Monoecious	Sessile
22	*F. microcarpa*	Axillary	Clustered	Monoecious	Sessile
23	*F. middletonii*	Axillary	Paired	Monoecious	Pedunculate
24	*F. mollis*	Axillary	Clustered	Monoecious	Sessile
25	*F. nervosa*	Axillary	Paired	Monoecious	Pedunculate
26	*F. pumila*	Axillary	Solitary	Dioecious	Pedunculate
27	*F. racemosa*	Cauliflorous/ Axillary	Clustered/ Solitary	Monoecious	Pedunculate
28	*F. religiosa*	Axillary	Solitary/ Paired	Monoecious	Sessile
29	*F. superba*	Axillary	Clustered	Monoecious	Pedunculate
30	*F. talbotii*	Axillary	Clustered	Monoecious	Sessile
31	*F. tinctoria* subsp. *gibbosa*	Axillary	Paired	Dioecious	Pedunculate
32	*F. tinctoria*	Axillary	Paired/	Dioecious	Pedunculate

	subsp. *parasitica*		Clustered		
33	*F. travancorica*	Axillary	Solitary/ Paired	Monoecious	Pedunculate
34	*F. tsjakela*	Axillary	Paired/ Clustered	Monoecious	Sessile
35	*F. virens* var. *dispersa*	Axillary	Solitary/ Paired	Monoecious	Pedunculate
36	*F. virens* var. *matthewii*	Axillary	Clustered	Monoecious	Pedunculate
37	*F. virens* var. *virens*	Axillary	Clustered	Monoecious	Pedunculate

The shape of the syconium varied from globose to sub globose to oblong to obovoid to turbinate to ellipsoid (Fig. 3.125). The size of the syconium was less than 1.0 cm in species like *F. binnendijkii, F. costata, F. microcarpa, F. talbotii etc.* and reached above 6.0 cm in *F. amplocarpa.* Syconium exhibited great diversity in the indumentum pattern. Receptacles were glabrous in majority of the species. Pubescent syconium was seen in *F. anamalayana, F. dalhousiae, F. guttata, F. racemosa* and *F. tinctoria* sp. *parasitica.* Puberulous indumentum was seen in the species of *F. fergusonii* and *F. krishnae.* The taxa *F. tinctoria* sp. *gibbosa* and *F. exasperata* had scabrous syconium. *F. mollis* produced syconium with tomentose hairs. The colour of the young syconium were pale green and it changed to yellow to orange to red to purple on maturity. Basal bracts were absent in *F. exasperata, F. heterophylla, F. nervosa, F. tinctoria* subsp. *gibbosa* and *F. tinctoria* subsp. *parasitica,* while basal bracts were present in all other species.

Male flowers

Male flowers were mainly positioned near the ostiolar region in most of the species and the male flowers were dispersed in *F. virens* var. *virens.* The flowers were either pedicellate or sessile. The size of the flowers was around 1.0–3.0 mm in most of the species. Male flowers with 4.0 mm and above in size were noted in *F. benghalensis* and *F. beddomei.* The number of tepals varied from 2–6. The common number of tepals was 3 or 4 and 6 tepals were found only in *F. amplocarpa.* The size of the anther measured 2.0 mm in *F. auriculata* and was less than 1.5 mm in most of the other species. Tepals of *F. exasperata* were pubescent and all others were glabrous. All the three varieties of *F. virens* had fused tepals (Fig. 3.126).

Female Flowers

Female flowers in the genus *Ficus* were either arranged in the basal region of the syconium or were found scattered within the syconium. They were sessile or pedicellate on the basis of attachment. The flowers of *F. beddomei* and *F. drupacea* were about 3.5 mm in size. Similar to the male flowers, the number of tepals was noted between 2–6, mostly 3 or 4 in most of the species. The pedicel and tepals of *F. exasperata* were pubescent. *F. fergusonii, F. virens* var. *matthewii* and *F. virens* var. *virens* had fused tepals. Stigma was very short; style measured up to 1 mm in *F. amplocarpa.* Ovary was obovoid and the size ranged from 1.0–2.0 mm (Fig. 3.127).

Gall Flowers

Within the syconium, the gall flowers were scattered. The size of the flowers was less than 3.5 mm in all species except *F. amplocarpa* where it measured 5.0 mm. The number of tepals were noted between 2–6, and mostly 3 or 4 in most of the species. Both pedicellate and sessile flowers were

found. Pedicel was pubescent in *F. exasperata* and *F. guttata.* Tepals were pubescent only in *F. exasperata* and was fused in all the three varieties of *F. virens.* Styles were smaller than the female flowers and measured maximum 1.0 mm. The size of the ovary ranged from 1.5–2.0 mm (Fig. 3.128).

Achenes

The achenes showed diversity on the shape. Oblong achenes were seen in *F. callosa* and *F. exasperata.* Trigonous achenes were noted in *F. benghalensis* and *F. elastica.* Three species *viz., F. heterophylla, F. racemosa* and *F. tinctoria* subsp. *gibbosa* had ellipsoid achenes. Globose achenes were found in *F. pumila* and *F. virens* var. *dispersa.* Achenes were obovoid in *F. amplocarpa, F. beddomei, F. binnendijkii, F. guttata, F. microcarpa, F. tinctoria* subsp. *parasitica* and *F. virens* var. *matthewii.* Ovoid was the most common shape and was seen in all the other species.

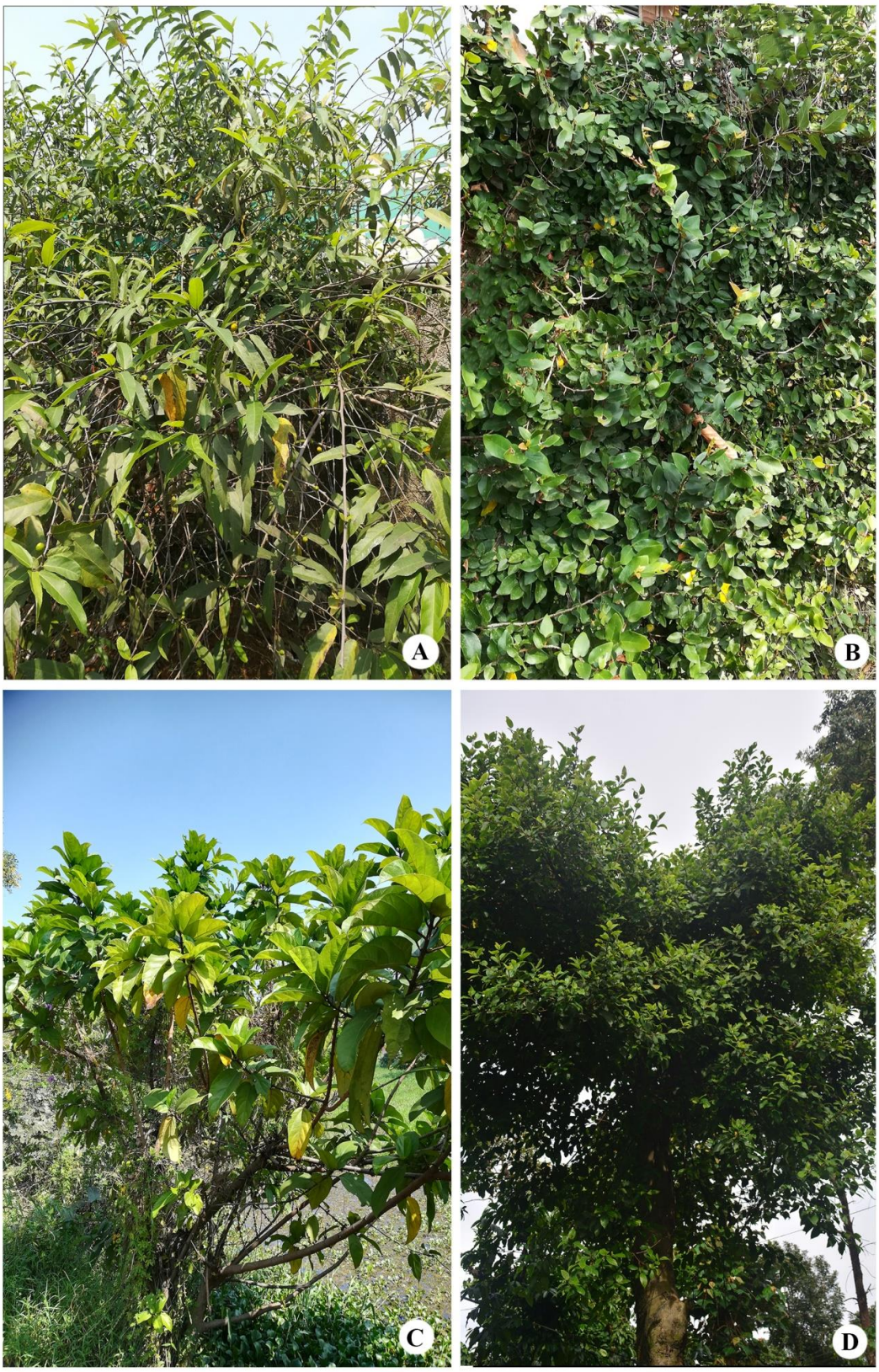


Fig. 3.117. Habits in *Ficus*. A. Shrub- *Ficus heterophylla;* **B.** Climber- *Ficus pumila;* **C.** Small tree- *Ficus hispida;* **D.** Medium tree- *Ficus exasperata.*

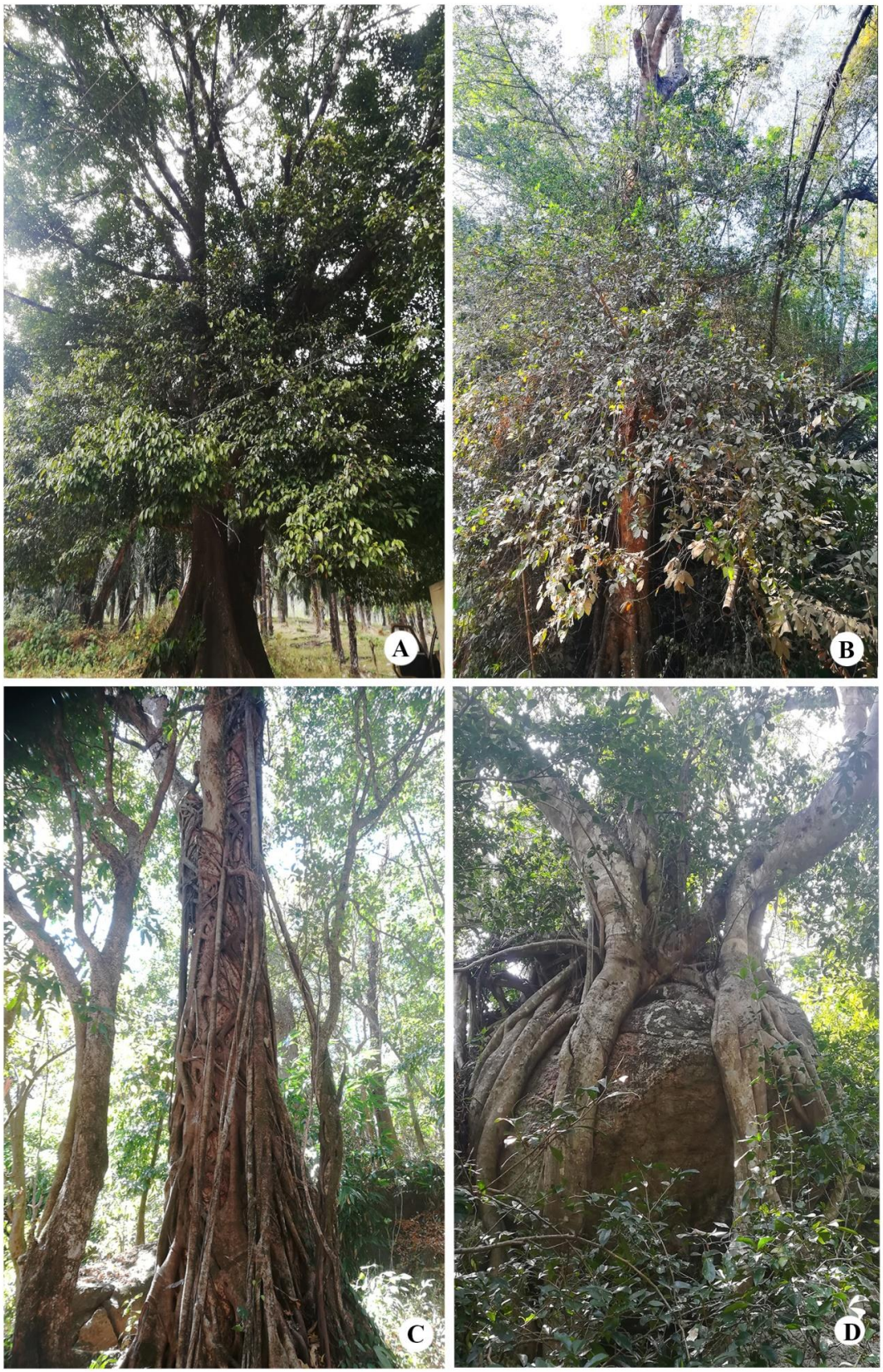


Fig. 3.118. Habits in *Ficus*. A. Large tree- *Ficus nervosa*; **B.** Epiphytic tree- *Ficus tinctoria* subsp. *parasitica*; **C.** Hemi-epiphytic tree- *Ficus drupacea*; **D.** Lithophytic tree- *Ficus microcarpa*.

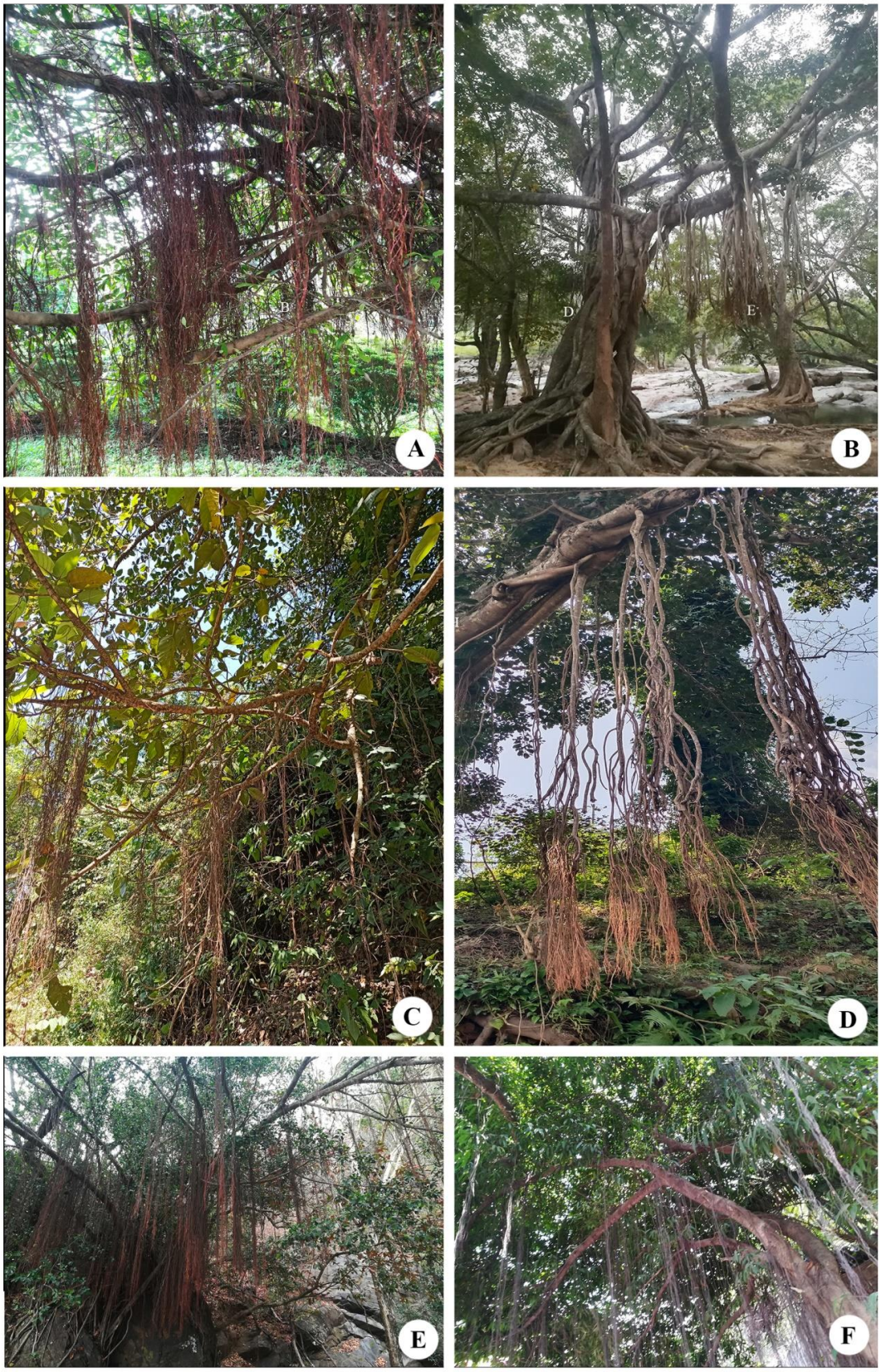


Fig. 3.119. Aerial roots in *Ficus*. A. *Ficus benjamina;* **B.** *Ficus benghalensis*; **C.** *Ficus dalhousiae*; **D.** *Ficus fergusonii*; **E.** *Ficus microcarpa*; **F.** *Ficus binnendijkii*.



Fig. 3.120. Stipules in *Ficus*. A. *F. amplissima*; **B.** *F. amplocarpa*; **C.** *F. anamalayana*; **D.** *F. arnottiana*; **E.** *F. auriculata*; **F.** *F. beddomei*; **G.** *F. benghalensis*; **H.** *F. benjamina*; **I.** *F. binnendijkii*; **J.** *F. callosa*; **K.** *F. caulocarpa*; **L.** *F. costata*; **M.** *F. dalhousiae*; **N.** *F. drupacea*; **O.** *F. elastica*; **P.** *F. exasperata*; **Q.** *F. fergusonii*; **R.** *F. guttata*; **S.** *F. heterophylla*; **T.** *F. hispida*; **U.** *F. krishnae*; **V.** *F. microcarpa*; **W.** *F. middletonii*; **X.** *F. mollis*; **Y.** *F. nervosa*; **Z.** *F. pumila*; **A1.** *F. racemosa*; **A2.** *F. religiosa*; **A3.** *F. superba*; **A4.** *F.talbotii*; **A5.** *F. tinctoria* subsp. *gibbosa*; **A6.** *F. tinctoria* subsp. *parasitica*; **A7.** *F. travancorica*; **A8.** *F. tsjakela*; **A9.** *F. virens* var. *dispersa*; **A10.** *F. virens* var. *matthewii*; **A11.** *F. virens* var. *virens*.

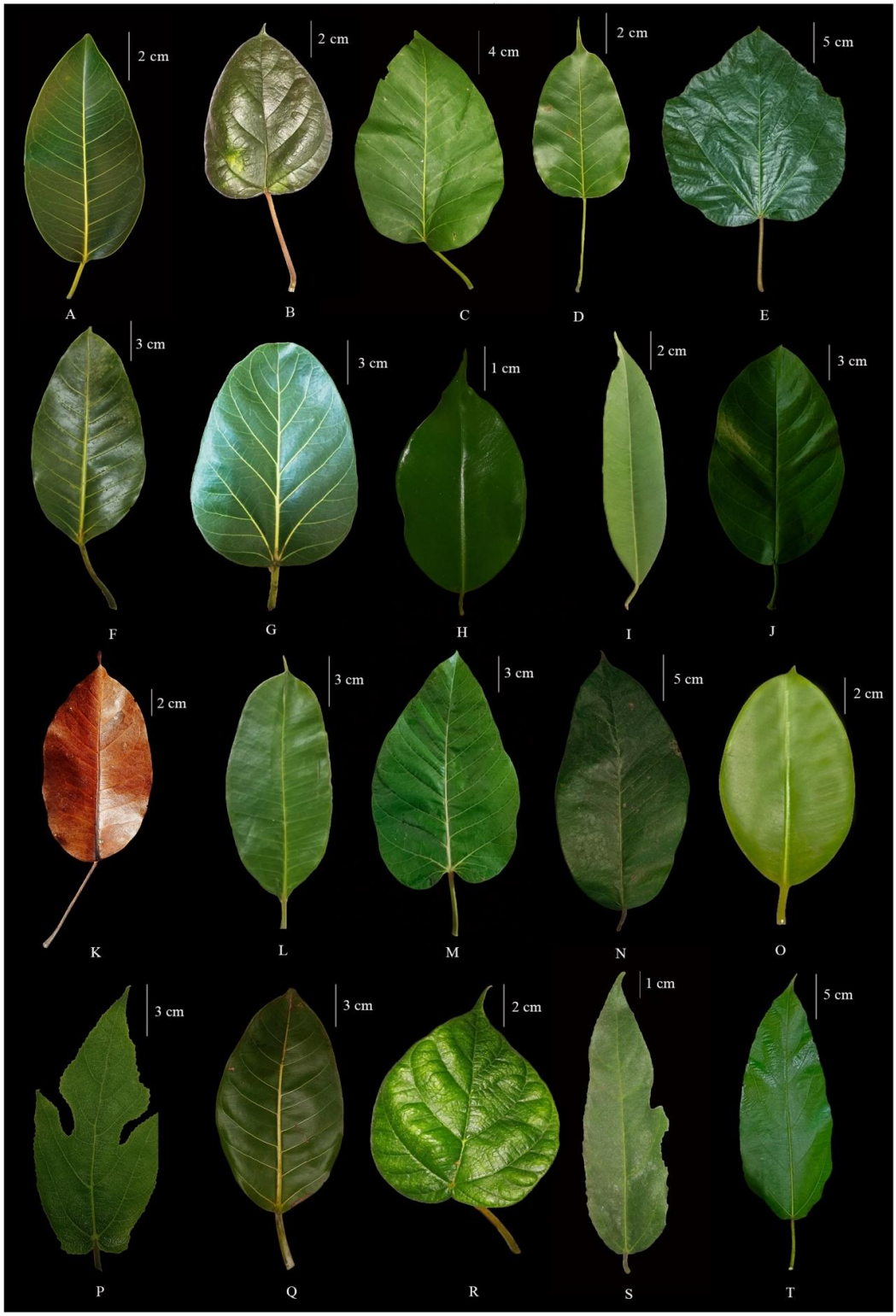


Fig. 3.121. Leaves in *Ficus*. A. *F. amplissima*; **B.** *F. amplocarpa*; **C.** *F. anamalayana*; **D.** *F. arnottiana*; **E.** *F. auriculata*; **F.** *F. beddomei*; **G.** *F. benghalensis*; **H.** *F. benjamina*; **I.** *F. binnendijkii*; **J.** *F. callosa*; **K.** *F. caulocarpa*; **L.** *F. costata*; **M.** *F. dalhousiae*; **N.** *F. drupacea*; **O.** *F. elastica*; **P.** *F. exasperata*; **Q.** *F. fergusonii*; **R.** *F. guttata*; **S.** *F. heterophylla*; **T.** *F. hispida*.

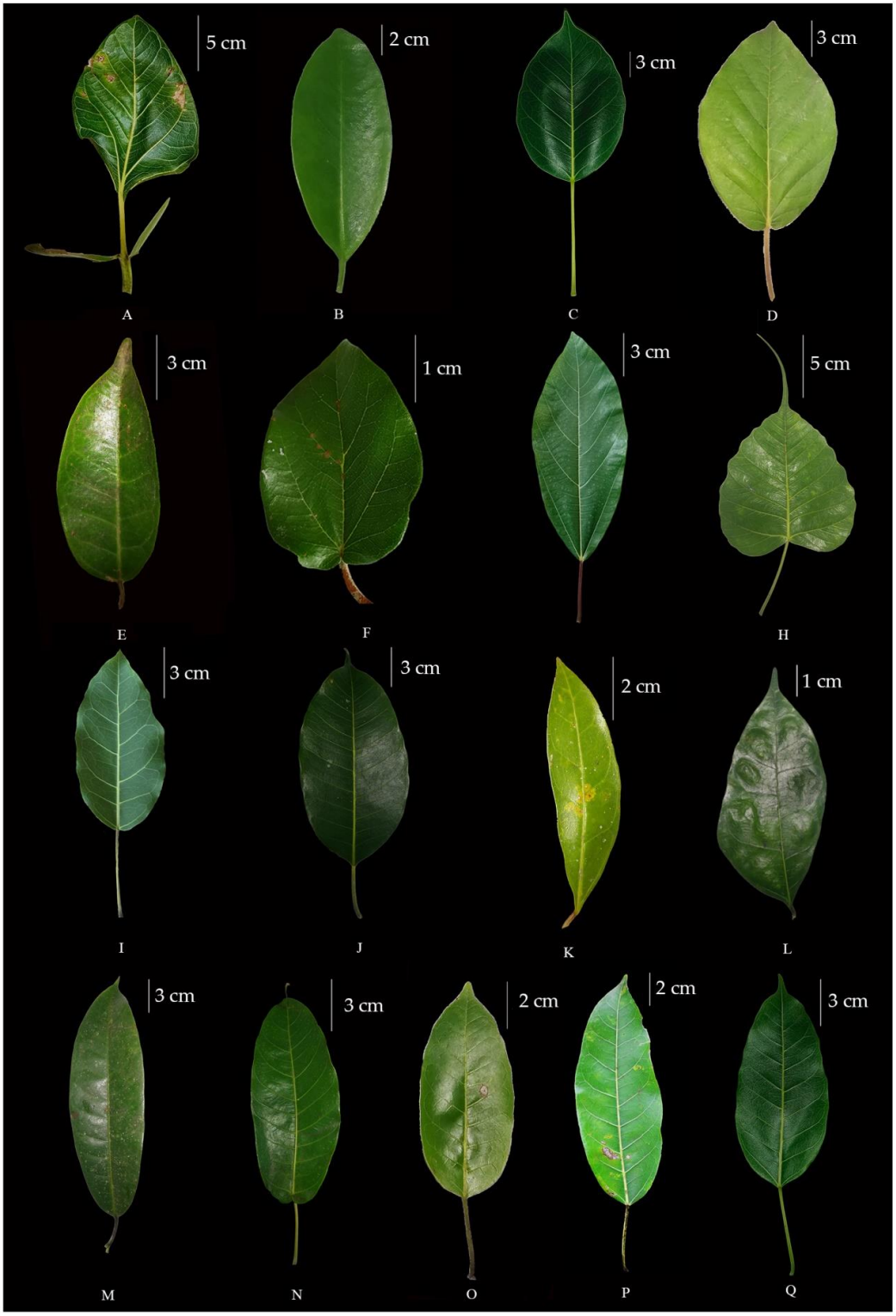


Fig. 3.122. Leaves in *Ficus*. A. *F. krishnae*; **B.** *F. microcarpa*; **C.** *F. middletonii*; **D.** *F. mollis*; **E.** *F. nervosa*; **E.** *F. pumila*; **G.** *F. racemosa*; **H.** *F. religiosa*; **I.** *F. superba*; **J.** *F.talbotii*; **K.** *F. tinctoria* subsp. *gibbosa*; **L.** *F. tinctoria* subsp. *parasitica*; **M.** *F. travancorica*; **N.** *F. tsjakela*; **O.** *F. virens* var. *dispersa*; **P.** *F. virens* var. *matthewii*; **Q.** *F. virens* var. *virens*.



Fig. 3.123. Receptacles in *Ficus*. A. *F. amplissima;* **B.** *F. amplocarpa;* **C.** *F. anamalayana;* **D.** *F. arnottiana;* **E.** *F. auriculata;* **F.** *F. beddomei;* **G.** *F. benghalensis;* **H.** *F. benjamina;* **I.** *F. binnendijkii;* **J.** *F. callosa;* **K.** *F. caulocarpa;* **L.** *F. dalhousiae;* **M.** *F. drupacea;* **N.** *F. elastica;* **O.** *F. exasperata;* **P.** *F. fergusonii;* **Q.** *F. heterophylla;* **R.** *F. hispida;* **S.** *F. krishnae.*



Fig. 3.124. Receptacles in *Ficus*. A. *F. microcarpa*; **B.** *F. middletonii*; **C.** *F. mollis*; **D.** *F. nervosa*; **E.** *F. pumila*; **F.** *F. racemosa*; **G.** *F. religiosa*; **H.** *F. superba*; **I.** *F.talbotii*; **J.** *F. tinctoria* subsp. *gibbosa*; **K.** *F. tinctoria* subsp. *parasitica*; **L.** *F. tsjakela*; **M.** *F. virens* var. *dispersa*; **N.** *F. virens* var. *matthewii*; **O.** *F. virens* var. *virens*.



Fig. 3.125. Syconiums in *Ficus*. A. *F. amplissima;* **B.** *F. amplocarpa*; **C.** *F. anamalayana*; **D.** *F. arnottiana*; **E.** *F. auriculata*; **F.** *F. beddomei*; **G.** *F. benghalensis*; **H.** *F. benjamina*; **I.** *F. binnendijkii*; **J.** *F. callosa*; **K.** *F. caulocarpa*; **L.** *F. costata;* **M,** *F. dalhousiae*; **N.** *F. drupacea*; **O.** *F. elastica*; **P.** *F. exasperata*; **Q.** *F. fergusonii*; **R.** *F. heterophylla*; **S.** *F. hispida*; **T.** *F. krishnae*; **U.** *F. microcarpa*; **V.** *F. middletonii*; **W.** *F. mollis*; **X.** *F. nervosa*; **Y.** *F. pumila*; **Z.** *F. racemosa*; **A1.** *F. religiosa*; **A2.** *F. superba*; **A3.** *F.talbotii*; **A4.** *F. tinctoria* subsp. *gibbosa*; **A5.** *F. tinctoria* subsp. *parasitica*; **A6.** *F. travancorica*; **A7.** *F. tsjakela*; **A8.** *F. virens* var. *dispersa*; **A9.** *F. virens* var. *matthewii*; **A10.** *F. virens* var. *virens*.

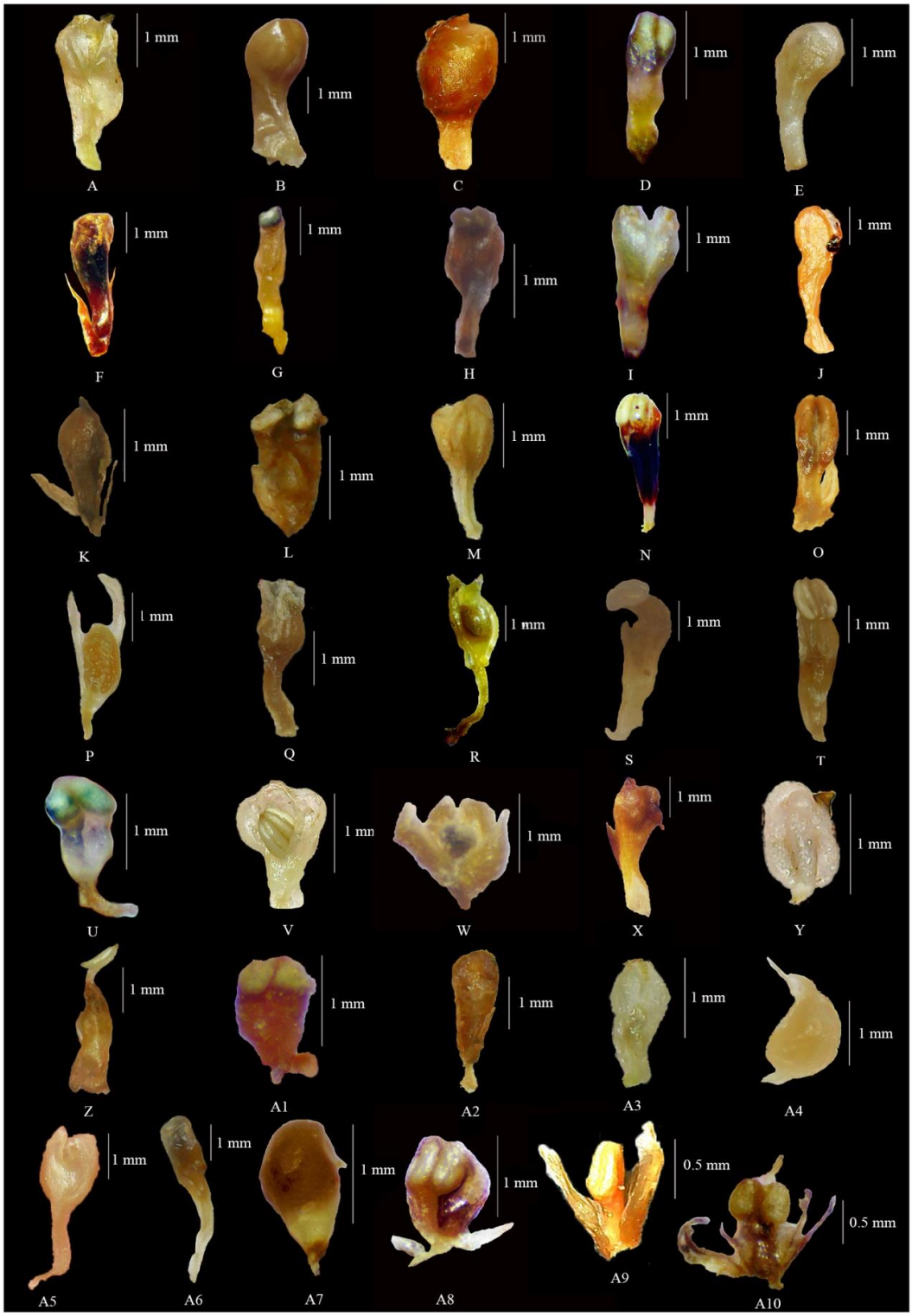


Fig. 3.126. Male flowers in *Ficus*. A. *F. amplissima;* **B.** *F. amplocarpa*; **C.** *F. anamalayana*; **D.** *F. arnottiana*; **E.** *F. auriculata*; **F.** *F. beddomei*; **G.** *F. benghalensis*; **H.** *F. benjamina*; **I.** *F. binnendijkii*; **J.** *F. callosa*; **K.** *F. caulocarpa*; **L.** *F. costata;* **M,** *F. dalhousiae*; **N.** *F. drupacea*; **O.** *F. elastica*; **P.** *F. exasperata*; **Q.** *F. fergusonii*; **R.** *F. heterophylla*; **S.** *F. hispida*; **T.** *F. krishnae*; **U.** *F. microcarpa*; **V.** *F. middletonii*; **W.** *F. mollis*; **X.** *F. nervosa*; **Y.** *F. pumila*; **Z.** *F. racemosa*; **A1.** *F. religiosa*; **A2.** *F. superba*; **A3.** *F.talbotii*; **A4.** *F. tinctoria* subsp. *gibbosa*; **A5.** *F. tinctoria* subsp. *parasitica*; **A6.** *F. travancorica*; **A7.** *F. tsjakela*; **A8.** *F. virens* var. *dispersa*; **A9.** *F. virens* var. *matthewii*; **A10.** *F. virens* var. *virens*.



Fig. 3.127. Female flowers in *Ficus*. A. *F. amplissima;* **B.** *F. amplocarpa;* **C.** *F. anamalayana;* **D.** *F. arnottiana;* **E.** *F. auriculata;* **F.** *F. beddomei;* **G.** *F. benghalensis;* **H.** *F. benjamina;* **I.** *F. binnendijkii;* **J.** *F. callosa;* **K.** *F. caulocarpa;* **L.** *F. costata;* **M.** *F. dalhousiae;* **N.** *F. drupacea;* **O.** *F. elastica;* **P.** *F. exasperata;* **Q.** *F. fergusonii;* **R.** *F. heterophylla;* **S.** *F. hispida;* **T.** *F. krishnae;* **U.** *F. microcarpa;* **V.** *F. middletonii;* **W.** *F. mollis;* **X.** *F. nervosa;* **Y.** *F. pumila;* **Z.** *F. racemosa;* **A1.** *F. religiosa;* **A2.** *F. superba;* **A3.** *F.talbotii;* **A4.** *F. tinctoria* subsp. *gibbosa;* **A5.** *F. tinctoria* subsp. *parasitica;* **A6.** *F. travancorica;* **A7.** *F. tsjakela;* **A8.** *F. virens* var. *dispersa;* **A9.** *F. virens* var. *matthewii;* **A10.** *F. virens* var. *virens.*

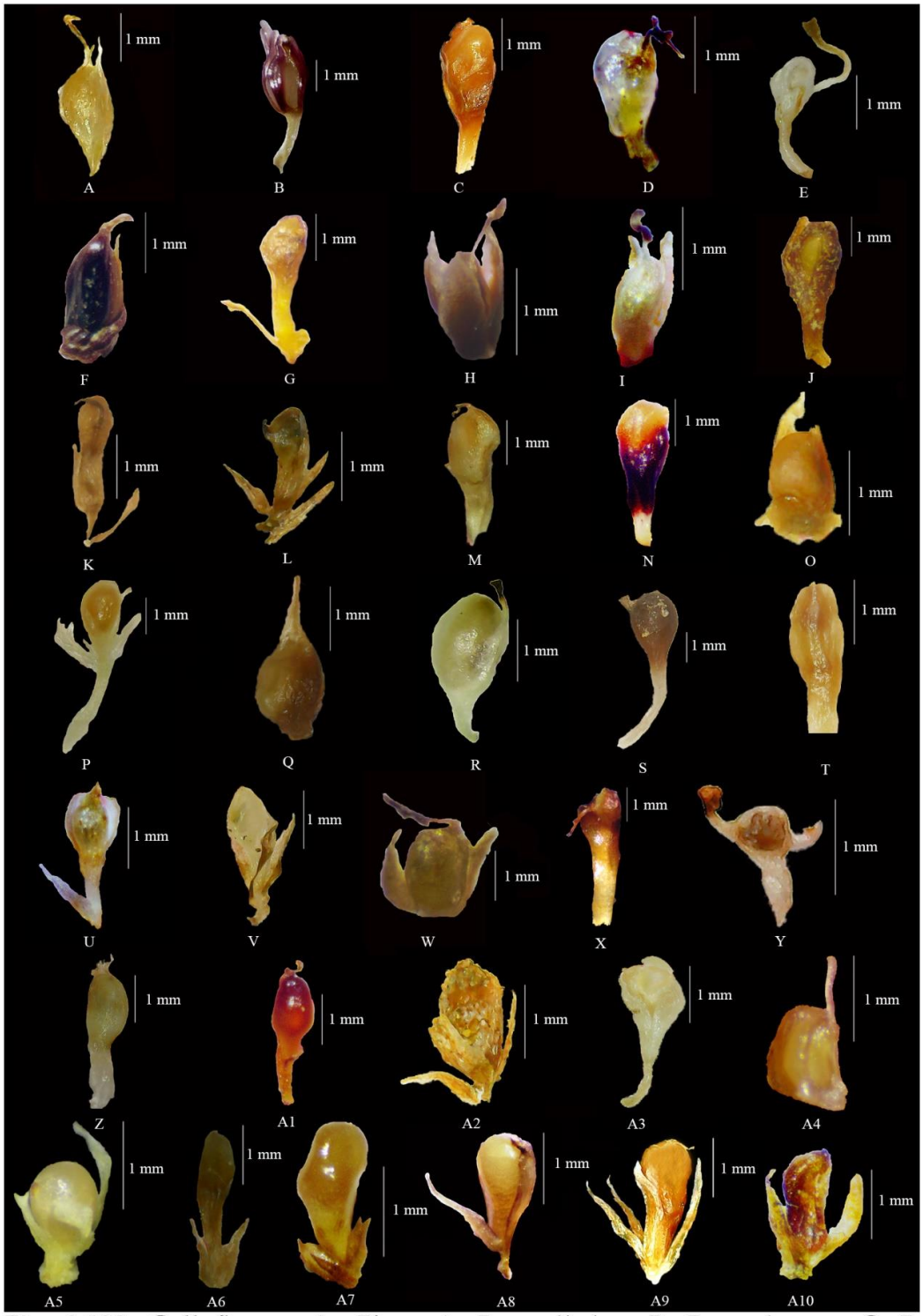


Fig. 3.128. Gall flowers in *Ficus*. A. *F. amplissima;* **B.** *F. amplocarpa*; **C.** *F. anamalayana*; **D.** *F. arnottiana*; **E.** *F. auriculata*; **F.** *F. beddomei*; **G.** *F.benghalensis*; **H.** *F. benjamina*; **I.** *F. binnendijkii*; **J.** *F. callosa*; **K.** *F. caulocarpa*; **L.** *F.costata;* **M.** *F. dalhousiae*; **N.** *F. drupacea*; **O.** *F. elastica*; **P.** *F. exasperata*; **Q.** *F. fergusonii*; **R.** *F. heterophylla*; **S.** *F. hispida*; **T.** *F. krishnae*; **U.** *F. microcarpa*; **V.** *F. middletonii*; **W.** *F. mollis*; **X.** *F. nervosa*; **Y.** *F. pumila*; **Z.** *F. racemosa*; **A1.** *F. religiosa*; **A2.** *F. superba*; **A3.** *F.talbotii*; **A4.** *F. tinctoria* subsp. *gibbosa*; **A5.** *F. tinctoria* subsp. *parasitica*; **A6.** *F. travancorica*; **A7.** *F. tsjakela*; **A8.** *F. virens* var. *dispersa*; **A9.** *F. virens* var. *matthewii*; **A10.** *F. virens* var. *virens.*

PHENETICS

CHAPTER 4

Chapter 4

PHENETICS

4.1 Introduction

Numerical taxonomy is defined as the numerical evaluation of the taxa based on their affinities and the classification of the taxa based on the affinity between the taxa (Sneath & Sokal, 1973). Phenetics classifies all the taxa under study based on their overall similarity considering equal weightage to all the characters under study (Steussy, 1990). Numerical taxonomy or cladistics classifies the taxa under study into several groups based on the common character they share. Each taxon considered under the study is termed as the operational taxonomic unit (OTU). The cladistic method is unbiased as it gives equal weightage to all the character states chosen under the study (Dragomirescu & Postelnicu, 2009). When investigating several different species, taking into account a wide range of characters rather than a small number of characters can improve level of classification (El-Gazzar *et al*., 2018).

In order to determine taxonomic relatedness, numerical taxonomic approaches were used in many genera (Sonibare *et al*., 2004), although less frequently in the genus *Ficus*. Phenetic analysis was carried out using leaf characters of *Ficus* showed positive correlation between the various morphological traits (Sonibare *et al*., 2004) and validated the subgeneric classification that had already been established.

According to Loutfy *et al*. (2005), the study of leaf architecture that was conducted using 24 species of *Ficus* did not matching with the existing

classification. Phenetic analysis were carried out using cystolith micromorphology in *Ficus* (Mohapatra & Janarthanam, 2020) and observed that the cystolith varies in the morphology between the species in the genus. The phenetic analysis was efficaciously implemented using both syconium and leaf characters for species delimitation in *F. aurea* complex (Hernández-Esquivel *et al.*, 2020).

The present analysis aimed to carry out hierarchical clustering of the taxa in the genus *Ficus* based on both vegetative and floral characters to establish the relationship between the taxa based on the current infrageneric system of classification and with the natural system of classification.

4.2. Materials and methods

4.2.1. Preparation of numerical data matrix

A total of 38 taxa were included in the phenetic analysis, with 37 taxa of *Ficus* representing the ingroup and *Antiaris toxicaria* from the same family as the outgroup for the study. The collected specimens of *Ficus* were observed for their vegetative and floral characters. The datasheet specifically prepared for the genus was used to record the observed vegetative and floral characters. The floral characters of the species were observed using a stereomicroscope and the measurements were properly recorded.

The genus *Ficus* shows variations in both vegetative and floral features. Variations in these characters were mainly used for the identification of the species and tend to be equally important (Corner, 1965a; Berg & Corner, 2005; Chantarasuwan *et al*., 2013; Sudhakar *et al*., 2017). Major variations were observed in the vegetative characters like the shape and size of the lamina, the length of the petiole, etc. The major floral variations were in the sexuality of the syconium, the presence and absence of

peduncles and basal bracts, etc. Therefore, both vegetative and floral characteristics were given equal attention in the current study.

A total of 143 characters, including 52 vegetative and 91 floral characters, were observed and recorded for each species. Each character was further divided into character states. The character states were developed based on the range of each observed character. 601-character states were studied in total, including 253 vegetative and 348 floral character states (Fig. 4.1).

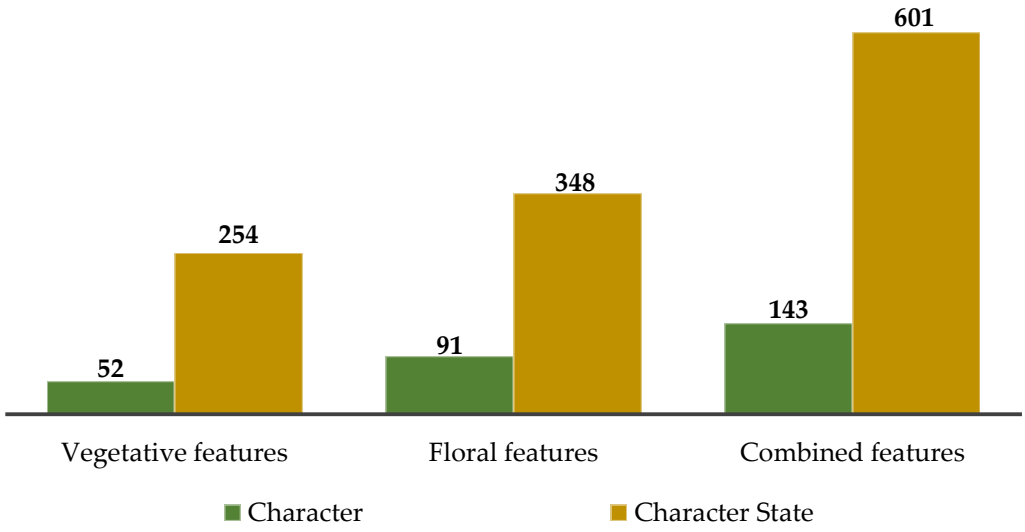


Fig. 4.1. Number of character and character states studied.

The observed characters and character states were compared with other phenetic works on the genus *Ficus* (Sonibare *et al*., 2004; Loutfy *et al*., 2005; Esmaiel *et al*., 2014; Mohapatra & Janarthanam, 2020; Mostafa *et al*., 2020; Hernández-Esquivel *et al*., 2020; Mahima, 2020; Nair *et al*., 2021a; 2021d). The characters and character states used in the present morphological study ensured a high proportion than previous works (Fig. 4.2) and included all the characters required for the taxa to be separated.

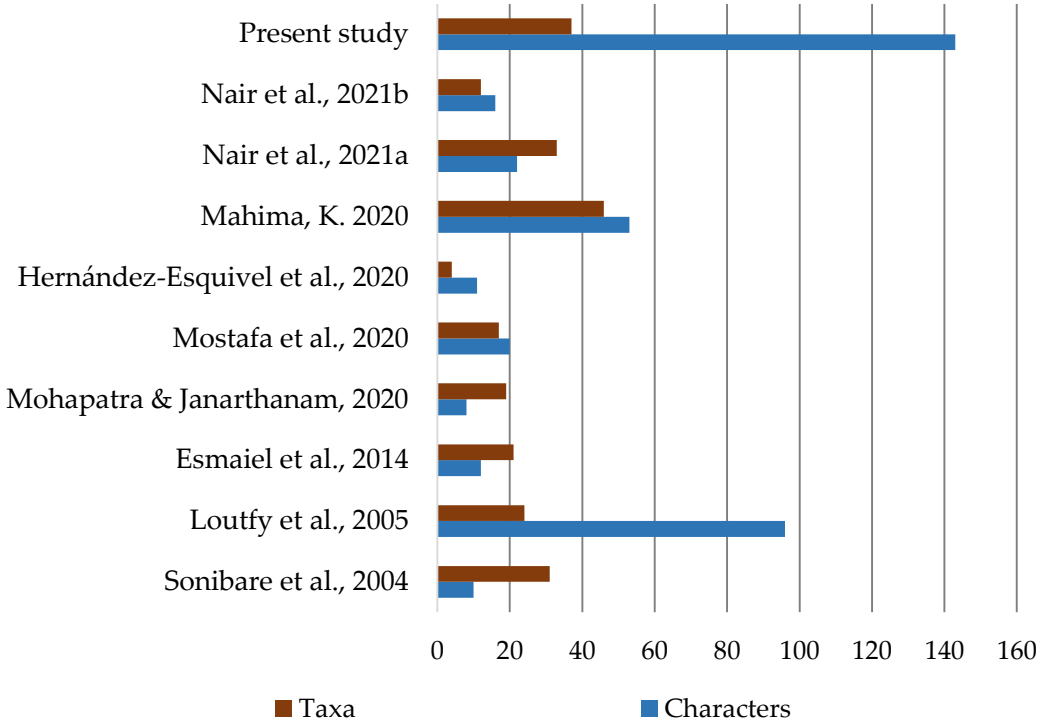


Fig 4.2. Comparison of number of taxa and characters studied in other phenetic analysis within the genus *Ficus*.

The observed character states were then converted into a standardised numerical format (Sneath & Sokal, 1973) and the data were entered into the numerical matrix representing 1 for the presence and 0 for the absence of 601-character states studied here (Nair *et al*., 2021a, 2021d). The numerical data matrix prepared is presented as Appendix IV.

4.2.2. Numerical Analysis

Analysis of the numerical data matrix was done using PAST ver. 4.03 software (Hammer *et al*., 2001). Similarity-based hierarchical clustering was done for the data using three methods: single lineage, paired group algorithm (UPGMA) and Wards method with Bray-Curtis similarity index giving equal weightage to all the character states taken into account. The best fitting tree was found out from the analysis based on the co-phenetic

correlation value. The best model was considered to be the one that generated the highest co-phenetic correlation value. A co-phenetic correlation value with in the range 0.8-0.9 was considered as the most reasonable representation of the data matrix (Sneath & Sokal, 1973; Mahima, 2020). Separate phenograms were prepared for the syconium characters as well as for the combined set of vegetative and floral characters. The clustering pattern was analysed from the phenogram obtained and the morphological similarity within each clade was found. The correlation value for the species was determined from the similarity index and the data is presented as Appendix V. The phenogram generated was viewed in Figtree ver. 1.4.4 software (Rambaut, 2018).

The preliminary analysis was done using separate vegetative and floral characters for testing the methodology and the hypothesis. The numerical data matrix was tested and standardised for both the vegetative and floral characters. Effective clustering was obtained for both analyses. All the taxa studied were separated with a significant level of difference and the results were published (Nair *et al*., 2021a, 2021d).

4.3. Result

4.3.1. Phenetic analysis based on complete morphological characters

The phenetic analysis using 601-character states of 143 characters provided a detailed phenogram (Fig. 4.3). The cophenetic correlation values obtained for single lineage, UPGMA and wards methods were 0.858, 0.888 and 0.44, respectively. The phenogram obtained from the UPGMA method had the highest cophenetic correlation value and hence it was considered the best-fit model. The phenogram obtained showed that the 37 taxa of *Ficus* and the outgroup studied were distinct with a considerable range of

dissimilarity. The outgroup *Antiaris toxicaria* was around 66% dissimilar from the genus *Ficus*. The members of the genus *Ficus* were clustered into three major clades and Clade 1 was further subdivided into six subclades.

Clade 1: Most of the species were represented in this clade. Clade 1 was comprised of 29 taxa of *Ficus* and included six subclades. All the members were monoecious species belonging to the subg. *Urostigma* and *Pharmacosycea*, except for the dioecious subg. Synoecia member *F. pumila*. All the members of this clade had axillary inflorescence and the presence of basal bracts (except for *F. nervosa*) as their common character and was 52% similar in their morphology with the other two clades.

Subclade 1: Eight species belonging to the subg. *Urostigma*: F. amplissima, *F. benjamina, F. binnendijkii, F. microcarpa, F. religiosa, F. tsjahela, F. elastica* and *F. travancorica* were included in subclade 1. The overall resemblance of this subclade to the other groups in the phenogram was 61%. All the species in the clade were sessile species with glabrous indumentum within the subg. *Urostigma*. With 72% of similarity, *F. binnendijkii* and *F. microcarpa* were the most closely related species in this subclade.

Subclade 2: Eight taxa of *Ficus* were grouped in subclade 2. They were *F. arnottiana, F. costata, F. caulocarpa, F. superba, F. middletonii, F. virens* var. *matthewii*, *F. virens* var. *virens* and *F. virens* var. *dispersa*. This clade had a total of 62% similarity compared with other clades. In general, every taxon was a huge tree with no aerial roots that produced pedunculate, axillary, or monoecious figs. With 83% similarity value, *F. caulocarpa* and *F. superba* were the most similar species. *F. virens* var. *virens* had more affinity with *F. virens* var. *virens* (75%).

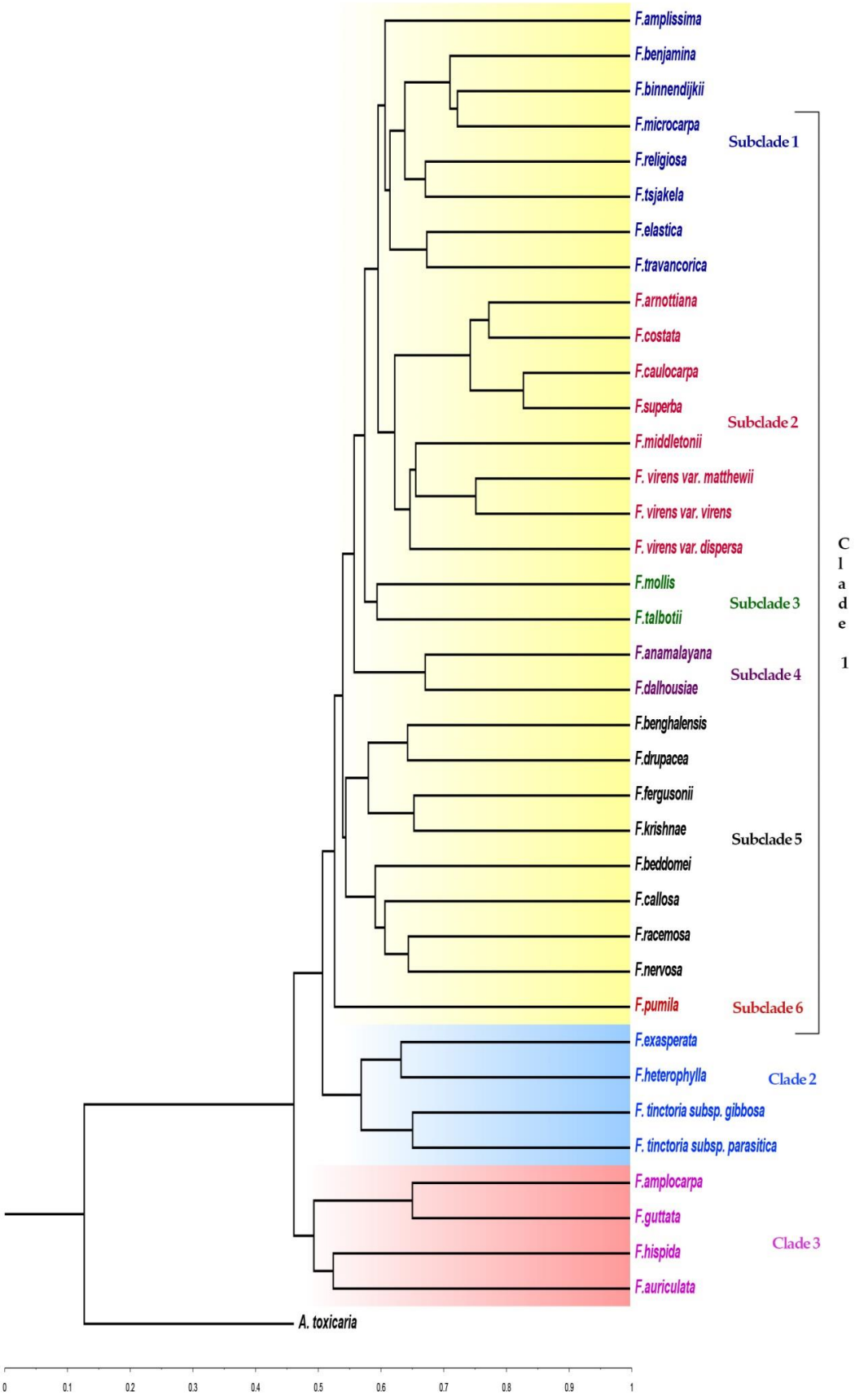


Fig. 4.3. Phenogram based on complete morphological characters.

Subclade 3: Only two species, *F. mollis* and *F. talbotii*, belonged to the third subclade and were both members of the subgenus *Urostigma*. They had 60% of similarity in characters, particularly in terms of the colour of the stem, leaf, and syconium shape, yet the indumentum pattern was very different.

Subclade 4: Subclade 4 had only two species, *F. anamalayana* and *F. dalhousiae*, two endemic species of the Southern Western Ghats. Despite sharing a similar morphology, both species differed by 33% in characters like the presence and absence of aerial roots, the presence of wax glands and size, as well as the shape of the peduncle and syconium.

Subclade 5: *F. benghalensis, F. drupacea, F. fergusonii, F. krishnae, F. beddomei, F. callosa, F. racemosa* and *F. nervosa* were the eight species that make up subclade 5. Three species, *viz., F. callosa, F. racemosa* and *F. nervosa,* belonged to the subg. *Pharmacosycea,* whereas other species belonged to the subg. *Urostigma*. They were all large monoecious trees, both independent and epiphytic respectively. There was 64% resemblance between *F. benghalensis* and *F. drupacea*, and 65% similarity between the taxa *F. fergusonii* and *F. krishnae*. *F. racemosa* and *F. nervosa* displayed affinity, with a similarity value of 65%.

Subclade 6: *F. pumila* was the sole species in the final subclade. The plant is a climber that produces axillary figs with basal bracts. This species stands apart from other species within this clade as it is a dioecious rather than monoecious species.

Clade 2: This clade included the taxa *F. exasperata*, *F. heterophylla*, *F. tinctoria* subsp. *gibbosa* and *F. tinctoria* subsp. *parasitica*, which are all dioecious All were members of the subg. *Sycidium*. *F. exasperata* and *F. heterophylla* belonged to the subsect. *Palaeomorphe* and the other two represented the

subsect. *Sycidium*. This clade was typically characterised by species with dioecious peduncular figs, without basal bracts. The clade was 43% dissimilar from the other clades. *F. exasperata* and *F. heterophylla* were 63% similar in morphology, while the morphologically cryptic *F. tinctoria* subsp. *gibbosa* and *F. tinctoria* subsp. *parasitica* showed 35% dissimilarity within their overall morphological characters.

Clade 3: Four species were included in this clade *viz., F. amplocarpa, F. guttata, F. hispida* and *F. auriculata.* All the four species in cade 3 had cauliflorous inflorescence and were dioecious species. The inflorescence of *F. hispida* was cauliflorous and it also displayed axillary inflorescence. All the *F. amplocarpa* and *F. guttata* were subg. *Synoecia* members whereas *F. hispida* and *F. auriculata* represented the subg. *Sycomorus.* The cauliflorous nature of inflorescence in the species separated this clade from the other groups. *F. amplocarpa* and *F. guttata*, two indigenous and endemic species from the Southern Western Ghats, were 65% morphologically similar to each other. Between the species *F. hispida* and *F. auriculata*, only 53% similarity was found.

4.3.2. Phenetic analysis based on syconium characters

The syconium traits were studied in the 91-characters and 348-character states. For the single lineage, UPGMA and wards methods, the cophenetic correlation values for the clustering were 0.862, 0.913, and 0.483, respectively. Since the UPGMA phenogram had the best cophenetic correlation value, it was considered to be the best fit model. The 37 *Ficus* taxa investigated here were divided into three clades based only on the overall characteristics of the syconium (Fig. 4.4). Less than 20% of the floral characteristics of the outgroup *Antiaris toxicaria* were similar to those of the

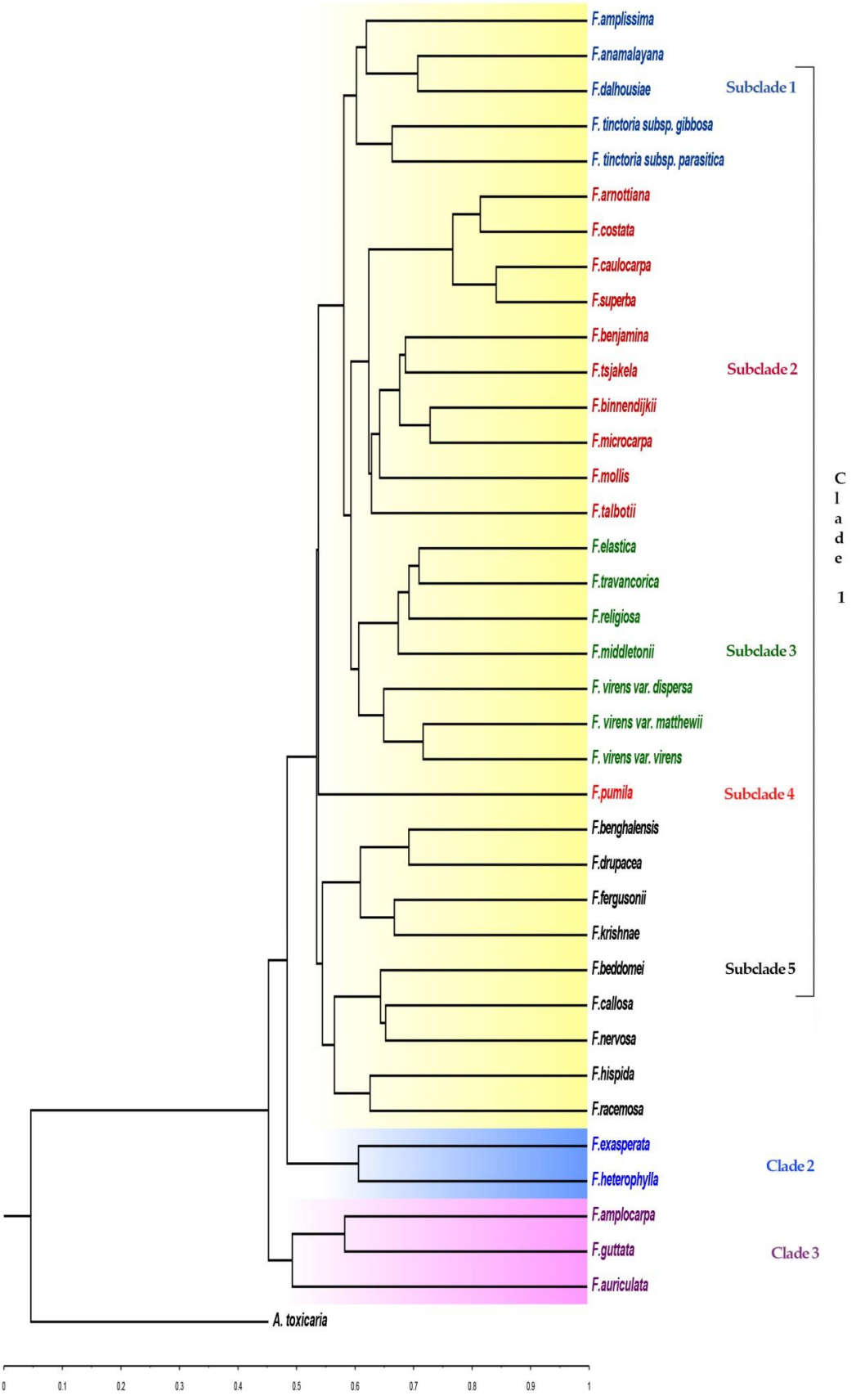


Fig. 4.4. Phenogram based on syconium characters.

genus *Ficus*. Clade 1, which was then divided into five subclades, contained majority of the taxa.

Clade 1: With 32 taxa, Clade 1 was the largest group in the clustering. The clade included both monoecious and dioecious members producing axillary figs. Only 53% resemblance was found for this clade with the other clades of the phenogram. Five subclades were formed from the clade 1.

Subclade 1: This subclade included five taxa of *Ficus, viz., F. amplissima, F. anamalayana, F. dalhousiae, F. tinctoria* subsp. *gibbosa* and *F. tinctoria* subsp. *parasitica*. 60% similarity was observed for this subclade with other groups in the clustering. The subclade was a mixture of monoecious and dioecious members. The monoecious members *F. amplissima* and *F. dalhousiae* belonged to the subg. *Urostigma*, and *F. anamalayana* represented the subg. *Pharmacosycea*. *F. tinctoria* subsp. *gibbosa* and *F. tinctoria* subsp. *parasitica* were the dioecious taxa from the subg. *Sycidium*. 71% similarity was observed for the closely related endemic species *F. anamalayana* and *F. dalhousiae*. The syconium characteristics of the two morphologically cryptic taxa, *F. tinctoria* subsp. *parasitica* and *F. tinctoria* subsp. *gibbosa*, differed by 34%.

Subclade 2: Ten taxa of *Ficus* were clustered in this clade. All the species were members of the subg. *Urostigma*. The members represented in the subclade were *F. arnottiana, F. costata, F. caulocarpa, F. superba, F. benjamina, F. tsjakela, F. binnendijkii, F. microcarpa, F. mollis* and *F. talbotii*. 62% similarity was observed for this subclade with other clades in the phenogram. *F. caulocarpa* and *F. superba* were the most similar species, with a similarity value of 84%.

Subclade 3: Seven taxa of *Ficus*, all of which are members of the subgenus *Urostigma*, make up the third subclade: *F. elastica, F. travancorica, F. religiosa,*

F. middletonii, F. virens var. *dispersa*, *F. virens* var. *matthewii* and *F. virens* var. *virens*. All three varieties of *F. virens* were grouped together. *F. virens* var. *matthewii* and *F. virens* var. *virens* were 72% similar in their syconium characters.

Subclade 4: The subclade 4 contained only a single dioecious species, *F. pumila* and was 53% similar in syconium characters with other taxa of the genus *Ficus* within the phenogram.

Subclade 5: Nine *Ficus* species were found in the last subclade. Five species belonged to the subg. *Urostigma,* two each from the subg. *Pharmacosycea* and *Sycomorus.* The subclade was 53 % similar in syconium characters with the other clades in the clustering. With a similarity of 65%, *F. callosa* and *F. nervosa* were the morphologically most related species in the subclade based on syconium characteristics.

Clade 2: Only two species were represented in Clade 2, *F. exasperata* and *F. heterophylla*. Both were dioecious members of the subg. *Sycidium* and showed 61% similarity in syconium characters. The shape and indumentum features were almost common among them.

Clade 3: Three dioecious species were represented in Clade 3, namely *F. guttata, F. amplocarpa* and *F. auriculata. F. guttata* and *F. amplocarpa* were subg. *Synoecia* members and *F. auriculata* was a member of the subg. *Sycomorus. F. guttata* and *F. amplocarpa* were two morphologically similar species endemic to the Southern Western Ghats and were 58% similar in syconium characters. The clade had only 49% similarity with the other clades of the phenogram.

4.4. Discussion

4.4.1. Based on complete morphological characters

Clade 1 represented 29 taxa, all had axillary inflorescence. The characters common to subclade 1 were trees with white milky latex, caducous stipules with an entire margin, alternate leaves, axillary inflorescence, persistent basal bracts, lanceolate-shaped free tepals and obovoid shaped ovary in gall flowers. The indumentum was glabrous for the stipules, petioles, lamina, basal bracts, syconium, outer and inner ostiolar bracts, tepals and ovary. Close lineages were shown between the taxa *F. binnendijkii* & *F. microcarpa, F. elastica* & *F. travancorica* and *F. religiosa* & *F. tsjakela. F. talbotii* was considered as closely allied to *F. amplissima* (Mahima, 2020) but, in the present study *F. talbotii* was added up in a different clade with 60% similarity with *F. amplissima*.

The second subclade within clade 1 had eight taxa and mostly represented the members of the *F. virens* complex. The characteristics of this clade were trees, caducous stipules, articulated petioles, subcoriaceous leaves with an entire margin, wax glands at the base of the midrib, axillary monoecious pedunculate figs, persistent basal bracts, an obovoid ovary in female and gall flowers. The indumentum of the petiole, lamina, syconium, inner ostiolar bracts, tepals, ovary of the female and gall flowers were glabrous in all the members. *F. middletonii* formed a lineage with the varieties of *F. virens*, indicating the species as one among the *F. virens* complex. Among the varieties of *F. virens, F. virens* var. *virens* and *F. virens* var. *matthewii* were the sister lineages with a similarity value of 75%. *F. virens* var. *dispersa* had around 64% similarity with other varieties of *F. virens* in their overall morphological characters.

F. superba and *F. caulocarpa* were similar mainly in their floral features. They can be differentiated based on characters like the presence and absence of aerial roots, minimum length of the lamina, number of lateral veins, length of acumen, indumentum of peduncle and basal bracts, attachment of male flowers, arrangement of female as well as gall flowers and ovary size of gall flowers. 77% of morphological similarity was seen between *F. arnottiana* and *F. costata*. The two species greatly differed in their characters including shape, base and acumen length of the lamina, number of lateral nerves, clustering pattern of inflorescence, ovary size of gall flowers, arrangement as well as tepal and anther length of male flowers.

Overall morphology suggested that *F. talbotii* was similar to *F. mollis.* The 40% of dissimilarity between the two species was based on the presence and absence of aerial roots, colour of the latex, shape, length and indumentum of the stipule, length of petiole, shape, apex, base, acumen, indumentum and texture of the lamina, number of lateral veins, size and shape of the basal bracts, indumentum of syconium, size, number of tepals and anther length of male flowers, arrangement, size and ovary shape of female flowers, attachment, number of tepals, colour and ovary shape of gall flowers.

F. anamalayana, a species described as similar to *F. dalhousiae,* which formed subclade 4. The lineage showed 67% similarity in the morphological characters. These morphologically cryptic species were dissimilar in the characters like the presence and absence of aerial roots, size, shape and colour of the stipules, length and colour of petioles, shape, length, colour in young stage, position of wax glands and acumen length of leaves, shape of the syconium, length of the pedicel, attachment of tepal, length of anther and

filament in male flowers, arrangement and ovary length of female flowers, size and attachment of gall flowers.

The members of the subclade 5 was all large trees with articulated leaves having entire margin, all were monoecious in sexuality, the gall flowers were pedicellate, had glabrous obovoid ovary with lanceolate glabrous tepals. *F. callosa, F. nervosa* and *F. racemosa* (members other than from the subg. *Urostigma*) were included in this group due to axillary monoecious figs, even though *F. racemosa* mainly produces cauliflorous inflorescence. The highly controversial taxa *F. benghalensis* and *F. krishnae* showed 37 % of dissimilarity in the morphological characters. *F. krishnae* was earlier considered as variety under *F. benghalensis.* Later, molecular studies confirmed *F. krishnae* as a distinct species from *F. benghalensis* (Tiwari *et al*., 2015; Mahima *et al*., 2021). In the present study, *F. benghalensis* showed more affinity with *F. drupacea* (65%). *F. krishnae* had more affinity with *F. fergusonii.* Despite of being different subgenus members *F. racemosa* and *F. nervosa* formed a single lineage due to the similarity they shared in their size and shape of the stipules, shape and number of lateral veins of leaves. The axillary figs made the clustering of *F. pumila* coming within this clade.

The second clade had four dioecious members with axillary inflorescence. As both *F. exasperata* and *F. heterophylla* produces heteromorphic leaves, the species identification may be confusing at some stages of the plant. But both differ in the habit, size of the lamina, indumentum patterns, number of lateral veins etc. The species identification seems easier while in the fruiting stage as both vary in the shape, indumentum and other floral features. *F. tinctoria* is a highly variable species and has different forms. The two subspecies, *F. tinctoria* subsp. *parasitica* and *F. tinctoria* subsp. *gibbosa* were previously merged (Berg & Corner, 2005).

Later it was proposed as separate subspecies based on the morphological features. The present morphometric analysis also distinguishes the two taxa as distinct ones. Both taxa under *F. tinctoria* were 65% similar in characters but differed in the habit, arial roots, indumentum of the vegetative parts, shape and size of the stipules and lamina.

The last clade had four cauliflorous species. *F. amplocarpa* and *F. guttata* were to morphologically complex species. 35% dissimilarity was established between these two species. The characters that mainly distinguished both the species were the difference in the indumentum pattern, size, apex and base of the lamina, number of lateral veins, size and attachment of the male flowers, attachment of tepals within the flowers and several other minor floral features. The last lineage was between *F. auriculata* and *F. hispida* with a similarity value of 52%. *F. hispida* is the only species with opposite leaves and the cauliflorous nature of inflorescence and dioecious syconium might have brought this species in the same clade of *Ficus* with cauliflorous receptacles.

4.4.2. Based on syconium characters

The clustering based on syconium characters were different from the clustering based on overall morphological characters. The number of clades remained the same but the pattern of clustering and the number of subclades changed. The number of subclades decreased to five in syconium characters form the six subclades obtained in combined characters. The number of taxa in clade 1 increased to 32 from 29.

All the species in the clade 1 were having axillary figs, glabrous inner bracts and glabrous, lanceolate tepals as their common character. The 32 taxa of *Ficus* were divided into five subclades. The subclade 1 was a mixture of

monoecious and dioecious species. The subclade 1 was characterised by axillary figs with male flowers arranged near the ostiole only, three lanceolate, glabrous tepals, single stamen, female flowers with obovoid, glabrous ovary and gall flowers with free, lanceolate, glabrous tepals, 1.0–2.0 mm sized obovoid ovary and achenes ranging from 0-1 mm in size. *F. amplissima* showed affinity with *F. dalhousiae* and *F. anamalayana* complex rather than *F. talbotii* as suggested by Mahima (2020). The morphologically mysterious *F. dalhousiae* and *F. anamalayana* were 71% similar in the syconium characters. *F. dalhousiae* was 29% distinct from *F. anamalayana* in having clustered inflorescence, pale green, ovate basal bracts, globose syconium, short pedicellate male flowers with free tepals and scattered female flowers.

F. tinctoria subsp. *gibbosa* and *F. tinctoria* subsp. *parasitica* were morphologically complex dioecious species. 34% dissimilarity was observed between them. The major difference between them was in the clustering pattern of the inflorescence, indumentum pattern in the peduncle and syconium, presence and absence of basal bracts, size of the syconium, size and attachment of the male flowers and female flowers.

The second subclade included all axillary monoecious figs with persistent basal bracts. *F. arnottiana* and *F. costata* were similar in the syconium characters and showed 82 % similarity. The major characters that distinguished the syconium of *F. arnottiana* was the nature of inflorescence, yellow-coloured basal bracts, wide ostiole ranging up to 2.0 mm, widely ovate outer ostiolar bracts, pedicellate male flowers arranged near the ostiole with free tepals. The most similar syconiums were found between the species *F. caulocarpa* and *F. superba* with 84 % of similarity. *F. caulocarpa* was diverse from *F. superba* in having pubescent peduncle, glabrous to

puberulous basal bracts, sessile male flowers, female flowers arranged in the basal regions and large tepals in gall flowers. The species with sessile figs, *F. benjamina, F. tsjakela, F. binnendijkii, F. microcarpa, F. mollis* and *F. talbotii* showed a common lineage within the subclade.

Seven taxa were included in the subclade three. All the members were having axillary monoecious, glabrous figs reaching 2.0–3.0 cm in size with persistent bracts. The three varieties of *F. virens viz., F. virens* var. *virens, F. virens* var. *matthewii* and *F. virens* var. *dispersa* were combined as a single lineage. *F. virens* var. *virens* was alligned with *F. virens* var. *matthewii* than *F. virens* var. *dispersa.* The characters common to *F. virens* members were obovoid or globose syconium with glabrous peduncle becoming purple on maturity, lanceolate inner ostiolar bracts, sessile or pedicellate 1.0–2.0 mm sized male flowers with united tepals, female flowers arranged at the base with 3 tepals and gall flowers with united tepals. *F. elastica* despite of having sessile syconium showed 71% similarity with pedunculate species *F. travancorica.*

F. pumila formed the fourth subclade as a single species lineage, with axillary solitary dioecious syconium reaching up to 6.0 cm in length. The last subclade had 9 members under two lineages. The first lineage were all species with sessile syconium. *F. benghalensis* showed affinity with *F. drupacea.* The syconium of *F. fergusonii* was like *F. krishnae.* The 34% dissimilarity in syconium characters ensure that *F. krishnae* as a distinct species rather than as a variety under *F. benghalensis.* The second lineage had figs with peduncle. *F. hispida* was the only dioecious member in the group and showed similarity with *F. racemosa* especially in the cauliflorous as well as axillary nature of inflorescence and the clustered pattern of figs. Similarity value between the two were 63%. The two members of the subg.

Pharmacosycea, *F. callosa* and *F. nervosa* showed 66% similarity in the syconium characters.

Second clade comprised of *F. exasperata* and *F. heterophylla* only with 61% of similarity in syconium characters. *F. exasperata* differed from *F. heterophylla* in having globose syconium with scabrous indumentum in both syconium and peduncle, ovate, strigose outer bracts, small male flowers up to 2 mm only with pubescent tepals, large female flowers up to 6.0 mm, arranged at the base with free pubescent tepals and obovoid ovary, gall flowers with six pubescent tepals and oblong achenes.

The last clade had three dioecious, strictly cauliflorous species namely, *F. amplocarpa*, *F. guttata* and *F. auriculata*. *F. amplocarpa* and *F. guttata* had 58% similarity in syconium characters and was distinct mainly based on the length of the peduncle, attachment of the basal bracts, size and pubescence of the syconium, attachment and size of male flowers, attachment and number of tepals, ovary shape of the gall flowers. *F. auriculata* showed less than 50 % similarity with *F. amplocarpa – F. guttata* clade and was similar in cauliflorous, clustered diecious peduncular figs with male flowers near the ostiolar region and presence of pedicellate gall flowers.

4.4.3. Comparison between floral and combined (vegetative and floral) characters

Comparing the similarity between floral characters and combined set of characters, few taxa showed deviation in similarity values. Higher similarity values in floral characters were observed for some taxa indicating that major similarity was in the floral characters rather than in the vegetative characters. While for some other taxa, the similarity in floral characters were

lower than the combined ones as the similarity in vegetative characters were more predominant in them. The detailed data set is provided in table 4.1.

Table 4.1. Comparison between floral and combined characters

Sl. No.	Comparison between		Similarity (%) in	
	Taxon 1	Taxon 2	Floral characters	Combined characters
1	*F. binnendijkii*	*F. microcarpa*	73	72
2	*F. elastica*	*F. travancorica*	71	68
3	*F. arnottiana*	*F. costata*	81	77
4	*F. caulocarpa*	*F. superba*	84	83
5	*F. anamalayana*	*F. dalhousiae*	71	67
6	*F. benghalensis*	*F. drupacea*	69	64
7	*F. benghalensis*	*F. krishnae*	65	63
8	*F. fergusonii*	*F. krishnae*	67	65
9	*F. tinctoria* subsp. *gibbosa*	*F. tinctoria* subsp. *parasitica*	66	65
10	*F. amplocarpa*	*F. guttata*	58	65
11	*F. virens var virens*	*F. virens var matthewii*	72	75
12	*F. exasperata*	*F. heterophylla*	60	63

4.4.4. Comparison with infrageneric classification

The infrageneric classification of *Ficus* is based on few morphological characters and divides the genus into 6 subgenera *viz., Ficus, Pharmacosycea,*

Sycomorus, Sycidium, Synoecia and *Urostigma.* Subg. *Pharmacosycea* and *Urostigma* includes the monoecious members.

The clustering based on the complete set of characters divided the taxa studied into three clades. The clade 1 included all the members form the subg. *Pharmacosycea* and *Urostigma*. Also included species from the subg. *Synoecia* (*F. pumila*) and subg. *Sycomorus* (*F. racemosa*). The species in the subg. *Pharmacosycea* were not found as sister lineages within the clade 1. *F. anamalayana,* currently a species within the subg. *Pharmacosycea* formed a sister lineage with *F. dalhousiae,* a species in the subg. *Urostigma.* The dioecious species *F. pumila* was separated from all the other members of the subg. *Synoecia* mostly due to the presence of axillary inflorescence in *F. pumila,* while all the other species of subg. *Synoecia* have cauliflorous inflorescence. *F. racemosa* was separated from other species of the subg. *Sycomorus* mainly due to it monoecious nature, while all others were dioecious.

The clade 2 was comprised of the members of the subg. *Sycidium* only. Subsect. *Pogonotrophe* of subg. *Synoecia* and subg. *Sycomorus* formed the clade 3. Thus, the clustering based on the overall characters were almost similar to the currently accepted infrageneric classification system (Fig. 4.5).

Based on the syconium characters alone, the clustering was not similar to the infrageneric classification (Fig. 4.6). Clade 1 was a mixture of all the subgenera. All the species of subg. *Urostigma* were included in clade 1. Here also, *F. anamalayana,* formed a sister lineage with *F. dalhousiae.* Thus, rather than being a species along with the subg. *Pharmacosycea, F. anamalayana* was clustered with subg. *Urostigma.* Clade 2 was comprised of subg. *Sycidium.* Subsect. *Pogonotrophe* of subg. *Synoecia* and subsect. *Neomorphe* of subg. *Sycomorus* formed the clade 3.

4.4.5. Comparison with natural classification

The natural classification of *Ficus* proposes three groups *viz.*, epiphytes & hemi epiphytes, independent trees and trees with cauliflorous inflorescence. They were locally termed as *Aṭṭhi*, *Iṭṭhi* and *Aal* respectively (van Rheede, 1678; Nair *et al.*, 2021a; 2021d). The combined morphological analysis clustered the species in such a way that all the species with the cauliflorous nature of inflorescence were clustered as a single clade, the only exception was the clustering of *F. racemosa* with *F. callosa* and *F. nervosa.* Most of the epiphytic and hemi-epiphytic species were clustered together (Fig. 4.7). The possible reason for such a change in clustering of *F. racemosa* could be the production of axillary figs similar to the other members. The independent species were not found as a single clade. *F. exasperata* and *F. heterophylla* were clustered with the *F. tinctoria* complex and *F. nervosa* & *F. callosa* were clustered with *F. beddomei.* The clustering of *F. exasperata* and *F. heterophylla* with the *F. tinctoria* complex was possibly due to the monoecious sexuality of the figs. *F. beddomei* even being a hemi epiphyte was clustered with the independent trees mainly due to the similar floral characters and the absence of aerial roots. Thus, the clustering based on the overall morphology had less resemblance with the natural classification.

The analysis based on the syconium characters showed a clustering pattern in which the epiphytic and hemi-epiphytic (*Iṭṭhi*) members were clubbed together (Fig. 4.8). Three cauliflorous species (*Aṭṭhi*), *F. amplocarpa, F. guttata* and *F. auriculata* formed a single clade. The other two cauliflorous species *F. hispida* and *F. racemosa* had a single lineage but in a separate cluster. The species showing independent form of life were not found as a single cluster. *F. exasperata* and *F. heterophylla* formed a single cluster while *F. callosa* and *F. nervosa* had same lineage in the cluster along with *F. beddomei.*

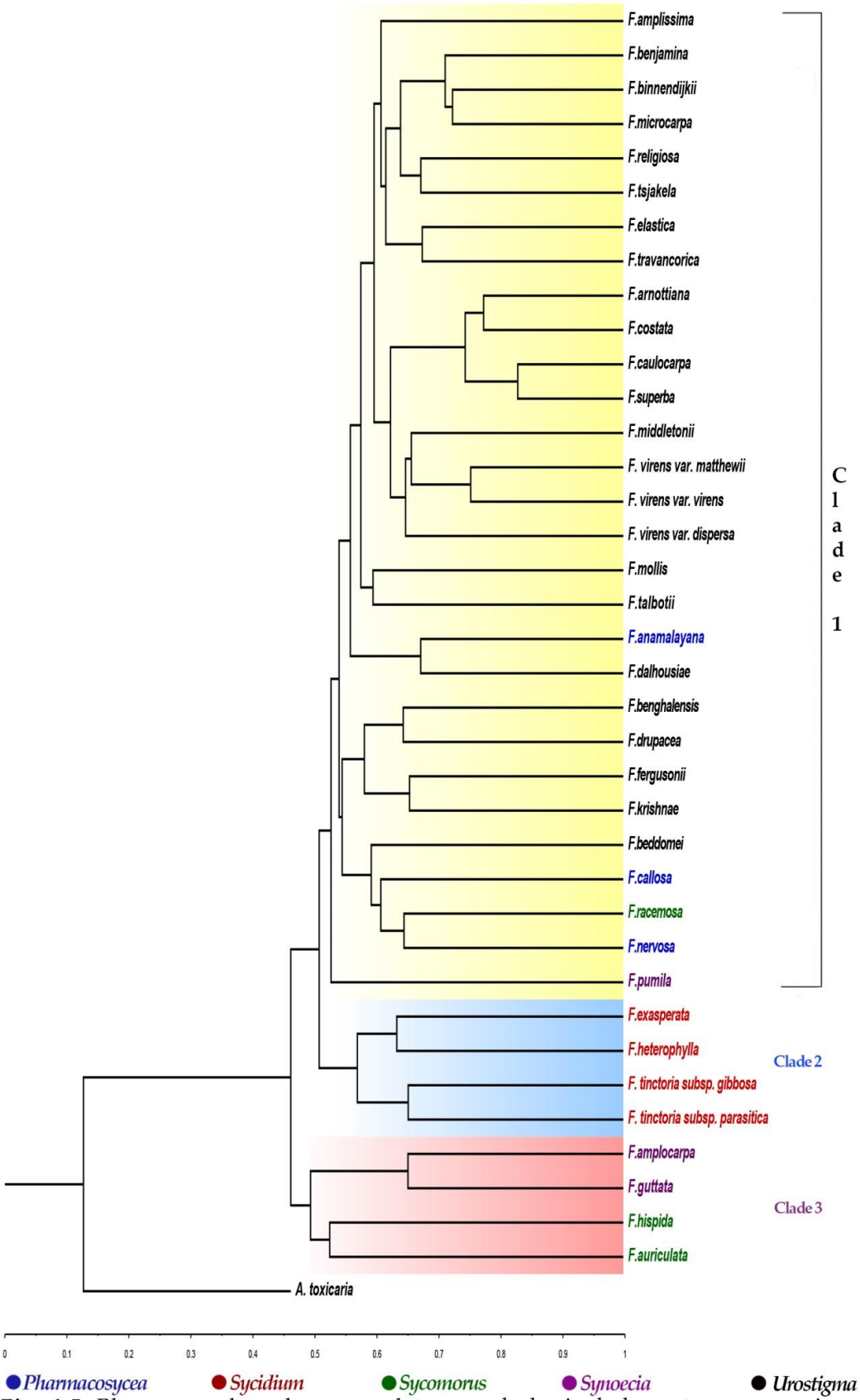


Fig. 4.5. Phenogram based on complete morphological characters comparing the infrageneric classification.

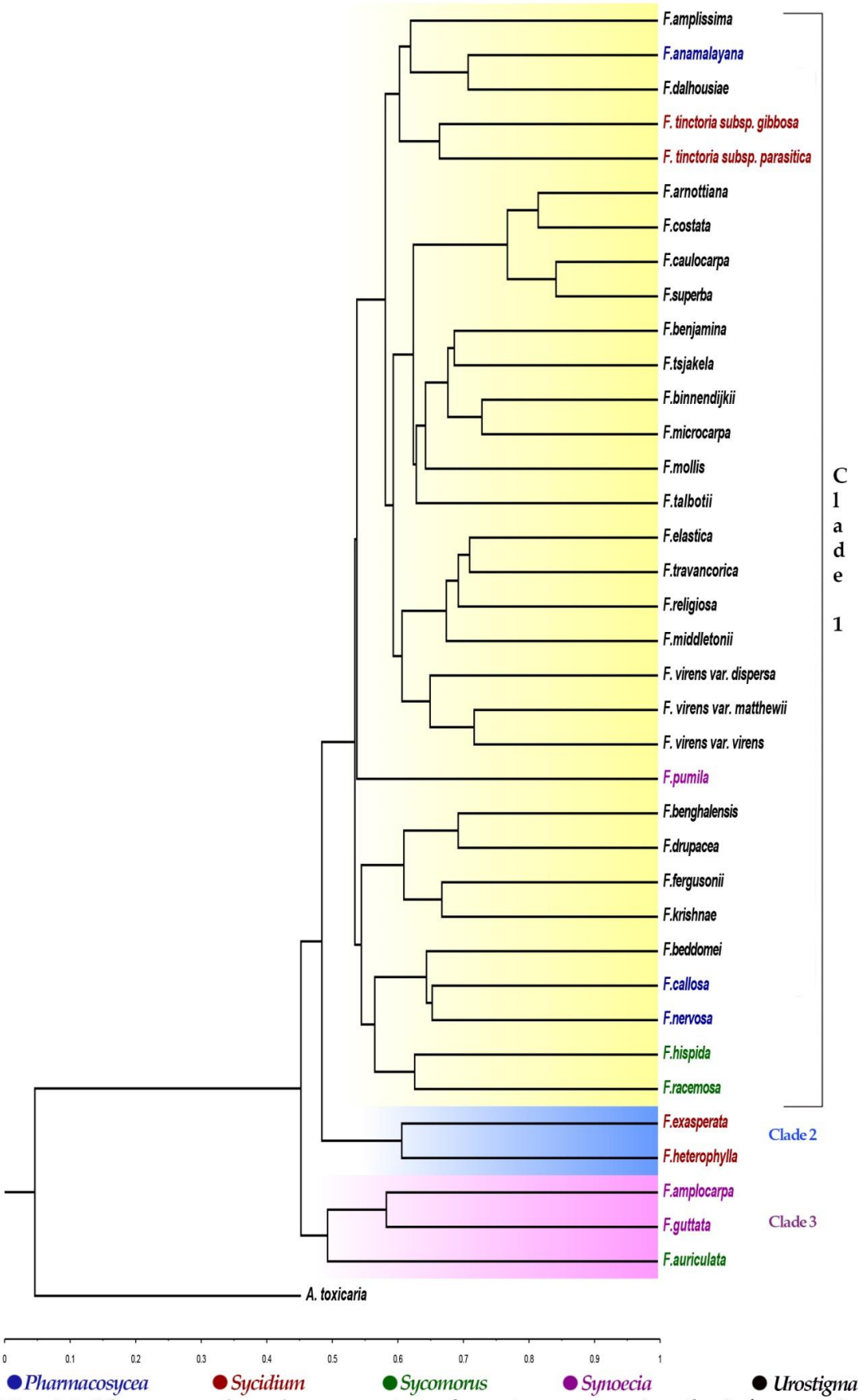


Fig. 4.6. Phenogram based on syconium characters comparing the infrageneric classification.

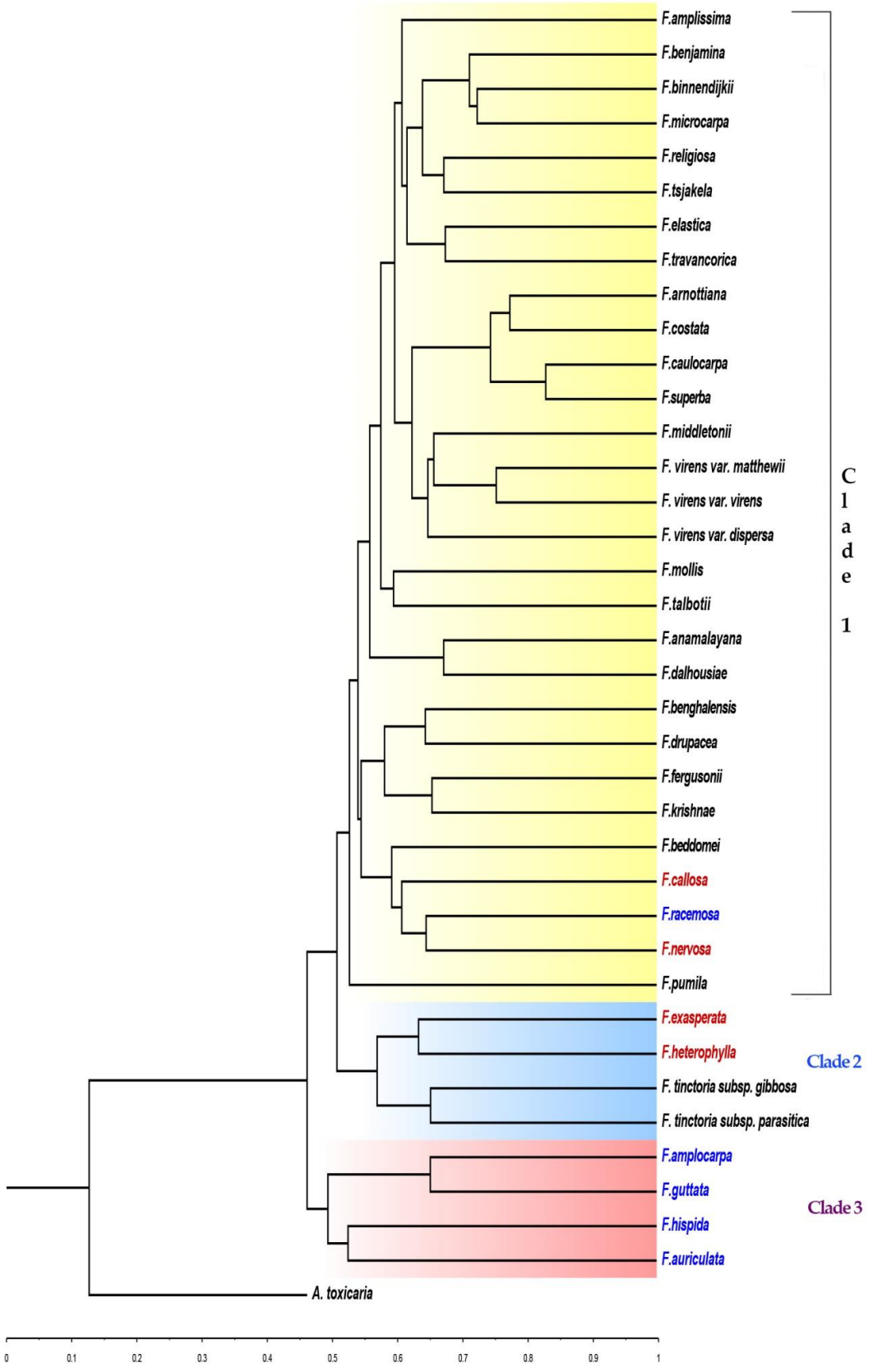


Fig. 4.7. Phenogram based on complete morphological characters comparing the natural classification.

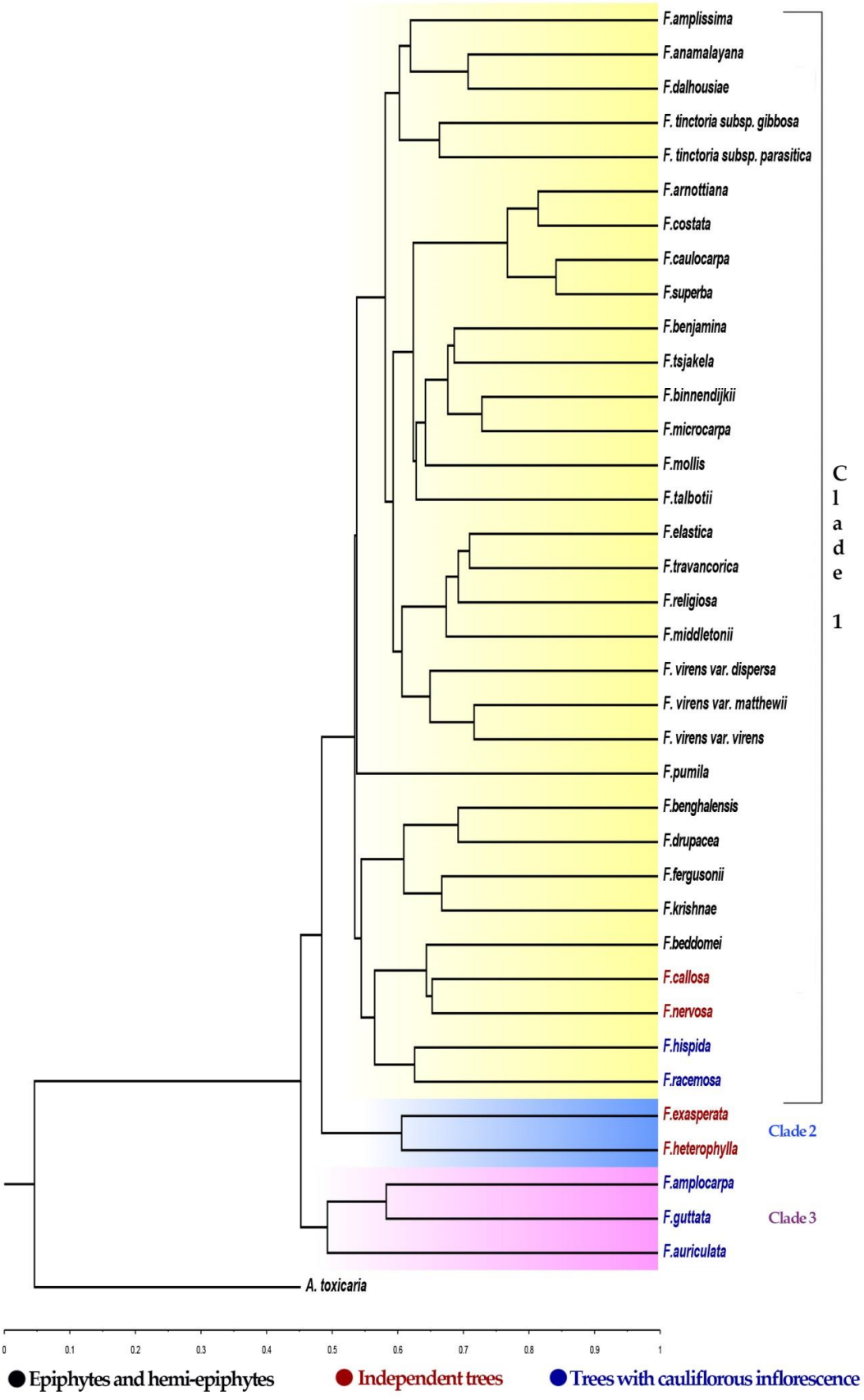


Fig. 4.8. Phenogram based on syconium characters comparing the natural classification.

MOLECULAR PHYLOGENY

CHAPTER 5

Chapter 5

MOLECULAR PHYLOGENY

5.1 Introduction

Phylogeny is the study of the evolutionary relationships among species as deduced from molecular data. The evolutionary relationship is depicted in the form of trees and is based on the assumption that diversification resulted in the evolution of new species from the ancestral forms. The advancements in sequencing techniques have led to the large-scale application of molecular techniques in determining the evolutionary relationship between organisms. These advancements led to the establishment of similarity between the organisms on the basis of genetic relatedness rather than merely depending on their morphological characters.

One of the key elements that determined the effectiveness of the phylogenetic analysis was the choice of the marker. The mitochondrial gene CO1 was found to be the best suitable marker in animals, but in plants, both the coding and non-coding chloroplast markers were found to be more effective along with nuclear markers (Janzen, 2009). The efficiency of combinations of markers for molecular analysis was studied, and it was found that various such combinations are effective at the family and genus level (Pang *et al.,* 2012). *trnH–psbA* has been found to be a highly variable region in plants (Storchová & Olson, 2007) and has good resolution power in separating the members of the family Moraceae (Pang *et al.,* 2012).

The markers *ITS* and *trnH-psbA* were widely used in plant identification process. Both markers showed good resolving power when used for identification of tree species (Bolson *et al*., 2015). The success rate of

amplification was high for *ITS* and *trnH-psbA*, but both showed only a moderate success rate in sequencing. *ITS* alone had good efficiency in determining the species and the resolution of the topology greatly increased when both *ITS* and *trnH-psbA* were combined. The combination of the markers *ITS* and *trnH-psbA* was found to be effective in the genus *Ficus* (Weiblen, 2000; Li *et al*., 2012; Zhang *et al*., 2018; Mahima *et al*., 2020a; Mahima *et al*., 2021).

Maximum Likelihood (ML) and Bayesian inference are the two character-based methods currently in practice for phylogenetic analysis. ML analysis provides a tree that has the highest likelihood and is the most reasonable according to the given data set. The Bayesian analysis is much more advanced than the ML analysis and uses much more complex models than the other analysis. The analysis is based on the posterior probability of a tree (Huelsenbeck *et al*., 2001).

Ficus is a highly complex genus in the family Moraceae. The genus is morphologically complex and is considered as a taxonomically complex group (Mahima *et al*., 2020b). A large number of species complexes exist in the group (Corner, 1958; Mahima, 2020). Molecular techniques were employed for species delimitation in the genus *Ficus* (Lu *et al*., 2016; Mahima *et al*., 2020b; Mahima *et al*., 2021). Phylogenetic studies were done in the genus (Rønsted *et al*., 2008; Lu *et al*., 2016; Zhang *et al*., 2018; Mahima, 2020; Mahima *et al*., 2020a; Zhang *et al*., 2020, 2023) to trace the evolutionary relationship.

The current study focused to carrying out a molecular analysis of the genus *Ficus* to separate the morphologically similar taxa and to establish the genetic relatedness between the various taxa under study and find their

resemblance with the current infrageneric classification and also with the natural system of classification.

5.2. Materials and methods

5.2.1. Taxon sampling and choice of markers

38 taxa were included in the molecular study with 37 taxa of *Ficus* as ingroup and *Antiaris toxicaria* was considered as the outgroup. Both nuclear and chloroplast markers were employed in the molecular analysis. *ITS* region was chosen as the nuclear marker and *trnH-psbA* region was taken as the chloroplast marker, as both the markers were widely employed for molecular studies in the genus *Ficus* and provided good resolution than other available markers (Weiblen, 2000; Li *et al*., 2012; Lu *et al*., 2016; Zhang *et al*., 2018; Mahima *et al*., 2020a, 2020b; Mahima *et al*., 2021). Samples with taxonomic ambiguity and sequences unavailable in the NCBI data base were newly sequenced. Eight taxa of *Ficus* were newly sequenced for *ITS* regions and nine taxa newly sequenced for *trnH-psbA* markers. Sequences were downloaded for the rest of the taxa studied. Detailed list of taxa with the accession number of each marker used is provided as Appendix VI.

5.2.2. DNA isolation, amplification and sequencing

DNA isolation

NucleoSpin Plant II Kit was used for the isolation of DNA for the study. Around 100 mg of the plant tissue was homogenized using liquid nitrogen and the powdered tissue was transferred to a microcentrifuge tube. The mixture was vortexed for 1 minute after adding 400 microlitres of PL1 buffer. Ten microlitres of RNase A solution was added and upturned to blend the mixture. After that, the homogenate was incubated for 10 minutes at 65 °C. Once obtaining the lysate, it was passed through a Nucleospin filter

and centrifuged at 11000 x g for two minutes. The filter was discarded once the liquid that had passed through it had been collected. Later, 450 microliters of buffer PC were added and thoroughly mixed. Transferring the solution to a Nucleospin Plant II column, centrifuging it for one minute, and then discarding the flow-through liquid. The column was filled with 400 microliters of buffer PW1, centrifuged at 11000 x g for one minute, and the flow-through liquid was discarded. Then 700 µl PW2 was added to the mixture and centrifuged at 11000 x g and flow through liquid was eliminated. At last, 200 µl of PW2 was added and centrifuged at 11000 x g for 2 minutes to dry the silica membrane. A new 1.7 ml tube was used to transfer the column, and 50 l of buffer PE was added. The tube was then incubated at 65 °C for 5 minutes. The column was then centrifuged at 11000 x g for 1 minute to elute the DNA and the eluted DNA was stored at 4°C.

Agarose Gel Electrophoresis and amplification

It was determined whether the obtained DNA was of high-quality using agarose gel electrophoresis. In order to load the samples onto a 0.8% agarose gel prepared in 0.5X TBE (Tris-Borate-EDTA) solution containing 0.5 g/ml ethidium bromide, 1 l of 6X gel-loading buffer (0.25% bromophenol blue, 30% sucrose in TE buffer pH-8.0) was added to 5 l of DNA. The bromophenol dye front was electrophoresed at 75 V with 0.5X TBE as the electrophoresis buffer until it migrated to the gel's bottom. In a UV transilluminator (Genei), the gels were seen, and a Gel documentation system (Bio-Rad) was used to captured image under UV light.

PCR amplification reactions were carried out in a 20 µl reaction volume which contained 1X Phire PCR buffer (contains 1.5 mM MgCl2), 0.2mM each dNTPs (dATP, dGTP, dCTP and dTTP), 1 µl DNA, 0.2 µl Phire Hotstart II DNA polymerase enzyme, 0.1 mg/ml BSA and 3% DMSO, 0.5M

Betaine, 5pM of forward and reverse primers. For the extracted DNA, PCR amplification was done in a PCR thermal cycler (GeneAmp PCR System 9700, Applied Biosystems). The primers used for the analysis were listed as follows:

Table 5.1. List of primers used in the analysis

Target	Primer Name	Direction	Sequence (5′ → 3′)
ITS	ITS-F2	Forward	GATTGAATGATCCGGTGAAG
	ITS-R2	Reverse	CTCGCCGTTACTAGGGGAAT
psbA-trnH	psbA3'f	Forward	GTTATGCATGAACGTAATGCTC
	trnH2	Reverse	CGCGCATGGTGGATTCACAATCC

PCR amplification profile for ITS and trnH-psbA

98 °C	-	30 sec	
98 °C	-	5 sec	40 cycles
58 °C	-	10 sec	
72 °C	-	15 sec	
72 °C	-	60 sec	
4 °C	-	∞	

In 1.2% agarose gels produced in 0.5X TBE buffer containing 0.5 g/ml ethidium bromide, the PCR results were analysed. In order to load the PCR products onto the gel, 1 l of 6X loading dye was combined with 4 l of PCR products. Electrophoresis was then carried out at 75 V with 0.5 X TBE as the electrophoresis buffer for approximately 1-2 hours, or until the bromophenol blue front had almost reached the bottom of the gel. The 2-log DNA ladder

(NEB) was the molecular benchmark utilised. In a UV transilluminator (Genei), the gels were seen, and a Gel documentation system (Bio-Rad) was used to take a UV photo of the image.

The elimination of undesired primers and dNTPs from a PCR product mixture without interfering with subsequent applications was achieved by mixing five microliters of PCR product with two millilitres of ExoSAP-IT and incubating the mixture for 15 minutes at 37 °C before the enzyme was inactivated for the remaining 15 minutes at 80 °C.

Gene sequencing

The BigDye Terminator v3.1 Cycle sequencing Kit (Applied Biosystems, USA) was used for the sequencing reaction, which was carried out in a PCR thermal cycler (GeneAmp PCR System 9700, Applied Biosystems) in accordance with the manufacturer's instructions. With the help of Applied Biosystems' Sequence Scanner Software v1, the cleaned-up, air-dried product was sequenced on an ABI 3500 DNA Analyzer.

5.2.3. Sequence alignment and phylogenetic analysis

Sequence alignment

The DNA sequences were edited using MEGA XI Software (Tamura *et al*., 2021). Multiple sequence alignments of sequences were performed with MUSCLE algorithm (Edgar, 2004) in MEGA XI.

Phylogenetic analysis

The maximum likelihood (ML) analysis and Bayesian inference (BI) were used for the phylogenetic analysis. ML analysis was done using IQTREE 2.1.3 software (Nguyen *et al.,* 2015). The best fit nucleotide substitution model was determined by Model Finder (Kalyaanamoorthy *et*

al., 2017) using the default parameters. ML tree was assessed by calculating 1000 Bootstrap replications. The bootstrap percentages above 50 % shown in the trees.

j-ModelTest v2.1.7 (Darriba *et al.,* 2012) was used to find the best-fit models of nucleotide substitution for the Bayesian inference. BI analyses were done using MrBayes 3.2.6 (Ronquist *et al.,* 2012) software. Two runs were conducted in parallel with four Markov Chain Monte Carlo (MCMC) chains, with each running for 1,000,000 generations and sampled every 100th generation. Examination of the loglikelihood values suggested that stationarity was reached in about 25,000 generations. Thus, the first 100,000 generations (10%) were discarded to make sure the burn-in period was sufficiently long. A majority rule consensus tree was produced, showing nodes with Bayesian Inference posterior probability values above 50%. All the trees developed in the phylogenetic analysis were visualized using Fig Tree ver. 1.4.4 (Rambaut, 2018) software.

5.3 Result

5.3.1 Phylogenetic Analysis Using *ITS*

Maximum Likelihood Analysis

The *ITS* region was 265 base pairs in length after the final alignment and trimming. The region included 140 constant sites, 64 parsimony informative sites and 140 invariant sites. TPM2u+F+G4 model was found as the best fit model for the analysis according to the BIC score. All the taxa were well separated using the *ITS* region. But poor resolution was found in separating the varieties of *F. virens.* The outgroup *Antiaris toxicaria* was well separated from all the taxa of *Ficus.* The tree was mainly separated into two clades, both further divided into subclades (Fig. 5.1).

The clade 1 had 30 taxa, divided into three sub clades. The subclade 1 comprised of 16 taxa of *Ficus* namely, *F. arnottiana, F. costata, F. benjamina, F. binnendijkii, F. amplissima, F. talbotii, F. drupacea, F. krishnae, F. benghalensis, F. fergusonii, F. elastica, F. microcarpa, F. anamalayana, F. dalhousiae, F. travancorica* and *F. beddomei.* All the taxa in this subclade were members of the subg. *Urostigma* except *F. anamalayana,* which belongs to the subg. *Pharmacosycea.* The morphologically similar species, *F. dalhousiae* and *F. anamalayana* were separated with 100 % bootstrap support and formed a sister lineage. *F. benghalensis* and *F. krishnae* were separated with 89 % support indicating them as distinct species.

The second subclade had only three species, *F. auriculata, F. racemosa* and *F. hispida,* all members of the subg. *Sycomorus.* 11 taxa were included in the third subclade of clade 1. The taxa include in the subclade were *F. religiosa, F. virens* var. *dispersa, F. virens* var. *virens, F. virens* var. *matthewii, F. middletonii, F. superba, F. caulocarpa, F. tsjakela, F. nervosa, F. mollis* and *F. callosa.* The three varieties of *F. virens* formed a same lineage with *F. middletonii* and formed polytomy. *F. virens* var. *dispersa* and *F. virens* var. *virens* were the closely related taxa based on *ITS* region and both had low distinction (32 %) between the taxa. *F. nervosa, F. mollis* and *F. callosa* formed a same lineage. *F. nervosa* formed a sister lineage with *F. mollis* having 96 % boot support value. *F. nervosa* and *F. callosa* were species within subg. *Pharmacosycea,* while *F. mollis* belonged to subg. *Urostigma.*

The second clade had only seven taxa, separated into two subclades. The first subclade had three species and the second subclade had four taxa. Subclade 1 of the clade 2 included all the root climbers *viz., F. amplocarpa, F. guttata* and *F. pumila,* all belonging to the subg. *Synoecia.* The two endemic species, *F. amplocarpa* and *F. guttata* were morphologically very similar and

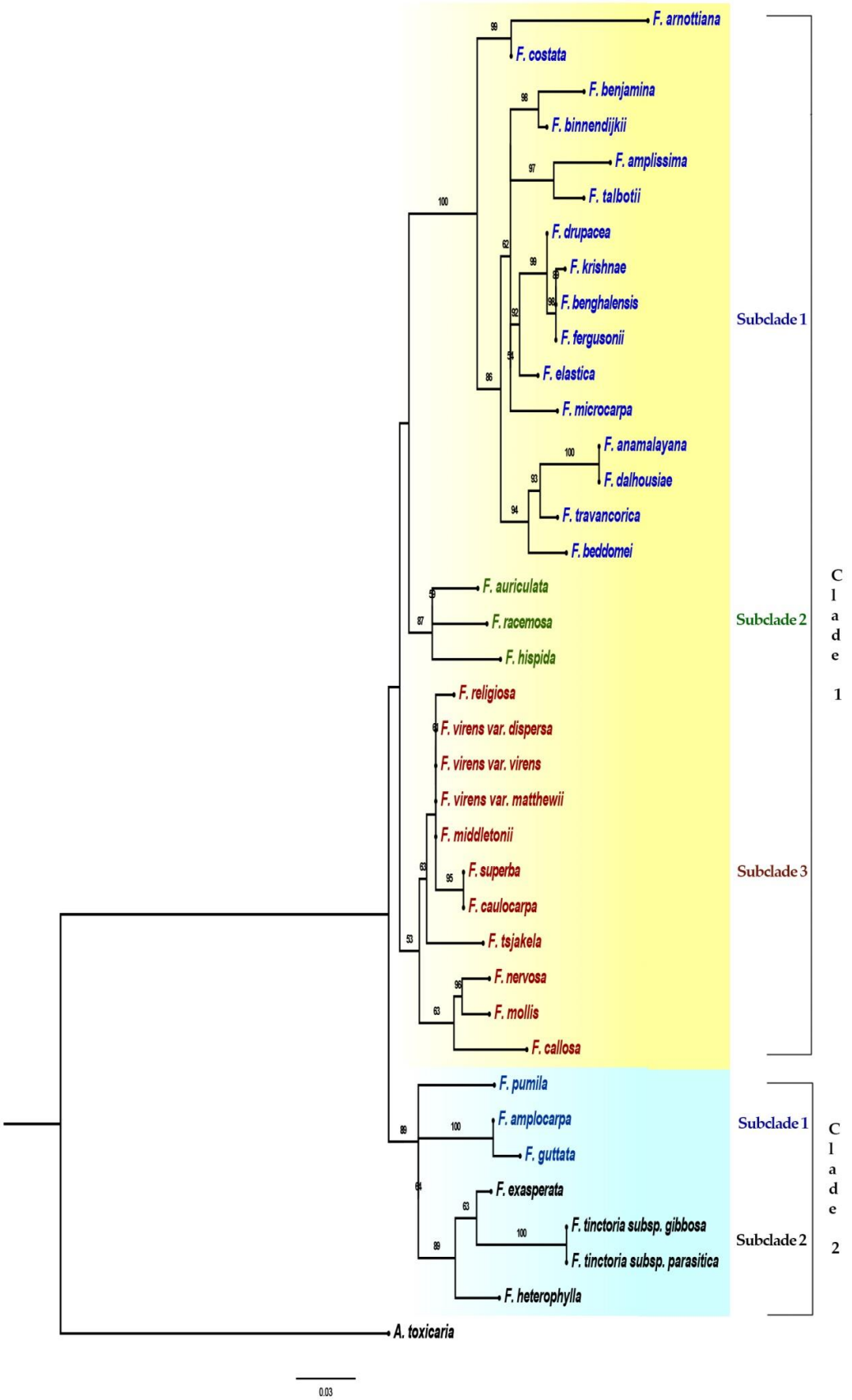


Fig. 5.1. ML dendrogram based on *ITS* marker.

they were separated as distinct species with 100 % bootstrap support. While, the second subclade had four taxa, *viz., F. exasperata, F. tinctoria* subsp. *gibbosa, F. tinctoria* subsp. *parasitica* and *F. heterophylla.* All the four taxa belonged to the subg. *Sycidium.* The separation between *F. tinctoria* subsp. *gibbosa* and *F. tinctoria* subsp. *parasitica* was well supported with 100 % boot support. The taxa were cryptic with overlapping characters and similar morphological characters. The separation of the taxa with good support indicates that both are distinct. *F. exasperata* formed a sister lineage with the *F. tinctoria* complex.

Bayesian Analysis

The GTR+I+G model was selected using jModelTest as the best suitable model for the Bayesian analysis using *ITS* marker. Some of the taxa showed polytomy. Even though the species separation were with good resolution, the clustering pattern was not much clear. The species lineages were similar compared to the ML analysis. The outgroup *Antiaris toxicaria* was separated out from rest of the taxa with good support (pp 1). *Ficus* were mainly divided into two clades and further divided into subclades (Fig. 5.2).

The clade 1 represented 22 taxa, divided into two subclades. The subclade 1 comprised of 6 taxa of which four showed polytomy. The taxa were *F. religiosa, F. tsjahela, F. virens* var. *dispersa F. virens* var. *matthewii, F. virens* var. *virens* and *F. middletonii.* The taxa distinction was clear with pp 1 for *F. virens* var. *dispersa, F. virens* var. *matthewii, F. virens* var. *virens* and *F. middletonii,* but showed polytomy.

The subclade 2 had 16 taxa namely *F. arnottiana, F. costata, F. benjamina, F. binnendijkii, F. drupacea, F. krishnae, F. fergusonii, F. benghalensis, F. elastica, F. microcarpa, F. amplissima, F. talbotii, F. anamalayana, F. dalhousiae,*

F. travancorica and *F. beddomei.* The pattern was similar to the ML analysis. *F. arnottiana* and *F. costata* formed a sister lineage to rest of the species in the clade. *F. krishnae* and *F. benghalensis* were separated as distinct species with pp 1. The subg. *Pharmacosycea* member *F. anamalayana* was clustered with the subg. *Urostigma* member *F. dalhousiae.* Both the species were separated with pp 1, indicating clear species distinction between the two taxa.

The second clade had 15 taxa clustered into four subclades. Subclade 1 had only two species, *F. superba* and *F. caulocarpa.* This clade was clearly separated from other subclades with pp 1. Both the species were also clearly distinct (pp 1). Seven taxa were included in the subclade 2 *viz., F. pumila, F. amplocarpa, F. guttata, F. exasperata, F. heterophylla, F. tinctoria* subsp. *gibbosa* and *F. tinctoria* subsp. *parasitica.* Among them *F. pumila, F. amplocarpa* and *F. guttata* represented the subg. *Synoecia.* The taxonomically complex species *F. amplocarpa* and *F. guttata* of subsect. *Pogonotrophe* formed a sister lineage and were precisely separated (pp 1). Four taxa *F. exasperata, F. heterophylla, F. tinctoria* subsp. *gibbosa* and *F. tinctoria* subsp. *parasitica* formed a single lineage, all belonging to subg. *Sycidium* with 0.94 pp. *F. exasperata* and *F. heterophylla* had sister lineage and belonged to the sect. *Sycidium.* The two taxa under the species *F. tinctoria* were evidently separated with pp 1.

Third subclade had three species in the subg. *Sycomorus* namely *F. auriculata, F. hispida* and *F. racemosa.* The three species were distinct with pp 1, but the subclade exhibited polytomy. The subclade four represented three taxa, *F. nervosa, F. mollis* and *F. callosa.* A sister lineage was observed between *F. nervosa* and *F. mollis* with 0.86 pp value, both belonged to the subg. *Pharmacosycea* and subg. *Urostigma* respectively.

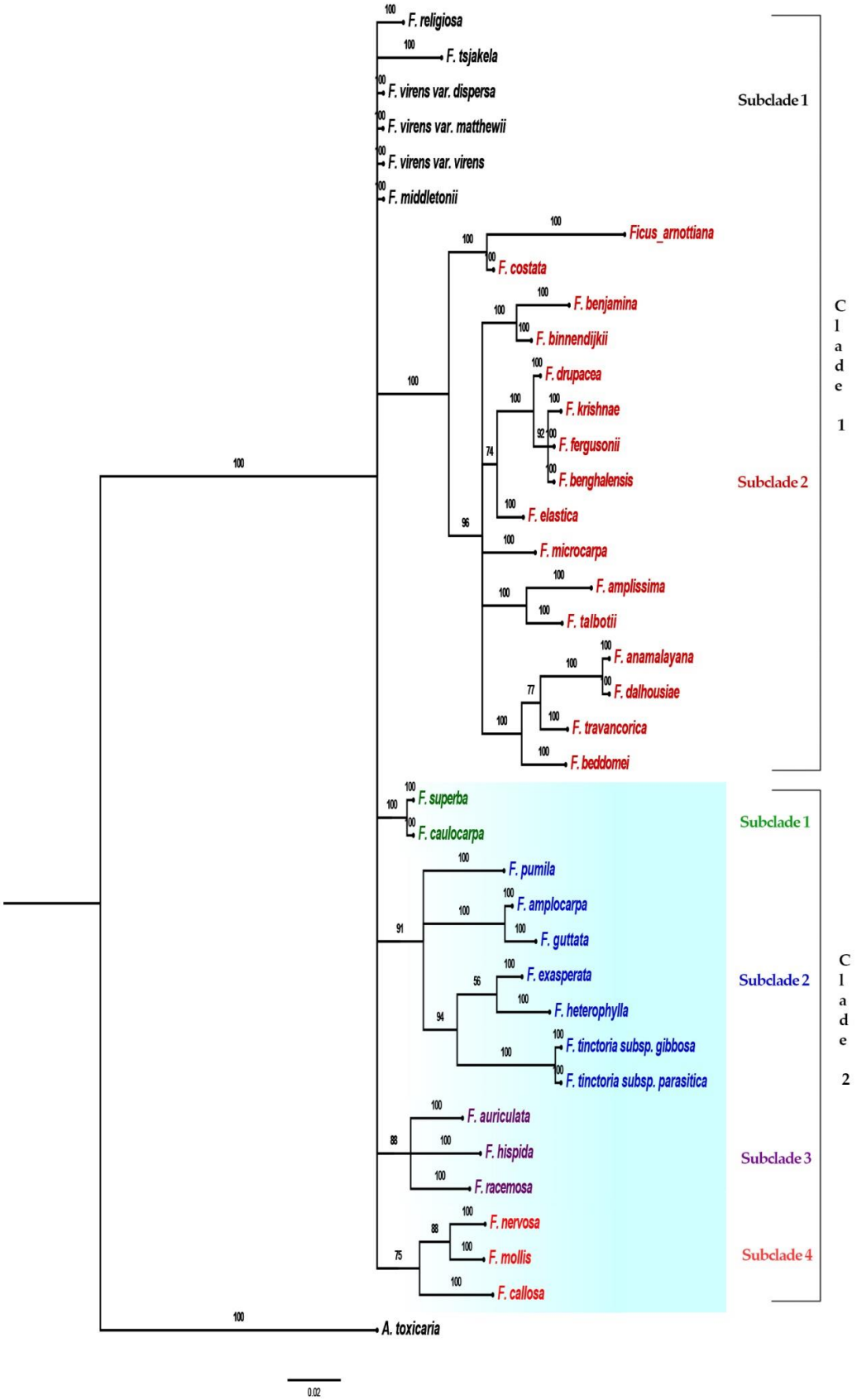


Fig. 5.2. Bayesian dendrogram based on *ITS* marker.

5.3.2 Phylogenetic Analysis Using *trnH-psbA*

Maximum Likelihood Analysis

The final alligned and trimmed sequences of the *trnH-psbA* genes were 440 base pair in length. Among them, there were 136 constant sites, 148 parsimony informative sites and 136 invariant sites. K3Pu+F+G4 model was found as the best fit model for the analysis according to the BIC score. The MP analysis using the *trnH-psbA* region did not provide a tree topology with good resolution. Polytomy was observed in the tree generated. The analysis separated all the taxa into two main clades, with the out group separated out from both the clades (Fig. 5.3). The clades were separated with good boot strap support (98 %).

Clade 1 had 15 taxa in total. It was again bifurcated into two groups, but with low resolution (57 %). The subclade 1 in the clade had 13 taxa *viz., F. auriculata, F. nervosa, F. virens* var. *virens, F. tinctoria* subsp. *gibbosa, F. hispida, F. callosa, F. binnendijkii, F. fergusonii, F. virens* var. *matthewii, F. travancorica, F. elastica, F. pumila* and *F. costata.* While, the subclade 2 had only 2 taxa, *F. virens* var. *dispersa* and *F. tinctoria* subsp. *parasitica. F. costata* was separated out from rest of the taxa in the subclade 1 with good boot strap support (98 %).

Clade 2 had 22 taxa. It was sub divided into two subgroups, sub clade 1 with three taxa, *F. amplissima, F. exasperata* and *F. talbotii.* The second subclade was the major one with 19 taxa, *F. beddomei, F. krishnae, F. anamalayana, F. dalhousiae, F. arnottiana, F. amplocarpa, F. guttata, F. middletonii, F. benghalensis, F. drupacea, F. microcarpa, F. benjamina, F. superba, F. caulocarpa, F. racemosa, F. tsjakela, F. religiosa, F. heterophylla* and *F. mollis.* The subclade 1 was separated from the subclade 2 with 63% boot support value. The

morphologically ambiguous species *F. amplocarpa* and *F. guttata* were well separated with 92 % boot support, indicating that they are distinct taxa.

F. virens var. *dispersa* and *F. tinctoria* subsp. *parasitica* formed a sister lineage in the clade 1. Both the taxa were entirely distinct based on both morphological and floral characters but, formed a close lineage. No significant characters were found to be common to the clade 1, other than the characters like white milky latex, caducous stipules etc. which very common among several species. In the subclade 1, *F. virens* var. *matthewii* and *F. tinctoria* subsp. *gibbosa* formed a same lineage. The lineage had 96 % boot strap value indicating good support to the lineage. Low boot strap support was found to many of the lineages indicating low species resolution using *trnH-psbA* marker.

The clade 2 mainly had the species coming under the subg. *Urostigma* and was further divided into two sub clades. The subclade 1 was a minor group with three species namely, *F. amplissima, F. exasperata* and *F. talbotii.* The subclade was separated from the other subclade with a boot strap percentage of 63 %, indicating lower support to the lineage. *F. exasperata* and *F. talbotii* formed a common lineage with good support (83 %). *F. amplissima* was separated out from the lineage with 96 % boot strap support.

The subclade 2 of the clade 2 included 19 taxa. The morphologically ambiguous species *F. benghalensis* and *F. krishnae,* were distantly grouped. *F. krishnae* was grouped with *F. beddomei* with 74 % support and showed great difference with *F. benghalensis.* The cryptic species *F. anamalayana* and *F. dalhousiae* were also separated confirming their genetic distinctness, but exhibited common ancestry.

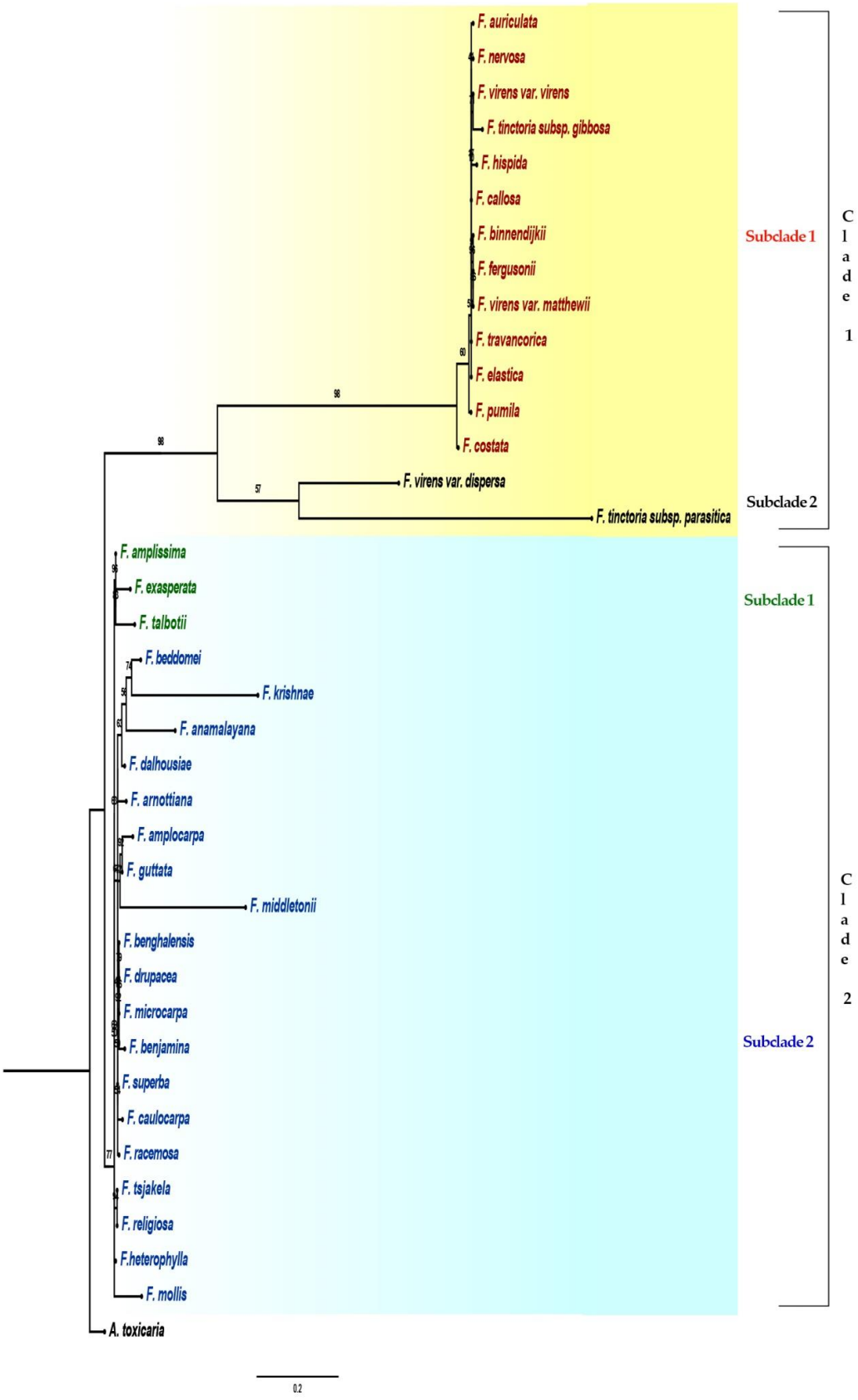


Fig. 5.3. ML dendrogram based on *trnH-psbA* marker.

92 % support was obtained for the separation of the species *F. guttata* and *F. amplocarpa.* Both the species showed similarity in their morphological characters and were clearly separated by the chloroplast marker. *F. caulocarpa* and *F. superba* showed similarity in the chloroplast sequences and had low boot strap support for the separation (54 %) indicating their genetic relatedness. *F. drupacea* and *F. microcarpa* were morphologically very distinct species, but they formed a common lineage. Thus, it was found that the chloroplast marker *trnH-psbA* had only lesser species resolution within some complex species.

Bayesian Analysis

The model GTR+I+G was selected using jModelTest as the best suitable model for the Bayesian analysis. The Bayesian analysis separated the taxa of *Ficus* studied with good resolution. Polytomy was observed in some of the species. The tree topology was almost similar to the ML analysis. The outgroup *Antiaris toxicaria* was clearly separated from rest of the *Ficus* studied. The species were separated into three clades, two of them were major clades and one was a minor clade (Fig. 5.4). The minor clade (Clade 1) was comprised of *F. heterophylla* and *F. mollis* only.

Second clade (Clade 2) included 15 taxa of *Ficus viz., F. auriculata, F. binnendijkii, F. fergusonii, F. virens* var. *matthewii, F. nervosa, F. virens* var. *virens, F. tinctoria* subsp. *gibbosa, F. costata, F. travancorica, F. callosa, F. elastica, F. hispida, F. pumila, F. tinctoria* subsp. *parasitica* and *F. virens* var. *dispersa.* Three taxa, *F. travancorica, F. callosa* and *F. elastica* showed polytomy. *F. virens* var. *dispersa* was separated from the other taxa with pp 1. The next taxa separated from the clade was *F. tinctoria* subsp. *parasitica* (pp 1). *F. virens* var. *virens* and *F. tinctoria* subsp. *gibbosa* formed a sister lineage in the clade. The species had pp 1, but the lineage showed only 0.58 pp.

Clade 3 comprised of 20 taxa and were further divided into three subclades. The first subclade had only two members, *F. tsjakela* and *F. religiosa*. The lineage had a strong support with 0.98 pp value. The second subclade had 15 taxa, *F. beddomei, F. krishnae, F. anamalayana, F. dalhousiae, F. amplocarpa, F. guttata, F. benghalensis, F. benjamina, F. drupacea, F. microcarpa, F. superba, F. middletonii, F. arnottiana, F. caulocarpa* and *F. racemosa.* The morphologically complex species, *F. anamalayana* and *F. dalhousiae* were found as distinct species. *F. anamalayana* formed a lineage with other two taxa, *F. beddomei* and *F. krishnae* while, *F. dalhousiae* was a sister taxon to the group. The endemic taxa *F. amplocarpa* and *F. guttata* were separated with 0.9 pp. It confirms the taxonomic distinctness between the two species based on the chloroplast sequences. Polytomy was observed between the species *F. microcarpa* and *F. drupacea.* The third subclade had only three species, *F. amplissima, F. exasperata* and *F. talbotii*. The subclade had 0.6 pp with the clade.

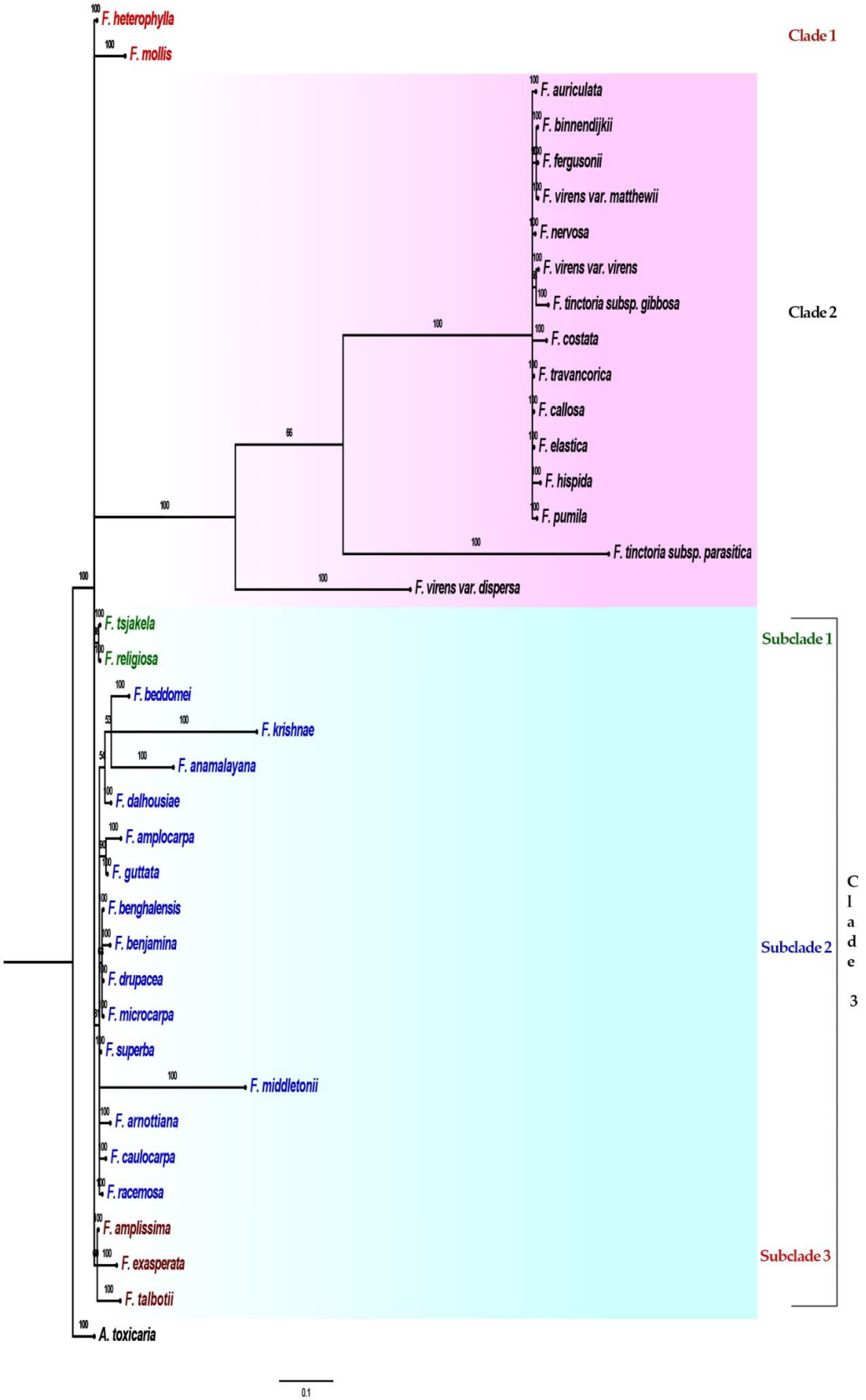


Fig. 5.4. Bayesian dendrogram based on *trnH-psbA* marker.

5.4. Discussion

Molecular techniques are widely applied for identification as well as for taxonomic delimitation of species. The morphological characters of the species may be overlapping or provide less information for exact identification. Even though many markers are available as tools for studying plant at molecular level, the correct choice of markers could provide accurate inferences. Among the markers studied, *ITS* and *trnH-psbA* regions showed the most successful results and species delimitation in the genus *Ficus* (Li *et al*., 2012; Pang *et al*., 2012; Anand *et al*., 2016; Lu *et al*., 2016; Zhang *et al*., 2018; Mahima, 2020; Mahima *et al*., 2020b). The present study using these markers (*ITS* and *trnH*-psbA) also provided adequate delimitation even between the morphologically similar and cryptic taxa. *trnH-psbA* region had more parsimony informative site (148) than the nuclear *ITS* region (64). But *ITS* region had 140 constant sites compared to the 136 constant sites in *trnH-psbA.*

5.4.1. Phylogenetic analysis using *ITS*

The ML and the Bayesian analysis using the nuclear *ITS* region didn't have much incongruency and had the same tree topology. Polytomy was observed between few of the taxa studied. *F. arnottiana* and *F. costata* formed a sister lineage in both the analysis. It was similar to the observation by Sasidharan and Augustine, (1999) who reported the species for the first time in India, that *F. costata* resembles *F. arnottiana* in their overall morphology. Similarly, *F. arnottiana* and *F. costata* showed genetic resemblance in their *ITS* region.

The taxonomic status of *F. krishnae* was of great confusion for long time and was considered to be a variety under *F. benghalensis.* The recent

studies implemented with molecular analysis suggested *F. krishnae* as an independent species (Tiwari *et al*., 2015; Mahima, 2020; Mahima *et al*., 2021). Based on the *ITS* region both the ML and Bayesian analysis formed *F. krishnae* as a sister clade of *F. benghalensis.* Polytomy was observed between the species but were separated with significant support values.

The India - Sri Lankan endemic species *F. fergusonii* had morphological similarity with *F. benghalensis* (Reddy *et al*., 2020) and it formed a clade with the sister lineage of *F. benghalensis* and *F. krishnae* indicating its similarity in the *ITS* region.

F. dalhousiae and *F. anamalayana* are two Southern Western Ghats endemic species belonging to the subg. *Urostigma* and subg. *Pharmacosycea* respectively. Morphological ambiguity between the species made the identification of the species problematic (Sudhakar & Murthy, 2015). The molecular studies in the species confirmed the taxonomic status of both the taxa as separate species (Mahima *et al*., 2020b; Mahima, 2020). Our study also showed variation in the sequences between both the species and were separated with significant support values. *F. dalhousiae* and *F. anamalayana* formed a sister lineage in a clade where all the other taxa belonged to the subg. *Urostigma.* Variations at molecular level confirmed *F. dalhousiae* and *F. anamalayana* as two separate taxa, but the taxonomic positioning of *F. anamalayana* is still confusing. Mahima (2020) reported that the combined analysis using both molecular and morphological data placed *F. anamalayana* among the subg. *Pharmacosycea.* This validates that the taxonomic classification in the genus *Ficus* is not supported by molecular evidences.

F. virens is one of the most widely distributed species and exhibits great morphological variations, with various forms proposed under the species (Chantarasuwan *et al*., 2013). *F. virens* complex comprises of around

eight taxa, that mainly includes *F. virens* and its allies (Mahima, 2020). All the taxa proposed under *F. virens* complex were clustered together in both ML and Bayesian analysis. As an exception to the results of Mahima (2020), *F. religiosa* and *F. tsjakela* were added to the *F. virens* complex. This group showed polytomy and hence the resolution was not clear, indicating the chances of a greater number of taxa in between the members included in the present study. It was interesting to note that the four endemic species of (*F. anamalayana, F. dalhousiae, F. beddomei* and *F. travancorica*) formed a same clade.

All the three varieties of *F. virens* were clustered together in same clade and showed polytomy. The distinction between the taxa was supported with pp 1 indicating all the accessions as separate taxa. The *ITS* region of *F. virens* var. *virens* was similar to *F. virens* var. *dispersa* than *F. virens* var. *matthewii.*

The endemic root climbers, *F. amplocarpa* and *F. guttata* were another morphologically complex species in the genus, since the morphological characters were overlapping and highly confusing. The nuclear *ITS* region separated both the species with significant support values, and confirmed them as distinct species. The misperceptions in *F. tinctoria* complexe were unravelled. *F. tinctoria* is highly variable species and several forms were proposed under the species. Considering them as morphological variations, they were merged under the name *F. tinctoria* var. *gibbosa.* Further studies from the region suggested them as separate taxa (Chaudhary *et al*., 2012; Mahima, 2020). The samples collected from the present study area were thoroughly examined for the morphological variations and the character similarities and dissimilarities were standardised. The *ITS* region showed variations in the two taxa studied and separated them with significant boot

strap support and pp value. Hence, it was confirmed that the two taxa distributed in the study region are separate forms under *F. tinctoria* species.

5.4.2. Phylogenetic analysis using *trnH-psbA*

The ML and Bayesian analysis using *trnH-psbA* region showed similar topology but was not congruent with the tree topologies with *ITS* region. The clustering was not strong compared to the pattern formed with *ITS.* More polytomy was observed in both the analysis indicating the chance for the existence of a large number of taxa in between the members currently studied.

The taxonomically cryptic taxa and species complexes in the genus were separated well, but clades were not formed similar to the *ITS* region. All the varieties of *F. virens* were separated at distant levels. They never clubbed together as sister lineages within the clade. The distant grouping and the presence of many in between taxa indicate that the varieties of *F. virens* are exactly separate taxa and are evolutionally distant.

Similar was the case for *F. tinctoria.* Both the taxa of *F. tinctoria* were not formed as sister lineages. In the Bayesian analysis both the taxa were supported with significant pp values (1 pp). Both the taxa formed separate lineages with the varieties of *F. virens* in ML analysis. The endemic root climbers *F. amplocarpa* and *F. guttata* were separated with pp 1 and they formed a sister lineage. They were the only morphologically similar species that formed sister lineage in analysis using *trnH-psbA*. *F. krishnae* had less affinity with *F. benghalensis* and formed a sister lineage with *F. beddomei.* The southern Western Ghats endemic species *F. anamalayana* and *F. dalhousiae* were clustered in the same clade, but not as sister taxa. The clustering of *F. anamalayana* in the group of species belonging to the subg. *Urostigma* questions the positioning of *F. anamalayana* in the subg. *Pharmacosycea.*

5.4.3. Implications between molecular analysis and infrageneric classification

The infrageneric classification of the genus *Ficus* was revised several times since 1786. All the major classifications proposed thereafter were based on morphological and reproductive characters (Thunberg, 1786; Miquel, 1844; Corner, 1958; Corner, 1965a; Ramírez, 1977; Berg & Corner, 2005). And the infrageneric classification was merely supported by molecular data (Rønsted *et al*., 2008; Xu *et al.*, 2011). According to the present study, the molecular analysis using the *ITS* region was almost congruent with the infrageneric classification as proposed by Berg and Corner (2005).

The ML analysis using *ITS* marker clustered *Ficus* into two clades, clade 1 and 2. Clade 1 was further divided into three subclades and clade 2 was further divided into two subclades. The clade 1 included all the members of the subg. *Urostigma,* subg. *Sycomorus* and subg. *Pharmacosycea.* Subclade 1 included 16 species of which 15 were species coming under subg. *Urostigma.* Only exception was the presence of *F. anamalayana,* currently positioned as subg. *Pharmacosycea* member along with subg. *Urostigma* members. Subclade2 included all species of subg. *Sycomorus.* Subclade 3 included taxa belonging to two subgenera, *Urostigma* and *Pharmacosycea.* The two species, *F. nervosa* and *F. callosa* of subg. *Pharmacosycea* formed a separate clade within the subclade 3 along with *F. mollis,* which belongs to subg. *Urostigma.* Thus, clade 1 retained all the taxa coming under subg. *Urostigma,* subg. *Sycomorus* and subg. *Pharmacosycea,* with exceptional lineage in two taxa only. The clade 2 included the subg. *Synoecia* and subg. *Sycidium.* The subclade 1 depicted all the species coming under subg. *Synoecia* and the subclade 2 represented all the taxa in the subg. *Sycidium* (Fig 5.5).

The Bayesian analysis using *ITS* region also followed the same pattern like that of the infrageneric classification. The tree was divided into two clades. Clade 1 was further divided into two subclades and the clade 2 split into four subclades. The clade 1, represented the all taxa in the subg. *Urostigma* with two exceptions. The clade included the *Pharmacosycea* member *F. anamalayana* and excluded *F. mollis, F. superba* and *F. caulocarpa* of the subg. *Urostigma.* The clade 2 denoted two species of subg. *Urostigma* (*F. superba* and *F. caulocarpa*) in the subclade 1. Taxa within the subg. *Synoecia* and subg. *Sycidium* were found in the subclade 2. All three species in the subg. *Synoecia* (*F. pumila, F. amplocarpa* and *F. guttata*) formed a group separated from the four species coming under the subg. *Sycidium.* Third subclade formed the cluster of species in the subg. *Sycomorus.* With the exception of including the subg. *Urostigma* species *F. mollis,* the subclade 4 represented subg. *Pharmacosycea* (Fig. 5.6).

The ML analysis using *trnH-psbA* separated *Ficus* into two clades each with two subclades. Subclade 1 of clade 1 had 13 species, two taxa each represented the subg. *Sycomorus,* subg. *Pharmacosycea* and subg. *Sycidium.* Only *F. pumila* belonged to the subg. *Synoecia* and the remaining seven taxa were subg. *Urostigma* members. The second subclade had two taxa *F. virens* var. *dispersa* and *F. tinctoria* subsp. *parasitica* fitting to the subg. *Urostigma* and subg. *Sycidium* correspondingly.

The second clade had two subclades, first subclade with three species. One species (*F. exasperata*) in the subg. *Sycidium* and two in the subg. *Urostigma.* The second subclade with 19 species comprised of two species from the subg. *Synoecia,* one species each from subg. *Pharmacosycea,* subg. *Sycomorus* and subg. *Sycidium.* 14 species represented the subg. *Urostigma* (Fig. 5.7).

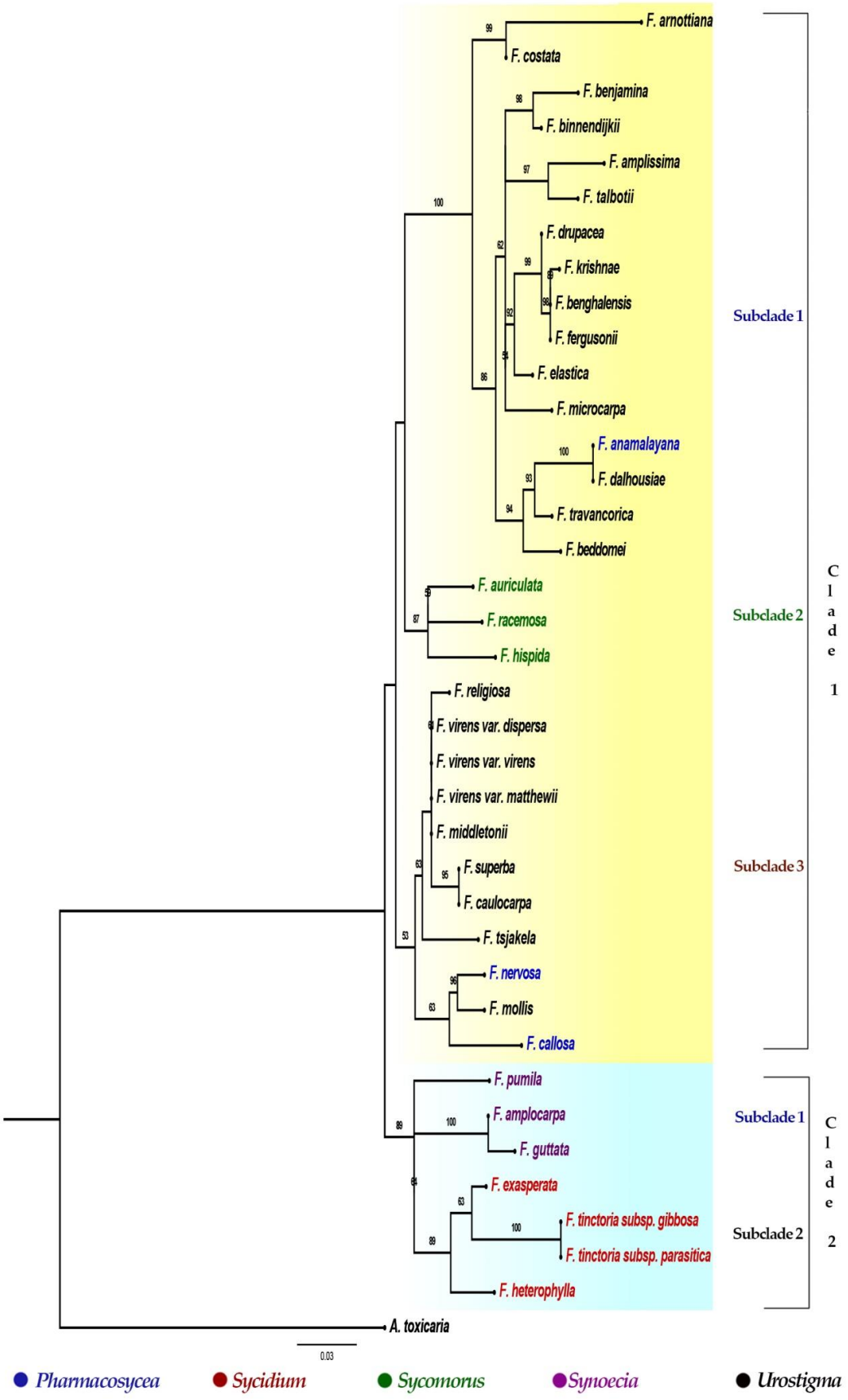


Fig. 5.5. ML dendrogram based on *ITS* marker comparing the infrageneric classification.

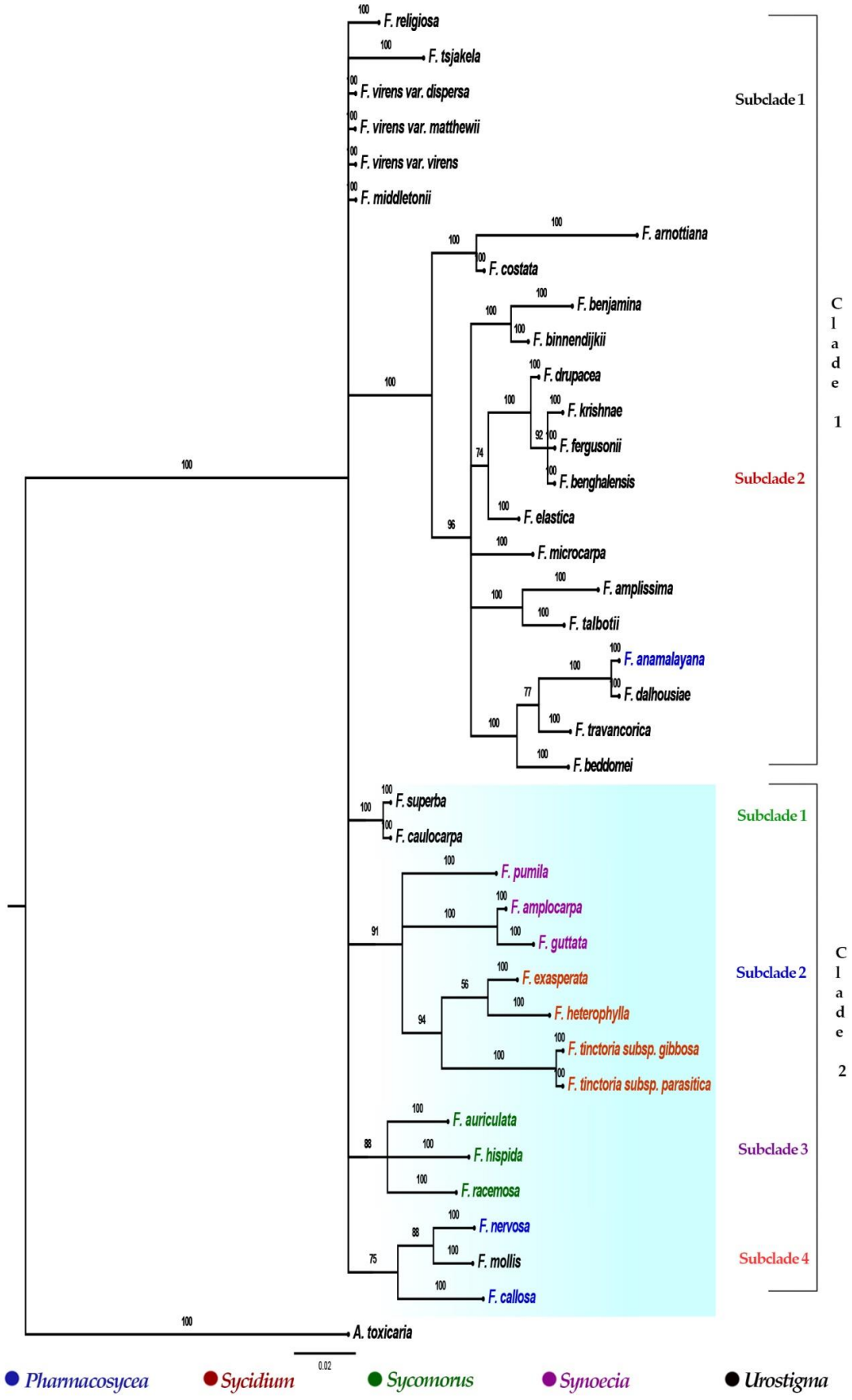


Fig. 5.6. Bayesian dendrogram based on *ITS* marker comparing the infrageneric classification.

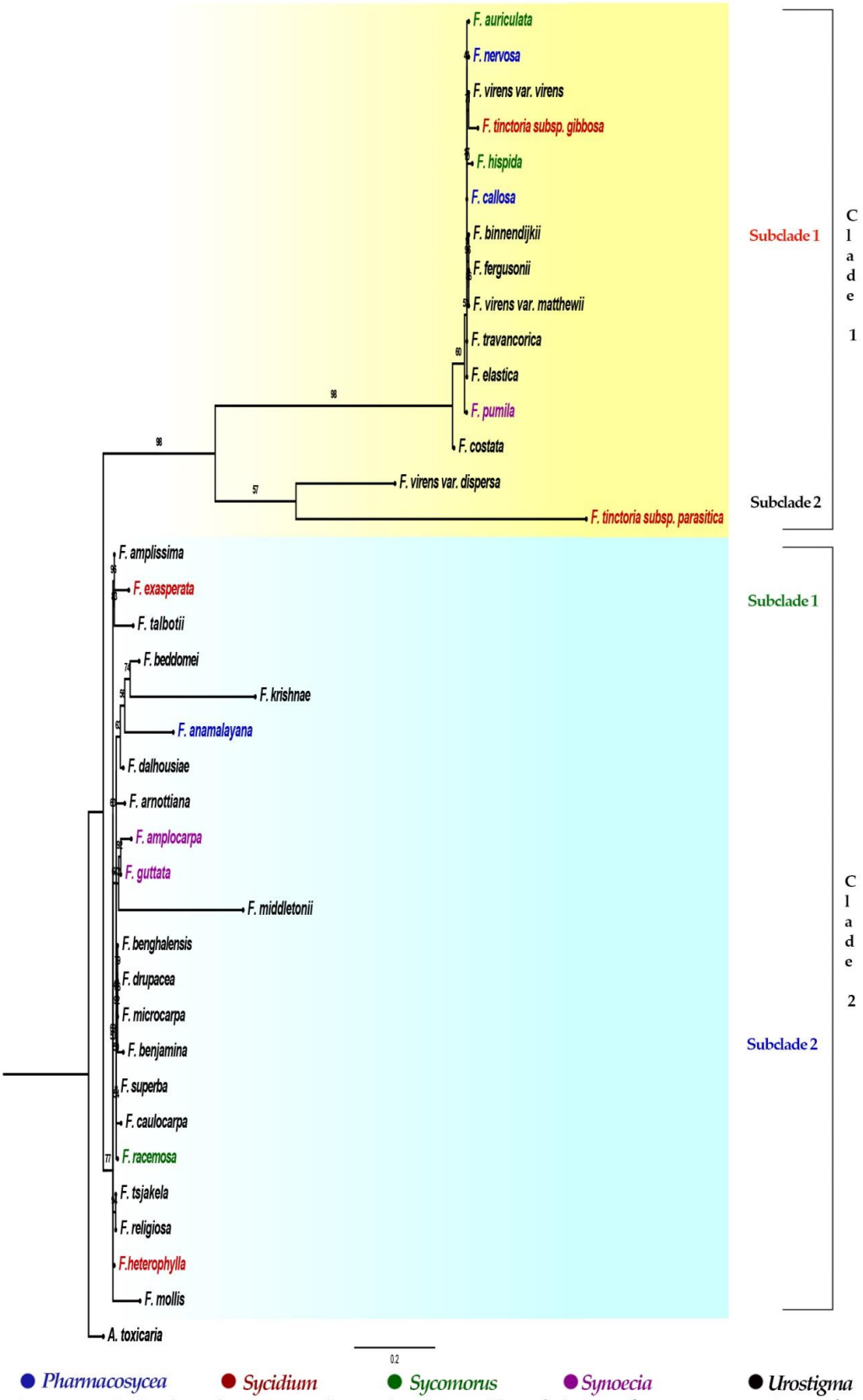


Fig. 5.7. ML dendrogram based on *trnH-psbA* marker comparing the infrageneric classification.

The Bayesian analysis using *trnH-psbA* divided *Ficus* into three clades and the third clade divided into three subclades. None of the clades or the subclades showed a pattern similar to the current infrageneric classification system of *Ficus.* The clade 1 comprised of only two species, each representing the subg. *Sycidium* and subg. *Urostigma.* The second clade had 15 taxa in total. *F. auriculata* and *F. hispida* were the members of subg. *Sycomorus.* Two species, *F. nervosa* and *F. callosa* denoted the subg. *Pharmacosycea.* Two taxa coming under the species *F. tinctoria* were the subg. *Sycidium* members. And *F. pumila* alone denoted the subg. *Synoecia.* Rest of the taxa (8) represented the subg. *Urostigma.*

The first subclade of the third clade had two species of the subg. *Urostigma.* The second subclade with 15 species had two species from the subg. *Synoecia* and one species each from subg. *Sycomorus* and subg. *Pharmacosycea.* All the other species belonged to the subg. *Urostigma.* The third subclade with three species comprised of two species from subg. *Urostigma* and one species from the subg. *Sycidium* (Fig. 5.8). Thus, the *trnH-psbA* based clustering was not congruent with the infrageneric system of classification.

5.4.4. Implications between molecular analysis and natural classification

The natural classification of the genus divided the species into three groups as '*Aṯhi*' (trees with cauliflorous inflorescence), '*Iṯhi'* (hemi epiphytic and epiphytic trees, stranglers) and '*Aal*' (independent trees) (van Rheede, 1678; Matthew, 1995; Nair *et al*., 2021a, 2021d).

According to the *ITS* based phylogenetic analysis, the ML tree showed a clustering pattern in which most of the hemi epiphytic and epiphytic trees as well as stranglers were clustered together. In the clade 1,

the first subclade was entirely represented by the group *'Itthi'*. Second subclade denoted the species coming under the category of cauliflorous trees called *'Atthi'*. Third subclade were epiphytes and stranglers, along with two independent trees (*Aal*), *F. callosa* and *F. nervosa.* The second clade showed a mixture of the three groups. Subclade 1 included the epiphytic species *F. pumila* with two cauliflorous climbers *F. amplocarpa* and *F. guttata.* Second subclade with four taxa composed of both independent and epiphytic groups. *F. exasperata* and *F. heterophylla* were independent (*Aal*) tree and shrub respectively (Fig 5.9).

In the Bayesian analysis, both subclades of the clade 1 entirely represented the '*Itthi*' group. The first subclade of the second clade were epiphytic species. Second subclade represented a mixture of all the three groups '*Atthi*', '*Itthi*' and '*Aal*'. All species in the third subclade were cauliflorous trees. The fourth subclade had three species in total, including the single epiphytic species *F. mollis* and independent trees (*Aal*), *F. nervosa* and *F. callosa* (Fig. 5.10).

The results of molecular analysis using *trnH-psbA* were not matching with the natural classification. The ML analysis divided the tree into two clades each with two subclades. The subclade 1 of the clade 1 was a mixture of all the three groups '*Atthi*', '*Itthi*' and '*Aal*'. Two species each were independent trees and cauliflorous trees. All the other taxa were epiphytes. The second subclade included two '*Itthi*' members only.

The subclade 1 of the second clade had two epiphytic species and an independent tree (*F. exasperata*). Second subclade of the clade 2 included two cauliflorous climbers (*F. amplocarpa* and *F. guttata*), cauliflorous tree (*F. racemosa*) and the independent shrub *F. heterophylla.* The remaining 15 species were epiphytic *Itthi* members (Fig. 5.11)

The Bayesian analysis divided the tree into three clades. The first clade with two species included the independent shrub, *F. exasperata* and the epiphytic tree, *F. mollis.* The second clade had two species each in the group '*Aththi*' and '*Aal*'. All the other taxa belonged to the group '*Itthi*'.

The third clade had three subclades, the first subclade had only two epiphytic species. The second subclade included two cauliflorous climbers (*F. amplocarpa* and *F. guttata*), cauliflorous tree (*F. racemosa*) combined with 12 epiphytic '*Itthi*' members. The third subclade included one independent tree, *F. exasperata* and two epiphytic species *F. amplissima* and *F. talbotii* (Fig. 5.12).

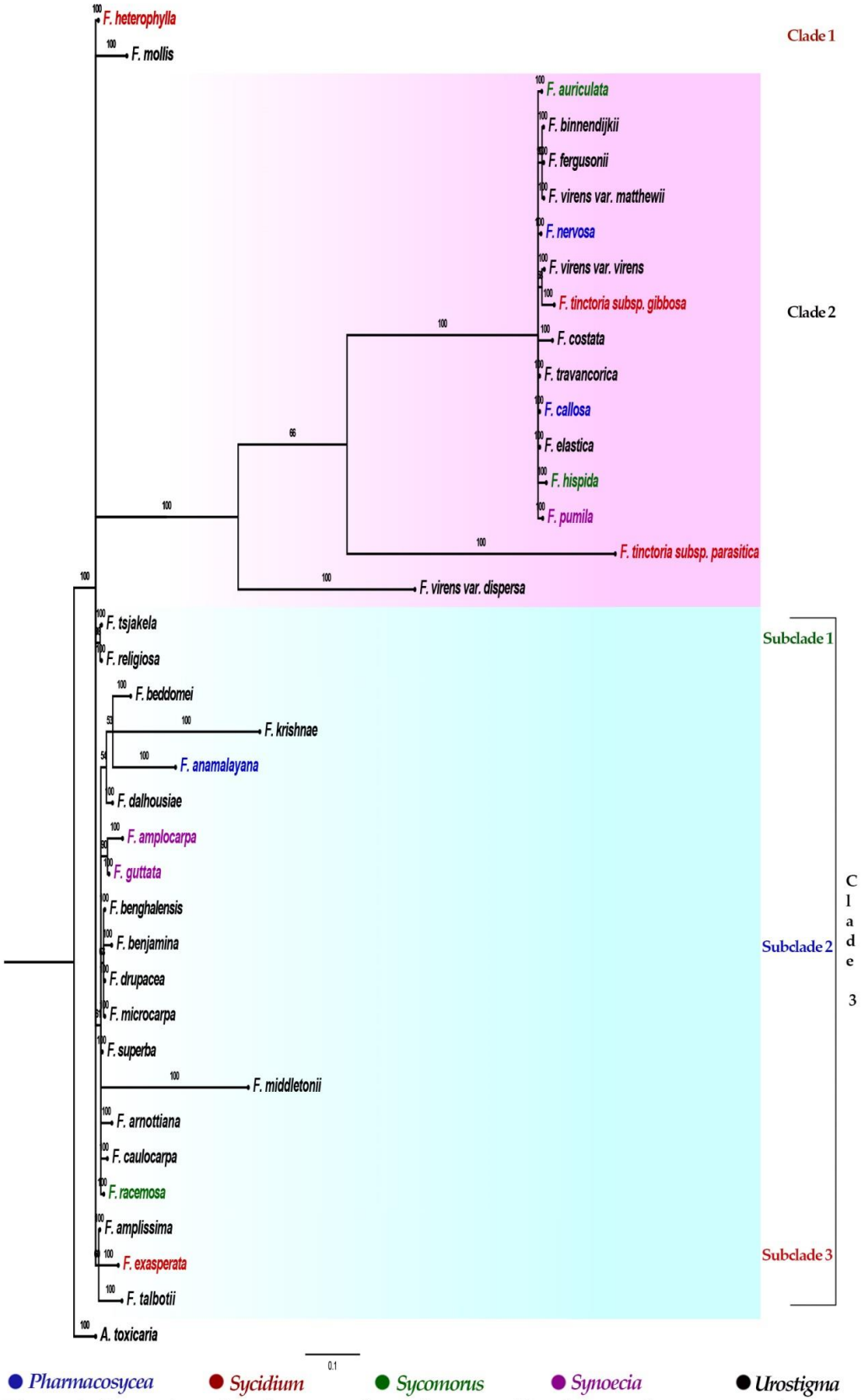


Fig. 5.8. Bayesian dendrogram based on *trnH-psbA* marker comparing the infrageneric classification.

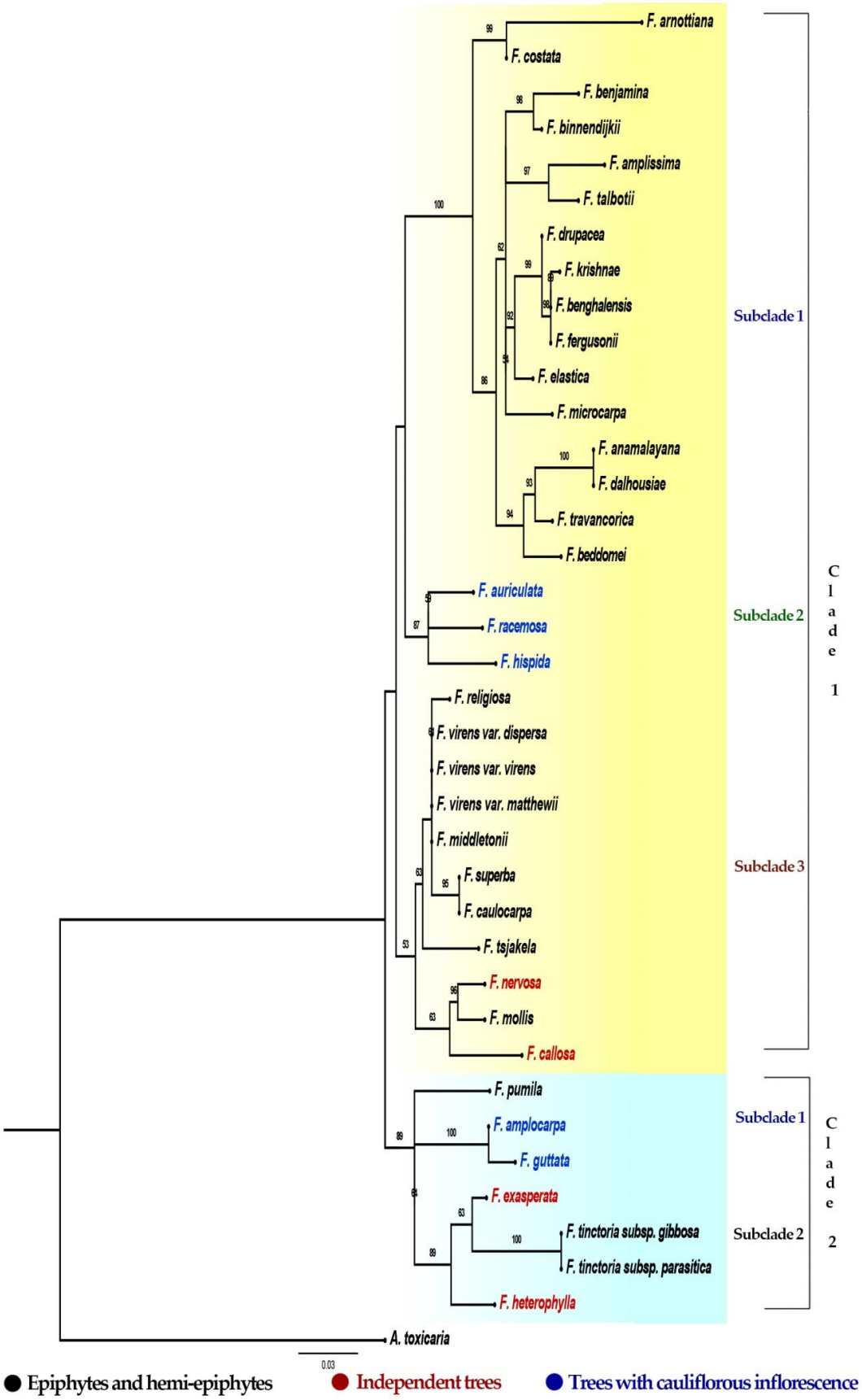


Fig. 5.9. ML dendrogram based on *ITS* marker comparing the natural classification.

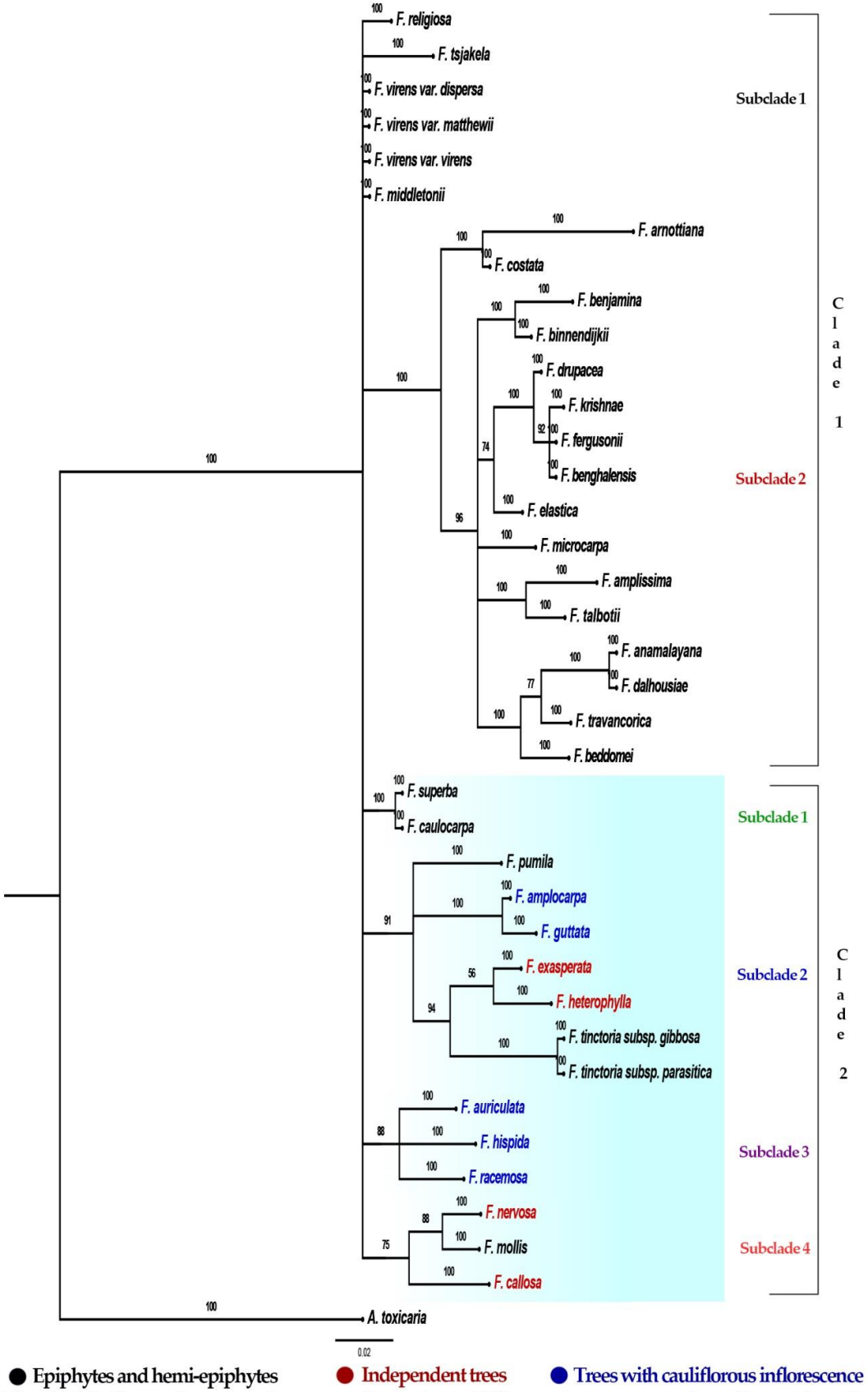


Fig. 5.10. Bayesian dendrogram based on *ITS* marker comparing the natural classification.

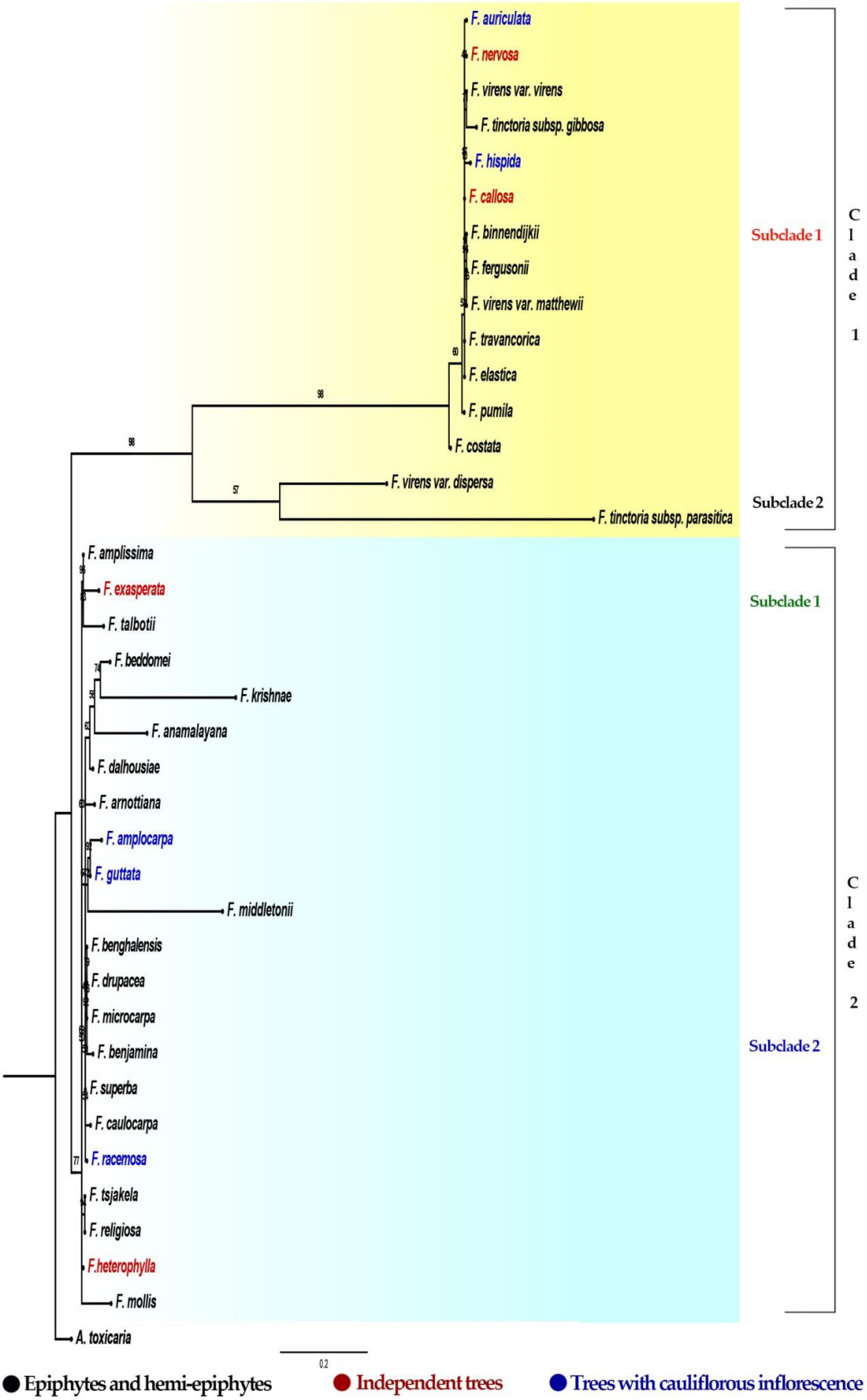


Fig. 5.11. ML dendrogram based on *trnH-psbA* marker comparing the natural classification.

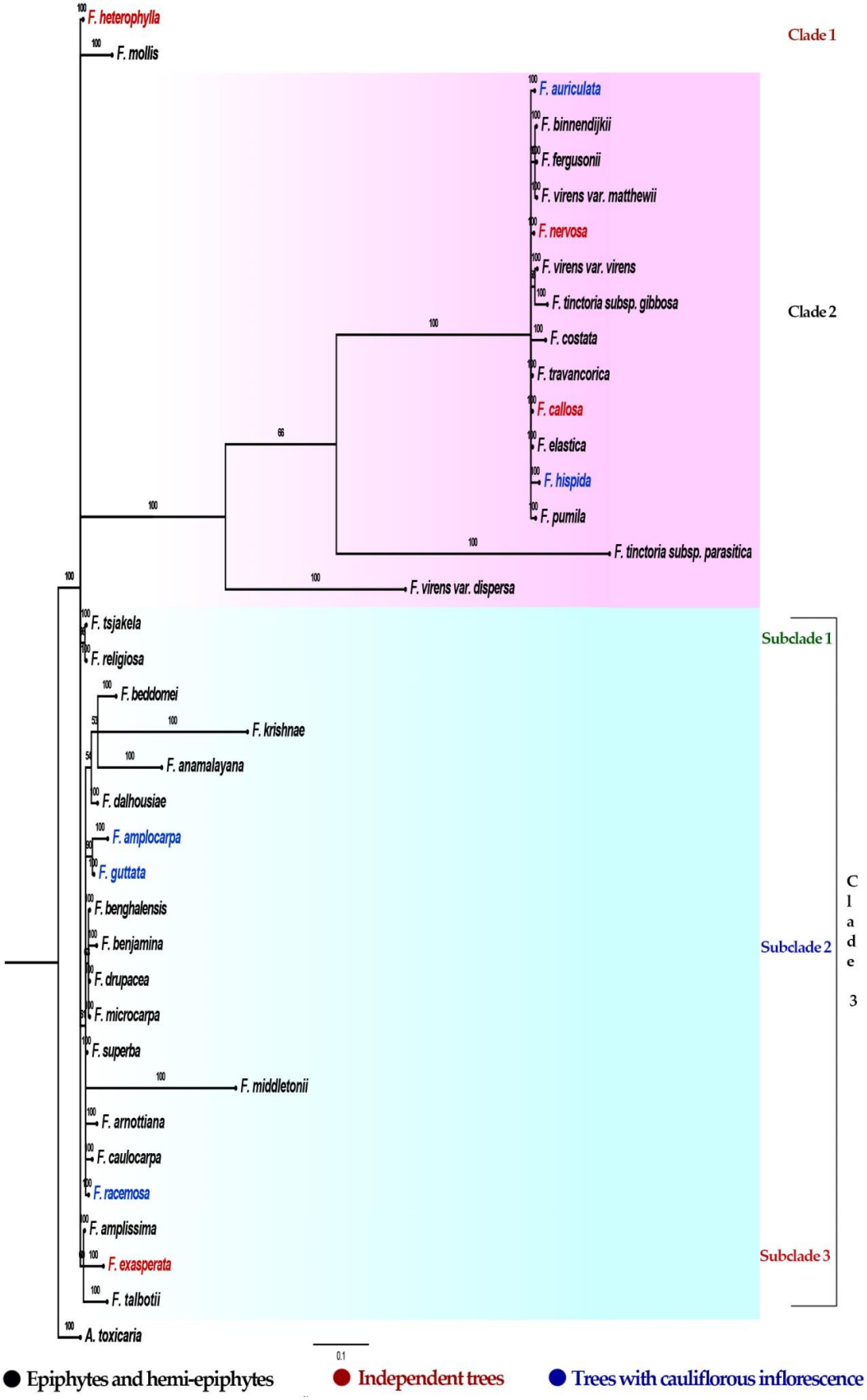
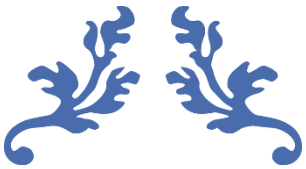


Fig. 5.12. Bayesian dendrogram based on *trnH-psbA* marker comparing the natural classification.



ECOLOGY

CHAPTER 6



Chapter 6

ECOLOGY

6.1. Introduction

Figs are a constant supply of food resources to many animals and birds in the forests and hence are regarded as a keystone species in the ecosystem (Gautier-hion & Michaloud, 1989; Lambert & Marshall, 1991; Azmil & Juliana, 2013; Shi *et al*., 2018; Mackay *et al*., 2018). *Ficus* is one of the plant genera that supports a large number of frugivores (Herre et al., 2008). The ubiquitousness and asynchronous fruiting pattern make the genus a common diet for frugivores (Walther *et al*., 2018). *Ficus* can be a potential keystone or umbrella species in many ecosystems as it supports a large number of frugivores as well as insectivores almost all year (Mackay *et al*., 2018).

Ficus shows the characteristics of a good pioneer species (Harrison, 2005; Hao *et al*., 2016). The small-sized seeds were considered the reason for the high success rate of figs, as they get easily dispersed and the challenging factor was the short life span of the pollinators (Corner, 1965b). The fruiting phenology of *Ficus* varied significantly. Individuals within a species showed differences in the fruiting period (Milton *et al*., 1982). The asynchronous fruiting pattern ensured the availability of pollinators throughout the year.

Ficus exhibits various life forms like shrubs, climbers, independent trees, hemi-epiphytes, stranglers, etc. The majority of the species in this genus are stranglers or hemi-epiphytes. Hemi-epiphyte is defined as any plant that begins life in another plant and whose roots are not yet rooted in

the ground. The epiphytes are considered as plants that are "different" from normal plants. And regarded more clearly as primary epiphytes, which start their life on another plant, send their roots to the ground and then establish themselves independently (Harrison, 2005). Ndolo Ebika *et al.* (2015) referred to stranglers as those plants that started life on another plant and later became independent, deriving water and nutrients on their own. The hemi epiphyte develops a pseudo trunk as the host enclosed by the strangler decays out, leaving the sheath alone.

The strangler figs use the host only for support in the initial stages of life but eventually kill the host. In the humus-rich cavities on the host plant, the fig germinates and spreads its roots underground. As soon as the root touches the ground, it starts to grow, getting nourishment from the ground. The strangler establishes its development by increasing the truck, expanding its canopy, and creating more roots. It eventually fully conceals the host tree, blocking the movement of food and water through its vessels. The host tree eventually dies because it is unable to compete with the strangler for water and nutrients from the ground (Athreya, 1997b).

Athreya (1997b) suggested that the germination of the fig saplings on the top of the host tree increases the chance of their establishment as it receives more sunlight than on the forest floor. The hollows where the fig germinates on the host tree are rich with humus and water, ensuring sufficient nutrients for the germinating saplings. The stranglers are only primary epiphytes that depend on the host tree only in the initial stages of growth. As soon as the root touches the ground, it obtains water and nutrients on its own and is hence not parasitic (Compton & Musgrave, 1993). The epiphytic figs established more successfully on the large host trees as

they provided more germination sites and also provided a better environment for the seed dispersers to spend time on the tree.

Ficus trees were found to be capable of producing more saplings below their canopy compared to non-*Ficus* trees (Cotte-Jones *et al*., 2016). The young saplings fail to establish themselves in the early stages when the humus-rich pockets in these trees desiccate and run out of water (Doyle, 2000). In most cases, these pockets rich in phosphorous seem to have a positive influence on seedling growth. Being stranglers, the development of the fig ultimately results in the death of the host plant. Thus, the fig has to meet its own nutritional requirements and also has to support the dead host plant. The aerial roots and the trunk are modified so that they can absorb nutrients and water from the environment and also hold the host plant.

It was observed that the host plants supporting figs had more chances to fall than those not supported by figs (Harrison, 2006). It is believed that either the figs will cause mechanical damage to the host trunk or the competition for nutrients and resources will damage the host trunk. The epiphytic growth form usually favours growth by providing more access to sunlight than from the forest floor, less competition, more availability of nutrients and reduced risks of damage from other biological hazards like forest fire (Holbrook & Putz, 1996). But produces a more stressful condition in which the rooting volume is much more limited.

Generally, the stranglers in *Ficus* are considered epiphytes that kill the host trees and have a negative impact on the vegetation. This ecological study on the genus *Ficus* aims to find out the ecological role of figs in forest dynamics. Determining the role of figs in forest dynamics could reveal whether the strangler figs are actually contributing to the success or degradation of the represented vegetation.

6.2 Methodology

6.2.1 Selection of species

Among the 34 *Ficus* species studied, nine species were chosen for the ecological analysis based on the criteria to incorporate species from all different kinds of habit and habitat groups.

1. Members from all the three natural groupings (*Atthi, Itthi* and *Aal*).
2. Included species whose distribution is restricted to forest areas only, commonly distributed species etc.

The species selected for ecological studies were:

1. *F. amplissima*
2. *F. beddomei*
3. *F. benghalensis*
4. *F. exasperata*
5. *F. hispida*
6. *F. microcarpa*
7. *F. nervosa*
8. *F. racemosa*
9. *F. tsjakela*

6.2.2 Phytosociological analysis

Circular plots measuring 10.5 m (0.034 ha) was established around the selected species of *Ficus* (James & Kannan, 2009; Bachan & Anitha, 2013). At least three plots each were taken for all the targeted species studied. Vegetation features was measured within these plots. GBH (Girth and Breast

Height) of all trees (>30 cm) including the targeted *Ficus* within this 10.5 m radius was measured using a measuring tape. The number of individuals of each species were noted. The trees were identified using regional floras and authentic literatures. These data were used for the phytosociological analysis.

Phytosociological parameters like Density, Frequency and Basal area were estimated using the following formula.

$$\text{Density (D)} = \frac{\text{Total number of individuals of the species studied}}{\text{Total number of quadrats studied}}$$

$$\text{Frequency (F)} = \frac{\text{Number of quadrats in which the species occurred}}{\text{Total number of quadrats studied}}$$

$$\text{Basal Area (BA)} = \text{GBH}^2 / (4 \times 3.14)$$

The relative values of these three parameters, Relative frequency, Relative density and Relative Basal area can provide comparative information of each species to the total number of species in the sample and they were calculated using the formula

Relative density (RD) = (Density of the species/ Total density) x 100

Relative frequency (RF) = (Frequency of the species/ Total frequency) x 100

Relative basal area (RBA) = (Basal area/ Total Basal area) x100

Sum of these three relative values gives Importance Value Index (IVI). IVI indicates the overall dominance of the species in terms of Frequency, Density and Dominance.

IVI= Relative density + Relative frequency + Relative basal area

6.3 RESULT

The phytosociological analysis was done for each of the selected species of *Ficus*. The Frequency (F), Density (D), Basal Area (BA), Relative Frequency (RF), Relative Density (RD), Relative Basal Area (RBA) and Importance Value Index (IVI) of the targeted species are presented as appendix. The IVI were enumerated separately for each species of *Ficus* targeted and it gives an indication of the dominant plant species within the complex. In most cases *Ficus* were found to be the dominant species.

Phytosociological analysis of *F. amplissima* habitat

A total of 16 plant species were observed from the three plots of *F. amplissima* and the total number of individuals were 30. Six individuals of *Xanthophyllum flavescens*, 5 individuals of *Vateria indica* and 3 individuals of *F. amplissima* were recorded. The total density was 10, *Xanthophyllum flavescens* recorded the highest density (2) followed by *Vateria indica* (1.67) and *F. amplissima* (1). *Vateria indica* and *F. amplissima* were present in all the plots and recorded the most frequency (1) followed by *Xanthophyllum flavescens* (0.67) (Fig. 6.1).

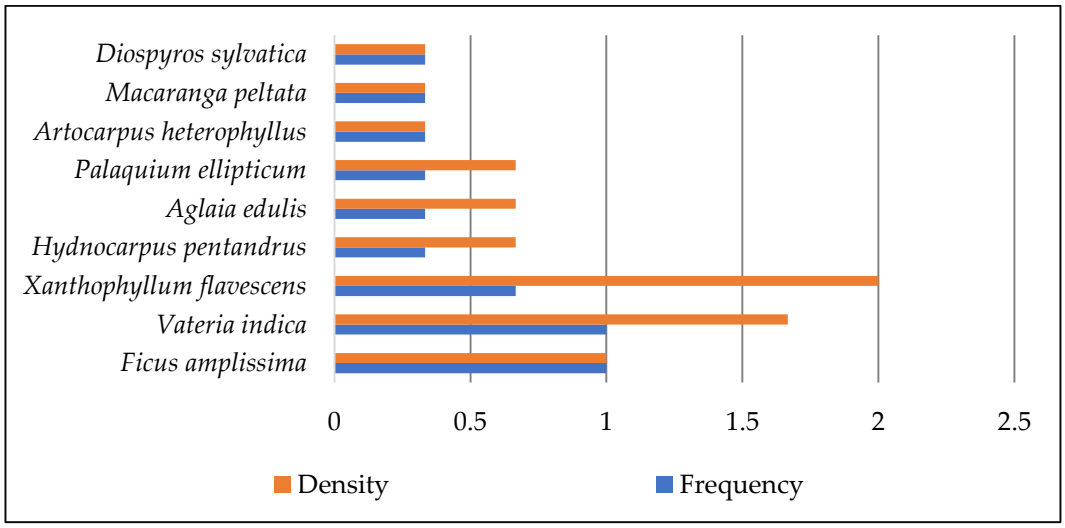


Fig. 6.1. Density and frequency of trees associated with *F. amplissima*.

The highest GBH was noted for *F. amplissima* (1881 cm) followed by *Vateria indica* (936 cm) and least for *Baccaurea courtallensis* (34 cm). The IVI analysis of these plots have shown *F. amplissima* (91.34) itself as the dominant plant species (Fig. 6.2). It was followed by *Vateria indica* (47.55), *Xanthophyllum flavescens* (30.82) etc. The IVI value of *F. amplissima* was almost twice as that of the second dominant species *Vateria indica* and covered almost 30 % of the total IVI of all the species in the plots. IVI was least for *Baccaurea courtallensis* (8.11).

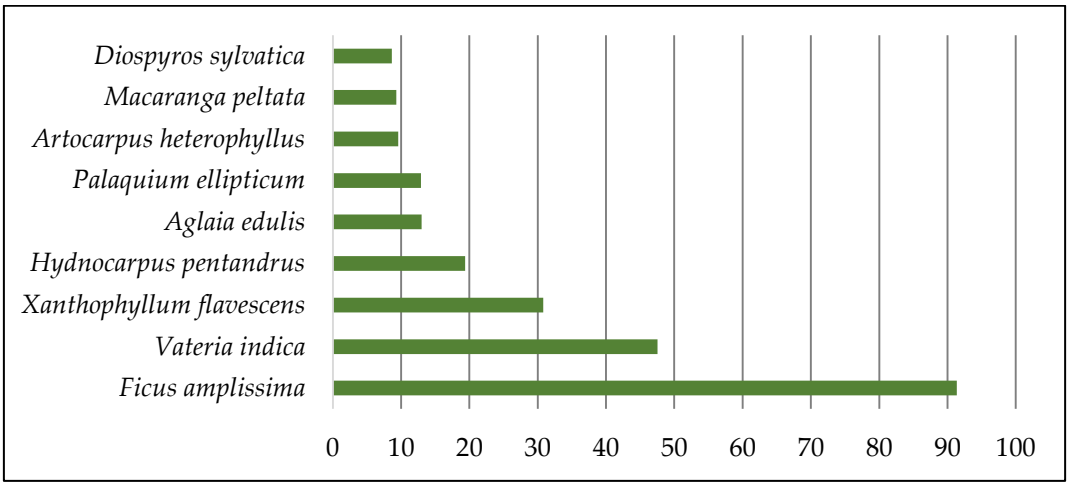


Fig 6. 2. IVI of trees in association with *F. amplissima*.

Phytosociological analysis of *F. beddomei* habitat

From the plots of *F. beddomei,* 25 individuals belonging to 15 species were recorded. *F. beddomei* had four individuals, *Aglaia edulis* had three individuals and most of the other species were represented with one individual each. The total density was calculated as 8.33. *F. beddomei* had the most density (1.33) followed by *Palaquium ellipticum* and *Aglaia edulis* with density 1. *Turpinia malabarica* was the most frequent species (0.67) apart from *F. beddomei,* followed by all other species with frequency 0.33 (Fig. 6.3).

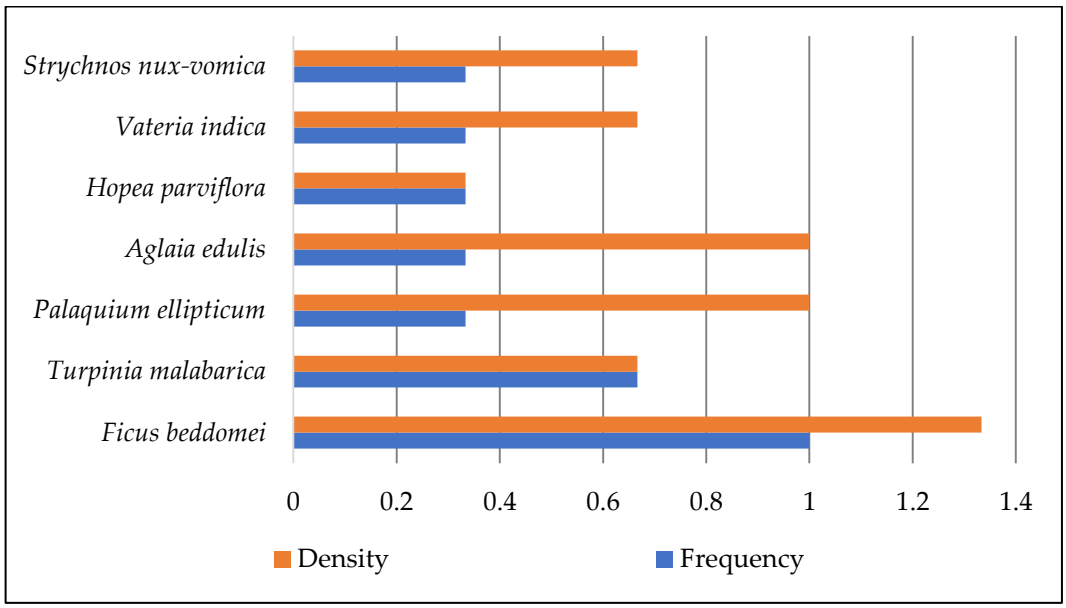


Fig. 6.3. Density and frequency of trees associated with *F. beddomei*.

The highest GBH was noted for *F. beddomei* (1444 cm) and least for *Antidesma pyrifolium* (30 cm). *F. beddomei* was observed with the greatest IVI (109.6) value followed by *Turpinia malabarici, Palaquium ellipticum* (Fig. 5. Xx). The least IVI was recorded for *Antidesma pyrifolium* (9.58). The IVI of *F. beddomei* was four times greater than *Turpinia malabaricia* and covered more than one third of the IVI value indicating its dominance.

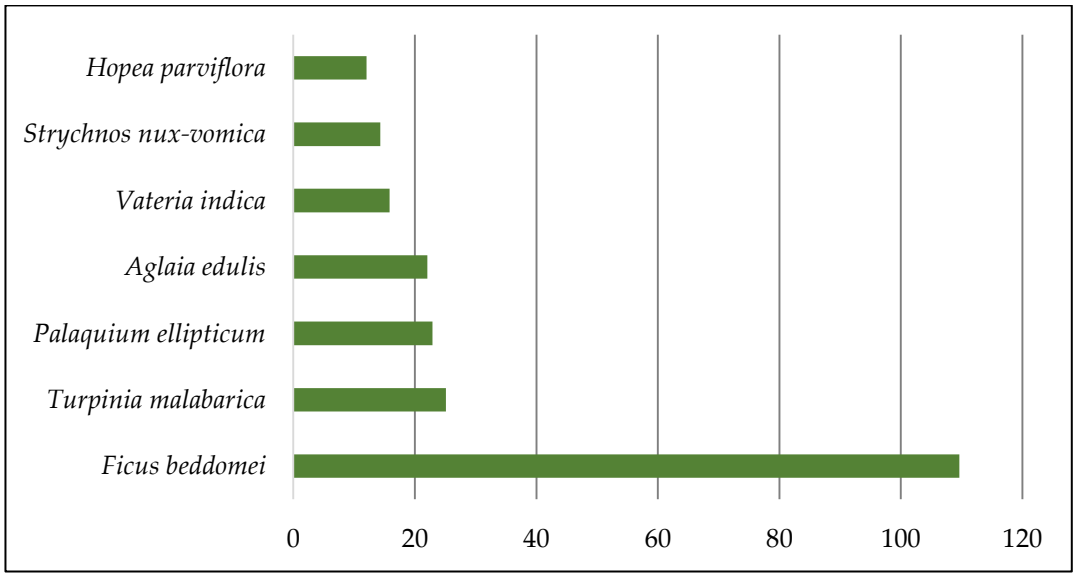


Fig. 6.4. IVI of trees in association with *F. beddomei*.

Phytosociological analysis of *F. benghalensis* habitat

Only seven species of trees were associated in the plots of *F. benghalensis*. The total individuals were 23 and 12 out of them were *F. benghalensis*. Total density of all the trees were 7.67 and *F. benghalensis* had largest density of four. The least density was 0.33 for *Azadirachta indica* and *Mallotus philippensis*. The calculated total density of all the trees were 3.33. *Diospyros ovalifolia* (0.67) was the most frequent apart from *F. benghalensis* and all other species had the same frequency value 0.33 (Fig. 6.5).

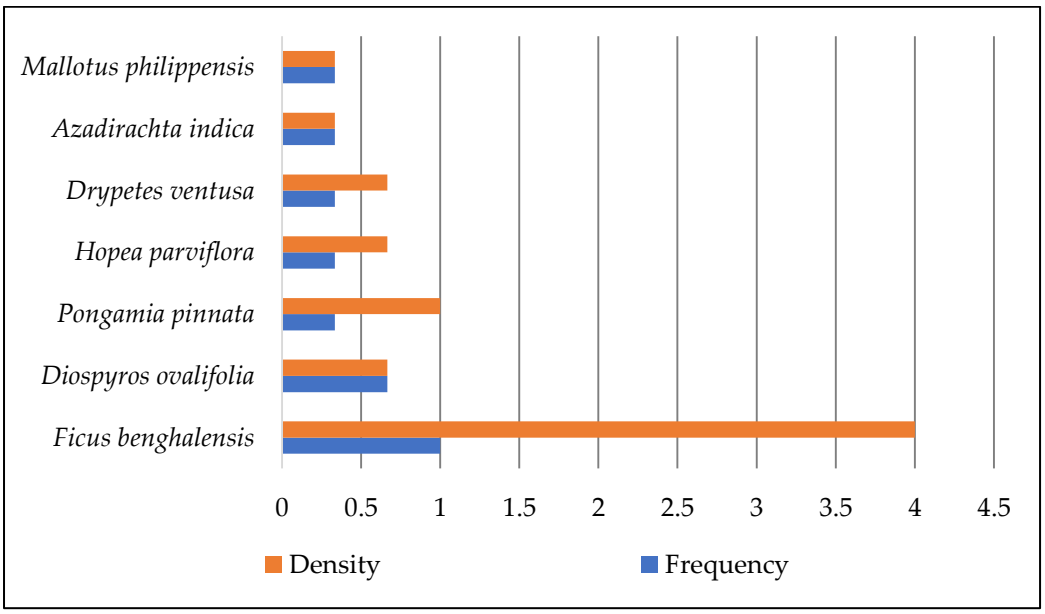


Fig. 6.5. Density and frequency of trees associated with *F. benghalensis*.

Highest GBH was recorded for *F. benghalensis* (1837 cm) and secondly for *Pongamia pinnata* (158 m). *Mallotus philippensis* had the least GBH (48 cm). The most dominant tree was *F. benghalensis* as it exhibited the greatest IVI (179.84). The other dominant species were *Diospyros ovalifolia* (29) and *Pongamia pinnata* (23.76). the least IVI was observed for *Mallotus philippensis* (14.41). Around 60 % of the total IVI was covered by *F. benghalensis* alone (Fig. 6.6).

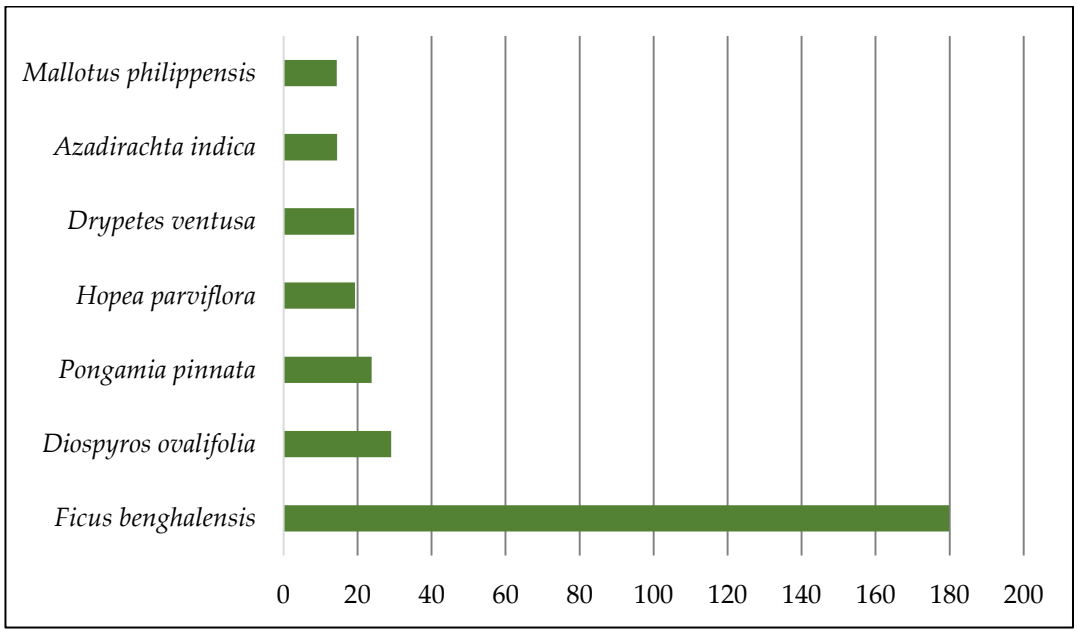


Fig. 6.6. IVI of trees in association with *F. benghalensis*.

Phytosociological analysis of *F. exasperata* habitat

The plot analysis recorded 13 species of trees from the plots of *F. exasperata* and it counted for 32 individuals in total. *Xanthophyllum flavescens* had the greatest number of individuals (6). It was preceded by *Palaquium ellipticum* with five individuals, *Ficus exasperata* and *Mallotus tetracoccus* with four individuals each. The total density of the plants was 10.67. *Xanthophyllum flavescens* contributed the most diversity (2). *Palaquium ellipticum* had a diversity value of 1.67, *Ficus exasperata* and *Mallotus tetracoccus* had density 1.34. The frequency of all the species were calculated as 6. *Xanthophyllum flavescens* and *F. exasperata* had the most frequency (1). Majority of the species had the same frequency value 0.33 (Fig. 6.7).

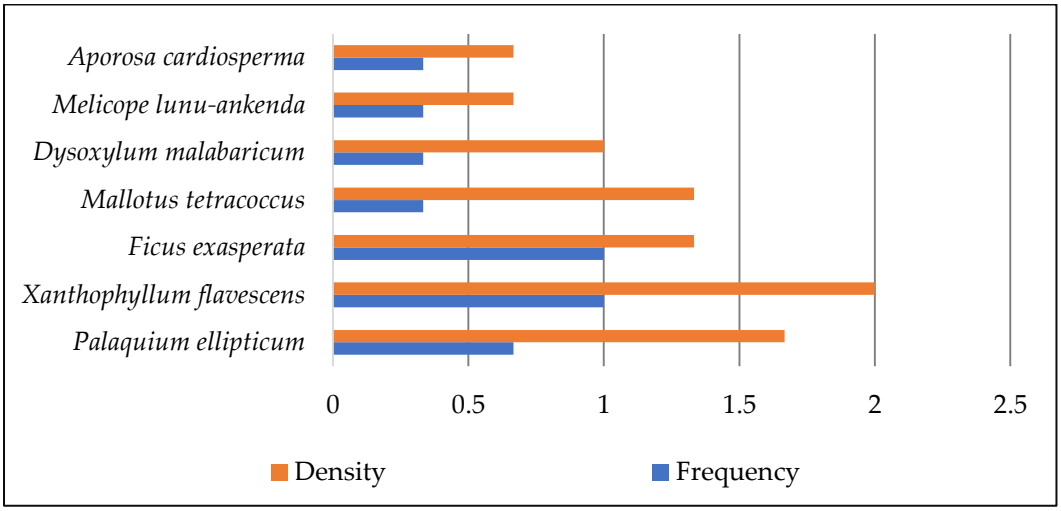


Fig. 6.7. Density and frequency of trees associated with *F. exasperata*.

Palaquium ellipticum had the largest GBH (672 cm), *F. exasperata* had the third largest GBH with 216 cm and *Tetrapilus dioicus* with the least GBH of 58 cm. The most dominant species was *Palaquium ellipticum* with an IVI value of 81.45 and *F. exasperata* had an IVI value of 34.81 and was recorded as the third dominant species in the analysis (Fig. 5. xx). *F. exasperata* occupied only 11 % of the total IVI.

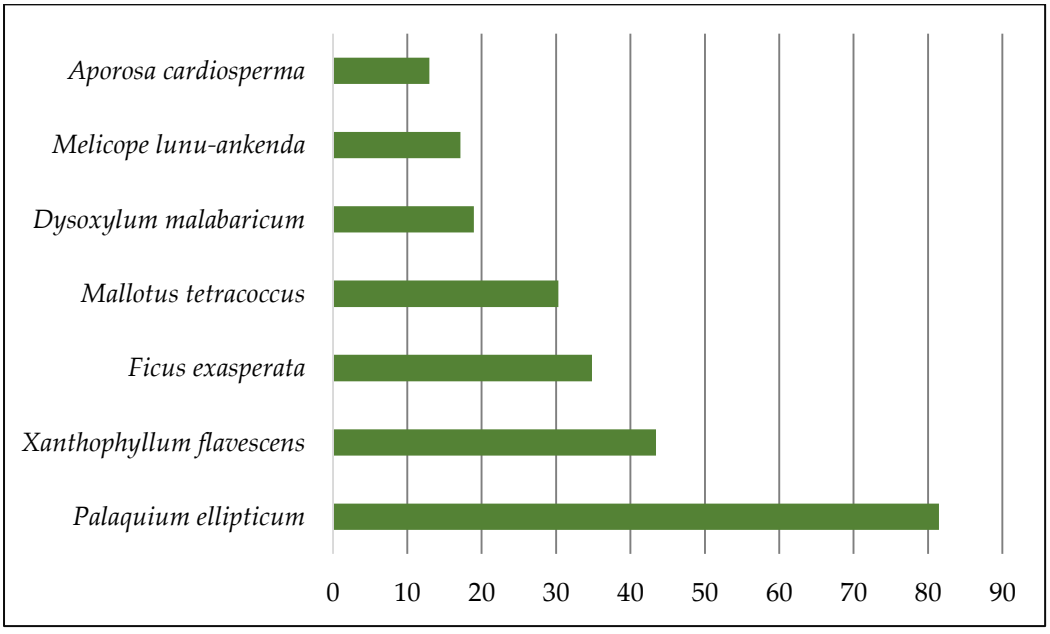


Fig. 6.8. IVI of trees in association with *F. exasperata*.

Phytosociological analysis of *F. hispida* habitat

The plot analysis noted 13 species to be associated with *F. hispida.* The total number of individuals in the plots were 47. *F. hispida* was the most frequent member with 13 individuals from three plots. *Gliricidia sepium* had nine individuals in total. The total frequency of the trees was six. *F. hispida* was the most frequent species with a frequency value of 1. The calculated total density of all the species was 15.67. Highest density was observed for *F. hispida* with a value of 4.33, it was followed by *Gliricidia sepium* having density 3. The least density of 0.33 was observed for 5 species *viz., Hydnocarpus pentandrus, Artocarpus hirsutus, Holigarna arnottiana, Caryota urens* and *Debregeasia longifolia* (Fig. 6.9).

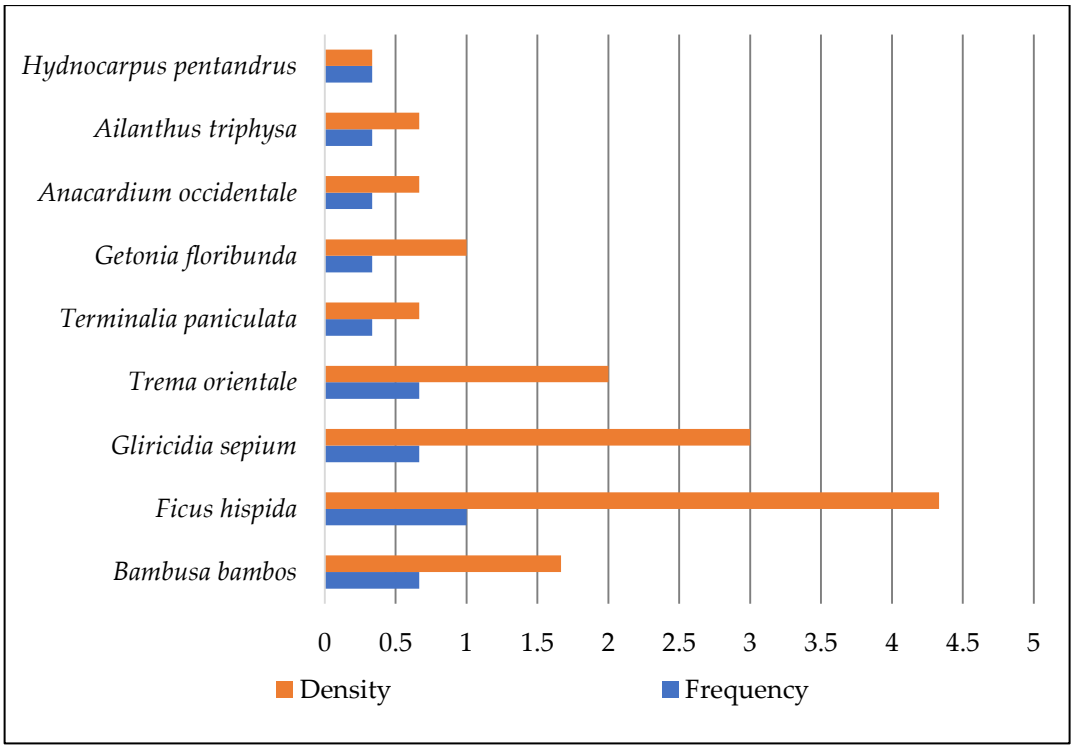


Fig. 6.9. Density and frequency of trees associated with *F. hispida*.

Most GBH was noted for *Bambusa bambos* (530 cm) followed by *F. hispida* (297 cm). The least IVI was noted for *Debregeasia longifolia* (34 cm).

The most dominant species was *Bambusa bambos* with an IVI of 77.87. *F. hispida* had an IVI value of 61.95. Only 17 % of the total IVI was occupied by *F. hispida.* The other dominant species were *Gliricidia sepium, Trema orientale, Terminalia paniculata* etc. (Fig. 6.10).

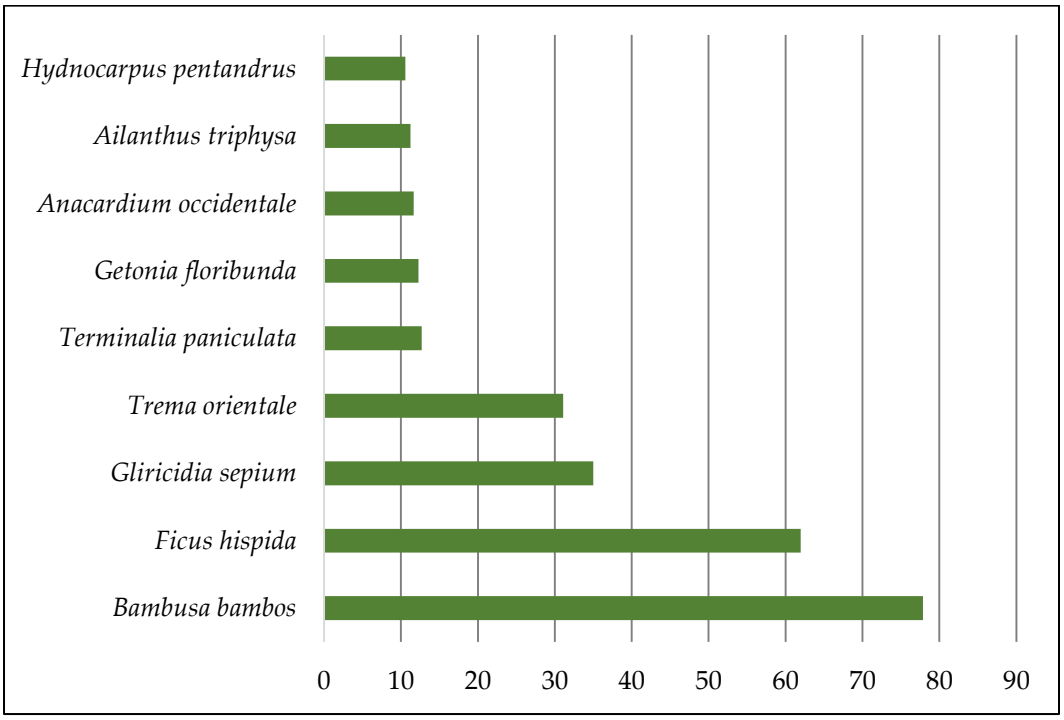


Fig. 6.10. IVI of trees in association with *F. hispida*.

Phytosociological analysis of *F. microcarpa* habitat

30 individuals of trees were noted from the plots of *F. microcarpa* and among them 8 were the species of *F. microcarpa.* All the other trees were represented by one or two individuals only. The total frequency of all the trees added up to 6.66. *F. microcarpa* was the most frequent tree species with a frequency of 1 followed by *Machilus glaucescens* (0.66). All the other species had a frequency value of 0.33 only. The total density of the trees was 10. The most density was noted for *F. microcarpa* (2.66). Second most dense member had a density value of 1 and it was represented by *Aglaia edulis* (Fig. 6.11).

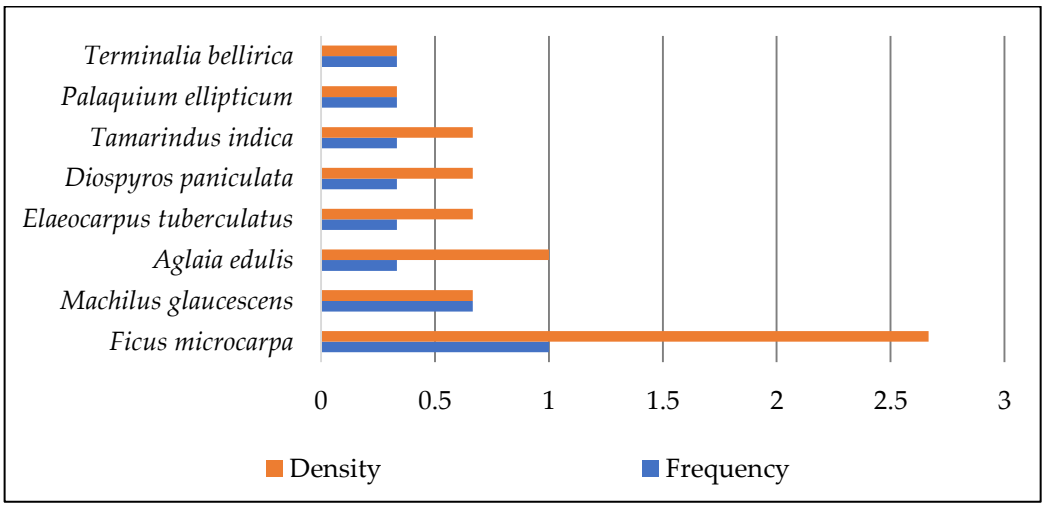


Fig. 6.11. Density and frequency of trees associated with *F. microcarpa*.

2125 cm was the GBH recorded for *F. microcarpa* followed by *Palaquium ellipticum* and *Elaeocarpus tuberculatus* with 495 cm and 370 cm respectively. The smallest GBH was observed for *Glycosmis mauritiana* with 31 cm. The most dominant tree was *F. microcarpa.* The IVI calculated for the species was 123.94. It accounted for 41 % of the total IVI. The second dominant tree was *Machilus glaucescens* (17.25) and it occupied only 5 % of IVI (Fig. 6.12). *Glycosmis mauritiana* had the least IVI (8.35). This clearly indicates the overall dominance of *Ficus microcarpa* in the plots studied.

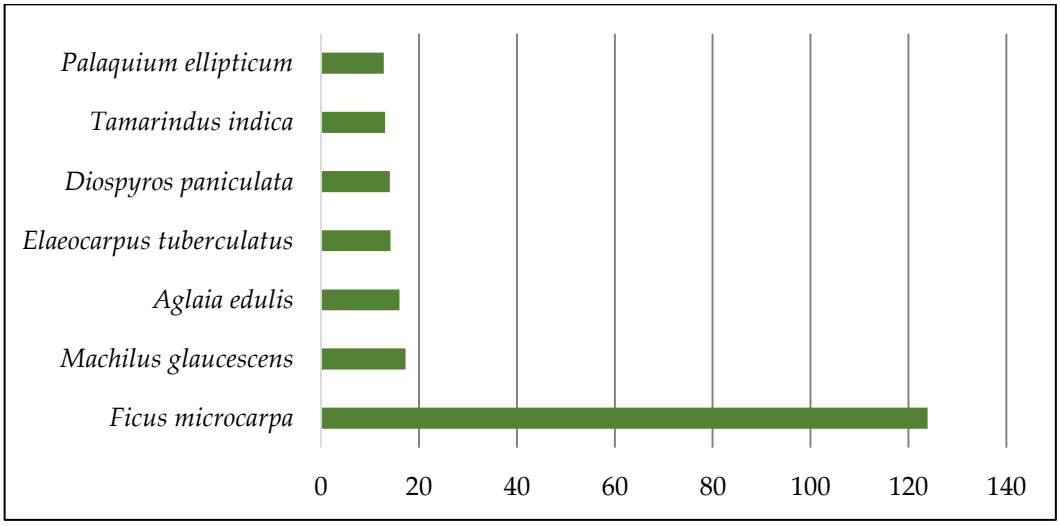


Fig. 6.12. IVI of trees in association with *F. microcarpa*.

Phytosociological analysis of *F. nervosa* habitat

31 individuals were studied in total, including 3 individuals of *F. nervosa.* Six individuals of *Schleichera oleosa* and four individuals of *Diospyros paniculata* were the trees with the greatest number of individuals.

F. nervosa and *Diospyros paniculata* were the most frequent species with frequency value of 1. The total density of the species was calculated as 10.33. *Schleichera oleosa* had the highest density of 2, followed by *Diospyros paniculata* (1.33) and *F. nervosa* (1). With density of 0.33, *Actinodaphne wightiana* was the least dense species (Fig. 6.13).

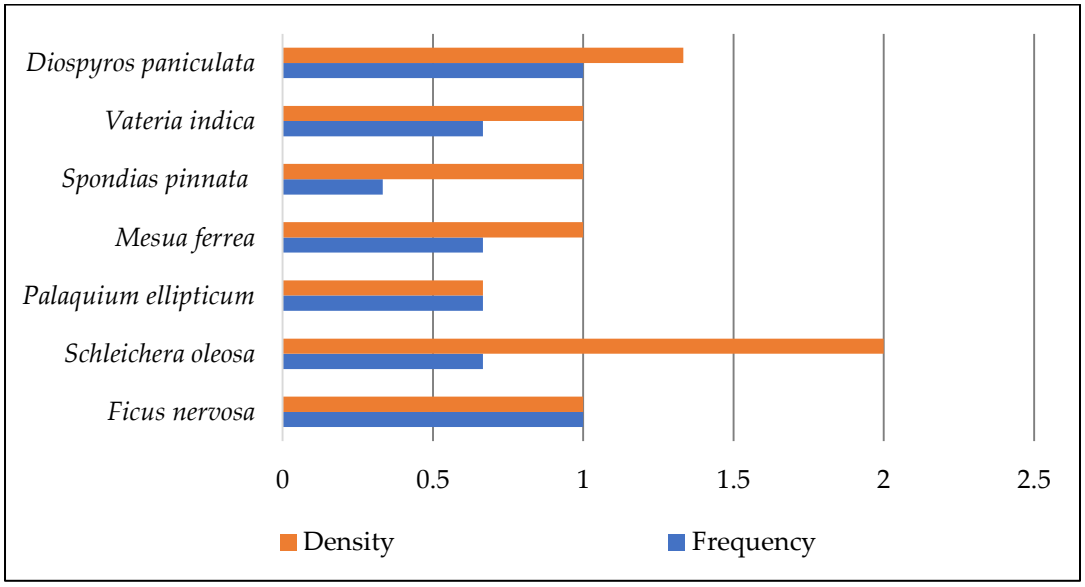


Fig. 6.13. Density and frequency of trees associated with *F. nervosa*.

Highest GBH was recorded for *F. nervosa* (905 cm). *Actinodaphne wightiana* had the lowest GBH of 39 cm. *F. nervosa* was identified as the most dominant species in the three targeted plots studied for *F. nervosa* with an IVI value of 74 (Fig. 6.14). The other dominant tree species were *Schleichera oleosa*, *Diospyros paniculate*, *Palaquium ellipticum*, *Mesua ferrea* etc. Around 25 % of the total IVI was covered by *F. nervosa.*

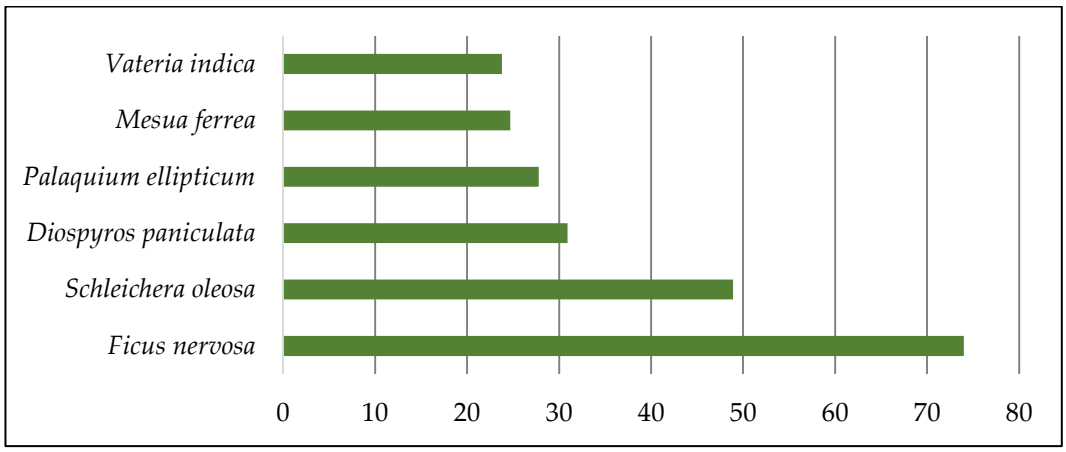


Fig. 6.14. IVI of trees in association with *F. nervosa*.

Phytosociological analysis of *F. racemosa* habitat

14 tree species were noted in the plots studied for *F. racemosa.* 64 individuals were noted from the plots. *Maesa indica* had 30 individuals, *Mallotus philippensis* had 9 individuals and *F. racemosa* had only 3 individuals. Highest frequency was noted for *F. racemosa* (1). The diversity of the plots was calculated as 21.33. *Maesa indica* had the highest diversity value (10), followed by *Mallotus philippensis* (3). The diversity of *F. racemosa* and *Pongamia pinnata* was 1 (Fig. 6.15).

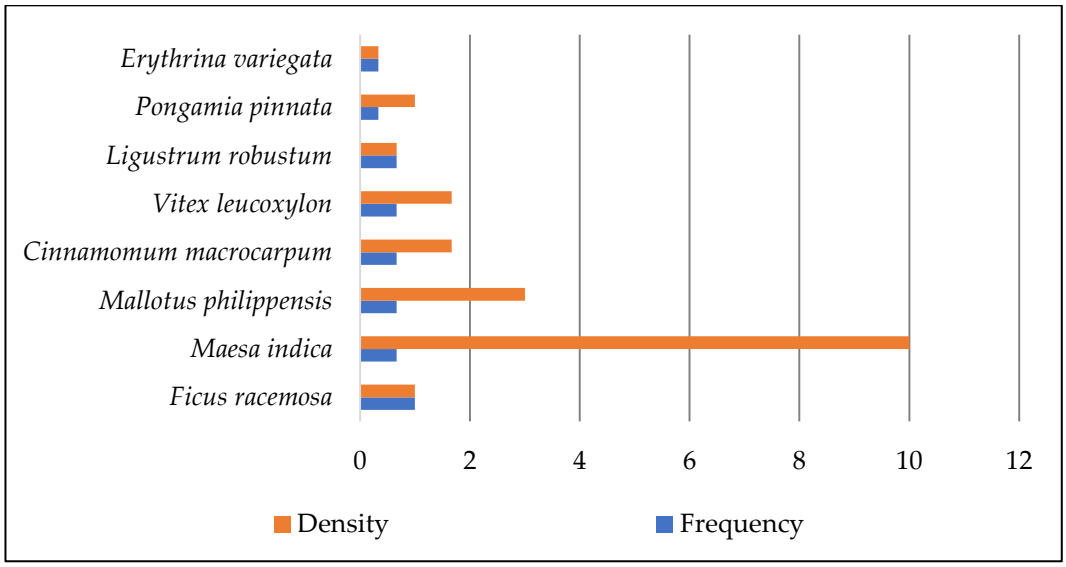


Fig. 6.15. Density and frequency of trees associated with *F. racemosa*.

F. racemosa was recorded as the species with the greatest GBH (1477). *Cinnamomum macrocarpum* had the second largest GBH of 562 cm. The least IVI was noted for *Hiptage benghalensis* (42 cm). The dominant species in the group was *F. racemosa* with an IVI value of 94.39, followed by species like *Maesa indica, Mallotus philippensis, Cinnamomum macrocarpum* and *Vitex leucoxylon* (Fig. 6.16). *Hiptage benghalensis* had the least IVI (6.38). More than 30 % of the total IVI was covered by *F. racemosa.*

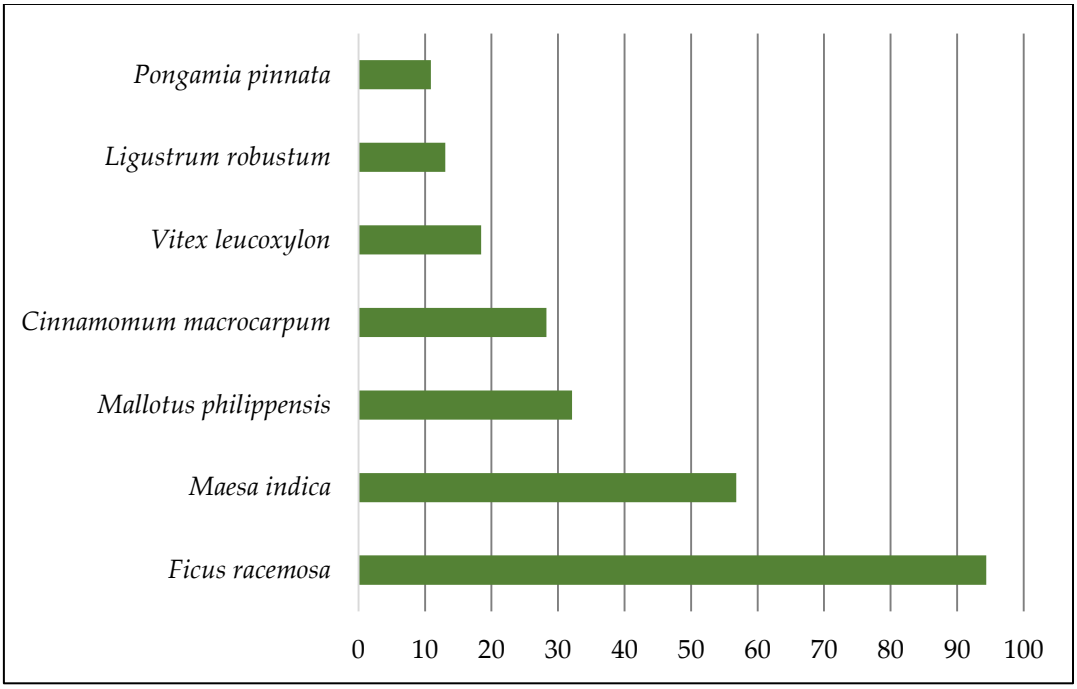


Fig. 6.16. IVI of trees in association with *F. racemosa*.

Phytosociological analysis of *F. tsjakela* habitat

The IVI analysis of trees in the plots targeted for *F. tsjakela* noted 15 species and 56 individuals in total. *Bambusa bambos* had 28 individuals in total. The highest frequency was seen for *F. tsjakela* (1), followed by *Bambusa bambos* (0.66). The total density of the species was 18.66. *Bambusa bambos* had the highest diversity value of 9.33, followed by *Ochlandra scriptoria* (4). *F. tsjakela* was observed with low density of 0.33 (Fig. 6.17)

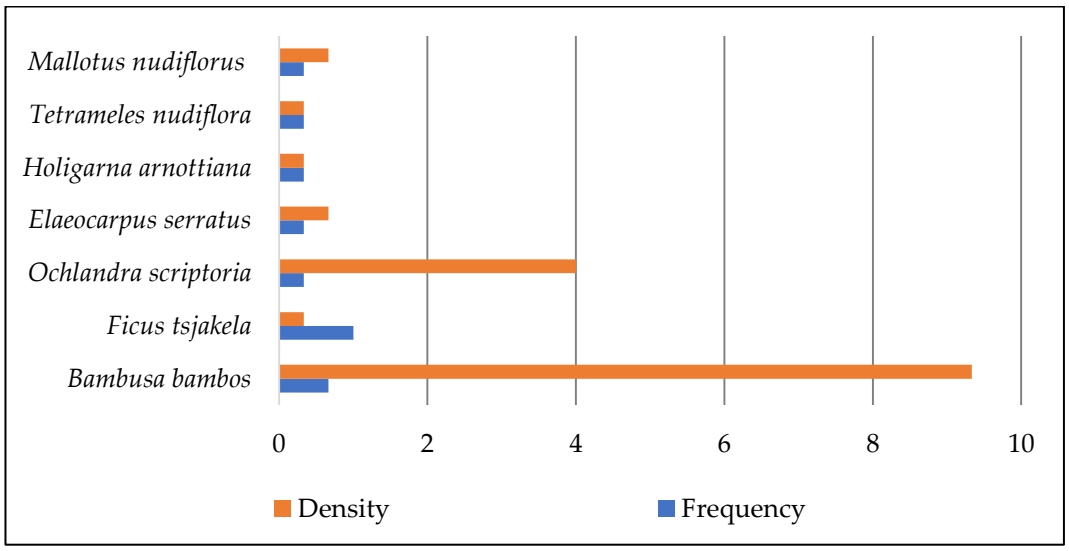


Fig. 6.17. Density and frequency of trees associated with *F. tsjakela*.

Bambusa bambos had the most GBH with 597 cm, followed by *F. tsjakela* with 586 cm. The least GBH was noted for *Vitex leucoxylon*. *Bambusa bambos* was the most dominant species with IVI of 94.29. *F. tsjakela* was the second dominant species (50.77) and accounted for 16 % of the total IVI (Fig. 6.18). The other dominant species were *Ochlandra scriptoria, Elaeocarpus serratus, Holigarna arnottiana, Tetrameles nudiflora* etc.

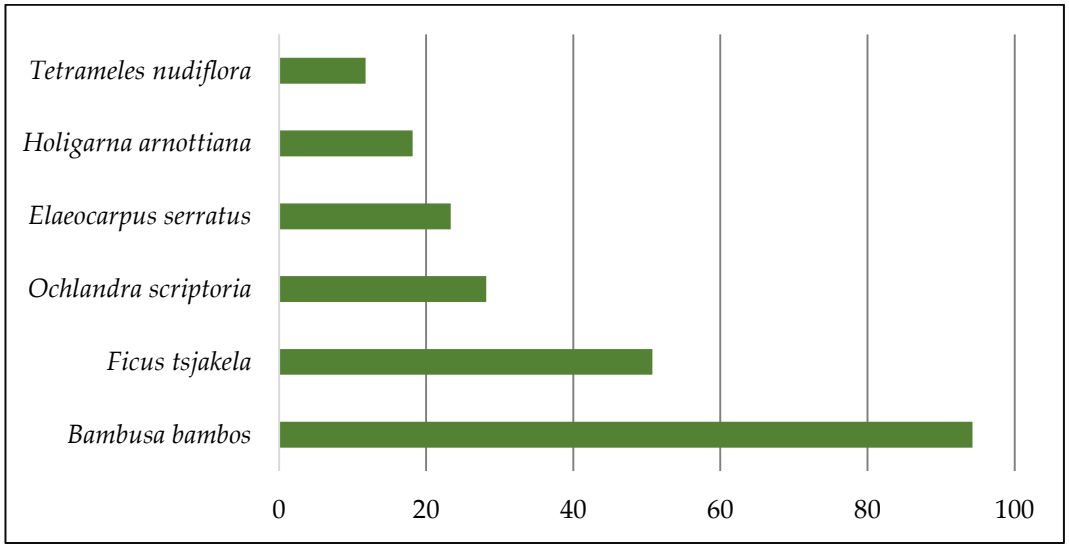


Fig. 6.18. IVI of trees in association with *F. tsjakela*.

6.4 Discussion

The species associated with *F. amplissima* were *Vateria indica* L., *Xanthophyllum flavescens* Roxb, *Hydnocarpus pentandrus* (Bauch.-Ham) Oken, *Aglaia edulis* (Roxb.) Wall., *Palaquium ellipticum* (Dalzell) Baill. etc. *F. amplissima* represented a species within the low elevation evergreen forests and was found as a dominating species within the vegetation. *F. amplissima* alone occupied 67 % of the overall dominance in the plots studied and covered 30.4 % of the total IVI (Fig. 6.19).

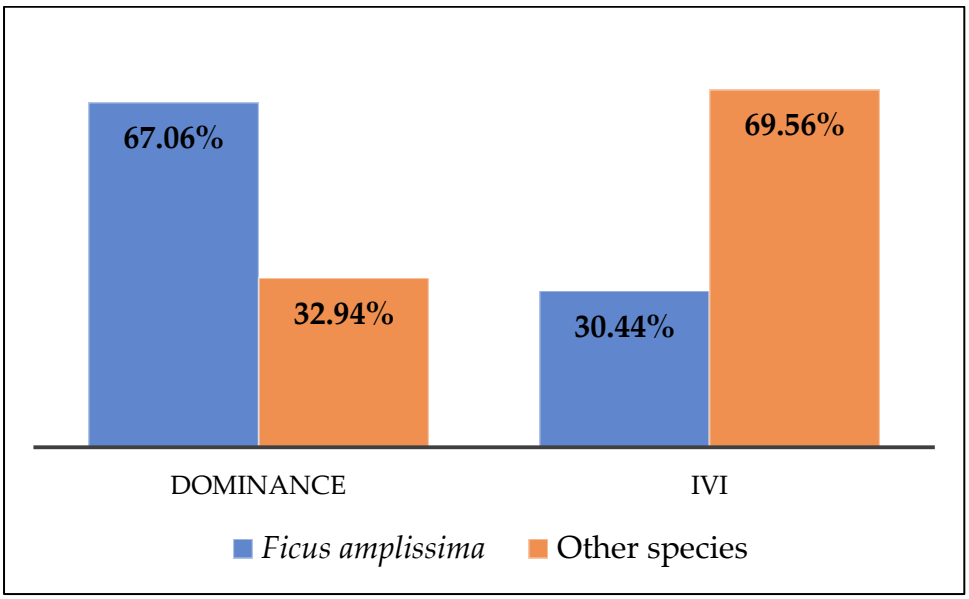


Fig. 6. 19. Overall dominance and IVI of *F. amplissima*.

Turpinia malabarica Gamble, *Palaquium ellipticum* (Dalzell) Baill., *Aglaia edulis* (Roxb.) Wall., *Vateria indica* L., *Strychnos nux-vomica* L. etc. were the species associated with *F. beddomei*. The overall dominance of *F. beddomei* in the plots studied were 76.94 % and occupied 30.44 % of the total IVI (Fig. 6.20). Thus, *F. beddomei* formed a dominating species in the medium elevation evergreen forests.

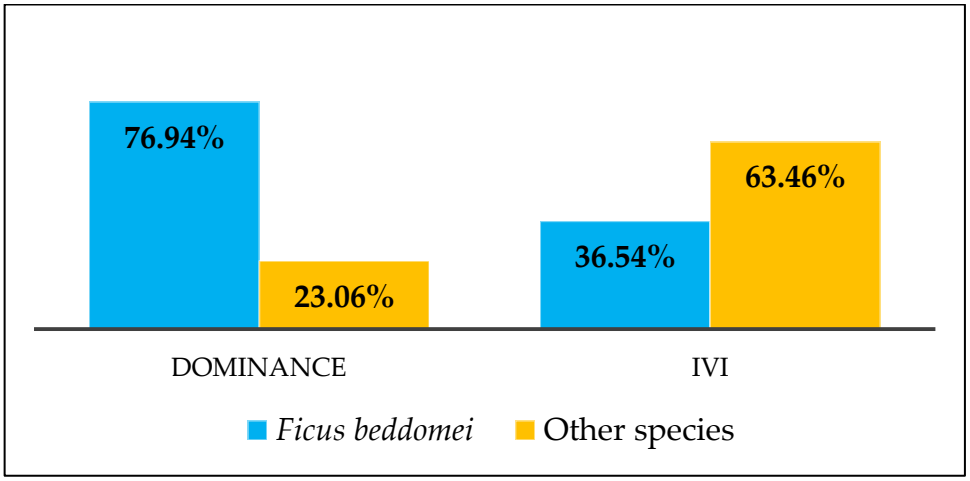


Fig. 6. 20. Overall dominance and IVI of *F. beddomei*.

The associated species of *F. benghalensis* were *Diospyros ovalifolia* Wight, *Pongamia pinnata* (L.) Pierre, *Hopea parviflora* Bedd., *Drypetes ventusa* (Wight) Pax & K. Hoffm, *Azadirachta indica* A. Juss. and *Mallotus philippensis* (Lam.) Muell. *F. benghalensis* was found as a dominating species in the moist and dry forests. *F. benghalensis* alone had 97.67 % dominance in the plots studied and covered 59.94 % of the total IVI (Fig. 6.21) indicating its complete dominance in the vegetation.

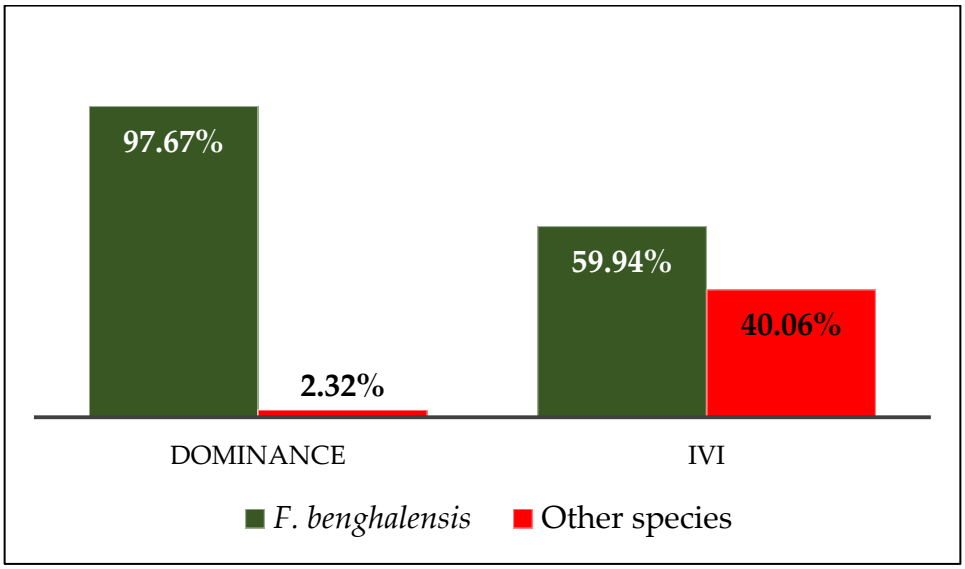


Fig. 6. 21. Overall dominance and IVI of *F. benghalensis*.

F. exasperata was associated with species like *Palaquium ellipticum* (Dalzell) Baill., *Mallotus tetracoccus* (Roxb.) Kurz, *Xanthophyllum flavescens* Roxb, *Melicope lunu-ankenda* (Gaertn.) T. G. Hartley, *Dysoxylum malabaricum* Bedd. ex C. DC., *Baccaurea courtallensis* (Wight) Müll. Arg. etc. *F. exasperata* was not found as the dominating species but, was only a normal component in the medium elevation evergreen forests indicated by the lower value for IVI. The overall dominance of *F. exasperata* was only 5.65 % compared to the other species and had only 11.60 % of the total IVI (Fig. 6.22).

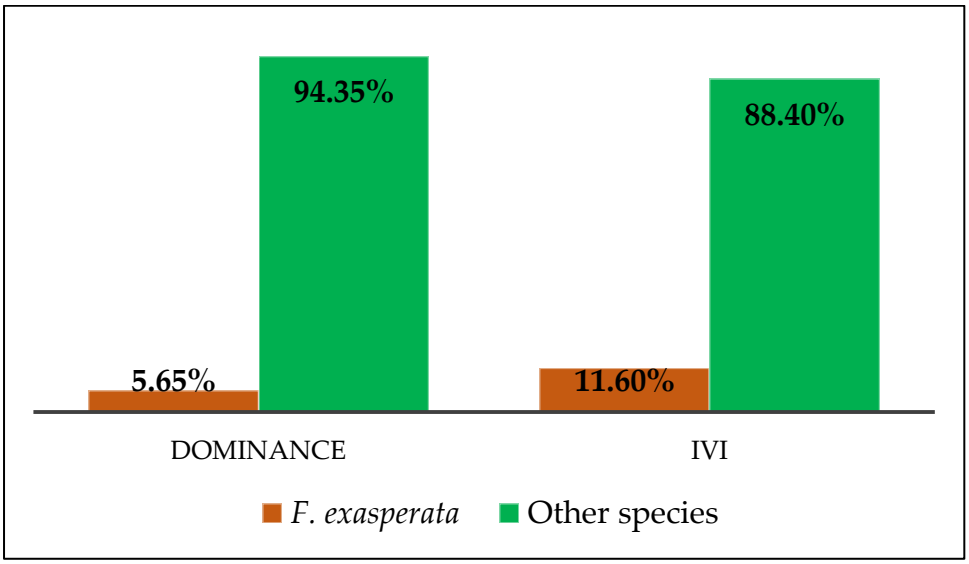


Fig. 6.22. Overall dominance and IVI of *F. exasperata*.

Bambusa bambos (L.) Voss, *Gliricidia sepium* (Jacq.) Kunth, *Trema orientale* (L.) Blume, *Terminalia paniculata* B.Heyne ex Roth, *Getonia floribunda* Roxb. etc. were the associated species of *F. hispida.* The dominance of *F. hispida* was only 17.62 % in the plots and occupied 20.65 % of the total IVI (Fig. 6.23). *F. hispida* was not dominant and was found as a common component in the degraded low - medium elevation moist forests and also in the moist deciduous forests.

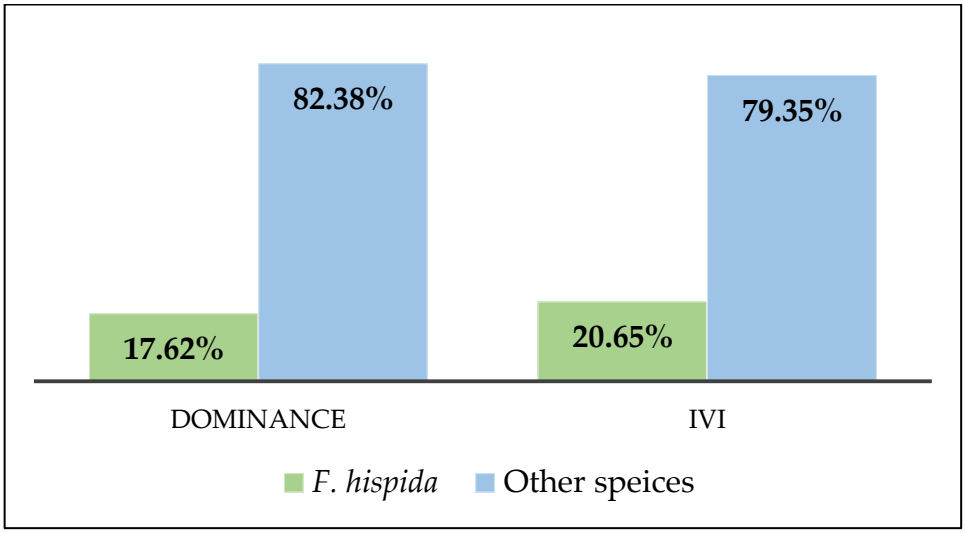


Fig. 6.23. Overall dominance and IVI of *F. hispida*.

F. microcarpa was associated with other species like *Aglaia edulis* (Roxb.) Wall., *Diospyros ovalifolia* Wight, *Diospyros paniculata* Dalzell, *Drypetes venusta* (Wight) Pax & K.Hoffm., *Elaeocarpus tuberculatus* Roxb. etc. *F. microcarpa* represented a dominant species in the low elevation degraded and riparian stretches of dry deciduous forests. *F. microcarpa* exhibited 82.75 % of overall dominance over other species in the plots and covered 41.31 % of the total IVI (Fig. 6.24.).

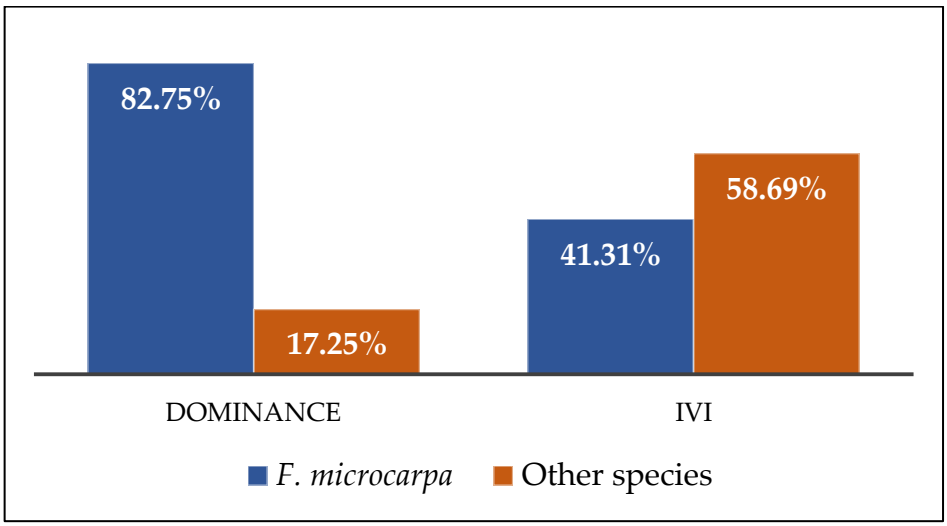


Fig. 6.24. Overall dominance and IVI of *F. microcarpa*.

The species associated with *F. nervosa* were *Actinodaphne wightiana* (Kuntze) Noltie, *Aporosa cardiosperma* (Gaertn.) Merr., *Diospyros paniculata* Dalzell, *Elaeocarpus tuberculatus* Roxb., *Mesua ferrea* L. etc. The overall dominance of *F. nervosa* was 49.31 % and covered 24.66 % of the total IVI (Fig. 6.25). *F. nervosa* was found as a true species in the evergreen and semi evergreen forests.

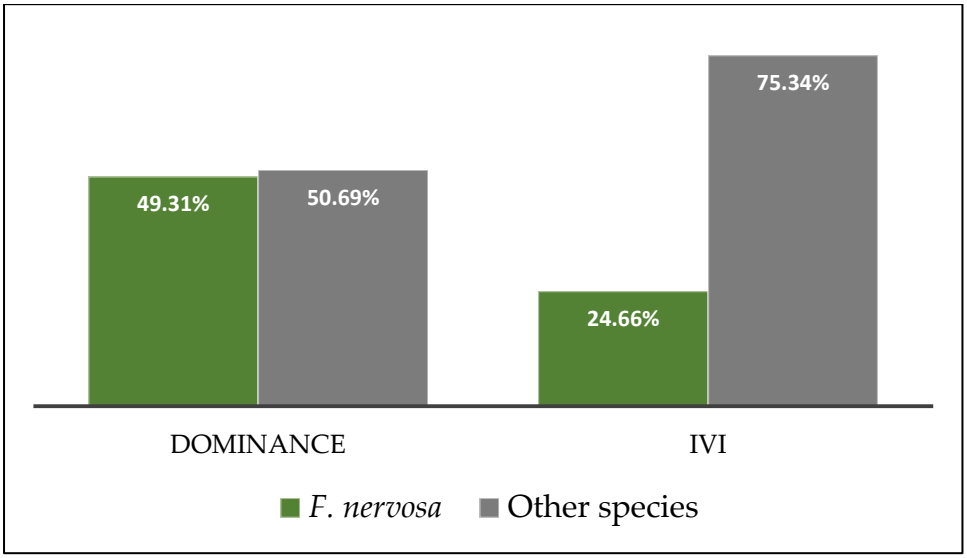


Fig. 6.25. Overall dominance and IVI of *F. nervosa*.

F. racemosa showed association with the species like *Maesa indica* (Roxb.) Sweet, *Mallotus philippensis* (Lam.) Müll. Arg., *Cinnamomum macrocarpum* Hook. f., *Vitex leucoxylon* L. f., *Ligustrum robustum* (Roxb.) Blume, *Pongamia pinnata* (L.) Pierre. The dominance of *F. racemosa* was 75.42 % compared to the other species in the plots studied and covered 31.46 % of the total IVI (Fig. 6.26). *F. racemosa* was a common member in the riparian stretches.

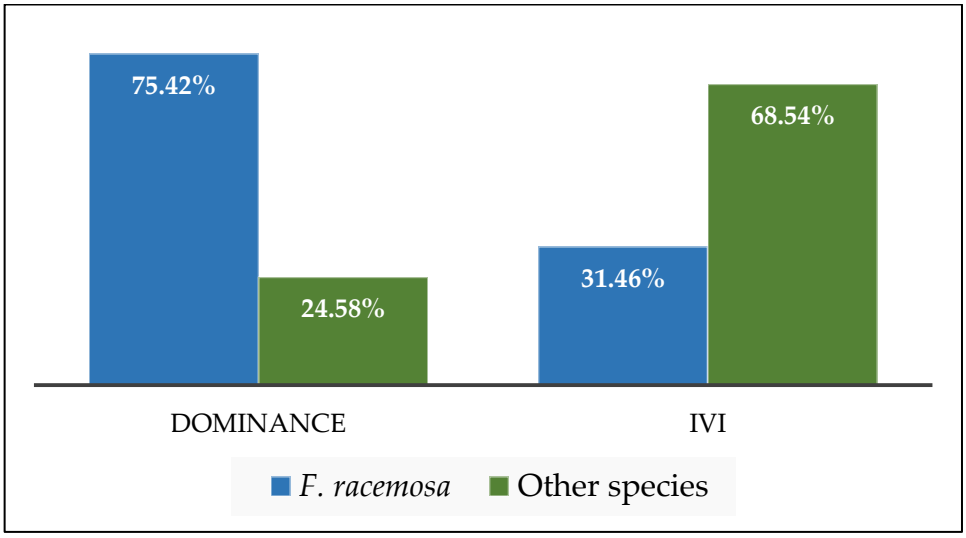


Fig. 6.26. Overall dominance and IVI of *F. racemosa*.

The species associated with *F. tsjakela* were *Holigarna arnottiana* Hook. f., *Bambusa bambos* (L.) Voss, *Elaeocarpus serratus* L., *Adina cordifolia* (Roxb.) Brandis, *Hydnocarpus pentandrus* (Buch.-Ham.) Oken, *Macaranga peltata* (Roxb.) Müll. Arg. etc. *F. tsjakela* was not a dominant species in the plots studied, the dominance was only 31.34 % and covered only 16.92 % of the total IVI (Fig. 6.27.). This species represented a member in the semi ever green and degraded forests.

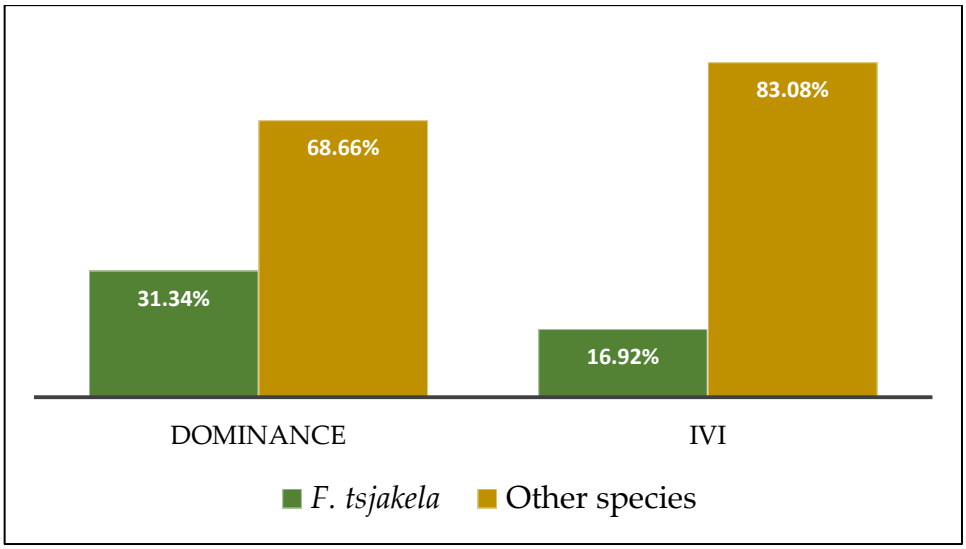


Fig. 6.27. Overall dominance and IVI of *F. tsjakela*.

66.6 % of the *Ficus* species studied were dominant species in the vegetation, indicated with IVI and other phytosociological parameters. The analysis shows that *Ficus* can tolerate wide range of habitat diversity and dominates within the vegetation. *F. exasperata* was seen as a general associate in the degraded to moist deciduous forests, but are not dominant over the others. Most of the figs (66.6 %) dominate the vegetation providing canopy cover to maintain the ecological integrity of the degrading vegetation. Species like *F. beddomei* and *F. nervosa* was a regular component seen in the wet evergreen forest. *F. racemosa* was found to be an original component in the riparian evergreen forests. The stranglers like *F. microcarpa* and *F. tsjakela* represented degraded forest formation ranging from evergreen, moist deciduous and dry deciduous forests.

The dominance or the basal area of the plots with figs were compared with plots without figs in the same vegetation (Fig. 6.28.). It was observed that in all the vegetation where figs were the dominant species, the total basal area was much high compared to the plots without figs in the same. And in the vegetation where figs were not the dominating species, the basal area was found to be larger in the plots without figs than the plots with figs.

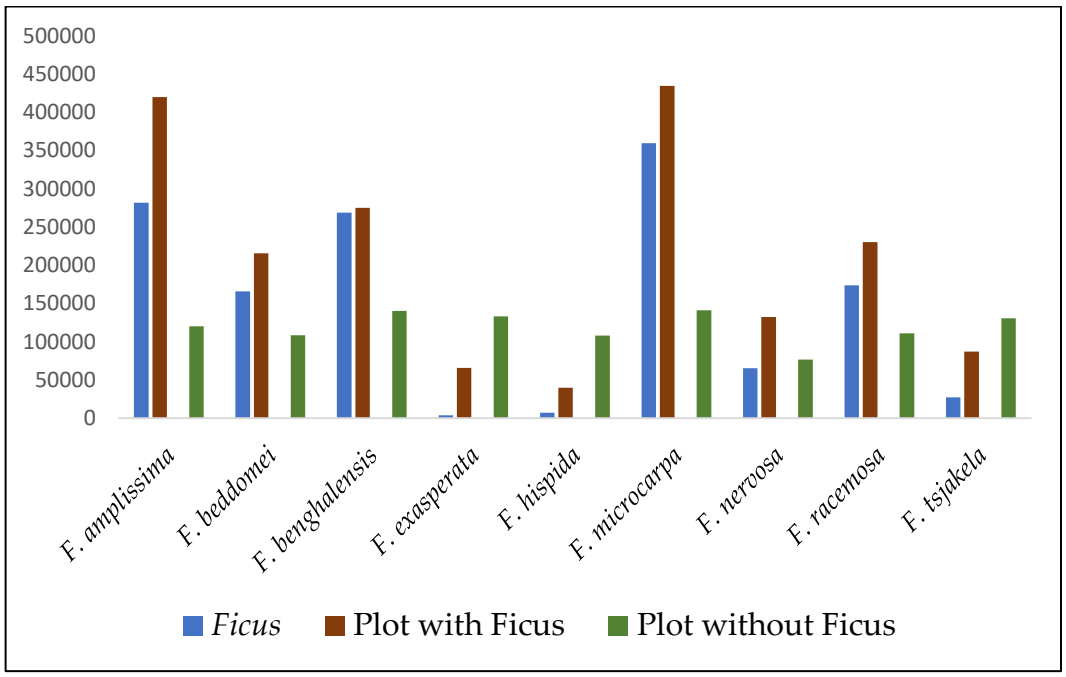


Fig. 6.28. Comparison of basal area between plots with and without *Ficus* in the same vegetation.

The overall dominance of figs, especially the large trees and stranglers indicated in the IVI, gives an inference about the ecological role of figs while providing enough canopy coverage and dominance. The stranglers are not abundant in healthy patches of the forests, whereas they are more abundant in the degraded forest strands. The stranglers are more commonly seen in degraded large or canopy trees, where they grow as stranglers and establish canopy cover, supporting the vegetation. The general assumption that figs kill the host trees of the vegetation was found to be ecologically wrong since figs provide more canopy cover and shade for the vegetation.

SUMMARY AND CONCLUSION

CHAPTER 7

Chapter 7

SUMMARY AND CONCLUSION

The genus *Ficus* L., is the most diverse genus in the family Moraceae. The genus is cosmopolitan in distribution, mainly in the tropical and subtropical regions of the world. The genus is distinct from all other flowering plants by the presence of the characteristic inflorescence called 'hypanthodium'. The diversity of the genus ranges in both vegetative and floral characters. The morphological variations and the presence of the microscopic flowers embedded within the hypanthodium makes the identification of the taxon problematic.

The present study aimed to solve the taxonomic enigma of the genus *Ficus* in the Western Ghats region, India. A thorough revision on the genus was done, based on both live and preserved specimens to determine the correct taxonomic identity and to understand the infra and intraspecific delimitations within the genus. Molecular techniques were implemented using *ITS* and *trnH-psbA* regions as core barcodes to aid the identification of the morphologically cryptic species. Phylogenetic studies were done to understand the evolutionary trend in the genus and were compared with the infrageneric and natural system of classification. The role of the stranglers in forest dynamics were analysed and were found to maintain the canopy cover. All the objectives proposed in the synopsis had been fulfilled in the study.

7.1 Taxonomy

The present study on the genus *Ficus* L., in the Western Ghats region recognized 37 taxa of *Ficus* (34 species, 2 subspecies and 3 varieties). Extensive field visits were done for the collection of the specimens and live materials were collected for all the taxa studied. A detailed taxonomic treatment was provided for all the taxa studied with correct name for each taxon, updated nomenclatural citation, synonyms, details on the type materials, detailed description, vernacular and common names, details on the distribution, flowering and fruiting period, IUCN status, uses, taxonomic notes and details of specimens examined were given. All the taxa were supplemented with colour photographs, illustrations and distribution maps. Comparative tables and photographs were provided for the morphologically related taxa to establish the differences. In addition to the live specimens, around 3000 herbarium specimens housed at various herbariums (Appendix 1) were also referred to understand the variations within the species. Three types of taxonomic keys (based on vegetative characters alone, based on syconium characters alone and based on combined vegetative and floral characters) were provided for the identification of the taxa.

Two taxa were added as new distributional records. *F. virens* var. *dispersa* was reported as a new distributional record to India and *F. virens* var. *matthewii* was recorded as a new distributional record to Kerala state. *F. cotoneifolia* Vahl., previously considered as a synonym of *F. benghalensis* L., was found to have characters different from *F. benghalensis.* Hence, based on the protologue and type specimen, it was confirmed that *F. cotoneifolia* Vahl., is not a synonym of *F. benghalensis* L. Similarly, *F. lancifolia* Moench was also treated as a synonym of *F. benghalensis.* But, on detailed study it was found that *F. lancifolia* is a pedunculate species. As, *F, benghalensis* is a species with

sessile syconium, *F. lancifolia* is not treated here a synonym of *F. benghalensis*. According to the previous literatures, *F. pomifera* Wall. ex King is treated as a synonym of *F. auriculata* Lour. But on detailed examination of the protologue and type specimen, it was found that *F. pomifera* is not a synonym of *F. auriculata*.

Among the 37 taxa recorded, 24 belonged to the subg. *Urostigma* and no taxa recorded under the subg. *Ficus* (Fig. 7.1). The compete list on the taxa studied along with the subgenus and section for each taxon is provided in table 7.1.

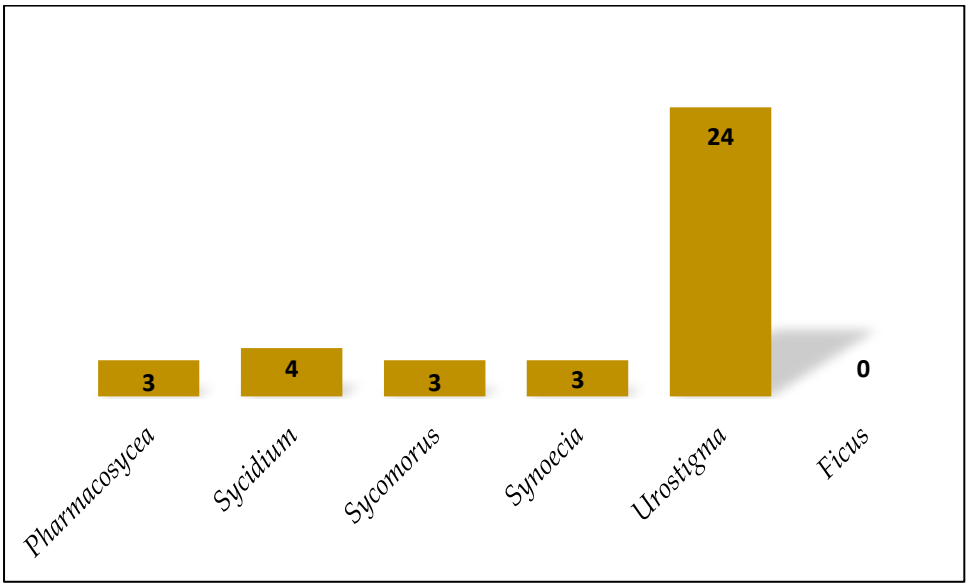


Fig. 7.1. Number of taxa of *Ficus* studied under each subgenus.

Table 7.1. List of taxa of *Ficus* included in the present study

Sl. No.	Species	Subgenus	Section
1	*Ficus anamalayana* Sudhakar & G.V.S. Murthy	*Pharmacosycea*	*Oreosycea*
2	*Ficus callosa* Willd.	*Pharmacosycea*	*Oreosycea*
3	*Ficus nervosa* B. Heyne ex Roth	*Pharmacosycea*	*Oreosycea*

4	*Ficus tinctoria* subsp. *gibbosa* (Blume) Corner.	*Sycidium*	*Palaeomorphe*
5	*Ficus tinctoria* subsp. *parasitica* (J. Koenig ex wild.) Corner.	*Sycidium*	*Palaeomorphe*
6	*Ficus exasperata* Vahl.	*Sycidium*	*Sycidium*
7	*Ficus heterophylla* L.f.	*Sycidium*	*Sycidium*
8	*Ficus hispida* L.f.	*Sycomorus*	*Sycocarpus*
9	*Ficus auriculata* Lour.	*Sycomorus*	*Sycomorus*
10	*Ficus racemosa* L.	*Sycomorus*	*Sycomorus*
11	*Ficus amplocarpa* Govind. & Masil.	*Synoecia*	*Rhizocladus*
12	*Ficus guttata* (Wight) Wight ex King	*Synoecia*	*Rhizocladus*
13	*Ficus pumila* L.	*Synoecia*	*Rhizocladus*
14	*Ficus amplissima* Sm.	*Urostigma*	*Urostigma*
15	*Ficus arnottiana* (Miq.) Miq.	*Urostigma*	*Urostigma*
16	*Ficus beddomei* King.	*Urostigma*	*Urostigma*
17	*Ficus benghalensis* L.	*Urostigma*	*Urostigma*
18	*Ficus benjamina* L.	*Urostigma*	*Urostigma*
19	*Ficus binnendijkii* (Miq.) Miq.	*Urostigma*	*Urostigma*
20	*Ficus caulocarpa* (Miq.) Miq.	*Urostigma*	*Urostigma*
21	*Ficus costata* Aiton	*Urostigma*	*Urostigma*
22	*Ficus dalhousiae* Miq.	*Urostigma*	*Urostigma*
23	*Ficus drupacea* Thunb.	*Urostigma*	*Urostigma*
24	*Ficus elastica* Roxb ex Hornem.	*Urostigma*	*Urostigma*

25	*Ficus fergusonii* (King) T.B. Worth ex Corner	*Urostigma*	*Urostigma*
26	*Ficus krishnae* C. DC.	*Urostigma*	*Urostigma*
27	*Ficus microcarpa* L.f.	*Urostigma*	*Urostigma*
28	*Ficus middletonii* Chantaras.	*Urostigma*	*Urostigma*
29	*Ficus mollis* Vahl.	*Urostigma*	*Urostigma*
30	*Ficus religiosa* L.	*Urostigma*	*Urostigma*
31	*Ficus superba* (Miq.) Miq.	*Urostigma*	*Urostigma*
32	*Ficus talbotii* King	*Urostigma*	*Urostigma*
33	*Ficus travancorica* King	*Urostigma*	*Urostigma*
34	*Ficus tsjahela* Burm.f.	*Urostigma*	*Urostigma*
35	*Ficus virens* Aiton var. *virens*	*Urostigma*	*Urostigma*
36	*Ficus virens* Aiton var. *dispersa* Chantaras.	*Urostigma*	*Urostigma*
37	*Ficus virens* Aiton var. *matthewii* Chantaras.	*Urostigma*	*Urostigma*

Diversity

The habit diversity in the genus ranges form climbers, shrubs, small to medium to large trees, epiphytes, hemi epiphytes and lithophytes. Aerial roots are found in majority of the species, especially belonging to the subg. *Urostigma.* All the members have latex and stipules. The stipules varied in their size, shape and in the indumentum pattern. The lamina was asymmetric in few species like *F. exasperata, F. heterophylla, F. pumila* and *F. tinctoria,* while it was symmetric in all other species. Lamina exhibited various shapes ranging from lanceolate to lanceovate to ovate to widely

ovate to elliptic to widely elliptic to oblong. The number of lateral veins ranged from 3–5 in few species to more than 14 pairs.

The receptacles varied in the position, clustering pattern, sexuality and attachment. They were either solitary, paired or clustered with axillary or cauliflorous clustering pattern. The sexuality was either monoecious or dioecious and were sessile or pedunculate. The syconium varied in the shape, colour and indumentum pattern. Being unisexual, three types of flowers namely male flowers, female flowers and gall flowers were present in the genus. Male flowers were mostly placed near the ostiolar region. Female flowers were arranged in the basal region of the syconium and the gall flowers were found to be scattered throughout the syconium.

Distribution

From the Western Ghats region 37 taxa of *Ficus* were reported from the present study. Among them most of them were collected from Kerala (36 taxa). The least number of taxa were reported from Gujarat (11 taxa). The state wise data on the number of taxa collected is given in Fig 7.2.

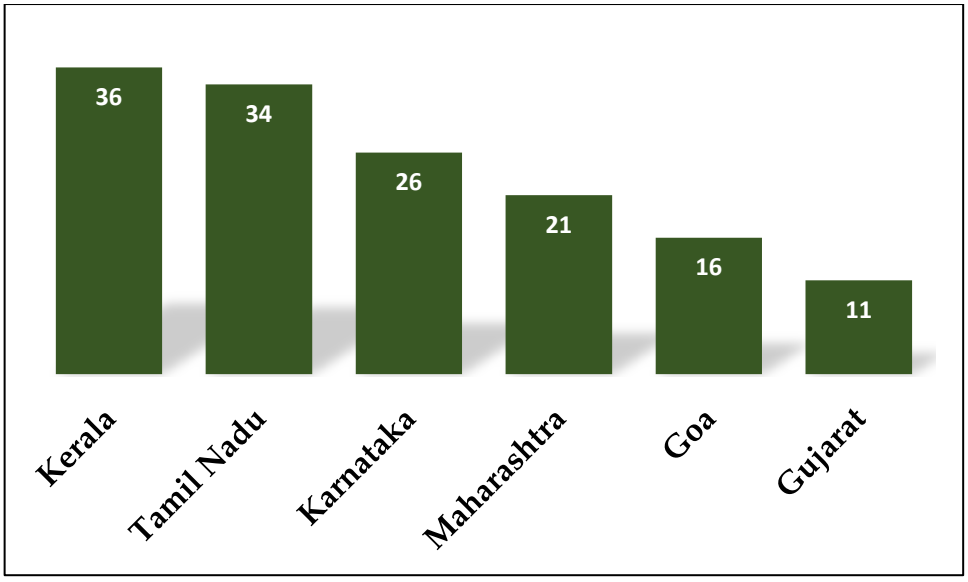


Fig. 7.2 State wise data on the number of taxa collected.

IUCN Status

Among the 37 taxa of *Ficus* studied here, one is in the Endangered category (*F. beddomei*), two under Vulnerable category (*F. costata* and *F. dalhousiae*) and one under Data Deficient category (*F. travancorica*). The IUCN status of 14 taxa were Least Concern and 19 were Not Evaluated.

Endemism

Six species of *Ficus* (*F. amplocarpa, F. anamalayana, F. beddomei, F. dalhousiae, F. guttata* and *F. travancorica*) are endemic to Southern Western Ghats and *F. fergusonii* was an Indo-Sri Lankan endemic species. Among the 115 taxa of *Ficus,* only ten species were reported to be endemic in India (Chaudhary *et al.,* 2012).

7.2. Phenetics

The phenetic analysis was done using all the 37 taxa of *Ficus* as ingroup and *Antiaris toxicaria* as the outgroup with Bray-Curtis similarity index using PAST ver. 4.03 software. A total of 143 characters including 52 vegetative and 91 floral characters were studied. The analysis comprised of 601-character states in total, with 253 vegetative and 348 floral character states. The phenetic analysis separated all the taxa with significant level of dissimilarity. The identification and delimitation issues among all the taxonomically cryptic taxa were resolved with the application of phenetic analysis. The clustering based on syconium characters were different from the clustering based on overall morphological characters. The clustering pattern based on overall morphological characters was almost similar to the infrageneric and natural classification system.

Based on the combined set of characters the clade 1 represented 29 taxa, where all had axillary inflorescence. The second subclade within the

clade 1 had eight taxa and mostly represented the members of *F. virens* complex. Among the varieties of *F. virens*, *F. virens* var. *virens* and *F. virens* var. *matthewii* were the sister lineages with a similarity value of 75%. The second clade had four dioecious members with axillary inflorescence. The last clade represented four dioecious members with cauliflorous species. *F. anamalayana* was clustered with subg. *Urostigma* members.

The clustering based on syconium characters were different from the clustering based on overall morphological characters. All the species in the clade 1 were having axillary figs, glabrous inner bracts and glabrous, lanceolate tepals as their common character. The second clade comprised of *F. exasperata* and *F. heterophylla* only with 61 % of similarity in syconium characters. The last clade had three dioecious, strictly cauliflorous species namely, *F. amplocarpa, F. guttata* and *F. auriculata*. *F. anamalayana,* currently a member of subg. *Pharmacosycea* was clustered with subg. *Urostigma* members.

7.3. Molecular phylogeny

The present molecular study using markers *ITS* and *trnH-psbA* provided adequate delimitation even between the morphologically similar and cryptic taxa. 17 new sequences were deposited to NCBI depository. The ML and the Bayesian analysis using the nuclear *ITS* region didn't have much incongruency. The analysis using *ITS* regions were much similar to the infrageneric and natural system of classification. The ML tree with *ITS* showed a clustering pattern in which most of the hemi epiphytic and epiphytic trees as well as stranglers were clustered together. The results of molecular analysis using *trnH-psbA* were not matching with the infrageneric and natural classification. The taxonomic position of *F. anamalayana* was confusing as the species was clustered with other species of the subg.

Urostigma in both phenetic and phylogenetic analysis Hence, the systematic position of *F. anamalayana* has to be rechecked.

7.4. Ecology

66.6 % of the *Ficus* species studied were dominant species in the representing vegetation, providing canopy cover and maintain the ecological integrity of the vegetation. The phytosociological analysis indicates that the fig trees and the vegetation patch with fig trees have more canopy cover and richness in other phytosociological parameters than the corresponding nearby vegetation, where *Ficus* is absent. The fig tree was found to establish itself moderately in degraded patches of forests and host trees. The comparatively better vegetation has less abundance of figs, and if so, species such as *Ficus beddomei*, which is seen as a regular endemic canopy tree were found to be the dominating species. Thus, the general assumption of figs killing the host species was found to be ecologically wrong as figs provide more canopy cover in the vegetation and eventually replaces only a single tree, especially in canopy gap filling in disturbed tropical evergreen forests.

RECOMMENDATIONS

CHAPTER 8

Chapter 8

RECOMMENDATIONS

The present study provides a comprehensive account on the genus *Ficus* L., (Moraceae) from the Western Ghats region. Four broad areas namely, 1. Taxonomy, 2. Phenetics, 3. Molecular phylogeny and 4. Ecology were studied in the present work to achieve the objectives. The following are the recommendations of this study.

- The study provided a thorough taxonomic revision on the genus *Ficus* in the Western Ghats region based on live and herbarium materials, supported with detailed descriptions, updated citations, phenology data, taxonomic notes, floral photographs, illustrations and distribution map. Hence, the work is an authentic reference to the *Ficus* of Western Ghats.
- The model phenetic data sheet prepared for the genus while analysing the numerical taxonomy can be used for documenting the details of species collected even from other regions and thus can be considered as a standard which includes both vegetative and floral details needed for the identification of the taxa.
- The phenetic analysis was based on 143 characters and 601-character states based on vegetative and floral features. This is the first study of this kind on the genus, that incorporated this much characters and character states for phenetic analysis. The inclusion of such large number of characters ensured significant level of species delimitation. The work thus provides a standard model for the application of phenetic analysis to separate the taxa.

- The methodology adopted can be followed in other taxonomically complex species and genus for the correct segregation of the taxa.
- The molecular markers employed in the present study, *ITS* and *trnH-psbA* significantly separated all the taxa. Hence, it is recommended that these markers can are the most ideal and successful markers in the genus.
- *F. anamalayana* was clustered with the members of subg. *Urostigma* in both phenetic and molecular analysis. The study recommends to incorporate *F. anamalayana* in the subg. *Urostigma* rather than in the subg. *Pharmacosycea.*
- Even though significantly separated, polytomy was observed in few of the species. Incorporation of many more molecular markers can provide better resolution between these species.
- Molecular studies with a greater number of markers and species from different regions of the world can provide more insight into the phylogeny and evolution of *Ficus.*
- Fig and fig wasps are best examples for mutualism. A study on the association of fig and fig wasps can reveal more details on the pollination mechanism of the genus and also on the successful distribution of the genus.
- The role of figs in vegetation dynamics was revealed, which proved to support the phytosociological parameters of the vegetation and enrich the vegetation, especially when it is disturbed, contrary to the general assumption that the figs kill the trees.

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APPENDICES

Appendix I
List of Herbaria Consulted

1. Blatter Herbarium, St. Xavier's College, Mumbai (BLAT).
2. Botanic Garden and Botanical Museum, Berlin-Dahlem Herbarium, Berlin, Germany (B)*.
3. Botanical Survey of India, Andaman & Nicobar Circle, Port Blair (PBL)*.
4. Botanical Survey of India, Deccan Regional Centre, Hyderabad, Telangana, India (BSID)*.
5. Botanical Survey of India, Southern Regional Centre, Coimbatore, Tamil Nadu, India (MH).
6. Botanical Survey of India, Western Regional Centre, Pune, Maharashtra, India (BSI).
7. Calicut University Herbarium, Department of Botany, University of Calicut, Kerala, India (CALI).
8. Central National Herbarium, Kolkata, West Bengal, India (CAL)*.
9. Harvard University, U.S.A. Massachusetts. Cambridge (A)*.
10. Herbarium of French Institute of Pondicherry, Pondicherry Union Territory, India (HIFP)*.
11. Herbarium, University of Michigan, U.S.A. (MICH)*.
12. Kerala Forest Research Institute Herbarium (KFRI).
13. Linnean Society of London, U.K. England (LINN)*.
14. Lund University, Sweden. Lund (LD)*.

15. MES Asmabi College Herbarium, P. Vemballur, Thrissur, Kerala (MESAH).
16. Museum National d'Histoire Naturelle, Paris, France (P)*.
17. Museum of Evolution Herbarium, Uppsala University, Sweden (UPS)*.
18. National Botanic Garden, Belgium (BR)*.
19. National Herbarium of the Netherlands, Herbarium Utrecht (U)*.
20. National Herbarium, Leiden University Branch, Nederlands (L)*.
21. National History Museum, London, England (BM)*.
22. Natural History Museum of Denmark, Copenhagen, Denmark (C)*.
23. Natural History Museum, Italy. Firenze (FI)*.
24. Royal Botanic Gardens, Edinburgh, Scotland (E)*
25. Royal Botanic Gardens, Melbourne, Australia (MEL)*.
26. Royal Botanical Gardens, Kew (K)*.
27. South African National Biodiversity Institute, Republic of South Africa, Gauteng Province, Pretoria (PRE)*.
28. St. Joseph's College Herbarium, Bengaluru (JCB)*.
29. Swedish Museum of Natural History, Sweden, Stockholm (S)*.
30. The Conservatory and Botanical Garden, Geneva (G)*.
31. The New York Botanical Garden, U.S.A. New York. Bronx (NY)*.
32. Tropical Botanical Garden Herbarium, Thiruvananthapuram (TBGT).
33. University of Kerala, Thiruvananthapuram, Kerala, India (KUBH).

* Consulted virtual database available online.

Appendix II

Ficus- Model Data Sheet

Name of the taxon:

Date:

Locality:

Collection No:

Bottle No (Syconium):

Sample No (Molecular):

GPS Reading:

Habitat:

Life form:

Associated species:

Habit:

Height:

GBH:

Scar:

Latex Colour:

Basal roots:

Aerial roots:

Bark	Texture:
	Colour:
Young twigs	Shape:

	Core:
	Indumentum:
	Colour:
Inter node	Length:
Stipule	Shape:
	Size:
	Margins:
	Apex:
	Base:
	Indumentum:
	Colour:
Petiole	Attachment:
	Shape:
	Size:
	Indumentum:
	Colour:
Leaf	Arrangement:
	Shape:
	Size:
	Margins:
	Length of Acumen:
	Apex:
	Base:
	Indumentum:

	Colour when Young: Abaxial:	Adaxial:
	Colour on maturity: Abaxial:	Adaxial:
	Nature:	
	Venation:	
	No. of basal veins:	
	No. of lateral veins:	
	Wax glands:	
Inflorescence	Nature:	
	No. of Figs:	
	Sexuality:	
Peduncle	Length:	
	Indumentum:	
	Colour:	
Basal bracts	Number:	
	Attachment:	
	Size:	
	Shape:	
	Indumentum:	
	Colour:	
Syconium	Size:	
	Shape:	
	Indumentum:	
	Colour when young:	
	Colour on ripening:	

	Colour on maturity:
	Nature of lenticels:
Ostiole	Diameter:
	Outer Bracts:
	Attachment:
	Size:
	Shape:
	Indumentum:
	Colour:
	Inner Bracts:
	Attachment:
	Size:
	Shape:
	Indumentum:
	Colour:
Male flower	Attachment:
	Size:
	Pedicel:
	Size:
	Tepals:
	Number:
	Attachment:
	Size:
	Shape:

Indumentum:

Colour:

Stamen:

Anther: Size:

Filament: Size:

Female flower Attachment:

Size:

Pedicel:

Size:

Tepals:

Attachment:

Size:

Shape:

Indumentum:

Colour:

Stigma:

Style: Length:

Ovary: Size: shape: Indumentum:

Colour:

Gall flower Attachment:

Size:

Pedicel:

Size:

Tepals:

Attachment:

Size:

Shape:

Indumentum:

Colour:

Stigma:

Style: Length:

Ovary: Size: shape: Indumentum:

Colour:

Achenes Size:

Shape:

Indumentum:

Colour:

Fruiting and Flowering:

Other observations:

Appendix III



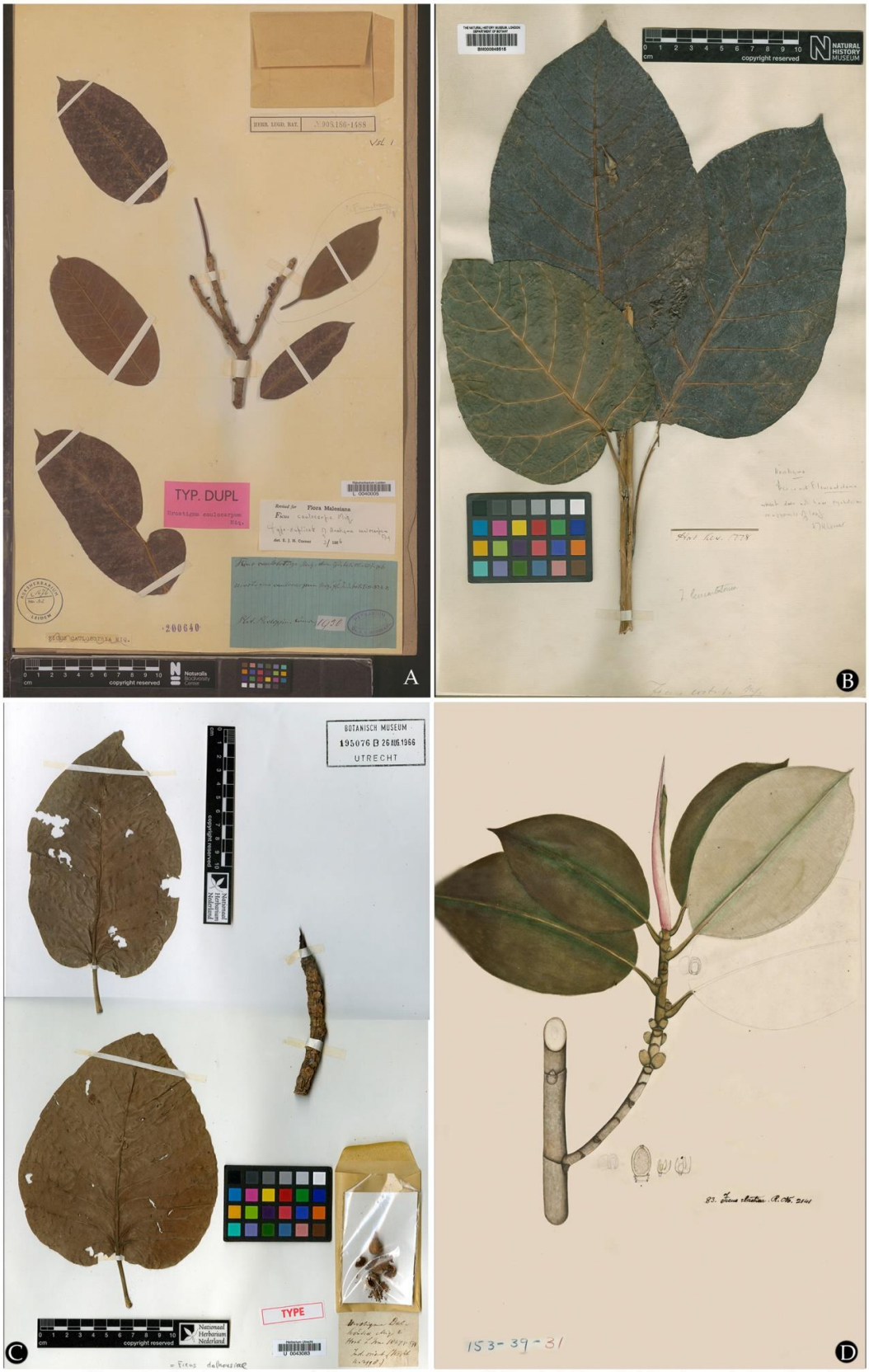
Appendix III a. A. Type of *F. amplissima* Sm.© Hortus Malabaricus;**B.** Isotype of *F. amplocarpa* Govind. & Masil. © Royal Botanic Gardens, Edinburgh; **C.** Isotype of *F. anamalayana* Sudhakar & G.V.S. Murthy © Botanical Survey of India, Coimbatore.



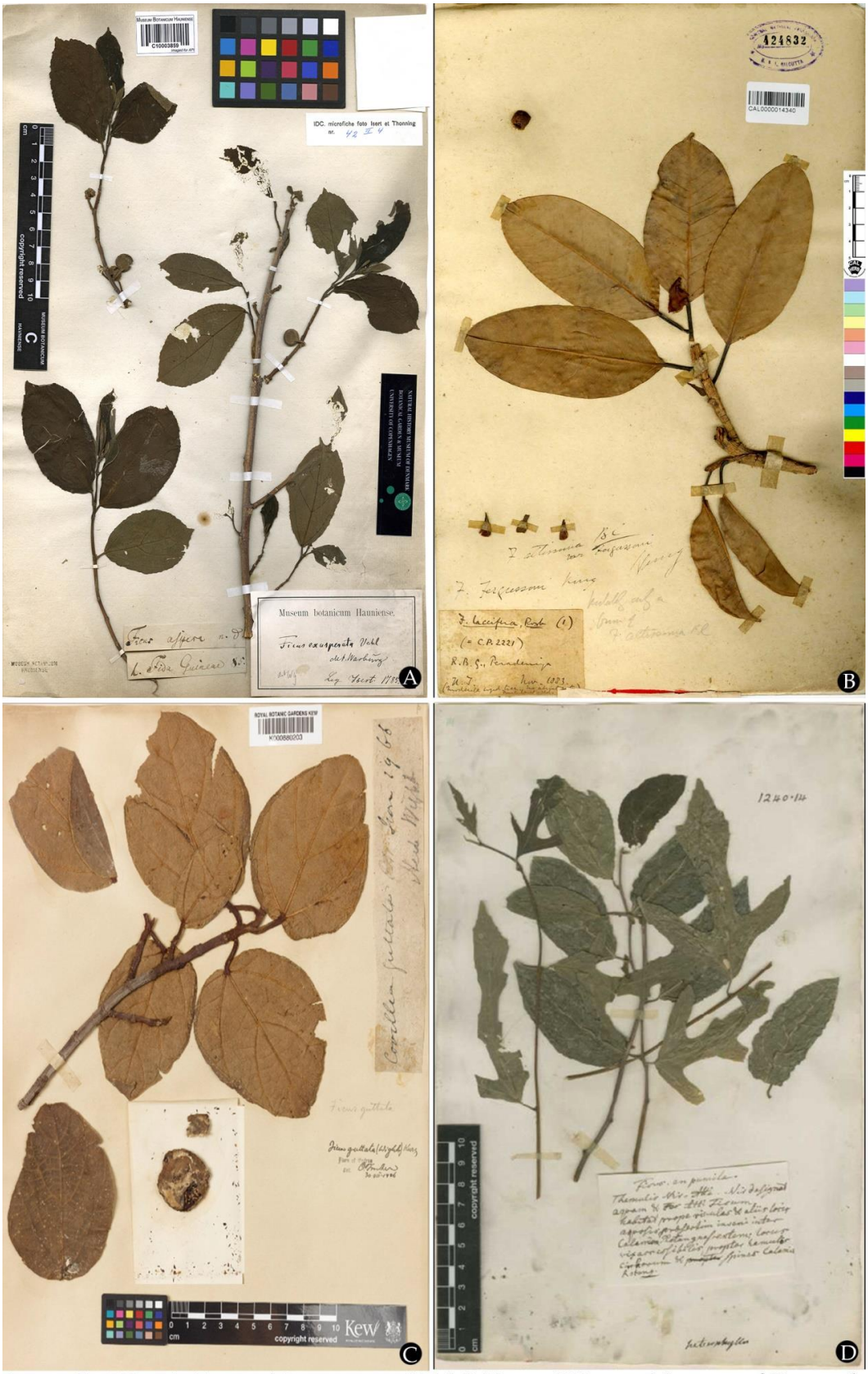
Appendix III b. A. Holotype of *F. arnottiana* (Miq.) Miq. © Royal Botanical Gardens, Kew; **B.** Lectotype of *F. beddomei* King © Royal Botanical Gardens, Kew; **C.** Syntype of *F. benghalensis* L. © Naturalis Biodiversity Center, Leiden, Netherlands; **D.** Holotype of *F. binnendijkii* (Miq.) Miq ©. National Herbarium of the Netherlands.



Appendix III c. A. Type of *F. benjamina* L. © Hortus Malabaricus; **B.** Holotype of *F. callosa* Willd. © Botanic Garden and Botanical Museum, Berlin; **C.** Type of *F. carica* L. © The Linnean Society of London.



Appendix III d. A. Type of *F. caulocarpa* (Miq.) Miq.© National Herbarium of the Netherlands; **B.** Type of *F. costata* Aiton © National History Museum, London; **C.** Holotype of *F. dalhousiae* (Miq.) Miq. © National Herbarium of the Netherlands; **D.** Type of *F. elastica* Roxb. ex Hornem. © Roxburgh Icon.



Appendix III e. A. Type of *F. exasperata* Vahl.© Natural History Museum of Denmark, Copenhagen; **B.** Type of *F. fergusonii* (King) T. B. Worth. ex Corner © Botanical Survey of India, Kolkata; **C.** Type of *F. guttata* (Wight) Wight ex King. © Royal Botanical Gardens, Kew; **D.** Holotype of *F. heterophylla* L.f. © The Linnean Society London.



Appendix III f. A. Type of *F. hispida* L.f.© The Linnean Society London; **B.** Type of *F. krishnae* C.DC. © National History Museum, London; **C.** Type of *F. microcarpa* L.f. © The Linnean Society London; **D.** Holotype of *F. middletonii* Chantaras. © Naturalis Biodiversity Center, Leiden.



Appendix III g. A. Holotype of *F. mollis* Vahl.© Natural History Museum of Denmark, Copenhagen; **B.** Holotype of *F. nervosa* Roth. © Botanic Garden and Botanical Museum, Berlin; **C.** Type of *F. pumila* L. © Kaempfer, Amoen. Exot. Fasc.: 804. 1712.; **D.** Epitype of *F. racemosa* L. © Botanical Survey of India, Kolkatta.



Appendix III h. A. Lectotype of *F. religiosa* L.© National History Museum, London; **B.** Isotype of *F. superba* (Miq.) Miq. © National Herbarium of the Netherlands; **C.** Holotype of *F. talbotii* king © Botanical Survey of India, Kolkata; **D.** Type of *F. tinctoria* subsp. *parasitica* (Willd.) Corner © Botanic Garden and Botanical Museum, Berlin.



Appendix III i. A. Isotype of *F. travancorica* King © Botanical Survey of India, Kolkata; **B.** Lectotype of *F. tsjakela* Burm.f. © The Conservatory and Botanical Garden, Geneva ; **C.** Type of *F. virens* var. *virens* © National History Museum, London; **D.** Holotype of *F. virens* Aiton var. *dispersa* Chantaras. © Naturalis Biodiversity Center, Leiden; **E.** Holotype of *F. virens* Aiton var. *matthewii* Chantaras. © Naturalis Biodiversity Center, Leiden.

Appendix IV

Data Matrix used for Phenetic Analysis

Character		Character State	*Antiaris toxicaria*	*F. amplissima*	*F. amplocarpa*	*F. anamalayana*	*F. arnottiana*	*F. auriculata*	*F. beddomei*	*F. benghalensis*	*F. benjamina*	*F. binnendijkii*	*F. callosa*	*F. caulocarpa*	*F. costata*	*F. dalhousiae*
General	Habit	Tree	1	1	0	1	1	1	1	1	1	1	1	1	1	1
		Shrub	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Climber	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Height (M)	Below 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		3–10	0	0	1	0	0	1	0	0	0	1	0	0	0	0
		10–15	0	0	0	1	1	0	0	0	1	0	0	0	1	1
		15–25	0	0	0	0	0	0	1	0	0	0	1	0	0	0
		25–35	1	1	0	0	0	0	0	1	0	0	0	1	0	0
		Above 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Life form	Independent	1	0	0	1	0	1	0	1	1	1	1	0	0	0
		Epiphytic	0	0	1	0	1	0	0	0	0	0	0	0	1	0
		Lithophytic	0	0	0	1	1	0	0	0	0	0	0	0	0	1
		Hemi	0	1	0	0	0	0	1	1	1	0	0	1	0	1

		epiphytic														
	Aerial roots	Present	0	0	0	0	0	0	0	1	1	1	0	1	0	1
		Absent	1	1	1	1	1	1	1	0	0	0	1	0	1	0
Bark	Type	Smooth	0	1	1	1	1	1	0	1	0	0	0	1	1	0
		Lenticellate	1	0	1	1	0	0	1	0	1	1	1	0	0	1
	Colour	White	0	1	0	0	0	0	0	1	0	0	1	0	0	0
		Pale yellow	0	1	0	0	1	0	0	1	0	0	0	1	0	0
		Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Brown	0	0	1	0	0	1	1	0	0	1	0	0	0	1
		Pale brown	1	0	0	1	1	0	0	0	1	0	1	1	1	0
Young twigs	Shape	Terete	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Core	Solid	1	1	1	1	1	0	1	1	1	1	1	1	1	1
		Hollow	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Colour	Pale brown	0	1	0	0	1	0	1	1	1	0	0	1	1	0
		Brown	1	0	1	0	0	1	0	0	0	0	0	0	0	0
		Green	0	0	0	1	0	0	0	0	0	0	1	0	0	1
		Pale green	0	0	0	0	0	0	0	0	0	1	0	0	0	0
		Pale red	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Indumentum	Pubescent	0	0	1	0	0	1	0	1	0	0	0	0	0	0
		Glabrous	0	1	0	1	1	0	1	0	1	1	1	1	1	0
		Puberulent	0	0	0	0	0	0	0	0	0	0	0	0	0	1
		Scabrous	0	0	0	0	0	0	0	0	0	0	0	0	0	0

		Tomentulose	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Strigose	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Tomentose	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Puberulous	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Inter node	Length - Min (CM)	0 –1.0	1	1	0	1	1	0	1	0	1	1	1	1	1	1
		1.1–2.0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
		2.1–3.0	0	0	1	0	0	0	0	1	0	0	0	0	0	0
	Length - Max (CM)	0–1.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		1.1–2.0	0	0	0	1	0	0	1	0	0	1	0	0	0	0
		2.1–3.0	0	1	0	0	0	0	0	0	1	0	0	0	0	1
		3.1–4.0	0	0	0	0	0	0	0	1	0	0	0	0	1	0
		4.1–5.0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
		Above 5.1 cm	1	0	1	0	0	1	0	0	0	0	1	1	0	0
Latex	Nature	Milky	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		Watery	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Colour	White	0	1	1	1	1	1	1	1	1	1	1	1	1	1
		Yellow	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Brown	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Stipule	Nature	Caducous	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		Persistent	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Shape	Ovate	0	1	1	0	0	0	0	0	0	0	1	0	0	0
		Widely ovate	0	0	0	0	0	0	1	1	0	0	0	0	0	0

	Lanceolate	1	0	0	1	1	0	0	0	0	1	0	1	1	0		
	Lanceovate	0	0	0	0	0	1	0	0	1	0	1	0	0	1		
Length - Min (CM)	**0–1.0**	1	0	0	0	0	0	0	0	1	1	1	1	1	0		
	1.1–2.0	0	1	1	0	1	1	0	1	0	0	0	0	0	0		
	2.1–3.0	0	0	0	1	0	0	0	0	0	0	0	0	0	1		
	3.1–4.0	0	0	0	0	0	0	1	0	0	0	0	0	0	0		
	4.1–5.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Above 5.1 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Length - Max (CM)	**0–1.0**	1	0	0	0	0	0	0	0	0	0	0	0	0	0		
	1.1–2.0	0	0	0	0	0	0	0	0	1	1	1	1	1	0		
	2.1–3.0	0	1	1	0	0	1	0	0	0	0	0	0	0	0		
	3.1–4.0	0	0	0	1	1	0	0	1	0	0	0	0	0	0		
	4.1–5.0	0	0	0	0	0	0	1	0	0	0	0	0	0	0		
	Above 5.1 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	1		
Width - Min (CM)	**0–0.5**	1	1	1	0	0	1	0	0	1	1	1	1	1	0		
	0.6–1.0	0	0	0	1	1	0	0	1	0	0	0	0	0	0		
	1.1–1.5	0	0	0	0	0	0	1	0	0	0	0	0	0	1		
Width - Max (CM)	**0–0.5**	0	0	0	0	0	0	0	0	1	1	1	0	0	0		
	0.6–1.0	1	1	1	0	0	0	0	1	0	0	0	1	1	0		
	1.1–1.5	0	0	0	1	1	1	0	0	0	0	0	0	0	0		
	1.6–2.0	0	0	0	0	0	0	1	0	0	0	0	0	0	1		
	Margins	**Entire**	1	1	1	1	1	1	1	1	1	1	1	1	1		

Apex	**Narrowly acute**	1	1	0	1	1	1	1	1	1	0	1	0	1	1	0	1
	Acute	0	0	1	0	1	0	0	0	0	1	0	1	0	0	1	0
Base	**Truncate**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Indumentum	**Glabrous**	0	1	0	1	1	0	1	0	1	1	0	1	0	0	0	1
	Pubescent	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0
	Puberulent	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
	Tomentose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Strigose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sericeous	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Strigulose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Puberulous	1	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0
Colour	**Red**	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Green	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Yellow	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	1
	Pale red	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1
	Pale green	0	1	0	0	0	0	1	1	1	1	1	1	0	0	0	0
	Brown	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Purple	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Pale brown	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0
Petiole	**Attachment**	**Articulated**	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1
		Not articulated	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0

Shape	**Canaliculate**	**0**	**1**	**0**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**0**	**0**	**0**	**0**
	Terete	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
	Sub terete	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	Angular	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Length - Min (CM)	**0–2.0**	**1**	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**1**	**1**	**0**	**1**	**0**	**1**	**0**
	2.1–4.0	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**1**	**1**	**0**	**1**
	4.1–6.0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	6.1–8.0	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	8.1–10.0	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Length - Max (CM)	**0–2.0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**1**	**0**	**0**	**0**	**0**	**0**
	2.1–4.0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	4.1–6.0	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**0**	**1**	**0**	**0**
	6.1–8.0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**
	8.1–10.0	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**
	10.1–12.0	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	12.1–14.0	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	Above 14.1	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Indumentum	**Glabrous**	**0**	**1**	**0**	**1**	**1**	**0**	**1**	**0**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**
	Pubescent	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**
	Tomentose	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	Puberulent	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	Scabrous	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

		Strigose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Hispid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Puberulous	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Colour	**Green**	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0
		Pale red	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
		Pale green	0	1	0	0	1	1	1	1	1	1	1	1	0	1	1	1	1	1
		Pale brown	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Brown	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leaf	**Type**	**Simple**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		Compound	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Arrangement	**Alternate**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		Opposite	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Spiral	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		Decussate	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Leafy appendages	**Present**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Absent	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Symmetry	**Symmetric**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		Asymmetric	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Shape	**Ovate**	0	1	0	1	0	0	0	1	1	1	1	0	1	1	1	1	1	1
		Widley ovate	0	0	1	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0
		Lanceolate	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
		Round	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	Elliptic	1	1	0	0	0	0	0	0	0	0	1	1	1	0
	Lance ovate	0	1	0	0	0	0	0	0	0	1	0	1	0	1
	Oblong	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	Obovate	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Lobed	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	Widely elliptic	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Length - Min (CM)	**0–5.0**	1	0	0	0	0	0	0	1	1	0	0	0	1	0
	5.1–10.0	0	1	1	0	1	0	1	0	0	1	1	1	0	0
	10.1–15.0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	15.1–20.0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	20.1–25.0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	25.1–30.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	30.1–35.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	35.1–40.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Length - Max (CM)	**0–5.0**	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	5.1–10.0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	10.1–15.0	0	0	1	0	0	0	0	0	0	0	1	0	0	0
	15.1–20.0	1	1	0	0	1	0	0	0	0	0	0	0	1	0
	20.1–25.0	0	0	0	0	0	0	0	1	0	0	0	1	0	0
	25.1–30.0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	30.1–35.0	0	0	0	1	0	0	1	0	0	0	0	0	0	0
	35.1–40.0	0	0	0	0	0	1	0	0	0	0	0	0	0	0

	Above 40.1	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Width - Min (CM)	**0–5.0**	**1**	**1**	**1**	**0**	**1**	**0**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**0**	**1**	**0**
	5.1–10.0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**1**	**0**	**1**
	10.1–15.0	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	15.1–20.0	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	20.1–25.0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	25.1–30.0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	30.1–35.0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	35.1–40.0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Width - Max (CM)	**0–5.0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**
	5.1–10.0	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**1**	**0**
	10.1–15.0	**0**	**0**	**1**	**0**	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**
	15.1–20.0	**0**	**0**	**0**	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**
	20.1–25.0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	25.1–30.0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	30.1–35.0	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	35.1–40.0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Margins	**Entire**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**
	Undulate	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**
	Serrate	**1**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	Dendate	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	Denticulate	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Apex	**Acute**	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1
	Acuminate	1	0	0	0	1	0	0	0	1	1	0	1	1	0	1	1	0
	Cuspidate	0	0	1	0	0	0	1	0	0	0	1	0	0	1	0	0	0
	Obtuse	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
	Rounded	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Caudate	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Base	**Obtuse**	0	1	0	0	0	0	1	0	1	0	0	1	0	1	0	0	0
	Rounded	1	0	0	0	1	1	0	1	0	0	0	1	1	1	1	1	0
	Cordate	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	1
	Cuneate	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Sub cordate	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	Oblique	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Attenuate	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Truncate	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Acute	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acumen length - Min (CM)	**0**	0	1	0	1	0	1	0	1	0	1	1	0	0	1	0	1	1
	0.6–1.0	0	0	1	0	1	0	0	0	0	0	0	1	1	0	1	0	0
	1.1–1.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1.6–2.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Above 2.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acumen length - Max (CM)	**0**	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
	0.6–1.0	1	0	0	1	0	0	1	0	1	0	1	0	1	1	1	0	0

		1.1–1.5	0	0	0	0	0	0	0	0	1	0	0	1	0
		1.6–2.0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Above 2.0	0	0	1	0	1	0	0	0	0	0	0	0	0
	Indumentum	**Glabrous**	0	1	1	1	1	0	1	1	1	1	1	1	1
		Pubescent	0	0	0	0	0	0	0	1	0	0	0	0	1
		Puberulous	0	0	0	0	0	1	0	0	0	0	0	0	0
		Tomentose	1	0	0	0	0	0	0	0	0	0	0	0	0
		Scabrous	0	0	0	0	0	0	0	0	0	0	0	0	0
		Puberulent	0	0	0	0	0	0	0	1	0	0	0	0	0
		Strigose	0	0	0	0	0	0	0	0	0	0	0	0	0
		Villous	0	0	0	0	0	0	0	0	0	0	0	0	0
		Pilose	0	0	0	0	0	1	0	0	0	0	0	0	0
		Hirtellous	0	0	0	0	0	0	0	0	0	0	0	0	0
		Hispid	0	0	0	0	0	0	0	0	0	0	0	0	0
	Colour when young	**Red**	0	1	0	0	0	1	0	1	0	0	0	0	1
		Pale red	0	0	0	0	1	0	0	0	0	0	1	1	0
		Pale green	1	1	1	1	0	1	1	1	1	1	0	0	0
		Purple	0	0	0	0	0	0	0	0	0	0	0	0	1
		Brown	0	0	0	0	0	0	0	0	0	0	0	0	0
	Colour when mature	**Dark green**	1	1	1	1	0	1	1	1	1	1	0	0	0
		Green	0	0	0	1	1	0	0	0	0	0	1	1	1
	Texture	**Coriaceous**	1	0	0	0	0	0	1	0	0	0	0	0	0

		Sub coriaceous	0	0	1	1	1	1	0	1	1	1	0	1	1	1
		Chartaceous	0	1	0	0	0	0	0	0	0	0	1	0	0	0
	No. of Veins - Min	1 or 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		3 or 4	0	0	1	0	0	0	0	0	0	0	0	0	0	0
		5 or 6	0	0	0	0	1	1	0	1	0	0	1	0	0	0
		7 or 8	0	1	0	0	0	0	0	0	0	0	0	0	0	0
		9 or 10	1	0	0	0	0	0	1	0	0	0	0	1	1	0
		11 or 12	0	0	0	0	0	0	0	0	0	1	0	0	0	0
		13 or 14	0	0	0	1	0	0	0	0	0	0	0	0	0	1
		Numerous	0	0	0	0	0	0	0	0	1	0	0	0	0	0
	No. of Veins - Max	1 or 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		3 or 4	0	0	1	0	0	0	0	0	0	0	0	0	0	0
		5 or 6	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		7 or 8	0	0	0	0	0	1	0	1	0	0	0	0	0	0
		9 or 10	0	1	0	0	1	0	0	0	0	0	0	0	0	0
		11 or 12	0	0	0	0	0	0	1	0	0	0	0	1	0	0
		13 or 14	1	0	0	0	0	0	0	0	0	0	1	0	0	0
		Above 14	0	0	0	1	0	0	0	0	0	1	0	0	1	1
		Numerous	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Waxy glands	Position	At the base of the midrib beneath	0	1	0	0	1	0	1	1	1	1	0	1	1	1

		Two in the axils of the lateral nerves	0	0	1	1	0	1	0	0	0	0	0	0	0	0
		Absent	1	0	0	0	0	0	0	0	0	0	1	0	0	0
Inflorescence	Hypanthodium	Present	0	1	1	1	1	1	1	1	1	1	1	1	1	1
		Absent	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Position	Axillary	1	1	0	1	1	0	1	1	1	1	1	1	1	1
		Cauliflorous	0	0	1	0	0	1	0	0	0	0	0	0	0	0
	Clustering	Solitary	1	0	0	0	0	0	1	0	0	0	1	0	0	0
		Paired	0	0	0	1	0	0	1	0	1	1	0	0	1	1
		Clustered	0	1	1	0	1	1	0	1	0	0	0	1	0	1
	Sexuality	Monoecious	1	1	0	1	1	0	1	1	1	1	1	1	1	1
		Dioecious	0	0	1	0	0	1	0	0	0	0	0	0	0	0
Peduncle	Peduncle	Present	0	0	1	1	1	1	1	0	0	0	1	1	1	1
		Absent	0	1	0	0	0	0	0	1	1	1	0	0	0	0
	Length - Min (MM)	01–10	0	0	0	1	1	0	0	0	0	0	0	1	1	1
		11–20	0	0	1	0	0	0	1	0	0	0	1	0	0	0
		21–30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		31–40	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Length - Max (MM)	01–10	0	0	0	1	1	0	0	0	0	0	0	1	1	1
		11–20	0	0	1	0	0	0	0	0	0	0	0	0	0	0
		21–30	0	0	0	0	0	0	1	0	0	0	1	0	0	0

		31–40	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Above 41	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Shape	Terete	0	0	1	1	1	0	0	0	0	0	1	1	1	1
		Angular	0	0	0	0	0	1	1	0	0	0	0	0	0	0
	Indumentum	Glabrous	0	0	1	0	1	0	1	0	0	0	0	0	1	0
		Pubescent	0	0	0	1	0	0	0	0	0	0	1	1	0	1
		Pilose	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Scars	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Scabrous	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Strigose	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Puberulent	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Villous	0	0	0	0	0	1	0	0	0	0	0	0	0	0
		Puberulous	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Strigulose	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Colour	Yellow	0	0	0	0	1	0	0	0	0	0	0	0	0	0
		Pale green	0	0	0	0	1	0	0	0	0	0	1	1	0	0
		Green	0	0	0	1	0	1	1	0	0	0	0	0	0	1
		Pale brown	0	0	1	0	0	1	0	0	0	0	0	1	1	0
Basal bracts	Basal bract	Present	0	1	1	1	1	1	1	1	1	1	1	1	1	1
		Absent	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Attachment	Persistent	0	1	0	1	1	1	1	1	1	1	1	1	1	1
		Caducous	0	0	1	0	0	0	0	0	0	0	0	0	0	0

Length - Min (MM)	**0–1.0**	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0
	1.1–2.0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0
	2.1–3.0	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	1	1
	3.1–4.0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
	Above 4.1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Length - Max (MM)	**0–1.0**	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	1.1–2.0	0	0	0	0	1	0	0	1	1	1	0	0	0	0	0	1	0
	2.1–3.0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3.1–4.0	0	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0	1
	Above 4.1	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0
Shape	**Ovate**	0	1	0	0	1	0	1	0	0	0	0	1	0	0	1	0	1
	Widely ovate	0	0	1	1	0	1	0	1	1	1	0	0	1	1	0	0	0
Indumentum	**Glabrous**	0	1	1	0	1	0	1	0	1	1	0	1	1	0	1	1	0
	Pubescent	0	0	0	1	0	0	0	1	0	0	1	0	0	1	0	0	1
	Hispid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Puberulous	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0
	Tomentose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sericeous	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Colour	**Pale Brown**	0	0	1	0	0	1	0	1	0	0	0	1	1	1	1	1	0
	Green	0	0	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0
	Yellow	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0
	Purple	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0

		Brown	0	0	0	0	0	0	1	0	0	0	0	0	0	0
		Pale green	0	1	0	0	0	0	0	0	0	0	1	0	0	1
Syconium	Length - Min (MM)	1–10	0	1	0	1	1	0	0	0	1	1	0	1	1	1
		11–20	0	0	0	0	0	0	1	1	0	0	1	0	0	0
		21–30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		31–40	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		41–50	0	0	1	0	0	1	0	0	0	0	0	0	0	0
		51–60	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Length - Max (MM)	1–10	0	0	0	0	1	0	0	0	0	1	0	1	1	0
		11–20	0	1	0	1	0	0	0	0	1	0	0	0	0	1
		21–30	0	0	0	0	0	0	1	1	0	0	0	0	0	0
		31–40	0	0	0	0	0	0	0	0	0	0	1	0	0	0
		41–50	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		51–60	0	0	0	0	0	1	0	0	0	0	0	0	0	0
		61–70	0	0	1	0	0	0	0	0	0	0	0	0	0	0
		71–80	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		81–90	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		91–100	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Width - Min (MM)	1–10	0	1	0	1	1	0	0	0	1	1	0	1	1	1
		11–20	0	0	0	0	0	0	1	1	0	0	1	0	0	0
		21–30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		31–40	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	41–50	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0
Width - Max (MM)	1–10	0	0	0	0	1	0	0	0	0	0	1	0	1	1	0
	11–20	0	1	0	1	0	0	0	0	1	0	0	0	0	0	1
	21–30	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
	31–40	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
	41–50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	51–60	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	61–70	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Shape	Obovoid	0	0	0	1	0	0	1	0	0	1	0	0	0	0	1
	Globose	0	1	1	0	1	0	0	1	1	0	1	1	1	1	1
	Turbinate	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	Oblong	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Ovoid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ellipsoid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sub globose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Indumentum	Hairy near ostiole	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Glabrous	0	1	1	0	1	0	1	0	1	1	1	1	1	1	0
	Pubescent	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1
	Pilose	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	Scars	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scabrous	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

		Strigose	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Puberulent	0	0	0	0	0	0	0	1	0	0	0	0	0	0
		Tomentose	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Puberulous	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Hispid	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Colour when young	Green	0	1	1	0	1	1	0	1	0	0	1	1	1	0
		Pale green	0	0	0	1	0	0	1	0	1	1	0	0	0	1
	Colour when mature	Green	0	0	0	0	0	0	1	0	0	0	0	0	0	0
		Dark green	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Pale brown	0	0	0	0	0	1	0	0	0	0	0	0	0	0
		Yellow	0	0	0	1	0	0	0	0	1	1	1	0	0	1
		Pale yellow	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Orange	0	0	0	0	0	0	0	0	1	0	0	0	0	0
		Pale red	0	0	1	0	0	0	0	0	0	0	0	0	0	0
		Red	0	0	0	0	0	1	0	1	1	0	0	0	0	0
		Purple	0	1	0	0	1	0	0	0	0	0	0	1	1	0
		White	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Grey	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Reddish brown	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ostiole	Ostiole diameter - Min (MM)	0–1.0	0	1	0	1	0	0	1	1	0	1	1	0	1	1
		1.1–2.0	0	0	0	0	1	0	0	0	1	0	0	1	0	0
		Above 2.1	0	0	1	0	0	1	0	0	0	0	0	0	0	0

	Ostiole diameter - Max (MM)	0–1.0	0	0	0	1	0	0	0	0	0	1	0	0	0	0
		1.1–2.0	0	1	0	0	0	0	1	1	1	0	1	0	1	1
		2.1–3.0	0	0	0	0	1	0	0	0	0	0	0	1	0	0
		Above 3.1	0	0	1	0	0	1	0	0	0	0	0	0	0	0
Outer bracts	Outer bracts	Present	0	1	1	1	1	1	1	1	1	1	1	1	1	1
		Absent	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Attachment	Free	0	1	1	1	1	1	1	1	1	1	1	1	1	1
		Fused	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Shape	Widely ovate	0	0	0	0	1	0	0	0	0	0	1	0	0	1
		Ovate	0	1	1	1	0	1	1	1	1	1	0	1	1	0
	Size - Min (MM)	0–1.0	0	1	0	0	1	0	0	0	0	1	1	0	1	1
		1.1–2.0	0	0	1	1	0	0	1	1	1	0	0	1	0	0
		Above 2.1	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Size - Max (MM)	0–1.0	0	1	1	0	0	0	0	0	0	0	0	0	0	0
		1.1–2.0	0	0	0	1	1	0	0	0	1	1	1	1	1	1
		2.1–3.0	0	0	1	0	0	0	0	1	0	0	0	0	0	0
		3.1–4.0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
		Above 4.1	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Indumentum	Glabrous	0	1	1	0	1	0	1	0	1	1	0	1	1	0
		Pubescent	0	0	0	1	0	1	0	1	0	0	1	0	0	1
		Pilose	0	0	0	0	0	0	0	1	0	0	0	0	0	0
		Strigose	0	0	0	0	0	0	0	0	0	0	0	0	0	0

		Scabrous	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Villose	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Puberulous	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Tomentose	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Colour	Red	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Yellow	0	0	0	1	1	0	0	1	0	0	0	1	0	0
		Brown	0	0	1	0	1	0	0	0	0	0	0	0	0	1
		Pale green	0	0	0	1	0	1	0	0	0	0	1	0	0	0
		Pale brown	0	0	0	0	1	0	1	1	0	0	0	1	1	0
		Pale yellow	0	1	0	0	0	0	0	0	1	1	0	0	0	0
Inner bracts	Inner Bracts	Present	0	1	1	1	1	1	1	1	1	1	1	1	1	1
		Absent	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Attachment	Free	0	1	1	1	1	1	1	1	1	1	1	1	1	1
		Fused	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Shape	Lanceolate	0	1	1	1	1	1	1	1	1	1	1	1	1	0
		Widely ovate	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Oblong	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Ovate	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Lanceovate	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Size - Min (MM)	0–1.0	0	1	0	1	1	0	0	0	0	1	0	1	1	1
		1.1–2.0	0	0	0	0	0	1	0	0	1	0	1	0	0	0
		2.1–3.0	0	0	0	0	0	0	1	1	0	0	0	0	0	0

		Above 3.1	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Size - Max (MM)	0–1.0	0	0	0	0	1	0	1	0	1	1	0	1	1	1
		1.1–2.0	0	1	0	1	0	0	0	0	0	0	0	0	0	0
		2.1–3.0	0	0	0	0	0	1	1	1	0	0	1	0	0	0
		Above 3.1	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Indumentum	Glabrous	0	1	1	1	1	1	1	1	1	1	1	1	1	1
		Strigose	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Scabrous	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Pubescent	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Colour	Pale brown	0	0	0	0	1	0	1	1	1	0	0	1	1	0
		Yellow	0	0	1	0	0	0	0	1	1	0	0	0	0	0
		White	0	1	0	0	0	1	0	0	0	1	1	0	0	0
		Pale yellow	0	0	0	1	0	0	0	0	0	0	0	0	0	1
		Pale red	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Brown	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Male flower	Arrangement	Near the ostiole	0	1	1	1	1	1	1	1	1	1	1	1	0	1
		Scattered	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	Size (MM)	0–1.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		1.1–2.0	1	0	0	0	1	0	0	0	0	1	0	1	1	1
		2.1–3.0	0	1	0	1	0	1	0	0	1	0	0	0	0	0
		3.1–4.0	0	0	0	0	0	0	0	1	0	0	1	0	0	0
		4.1–5.0	0	0	1	0	0	0	1	0	0	0	0	0	0	0

	Attachment	Sessile	0	0	0	0	0	1	0	0	0	0	0	1	0	0
		Pedicellate	1	1	1	1	1	0	1	1	1	1	1	0	1	1
	Pedicel length (MM)	0–0.5	0	0	0	0	1	0	0	0	1	0	0	0	0	1
		0.6–1.0	0	1	0	1	0	0	0	0	0	1	0	0	1	0
		1.1–1.5	1	0	0	0	0	0	0	0	0	0	1	0	0	0
		1.6–2.0	0	0	1	0	0	0	1	1	0	0	0	0	0	0
		Above 2.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	No. of Tepals	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0
		3	1	1	0	1	1	1	0	1	1	1	1	1	1	1
		4	0	0	0	0	0	0	1	1	1	1	1	0	0	0
		6	1	0	1	0	0	0	0	0	0	0	0	0	0	0
	Tepal attachment	Free	1	1	0	0	1	1	1	1	1	1	1	1	0	1
		Fused	0	0	1	1	0	0	0	0	0	0	0	0	1	0
	Tepal length (MM)	0–1.0	0	0	0	0	1	0	0	0	0	0	0	0	1	1
		1.1–2.0	1	1	0	1	0	0	0	1	1	1	0	1	0	0
		2.1–3.0	0	0	1	0	0	1	1	0	0	0	1	0	0	0
		3.1–4.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		4.1–5.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tepal shape	Lanceolate	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		Ovate	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tepal indumentum	Glabrous	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		Pubescent	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	Tepal colour	Yellow	0	0	0	1	0	0	0	1	1	0	0	0	0	0
		Pale Brown	0	0	0	0	0	0	1	1	0	0	1	0	0	0
		Pale yellow	1	1	0	0	1	1	0	0	0	0	0	1	1	0
		White	0	1	0	1	1	0	0	0	1	1	0	0	0	1
		Pale red	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Stamen number	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1
		2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		3 and more	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Anther length (MM)	0–0.5	0	0	0	0	0	0	0	1	1	0	0	0	1	0
		0.6–1.0	1	1	0	0	1	0	0	0	0	1	0	1	0	1
		1.1–1.5	0	0	1	1	0	0	0	0	0	0	1	0	0	0
		1.6–2.0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
		2.1–2.5	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	Filament length (MM)	0–0.5	1	0	1	0	0	0	0	1	0	1	0	0	0	1
		0.6–1.0	0	1	0	1	1	1	0	0	1	0	1	0	1	0
		1.1–1.5	0	0	0	0	0	0	1	0	0	0	0	1	0	0
Female flower	Arrangement	Scattered	0	0	1	0	0	0	0	1	0	1	0	0	0	1
		At the base	0	1	0	1	1	1	1	0	1	0	1	1	1	0
	Size (MM)	0–1.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		1.1–2.0	0	0	0	0	1	0	0	0	1	1	0	1	1	0
		2.1–3.0	0	1	0	1	0	0	0	0	0	0	1	0	0	1
		3.1–4.0	0	0	1	0	0	1	1	1	0	0	0	0	0	0

	4.1–5.0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	5.1–6.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Attachment	Sessile	0	1	0	1	1	1	1	1	0	1	1	1	1	1	1	1	1
	Pedicellate	1	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Pedicel length (MM)	0–0.5	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	0.6–1.0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1.1–1.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1.6–2.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2.1 -2.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2.6–3.0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
No. of Tepals	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3	0	1	0	1	1	1	1	0	1	1	0	1	1	1	1	1	1
	4	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0
	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	6	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tepal attachment	Free	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Fused	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tepal length (MM)	0–1.0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1
	1.1–2.0	0	1	1	1	0	0	0	0	1	1	1	0	1	0	1	0	0
	2.1–3.0	0	0	0	0	0	1	1	0	0	0	0	1	0	0	0	0	0
	3.1–4.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tepal shape	Lanceolate	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Tepal indumentum	**Glabrous**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
	Pubescent	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Tepal colour	**Pale yellow**	**0**	**1**	**0**	**0**	**1**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**0**
	Pale brown	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**0**	**1**	**0**	**0**	**0**	**0**
	Pale red	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	White	**0**	**1**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**1**
	Yellow	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Stigma length (MM)	**0–0.5**	**0**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
	0.6–1.0	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Style length (MM)	**0–0.5**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**
	0.6–1.0	**1**	**1**	**1**	**1**	**1**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**1**	**1**
	1.1–1.5	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	1.6–2.0	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**
Ovary length (MM)	**0–1.0**	**1**	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**1**	**1**	**1**	**1**	**1**	**0**
	1.1–2.0	**0**	**1**	**1**	**0**	**0**	**1**	**1**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**1**
	2.1–3.0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	3.1–4.0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Ovary shape	**Obovoid**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
	Ovoid	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	Globose	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Ovary indumentum	**Glabrous**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Ovary colour	**Pale brown**	**0**	**0**	**1**	**1**	**0**	**0**	**1**	**1**	**1**	**0**	**1**	**0**	**0**	**0**	**1**

		Pale yellow	1	0	0	0	1	1	0	0	0	0	0	1	1	0
		White	0	1	0	0	0	0	0	0	0	1	0	0	0	0
		Yellow	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Gall flower	Arrangement	Scattered	0	1	1	1	1	1	1	1	1	1	1	1	1	1
	Size (MM)	0–1.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		1.1–2.0	0	0	0	0	1	0	0	0	1	1	0	1	1	0
		2.1–3.0	0	1	0	0	0	0	1	0	0	0	0	0	0	1
		3.1–4.0	0	0	0	1	0	1	0	1	0	0	1	0	0	0
		4.1–5.0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Attachment	Sessile	0	1	0	1	0	0	0	0	1	1	0	1	0	0
		Pedicellate	0	0	1	0	1	1	1	1	0	0	1	0	1	1
	Pedicel length (MM)	0–0.5	0	0	0	0	1	0	1	0	0	0	0	0	1	0
		0.6–1.0	0	0	0	0	0	1	0	0	0	0	0	1	0	0
		1.1–1.5	0	0	0	0	0	0	0	0	0	0	1	0	0	1
		1.6–2.0	0	0	1	0	0	0	0	1	0	0	0	0	0	0
		2.1 -2.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	No. of Tepals	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0
		3	0	1	0	1	1	1	0	1	1	0	0	1	1	1
		4	0	0	0	0	0	0	1	1	0	1	1	0	0	0
		6	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Tepal attachment	Free	0	1	0	1	1	1	1	1	1	1	1	1	1	1
		Fused	0	0	1	0	0	0	0	0	0	0	0	0	0	0

	Tepal length (MM)	0–1.0	0	0	0	0	1	0	0	0	0	0	0	1	1	1
		1.1–2.0	0	1	0	1	0	0	0	1	1	1	0	0	0	0
		2.1–3.0	0	1	1	0	0	1	1	0	0	0	0	0	0	0
		3.1–4.0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
	Tepal shape	Lanceolate	0	1	1	1	1	1	1	1	1	1	1	1	1	1
	Tepal indumentum	Glabrous	0	1	1	1	1	1	1	1	1	1	1	1	0	1
		Pubescent	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tepal colour	Pale yellow	0		0	0	1	1	0	1	0	0	0	1	1	0
		White	0	0	0	1	1	0	0	0	0	1	0	0	0	1
		Pale brown	0	1	0	0	0	0	1	0	1	0	1	0	0	0
		Yellow	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Pale red	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Stigma nature	Short	0	0	1	1	1	1	1	1	1	0	1	1	1	1
	Stigma length (MM)	0–0.5	0	0	0	1	1	1	1	1	1	1	0	1	1	1
		0.6–1.0	0	1	1	0	0	0	0	0	0	0	0	0	0	0
	Style size (MM)	0–0.5	0	1	0	0	1	0	1	1	1	1	1	1	1	1
		0.6–1.0	0	0	1	1	0	1	0	0	0	0	0	0	0	0
		1.1–1.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ovary size (MM)	0–1.0	0	0	0	0	0	0	0	0	1	1	0	1	1	0
		1.1–2.0	0	1	1	1	1	1	1	1	0	0	1	0	0	1
		2.1–3.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		3.1–4.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	Ovary shape	Obovoid	0	1	1	1	1	1	1	1	1	1	1	1	1	1
		Globose	0	0	0	0	0	0	0	0	0	0	1	0	0	0
	Ovary indumentum	Glabrous	0	1	1	1	1	1	1	1	1	1	1	1	1	1
	Ovary colour	White	0	0	0	0	0	0	0	0	0	1	0	0	0	0
		Pale brown	0	1	0	1	0	1	1	0	0	0	1	1	0	1
		Pale yellow	0	0	0	0	1	0	0	0	0	0	0	0	1	0
		Yellow	0	0	1	0	0	0	0	1	1	0	0	0	0	0
Achenes	Size - Min (MM)	0–1.0	0	1	1	1	1	1	1	1	1	1	1	1	1	1
		1.1–2.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Size - Max (MM)	0–1.0	0	1	1	0	1	0	0	0	0	1	0	1	1	0
		1.1–2.0	0	0	0	1	0	1	1	1	1	0	1	0	0	1
	Shape	Obovoid	0	0	1	0	0	0	1	0	0	1	0	0	0	0
		Widely ovate	0	1	0	0	0	0	0	0	0	0	0	0	0	0
		Ovoid	0	0	0	1	1	1	0	1	1	0	0	1	1	1
		Trigonous	0	0	0	0	0	0	0	1	0	0	0	0	0	0
		Oblong	0	0	0	0	0	0	0	0	0	0	1	0	0	0
		Ellipsoid	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Globose	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Colour	Pale brown	0	1	1	0	0	0	0	0	0	0	0	1	0	0
		red	0	0	0	0	0	0	0	1	0	0	0	0	0	0
		Brown	0	0	0	0	0	0	0	1	0	0	0	0	0	1
		Pale yellow	0	0	0	1	1	1	1	0	1	1	1	0	1	0
		White	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Character		Character State	*F. drupacea*	*F. elastica*	*F. exasperata*	*F. fergusonii*	*F. guttata*	*F. heterophylla*	*F. hispida*	*F. krishnae*	*F. microcarpa*	*F. middletonii*	*F. mollis*	*F. nervosa*	*F. pumila*	*F. racemosa*	*F. religiosa*
General	Habit	Tree	1	1	1	1	0	0	1	1	1	1	1	1	0	1	1
		Shrub	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
		Climber	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0
	Height (M)	Below 3	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0
		3–10	0	0	1	0	1	0	1	0	0	0	1	0	0	0	0
		10–15	0	1	0	0	0	0	0	1	0	1	0	0	0	0	0
		15–25	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0
		25–35	1	0	0	0	0	0	0	0	0	0	0	1	0	1	1
		Above 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Life form	Independent	1	1	1	1	0	1	1	1	0	1	1	1	0	1	0
		Epiphytic	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0
		Lithophytic	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0
		Hemi epiphytic	1	0	0	1	0	0	0	1	1	1	0	0	0	0	1
	Aerial roots	Present	1	1	0	1	0	0	0	1	1	0	1	0	0	0	0
		Absent	0	0	1	0	1	1	1	0	0	1	0	1	1	1	1
Bark	Type	Smooth	1	0	1	0	0	0	0	1	0	1	1	0	0	0	0
		Lenticellate	1	1	0	1	1	1	1	1	1	0	0	1	1	1	1

	Colour	White	1	0	1	0	0	0	0	0	1	1	1	0	0	0	0
		Pale yellow	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
		Black	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
		Brown	0	1	0	0	1	0	1	0	0	0	0	1	1	0	0
		Pale brown	1	0	1	1	0	1	0	1	1	0	0	0	0	1	1
Young twigs	Shape	Terete	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Core	Solid	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1
		Hollow	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Colour	Pale brown	1	0	0	0	0	0	0	0	1	1	1	1	1	1	0
		Brown	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0
		Green	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Pale green	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
		Pale red	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	Indumentum	Pubescent	1	0	0	0	1	0	0	1	0	1	0	0	0	0	0
		Glabrous	0	1	0	1	0	0	0	1	1	0	0	0	0	1	1
		Puberulent	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
		Scabrous	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0
		Tomentulose	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
		Strigose	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
		Tomentose	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0
		Puberulous	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Inter node	Length - Min (CM)	0–1.0	1	0	1	1	0	1	0	0	1	1	1	0	1	0	0

		1.1–2.0	0	1	0	0	0	0	1	1	0	0	0	0	0	1	1
		2.1–3.0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0
	Length - Max (CM)	0 -1.0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
		1.1–2.0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0
		2.1 -3.0	1	0	0	0	1	0	0	1	0	0	0	0	1	0	0
		3.1–4.0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
		4.1–5.0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0
		Above 5.1 cm	0	0	0	0	0	1	1	0	0	0	1	0	0	0	1
Latex	Nature	Milky	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		Watery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Colour	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		Yellow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Brown	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stipule	Nature	Caducous	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1
		Persistent	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
	Shape	Ovate	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0
		Widely ovate	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Lanceolate	0	1	1	0	0	1	1	0	1	1	1	1	1	1	1
		Lanceovate	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Length - Min (CM)	0 -1.0	1	0	1	0	0	1	0	0	1	1	0	1	1	1	0
		1.1–2.0	0	1	0	1	1	0	1	0	0	0	0	0	0	0	0
		2.1 -3.0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	1

		3.1–4.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		4.1–5.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Above 5.1 cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Length - Max (CM)	0 -1.0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0
		1.1–2.0	1	0	0	0	0	1	0	0	0	1	0	0	1	0	0
		2.1 -3.0	0	0	0	1	1	0	0	0	0	0	0	1	0	1	0
		3.1–4.0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
		4.1–5.0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
		Above 5.1 cm	0	1	0	0	0	0	0	1	0	0	0	0	0	0	1
	Width - Min (CM)	0–0.5	1	1	1	0	1	1	0	0	1	1	0	1	0	1	1
		0.6–1.0	0	0	0	1	0	0	1	1	0	0	0	0	1	0	0
		1.1–1.5	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	Width - Max (CM)	0–0.5	0	0	1	0	0	1	0	0	1	0	0	0	0	0	1
		0.6–1.0	1	0	0	0	0	0	0	0	0	1	0	0	1	1	0
		1.1–1.5	0	1	0	1	1	0	1	1	0	0	0	1	0	0	0
		1.6–2.0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	Margins	Entire	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Apex	Narrowly acute	1	0	0	1	0	0	0	0	0	1	0	1	0	1	0
		Acute	0	1	1	0	1	1	1	1	1	0	1	0	1	0	1
	Base	Truncate	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Indumentum	Glabrous	0	1	0	0	0	1	0	0	1	0	0	0	1	1	1
		Pubescent	0	0	0	0	1	0	0	1	0	1	0	0	0	0	0

		Puberulent	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
		Tomentose	1	0	0	0	0	0	0	0	0	0	1	0	1	0	0
		Strigose	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0
		Sericeous	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Strigulose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Puberulous	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0
	Colour	Red	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Green	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0
		Yellow	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
		Pale red	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
		Pale green	0	0	0	0	0	1	1	1	1	1	0	0	0	1	1
		Brown	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0
		Purple	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
		Pale brown	0	0	1	0	0	0	0	0	0	0	1	1	1	0	0
Petiole	Attachment	Articulated	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		Not articulated	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Shape	Canaliculate	1	0	0	1	0	0	0	1	1	1	1	0	1	1	0
		Terete	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		Sub terete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Angular	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Length - Min (CM)	0–2.0	1	1	1	1	1	1	1	0	1	0	1	1	1	0	0
		2.1–4.0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0

		4.1–6.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
		6.1–8.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		8.1–10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Length - Max (CM)	0–2.0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0
		2.1–4.0	1	0	1	0	1	1	0	0	0	0	0	1	0	0	0
		4.1–6.0	0	1	0	0	0	0	0	0	0	0	1	0	0	1	0
		6.1–8.0	0	0	0	1	0	0	0	1	0	1	0	0	0	0	0
		8.1–10.0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
		10.1–12.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		12.1–14.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Above 14.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Indumentum	Glabrous	1	1	0	1	0	0	0	0	1	1	1	0	1	1	1
		Pubescent	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0
		Tomentose	1	0	0	0	1	0	0	0	0	0	1	0	0	0	0
		Puberulent	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Scabrous	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
		Strigose	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0
		Hispid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Puberulous	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	Colour	Green	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
		Pale red	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
		Pale green	0	1	1	1	0	0	0	1	1	1	0	0	0	0	1

		Pale brown	1	0	1	0	0	1	0	0	0	0	1	1	1	1	0
		Brown	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Leaf	Type	Simple	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		Compound	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Arrangement	Alternate	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1
		Opposite	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
		Spiral	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1
		Decussate	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Leafy appendages	Present	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
		Absent	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1
	Symmetry	Symmetric	1	1	1	1	1	0	1	1	1	1	1	1	0	1	1
		Asymmetric	0	0	1	0	0	1	0	0	0	0	0	0	1	0	0
	Shape	Ovate	0	1	0	0	0	0	0	1	1	1	1	0	1	0	1
		Widley ovate	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1
		Lanceolate	0	0	0	0	0	1	0	0	0	0	0	1	0	1	0
		Round	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Elliptic	1	0	1	1	0	0	1	1	1	0	1	0	0	0	0
		Lance ovate	0	1	1	1	0	1	1	0	1	0	0	0	1	1	0
		Oblong	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Obovate	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Lobed	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0
		Widely elliptic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	Length – Min (CM)	0–5.0	0	0	1	0	0	0	0	0	1	0	0	0	1	0	0
		5.1–10.0	0	0	0	1	1	0	0	1	0	1	1	1	0	1	1
		10.1–15.0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0
		15.1–20.0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
		20.1–25.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		25.1–30.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		30.1–35.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		35.1–40.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Length – Max (CM)	0–5.0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
		5.1–10.0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0
		10.1–15.0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0
		15.1–20.0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	1
		20.1–25.0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0
		25.1–30.0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		30.1–35.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		35.1–40.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Above 40.1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Width – Min (CM)	0–5.0	0	0	1	1	0	1	0	0	1	1	1	0	1	1	1
		5.1–10.0	1	1	0	0	1	0	1	1	0	0	0	1	0	0	0
		10.1–15.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		15.1–20.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		20.1–25.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	25.1–30.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	30.1–35.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	35.1- 40.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Width – Max (CM)	0–5.0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
	5.1–10.0	0	0	1	0	1	1	0	1	0	1	0	1	1	1	0	1	0	0
	10.1–15.0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	15.1–20.0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	20.1–25.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	25.1–30.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	30.1–35.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	35.1–40.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Margins	Entire	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1
	Undulate	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Serrate	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0
	Dendate	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Denticulate	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apex	Acute	0	0	1	1	1	0	0	0	0	0	1	1	0	0	0	1	0	0
	Acuminate	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	1	1
	Cuspidate	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Obtuse	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1	0	0	0
	Rounded	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Caudate	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	Base	Obtuse	0	1	1	1	0	0	1	0	1	1	0	1	0	1	0
		Rounded	1	1	0	0	0	1	0	0	0	1	0	0	0	0	0
		Cordate	1	0	0	0	1	0	0	0	0	0	1	0	1	0	1
		Cuneate	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
		Sub cordate	0	0	0	0	1	1	0	0	0	0	1	0	0	0	0
		Oblique	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Attenuate	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Truncate	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
		Acute	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	Acumen length – Min (CM)	0	0	1	0	1	0	0	0	1	1	1	1	0	1	0	0
		0.6–1.0	0	0	1	0	0	1	1	0	0	0	0	1	0	0	1
		1.1–1.5	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
		1.6–2.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Above 2.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Acumen length – Max (CM)	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	0
		0.6–1.0	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0
		1.1–1.5	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
		1.6–2.0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
		Above 2.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Indumentum	Glabrous	1	1	0	1	1	0	0	1	1	1	0	1	1	1	1
		Pubescent	1	0	0	0	1	0	0	0	0	0	1	1	1	0	0
		Puberulous	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0

	Tomentose	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	Scabrous	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Puberulent	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Strigose	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Villous	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pilose	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Hirtellous	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hispid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Colour when young	**Red**	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0
	Pale red	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
	Pale green	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Purple	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Brown	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Colour when mature	**Dark green**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Green	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Texture	**Coriaceous**	1	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0
	Sub coriaceous	0	0	0	1	1	0	0	1	0	0	1	0	1	1	1	1	1	1
	Chartaceous	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0
No. of Veins – Min	**1 or 2**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3 or 4	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	0	0	0
	5 or 6	0	0	0	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0
	7 or 8	1	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1

		9 or 10	0	0	0	1	0	0	0	0	0	0	0	1	0	1	0
		11 or 12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		13 or 14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Numerous	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0
	No. of Veins–Max	1 or 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		3 or 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		5 or 6	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0
		7 or 8	0	0	1	0	0	1	1	1	0	0	1	0	0	0	0
		9 or 10	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
		11 or 12	0	0	0	1	0	0	0	0	0	0	0	1	0	1	0
		13 or 14	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Above 14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Numerous	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0
Waxy Glands	Position	At the base of the midrib beneath	1	1	0	1	0	0	0	1	1	1	1	0	0	0	1
		Two in the axils of the lateral nerves	0	0	1	0	1	1	1	0	0	0	0	1	1	1	0
		Absent	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Inflorescence	Hypanthodium	Present	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		Absent	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Position	Axillary	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1

		Cauliflorous	0	0	0	0	1	0	1	0	0	0	0	0	0	1	0
Clustering		**Solitary**	1	0	1	1	0	1	1	0	0	0	0	0	1	1	1
		Paired	1	1	0	1	0	0	0	1	0	1	0	1	0	0	1
		Clustered	0	0	0	0	1	0	1	0	1	0	1	0	0	1	0
Sexuality		**Monoecious**	1	1	0	1	0	0	0	1	1	1	1	1	0	1	1
		Dioecious	0	0	1	0	1	1	1	0	0	0	0	0	1	0	0
Peduncle		**Present**	0	0	1	0	1	1	1	0	0	1	0	1	1	1	0
		Absent	1	1	0	1	0	0	0	1	1	0	1	0	0	0	1
Peduncle	**Length – Min (MM)**	**01–10.**	0	0	1	0	0	1	1	0	0	0	0	0	0	1	0
		11–20.	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0
		21–30	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
		31–40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Length – Max (MM)	**01–10.**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		11–20.	0	0	1	0	0	1	1	0	0	0	0	0	0	1	0
		21–30	0	0	0	0	1	0	0	0	0	1	0	1	1	0	0
		31–40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Above 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Shape	**Terete**	0	0	1	0	1	1	1	0	0	1	0	1	1	1	0
		Angular	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Indumentum	**Glabrous**	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0
		Pubescent	0	0	0	0	0	1	0	0	0	1	0	0	1	0	0
		Pilose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

		Scars	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Scabrous	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
		Strigose	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
		Puberulent	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Villous	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Puberulous	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
		Strigulose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Colour	Yellow	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
		Pale green	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Green	0	0	1	0	0	1	1	0	0	1	0	0	1	0	0
		Pale brown	0	0	0	0	1	1	0	0	0	0	0	1	0	1	0
Basal bracts	Basal bract	Present	1	1	0	1	1	0	1	1	1	1	1	0	1	1	1
		Absent	0	0	1	0	0	1	0	0	0	0	0	1	0	0	0
	Attachment	Persistent	1	1	0	1	1	0	1	1	1	1	1	0	1	0	1
		Caducous	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	Length – Min (MM)	0–1.0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0
		1.1–2.0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0
		2.1–3.0	0	0	0	1	0	0	1	0	0	0	1	0	0	1	0
		3.1–4.0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
		Above 4.1	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0
	Length – Max (MM)	0–1.0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0
		1.1–2.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

		2.1–3.0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
		3.1–4.0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	1
		Above 4.1	1	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	0
	Shape	Ovate	0	1	0	1	0	0	0	0	0	1	0	0	0	1	0	0	0
		Widely ovate	1	0	0	0	1	0	1	1	1	0	1	0	0	0	1	1	1
	Indumentum	Glabrous	0	1	0	1	0	0	0	1	1	0	0	0	0	1	0	1	1
		Pubescent	1	0	0	0	1	0	0	0	1	0	1	0	0	0	1	0	0
		Hispid	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
		Puberulous	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0
		Tomentose	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
		Sericeous	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
	Colour	Pale Brown	1	0	0	1	1	0	0	1	1	1	1	0	1	1	0	1	1
		Green	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Yellow	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0
		Purple	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Brown	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Pale green	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Syconium	Length – Min (MM)	1–10	0	1	0	1	0	0	1	0	1	1	1	1	0	0	0	0	1
		11–20	0	0	1	0	0	1	0	1	0	0	0	0	1	0	1	0	0
		21–30	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
		31–40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		41–50	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0

Length – Max (MM)	**51–60**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1–10	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
	11–20	0	1	0	1	0	0	0	1	0	1	0	1	0	0	0	1	0	0	1
	21–30	1	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	31–40	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	41–50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	51–60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	61–70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	71–80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	81–90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	91–100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Width – Min (MM)	**1–10**	0	1	0	1	0	0	1	0	1	0	1	1	0	0	0	0	0	1	1
	11–20	0	0	1	0	0	1	0	1	0	1	0	0	1	0	1	0	1	0	0
	21–30	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	31–40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
	41–50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Width – Max (MM)	**1–10**	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
	11–20	0	1	0	1	0	0	0	1	0	1	0	1	0	0	0	1	0	0	1
	21–30	1	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	31–40	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0
	41–50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	51–60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	61–70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shape	Obovoid	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	Globose	0	0	1	1	1	0	1	1	1	1	1	1	1	1	1	0	1	1	0	1
	Turbinate	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	Oblong	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ovoid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ellipsoid	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sub globose	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Indumentum	Hairy near ostiole	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Glabrous	1	1	0	0	0	1	0	0	1	1	0	1	1	0	1	0	0	1	0	1
	Pubescent	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	1	0	1	0
	Pilose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scars	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Scabrous	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Strigose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Puberulent	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
	Tomentose	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Puberulous	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Hispid	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Colour when young	Green	0	0	1	1	1	0	1	1	0	0	0	0	0	0	1	0	1	1	0	0
	Pale green	1	1	0	0	0	1	0	0	1	1	1	1	1	1	0	1	0	0	1	1

	Colour when mature	Green	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Dark green	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Pale brown	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
		Yellow	0	0	0	0	0	1	1	0	1	0	0	1	0	0	0
		Pale yellow	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0
		Orange	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0
		Pale red	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Red	1	0	1	1	1	0	0	1	0	0	0	0	0	1	0
		Purple	0	1	0	0	0	1	0	0	0	0	0	1	0	0	0
		White	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Grey	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Reddish brown	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Ostiole	Ostiole diameter – Min (MM)	0–1.0	0	1	1	1	0	1	1	1	1	0	1	1	0	0	1
		1.1–2.0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0
		Above 2.1	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0
	Ostiole diameter – Max (MM)	0–1.0	0	1	1	1	0	0	1	0	1	0	1	0	0	0	0
		1.1–2.0	0	0	0	0	0	1	0	1	0	0	0	1	0	0	1
		2.1–3.0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0
		Above 3.1	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0
Outer bracts	Outer bracts	Present	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		Absent	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Attachment	Free	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

		Fused	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Shape	**Widely ovate**	1	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	1
		Ovate	0	1	1	1	0	1	0	1	1	0	1	1	1	1	0	0	0
	Size – Min (MM)	**0–1.0**	1	0	1	1	0	1	0	0	0	0	1	0	0	0	0	0	0
		1.1–2.0	0	0	0	0	0	0	0	1	1	0	1	1	1	1	1	1	1
		Above 2.1	0	1	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0
	Size – Max (MM)	**0–1.0**	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		1.1–2.0	1	0	0	1	0	1	0	1	1	1	1	1	1	1	0	1	1
		2.1–3.0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0
		3.1–4.0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Above 4.1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Indumentum	**Glabrous**	1	1	0	1	0	0	1	1	1	1	1	0	1	0	0	0	1
		Pubescent	0	0	0	0	1	0	0	0	0	0	0	1	0	1	1	1	0
		Pilose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Strigose	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Scabrous	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
		Villose	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
		Puberulous	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
		Tomentose	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
	Colour	**Red**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Yellow	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
		Brown	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

		Pale green	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Pale brown	1	0	1	0	1	1	1	0	1	1	1	1	1	1	1
		Pale yellow	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0
Inner bracts	Inner bracts	Present	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		Absent	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Attachment	Free	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1
		Fused	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Shape	Lanceolate	1	0	1	1	1	0	1	1	0	0	0	1	1	1	1
		Widely ovate	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
		Oblong	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
		Ovate	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
		Lanceovate	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0
	Size – Min (MM)	0–1.0	0	1	0	0	0	0	0	0	1	0	1	1	0	0	1
		1.1–2.0	0	0	1	1	0	1	0	1	0	1	0	0	0	0	0
		2.1–3.0	1	0	0	0	1	0	1	0	0	0	0	0	1	1	0
		Above 3.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Size – Max (MM)	0–1.0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1
		1.1–2.0	0	1	1	1	0	1	0	1	0	1	0	1	0	0	0
		2.1–3.0	1	0	0	0	1	0	1	0	0	0	0	0	0	1	0
		Above 3.1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	Indumentum	Glabrous	1	1	0	1	1	0	1	1	1	1	1	1	1	1	1
		Strigose	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0

		Scabrous	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Pubescent	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	Colour	Pale brown	1	1	0	1	0	0	0	0	1	1	1	0	0	0	1
		Yellow	1	0	0	1	0	1	0	0	1	0	0	0	0	0	0
		White	0	0	1	0	0	0	1	0	0	1	0	0	1	1	0
		Pale yellow	0	0	1	0	1	0	1	1	0	0	0	0	0	0	0
		Pale red	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Brown	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Male flower	Arrangement	Near the ostiole	0	1	1	0	1	1	1	0	1	1	1	1	1	1	1
		Scattered	1	0	0	1	0	0	0	1	1	0	0	0	0	0	0
	Size (MM)	0–1.0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1
		1.1–2.0	0	0	1	0	1	0	0	0	1	0	0	0	1	0	0
		2.1–3.0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
		3.1–4.0	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0
		4.1–5.0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	0
	Attachment	Sessile	0	1	0	0	1	0	0	0	0	1	0	0	0	0	1
		Pedicellate	1	0	1	1	0	1	1	1	1	0	1	1	1	1	0
	Pedicel length (MM)	0–0.5	0	0	1	0	0	0	0	0	1	0	1	0	1	0	0
		0.6–1.0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
		1.1–1.5	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0
		1.6–2.0	1	0	0	0	0	1	0	0	0	0	0	0	0	1	0
		Above 2.1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0

No. of Tepals	**2**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3	1	1	1	1	0	1	1	1	1	1	1	0	1	1	1	1	1	0
	4	1	1	0	1	1	1	0	1	0	1	0	1	1	1	1	1	1	1
	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tepal attachment	**Free**	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1
	Fused	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tepal length (MM)	**0–1.0**	0	0	0	0	0	0	0	0	1	0	1	1	1	1	0	0	0	1
	1.1–2.0	1	1	1	1	1	0	0	0	0	1	0	0	0	0	1	0	0	0
	2.1–3.0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0
	3.1–4.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	4.1–5.0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Tepal shape	**Lanceolate**	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Ovate	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tepal indumentum	**Glabrous**	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Pubescent	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tepal colour	**Yellow**	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1
	Pale brown	1	1	0	1	1	0	0	0	0	0	0	1	1	1	1	0	1	1
	Pale yellow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	White	0	0	1	0	0	1	1	1	1	1	1	1	0	0	1	0	0	0
	Pale red	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stamen number	**1**	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1
	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0

		3 and more	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Anther length (MM)	0–0.5	1	0	0	0	0	0	1	0	1	0	0	0	0	0	1
		0.6–1.0	0	0	1	0	0	0	0	1	0	1	1	0	1	0	0
		1.1–1.5	0	1	0	0	1	0	0	0	0	0	0	1	0	0	0
		1.6–2.0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	0
		2.1–2.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Filament length (MM)	0–0.5	1	0	1	1	1	0	1	1	1	1	1	0	1	0	1
		0.6–1.0	0	0	0	0	0	1	0	0	0	0	0	1	0	1	0
		1.1–1.5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Female flower	Arrangement	Scattered	1	1	0	1	1	1	1	1	1	1	0	0	1	1	1
		At the base	0	0	1	0	0	0	0	0	0	0	1	1	0	0	0
	Size (MM)	0–1.0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
		1.1–2.0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
		2.1–3.0	0	1	0	1	1	0	1	0	1	0	0	0	0	0	1
		3.1–4.0	1	0	0	0	0	1	0	1	0	0	0	1	0	0	0
		4.1–5.0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
		5.1–6.0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Attachment	Sessile	0	1	0	1	0	0	0	0	1	1	1	0	1	0	1
		Pedicellate	1	0	1	0	1	1	1	1	0	0	0	1	0	1	0
	Pedicel length (MM)	0–0.5	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
		0.6–1.0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
		1.1–1.5	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0

		1.6–2.0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
		2.1–2.5	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
		2.6–3.0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	No. of Tepals	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		3	1	0	0	1	0	0	1	1	0	0	1	1	1	1	0
		4	1	1	0	1	0	0	0	1	1	1	0	0	1	0	1
		5	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
		6	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0
	Tepal attachment	Free	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1
		Fused	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	Tepal length (MM)	0–1.0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
		1.1–2.0	1	1	1	1	1	1	0	1	1	1	0	0	1	0	1
		2.1–3.0	0	0	0	0	0	0	1	0	0	0	0	1	0	1	0
		3.1–4.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tepal shape	Lanceolate	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Tepal indumentum	Glabrous	1	1	0	1	1	1	1	1	1	1	1	0	1	1	1
		Pubescent	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Tepal colour	Pale yellow	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
		Pale brown	1	1	0	1	0	0	0	1	0	1	0	1	0	1	0
		Pale red	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
		White	0	0	1	0	0	1	1	0	1	1	0	0	1	0	1
		Yellow	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0

	Stigma length (MM)	0–0.5	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1
		0.6–1.0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
	Style length (MM)	0–0.5	1	0	1	0	0	1	0	0	0	0	1	0	1	0	0
		0.6–1.0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	1
		1.1–1.5	0	1	0	1	1	0	0	1	1	0	0	0	0	1	0
		1.6–2.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ovary length (MM)	0–1.0	0	0	0	1	0	0	1	1	1	1	1	0	1	0	0
		1.1–2.0	1	1	1	0	1	1	0	0	0	0	0	1	0	1	1
		2.1–3.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		3.1–4.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ovary shape	Obovoid	1	1	1	0	1	0	1	0	0	1	1	1	1	1	1
		Ovoid	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0
		Globose	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
	Ovary indumentum	Glabrous	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Ovary colour	Pale Brown	1	1	0	0	1	1	1	1	0	1	1	1	1	1	1
		Pale yellow	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
		White	0	0	1	0	0	0	0	0	1	1	0	0	0	0	0
		Yellow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gall flower	Arrangement	Scattered	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Size (MM)	0–1.0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0
		1.1–2.0	0	1	0	0	0	1	0	0	1	1	0	0	0	0	0
		2.1–3.0	1	0	0	1	0	0	0	0	0	0	0	1	0	0	1

	3.1–4.0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	4.1–5.0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	1	0
Attachment	Sessile	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
	Pedicellate	1	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1
Pedicel length (MM)	0–0.5	0	0	0	0	0	0	0	0	1	0	1	0	1	0	1	1	0	0
	0.6–1.0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1
	1.1–1.5	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	1.6–2.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	2.1–2.5	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0
No. of Tepals	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3	1	0	0	1	0	0	1	1	1	0	0	0	0	1	1	1	1	1
	4	1	1	0	0	0	1	0	0	1	1	1	1	1	1	1	0	1	1
	6	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Tepal attachment	Free	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Fused	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tepal length (MM)	0–1.0	0	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1
	1.1–2.0	1	0	1	1	0	1	0	1	0	1	0	1	0	0	1	0	0	0
	2.1–3.0	0	0	0	0	1	0	1	0	0	0	0	0	0	1	0	1	0	0
	3.1–4.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tepal shape	Lanceolate	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Tepal indumentum	Glabrous	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Pubescent	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Tepal colour	**Pale yellow**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	White	0	0	1	0	0	1	1	0	0	1	0	0	0	1	0	0	0	0
	Pale brown	1	1	0	0	0	0	0	0	0	1	1	1	1	0	1	1	1	1
	Yellow	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	1	0	0
	Pale red	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Stigma nature	**Short**	1	0	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1
Stigma length (MM)	**0–0.5**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	0.6–1.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Style size (MM)	**0–0.5**	1	1	1	0	1	1	1	0	1	1	1	1	1	1	1	1	1	1
	0.6–1.0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1.1–1.5	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Ovary size (MM)	**0–1.0**	0	0	0	0	0	0	0	1	1	1	1	0	1	1	0	1	0	0
	1.1–2.0	1	1	1	1	1	1	1	0	0	0	0	0	1	0	1	0	1	1
	2.1–3.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3.1–4.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ovary shape	**Obovoid**	1	1	1	1	0	1	1	1	1	1	1	0	1	1	1	1	1	1
	Globose	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0
Ovary indumentum	**Glabrous**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Ovary colour	**White**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pale brown	0	1	1	0	0	1	1	0	1	1	1	1	1	1	1	1	0	1
	Pale yellow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Yellow	1	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	1	0

Achenes	Size – Min (MM)	0–1.0	0	0	1	1	1	1	1	1	1	0	1	1	1	1	1
		1.1–2.0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0
	Size – Max (MM)	0–1.0	0	0	0	0	1	0	0	1	0	0	1	1	0	0	0
		1.1–2.0	1	1	1	1	0	1	1	0	1	1	0	0	1	1	1
	Shape	Obovoid	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0
		Widely ovate	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Ovoid	1	0	0	1	0	0	1	1	0	1	1	1	0	1	1
		Trigonous	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
		Oblong	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
		Ellipsoid	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
		Globose	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	Colour	Pale brown	1	1	0	0	1	1	0	0	0	1	0	0	1	0	1
		Red	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Brown	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
		Pale yellow	0	0	1	0	0	0	0	1	1	0	1	0	0	0	0
		White	0	0	0	1	0	0	0	0	1	0	0	1	0	1	0

Character		Character State	*F. superba*	*F. talbotii*	*F. tinctoria* subsp. *gibbosa*	*F. tinctoria* subsp. *parasitica*	*F. travancorica*	*F. tsjakela*	*F. virens* var. *virens*	*F. virens* var. *dispersa*	*F. virens* var. *matthewii*
General	Habit	Tree	1	1	1	1	0	1	1	1	1
		Shrub	0	0	0	0	1	0	0	0	0
		Climber	0	0	0	0	1	0	0	0	0
	Height (M)	Below 3	0	0	0	0	0	0	0	0	0
		3–10	0	0	1	0	1	0	0	0	0
		10–15	0	1	0	1	0	0	0	1	0
		15–25	0	0	0	0	0	1	0	0	0
		25–35	1	0	0	0	0	0	1	0	1
		Above 35	0	0	0	0	0	0	0	0	0
	Life form	Independent	0	0	0	0	0	0	1	0	1
		Epiphytic	1	1	1	1	1	1	0	0	0
		Lithophytic	0	0	1	0	0	0	0	0	0
		Hemi epiphytic	0	0	0	0	0	0	1	1	1

	Aerial roots	Present	0	0	0	1	1	0	0	0	0
		Absent	1	1	1	0	0	1	1	1	1
Bark	Type	Smooth	1	1	1	1	1	0	1	0	0
		Lenticellate	0	0	0	0	0	1	0	1	1
	Colour	White	0	1	0	0	0	0	0	0	0
		Pale yellow	1	1	1	0	0	0	0	0	0
		Black	0	0	0	0	0	0	0	0	0
		Brown	0	0	0	0	1	0	1	1	1
		Pale brown	1	0	1	1	0	1	0	0	0
Young twigs	Shape	Terete	1	1	1	1	1	1	1	1	1
	Core	Solid	1	1	1	1	1	1	1	1	1
		Hollow	0	0	0	0	0	0	0	0	0
	Colour	Pale brown	1	0	1	1	1	1	1	0	1
		Brown	0	1	0	0	0	0	0	1	0
		Green	0	0	0	1	0	0	0	0	0
		Pale green	0	0	0	0	0	0	0	0	0
		Pale red	0	0	0	0	0	0	0	0	0
	Indumentum	Pubescent	0	0	0	1	0	0	1	0	1
		Glabrous	0	1	1	0	1	1	0	1	0
		Puberulent	0	0	0	0	0	0	0	0	0
		Scabrous	0	0	0	0	0	0	0	0	0
		Tomentulose	0	0	0	0	0	0	0	0	0

		Strigose	0	0	0	0	0	0	0	0	0
		Tomentose	0	0	0	0	0	0	0	0	0
		Puberulous	1	0	0	0	0	0	0	0	0
Inter node	Length – Min (CM)	0–1.0	1	1	0	0	0	0	1	1	1
		1.1–2.0	0	0	1	1	1	0	0	0	0
		2.1–3.0	0	0	0	0	0	1	0	0	0
	Length – Max (CM)	0–1.0	0	0	0	0	0	0	0	0	0
		1.1–2.0	0	0	0	0	0	0	0	1	0
		2.1–3.0	0	1	0	0	0	0	0	0	0
		3.1–4.0	0	0	1	0	1	1	1	0	1
		4.1–5.0	1	0	0	0	0	0	0	0	0
		Above 5.1 cm	0	0	0	1	0	0	0	0	0
Latex	Nature	Milky	1	1	1	1	1	1	1	1	1
		Watery	0	0	0	0	0	0	0	0	0
	Colour	White	1	0	1	1	1	1	1	1	1
		Yellow	0	1	0	0	0	0	0	0	0
		Brown	0	0	0	0	0	0	0	0	0
Stipule	Nature	Caducous	1	1	1	1	1	1	1	1	1
		Persistent	0	0	0	0	0	0	0	0	0
	Shape	Ovate	0	1	0	0	0	0	0	1	0
		Widely ovate	0	0	0	0	0	0	0	0	0
		Lanceolate	1	0	1	1	1	1	1	0	1

		Lanceovate	0	0	0	0	0	0	0	0	0
	Length – Min (CM)	0 –1.0	1	1	1	0	0	1	1	1	1
		1.1–2.0	0	0	0	1	0	0	0	0	0
		2.1–3.0	0	0	0	0	0	0	0	0	0
		3.1–4.0	0	0	0	0	0	0	0	0	0
		4.1–5.0	0	0	0	0	0	0	0	0	0
		Above 5.1 cm	0	0	0	0	1	0	0	0	0
	Length – Max (CM)	0–1.0	1	1	1	0	0	0	0	0	0
		1.1–2.0	0	0	0	1	0	0	1	1	1
		2.1–3.0	0	0	0	0	0	0	0	0	0
		3.1–4.0	0	0	0	0	0	0	0	0	0
		4.1–5.0	0	0	0	0	0	0	0	0	0
		Above 5.1 cm	0	0	0	0	1	1	0	0	0
	Width – Min (CM)	0–0.5	1	1	1	1	1	1	1	1	1
		0.6–1.0	0	0	0	0	0	0	0	0	0
		1.1–1.5	0	0	0	0	0	0	0	0	0
	Width – Max (CM)	0–0.5	0	1	1	1	0	0	1	0	0
		0.6–1.0	1	0	0	0	0	0	0	1	0
		1.1–1.5	0	0	0	0	1	1	0	0	1
		1.6–2.0	0	0	0	0	0	0	0	0	0
	Margins	Entire	1	1	1	1	1	1	1	1	1
	Apex	Narrowly acute	0	0	1	1	1	1	1	0	0

		Acute	1	1	0	0	0	0	0	1	1	1
	Base	**Truncate**	1	1	1	1	1	1	1	1	1	1
	Indumentum	**Glabrous**	0	0	1	0	1	1	1	1	1	0
		Pubescent	0	0	0	0	0	0	0	0	0	0
		Puberulent	0	0	0	0	0	0	0	0	0	0
		Tomentose	0	0	0	0	0	0	0	0	0	1
		Strigose	0	0	0	0	0	0	0	0	0	0
		Sericeous	0	1	0	0	0	0	0	0	0	0
		Strigulose	0	0	0	1	0	0	0	0	0	0
		Puberulous	1	0	0	0	0	1	0	0	0	0
	Colour	**Red**	0	0	0	0	0	0	0	0	0	0
		Green	0	0	0	0	0	0	0	0	0	0
		Yellow	0	0	0	0	0	0	0	0	0	0
		Pale red	0	0	0	0	1	1	0	0	0	0
		Pale green	0	0	1	0	1	0	0	1	0	0
		Brown	0	0	0	0	0	0	0	0	0	0
		Purple	0	0	0	0	0	0	0	0	0	0
		Pale brown	1	1	0	1	0	0	1	0	0	1
Petiole	**Attachment**	**Articulated**	1	1	1	1	1	0	1	1	1	1
		Not articulated	0	0	0	0	0	1	0	0	0	0
	Shape	**Canaliculate**	1	1	1	1	1	1	1	0	1	1
		Terete	1	1	1	1	1	1	1	1	1	1

		Sub terete	0	0	0	0	0	0	0	0	0
		Angular	0	0	0	0	0	0	0	0	0
	Length – Min (CM)	0–2.0	0	1	1	1	1	0	1	0	1
		2.1–4.0	1	0	0	0	0	0	0	1	0
		4.1–6.0	0	0	0	0	0	1	0	0	0
		6.1–8.0	0	0	0	0	0	0	0	0	0
		8.1–10.0	0	0	0	0	0	0	0	0	0
	Length – Max (CM)	0–2.0	0	0	1	0	0	0	0	0	0
		2.1–4.0	0	1	0	1	1	0	0	0	0
		4.1–6.0	0	0	0	0	0	0	0	1	0
		6.1–8.0	0	0	0	0	0	0	1	0	0
		8.1–10.0	1	0	0	0	0	1	0	0	0
		10.1–12.0	0	0	0	0	0	0	0	0	1
		12.1–14.0	0	0	0	0	0	0	0	0	0
		Above 14.1	0	0	0	0	0	0	0	0	0
	Indumentum	Glabrous	1	1	0	0	1	1	1	1	1
		Pubescent	0	0	0	1	0	0	0	0	0
		Tomentose	0	0	0	0	0	0	0	0	0
		Puberulent	0	0	0	0	0	0	0	0	0
		Scabrous	0	0	0	0	0	0	0	0	0
		Strigose	0	0	0	0	0	0	0	0	0
		Hispid	0	0	0	1	0	0	0	0	0

		Puberulous	0	0	1	0	0	0	0	0	0
	Colour	Green	0	0	0	1	0	0	0	0	0
		Pale red	0	0	0	0	0	0	0	0	0
		Pale green	1	1	1	0	1	1	1	1	1
		Pale brown	0	0	0	0	0	0	0	0	0
		Brown	0	0	0	0	0	0	0	0	0
Leaf	Type	Simple	1	1	1	1	1	1	1	1	1
		Compound	0	0	0	0	0	0	0	0	0
	Arrangement	Alternate	1	1	1	1	1	1	1	1	1
		Opposite	0	0	0	0	0	0	0	0	0
		Spiral	1	1	1	1	1	1	1	1	1
		Decussate	0	0	0	0	0	0	0	0	0
	Leafy appendages	Present	0	0	0	0	0	0	0	0	0
		Absent	1	1	1	1	1	1	1	1	1
	Symmetry	Symmetric	1	1	0	0	1	1	1	1	1
		Asymmetric	0	0	1	1	0	0	0	0	0
	Shape	Ovate	0	1	0	0	0	0	1	1	1
		Widley ovate	0	0	0	0	0	0	0	0	0
		Lanceolate	0	0	0	0	0	1	1	1	1
		Round	0	0	0	0	0	0	0	0	0
		Elliptic	1	0	0	1	1	0	1	0	1
		Lance ovate	0	1	1	1	1	1	0	0	1

		Oblong	1	0	0	0	0	0	0	0	0
		Obovate	0	0	0	0	0	0	1	0	0
		Lobed	0	0	0	0	0	0	0	0	0
		Widely elliptic	0	0	0	0	0	0	0	0	0
	Length – Min (CM)	0–5.0	0	0	1	1	0	0	0	0	0
		5.1–10.0	0	1	0	0	0	1	1	1	1
		10.1 -15.0	1	0	0	0	1	0	0	0	0
		15.1 -20.0	0	0	0	0	0	0	0	0	0
		20.1 -25.0	0	0	0	0	0	0	0	0	0
		25.1–30.0	0	0	0	0	0	0	0	0	0
		30.1–35.0	0	0	0	0	0	0	0	0	0
		35.1- 40.0	0	0	0	0	0	0	0	0	0
	Length – Max (CM)	0–5.0	0	0	0	0	0	0	0	0	0
		5.1–10.0	0	0	1	0	0	0	0	0	0
		10.1–15.0	0	1	0	1	0	0	0	1	0
		15.1–20.0	1	0	0	0	0	0	1	0	0
		20.1–25.0	0	0	0	0	0	1	0	0	1
		25.1–30.0	0	0	0	0	1	0	0	0	0
		30.1–35.0	0	0	0	0	0	0	0	0	0
		35.1–40.0	0	0	0	0	0	0	0	0	0
		Above 40.1	0	0	0	0	0	0	0	0	0
	Width – Min (CM)	0–5.0	1	1	1	1	1	1	1	1	1

	5.1–10.0	0	0	0	0	0	0	0	0	0	0	0
	10.1–15.0	0	0	0	0	0	0	0	0	0	0	0
	15.1–20.0	0	0	0	0	0	0	0	0	0	0	0
	20.1–25.0	0	0	0	0	0	0	0	0	0	0	0
	25.1–30.0	0	0	0	0	0	0	0	0	0	0	0
	30.1–35.0	0	0	0	0	0	0	0	0	0	0	0
	35.1–40.0	0	0	0	0	0	0	0	0	0	0	0
Width – Max (CM)	0–5.0	0	0	1	0	0	0	0	0	0	0	0
	5.1–10.0	1	1	0	1	1	0	1	1	1	1	1
	10.1–15.0	0	0	0	0	0	0	1	0	0	0	0
	15.1–20.0	0	0	0	0	0	0	0	0	0	0	0
	20.1–25.0	0	0	0	0	0	0	0	0	0	0	0
	25.1–30.0	0	0	0	0	0	0	0	0	0	0	0
	30.1–35.0	0	0	0	0	0	0	0	0	0	0	0
	35.1–40.0	0	0	0	0	0	0	0	0	0	0	0
Margins	Entire	1	1	1	1	1	1	1	1	1	1	1
	Undulate	1	0	0	0	0	0	0	0	0	0	0
	Serrate	0	0	0	0	0	0	0	0	0	0	0
	Dendate	0	0	0	1	0	0	0	0	0	0	0
	Denticulate	0	0	0	0	0	0	0	0	0	0	0
Apex	Acute	0	0	0	0	0	0	0	1	0	0	1
	Acuminate	1	0	1	1	1	0	0	0	0	0	1

		Cuspidate	0	0	0	0	0	1	0	1	0
		Obtuse	0	0	0	0	0	0	0	0	1
		Rounded	0	0	0	0	0	0	0	0	0
		Caudate	0	1	0	0	0	0	0	0	0
	Base	Obtuse	1	1	0	0	0	0	0	1	1
		Rounded	1	0	0	0	0	0	1	1	1
		Cordate	0	0	0	0	0	1	0	0	0
		Cuneate	0	0	1	0	1	0	0	1	1
		Sub cordate	0	0	0	0	0	0	0	0	0
		Oblique	0	0	1	1	0	0	0	0	0
		Attenuate	0	0	0	0	0	0	0	0	1
		Truncate	0	0	0	0	0	0	1	0	1
		Acute	0	0	0	0	0	0	0	0	0
	Acumen length – Min (CM)	0	0	0	0	1	1	0	1	0	1
		0.6–1.0	1	0	1	0	0	0	0	1	0
		1.1–1.5	0	1	0	0	0	1	0	0	0
		1.6–2.0	0	0	0	0	0	0	0	0	0
		Above 2.0	0	0	0	0	0	0	0	0	0
	Acumen length – Max (CM)	0	0	0	0	0	0	0	0	0	0
		0.6–1.0	0	0	1	1	1	0	1	0	1
		1.1–1.5	1	0	0	0	0	1	0	1	0
		1.6–2.0	0	0	0	0	0	0	0	0	0

	Above 2.0	0	0	0	0	0	0	0	0	0	0	0
Indumentum	Glabrous	1	1	1	0	1	1	1	1	1	1	1
	Pubescent	0	0	0	0	0	0	0	0	0	0	0
	Puberulous	0	0	0	0	0	0	0	0	0	0	0
	Tomentose	0	0	0	0	0	0	0	0	0	0	0
	Scabrous	0	0	0	0	0	0	0	0	0	0	0
	Puberulent	0	0	0	0	0	0	0	0	0	0	0
	Strigose	0	0	0	0	0	0	0	0	0	0	0
	Villous	0	0	0	0	0	0	0	0	0	0	0
	Pilose	0	0	0	0	0	0	0	0	0	0	0
	Hirtellous	0	0	0	1	0	0	0	0	0	0	0
	Hispid	0	0	0	1	0	0	0	0	0	0	0
Colour when young	Red	0	0	0	0	0	0	0	1	0	0	0
	Pale red	1	0	0	0	1	1	1	0	1	0	0
	Pale green	0	1	1	1	1	1	1	1	1	1	1
	Purple	0	0	0	0	0	0	0	0	0	0	0
	Brown	0	0	0	0	0	0	0	0	0	0	0
Colour when mature	Dark green	0	1	0	0	1	1	1	1	0	1	1
	Green	1	0	1	1	0	0	0	1	1	1	0
Texture	Coriaceous	0	0	0	0	1	0	0	0	0	0	0
	Sub coriaceous	1	1	1	1	0	1	1	1	1	1	1
	Chartaceous	0	0	0	0	0	0	0	0	0	0	0

	No. of Veins – Min	1 or 2	0	0	0	0	0	0	0	0	0
		3 or 4	0	0	1	0	0	0	0	0	0
		5 or 6	1	0	0	1	0	0	0	0	0
		7 or 8	0	0	0	0	0	1	1	1	0
		9 or 10	0	0	0	0	0	0	0	0	1
		11 or 12	0	1	0	0	0	0	0	0	0
		13 or 14	0	0	0	0	1	0	0	0	0
		Numerous	0	0	0	0	0	0	0	0	0
	No. of Veins – Max	1 or 2	0	0	0	0	0	0	0	0	0
		3 or 4	0	0	1	0	0	0	0	0	0
		5 or 6	0	0	0	0	0	0	0	0	0
		7 or 8	0	0	0	1	0	0	0	0	0
		9 or 10	1	0	0	0	0	1	0	1	0
		11 or 12	0	0	0	0	0	0	1	0	1
		13 or 14	0	0	0	0	0	0	0	0	0
		Above 14	0	1	0	0	1	0	0	0	0
		Numerous	0	0	0	0	0	0	0	0	0
Waxy glands	Position	At the base of the midrib beneath	1	1	0	0	1	0	1	1	1

		Two in the axils of the lateral nerves	0	0	1	1	0	1	0	0	0
		Absent	0	0	0	0	0	0	0	0	0
Inflorescence	Hypanthodium	Present	1	1	1	1	1	1	1	1	1
		Absent	0	0	0	0	0	0	0	0	0
	Position	Axillary	1	1	1	1	1	1	1	1	1
		Cauliflorous	0	0	0	0	0	0	0	0	0
	Clustering	Solitary	0	0	0	0	1	0	0	1	0
		Paired	0	0	1	1	1	1	0	1	0
		Clustered	1	1	0	1	0	1	1	0	1
	Sexuality	Monoecious	1	1	0	0	1	1	1	1	1
		Dioecious	0	0	1	1	0	0	0	0	0
Peduncle	Peduncle	Present	1	0	1	1	1	0	1	1	1
		Absent	0	1	0	0	0	1	0	0	0
	Length – Min (MM)	01–10	1	0	1	1	1	0	0	1	1
		11–20	0	0	0	0	0	0	1	0	0
		21–30	0	0	0	0	0	0	0	0	0
		31–40	0	0	0	0	0	0	0	0	0
	Length – Max (MM)	01–10	1	0	1	1	1	0	0	1	1
		11–20	0	0	0	0	0	0	0	0	0
		21–30	0	0	0	0	0	0	1	0	0

		31–40	0	0	0	0	0	0	0	0	0
		Above 41	0	0	0	0	0	0	0	0	0
	Shape	Terete	1	0	1	1	1	0	1	1	0
		Angular	0	0	0	0	0	0	0	0	1
	Indumentum	Glabrous	1	0	0	0	1	0	1	1	1
		Pubescent	0	0	0	0	0	0	0	0	0
		Pilose	0	0	0	0	0	0	0	0	0
		Scars	0	0	0	0	0	0	0	0	0
		Scabrous	0	0	0	0	0	0	0	0	0
		Strigose	0	0	0	0	0	0	0	0	0
		Puberulent	0	0	0	1	0	0	0	0	0
		Villous	0	0	0	0	0	0	0	0	0
		Puberulous	0	0	0	0	0	0	0	0	0
		Strigulose	0	0	1	0	0	0	0	0	0
	Colour	Yellow	0	0	1	1	0	0	0	0	0
		Pale green	1	0	1	1	1	0	0	0	1
		Green	0	0	0	0	0	0	1	1	0
		Pale Brown	0	0	0	0	0	0	0	0	0
Basal bracts	Basal bract	Present	1	1	0	1	1	1	1	1	1
		Absent	0	0	1	0	0	0	0	0	0
	Attachment	Persistent	1	1	0	1	1	1	1	1	1
		Caducous	0	0	0	0	0	0	0	0	0

Length – Min (MM)	**0–1.0**	0	0	0	1	1	0	0	1	0	0	0
	1.1–2.0	0	0	0	0	0	0	0	0	0	0	0
	2.1–3.0	1	1	0	0	0	1	1	0	1	0	1
	3.1–4.0	0	0	0	0	0	0	0	0	0	0	0
	Above 4.1	0	0	0	0	0	0	0	0	0	0	0
Length – Max (MM)	**0–1.0**	0	0	0	0	0	0	0	0	0	0	0
	1.1–2.0	0	0	0	1	1	0	0	1	0	1	0
	2.1–3.0	0	1	0	0	0	0	1	0	0	0	0
	3.1–4.0	1	0	0	0	0	1	0	0	0	0	0
	Above 4.1	0	0	0	0	0	0	0	0	0	0	1
Shape	**Ovate**	0	0	0	1	1	0	0	0	0	0	0
	Widely ovate	1	1	0	0	0	1	1	1	1	1	1
Indumentum	**Glabrous**	0	0	0	0	1	1	1	1	0	0	0
	Pubescent	1	1	0	1	0	0	0	0	0	0	0
	Hispid	0	0	0	0	0	0	0	0	0	0	0
	Puberulous	0	0	0	0	0	0	0	0	1	1	1
	Tomentose	0	0	0	0	0	0	0	0	0	0	0
	Sericeous	0	0	0	0	0	0	0	0	0	0	0
Colour	**Pale Brown**	1	0	0	0	0	0	0	0	1	1	1
	Green	0	0	0	0	0	1	0	0	0	0	0
	Yellow	0	0	0	0	0	0	0	0	0	0	1
	Purple	0	0	0	0	0	0	0	0	0	0	0

		Brown	0	1	0	1	0	1	1	0	0
		Pale green	0	0	0	0	1	0	0	0	0
Syconium	Length – Min (MM)	1–10	1	1	1	1	1	1	1	1	1
		11–20	0	0	0	0	0	0	0	0	0
		21–30	0	0	0	0	0	0	0	0	0
		31–40	0	0	0	0	0	0	0	0	0
		41–50	0	0	0	0	0	0	0	0	0
		51–60	0	0	0	0	0	0	0	0	0
	Length – Max (MM)	1–10	1	1	1	0	0	1	0	0	0
		11–20	0	0	0	1	1	0	1	1	0
		21–30	0	0	0	0	0	0	0	0	1
		31–40	0	0	0	0	0	0	0	0	0
		41–50	0	0	0	0	0	0	0	0	0
		51–60	0	0	0	0	0	0	0	0	0
		61–70	0	0	0	0	0	0	0	0	0
		71–80	0	0	0	0	0	0	0	0	0
		81–90	0	0	0	0	0	0	0	0	0
		91–100	0	0	0	0	0	0	0	0	0
	Width – Min (MM)	1–10	1	1	1	1	1	1	1	1	1
		11–20	0	0	0	0	0	0	0	0	0
		21–30	0	0	0	0	0	0	0	0	0
		31–40	0	0	0	0	0	0	0	0	0

	41–50	0	0	0	0	0	0	0	0	0	0	0
Width – Max (MM)	1–10	1	1	1	0	0	1	0	0	0	0	0
	11–20	0	0	0	1	1	0	1	0	1	1	0
	21–30	0	0	0	0	0	0	0	0	0	0	1
	31–40	0	0	0	0	0	0	0	0	0	0	0
	41–50	0	0	0	0	0	0	0	0	0	0	0
	51–60	0	0	0	0	0	0	0	0	0	0	0
	61–70	0	0	0	0	0	0	0	0	0	0	0
Shape	Obovoid	0	0	0	0	0	0	0	0	0	0	1
	Globose	1	1	1	1	1	1	1	1	1	1	0
	Turbinate	0	0	0	0	0	0	0	0	0	0	0
	Oblong	0	0	0	0	0	0	0	0	0	0	0
	Ovoid	0	0	0	0	0	0	0	0	0	0	0
	Ellipsoid	0	0	0	0	0	0	0	0	0	0	0
	Sub globose	0	0	0	0	0	0	0	0	0	0	0
Indumentum	Hairy near ostiole	0	0	0	0	0	0	0	0	0	0	0
	Glabrous	1	1	0	0	1	1	1	1	1	1	1
	Pubescent	0	0	0	1	0	0	0	0	0	0	0
	Pilose	0	0	0	0	0	0	0	0	0	0	0
	Scars	0	1	0	0	0	0	0	0	0	0	0
	Scabrous	0	0	1	0	0	0	0	0	0	0	0

		Strigose	0	0	0	0	0	0	0	0	0
		Puberulent	0	0	0	0	0	0	0	0	0
		Tomentose	0	0	0	0	0	0	0	0	0
		Puberulous	0	0	0	0	0	0	1	0	0
		Hispid	0	0	0	0	0	0	0	0	0
	Colour when young	Green	1	0	1	1	0	0	0	0	0
		Pale green	0	1	0	0	1	1	1	1	1
	Colour when mature	Green	0	0	0	0	1	0	0	0	0
		Dark green	0	0	0	0	0	0	0	0	0
		Pale brown	0	0	0	0	0	0	0	0	0
		Yellow	0	0	1	1	0	0	0	0	0
		Pale yellow	0	0	0	0	0	1	0	0	0
		Orange	0	0	0	0	0	0	0	0	0
		Pale red	0	0	0	0	0	0	0	0	0
		Red	0	0	0	0	0	0	0	0	0
		Purple	1	0	0	0	0	0	1	1	1
		White	0	0	0	0	0	0	0	0	0
		Grey	0	0	0	0	0	0	0	0	0
		Reddish brown	0	1	0	0	0	0	0	0	0
Ostiole	Ostiole diameter – Min (MM)	0–1.0	0	1	1	1	1	1	0	1	0
		1.1–2.0	1	0	0	0	0	0	1	0	0
		Above 2.1	0	0	0	0	0	0	0	0	1

	Ostiole diameter – Max (MM)	0–1.0	0	0	1	0	1	0	0	0	0
		1.1–2.0	0	1	0	0	0	1	0	1	0
		2.1–3.0	1	0	0	1	0	0	0	0	0
		Above 3.1	0	0	0	0	0	0	1	0	1
Outer bracts	Outer bracts	Present	1	1	1	1	1	1	1	1	1
		Absent	0	0	0	0	0	0	0	0	0
	Attachment	Free	1	1	1	1	1	1	1	1	1
		Fused	0	0	0	0	0	0	0	0	0
	Shape	Widely ovate	0	1	1	1	0	0	1	0	0
		Ovate	1	0	0	0	1	1	0	1	1
	Size – Min (MM)	0–1.0	0	1	1	1	0	1	0	1	0
		1.1–2.0	1	0	0	0	0	0	1	0	1
		Above 2.1	0	0	0	0	1	0	0	0	0
	Size – Max (MM)	0–1.0	0	1	0	0	0	1	0	1	0
		1.1–2.0	1	0	1	1	0	0	0	0	1
		2.1–3.0	0	0	0	0	0	0	1	0	0
		3.1–4.0	0	0	0	0	1	0	0	0	0
		Above 4.1	0	0	0	0	0	0	0	0	0
	Indumentum	Glabrous	1	0	1	1	1	1	1	1	0
		Pubescent	0	1	0	0	0	0	0	0	0
		Pilose	0	0	0	0	0	0	0	0	0
		Strigose	0	0	0	0	0	0	0	0	0

		Scabrous	0	0	0	0	0	0	0	0	0
		Villose	0	0	0	0	0	0	0	0	0
		Puberulous	0	0	0	0	0	0	0	0	1
		Tomentose	0	0	0	0	0	0	0	0	0
	Colour	Red	0	0	0	0	0	0	0	0	0
		Yellow	0	1	0	1	0	0	0	0	0
		Brown	0	0	0	0	0	0	1	0	0
		Pale green	0	0	0	0	0	1	0	0	0
		Pale brown	1	1	0	0	1	0	0	1	1
		Pale yellow	0	0	1	0	0	0	0	0	0
Inner bracts	Inner bracts	Present	1	1	1	1	1	1	1	1	1
		Absent	0	0	0	0	0	0	0	0	0
	Attachment	Free	1	1	1	1	1	1	1	1	1
		Fused	0	0	0	0	0	0	0	0	0
	Shape	Lanceolate	1	0	1	1	1	1	1	1	1
		Widely ovate	0	1	0	0	0	0	0	0	0
		Oblong	0	0	0	0	0	0	0	0	0
		Ovate	0	0	0	0	0	0	0	0	0
		Lanceovate	0	0	0	0	0	0	0	0	0
	Size – Min (MM)	0–1.0	1	1	1	0	0	1	0	0	1
		1.1–2.0	0	0	0	1	1	0	1	1	0
		2.1–3.0	0	0	0	0	0	0	0	0	0

		Above 3.1	0	0	0	0	0	0	0	0	0
	Size – Max (MM)	0–1.0	1	1	1	0	0	1	0	0	0
		1.1–2.0	0	0	0	1	1	0	1	1	1
		2.1–3.0	0	0	0	0	0	0	0	0	0
		Above 3.1	0	0	0	0	0	1	0	0	0
	Indumentum	Glabrous	1	1	1	1	1	1	1	1	1
		Strigose	0	0	0	0	0	0	0	0	0
		Scabrous	0	0	0	0	0	0	0	0	0
		Pubescent	0	0	0	0	0	0	0	0	0
	Colour	Pale brown	1	1	0	0	1	0	1	0	1
		Yellow	0	0	0	0	0	0	0	0	0
		White	0	0	0	0	0	0	0	0	0
		Pale yellow	0	0	1	1	0	1	0	0	0
		Pale red	0	0	0	0	0	0	0	1	0
		Brown	0	0	0	0	0	0	0	1	0
Male flower	Arrangement	Near the ostiole	1	1	1	1	1	1	1	0	1
		Scattered	0	0	0	0	0	0	0	1	0
	Size (MM)	0–1.0	0	0	0	0	0	0	0	0	0
		1.1–2.0	0	1	1	0	0	1	1	1	1
		2.1–3.0	1	0	0	1	0	0	0	0	0
		3.1–4.0	0	0	0	0	1	0	0	0	0
		4.1–5.0	0	0	0	0	0	0	0	0	0

	Attachment	Sessile	0	0	1	0	0	1	1	1	1
		Pedicellate	1	1	0	1	1	0	1	0	1
	Pedicel length (MM)	0–0.5	1	0	0	0	0	0	1	0	1
		0.6–1.0	0	1	0	0	0	0	0	0	0
		1.1–1.5	0	0	0	1	1	0	0	0	0
		1.6–2.0	0	0	0	0	0	0	0	0	0
		Above 2.1	0	0	0	0	0	0	0	0	0
	No. of Tepals	2	0	0	0	0	0	0	0	0	0
		3	1	1	1	1	0	0	1	0	1
		4	0	0	1	0	1	1	1	1	1
		6	0	0	0	0	0	0	0	0	0
	Tepal attachment	Free	1	1	1	1	1	1	0	0	0
		Fused	0	0	0	0	0	0	1	1	1
	Tepal length (MM)	0–1.0	0	1	1	0	0	0	1	1	1
		1.1–2.0	1	0	0	1	1	1	0	0	0
		2.1–3.0	0	0	0	0	0	0	0	0	0
		3.1–4.0	0	0	0	0	0	0	0	0	0
		4.1- 5.0	0	0	0	0	0	0	0	0	0
	Tepal shape	Lanceolate	1	1	1	1	1	1	1	1	1
		Ovate	0	0	0	0	0	0	0	0	0
	Tepal indumentum	Glabrous	1	1	1	1	1	1	1	1	1
		Pubescent	0	0	0	0	0	0	0	0	0

	Tepal colour	Yellow	0	0	0	0	0	1	0	0	0
		Pale brown	0	0	0	0	1	0	1	0	1
		Pale yellow	1	0	0	1	0	0	0	0	0
		White	0	1	1	1	0	1	0	0	0
		Pale red	0	0	0	0	0	0	0	1	0
	Stamen number	1	1	1	1	1	1	1	1	1	1
		2	0	0	0	0	0	0	0	0	0
		3 and more	0	0	0	0	0	0	0	0	0
	Anther length (MM)	0–0.5	1	1	0	0	0	0	0	1	0
		0.6–1.0	0	0	1	0	1	1	1	0	1
		1.1–1.5	0	0	0	1	0	0	0	0	0
		1.6 -2.0	0	0	0	0	0	0	0	0	0
		2.1–2.5	0	0	0	0	0	0	0	0	0
	Filament length (MM)	0–0.5	0	1	1	0	1	1	0	1	0
		0.6–1.0	1	0	0	1	0	0	1	0	1
		1.1–1.5	0	0	0	0	0	0	0	0	0
Female flower	Arrangement	Scattered	1	1	0	0	1	0	0	0	0
		At the base	0	0	1	1	0	1	1	1	1
	Size (MM)	0–1.0	0	0	0	0	0	0	0	0	0
		1.1–2.0	1	0	1	0	0	1	1	0	0
		2.1–3.0	0	1	0	1	1	0	0	1	1
		3.1–4.0	0	0	0	0	0	0	0	0	0

		4.1–5.0	0	0	0	0	0	0	0	0	0
		5.1–6.0	0	0	0	0	0	0	0	0	0
	Attachment	Sessile	1	1	1	0	1	1	0	1	0
		Pedicellate	0	0	0	1	0	0	1	0	1
	Pedicel length (MM)	0–0.5	0	0	0	0	0	0	1	0	0
		0.6–1.0	0	0	0	0	0	0	0	0	0
		1.1–1.5	0	0	0	0	0	0	0	0	0
		1.6–2.0	0	0	0	1	0	0	0	0	0
		2.1 -2.5	0	0	0	0	0	0	0	0	0
		2.6–3.0	0	0	0	0	0	0	0	0	1
	No. of tepals	2	0	0	0	0	0	0	0	0	0
		3	1	1	0	1	0	1	1	1	1
		4	0	0	1	0	1	1	0	0	0
		5	0	0	0	0	0	0	0	0	0
		6	0	0	1	0	0	0	0	0	0
	Tepal attachment	Free	1	1	1	1	1	1	0	1	0
		Fused	0	0	0	0	0	0	1	0	1
	Tepal length (MM)	0–1.0	0	1	0	0	0	1	1	0	0
		1.1–2.0	1	0	1	1	1	0	0	1	1
		2.1–3.0	0	0	0	0	0	0	0	0	0
		3.1–4.0	0	0	0	0	0	0	0	0	0
	Tepal shape	Lanceolate	1	1	1	1	1	1	1	1	1

Tepal indumentum	**Glabrous**	1	1	1	1	1	1	1	1	1	1	1
	Pubescent	0	0	0	0	0	0	0	0	0	0	0
Tepal colour	**Pale yellow**	1	1	0	1	1	0	0	0	0	0	0
	Pale brown	0	0	0	0	0	0	1	1	1	0	1
	Pale red	0	0	0	0	0	0	0	0	0	1	0
	White	0	0	1	1	0	0	0	0	0	0	0
	Yellow	0	0	0	0	0	0	0	0	0	0	0
Stigma length (MM)	**0–0.5**	1	1	1	1	1	1	1	1	1	1	1
	0.6–1.0	0	0	0	0	0	0	0	0	0	0	0
Style length (MM)	**0–0.5**	0	0	1	1	0	0	0	0	0	0	0
	0.6–1.0	1	0	0	0	0	0	1	1	1	1	1
	1.1–1.5	0	1	0	0	1	0	0	0	0	0	0
	1.6–2.0	0	0	0	0	0	0	0	0	0	0	0
Ovary length (MM)	**0–1.0**	1	1	0	0	1	1	1	1	0	0	0
	1.1–2.0	0	0	1	1	0	0	0	0	1	1	1
	2.1–3.0	0	0	0	0	0	0	0	0	0	0	0
	3.1–4.0	0	0	0	0	0	0	0	0	0	0	0
Ovary shape	**Obovoid**	1	0	1	1	0	1	1	1	1	1	1
	Ovoid	0	0	0	0	1	0	0	0	0	0	0
	Globose	0	1	0	0	0	0	0	0	0	0	0
Ovary indumentum	**Glabrous**	1	1	1	1	1	1	1	1	1	1	1
Ovary colour	**Pale brown**	0	1	0	0	1	1	1	1	1	1	1

		Pale yellow	1	0	0	1	0	0	0	0	0
		White	0	0	0	0	0	0	0	0	0
		Yellow	0	0	1	0	0	0	0	0	0
Gall flower	Arrangement	Scattered	1	1	1	1	1	1	1	1	1
	Size (MM)	0–1.0	0	0	0	0	0	0	0	0	0
		1.1–2.0	1	0	1	1	0	1	1	1	0
		2.1–3.0	0	1	0	0	1	0	0	0	1
		3.1–4.0	0	0	0	0	0	0	0	0	0
		4.1–5.0	0	0	0	0	0	0	0	0	0
	Attachment	Sessile	1	0	1	0	0	1	0	0	0
		Pedicellate	1	1	0	1	1	0	1	1	1
	Pedicel length (MM)	0–0.5	1	0	0	1	0	0	0	0	0
		0.6–1.0	0	0	0	0	1	0	0	0	0
		1.1–1.5	0	1	0	0	0	0	0	0	0
		1.6–2.0	0	0	0	0	0	0	1	1	1
		2.1 -2.5	0	0	0	0	0	0	0	0	0
	No. of tepals	2	0	0	0	0	0	0	0	0	0
		3	1	1	0	1	0	0	0	1	0
		4	0	0	1	0	1	1	1	0	1
		6	0	0	1	0	0	0	0	0	0
	Tepal attachment	Free	1	0	1	1	1	1	0	0	0
		Fused	0	1	0	0	0	0	1	1	1

Tepal length (MM)	**0–1.0**	0	0	0	0	0	1	1	0	0	0	0
	1.1–2.0	1	1	1	1	1	0	0	1	1	0	1
	2.1–3.0	0	0	0	0	0	0	0	0	0	0	0
	3.1–4.0	0	0	0	0	0	0	0	0	0	0	0
Tepal shape	**Lanceolate**	1	1	1	1	1	1	1	1	1	1	1
	Glabrous	0	1	1	1	1	1	1	1	1	1	1
Tepal indumentum	**Pubescent**	0	0	0	0	0	0	0	0	0	0	0
	Pale yellow	1	1	0	1	0	0	0	0	0	0	0
	White	0	1	1	1	0	0	0	0	0	0	0
Tepal colour	**Pale brown**	0	0	0	0	1	1	1	1	1	0	1
	Yellow	0	0	0	0	0	0	0	0	0	0	0
	Pale red	0	0	0	0	0	0	0	0	0	1	0
Stigma nature	**Short**	1	1	1	1	1	1	1	1	1	1	1
Stigma length (MM)	**0–0.5**	1	1	1	1	1	1	1	1	1	1	1
	0.6–1.0	0	0	0	0	0	0	0	0	0	0	0
Style size (MM)	**0–0.5**	1	1	1	1	1	1	1	1	1	1	1
	0.6–1.0	0	0	0	0	0	0	0	0	0	0	0
	1.1–1.5	0	0	0	0	0	0	0	0	0	0	0
Ovary size (MM)	**0–1.0**	0	1	0	0	1	0	1	1	0	1	1
	1.1–2.0	1	0	1	1	0	1	0	0	1	1	0
	2.1–3.0	0	0	0	0	0	0	0	0	0	0	0
	3.1–4.0	0	0	0	0	0	0	0	0	0	0	0

	Ovary shape	Obovoid	1	1	1	1	1	1	1	1	1
		Globose	0	0	0	0	0	0	0	0	0
	Ovary indumentum	Glabrous	1	1	1	1	1	1	1	1	1
	Ovary colour	White	0	0	0	0	0	0	0	0	0
		Pale brown	1	1	0	0	1	0	1	1	1
		Pale yellow	0	0	1	1	0	0	0	0	0
		Yellow	0	0	0	0	0	1	0	0	0
Achenes	Size – Min (MM)	0–1.0	1	1	1	1	0	1	1	1	1
		1.1–2.0	0	0	0	0	1	0	0	0	0
	Size – Max (MM)	0–1.0	1	1	1	0	0	1	0	1	1
		1.1–2.0	0	0	0	1	1	0	1	0	0
	Shape	Obovoid	0	0	0	1	0	0	0	0	1
		Widely ovate	0	0	0	0	0	0	0	0	0
		Ovoid	1	1	0	0	1	1	1	0	0
		Trigonous	0	0	0	0	0	0	0	0	0
		Oblong	0	0	0	0	0	0	0	0	0
		Ellipsoid	0	0	1	0	0	0	0	0	0
		Globose	0	0	0	0	0	0	0	1	0
	Colour	Pale brown	1	0	0	0	1	0	0	1	1
		red	0	0	0	0	0	0	0	0	0
		Brown	0	0	0	0	0	0	0	0	0
		Pale yellow	0	0	1	1	0	0	1	0	0
		White	0	1	0	0	0	1	0	0	0

Appendix V

Correlation Value between the Taxa Studied

Correlation between the taxa studied based on combined characters

	A. toxicaria	*F. amplissima*	*F. amplocarpa*	*F. anamalayana*	*F. arnottiana*	*F. auriculata*	*F. beddomei*	*F. benghalensis*	*F. benjamina*	*F. binnendijkii*	*F. callosa*	*F. caulocarpa*	*F. costata*	*F. dalhousiae*	*F. drupacea*	*F. elastica*	*F. exasperata*	*F. fergusonii*	*F. guttata*
A. toxicaria	1	0.33	0.29	0.31	0.32	0.27	0.27	0.28	0.33	0.36	0.38	0.39	0.39	0.25	0.38	0.29	0.4	0.34	0.27
F. amplissima	0.33	1	0.45	0.57	0.6	0.49	0.56	0.53	0.65	0.61	0.55	0.62	0.6	0.58	0.52	0.6	0.51	0.59	0.42
F. amplocarpa	0.29	0.45	1	0.41	0.44	0.49	0.48	0.48	0.41	0.44	0.44	0.46	0.43	0.38	0.45	0.42	0.43	0.43	0.65
F. anamalayana	0.31	0.57	0.41	1	0.58	0.5	0.53	0.5	0.61	0.57	0.55	0.56	0.55	0.67	0.47	0.55	0.47	0.57	0.44
F. arnottiana	0.32	0.6	0.44	0.58	1	0.48	0.52	0.51	0.59	0.6	0.51	0.72	0.77	0.6	0.48	0.51	0.47	0.52	0.41
F. auriculata	0.27	0.49	0.49	0.5	0.48	1	0.46	0.53	0.46	0.4	0.49	0.5	0.46	0.44	0.44	0.45	0.45	0.46	0.5
F. beddomei	0.27	0.56	0.48	0.53	0.52	0.46	1	0.56	0.58	0.57	0.61	0.53	0.52	0.52	0.56	0.59	0.45	0.53	0.44
F. benghalensis	0.28	0.53	0.48	0.5	0.51	0.53	0.56	1	0.59	0.49	0.56	0.54	0.5	0.48	0.65	0.54	0.47	0.58	0.49
F. benjamina	0.33	0.65	0.41	0.61	0.59	0.46	0.58	0.59	1	0.7	0.55	0.63	0.62	0.57	0.61	0.63	0.47	0.63	0.39
F. binnendijkii	0.36	0.61	0.44	0.57	0.6	0.4	0.57	0.49	0.7	1	0.5	0.62	0.61	0.54	0.54	0.61	0.51	0.57	0.42
F. callosa	0.38	0.55	0.44	0.55	0.51	0.49	0.61	0.56	0.55	0.5	1	0.5	0.53	0.52	0.57	0.53	0.51	0.56	0.46
F. caulocarpa	0.39	0.62	0.46	0.56	0.72	0.5	0.53	0.54	0.63	0.62	0.5	1	0.76	0.54	0.52	0.54	0.45	0.54	0.41
F. costata	0.39	0.6	0.43	0.55	0.77	0.46	0.52	0.5	0.62	0.61	0.53	0.76	1	0.54	0.5	0.5	0.47	0.52	0.4
F. dalhousiae	0.25	0.58	0.38	0.67	0.6	0.44	0.52	0.48	0.57	0.54	0.52	0.54	0.54	1	0.5	0.57	0.43	0.53	0.43

	A. toxicaria	*F. amplissima*	*F. amplocarpa*	*F. anamalayana*	*F. arnottiana*	*F. auriculata*	*F. beddomei*	*F. bengbalensis*	*F. benjamina*	*F. binnendijkii*	*F. callosa*	*F. caulocarpa*	*F. costata*	*F. dalhousiae*	*F. drupacea*	*F. elastica*	*F. exasperata*	*F. fergusonii*	*F. guttata*
F. drupacea	0.38	0.52	0.45	0.47	0.48	0.44	0.56	0.65	0.61	0.54	0.57	0.52	0.5	0.5	1	0.55	0.47	0.58	0.5
F. elastica	0.29	0.6	0.42	0.55	0.51	0.45	0.59	0.54	0.63	0.61	0.53	0.54	0.5	0.57	0.55	1	0.42	0.6	0.45
F. exasperata	0.4	0.51	0.43	0.47	0.47	0.45	0.45	0.47	0.47	0.51	0.51	0.45	0.47	0.43	0.47	0.42	1	0.46	0.45
F. fergusonii	0.34	0.59	0.43	0.57	0.52	0.46	0.53	0.58	0.63	0.57	0.56	0.54	0.52	0.53	0.58	0.6	0.46	1	0.45
F. guttata	0.27	0.42	0.65	0.44	0.41	0.5	0.44	0.49	0.39	0.42	0.46	0.41	0.4	0.43	0.5	0.45	0.45	0.45	1
F. heterophylla	0.37	0.44	0.46	0.49	0.46	0.43	0.48	0.45	0.51	0.52	0.54	0.46	0.45	0.46	0.5	0.47	0.63	0.43	0.41
F. hispida	0.31	0.46	0.5	0.54	0.49	0.53	0.5	0.49	0.47	0.49	0.52	0.45	0.43	0.53	0.45	0.47	0.58	0.47	0.49
F. krishnae	0.3	0.54	0.46	0.54	0.49	0.49	0.49	0.63	0.62	0.56	0.53	0.54	0.51	0.53	0.55	0.54	0.45	0.66	0.46
F. microcarpa	0.34	0.6	0.41	0.53	0.58	0.4	0.59	0.55	0.72	0.72	0.56	0.61	0.59	0.56	0.58	0.65	0.5	0.6	0.41
F. middletonii	0.32	0.63	0.43	0.58	0.6	0.45	0.58	0.58	0.64	0.64	0.56	0.65	0.6	0.59	0.57	0.6	0.5	0.57	0.44
F. mollis	0.32	0.55	0.39	0.52	0.58	0.44	0.51	0.52	0.54	0.59	0.48	0.61	0.56	0.54	0.52	0.51	0.44	0.48	0.44
F. nervosa	0.39	0.57	0.49	0.53	0.54	0.49	0.6	0.54	0.56	0.5	0.61	0.55	0.59	0.51	0.54	0.52	0.53	0.52	0.5
F. pumila	0.32	0.49	0.47	0.53	0.52	0.49	0.53	0.51	0.57	0.59	0.53	0.53	0.49	0.54	0.54	0.48	0.51	0.47	0.51

	A. toxicaria	*F. amplissima*	*F. amplocarpa*	*F. anamalayana*	*F. arnottiana*	*F. auriculata*	*F. beddomei*	*F. bengbalensis*	*F. benjamina*	*F. binnendijkii*	*F. callosa*	*F. caulocarpa*	*F. costata*	*F. dalhousiae*	*F. drupacea*	*F. elastica*	*F. exasperata*	*F. fergusonii*	*F. guttata*
F. racemosa	0.39	0.53	0.53	0.52	0.51	0.53	0.57	0.6	0.56	0.46	0.61	0.57	0.51	0.49	0.55	0.46	0.51	0.55	0.55
F. religiosa	0.32	0.61	0.49	0.58	0.6	0.44	0.62	0.58	0.65	0.63	0.55	0.63	0.59	0.6	0.6	0.65	0.46	0.59	0.46
F. superba	0.39	0.62	0.48	0.56	0.75	0.49	0.5	0.54	0.61	0.58	0.5	0.83	0.75	0.53	0.55	0.5	0.52	0.51	0.43
F. talbotii	0.31	0.6	0.42	0.52	0.6	0.44	0.5	0.53	0.58	0.63	0.51	0.59	0.59	0.57	0.53	0.53	0.49	0.55	0.45
F. tinctoria subsp. *gibbosa*	0.32	0.53	0.43	0.53	0.64	0.43	0.47	0.46	0.6	0.68	0.5	0.58	0.62	0.53	0.45	0.49	0.6	0.47	0.44
F. tinctoria subsp. *parasitica*	0.32	0.56	0.43	0.59	0.63	0.51	0.44	0.51	0.59	0.52	0.54	0.57	0.58	0.54	0.5	0.5	0.56	0.51	0.44
F. travancorica	0.31	0.59	0.42	0.54	0.57	0.44	0.6	0.54	0.61	0.61	0.53	0.59	0.59	0.57	0.56	0.68	0.49	0.63	0.46
F. tsjakela	0.32	0.6	0.47	0.57	0.62	0.44	0.57	0.53	0.63	0.66	0.53	0.62	0.62	0.55	0.52	0.59	0.45	0.56	0.45
F. virens var. *dispersa*	0.31	0.61	0.55	0.56	0.59	0.45	0.58	0.53	0.61	0.61	0.54	0.63	0.68	0.57	0.53	0.59	0.5	0.55	0.49
F. virens var. *matthewii*	0.37	0.58	0.5	0.54	0.57	0.47	0.59	0.55	0.61	0.59	0.54	0.67	0.6	0.53	0.58	0.57	0.5	0.56	0.5
F. virens var. *virens*	0.38	0.59	0.5	0.57	0.63	0.49	0.58	0.54	0.65	0.57	0.55	0.66	0.64	0.57	0.53	0.57	0.48	0.55	0.43

	E. heterophylla	*E. hispida*	*E. krishnae*	*E. microcarpa*	*E. middletonii*	*E. mollis*	*E. nervosa*	*E. pumila*	*E. racemosa*	*E. religiosa*	*E. superba*	*E. talbotii*	*E. tinctoria* subsp. *gibbosa*	*E. tinctoria* subsp. *parasitica*	*E. travancorica*	*E. tsjakela*	*E. virens* var. *dispersa*	*E. virens* var. *matthewii*	*E. virens* var. *virens*
A. toxicaria	0.37	0.31	0.3	0.34	0.32	0.32	0.39	0.32	0.39	0.32	0.39	0.31	0.32	0.32	0.31	0.32	0.31	0.37	0.38
F. amplissima	0.44	0.46	0.54	0.6	0.63	0.55	0.57	0.49	0.53	0.61	0.62	0.6	0.53	0.56	0.59	0.6	0.61	0.58	0.59
F. amplocarpa	0.46	0.5	0.46	0.41	0.43	0.39	0.49	0.47	0.53	0.49	0.48	0.42	0.43	0.43	0.42	0.47	0.55	0.5	0.5
F. amamalayana	0.49	0.54	0.54	0.53	0.58	0.52	0.53	0.53	0.52	0.58	0.56	0.52	0.53	0.59	0.54	0.57	0.56	0.54	0.57
F. arnottiana	0.46	0.49	0.49	0.58	0.6	0.58	0.54	0.52	0.51	0.6	0.75	0.6	0.64	0.63	0.57	0.62	0.59	0.57	0.63
F. auriculata	0.43	0.53	0.49	0.4	0.45	0.44	0.49	0.49	0.53	0.44	0.49	0.44	0.43	0.51	0.44	0.44	0.45	0.47	0.49
F. beddomei	0.48	0.5	0.49	0.59	0.58	0.51	0.6	0.53	0.57	0.62	0.5	0.5	0.47	0.44	0.6	0.57	0.58	0.59	0.58
F. benghalensis	0.45	0.49	0.63	0.55	0.58	0.52	0.54	0.51	0.6	0.58	0.54	0.53	0.46	0.51	0.54	0.53	0.53	0.55	0.54
F. benjamina	0.51	0.47	0.62	0.72	0.64	0.54	0.56	0.57	0.56	0.65	0.61	0.58	0.6	0.59	0.61	0.63	0.61	0.61	0.65
F. binnendijkii	0.52	0.49	0.56	0.72	0.64	0.59	0.5	0.59	0.46	0.63	0.58	0.63	0.68	0.52	0.61	0.66	0.61	0.59	0.57
F. callosa	0.54	0.52	0.53	0.56	0.56	0.48	0.61	0.53	0.61	0.55	0.5	0.51	0.5	0.54	0.53	0.53	0.54	0.54	0.55
F. caulocarpa	0.46	0.45	0.54	0.61	0.65	0.61	0.55	0.53	0.57	0.63	0.83	0.59	0.58	0.57	0.59	0.62	0.63	0.67	0.66
F. costata	0.45	0.43	0.51	0.59	0.6	0.56	0.59	0.49	0.51	0.59	0.75	0.59	0.62	0.58	0.59	0.62	0.68	0.6	0.64
F. dalhousiae	0.46	0.53	0.53	0.56	0.59	0.54	0.51	0.54	0.49	0.6	0.53	0.57	0.53	0.54	0.57	0.55	0.57	0.53	0.57

	F. heterophylla	*F. hispida*	*F. krishnae*	*F. microcarpa*	*F. middletonii*	*F. mollis*	*F. nervosa*	*F. pumila*	*F. racemosa*	*F. religiosa*	*F. superba*	*F. talbotii*	*F. tinctoria* subsp. *gibbosa*	*F. tinctoria* subsp. *parasitica*	*F. travancorica*	*F. tsjakela*	*F. virens* var. *dispersa*	*F. virens* var. *matthewii*	*F. virens* var. *virens*
F. drupacea	0.5	0.45	0.55	0.58	0.57	0.52	0.54	0.54	0.55	0.6	0.55	0.53	0.45	0.5	0.56	0.52	0.53	0.58	0.53
F. elastica	0.47	0.47	0.54	0.65	0.6	0.51	0.52	0.48	0.46	0.65	0.5	0.53	0.49	0.5	0.68	0.59	0.59	0.57	0.57
F. exasperata	0.63	0.58	0.45	0.5	0.5	0.44	0.53	0.51	0.51	0.46	0.52	0.49	0.6	0.56	0.49	0.45	0.5	0.5	0.48
F. fergusonii	0.43	0.47	0.66	0.6	0.57	0.48	0.52	0.47	0.55	0.59	0.51	0.55	0.47	0.51	0.63	0.56	0.55	0.56	0.55
F. guttata	0.41	0.49	0.46	0.41	0.44	0.44	0.5	0.51	0.55	0.46	0.43	0.45	0.44	0.44	0.46	0.45	0.49	0.5	0.43
F. heterophylla	1	0.54	0.45	0.49	0.51	0.39	0.58	0.53	0.54	0.53	0.48	0.47	0.55	0.58	0.51	0.42	0.53	0.52	0.51
F. hispida	0.54	1	0.46	0.5	0.46	0.45	0.51	0.5	0.55	0.52	0.5	0.47	0.47	0.51	0.52	0.47	0.48	0.49	0.47
F. krishnae	0.45	0.46	1	0.55	0.57	0.49	0.55	0.5	0.53	0.58	0.49	0.55	0.49	0.51	0.59	0.52	0.57	0.54	0.55
F. microcarpa	0.49	0.5	0.55	1	0.61	0.61	0.47	0.59	0.51	0.66	0.61	0.66	0.59	0.52	0.61	0.61	0.55	0.59	0.6
F. middletonii	0.51	0.46	0.57	0.61	1	0.57	0.56	0.59	0.54	0.65	0.62	0.58	0.56	0.55	0.64	0.58	0.65	0.62	0.69
F. mollis	0.39	0.45	0.49	0.61	0.57	1	0.49	0.53	0.47	0.57	0.58	0.6	0.5	0.46	0.55	0.57	0.47	0.57	0.58
F. nervosa	0.58	0.51	0.55	0.47	0.56	0.49	1	0.5	0.65	0.58	0.58	0.49	0.53	0.55	0.56	0.56	0.56	0.63	0.63
F. pumila	0.53	0.5	0.5	0.59	0.59	0.53	0.5	1	0.5	0.53	0.52	0.51	0.54	0.5	0.56	0.51	0.52	0.58	0.54

	F. heterophylla	*F. hispida*	*F. krishnae*	*F. microcarpa*	*F. middletonii*	*F. mollis*	*F. nervosa*	*F. pumila*	*F. racemosa*	*F. religiosa*	*F. superba*	*F. talbotii*	*F. tinctoria* subsp. *gibbosa*	*F. tinctoria* subsp. *parasitica*	*F. travancorica*	*F. tsjakela*	*F. virens* var. *dispersa*	*F. virens* var. *matthewii*	*F. virens* var. *virens*
F. racemosa	0.54	0.55	0.53	0.51	0.54	0.47	0.65	0.5	1	0.56	0.58	0.5	0.49	0.51	0.58	0.55	0.51	0.57	0.58
F. religiosa	0.53	0.52	0.58	0.66	0.65	0.57	0.58	0.53	0.56	1	0.62	0.6	0.58	0.63	0.67	0.67	0.67	0.6	0.61
F. superba	0.48	0.5	0.49	0.61	0.62	0.58	0.58	0.52	0.58	0.62	1	0.6	0.58	0.59	0.58	0.6	0.62	0.63	0.61
F. talbotii	0.47	0.47	0.55	0.66	0.58	0.6	0.49	0.51	0.5	0.6	0.6	1	0.52	0.51	0.55	0.59	0.6	0.57	0.57
F. tinctoria subsp. *gibbosa*	0.55	0.47	0.49	0.59	0.56	0.5	0.53	0.54	0.49	0.58	0.58	0.52	1	0.65	0.57	0.61	0.54	0.52	0.53
F. tinctoria subsp. *parasitica*	0.58	0.51	0.51	0.52	0.55	0.46	0.55	0.5	0.51	0.48	0.59	0.51	0.65	1	0.58	0.47	0.52	0.52	0.54
F. travancorica	0.51	0.52	0.59	0.61	0.64	0.55	0.56	0.56	0.51	0.63	0.58	0.55	0.57	0.58	1	0.57	0.59	0.6	0.6
F. tsjakela	0.42	0.47	0.52	0.61	0.58	0.57	0.56	0.51	0.55	0.67	0.6	0.59	0.61	0.47	0.57	1	0.6	0.56	0.61
F. virens var. *dispersa*	0.53	0.48	0.57	0.55	0.65	0.47	0.56	0.52	0.51	0.67	0.62	0.6	0.54	0.52	0.59	0.6	1	0.65	0.64
F. virens var. *matthewii*	0.52	0.49	0.54	0.59	0.62	0.57	0.63	0.58	0.57	0.6	0.63	0.57	0.52	0.52	0.6	0.56	0.65	1	0.75
F. virens var. *virens*	0.51	0.47	0.55	0.6	0.69	0.58	0.63	0.54	0.58	0.61	0.61	0.57	0.53	0.54	0.6	0.61	0.64	0.75	1

Correlation between the taxa studied based on syconium characters alone

	A. toxicaria	*F. amplissima*	*F. amplocarpa*	*F. anamalayana*	*F. arnottiana*	*F. auriculata*	*F. beddomei*	*F. benghalensis*	*F. benjamina*	*F. binnendijkii*	*F. callosa*	*F. caulocarpa*	*F. costata*	*F. dalhousiae*	*F. drupacea*	*F. elastica*	*F. exasperata*	*F. fergusonii*	*F. guttata*
A. toxicaria	1	0.21	0.14	0.19	0.23	0.12	0.13	0.17	0.18	0.24	0.19	0.24	0.19	0.21	0.2	0.15	0.22	0.21	0.14
F. amplissima	0.21	1	0.44	0.62	0.61	0.49	0.52	0.48	0.66	0.64	0.54	0.62	0.6	0.63	0.49	0.62	0.5	0.56	0.4
F. amplocarpa	0.14	0.44	1	0.4	0.41	0.48	0.47	0.46	0.42	0.39	0.4	0.45	0.41	0.4	0.45	0.38	0.42	0.4	0.59
F. anamalayana	0.19	0.62	0.4	1	0.56	0.52	0.5	0.51	0.66	0.61	0.57	0.6	0.56	0.71	0.49	0.56	0.47	0.56	0.43
F. arnottiana	0.23	0.61	0.41	0.56	1	0.5	0.51	0.48	0.62	0.62	0.54	0.78	0.82	0.67	0.47	0.5	0.48	0.48	0.39
F. auriculata	0.12	0.49	0.48	0.52	0.5	1	0.51	0.54	0.49	0.39	0.53	0.54	0.5	0.45	0.47	0.45	0.43	0.45	0.51
F. beddomei	0.13	0.52	0.47	0.5	0.51	0.51	1	0.56	0.56	0.54	0.64	0.49	0.52	0.52	0.6	0.59	0.48	0.47	0.46
F. benghalensis	0.17	0.48	0.46	0.51	0.48	0.54	0.56	1	0.61	0.49	0.57	0.52	0.49	0.51	0.7	0.56	0.49	0.59	0.55
F. benjamina	0.18	0.66	0.42	0.66	0.62	0.49	0.56	0.61	1	0.69	0.54	0.63	0.63	0.59	0.64	0.63	0.45	0.61	0.39
F. bimendijkii	0.24	0.64	0.39	0.61	0.62	0.39	0.54	0.49	0.69	1	0.5	0.62	0.62	0.57	0.54	0.61	0.49	0.55	0.39
F. callosa	0.19	0.54	0.4	0.57	0.54	0.53	0.64	0.57	0.54	0.5	1	0.49	0.52	0.59	0.57	0.51	0.48	0.52	0.48
F. caulocarpa	0.24	0.62	0.45	0.6	0.78	0.54	0.49	0.52	0.63	0.62	0.49	1	0.77	0.58	0.48	0.55	0.43	0.5	0.44
F. costata	0.19	0.6	0.41	0.56	0.82	0.5	0.52	0.49	0.63	0.62	0.52	0.77	1	0.59	0.47	0.5	0.41	0.53	0.4
F. dalhousiae	0.21	0.63	0.4	0.71	0.67	0.45	0.52	0.51	0.59	0.57	0.59	0.58	0.59	1	0.52	0.56	0.51	0.53	0.43

	A. toxicaria	*F. amplissima*	*F. amplocarpa*	*F. anamalayana*	*F. arnottiana*	*F. auriculata*	*F. beddomei*	*F. bengbalensis*	*F. benjamina*	*F. binnendijkii*	*F. callosa*	*F. caulocarpa*	*F. costata*	*F. dalhousiae*	*F. drupacea*	*F. elastica*	*F. exasperata*	*F. fergusonii*	*F. guttata*
F. drupacea	0.2	0.49	0.45	0.49	0.47	0.47	0.6	0.7	0.64	0.54	0.57	0.48	0.47	0.52	1	0.57	0.46	0.61	0.53
F. elastica	0.15	0.62	0.38	0.56	0.5	0.45	0.59	0.56	0.63	0.61	0.51	0.55	0.5	0.56	0.57	1	0.39	0.58	0.43
F. exasperata	0.22	0.5	0.42	0.47	0.48	0.43	0.48	0.49	0.45	0.49	0.48	0.43	0.41	0.51	0.46	0.39	1	0.42	0.46
F. fergusonii	0.21	0.56	0.4	0.56	0.48	0.45	0.47	0.59	0.61	0.55	0.52	0.5	0.53	0.53	0.61	0.58	0.42	1	0.42
F. guttata	0.14	0.4	0.59	0.43	0.39	0.51	0.46	0.55	0.39	0.39	0.48	0.44	0.4	0.43	0.53	0.43	0.46	0.42	1
F. heterophylla	0.14	0.46	0.46	0.51	0.46	0.42	0.54	0.48	0.5	0.5	0.53	0.44	0.42	0.56	0.54	0.48	0.61	0.43	0.38
F. hispida	0.2	0.53	0.53	0.6	0.55	0.54	0.56	0.57	0.54	0.54	0.54	0.53	0.5	0.65	0.54	0.48	0.6	0.5	0.53
F. krishnae	0.21	0.53	0.45	0.54	0.5	0.49	0.48	0.66	0.65	0.58	0.55	0.51	0.53	0.52	0.59	0.51	0.46	0.67	0.43
F. microcarpa	0.19	0.55	0.42	0.54	0.62	0.41	0.54	0.55	0.67	0.73	0.53	0.62	0.61	0.61	0.59	0.62	0.45	0.57	0.43
F. middletonii	0.18	0.59	0.39	0.59	0.61	0.43	0.55	0.53	0.64	0.65	0.58	0.63	0.59	0.63	0.58	0.64	0.49	0.56	0.43
F. mollis	0.18	0.53	0.35	0.55	0.6	0.43	0.52	0.52	0.6	0.64	0.52	0.65	0.59	0.59	0.51	0.55	0.39	0.47	0.42
F. nervosa	0.2	0.6	0.49	0.56	0.58	0.48	0.65	0.57	0.6	0.48	0.66	0.55	0.6	0.57	0.56	0.55	0.51	0.51	0.47
F. pumila	0.21	0.48	0.45	0.56	0.54	0.52	0.56	0.54	0.54	0.6	0.56	0.53	0.48	0.57	0.56	0.5	0.53	0.47	0.49

	A. toxicaria	*F. amplissima*	*F. amplocarpa*	*F. anamalayana*	*F. arnottiana*	*F. auriculata*	*F. beddomei*	*F. bengbalensis*	*F. benjamina*	*F. binnendijkii*	*F. callosa*	*F. caulocarpa*	*F. costata*	*F. dalhousiae*	*F. drupacea*	*F. elastica*	*F. exasperata*	*F. fergusonii*	*F. guttata*
F. racemosa	0.19	0.47	0.54	0.51	0.5	0.56	0.55	0.65	0.53	0.39	0.61	0.52	0.45	0.53	0.58	0.43	0.49	0.51	0.6
F. religiosa	0.16	0.62	0.45	0.6	0.58	0.46	0.63	0.63	0.69	0.61	0.58	0.63	0.6	0.68	0.68	0.69	0.43	0.62	0.47
F. superba	0.23	0.64	0.48	0.63	0.78	0.52	0.5	0.56	0.66	0.6	0.52	0.84	0.75	0.6	0.55	0.53	0.47	0.53	0.46
F. talbotii	0.18	0.57	0.38	0.55	0.65	0.46	0.49	0.56	0.56	0.62	0.5	0.6	0.61	0.66	0.56	0.53	0.42	0.54	0.41
F. tinctoria subsp. *gibbosa*	0.16	0.55	0.4	0.55	0.68	0.42	0.47	0.46	0.57	0.72	0.51	0.61	0.62	0.62	0.47	0.52	0.62	0.47	0.45
F. tinctoria subsp. *parasitica*	0.2	0.62	0.42	0.66	0.71	0.52	0.48	0.51	0.6	0.55	0.57	0.57	0.6	0.63	0.51	0.53	0.57	0.52	0.45
F. travancorica	0.21	0.59	0.4	0.56	0.57	0.44	0.63	0.56	0.61	0.61	0.59	0.59	0.57	0.59	0.58	0.71	0.49	0.67	0.46
F. tsjakela	0.21	0.63	0.44	0.6	0.64	0.44	0.57	0.56	0.69	0.72	0.53	0.68	0.64	0.62	0.54	0.63	0.44	0.55	0.44
F. virens var. *dispersa*	0.16	0.6	0.52	0.59	0.59	0.47	0.54	0.54	0.61	0.54	0.51	0.6	0.68	0.6	0.54	0.57	0.5	0.55	0.49
F. virens var. *matthewii*	0.2	0.55	0.53	0.57	0.59	0.46	0.57	0.54	0.59	0.54	0.51	0.64	0.58	0.56	0.59	0.54	0.46	0.48	0.5
F. virens var. *virens*	0.2	0.52	0.52	0.57	0.66	0.46	0.56	0.51	0.66	0.53	0.56	0.62	0.62	0.6	0.5	0.58	0.42	0.51	0.41

	E. heterophylla	*E. hispida*	*E. krishnae*	*E. microcarpa*	*E. middletonii*	*E. mollis*	*E. nervosa*	*E. pumila*	*E. racemosa*	*E. religiosa*	*E. superba*	*E. talbotii*	*E. tinctoria* subsp. *gibbosa*	*E. tinctoria* subsp. *parasitica*	*E. tragoncorica*	*E. tsjakela*	*E. virens* var. *dispersa*	*E. virens* var. *matthewii*	*E. virens* var. *virens*
A. toxicaria	0.14	0.2	0.21	0.19	0.18	0.18	0.2	0.21	0.19	0.16	0.23	0.18	0.16	0.2	0.21	0.21	0.16	0.2	0.2
F. amplissima	0.46	0.53	0.53	0.55	0.59	0.53	0.6	0.48	0.47	0.62	0.64	0.57	0.55	0.62	0.59	0.63	0.6	0.55	0.52
F. amplocarpa	0.46	0.53	0.45	0.42	0.39	0.35	0.49	0.45	0.54	0.45	0.48	0.38	0.4	0.42	0.4	0.44	0.52	0.53	0.52
F. anamalayana	0.51	0.6	0.54	0.54	0.59	0.55	0.56	0.56	0.51	0.6	0.63	0.55	0.55	0.66	0.56	0.6	0.59	0.57	0.57
F. arnottiana	0.46	0.55	0.5	0.62	0.61	0.6	0.58	0.54	0.5	0.58	0.78	0.65	0.68	0.71	0.57	0.64	0.59	0.59	0.66
F. auriculata	0.42	0.54	0.49	0.41	0.43	0.43	0.48	0.52	0.56	0.46	0.52	0.46	0.42	0.52	0.44	0.44	0.47	0.46	0.46
F. beddomei	0.54	0.56	0.48	0.54	0.55	0.52	0.65	0.56	0.55	0.63	0.5	0.49	0.47	0.48	0.63	0.57	0.54	0.57	0.56
F. benghalensis	0.48	0.57	0.66	0.55	0.53	0.52	0.57	0.54	0.65	0.63	0.56	0.56	0.46	0.51	0.56	0.56	0.54	0.54	0.51
F. benjamina	0.5	0.54	0.65	0.67	0.64	0.6	0.6	0.54	0.53	0.69	0.66	0.56	0.57	0.6	0.61	0.69	0.61	0.59	0.66
F. bimmendijkii	0.5	0.54	0.58	0.73	0.65	0.64	0.48	0.6	0.39	0.61	0.6	0.62	0.72	0.55	0.61	0.72	0.54	0.54	0.53
F. callosa	0.53	0.54	0.55	0.53	0.58	0.52	0.66	0.56	0.61	0.58	0.52	0.5	0.51	0.57	0.59	0.53	0.51	0.51	0.56
F. caulocarpa	0.44	0.53	0.51	0.62	0.63	0.65	0.55	0.53	0.52	0.63	0.84	0.6	0.61	0.57	0.59	0.68	0.6	0.64	0.62
F. costata	0.42	0.5	0.53	0.61	0.59	0.59	0.6	0.48	0.45	0.6	0.75	0.61	0.62	0.6	0.57	0.64	0.68	0.58	0.62
F. dalhousiae	0.56	0.65	0.52	0.61	0.63	0.59	0.57	0.57	0.53	0.68	0.6	0.66	0.62	0.63	0.59	0.62	0.6	0.56	0.6

	F. heterophylla	*F. hispida*	*F. krishnae*	*F. microcarpa*	*F. middletonii*	*F. mollis*	*F. nervosa*	*F. pumila*	*F. racemosa*	*F. religiosa*	*F. superba*	*F. talbotii*	*F. tinctoria* subsp. *gibbosa*	*F. tinctoria* subsp. *parasitica*	*F. travancorica*	*F. tsjakela*	*F. virens* var. *dispersa*	*F. virens* var. *mattheuii*	*F. virens* var. *virens*
F. drupacea	0.54	0.54	0.59	0.59	0.58	0.51	0.56	0.56	0.58	0.68	0.55	0.56	0.47	0.51	0.58	0.54	0.54	0.59	0.5
F. elastica	0.48	0.48	0.51	0.62	0.64	0.55	0.55	0.5	0.43	0.69	0.53	0.53	0.52	0.53	0.71	0.63	0.57	0.54	0.58
F. exasperata	0.61	0.6	0.46	0.45	0.49	0.39	0.51	0.53	0.49	0.43	0.47	0.42	0.62	0.57	0.49	0.44	0.5	0.46	0.42
F. fergusonii	0.43	0.5	0.67	0.57	0.56	0.47	0.51	0.47	0.51	0.62	0.53	0.54	0.47	0.52	0.67	0.55	0.55	0.48	0.51
F. guttata	0.38	0.53	0.43	0.43	0.43	0.42	0.47	0.49	0.6	0.47	0.46	0.41	0.45	0.45	0.46	0.44	0.49	0.5	0.41
F. heterophylla	1	0.55	0.47	0.5	0.55	0.37	0.58	0.54	0.53	0.54	0.46	0.47	0.56	0.58	0.53	0.41	0.53	0.52	0.49
F. hispida	0.55	1	0.49	0.57	0.55	0.5	0.54	0.58	0.63	0.58	0.58	0.56	0.52	0.56	0.58	0.55	0.56	0.53	0.55
F. krishnae	0.47	0.49	1	0.56	0.57	0.51	0.61	0.53	0.52	0.58	0.51	0.56	0.51	0.53	0.61	0.57	0.58	0.52	0.55
F. microcarpa	0.5	0.57	0.56	1	0.61	0.65	0.49	0.57	0.48	0.7	0.64	0.7	0.58	0.54	0.62	0.64	0.52	0.55	0.59
F. middletonii	0.55	0.55	0.57	0.61	1	0.58	0.58	0.65	0.5	0.69	0.61	0.55	0.57	0.56	0.7	0.61	0.62	0.58	0.66
F. mollis	0.37	0.5	0.51	0.65	0.58	1	0.51	0.52	0.48	0.64	0.64	0.64	0.55	0.43	0.57	0.69	0.49	0.58	0.6
F. nervosa	0.58	0.54	0.61	0.49	0.58	0.51	1	0.49	0.6	0.63	0.6	0.49	0.54	0.57	0.58	0.56	0.61	0.61	0.62
F. pumila	0.54	0.58	0.53	0.57	0.65	0.52	0.49	1	0.49	0.56	0.54	0.52	0.51	0.51	0.59	0.51	0.52	0.56	0.53

	F. heterophylla	*F. hispida*	*F. krishnae*	*F. microcarpa*	*F. middletonii*	*F. mollis*	*F. nervosa*	*F. pumila*	*F. racemosa*	*F. religiosa*	*F. superba*	*F. talbotii*	*F. tinctoria* subsp. *gibbosa*	*F. tinctoria* subsp. *parasitica*	*F. travancorica*	*F. tsjakela*	*F. virens* var. *dispersa*	*F. virens* var. *matthewii*	*F. virens* var. *virens*
F. racemosa	0.53	0.63	0.52	0.48	0.5	0.48	0.6	0.49	1	0.55	0.56	0.48	0.43	0.51	0.47	0.49	0.46	0.52	0.54
F. religiosa	0.54	0.58	0.58	0.7	0.69	0.64	0.63	0.56	0.55	1	0.63	0.63	0.58	0.52	0.7	0.69	0.67	0.61	0.62
F. superba	0.46	0.58	0.51	0.64	0.61	0.64	0.6	0.54	0.56	0.63	1	0.63	0.58	0.63	0.6	0.62	0.61	0.63	0.6
F. talbotii	0.47	0.56	0.56	0.7	0.55	0.64	0.49	0.52	0.48	0.63	0.63	1	0.52	0.53	0.58	0.64	0.58	0.55	0.56
F. tinctoria subsp. *gibbosa*	0.56	0.52	0.51	0.58	0.57	0.55	0.54	0.51	0.43	0.58	0.58	0.52	1	0.67	0.53	0.64	0.56	0.51	0.5
F. tinctoria subsp. *parasitica*	0.58	0.56	0.53	0.54	0.56	0.43	0.57	0.51	0.51	0.52	0.63	0.53	0.67	1	0.58	0.49	0.57	0.51	0.53
F. travancorica	0.53	0.58	0.61	0.62	0.7	0.57	0.58	0.59	0.47	0.7	0.6	0.58	0.53	0.58	1	0.57	0.65	0.59	0.6
F. tsjakela	0.41	0.55	0.57	0.64	0.61	0.69	0.56	0.51	0.49	0.69	0.62	0.64	0.64	0.49	0.57	1	0.6	0.55	0.63
F. virens var. *dispersa*	0.53	0.56	0.58	0.52	0.62	0.49	0.61	0.52	0.46	0.67	0.61	0.58	0.56	0.57	0.65	0.6	1	0.67	0.63
F. virens var. *matthewii*	0.52	0.53	0.52	0.55	0.58	0.58	0.61	0.56	0.52	0.61	0.63	0.55	0.51	0.51	0.59	0.55	0.67	1	0.72
F. virens var. *virens*	0.49	0.55	0.55	0.59	0.66	0.6	0.62	0.53	0.54	0.62	0.6	0.56	0.5	0.53	0.6	0.63	0.63	0.72	1

Appendix VI

List of newly sequenced samples and accession numbers

Sl. No.	Taxa	*ITS* Accession Number	*trnH-psbA* Accession Number	Voucher specimen
1	*F. arnottiana*	OR130924	-	MESAH12231
2	*F. costata*	OQ658620	OQ729926	MESAH12175
3	*F. fergusonii*	OQ683788	OQ749386	MESAH12167
4	*F. talbotii*	-	OR339578	MESAH12230
5	*F. travancorica*	OQ658621	OQ729927	MESAH12189
6	*F. tinctoria* sp. *gibbosa*	OQ691629	OQ749385	MESAH12136
7	*F. tinctoria* sp. *parasitica*	OQ691630	OQ749387	MESAH12944
8	*F. tsjakela*	-	OR239866	MESAH12229
9	*F. virens* var. *dispersa*	OQ617446	OQ676848	MESAH12121
10	*F. virens* var. *matthewii*	OQ683793	OQ676849	MESAH12968

List of samples and accession numbers retrieved from NCBI

Sl. No.	Taxa	*ITS* Accession Number	*trnH-psbA* Accession Number
1	*F. amplissima*	EU091577	MT445803
2	*F. amplocarpa*	KU365058	MF288779
3	*F. anamalayana*	KU365054	MF288776
4	*F. arnottiana*	-	MT445815
5	*F. auriculata*	JQ773835	JQ774226
6	*F. beddomei*	MF288770	MT445816

7	*F. benghalensis*	AY730065	MF288774
8	*F. benjamina*	JQ773839	MT445817
9	*F. binnendijkii*	JQ773843	JQ774162
10	*F. callosa*	JX185792	JX185798
11	*F. caulocarpa*	JQ773852	MT445799
12	*F. dalhousiae*	KU365055	MF288777
13	*F. drupacea*	JQ773863	MT445807
14	*F. elastica*	JQ773865	GU935096
15	*F. exasperata*	EU091665	MT445819
16	*F. guttata*	KX173432	MF288773
17	*F. heterophylla*	EU091667	KP095824
18	*F. hispida*	JQ773901	GU935101
19	*F. krishnae*	KX277723	MF288781
20	*F. microcarpa*	JQ773920	MT445823
21	*F. middletonii*	MN922249	MT445795
22	*F. mollis*	MN922250	MT445825
23	*F. nervosa*	JQ773928	JQ774272
24	*F. pumila*	JQ773955	KT726864
25	*F. racemosa*	AF165405	MT445827
26	*F. religiosa*	KJ845981	MT445789
27	*F. superba*	KJ845944	MT445805
28	*F. talbotii*	MK472767	-
29	*F. tsjakela*	KJ845951	-
30	*F. virens* var. *virens*	JQ773827	JQ774263
31	*Antiaris toxicaria*	MN402509	GQ435322

Appendix VII

Data of Phytosociological Analysis

Associates, vegetation and population characteristics of *Ficus amplissima*

SL. NO.	SCIENTIFIC NAME	T0TAL NO. OF INDIVIDUALS	T0TAL NO. OF QUADRATES	QUADRATE OF OCCURRENCE	GBH	BASAL AREA	FREQUENCY	DENSITY	RF	RD	RBA	IVI
1	***Ficus amplissima* Sm.**	3	3	3	1881	281700.7166	1	1	14.2857	10	67.06170874	91.3474
2	*Vateria indica* L.	5	3	3	936	69752.86624	1	1.66667	14.2857	16.6667	16.60537629	47.5578
3	*Xanthophyllum flavescens* Roxb	6	3	2	262	5465.286624	0.66667	2	9.52381	20	1.301066835	30.8249
4	*Hydnocarpus pentandrus* (Bauch.-Ham) Oken	2	3	1	648	33431.84713	0.33333	0.66667	4.7619	6.66667	7.95878982	19.3874
5	*Aglaia edulis* (Roxb.) Wall.	2	3	1	286	6512.420382	0.33333	0.66667	4.7619	6.66667	1.550347632	12.9789
6	*Palaquium ellipticum* (Dalzell) Baill.	2	3	1	279	6197.531847	0.33333	0.66667	4.7619	6.66667	1.475385227	12.904
7	*Artocarpus heterophyllus* Lam	1	3	1	281	6286.703822	0.33333	0.33333	4.7619	3.33333	1.496613519	9.59185

8	*Macaranga peltata* (Roxb.) Müll.Arg.	1	3	1	252	5056.050955	0.33333	0.33333	4.7619	3.33333	1.203644139	9.29888
9	*Diospyros sylvatica* Roxb.	1	3	1	172	2355.414013	0.33333	0.33333	4.7619	3.33333	0.560730162	8.65597
10	*Elaeocarpus tuberculatus* Roxb.	1	3	1	128	1304.458599	0.33333	0.33333	4.7619	3.33333	0.310539581	8.40578
11	*Dysoxylum malabaricum* Bedd. ex C.DC.	1	3	1	95	718.5509554	0.33333	0.33333	4.7619	3.33333	0.171058333	8.2663
12	*Melicope lunu-ankenda* (Gaertn.) T.G.Hartley	1	3	1	75	447.8503185	0.33333	0.33333	4.7619	3.33333	0.106615304	8.20185
13	*Machilus glaucescens* (Nees) Wight	1	3	1	65	336.3853503	0.33333	0.33333	4.7619	3.33333	0.08007994	8.17532
14	*Syzygium cumini* (L.) Skeels	1	3	1	56	249.6815287	0.33333	0.33333	4.7619	3.33333	0.059439217	8.15468
15	*Actinodaphne wightiana* (Kuntze) Noltie	1	3	1	44	154.1401274	0.33333	0.33333	4.7619	3.33333	0.036694619	8.13193
16	*Baccaurea courtallensis* (Wight) Müll.Arg.	1	3	1	34	92.03821656	0.33333	0.33333	4.7619	3.33333	0.02191063	8.11715
	Total	**30**				**420061.9427**	**7**	**10**	**100**	**100**	**100**	**300**

Associates, vegetation and population characteristics of *Ficus beddomei*

SL. NO.	SCIENTIFIC NAME	T0TAL NO. OF INDIVIDUALS	T0TAL NO. OF QUADRATES	QUADRATE OF OCCURRENCE	GBH	BASAL AREA	FREQUENCY	DENSITY	RF	RD	RBA	IVI
1	***Ficus beddomei* King**	4	3	3	1444	166014	1	1.33333	16.6667	16	76.9373	109.604
2	*Turpinia malabarica* Gamble	2	3	2	404	12994.9	0.66667	0.66667	11.1111	8	6.02234	25.1334
3	*Palaquium ellipticum* (Dalzell) Baill.	3	3	1	381	11557.4	0.33333	1	5.55556	12	5.35615	22.9117
4	*Aglaia edulis* (Roxb.) Wall.	3	3	1	350	9753.18	0.33333	1	5.55556	12	4.52	22.0756
5	*Vateria indica* L.	2	3	1	250	4976.11	0.33333	0.66667	5.55556	8	2.30612	15.8617
6	*Strychnos nux-vomica* L.	2	3	1	145	1673.96	0.33333	0.66667	5.55556	8	0.77578	14.3313
7	*Hopea parviflora* Bedd.	1	3	1	260	5382.17	0.33333	0.33333	5.55556	4	2.4943	12.0499
8	*Garcinia gummi-gutta* (L.) N. Robson	1	3	1	130	1345.54	0.33333	0.33333	5.55556	4	0.62358	10.1791
9	*Vitex leucoxylon* L.f.	1	3	1	82	535.35	0.33333	0.33333	5.55556	4	0.2481	9.80366
10	*Actinodaphne bourdillonii* Gamble	1	3	1	80	509.554	0.33333	0.33333	5.55556	4	0.23615	9.7917

11	*Mesua ferrea* L.	1	3	1	71	401.354	0.33333	0.33333	5.55556	4	0.186	9.74156
12	*Diospyros sylvatica* Roxb.	1	3	1	55	240.844	0.33333	0.33333	5.55556	4	0.11162	9.66717
13	*Xanthophyllum flavescens* Roxb	1	3	1	55	240.844	0.33333	0.33333	5.55556	4	0.11162	9.66717
14	*Schleichera oleosa* (Lour.) Oken	1	3	1	32	81.5287	0.33333	0.33333	5.55556	4	0.03778	9.59334
15	*Antidesma pyrifolium* Müll.Arg.	1	3	1	30	71.6561	0.33333	0.33333	5.55556	4	0.03321	9.58876
	Total	**25**				**215778**	**6**	**8.33333**	**100**	**100**	**100**	**300**

Associates, vegetation and population characteristics of *Ficus benghalensis*

SL. NO.	SCIENTIFIC NAME	T0TAL NO. OF INDIVIDUALS	T0TAL NO. OF QUADRATES	QUADRATE OF OCCURRENCE	GBH	BASAL AREA	FREQUENCY	DENSITY	RF	RD	RBA	IVI
1	***Ficus benghalensis* L.**	12	3	3	1837	268675.8758	1	4	30	52.1739	97.67382155	179.848
2	*Diospyros ovalifolia* Wight	2	3	2	112	998.7261146	0.66667	0.66667	20	8.69565	0.363074638	29.0587
3	*Pongamia pinnata* (L.) Pierre	3	3	1	158	1987.579618	0.33333	1	10	13.0435	0.722560209	23.766

4	*Hopea parviflora* Bedd.	2	3	1	146	1697.133758	0.33333	0.66667	10	8.69565	0.616972176	19.3126
5	*Drypetes ventusa* (Wight) Pax & K.Hoffm	2	3	1	122	1185.031847	0.33333	0.66667	10	8.69565	0.430803803	19.1265
6	*Azadirachta indica* A.Juss.	1	3	1	66	346.8152866	0.33333	0.33333	10	4.34783	0.126080447	14.4739
7	*Mallotus philippensis* (Lam.) Muell	1	3	1	48	183.4394904	0.33333	0.33333	10	4.34783	0.066687178	14.4145
	Total	**23**				**275074.6019**	**3.33333**	**7.66667**	**100**	**100**	**100**	**300**

Associates, vegetation and population characteristics of *Ficus exasperata*

SL. NO.	SCIENTIFIC NAME	T0TAL NO. OF INDIVIDUALS	T0TAL NO. OF QUADRATES	QUADRATE OF OCCURRENCE	GBH	BASAL AREA	FREQUENCY	DENSITY	RF	RD	RBA	IVI
1	*Palaquium ellipticum* (Dalzell) Baill.	5	3	2	672	35954.14013	0.66667	1.666666667	11.1111	15.625	54.7166	81.4527
2	*Mallotus tetracoccus* (Roxb.) Kurz	4	3	1	318	8051.273885	0.33333	1.333333333	5.55556	12.5	12.2528	30.3083
3	Xanthophyllum flavescens Roxb	6	3	3	257	5258.678344	1	2	16.6667	18.75	8.00288	43.4196
4	***Ficus exasperata* Vahl.**	4	3	3	216	3714.649682	1	1.333333333	16.6667	12.5	5.65311	34.8198
5	Melicope *lunu-ankenda* (Gaertn.) T.G.Hartley	2	3	1	210	3511.146497	0.33333	0.666666667	5.55556	6.25	5.34341	17.149

6	*Dysoxylum malabaricum* Bedd. ex C.DC.	3	3	1	182	2637.261146	0.33333	1	5.55556	9.375	4.0135	18.9441
7	*Baccaurea courtallensis* (Wight) Müll.Arg.	1	3	1	162	2089.490446	0.33333	0.333333333	5.55556	3.125	3.17988	11.8604
8	*Knema attenuata* (Wall. Ex Hook.f. & Thomson) Warb.	1	3	1	160	2038.216561	0.33333	0.333333333	5.55556	3.125	3.10185	11.7824
9	*Aporosa cardiosperma* (Gaertn.) Merr.	2	3	1	98	764.6496815	0.33333	0.666666667	5.55556	6.25	1.16368	12.9692
10	*Elaeocarpus serratus* L.	1	3	1	89	630.6528662	0.33333	0.333333333	5.55556	3.125	0.95975	9.64031
11	*Myristica beddomei* King	1	3	1	72	412.7388535	0.33333	0.333333333	5.55556	3.125	0.62812	9.30868
12	*Macaranga peltata* (Roxb.) Müll.Arg.	1	3	1	69	379.0605096	0.33333	0.333333333	5.55556	3.125	0.57687	9.25743
13	*Tetrapilus dioicus* (Roxb.) L.A.S.Johnson	1	3	1	58	267.8343949	0.33333	0.333333333	5.55556	3.125	0.4076	9.08816
	Total	**32**				**65709.79299**	**6**	**10.66666667**	**100**	**100**	**100**	**300**

Associates, vegetation and population characteristics of *Ficus hispida*

SL. NO.	SCIENTIFIC NAME	T0TAL NO. OF INDIVIDUALS	T0TAL NO. OF QUADRATES	QUADRATE OF OCCURRENCE	GBH	BASAL AREA	FREQUENCY	DENSITY	RF	RD	RBA	IVI
1	*Bambusa bambos* (L.) Voss	5	3	2	530	22364.64968	0.666666667	1.66666667	11.11111111	10.6383	56.1268	77.8762
2	***Ficus hispida* L.f.**	13	3	3	297	7023.009554	1	4.33333333	16.66666667	27.6596	17.6251	61.9513
3	*Gliricidia sepium* (Jacq.) Kunth	9	3	2	154	1888.216561	0.666666667	3	11.11111111	19.1489	4.73871	34.9988
4	*Trema orientale* (L.) Blume	6	3	2	190	2874.203822	0.666666667	2	11.11111111	12.766	7.21316	31.0902
5	*Terminalia paniculata* B.Heyne ex Roth	2	3	1	120	1146.496815	0.333333333	0.66666667	5.555555556	4.25532	2.87727	12.6881
6	*Getonia floribunda* Roxb.	3	3	1	42	140.4458599	0.333333333	1	5.555555556	6.38298	0.35247	12.291
7	*Anacardium occidentale* L.	2	3	1	96	733.7579618	0.333333333	0.66666667	5.555555556	4.25532	1.84145	11.6523
8	*Ailanthus triphysa* (Dennst.) Alston	2	3	1	84	561.7834395	0.333333333	0.66666667	5.555555556	4.25532	1.40986	11.2207
9	*Hydnocarpus pentandrus* (Bauch.-Ham) Oken	1	3	1	120	1146.496815	0.333333333	0.33333333	5.555555556	2.12766	2.87727	10.5605
10	*Artocarpus hirsutus* Lam.	1	3	1	105	877.7866242	0.333333333	0.33333333	5.555555556	2.12766	2.20291	9.88613
11	*Holigarna arnottiana* Hook.f.	1	3	1	84	561.7834395	0.333333333	0.33333333	5.555555556	2.12766	1.40986	9.09308

12	*Caryota urens* L.	1	3	1	74	435.9872611	0.333333333	0.33333333	5.555555556	2.12766	1.09416	8.77738
13	*Debregeasia longifolia* (Burm.f.) Wedd.	1	3	1	34	92.03821656	0.333333333	0.33333333	5.555555556	2.12766	0.23098	7.9142
	Total					**39846.65605**	**6**	**15.6666667**	**100**	**100**	**100**	**300**

Associates, vegetation and population characteristics of *Ficus microcarpa*

SL. NO.	SCIENTIFIC NAME	T0TAL NO. OF INDIVIDUALS	T0TAL NO. OF QUADRATES	QUADRATE OF OCCURRENCE	GBH	BASAL AREA	FREQUENCY	DENSITY	RF	RD	RBA	IVI
1	*Aglaia edulis* (Roxb.) Wall.	3	3	1	239	4547.8503	0.33333	1	5	10	1.04678	16.0468
2	*Diospyros ovalifolia* Wight	1	3	1	35	97.531847	0.33333	0.33333	5	3.33333	0.02245	8.35578
3	*Diospyros paniculata* Dalzell	2	3	1	360	10318.471	0.33333	0.66667	5	6.66667	2.37501	14.0417
4	*Drypetes venusta* (Wight) Pax & K.Hoffm.	1	3	1	52	215.28662	0.33333	0.33333	5	3.33333	0.04955	8.38288
5	*Elaeocarpus tuberculatus* Roxb.	2	3	1	370	10899.682	0.33333	0.66667	5	6.66667	2.50878	14.1754
6	***Ficus microcarpa* L.f.**	8	3	3	2125	359524.28	1	2.66667	15	26.6667	82.7519	124.419
7	*Glycosmis mauritiana* (Lam.) Tanaka	1	3	1	31	76.512739	0.33333	0.33333	5	3.33333	0.01761	8.35094

8	*Hopea parviflora* Bedd.	1	3	1	247	4857.4045	0.33333	0.33333	5	3.33333	1.11803	9.45136
9	*Litsea bourdillonii* Gamble	1	3	1	85	575.23885	0.33333	0.33333	5	3.33333	0.1324	8.46573
10	*Mallotus philippensis* (Lam.) Müll.Arg.	1	3	1	99	780.33439	0.33333	0.33333	5	3.33333	0.17961	8.51294
11	*Mesua ferrea* L.	1	3	1	220	3853.5032	0.33333	0.33333	5	3.33333	0.88696	9.22029
12	*Palaquium ellipticum* (Dalzell) Baill.	1	3	1	495	19508.36	0.33333	0.33333	5	3.33333	4.49025	12.8236
13	*Machilus glaucescens* (Nees) Wight	2	3	2	180	2579.6178	0.66667	0.66667	10	6.66667	0.59375	17.2604
14	*Premna tomentosa* Willd.	1	3	1	92	673.88535	0.33333	0.33333	5	3.33333	0.15511	8.48844
15	*Putranjiva roxburghii* Wall.	1	3	1	178	2	0.33333	0.33333	5	3.33333	0.00046	8.33379
16	*Tamarindus indica* L	2	3	1	279	6197.5318	0.33333	0.66667	5	6.66667	1.42649	13.0932
17	*Terminalia bellirica* (Gaertn.) Roxb.	1	3	1	350	9753.1847	0.33333	0.33333	5	3.33333	2.24489	10.5782
	Total					**434460.68**	**6.66667**	**10**	**100**	**100**	**100**	**300**

Associates, vegetation and population characteristics of *Ficus nervosa*

SL. NO.	SCIENTIFIC NAME	T0TAL NO. OF INDIVIDUALS	T0TAL NO. OF QUADRATES	QUADRATE OF OCCURRENCE	GBH	BASAL AREA	FREQUENCY	DENSITY	RF	RD	RBA	IVI
1	***Ficus nervosa* Roth**	3	3	3	905	65208.997	1	1	15	9.67742	49.3168	73.9943
2	*Schleichera oleosa* (Lour.) Oken	6	3	2	570	25867.834	0.66667	2	10	19.3548	19.5636	48.9184
3	*Diospyros paniculata* Dalzell	4	3	3	224	3994.9045	1	1.33333	15	12.9032	3.0213	30.9245
4	*Palaquium ellipticum* (Dalzell) Baill.	2	3	2	434	14996.497	0.66667	0.66667	10	6.45161	11.3417	27.7933
5	*Mesua ferrea* L.	3	3	2	289	6649.7611	0.66667	1	10	9.67742	5.02914	24.7066
6	*Vateria indica* L.	3	3	2	261	5423.6465	0.66667	1	10	9.67742	4.10184	23.7793
7	*Spondias pinnata* (L.f.) Kurz	3	3	1	285	6466.9586	0.33333	1	5	9.67742	4.89089	19.5683
8	*Elaeocarpus tuberculatus* Roxb.	2	3	2	146	1697.1338	0.66667	0.66667	10	6.45161	1.28352	17.7351
9	*Aporosa cardiosperma* (Gaertn.) Merr.	2	3	1	134	1429.6178	0.33333	0.66667	5	6.45161	1.0812	12.5328
10	*Xanthophyllum flavescens* Roxb.	2	3	1	68	368.15287	0.33333	0.66667	5	6.45161	0.27843	11.73
11	*Actinodaphne wightiana* (Kuntze) Noltie	1	3	1	39	121.09873	0.33333	0.33333	5	3.22581	0.09159	8.31739
	Total					**132224.6**	**6.66667**	**10.3333**	**100**	**100**	**100**	**300**

Associates, vegetation and population characteristics of *Ficus racemosa*

SL. NO.	SCIENTIFIC NAME	TOTAL NO. OF INDIVIDUALS	TOTAL NO. OF QUADRATES	QUADRATE OF OCCURRENCE	GBH	BASAL AREA	FREQUENCY	DENSITY	RF	RD	RBA	IVI
1	***Ficus racemosa* L.**	3	3	3	1477	173688.6146	1	1	14.2857	4.68750007	75.42313666	94.3964
2	*Maesa indica* (Roxb.) Sweet	30	3	2	108	928.6624204	0.66667	10	9.52381	46.8750007	0.403265538	56.8021
3	*Mallotus philippensis* (Lam.) Müll.Arg.	9	3	2	497	19666.32166	0.66667	3	9.52381	14.0625002	8.539970618	32.1263
4	*Cinnamomum macrocarpum* Hook.f.	5	3	2	562	25146.81529	0.66667	1.66666667	9.52381	7.81250012	10.91983887	28.2561
5	*Vitex leucoxylon* L.f.	5	3	2	179	2551.035032	0.66667	1.66666667	9.52381	7.81250012	1.107770156	18.4441
6	*Ligustrum robustum* (Roxb.) Blume	2	3	2	109	945.9394904	0.66667	0.66666667	9.52381	3.12500005	0.410767992	13.0596
7	*Pongamia pinnata* (L.) Pierre	3	3	1	202	3248.726115	0.33333	1	4.7619	4.68750007	1.410737913	10.8601
8	*Erythrina variegata* L.	1	3	1	142	1605.414013	0.33333	0.33333333	4.7619	1.56250002	0.697140459	7.02155
9	*Meliosma pinnata* (Roxb.) Maxim.	1	3	1	110	963.3757962	0.33333	0.33333333	4.7619	1.56250002	0.418339593	6.74274
10	*Glochidion zeylanicum* (Gaertn.) A.Juss.	1	3	1	80	509.5541401	0.33333	0.33333333	4.7619	1.56250002	0.221270528	6.54568
11	*Putranjiva roxburghii* Wall.	1	3	1	65	336.3853503	0.33333	0.33333333	4.7619	1.56250002	0.146073122	6.47048
12	*Callicarpa tomentosa* (L.) L.	1	3	1	59	277.1496815	0.33333	0.33333333	4.7619	1.56250002	0.120350423	6.44476

13	*Strobocalyx arborea* (Buch.-Ham.) Sch.Bip.	1	3	1	59	277.1496815	0.33333	0.33333333	4.7619	1.56250002	0.120350423	6.44476
14	*Hiptage benghalensis* (L.) Kurz	1	3	1	42	140.4458599	0.33333	0.33333333	4.7619	1.56250002	0.060987689	6.38539
	Total	**64**				**230285.5892**	**7**	**21.3333333**	**100**	**100**	**100**	**300**

Associates, vegetation and population characteristics of *Ficus tsjakela*

SL. NO.	SCIENTIFIC NAME	T0TAL NO. OF INDIVIDUALS	T0TAL NO. OF QUADRATES	QUADRATE OF OCCURRENCE	GBH	BASAL AREA	FREQUENCY	DENSITY	RF	RD	RBA	IVI
1	*Holigarna arnottiana* Hook.f.	1	3	1	339	9149.761146	0.333333333	0.33333333	5.8823529	1.78571	10.48764573	18.1557
2	*Bambusa bambos* (L.) Voss	28	3	2	597	28376.51274	0.666666667	9.33333333	11.764706	50	32.52574662	94.2905
4	*Elaeocarpus serratus* L.	2	3	1	390	12109.87261	0.333333333	0.66666667	5.8823529	3.57143	13.8805868	23.3344
5	***Ficus tsjakela* Burm.f.**	1	3	3	586	27340.44586	1	0.33333333	17.647059	1.78571	31.3381853	50.771
6	*Adina cordifolia* (Roxb.) Brandis	1	3	1	84	561.7834395	0.333333333	0.33333333	5.8823529	1.78571	0.643927814	8.312
7	*Hydnocarpus pentandrus* (Buch.-Ham.) Oken	1	3	1	149	1767.595541	0.333333333	0.33333333	5.8823529	1.78571	2.026054619	9.69412

8	*Macaranga peltata* (Roxb.) Müll.Arg.	1	3	1	66	346.8152866	0.333333333	0.33333333	5.8823529	1.78571	0.397526865	8.06559
9	*Ochlandra scriptoria* (Dennst.) C.E.C.Fisch.	12	3	1	96	733.7579618	0.333333333	4	5.8823529	21.4286	0.841048573	28.152
10	*Salix tetrasperma* Roxb.	2	3	1	64	326.1146497	0.333333333	0.66666667	5.8823529	3.57143	0.373799366	9.82758
11	*Stereospermum colais* (Buch.-Ham. ex Dillwyn) Mabb.	1	3	1	98	764.6496815	0.333333333	0.33333333	5.8823529	1.78571	0.876457302	8.54452
12	*Terminalia paniculata* B.Heyne ex Roth	1	3	1	114	1034.713376	0.333333333	0.33333333	5.8823529	1.78571	1.186009902	8.85408
13	*Tetrameles nudiflora* R.Br.	1	3	1	212	3578.343949	0.333333333	0.33333333	5.8823529	1.78571	4.101571947	11.7696
14	*Mallotus nudiflorus* (L.) Kulju & Welzen	2	3	1	112	998.7261146	0.333333333	0.66666667	5.8823529	3.57143	1.144760558	10.5985
15	*Vitex leucoxylon* L.f.	2	3	1	44	154.1401274	0.333333333	0.66666667	5.8823529	3.57143	0.176678606	9.63046
	Total					**87243.23248**	**5.666666667**	**18.6666667**	**100**	**100**	**100**	**300**

Phytosociological data of plots in similar vegetation of *F. amplissima*

SL. NO.	SCIENTIFIC NAME	T0TAL NO. OF INDIVIDUALS	T0TAL NO. OF QUADRATES	QUADRATE OF OCCURRENCE	GBH	BASAL AREA	FREQUENCY	DENSITY	RF	RD	RBA	IVI
1	*Terminalia travancorensis* Wight & Arn.	2	3	1	675	36275.9	0.33333	0.66667	3.0303	3.1746	30.1357	36.3406
2	*Vateria indica* L.	7	3	3	393	12296.9	1	2.33333	9.09091	11.1111	10.2155	30.4175
3	*Mallotus philippensis (Lam.)* Müll.Arg.	14	3	2	123	1204.54	0.66667	4.66667	6.06061	22.2222	1.00065	29.2835
4	*Alstonia scholaris* (L.) R.Br.	2	3	1	544	23561.8	0.33333	0.66667	3.0303	3.1746	19.5737	25.7786
5	*Aglaia edulis* (Roxb.) Wall.	4	3	2	344	9421.66	0.66667	1.33333	6.06061	6.34921	7.82692	20.2367
6	*Knema attenuata* (Wall. ex Hook.f. & Thomson) Warb.	3	3	2	365	10607.1	0.66667	1	6.06061	4.7619	8.8117	19.6342
7	*Monoon coffeoides* (Thwaites ex Hook.f. & Thomson) B.Xue & R.M.K.Saunders	5	3	1	296	6975.8	0.33333	1.66667	3.0303	7.93651	5.79505	16.7619

8	*Xanthophyllum flavescens* Roxb.	3	3	2	157	1962.5	0.66667	1	6.06061	4.7619	1.63032	12.4528
9	*Elaeocarpus variabilis* Zmarzty	2	3	1	292	6788.54	0.33333	0.66667	3.0303	3.1746	5.63949	11.8444
10	*Carallia brachiata* (Lour.) Merr.	3	3	2	82	535.35	0.66667	1	6.06061	4.7619	0.44474	11.2672
11	*Monoon fragrans* (Dalzell) B.Xue & R.M.K.Saunders	2	3	2	170	2300.96	0.66667	0.66667	6.06061	3.1746	1.91149	11.1467
12	*Cinnamomum malabatrum* (Burm.f.) J.Presl	2	3	2	139	1538.3	0.66667	0.66667	6.06061	3.1746	1.27792	10.5131
13	*Diospyros ebenum* J.Koenig	1	3	1	220	3853.5	0.33333	0.33333	3.0303	1.5873	3.20125	7.81885
14	*Machilus glaucescens* (Nees) Wight	2	3	1	70	390.127	0.33333	0.66667	3.0303	3.1746	0.32409	6.529
15	*Symplocos macrophylla* Wall. ex DC.	2	3	1	54	232.166	0.33333	0.66667	3.0303	3.1746	0.19287	6.39777
16	*Aglaia perviridis* Hiern	1	3	1	105	877.787	0.33333	0.33333	3.0303	1.5873	0.72921	5.34681
17	*Canarium strictum* Roxb.	1	3	1	65	336.385	0.33333	0.33333	3.0303	1.5873	0.27945	4.89705
18	*Garcinia spicata* (Wight & Arn.) Hook.f	1	3	1	65	336.385	0.33333	0.33333	3.0303	1.5873	0.27945	4.89705
19	*Hydnocarpus pentandrus* (Buch.-Ham.) Oken	1	3	1	62	306.051	0.33333	0.33333	3.0303	1.5873	0.25425	4.87185

20	*Palaquium ellipticum* (Dalzell) Baill.	1	3	1	50	199.045	0.33333	0.33333	3.0303	1.5873	0.16535	4.78296
21	*Acacia glaucoptera* Benth.	1	3	1	36	103.185	0.33333	0.33333	3.0303	1.5873	0.08572	4.70332
22	*Syzygium cumini* (L.) Skeels	1	3	1	35	97.5318	0.33333	0.33333	3.0303	1.5873	0.08102	4.69863
23	*Cinnamomum tavoyanum* Meisn.	1	3	1	34	92.0382	0.33333	0.33333	3.0303	1.5873	0.07646	4.69406
24	*Leea asiatica* (L.) Ridsdale	1	3	1	32	81.5287	0.33333	0.33333	3.0303	1.5873	0.06773	4.68533
	Total					**120375**	**11**	**21**	**100**	**100**	**100**	**300**

Phytosociological data of plots in similar vegetation of *F. beddomei*

SL. NO.	SCIENTIFIC NAME	TOTAL NO. OF INDIVIDUALS	TOTAL NO. OF QUADRATES	QUADRATE OF OCCURRENCE	GBH	BASAL AREA	FREQUENCY	DENSITY	RF	RD	RBA	IVI
1	*Mallotus resinosus* (Blanco) Merr.	10	3	2	625	31100.72	0.666667	3.333333	9.09091	19.60784	28.64351	57.34226
2	*Terminalia travancorensis* Wight & Arn.	2	3	1	675	36275.88	0.333333	0.666667	4.545455	3.921569	33.40979	41.87681

3	*Aglaia edulis* (Roxb.) Wall.	4	3	2	333	8828.742	0.666667	1.333333	9.09091	7.843137	8.1312	25.06525
4	*Turpinia malabarica* Gamble	4	3	1	359	10261.23	0.333333	1.333333	4.545455	7.843137	9.450507	21.8391
5	*Cinnamomum malabatrum* (Burm.f.) J.Presl	6	3	1	226	4066.561	0.333333	2	4.545455	11.76471	3.745269	20.05543
6	*Machilus glaucescens* (Nees) Wight	4	3	2	137	1494.347	0.666667	1.333333	9.09091	7.843137	1.376282	18.31033
7	*Myristica beddomei* King	2	3	2	243	4701.354	0.666667	0.666667	9.09091	3.921569	4.329909	17.34239
8	*Vateria indica* L.	4	3	1	164	2141.401	0.333333	1.333333	4.545455	7.843137	1.972213	14.36081
9	*Terminalia paniculata* B.Heyne ex Roth	4	3	1	102	828.3439	0.333333	1.333333	4.545455	7.843137	0.762898	13.15149
10	*Madhuca neriifolia* (Moon) H.J.Lam	3	3	1	190	2874.204	0.333333	1	4.545455	5.882353	2.647119	13.07493
11	*Hopea parviflora* Bedd.	1	3	1	183	2666.322	0.333333	0.333333	4.545455	1.960784	2.455661	8.9619
12	*Knema attenuata* (Wall. ex Hook.f. & Thomson) Warb.	1	3	1	150	1791.401	0.333333	0.333333	4.545455	1.960784	1.649866	8.156105
13	*Aglaia perviridis* Hiern	1	3	1	105	877.7866	0.333333	0.333333	4.545455	1.960784	0.808434	7.314673
14	*Palaquium ellipticum* (Dalzell) Baill.	1	3	1	50	199.0446	0.333333	0.333333	4.545455	1.960784	0.183318	6.689558

15	*Bombax ceiba* L.	1	3	1	45	161.2261	0.333333	0.333333	4.545455	1.960784	0.148488	6.654727
16	*Calophyllum polyanthum* Wall. ex Choisy	1	3	1	38	114.9682	0.333333	0.333333	4.545455	1.960784	0.105885	6.612124
17	*Strychnos nux-vomica* L.	1	3	1	35	97.53185	0.333333	0.333333	4.545455	1.960784	0.089826	6.596065
18	*Syzygium cumini* (L.) Skeels	1	3	1	35	97.53185	0.333333	0.333333	4.545455	1.960784	0.089826	6.596065
	Total					**108578.6**	**7.333333**	**17**	**100**	**100**	**100**	**300**

Phytosociological data of plots in similar vegetation of *F. benghalensis*

SL. NO.	SCIENTIFIC NAME	T0TAL NO. OF INDIVIDUALS	T0TAL NO. OF QUADRATES	QUADRATE OF OCCURRENCE	GBH	BASAL AREA	FREQUENCY	DENSITY	RF	RD	RBA	IVI
1	*Humboldtia vahliana* Wight	14	3	1	723	41618.6	0.33333	4.66667	5	31.1111	29.664	65.7751
2	*Hopea parviflora* Bedd.	2	3	2	614	30015.6	0.66667	0.66667	10	4.44444	21.3939	35.8383
3	*Madhuca neriifolia* (Moon) H.J.Lam	3	3	1	580	26783.4	0.33333	1	5	6.66667	19.0901	30.7568

4	*Macaranga peltata* (Roxb.) Müll.Arg.	2	3	2	289	6649.76	0.66667	0.66667	10	4.44444	4.73967	19.1841
5	*Pongamia pinnata* (L.) Pierre	2	3	2	199	3152.95	0.66667	0.66667	10	4.44444	2.24729	16.6917
6	*Schleichera oleosa* (Lour.) Oken	2	3	1	330	8670.38	0.33333	0.66667	5	4.44444	6.17988	15.6243
7	*Albizia odoratissima* (L.f.) Benth.	2	3	1	287	6558.04	0.33333	0.66667	5	4.44444	4.6743	14.1187
8	*Vitex leucoxylon* L.f.	3	3	1	132	1387.26	0.33333	1	5	6.66667	0.98878	12.6554
9	*Mallotus resinosus* (Blanco) Merr.	3	3	1	103	844.666	0.33333	1	5	6.66667	0.60204	12.2687
10	*Hopea ponga* (Dennst.) Mabb.	2	3	1	210	3511.15	0.33333	0.66667	5	4.44444	2.5026	11.947
11	*Mallotus philippensis* (Lam.) Müll.Arg.	2	3	1	210	3511.15	0.33333	0.66667	5	4.44444	2.5026	11.947
12	*Xanthophyllum flavescens* Roxb.	2	3	1	190	2874.2	0.33333	0.66667	5	4.44444	2.04861	11.4931
13	*Barringtonia acutangula* (L.) Gaertn.	2	3	1	72	412.739	0.33333	0.66667	5	4.44444	0.29418	9.73863
14	*Vitex altissima* L.f.	1	3	1	182	2637.26	0.33333	0.33333	5	2.22222	1.87973	9.10195

15	*Elaeocarpus serratus* L.	1	3	1	94	703.503	0.33333	0.33333	5	2.22222	0.50143	7.72365
16	*Garcinia gummi-gutta* (L.) N.Robson	1	3	1	80	509.554	0.33333	0.33333	5	2.22222	0.36319	7.58541
17	*Gmelina arborea* Roxb. ex Sm.	1	3	1	76	459.873	0.33333	0.33333	5	2.22222	0.32778	7.55
	Total					**140300**	**6.66667**	**15**	**100**	**100**	**100**	**300**

Phytosociological data of plots in similar vegetation of *F. exasperata*

SL. NO.	SCIENTIFIC NAME	TOTAL NO. OF INDIVIDUALS	TOTAL NO. OF QUADRATES	QUADRATE OF OCCURRENCE	GBH	BASAL AREA	FREQUENCY	DENSITY	RF	RD	RBA	IVI
1	*Schleichera oleosa* (Lour.) Oken	4	3	2	644	33020.4	0.66667	1.33333	8.69565	10.2564	24.7766	43.7286
2	*Meliosma simplicifolia* (Roxb.) Walp.	5	3	1	485	18728.1	0.33333	1.66667	4.34783	12.8205	14.0525	31.2208
3	*Holigarna arnottiana* Hook.f.	3	3	2	496	19587.3	0.66667	1	8.69565	7.69231	14.6971	31.0851

4	*Xanthophyllum flavescens* Roxb.	4	3	2	442	15554.5	0.66667	1.33333	8.69565	10.2564	11.6712	30.6232
5	*Hopea parviflora* Bedd.	3	3	2	350	9753.18	0.66667	1	8.69565	7.69231	7.31822	23.7062
6	*Gmelina arborea* Roxb. ex Sm.	3	3	2	228	4138.85	0.66667	1	8.69565	7.69231	3.10555	19.4935
7	*Vateria indica* L.	2	3	1	340	9203.82	0.33333	0.66667	4.34783	5.12821	6.90601	16.382
8	*Aporosa cardiosperma* (Gaertn.) Merr.	3	3	2	112	998.726	0.66667	1	8.69565	7.69231	0.74939	17.1373
9	*Poeciloneuron indicum* Bedd.	1	3	1	320	8152.87	0.33333	0.33333	4.34783	2.5641	6.11743	13.0294
10	*Palaquium ellipticum* (Dalzell) Baill.	1	3	1	312	7750.32	0.33333	0.33333	4.34783	2.5641	5.81538	12.7273
11	*Mallotus philippensis* (Lam.) Müll.Arg.	2	3	1	210	3511.15	0.33333	0.66667	4.34783	5.12821	2.63456	12.1106
12	*Baccaurea courtallensis* (Wight) Müll.Arg.	2	3	1	58	267.834	0.33333	0.66667	4.34783	5.12821	0.20097	9.677
13	*Atalantia racemosa* Wight ex Hook.	2	3	1	48	183.439	0.33333	0.66667	4.34783	5.12821	0.13764	9.61367
14	*Cinnamomum*	1	3	1	116	1071.34	0.33333	0.33333	4.34783	2.5641	0.80387	7.7158

	malabatrum (Burm.f.) J.Presl											
15	*Melicope lunu-ankenda* (Gaertn.) T.G.Hartley	1	3	1	82	535.35	0.33333	0.33333	4.34783	2.5641	0.4017	7.31362
16	*Garcinia gummi-gutta* (L.) N.Robson	1	3	1	80	509.554	0.33333	0.33333	4.34783	2.5641	0.38234	7.29427
17	*Diospyros crumenata* Thwaites	1	3	1	62	306.051	0.33333	0.33333	4.34783	2.5641	0.22964	7.14157
	Total					**133273**	**7.66667**	**13**	**100**	**100**	**100**	**300**

Phytosociological data of plots in similar vegetation of *F. hispida*

SL. NO.	SCIENTIFIC NAME	T0TAL NO. OF INDIVIDUALS	T0TAL NO. OF QUADRATES	QUADRATE OF OCCURRENCE	GBH	BASAL AREA	FREQUENCY	DENSITY	RF	RD	RBA	IVI
1	*Bambusa bambos* (L.) Voss	22	3	2	932	69158	0.66667	7.33333	10.5263	26.8293	64.0234	101.379
2	*Tripidium arundinaceum* (Retz.) Welker, Voronts. &	24	3	1	132	1387.26	0.33333	8	5.26316	29.2683	1.28426	35.8157

	E.A.Kellogg											
3	*Alstonia scholaris* (L.) R.Br.	2	3	1	500	19904.5	0.33333	0.66667	5.26316	2.43902	18.4267	26.1288
4	*Pandanus furcatus* Roxb.	6	3	1	139	1538.3	0.33333	2	5.26316	7.31707	1.42409	14.0043
5	*Mallotus resinosus* (Blanco) Merr.	5	3	1	140	1560.51	0.33333	1.66667	5.26316	6.09756	1.44465	12.8054
6	*Gliricidia sepium* (Jacq.) Kunth	4	3	1	73	424.283	0.33333	1.33333	5.26316	4.87805	0.39278	10.534
7	*Humboldtia vahliana* Wight	2	3	1	190	2874.2	0.33333	0.66667	5.26316	2.43902	2.66081	10.363
8	*Thespesia populnea* (L.) Sol. ex Corrêa	2	3	1	182	2637.26	0.33333	0.66667	5.26316	2.43902	2.44146	10.1436
9	*Holigarna arnottiana* Hook.f.	3	3	1	90	644.904	0.33333	1	5.26316	3.65854	0.59702	9.51872
10	*Xylia xylocarpa* (Roxb.) W.Theob.	2	3	1	140	1560.51	0.33333	0.66667	5.26316	2.43902	1.44465	9.14683
11	*Hydnocarpus pentandrus* (Buch.-Ham.) Oken	1	3	1	190	2874.2	0.33333	0.33333	5.26316	1.21951	2.66081	9.14348
12	*Gmelina arborea* Roxb. ex Sm.	2	3	1	72	412.739	0.33333	0.66667	5.26316	2.43902	0.3821	8.08428
13	*Ailanthus triphysa* (Dennst.) Alston	2	3	1	46	168.471	0.33333	0.66667	5.26316	2.43902	0.15596	7.85815

14	*Hopea parviflora* Bedd.	1	3	1	120	1146.5	0.33333	0.33333	5.26316	1.21951	1.06138	7.54405
15	*Melicope lunu-ankenda* (Gaertn.) T.G.Hartley	1	3	1	110	963.376	0.33333	0.33333	5.26316	1.21951	0.89185	7.37452
16	*Terminalia paniculata* B.Heyne ex Roth	1	3	1	80	509.554	0.33333	0.33333	5.26316	1.21951	0.47172	6.95439
17	*Carallia brachiata* (Lour.) Merr.	1	3	1	42	140.446	0.33333	0.33333	5.26316	1.21951	0.13002	6.61269
18	*Tetrapilus dioicus* (Roxb.) L.A.S.Johnson	1	3	1	38	114.968	0.33333	0.33333	5.26316	1.21951	0.10643	6.5891
	Total					**108020**	**6.33333**	**27.3333**	**100**	**100**	**100**	**300**

Phytosociological data of plots in similar vegetation of *F. microcarpa*

SL. NO.	SCIENTIFIC NAME	T0TAL NO. OF INDIVIDUALS	T0TAL NO. OF QUADRATES	QUADRATE OF OCCURRENCE	GBH	BASAL AREA	FREQUENCY	DENSITY	RF	RD	RBA	IVI
1	*Aglaia barberi* (Roxb.) Wall.	6	3	2	759	45866.3	0.66667	2	8	14.2857	32.4965	54.7822

2	*Terminalia travancorensis* Wight & Arn.	2	3	1	675	36275.9	0.33333	0.66667	4	4.7619	25.7016	34.4635
3	*Diospyros paniculata* Dalzell	4	3	1	408	13253.5	0.33333	1.33333	4	9.52381	9.39017	22.914
4	*Monoon coffeoides* (Thwaites ex Hook.f. & Thomson) B.Xue & R.M.K.Saunders	5	3	1	296	6975.8	0.33333	1.66667	4	11.9048	4.94239	20.8471
5	*Machilus glaucescens* (Nees) Wight	3	3	2	163	2115.37	0.66667	1	8	7.14286	1.49875	16.6416
6	*Baccaurea courtallensis* (Wight) Müll.Arg.	3	3	2	134	1429.62	0.66667	1	8	7.14286	1.01289	16.1557
7	*Madhuca neriifolia* (Moon) H.J.Lam	1	3	1	406	13123.9	0.33333	0.33333	4	2.38095	9.29834	15.6793
8	*Hopea parviflora* Bedd.	2	3	1	175	2438.3	0.33333	0.66667	4	4.7619	1.72754	10.4894
9	*Elaeocarpus tuberculatus* Roxb.	1	3	1	220	3853.5	0.33333	0.33333	4	2.38095	2.73023	9.11118
10	*Myristica beddomei* King	1	3	1	220	3853.5	0.33333	0.33333	4	2.38095	2.73023	9.11118
11	*Cinnamomum malabatrum* (Burm.f.) J.Presl	2	3	1	133	1408.36	0.33333	0.66667	4	4.7619	0.99783	9.75973
12	*Garcinia indica* (Thouars) Choisy	1	3	1	188	2814.01	0.33333	0.33333	4	2.38095	1.99374	8.37469
13	*Litsea floribunda* (Blume) Gamble	2	3	1	86	588.854	0.33333	0.66667	4	4.7619	0.41721	9.17911
14	*Paracroton pendulus* (Hassk.) Miq.	1	3	1	178	2522.61	0.33333	0.33333	4	2.38095	1.78728	8.16824
15	*Terminalia bellirica* (Gaertn.) Roxb.	1	3	1	173	2382.88	0.33333	0.33333	4	2.38095	1.68828	8.06924
16	*Aglaia perviridis* Hiern	1	3	1	105	877.787	0.33333	0.33333	4	2.38095	0.62192	7.00287
17	*Vitex altissima* L.f.	1	3	1	83	548.487	0.33333	0.33333	4	2.38095	0.38861	6.76956

18	*Alstonia scholaris* (L.) R.Br.	1	3	1	55	240.844	0.33333	0.33333	4	2.38095	0.17064	6.55159
19	*Palaquium ellipticum* (Dalzell) Baill.	1	3	1	50	199.045	0.33333	0.33333	4	2.38095	0.14102	6.52198
20	*Antidesma pyrifolium* Müll.Arg.	1	3	1	45	161.226	0.33333	0.33333	4	2.38095	0.11423	6.49518
21	*Calophyllum polyanthum* Wall. ex Choisy	1	3	1	38	114.968	0.33333	0.33333	4	2.38095	0.08146	6.46241
22	*Monoon fragrans* (Dalzell) B.Xue & R.M.K.Saunders	1	3	1	35	97.5318	0.33333	0.33333	4	2.38095	0.0691	6.45005
	Total					**141142**	**8.33333**	**14**	**100**	**100**	**100**	**300**

Phytosociological data of plots in similar vegetation of *F. nervosa*

SL. NO.	SCIENTIFIC NAME	T0TAL NO. OF INDIVIDUALS	T0TAL NO. OF QUADRATES	QUADRATE OF OCCURRENCE	GBH	BASAL AREA	FREQUENCY	DENSITY	RF	RD	RBA	IVI
1	*Vateria indica* L.	6	3	3	662	34892	1	2	13.6364	17.1429	45.5262	76.3054
2	*Palaquium ellipticum* (Dalzell) Baill.	3	3	1	381	11557.4	0.33333	1	4.54545	8.57143	15.0798	28.1967
3	*Turpinia malabarica* Gamble	1	3	1	370	10899.7	0.33333	0.33333	4.54545	2.85714	14.2216	21.6242
4	*Chukrasia tabularis* A.Juss.	3	3	1	168	2247.13	0.33333	1	4.54545	8.57143	2.932	16.0489

5	*Myristica beddomei* King	3	3	1	115	1052.95	0.33333	1	4.54545	8.57143	1.37385	14.4907
6	*Calophyllum austroindicum* Kosterm. ex P.F.Stevens	2	3	1	188	2814.01	0.33333	0.66667	4.54545	5.71429	3.67165	13.9314
7	*Aporosa cardiosperma* (Gaertn.) Merr.	2	3	1	164	2141.4	0.33333	0.66667	4.54545	5.71429	2.79404	13.0538
8	*Cinnamomum malabatrum* (Burm.f.) J.Presl	2	3	1	94	703.503	0.33333	0.66667	4.54545	5.71429	0.91791	11.1777
9	*Otonephelium stipulaceum* (Bedd.) Radlk.	2	3	1	74	435.987	0.33333	0.66667	4.54545	5.71429	0.56886	10.8286
10	*Pterocarpus marsupium* Roxb.	1	3	1	195	3027.47	0.33333	0.33333	4.54545	2.85714	3.95016	11.3528
11	*Artocarpus hirsutus* Lam.	1	3	1	130	1345.54	0.33333	0.33333	4.54545	2.85714	1.75563	9.15822
12	*Stereospermum colais* (Buch.-Ham. ex Dillwyn) Mabb.	1	3	1	127	1284.16	0.33333	0.33333	4.54545	2.85714	1.67553	9.07813
13	*Monoon fragrans* (Dalzell) B.Xue & R.M.K.Saunders	1	3	1	122	1185.03	0.33333	0.33333	4.54545	2.85714	1.5462	8.94879
14	*Dysoxylum malabaricum* Bedd. ex C.DC.	1	3	1	108	928.662	0.33333	0.33333	4.54545	2.85714	1.21169	8.61429
15	*Vitex leucoxylon* L.f.	1	3	1	82	535.35	0.33333	0.33333	4.54545	2.85714	0.69851	8.10111
16	*Actinodaphne bourdillonii* Gamble	1	3	1	80	509.554	0.33333	0.33333	4.54545	2.85714	0.66485	8.06745
17	*Aglaia edulis* (Roxb.) Wall.	1	3	1	78	484.395	0.33333	0.33333	4.54545	2.85714	0.63203	8.03462
18	*Gymnacranthera canarica* (Bedd. ex King) Warb.	1	3	1	68	368.153	0.33333	0.33333	4.54545	2.85714	0.48036	7.88295
19	*Allophylus cobbe* (L.) Forsyth f.	1	3	1	48	183.439	0.33333	0.33333	4.54545	2.85714	0.23935	7.64194
20	*Callicarpa tomentosa* (L.) L.	1	3	1	24	45.8599	0.33333	0.33333	4.54545	2.85714	0.05984	7.46243
	Total					**76641.7**	**7.33333**	**11.6667**	**100**	**100**	**100**	**300**

Phytosociological data of plots in similar vegetation of *F. racemosa*

SL. NO.	SCIENTIFIC NAME	T0TAL NO. OF INDIVIDUALS	T0TAL NO. OF QUADRATES	QUADRATE OF OCCURRENCE	GBH	BASAL AREA	FREQUENCY	DENSITY	RF	RD	RBA	IVI
1	*Ochlandra scriptoria* (Dennst.) C.E.C.Fisch.	96	3	2	906	65353.2	0.66667	32	10	69.0647	58.9889	138.054
2	*Maesa indica* (Roxb.) Sweet	14	3	1	120	1146.5	0.33333	4.66667	5	10.0719	1.03485	16.1068
3	*Hopea parviflora* Bedd.	1	3	1	360	10318.5	0.33333	0.33333	5	0.71942	9.31362	15.033
4	*Albizia odoratissima* (L.f.) Benth.	2	3	1	287	6558.04	0.33333	0.66667	5	1.43885	5.9194	12.3582
5	*Meliosma pinnata* (Roxb.) Maxim.	2	3	1	277	6109	0.33333	0.66667	5	1.43885	5.51408	11.9529
6	*Cinnamomum macrocarpum* Hook.f.	2	3	1	232	4285.35	0.33333	0.66667	5	1.43885	3.86803	10.3069

7	*Hopea ponga* (Dennst.) Mabb.	2	3	1	210	3511.15	0.33333	0.66667	5	1.43885	3.16922	9.60807
8	*Vitex leucoxylon* L.f.	3	3	1	132	1387.26	0.33333	1	5	2.15827	1.25216	8.41044
9	*Vitex altissima* L.f.	1	3	1	182	2637.26	0.33333	0.33333	5	0.71942	2.38044	8.09986
10	*Macaranga peltata* (Roxb.) Müll.Arg.	1	3	1	180	2579.62	0.33333	0.33333	5	0.71942	2.32841	8.04783
11	*Cinnamomum riparium* Gamble	3	3	1	106	894.586	0.33333	1	5	2.15827	0.80747	7.96574
12	*Mallotus resinosus* (Blanco) Merr.	3	3	1	103	844.666	0.33333	1	5	2.15827	0.76241	7.92068
13	*Staphylea cochinchinensis* (Lour.) Byng & Christenh.	2	3	1	115	1052.95	0.33333	0.66667	5	1.43885	0.95041	7.38926
14	*Pongamia pinnata* (L.) Pierre	1	3	1	143	1628.11	0.33333	0.33333	5	0.71942	1.46955	7.18898
15	*Barringtonia acutangula* (L.) Gaertn.	2	3	1	72	412.739	0.33333	0.66667	5	1.43885	0.37254	6.81139

16	*Erythrina variegata* L.	1	3	1	96	733.758	0.33333	0.33333	5	0.71942	0.6623	6.38173
17	*Elaeocarpus serratus* L.	1	3	1	94	703.503	0.33333	0.33333	5	0.71942	0.63499	6.35442
18	*Ligustrum robustum* (Roxb.) Blume	1	3	1	82	535.35	0.33333	0.33333	5	0.71942	0.48322	6.20264
19	*Callicarpa tomentosa* (L.) L.	1	3	1	35	97.5318	0.33333	0.33333	5	0.71942	0.08803	5.80746
	Total					**110789**	**6.66667**	**46.3333**	**100**	**100**	**100**	**300**

Phytosociological data of plots in similar vegetation of *F. tsjakela*

SL. NO.	SCIENTIFIC NAME	T0TAL NO. OF INDIVIDUALS	T0TAL NO. OF QUADRATES	QUADRATE OF OCCURRENCE	GBH	BASAL AREA	FREQUENCY	DENSITY	RF	RD	RBA	IVI
1	*Ochlandra scriptoria*	30	3	3	901	64633.8	1	10	12.5	35.7143	49.5325	97.7468

	(Dennst.) C.E.C.Fisch.											
2	*Bambusa bambos* (L.) Voss	16	3	1	312	7750.32	0.33333	5.33333	4.16667	19.0476	5.9395	29.1538
3	*Machilus glaucescens* (Nees) Wight	3	3	2	310	7651.27	0.66667	1	8.33333	3.57143	5.8636	17.7684
4	*Hopea parviflora* Bedd.	1	3	1	360	10318.5	0.33333	0.33333	4.16667	1.19048	7.90762	13.2648
5	*Aglaia edulis* (Roxb.) Wall.	3	3	1	300	7165.61	0.33333	1	4.16667	3.57143	5.4914	13.2295
6	*Lagerstroemia speciosa* (L.) Pers.	6	3	1	175	2438.3	0.33333	2	4.16667	7.14286	1.8686	13.1781
7	*Albizia odoratissima* (L.f.) Benth.	2	3	1	287	6558.04	0.33333	0.66667	4.16667	2.38095	5.02579	11.5734
8	*Hopea ponga* (Dennst.)	2	3	1	210	3511.15	0.33333	0.66667	4.16667	2.38095	2.69079	9.23841

	Mabb.											
9	*Vitex leucoxylon* L.f.	3	3	1	132	1387.26	0.33333	1	4.16667	3.57143	1.06314	8.80123
10	*Holigarna arnottiana* Hook.f.	2	3	1	180	2579.62	0.33333	0.66667	4.16667	2.38095	1.9769	8.52452
11	*Tetrameles nudiflora* R.Br.	2	3	1	180	2579.62	0.33333	0.66667	4.16667	2.38095	1.9769	8.52452
12	*Mallotus resinosus* (Blanco) Merr.	3	3	1	103	844.666	0.33333	1	4.16667	3.57143	0.64731	8.38541
13	*Myristica beddomei* King	1	3	1	220	3853.5	0.33333	0.33333	4.16667	1.19048	2.95315	8.3103
14	*Macaranga peltata* (Roxb.) Müll.Arg.	1	3	1	180	2579.62	0.33333	0.33333	4.16667	1.19048	1.9769	7.33405
15	*Paracroton pendulus* (Hassk.) Miq.	1	3	1	178	2522.61	0.33333	0.33333	4.16667	1.19048	1.93322	7.29036
16	*Vateria indica* L.	2	3	1	85	575.239	0.33333	0.66667	4.16667	2.38095	0.44084	6.98846

17	*Barringtonia acutangula* (L.) Gaertn.	2	3	1	72	412.739	0.33333	0.66667	4.16667	2.38095	0.3163	6.86392
18	*Gmelina arborea* Roxb. ex Sm.	1	3	1	130	1345.54	0.33333	0.33333	4.16667	1.19048	1.03116	6.38831
19	*Aglaia perviridis* Hiern	1	3	1	105	877.787	0.33333	0.33333	4.16667	1.19048	0.6727	6.02984
20	*Elaeocarpus serratus* L.	1	3	1	94	703.503	0.33333	0.33333	4.16667	1.19048	0.53913	5.89628
21	*Palaquium ellipticum* (Dalzell) Baill.	1	3	1	50	199.045	0.33333	0.33333	4.16667	1.19048	0.15254	5.50968
	Total					**130488**	**8**	**28**	**100**	**100**	**100**	**300**

Appendix VIII
List of Publications and Presentations

I. Papers published in Journals:

1. **Nair, S.S.,** & Bachan, A.K.H. (2020). Phylogenetic study on the genus *Ficus* L. (Moraceae) in Kerala using *ITS* sequences as molecular marker. *Meridian*, *9*(1), 34–37.

2. **Nair, S.S.,** & Bachan, A.K.H. (2020). Role of Figs in Riparian Eco-Restoration. *Journal of Aquatic Biology & Fisheries*, 8, 122–126.

3. **Nair, S.S.,** Bachan, A.K.H., & Ebin, P.J. (2021). Diversity and phenetic study on syconium of *Ficus* L. (Moraceae) from Kerala, India revealing natural classification along with an identification key. *Reinwardtia*, 20(1), 27–36. https://doi.org/10.14203/REINWARDTIA.V20I1.4031

4. **Nair, S.S.,** Bachan, A.K.H., Ebin, P.J., Augustine, L., & Joseph, A. (2021). *Ficus virens* Aiton var. *matthewii* Chantaras: A new distributional record from Kerala. *Species*, *22*(69), 21–28. www.discoveryjournals.org

5. **Nair, S.S.,** Bachan, A.K.H., & Ebin, P.J. (2021). *Ficus virens* Aiton var. *dispersa* (Moraceae): A new record for India. *Biodiversity Research and Conservation*, *63*(1), 41–47. https://doi.org/10.2478/biorc-2021-0007

II. Papers published as Book chapters:

1. **Nair, S.S.,** & Bachan, A.K.H. (2020). A preliminary assessment on the diversity of genus *Ficus* L. (Moraceae) in Kerala. In *Current status and challenges for conservation and sustainable use of biodiversity* (pp. 235–242).

2. **Nair, S. S.,** Bachan, A.K.H., & Ebin, P.J. (2021). Leaf based phenetic analysis on the selected taxa from the genus *Ficus* L. (Moraceae) from

Southern Western Ghats. In *Plant biodiversity and Environment Conservation* (pp. 665–672). Unimax Publications, India.

3. **Nair, S.S.,** & Bachan, A.K.H. (2022). Taxonomy and diversity of the lesser-known varieties of *Ficus virens* (Moraceae) from the Western Ghats. In *Species the passion 7* (pp. 56–65).

III. Papers presented in National and International Conferences

1. **Diversity and syconium based identification of figs (*Ficus*, Moraceae) in Kerala** in XLII All India Botanical Conference of The Indian Botanical Society and National Symposium on Innovations and Inventions in Plant Science Research, 6th - 8th November, 2019 Organised by Indian Botanical Society, held at University of Calicut, Kerala.

2. **Preliminary assessment on the diversity of the genus *Ficus* L. Kerala** in the International Seminar Current Status and Challenges for Conservation and Sustainable use of Biodiversity jointly organised by Department of Zoology, S N College, Kollam and Indian Science Congress Association, 22nd – 24th January 2020.

3. **"Role of figs in riparian eco restoration"** in the International Conference "Rivers for Future 2020, organised by Department of Aquatic Biology, University of Kerala, 5th -7th Feb 2020.

4. **"Leaf based phenetic analysis on the selected taxa from the genus *Ficus* L (Moraceae) from Southern Western Ghats"** in the "International Conference on Plant Biodiversity and Environment Conservation" organized by Hans Raj Mahila Maha Vidyala and Punjab Biodiversity Board, 20th and 21st May 2021.

5. **'An inventory on the lesser-known Figs of Western Ghats'** in the National Seminar Species the Passion organized by St Thomas College, Thrissur, 9th March 2022.

6. **"Revision of *Ficus* L. (Moraceae) in Southern Western Ghats contributing to Phenetics and Phylogenetics"** in the 31st IAAT Conference, 5th to 7th April 2022.

7. **"Taxonomic relatedness among the lesser-known varieties of *Ficus virens* Aiton. (Moraceae) in the western ghats inferred from molecular studies"** presented in ESPLORO 23, the Annual Research Conclave & International Conference on Advancement in Research organized by organized by MES Asmabi College, 29th -30th March 2023.

IV. Awards received

1. Best paper award for the paper entitled **"Role of figs in riparian eco restoration"** presented in the International Conference "Rivers for Future 2020, organised by Department of Aquatic Biology, University of Kerala, 5th -7th Feb 2020.

2. Consolation prize in Young Scientist category for the paper entitled **"Leaf based phenetic analysis on the selected taxa from the genus Ficus L (Moraceae) from Southern Western Ghats"** presented in the "International Conference on Plant Biodiversity and Environment Conservation" organized by Hans Raj Mahila Maha Vidyala and Punjab Biodiversity Board, 20th and 21st May 2021.

3. Best paper award for the paper entitled **"Taxonomic relatedness among the lesser-known varieties of Ficus virens Aiton. (Moraceae) in the western ghats inferred from molecular studies"** presented in ESPLORO 23, the Annual Research Conclave & International

Conference on Advancement in Research organized by organized by MES Asmabi College, 29th -30th March 2023.

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Phylogenetic Study on The Genus *Ficus* L. (Moraceae) in Kerala Using ITS Sequences as Molecular Marker

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Abstract

A preliminary molecular phylogenetic study on Ficus species from Kerala is done using Internal Transcriber Spacer (ITS) sequences. 29 species of Ficus were studied here to establish their phylogenetic relationship. Sequences of the ITS 2 region were retrieved from NCBI, with reference to accession numbers from authentic specimens. The sequences were alligned and Neighbour Joining tree was prepared by MEGA 10 software. The dendrogram obtained well separated the Ficus species into two major groups. Most of the morphologically similar species showed a common lineage and were closely related. *F. caulocarpa* and *F. superba* were the closest species. *F. carica*, the type species of the genus stands distinct from other species in the dendrogram.

Key Words: Ficus, Figs, Phylogeny, ITS sequences, Kerala.

Introduction

With a global distribution of around 750 species (Noor *et al*., 2007; Chaudhary, 2012), Ficus L. (Moraceae), commonly referred as figs, is one among the most abundant and diverse group of angiosperm plants. They remain as a highly complex taxonomic group with respect to the morphological complexities and floral characters. Figs have the specific hypanthodium inflorescence, pollinated by Agaonidae wasps exhibiting mutualism and co evolution (Priyadharsan 2000; Li *et al.,* 2012 a). Figs exhibit diversified habitat pattern including independent trees, hemi epiphytes, epiphytes and rarely some woody climbers. They fruit throughout the year, ensuring rich nutritional supply to many animals and birds feeding on the fig trees (Harrison, 2005). Thus, figs help to maintain an ecological balance in the ecosystem and act as a keystone species. According to the current status, 32 species of Ficus is reported from Kerala, belonging to 5 subgenera (Sasidharan, 2004).

DNA barcoding techniques aims to reveal the identity of plants that are morphologically indistinguishable. Various molecular markers are used to identify the specimens. Internal Transcribed Spacer (ITS) sequences are such molecular markers used in plant identification. ITS shows the most variable sites, greater intra- and inter-specific divergences and high species discrimination rate in the genus Ficus (Li *et al*., 2012 b). Hence, ITS is the most suitable single locus DNA barcode in Ficus. The present study aims to provide a preliminary knowledge on the phylogeny of fig species in Kerala using ITS sequences.

Materials and Methods

Selection of species and sequences

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Role of Figs in Riparian Eco-Restoration

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Abstract

Riparian forests are one among the unique ecosystem supporting diverse plant and animal communities. The riparian ecosystem could be considered as an ecotone and are generally resilient to natural flood. But the recent abnormal rainfall and torrential flow in rivers made a disastrous effect on the riparian vegetation across the Kerala state. The riparian ecosystem must be properly restored for sustaining the diverse flora and fauna, that are depending on the riparian ecosystem for the survival. The members of the genus *Ficus* L., (Moraceae) commonly called 'figs' are keystone species, and the plants have a major role in sustaining the ecosystem. The figs are considered as a diverse genus with respect to their life forms and habitat patterns. Most of them are large trees, with a high growth rate and dominates the canopy in a short span of time. Figs could be one of the best plant group considered for the restoration of the riparian ecosystem. Many species of figs including *F. racemosa, F. tsjakela, F. drupacea* etc. are common along the riparian stretches of the river. Mostly being large trees with high growth rate, these plants could be a suitable species for ecorestoration along with the degraded riparian areas. The reckless growth rate of the figs will help to cover the open canopy at a faster rate than the other tree species. As the plants follow a wide range of growth habitats including rheophytes, it is preferred for ecorestoration even in rocky areas. Planting figs will not only restore the riparian forests but will sustain a large number of birds and animals; this will, in turn, help to maintain the functional aspects of the ecosystem.

Keywords: Ficus, Keystone species, Flood, Epiphytes, Eco-restoration methodology

1. Introduction

Riparian vegetation commonly refers to the plant community seen along the river banks. Riparian forests are unique ecotone, which is greatly influenced by water (Goebel *et al.,* 2003; Sunil *et al.*, 2016). The nature of the plant community is determined by the elevation, annual rainfall, duration of the rainy season, wind, and temperature along with soil characteristics influenced by climatic factors (Nair, 1994). The riparian ecosystem is considered as a functionally dominant component of a terrestrial landscape (Tabacchi *et al.,* 1998). Riparian zones have been reported as some of the most species-rich and most productive systems (Malanson, 1993). Riparian forests are having unique vegetation and species diversity (Bachan, 2010). Riparian zones help to maintain the continuity of the forests and act as a corridor for the migration of many animal groups. As the riparian ecosystems are much sensitive to human influence and are mainly degraded by human disturbances (NRC, 1992), they are considered as a potentially threatened ecosystem (Malanson, 1993). Restoration denotes to bring back to the original form (Goodwin *et al.,* 1997). Thus, it implies that simply planting a species may not be a good restoration strategy. The suitable species must be planted in the proper place, commonly referred to as the ecorestoration methodology.

The plants belonging to the family Moraceae are one of the most abundant and extensively distributed taxa among the angiosperms. They are considered a keystone species (Vanitharani *et al.,* 2009; Kumar *et al.,* 2011) in many ecosystems. The presence of minute seeds and multiple dispersers of the fruits could be one of the reasons for the dispersal and distribution of the species (Corner, 1965; Lambert and Marshall, 1991; Lomáscolo *et al.,* 2010). They possess a varied habit ranging from climbers, woody shrubs, epiphytic and hemi epiphytic trees. The different habit patterns these plants could survive may be the possible reason for the success rate of the plants over a diversified habitat. Most of the plants being large trees, with a high growth rate and supporting many other life forms, these plants are a good choice for ecorestoration practices. The current study emphasises the role and the suitability of the fig plants in the ecorestoration of riparian forests. The seasonal availability of figs as well as, the fruiting pattern makes Ficus one among the most suitable food source for most of the frugivores and other animals.

2. Materials and Methods

Study area

The Chalakkudy River extending for a stretch of 144 km is the 5th largest river in Kerala. It originates from the Anamala and Nelliyampathy hill ranges of Southern Western Ghats. The major tributaries are the Sholayar, Parambikulam Aar, Karappara Aar and the Kuriarkutty Aar, joins at Orukumbankutty and flow like the River Chalakkudy. The river has five large dams in its tributaries and another one after Orukumbankutty at Poringalkuthu in the main river. The remaining 70 km length of the river after Poringalkuthu dam is not having any large obstruction except a River Diversion Scheme at Thumboormuzhi to irrigate 14, 000 hector of land. The Chalakkudy river joins with another river Periyar at Elanthikkara just 6 km before they together end in the Lakshadweep sea. The Chalakkudy river stretch was filled with riparian forests along its margins (Fig. 1). The Kerala flood 2018 had a major impact on the riparian stretches

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DIVERSITY AND PHENETIC STUDY ON SYCONIUM OF *FICUS* L. (MORACEAE) FROM KERALA, INDIA REVEALING NATURAL CLASSIFICATION ALONG WITH AN IDENTIFICATION KEY

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ABSTRACT
NAIR, S. S., BACHAN, K. H. A. & EBIN, P. J. 2021. Diversity and phenetic study on syconium of *Ficus* L. (Moraceae) from Kerala, India revealing natural classification along with an identification key. *Reinwardtia* 20(1): 27–36. — *Ficus* L. commonly called 'figs' is one of the most complex genera among the angiosperms with its specialised inflorescence called syconium that looks like a fruit. Syconium of 33 species of *Ficus* reported from Kerala were observed here to develop a novel key, solely based on syconium morphology. Numerical taxonomic methodo logy for syconium morphological characters were standardised, considering 22 characters with 104 character states and analysed using similarity clustering. The floral features of the genus are very much complex and all the existing keys for the species identification relays on both vegetative as well as floral features. Hence, the present key will be practical in use when syconium is the only available part. The numerical analysis of the syconium features well clustered and separated the trees with cauliflorous inflorescence, hemi epiphytic-epiphytic life forms and independent trees similar to the natural classification of the figs as "Atthi, Itthi and Aal", indicating that phenetic analysis using the syconium characters alone provided a grouping similar to the natural grouping based on the habit. Preliminary phylogenetic analysis of figs also provided a similar clustering. This gives an insight into the fact that the separation of figs into these natural groups is reflecting phylogenetic trait. Detailed studies including more morphological traits and molecular analysis could establish the phylogenetic relation of figs in relation to the evolutionary history of climate and vegetation.

Key words: Diversity, *Ficus*, identification key, natural classification, phenetics, syconium.

ABSTRAK
NAIR, S. S., BACHAN, K. H. A. & EBIN, P. J. 2021. Penelitian keanekaragaman dan fenetik bentuk sikonium *Ficus* L. (Moraceae) dari Kerala, India, mengungkap klasifikasi alami dan kunci identifikasinya. *Reinwardtia* 20(1): 27–36. — *Ficus* L. biasa disebut 'buah ara' adalah salah satu marga paling kompleks di antara angiospermae dengan perbungaan khusus yang disebut sikonium, yang terlihat seperti buah. Sikonium dari 33 jenis *Ficus* yang dilaporkan dari Kerala diamati di sini untuk mengembangkan kunci baru, hanya berdasarkan morfologi sikonium. Metodologi taksonomi numerik untuk karakter morfologi sikonium distandarisasi, dengan mempertimbangkan 22 karakter dengan 104 status karakter dan dianalisis menggunakan penggugusan keserupaan. Ciri-ciri bunga dari marga sangat kompleks dan semua kunci yang ada untuk identifikasi jenis bergantung pada ciri vegetatif dan juga ciri-ciri bunga. Karenanya, kunci sekarang akan praktis digunakan jika sikonium adalah satu-satunya bagian yang tersedia. Analisis numerik fitur sikonium mengelompok dengan baik dan memisahkan pohon dengan perbungaan kauliflorus, bentuk kehidupan hemi epifitik-epifitik dan pohon independen yang mirip dengan klasifikasi alami buah ara sebagai "Atthi, Itthi dan Aal", menunjukkan bahwa analisis fenetik menggunakan karakter sikonium sendiri memberikan pengelompokan yang mirip dengan pengelompokan alami berdasarkan perawakan. Analisis filogenetik awal dari buah ara juga memberikan pengelompokan yang serupa. Ini memberikan wawasan tentang fakta bahwa pemisahan buah ara ke dalam kelompok alami ini mencerminkan sifat filogenetik. Studi terperinci termasuk lebih banyak sifat morfologi dan analisis molekuler dapat menetapkan hubungan filogenetik buah ara dalam kaitannya dengan sejarah evolusi iklim dan vegetasi.

Kata kunci: Fenetik, *Ficus*, keanekaragaman, klasifikasi alami, kunci identifikasi, sikonium.

REPORT

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Species

Ficus virens Aiton var. *matthewii* Chantaras: A new distributional record from Kerala

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ABSTRACT

During the field explorations in the Wayanad District of Kerala, the authors came across an interesting specimen of *Ficus*. On further examination, literature review and herbarium references, it was confirmed as *Ficus virens* Aiton var. *matthewii* Chantaras. This variety is an addition to the floral diversity of Kerala. Detailed description, illustrations and colour plates are provided here along with a comparison with its allied variety.

Key words: Ficus, Kerala, New distributional record.

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Ficus virens Aiton var. *dispersa* (Moraceae): a new record for India

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Abstract. An interesting specimen of *Ficus* L. was collected from the Idukki district of Kerala. Based on detailed examination with protologues, literatures and type specimens, the plant was identified as *Ficus virens* Aiton var. *dispersa* Chantaras. This is the first report on the occurrence of this taxon in India. A detailed description, photographs, illustrations, comparison with allied taxa and identification key are provided.

Key words: *Ficus,* Idukki District, Kerala, new addition, *Urostigma*

1. Introduction

The genus *Ficus* L., belonging to the family Moraceae has a world-wide distribution, mainly in the tropics and subtropics (Berg & Corner 2005). *Ficus* is the most abundant and diverse genus in the family Moraceae. Its representatives are commonly called figs or fig trees. They support a large number of animals, due to their nutrient rich fruits available all throughout the year as a source of food, and are hence considered to be keystone species (Vanitharani *et al.* 2009; Kumar *et al.* 2011). The global diversity of figs accounts for about 750 species. In India, the genus is represented by 91 species and 24 infraspecific taxa (Chaudhary *et al.* 2012).

The genus is divided into six subgenera, among which the subgenus *Urostigma* is the dominant one with about 280 species (Berg 2004). *Ficus virens* Aiton, belonging to the subgenus *Urostigma*, is a species with worldwide distribution. This species is highly variable in terms of its vegetative and floral morphology. *Ficus virens* var. *dispersa* is a new variety of *F. virens,* distinguished from *F. virens* complex (Chantarasuwan *et al.* 2013).

During the field explorations in the forests of Idukki district in Kerala, the authors collected an interesting specimen of *Ficus*. The plant differed from the known varieties of *F. virens* reported so far from the country and was similar to *F. prolixa*. Based on detailed observations, literature reference (Gamble 1925; Corner 1965; Sasidharan & Sivarajan 2004; Chantarasuwan *et al.* 2013; Nair *et al.* 2021) and herbarium references in K, L, MH, KFRI, TBGT and CALI, the plant was identified as *Ficus virens* var. *dispersa.* The acronyms are according to the NYMG Index Herbarium. This taxon has not been so far reported from India and is a new record for the floristic diversity of the country. A detailed description, identification key, photographs, illustrations, and comparison with other varieties of *F. virens* reported from Kerala and with the similar taxon *F. prolixa* are provided in this article.

2. Taxonomic treatment

***Ficus virens* Aiton var. *dispersa* Chantaras.** Syst. Bot. 38(3): 681. 2013.

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CHAPTER 37

A PRELIMINARY ASSESSMENT ON THE DIVERSITY OF GENUS *FICUS* L. (MORACEAE) IN KERALA

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ABSTRACT

The current estimate accounts for the presence of about 750 species of *Ficus*L. in the world. 115 species have been so far reported within the political boundary of India. The plants are grouped into 6 subgenera and 12 sections. Majority of the species belongs to the sub genus *Urostigma*. Among them, only 10 species are reported as endemic. North eastern parts of India are considered as the hot spot of figs with a total diversity of 43 species. The current study provides a preliminary assessment on the diversity of figs in Kerala. The assessment revels the identity of 33 species within the Kerala state. Plants belonging to 5 sub genera are only reported from Kerala. Members belonging to the subgenus Ficus are not reported from Kerala. Five species are endemic to Western Ghats one each being in the endangered and Near Threatened category. Four among the species are exotic. In Kerala subgenus *Urostigma* is dominant with a total of 19 species, in which 11 and 8 species in the subsection *Conosycea* and *Urostigma* respectively almost similar to the Indian distribution.

Key words: Diversity, Distribution, Endemic, *Ficus*

Introduction

The term 'Figs' commonly refers to the genus *Ficus*L., belonging to the family Moraceae. It is one among the most advanced and abundant plants among the angiosperms. The genus is characterised by the presence of simple alternate leaves, latex, hypanthodium inflorescence with minute flowers embedded within the cup shaped structure. They are considered as a keystone species in many ecosystems (Vanitharani *et al.,* 2009; Kumar *et al.,* 2011), with a diversified habitat and life forms. The highly nutritional attractive figs, fruiting the year around are a source of nutrition to a wide variety of birds and animals.

The genus has worldwide distribution (Corner, 1965; Lambert and Marshall, 1991; Lomáscolo *et al.,* 2010) and with majority of the species in the subtropical and tropical regions. According to the current status, around 750 species of figs were reported from the world (Chaudhary *et al.,* 2012). The variable habitat pattern and life forms could be the reason for the diversification of the genus. The recent systematic account for the genus states the presence of 115 species of figs within the political boundary of India. The taxa being problematic with respect to the taxonomic characters and identification difficulties, remain unnoticed. The comprehensive studies at global level, done on the genus accounts for the work of King (1887-1888), Corner (1958, 1965, 1981) Berg and Corner (2005) etc (Chaudhary *et al.*, 2012). In India the revisionary study on the genus was initiated by Botanical Survey of India (BSI) in 2008. Only minor regional works were done on the genus in Kerala and the studies accounts for the works of Sasidharan and Jomy Augustine (1999) and Priyadharsanan (1999). No complete revisionary work was done on the genus in Kerala. Hence being a keystone species, supporting

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Leaf Based Phenetic Analysis On The Selected Taxa From The Genus *Ficus* L (Moraceae) From Southern Western Ghats

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ABSTRACT

The present work is a leaf based phenetic study on the selected members of the genus *Ficus* from Southern Western Ghats. Sixteen morphological characters of the leaf considering 102-character states were studied. The species were collected and careful morphological observations were made. The morphological characters were standardised into numerical format with the presence or absence of each character state represented with 1 and 0 respectively. The data was analysed using PAST Ver 2 Software and a dendrogram was obtained. The species were alligned based on the similarities on leaf morphology. The dendrogram obtained showed that the leaf morphology-based clustering is not exactly similar to the current accepted sub generic classification of *Ficus.* But the clustering was almost similar to a habit-based classification of *Ficus* into plants with cauliflorous inflorescence, stranglers, epiphytic & hemi epiphytic trees and independent trees. Thus, it implies that the leaf morphology-based clustering in *Ficus* is similar to its habit pattern.

Key words: *Ficus*, Leaf morphology, Phenetic study.

INTRODUCTION

The genus *Ficus* L. (Moraceae) is one among the most abundant, complex and diverse angiosperms. The hypanthodium inflorescence, minute flowers and morphological complexity make the genera problematic. They are commonly called as 'Fig' plants. About 750 species of *Ficus* is distributed in the world, chiefly in the tropics and sub tropics (Corner, 1965; Berg & Corner, 2005). India has a diversity of 115 taxa of *Ficus,* majority of them distributed in the North Eastern regions (Chaudhary *et al*., 2012). Around 40 species of *Ficus* have been reported from the Western Ghats region. According to the current classification, the genus is divided into six subgenera based on overall morphological and sexual features (Berg, 2003).

Taxonomy and Diversity of the Lesser-Known Varieties of *Ficus virens* (Moraceae) from The Western Ghats

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Abstract

The genus *Ficus* (Moraceae) which comprises around 115 taxa distributed in India is a dominant genus among the angiosperms. A comprehensive revision of the genus *Ficus* L., from the Western Ghats, recorded 36 taxa of *Ficus*. Encountered two interesting specimens were identified as varieties of *Ficus virens*. *Ficus virens* Aiton is one of the most common and widely distributed species of *Ficus* in the world. Which shows great complexity in the morphological characters and hence more complex in the taxa. Whereas the *Ficus virens* var *matthewii*, is a new record for Kerala and *Ficus virens* var *dispersa,* a new report to India. These two varieties of *Ficus virens* showed significant differences from the common variety *Ficus virens* var *virens.* A detailed taxonomic description of all the three varieties along with an identification key and images are provided here.

Keywords: Distributional record, *Ficus virens, Urostigma,* Western Ghats.

Introduction

The genus *Ficus* L., (Moraceae) is a highly diversified genera with respect to the habit pattern and life forms. The genus is mainly distributed in the tropical and sub-tropical regions of the world (Chaudhary *et al.,* 2012; Mohapatra *et al.,* 2020). The presence of the specialised inflorescence - hypanthodium, minute flowers and morphological complexities make the genera problematic. The global revision of the genus by E. J. H. Corner since 1930, reduced the number of species to ca. 750. The first detailed work on the genus from India was carried out by G. King (1887) and recorded 113 species and 47 infraspecific taxa of *Ficus.* The genus remained unnoticed except few regional works. BSI initiated a revisionary work on the genera and reported 115

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CERTIFICATE ON PLAGIARISM CHECK

1.	Name of the research scholar	SREEHARI S NAIR		
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3.	Name of the supervisor	Dr. AMITHA BACHAN K.H.		
4.	Department/Institution	RESEARCH DEPARTMENT OF BOTANY MES ASMABI COLLEGE P. VEMBALLUR, THRISSUR, KERALA		
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