TAXONOMIC AND ECOLOGICAL STUDIES ON THE SHOLA FORESTS OF KERALA

Thesis submitted to the
UNIVERSITY OF CALICUT

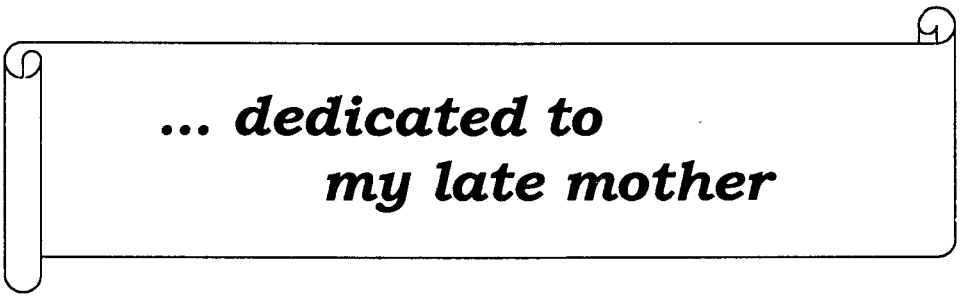
in partial-fulfilment of the
requirements for the degree of
DOCTOR OF PHILOSOPHY

by

K. KISHORE KUMAR

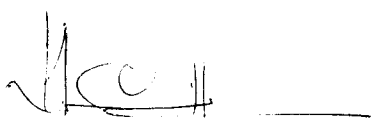
DIVISION OF ECOLOGY
KERALA FOREST RESEARCH INSTITUTE
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KERALA, INDIA

March 2004


... dedicated to
my late mother

DECLARATION

I hereby declare that the thesis entitled **"Taxonomic and Ecological studies on the Shola Forests of Kerala"** submitted by me in partial-fulfilment of the requirements for the degree of Doctor of Philosophy of the University of Calicut, incorporates the results of the work done by me. This thesis has not been submitted by me to any other University for the award of any other degree or diploma and it represents the original work done by me.



Peechi
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Kerala Forest Research Institute

(An Institute under Kerala State Council for Science, Technology and Environment)

Peechi - 680 653, Thrissur, Kerala, India

5-3-2004

CERTIFICATE

We hereby declare that the thesis entitled **"Taxonomic and Ecological studies on the Shola Forests of Kerala"** submitted by **Mr. K. Kishore Kumar** in partial-fulfilment of the requirements for the degree of Doctor of Philosophy of the University of Calicut, incorporates the results of the work done by him under our supervision. This thesis has not been submitted by him to any other University for the award of any other degree or diploma and it represents the original work done by him.

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INTRODUCTION

K. Kishore kumar "Taxonomic and ecological studies on the shola forests of Kerala" Thesis. Kerala Forest Research Institute Thrissur, University of Calicut, 2004



INTRODUCTION

"I keep six honest serving men. They taught me all I know.
They are what, where, why, how, when and who"

Rudyard Kipling (1865-1936)
(English writer and Nobel Laureate)

1. INTRODUCTION

"God's own country", the name attributed to Kerala, one among the ten *'Paradises'* identified by the National Geographic Traveler for its diverse geography and overwhelming greenery, is rather fascinating. It is a fact that Kerala is a land much acclaimed for the contemporary nature of its cultural ethos and much appreciated for the soothing, rejuvenating paradise that it is. The scintillating beauty of Kerala, a landscape of green magic, pulsating with the rhythms of culture and nourished by the richness of traditions, has always attracted foreigners to succumb to the irresistible charm of this enigmatic land.

Why is Kerala called so? When we think about this, several facts have to be highlighted. It is the unique geographical position, the regular monsoon, presence of high mountains, dense forests and ultimately the climate, which prevails in this piece of land, which make it a *'paradise'*. The land is caressed by the Arabian Sea on one side, with the mountains of the Western Ghats offering protection on the other, separating the state from the rest of the country. Plenty of rivers, lakes, canals and palm-fringed hinterlands make this land a genuine paradise. The presence of the Western Ghats across the path of the Southwest monsoon creates an important climatic zone with copious rainfall on the windward side and a dry belt on the leeward side in the east. Thus, Kerala has a warm pleasant tropical monsoon climate with seasonally excessive rainfall. The total rainfall in the state varies from 3800 mm over the extreme northern parts to about 1800 mm in the south, about 54 to 85 percent of which is contributed by the monsoons. Thus, vast expanses of forestlands, sacred groves and agricultural lands thrive well here making Kerala the greenest of all Indian states and also one of the megacentres of diversity of ecosystems, species and genetic resources and also the 'hottest' of hotspots of endemism in India.

In fact it is this immense amount of rainfall, which supports about 44 perennial rivers and several hundreds of streams and other water bodies in this small state. The role of forests, especially the high altitude evergreen forests (where the precipitation is maximum), in sustaining these water bodies is remarkable. These high altitude evergreen forests locally known as *'sholas'*

set in a matrix of grasslands, act as a sponge absorbing a great percentage of rain water to nourish the streams and rivers throughout the year.

1.1. THE TERM 'SHOLA' AND THE VARIOUS SCIENTIFIC TERMINOLOGIES

The term `Shola', which glorified ancient Tamil literature, songs and films, and a popular term discussed very often, nowadays owes its origin to the Tamil word *`Cholai'*, meaning a stream or a cool, shadowy place. Gradually, *`Cholai'* transformed to *`Shola'*, through the intermediary form *`Sholai'*, and began to be used to refer both *`streamlet'* and *`forests associated with the streamlets'*. Later Schimper, a well-known Plant Geographer, borrowed this popular term and incorporated into Forest typology. The etymology of this name has well been discussed by Swarupanandan *et al.* (1998).

Scientifically speaking, *`Sholas'* are *`Tropical Montane Forests'* situated in the higher mountain tracts of the Western Ghats, above 1500 m. They are the continuation of the *`Tropical Wet Evergreen Forests'* in the higher altitudes. Elevation is one among the main factors dictating the local climate, which influences the patterns of species distributions (flora) and the vegetation types. Foresters such as Champion and Seth (1968) equated the term *'shola forests'* with 'stunted forests of the high elevational belts' and classified them under *`Southern Montane Wet Temperate Forests'* (Subgroup: IIA - Type $C_1$), which are situated above 1500 m. Upper reaches of the *`Southern Subtropical Broadleaved Hill Forests'* (Subgroup: 8A) were also referred by them as *`Sholas'*, since the vegetation was almost similar and a clear cut demarcation with respect to altitude was not possible always. So the sequence of the forests with respect to altitude can be denoted as *Wet Evergreen Forests* → *Subtropical Broadleaved Hill Forests* → *Montane Wet Temperate Forests.*

Several authors have coined various terminologies to designate Shola forests. *Temperate Rain forests in the Upper Montane Region* (Schimper, 1903), *Tropical Upper Montane Rain Forests* (Burtt-Davy, 1938), *Montane Temperate Forests* (Champion, 1936), *Southern Montane Wet Temperate Forests* (Chandrasekharan, 1960; Champion & Seth, 1968; Puri *et al.*, 1989) etc. are some of them. The terms *`subtropical'* and *`temperate'* were attributed to denote these forests because diurnal temperatures resembling `subtropical'

and `temperate' latitudes are experienced in these areas during the cooler months. But, according to Meher-Homji (1965, 1967, 1968, 1987-88), Puri *et al.* (1983), these forests situated in the tropical latitudes, should not be referred to by such terms, which are those referring latitudes and in the strict sense, such a temperate climate does not exist in the sholas, with respect to the temperature and photoperiodic regimes. Moreover, the structural, functional and distributional patterns of the vegetations are also different from that of a temperate one. So the term *`Tropical Montane Forests'* is currently used to designate the shola forests (in the wider sense of the term), which inhabit altitudes above 1,500 m msl.

These forests have a wide range of distribution in the tropics and are encountered at Central and South America (Ecuador, Mexico, Venezuela, Columbia, Cuba, Jamaica, British Guyana, Costa Rica), Tropical Africa (Cameroon, Uganda, Madagascar, Tanganyika) and Tropical Asia (South India, Sri Lanka, Laos, Borneo, New Guinea, Malesia, Thailand and Vietnam) (Gentry, 1992).

In Kerala, typical shola forests are distributed along the crest of the Western Ghats, where the altitude goes beyond 1800 m. Eravikulam (located in the High ranges) in the Idukki district, Devarmala in Pathanamthitta disrict, Agasthyamala in Thiruvananthapuram district, Sispara Ghat in Palakkad district, New Amarambalam reserve forest in Malappuram district, Vellarimala sholas in Kozhikode district and Brahmagiri hills in Wayanad district are some of the prominent regions. Some of these regions are actually extensions of the forest types of Tamilnadu state, from the Nilgiris, Pulneys or Anamalai hills. However, it is to be noted that majority of shola forests are distributed in the 'High ranges' of Idukki district and even the largest shola forest of the state, namely Mannavan Shola, is located in this region. In total, the area under shola-grassland vegetation in Kerala is estimated to be approximately 70 km^2. (CESS, 1984)

1.2. VEGETATION CHARACTERISTICS AND STATEMENT OF THE PROBLEM

'Sholas' are very characteristic vegetation. The trees are stunted, profusely branched, without a straight bole and with an umbrella shaped canopy. The crooked branches are densely covered with epiphytic mosses, ferns, lichens

and orchids. The species are basically of a tropical stock. But, temperate species are dominating in the forest ecotones.

The sholas have often been referred to as '*living fossils*'. This is essentially because of their inability to expand, due to the nature of the climatic conditions in the area. The action of ground frost and sun in the morning prevents any sapling from surviving in the grassland. The situation is worse in the eastern and southern slopes, which are more prone to the effect of morning sun. Woody species in the open grassland are cold resistant (heliophylic) and have a range extending to the higher altitudes in the Himalayas or temperate region. However, as majority of the species are of tropical stock, they cannot withstand the low temperature in their life in an open eco-climate, and are consequently eliminated. However, the temperature inside the sholas remains remarkably constant and therefore there is ample regeneration within the sholas. This has been reflected in the studies that show that the relative extent of the sholas and the grasslands has varied over geological time.

In fact, during periods of higher temperature, the sholas have been more widespread and during the ice ages they have contracted. Whether the sholas are contracting or expanding today as a result of global change is irrelevant, considering that substantial damage has already been done by human interference in the upper reaches of the Western Ghats. Apart from a few area that are today protected as sanctuaries, national parks and reserve forests, the remaining areas have been deforested or replaced with plantations of various sorts such as tea, eucalyptus, wattle, silver oak, pine, lemongrass etc. This resulted in the decrease of temperature and rainfall, water scarcity, soil erosion and soil acidification (Sukumar & Sukumar, 1992). The high amount of tannin present in the leaves and bark of these plantation species retards decomposition of litter and thus impoverish soil and prevents regeneration of the native species (Agarwal *et al.,* 1961; Chinnamani *et al.,* 1965; Noble, 1967). Lemongrass and sugarcane cultivations are also predominant in these regions. For distilling lemongrass oil and for processing sugarcane juice to jaggery, large amount of firewood is needed, in addition to the needs of cooking, room heating and other household activities. All these pose a serious pressure on Sholas (Kumar *et al.,* 1999).

In the open grasslands where frosts occur during winter temperature falls below 0 ^{o}C, while it is above 0 ^{o}C inside the Sholas (Ranganathan, 1938). The plants will then be subjected to intracellular crystallisation. In contrast to the climate that prevails in the temperate latitudes, a frosty night is followed by a day, which is hot and the bright morning sun emits such an amount of radiant energy, which promotes rapid thawing of the crystallised water, which is quickly transpired by the plant. At the same time, the land will be in a frozen state, so that the plants find it difficult to absorb water from the soil to compensate the transpiratory loss. This results in a water stress, a situation of physiological dryness, which in turn causes wilting and death of the plant. Seedlings are affected the most, since they have only peripheral root system, but the trees, once established, survives with less damage. However, the shola trees exhibit various levels of frost hardening and most of them are having slightly incurved, coriaceous leaves. At the same time, grasses which have a perennial root stock and bulliform cells in their leaves can withstand these extremes of frost by curling their leaves thereby reducing the transpiration rate and spreading quickly by vegetative means, even if badly damaged by frost (Balasubramaniam and Kumar, 1999).

There is a good amount of regeneration inside the sholas, where frost damage is negligible (Jose *et al.,* 1994). However, seedling mortality is high during winter, due to low temperature and high moisture stress (Khan *et al.*, 1986). As majority of the tree species come under *Lauraceae, Myrtaceae, Rubiaceae* and *Oleaceae* families, all bearing drupaceous fruits, which are recalcitrant, viability of the seeds is less (Kumar and Chacko, 1999). Such seeds, which are shed at relatively high moisture content, are highly susceptible to desiccation and chilling injuries (King and Roberts, 1979), and so the viability period is cut short from a few weeks to a few months depending on the species (Chin and Roberts, 1980; Farrant *et al.*, 1988).

Fire, frost and wind are the three main factors determining the distribution of the sholas. Fires which are mainly man made arises somewhere down in the settlements and finds their way up, swallowing the grasslands, very often entering the sholas through the reed zones. In the process, it licks out practically the last seedling, which had escaped the dangerous effect of frost during winter and got established in the open grasslands, thereby preventing

the expansion of the sholas. Very often, people light fires purposely, so that the fertile ash from the grasslands may reach their cultivated land during the next rain.

The presence of adequate amount of soil moisture would appear to be an essential condition for the growth of the shola, especially in regions where ground frost occur. Good drainage is as important as sufficiency of soil moisture. Moreover, shola has the effect of increasing the soil water content in its immediate neighbourhood by holding up of water received by precipitation and by preventing too rapid run off on the one hand and too rapid drainage on the other (Ranganathan, 1938). They are thus having high ecological significance in protecting the headwaters of rivers.

Even though, Sholas are found in regions where erosion is high and soil depth is poor, most of the species are shallow rooted, even in regions of considerable soil depth. The stunted growth of the trees is also an adaptation to resist damage by strong winds, so that windfall is rare in the sholas. The hill folds and depressions, in which they are found, also offer enough protection.

The influence of the aspect on the distribution of sholas is a significant factor, and in reality it has an effect of temperature. Eastern slopes are cooler than western slopes, so that not only is the incidence and intensity of frost greater on the eastern slopes, but the damage is also greater as such slopes are exposed to the morning sun, which is known to intensify frost damage.

All these problems make the shola forests a *'living fossil community'* as opined by Bir (1938) and Vishnu-Mittre and Gupta (1965). They are considered as a relict of an evergreen forest climax, pushed back to damper sites, by the combined effects of fire, frost, grazing, clearance for agriculture and prevention of regeneration by rapid erosion of soil.

Very few scientific explorations have been carried out in the sholas of Kerala, mainly due to their remote occurrence and unfavourable climates prevailing in the areas. Usefulness of the shola plants also remained as a mystery, since the only tribal group *'Muthuvans'*, who live in the close vicinity of these forests did not mingle with the locals until recently to disclose any such information. All these features, mainly the dearth of information,

resulted in the conclusion that shola forests are 'unproductive' in all respects. With the result, vast regions of sholas were cleared out for establishing plantations of tea, coffee, eucalypts, wattle, oak and others, in addition to those established in the adjacent grasslands - a more logical way to convert these so called 'unproductive' areas to productive.

Thus it is understood that only scanty information is available on the floristic, ethnobotanical and ecological aspects of the shola forests, especially on the diversity content, vegetation structure and dynamics. So the present study was intended to fill in this lacunae.

1.3. OBJECTIVES OF THE STUDY

1. To undertake a detailed floristic account of the shola forests of Kerala, based on studies at the important shola regions such as Mannavan Shola, Eravikulam (National Park) Sholas, Pullaradi Shola, Pambadam Shola, etc.
2. To generate benchmark information on the biodiversity content, structural, community ecological and dynamic details of shola forests.
3. To analyse the effect of altitude on the physiognomy of the vegetation, stratification and on the girth and height of the plants.
4. To analyse the effect of altitude on structural factors such as density, frequency, abundance, basal area, etc.
5. To evaluate the effect of altitude on the diversity, species distribution, diameter distribution, etc.

1.4. HYPOTHESES TO BE TESTED

1. The shola forest is a refugium for a number of endemic, rare, endangered and threatened plants so that their preservation is very important.
2. The shola forest is a rich resource, both biologically and economically.
3. There is significant difference in the diversity content of the shola forests within different elevational belts.
4. There is no stratification of trees in the shola forests.
5. Density and diversity of plants are very high in the sholas.

1.5. ORGANISATON OF THE THESIS

The thesis begins with a general introduction on the shola forests giving the relevance, objectives and hypotheses to be tested in the present study. A chapter reviewing the literature on the subject under three main sections namely Taxonomy, Ethnobotany and Ecology follows this. The study areas are described in detail as the third chapter. This is followed by three chapters on the three major aspects of shola forests viz., Taxonomy, Ethnobotany and Ecology. Each of these chapters contains an introduction, followed by the methodology, results, analysis and discussion, conclusions, etc. Photographs and figures if any, pertaining to these chapters are given together at the end of the respective chapters. General chapters on analysis and discussion summary and conclusion, etc. comes next. This is followed by the list of references cited, appendices, list of publications, index to botanical names, etc.

REVIEW OF LITERATURE

K. Kishore kumar "Taxonomic and ecological studies on the shola forests of Kerala" Thesis. Kerala Forest Research Institute Thrissur, University of Calicut, 2004



REVIEW OF LITERATURE

"Previous knowledge is one which acts as a hook in mind upon which we can hang the new knowledge"

David. P. Ausubel (1963)
(American Psychologist)

2. REVIEW OF LITERATURE

2.1. TAXONOMICAL STUDIES

2.1.1 Taxonomy in South India – a brief sketch

Although Garcia D' Orta's *'Os Coloquious'* published in 1565 (*cf:* Santapau, 1958) is chronologically the first printed publication on Indian plants, the earliest book of any real importance on the botany of India is by Hendrik Adriaan van Rheede's *Hortus Indicus Malabaricus* published during 1678-1703 (Warner, 1920; Manilal, 1980a and 1980b). But it is only after the arrival of Europeans, floristic studies in India, especially in the peninsular region gained momentum. The pioneering works were carried out by Sir Robert Wight. His prominent works include *Illustrations of Indian Botany* (1840) and *Icones Plantarum Indiae Orientalis* (1838-1853). He, along with Walker-Arnott published another monumental work, *Prodromus Florae Peninsulae Indiae Orientalis* (1834). Later, *The Flora Sylvatica of South India* (1869-1874) and *Icones Plantarum Indiae Orientalis* (1868-1874) were published by Col. R. H. Beddome. It was during this period Hooker and Thompson began their most comprehensive work, *The Flora of British India,* which was completed in a time span of 25 years (1872-1897). Logan (1906) and Bourdillon (1908) are other famous British officials who explored this area and compiled lists of plants.

With the establishment of the Botanical Survey of India by Sir George King in 1890, several regional floras were published. *The Flora of the Presidency of Madras* by Gamble and Fischer (1915-1936) is such a remarkable work as far as the south Indian region is concerned. Other notable works on the flora of South India are *Flowering Plants of Travancore* by Rama Rao (1914), *Flora of Anamalais* by Fischer (1921), Fyson's *Flora of the Nilgiri and Pulney Hilltops* (1915-1921) and *Flora of South Indian Hill Stations* (1932). The comparative study of the South Indian hill top vegetation with the Eastern Himalyas particularly of the Khasi Hills were a matter of interest of Hooker (1872-1897), Fyson (1915 and 1932) and Razi (1955). Similarly, Gupta (1962b) conducted comparison studies with the Western Himalayas taking into account of the common species found in both localities. Other famous workers who studied the South Indian flora include Aiyyar (1932), Champion (1935), Bor (1938 and 1960), Pallithanam (1957), Matthew (1959), Gupta and Rege (1965), Meher-

Homji (1967, 1969 and 1978), Blasco (1970b), Henry *et al.* (1979), Rao and Razi (1981), Joseph (1982), Jain (1986) etc. Karthikeyan and Sharma (1983) compiled the names of new taxa and new records published since the publication of the *Flora of the Presidency of Madras*. Quite recently Matthew (1999) published *The Flora of Palni Hills* along with the illustrations of plants.

Some notable district floras published in Kerala during this period include *Flora of Calicut* by Manilal and Sivarajan (1982), *Flora of Cannanore* by Ramachandran and Nair (1988), *Flora or Silent Valley* by Manilal (1988b), *Flora of Palghat* by Vajravelu (1990), *Flora of Thiruvananthapuram District* by Mohanan and Henry (1992), and *Flowering Plants of Thrissur Forests* by Sasidharan and Sivarajan (1996). *The Flora of Kerala: Grasses* was published by Sreekumar and Nair (1991). *Flora of Agasthyamala* was published by Mohanan and Sivadasan (2002).

2.1.2. Taxonomy of Shola Forests

Very limited information on the floristic elements of the shola forests are found in the *Working Plans* and *Management Plans*, the working documents for Forest Divisions. Much floristic information on the vegetation type is found in a fragmented state in earlier floristic works like Wight's (1835-1853) *Icones Plantarum Indiae Orientalis*, Hooker's (1872-1897) *Flora of British India*, Gamble and Fischer's (1915-1936) *Flora of the Presidency of Madras*, and other regional and local floras mentioned earlier.

However, a flora particularly devoted to shola forests is lacking. The conventional taxonomic practice is to study the plants (and animals) of selected geographic areas and is in no way, on the basis of vegetation types. The result is that floras exclusively devoted to individual vegetation type are wanting altogether and a literature search only proves the fact in the context of the shola forests too.

Perhaps the first monographic floristic account on the shola forests was that of Fyson's (1915-1921) *Flora of the Nilgiri and Pulney Hill-tops*, while floristic particulars of other kinds of vegetations also occupy much coverage here. He also published another monumental work *The Flora of South Indian Hill Stations* in 1932, which covered a still broader area. The flora and vegetation of the shola forests of the Nilgiris, Pulneys and Kodaikanal in Tamil

Nadu were relatively well studied in comparison with that of Kerala (Gupta, 1960a, 1960b, 1962a; Mathew, 1959, 1969; Sharma *et al.*, 1977; Matthew, 1999).

Very few studies have been conducted in the shola forests of Kerala, parhaps due to their remote occurrance and unfavourable climates. A comparable floristic account of the shola forests of Kerala is due to the pioneering studies of Sebastine and Vivekananthan (1967), Shetty and Vivekananthan (1968, 1970. 1971, 1972, 1973a, 1973b, 1975 and 1991) and others. Shetty and Vivekananthan could record a total of about 400 species from the Anamudi and surrounding regions, of which 143 are from grasslands alone. In addition to this they described eight new taxa and about 28 rare and endangered species from the area. Rice (1984), Jose *et al.* (1994), Karunakaran (1997) and others have added further documentation on the plant wealth of the region. But most of these studies were concentrated mainly on the ecological aspects. So in spite of these studies, botany of the region remained scanty. Later, Swarupanandan *et al.* (1998) conducted some studies on the floristic and ecological aspects of the shola forests of the High Ranges of Idukki district.

2.1.3. Studies in the Idukki District

It is to be noted that majority of the shola forest regions in the state of Kerala is concentrated in the Idukki district, the largest and the most forested district of the state. But unlike other districts of Kerala the flora of Idukki has not yet been completely explored, perhaps because of the nature of the terrain of this area which occupy both the low lands of the Deccan plateau at one end and the highest peak south of Himalayas (Anamudi) on the other. Thus the available scattered and fragmentary floristic studies of the district are not enough to elucidate the actual picture of the floristic structure of this highly undulating area. It was Beddome (1882), who made the first botanical collection from the district, from Peermade. Barnes, Beddome, Bourdillon, Meebold and Venkoba Rao made collections in the late 19th century and early 20th century and their collections were cited by Hooker (1872-1897) and Gamble (1915-1936). One of the study areas, Mannavan Shola forms the type locality of several species including the recently rediscovered *Arisaema psittacus* (Nair *et al.*, 1997). Barnes (1939) studied the *Geraniaceae* of the High

Ranges. Rama Rao (1914) in his *Flowering Plants of Travancore* cited several places of this area. Iyppu (1960) and Chandrasekharan (1962c) studied the forest types of this district. Sebastine and Vivekananthan (1967), and Shetty and Vivekananthan (1971, 1991) published brief accounts on the flora of Anamudi and Devikulam. Vivekananthan (1978) studied the vegetation of Periyar Tiger Reserve and also enumerated 12 rare and threatened plants of the area. Studies by Shetty and Vivekananthan (1968, 1969, 1970, 1972, 1973 and 1975), Sharma *et al.* (1974), Nayar (1974), Sreekumar *et al.* (1983a, 1983b), Nair and Sreekumar (1985), and Pandurangan and Nair (1995) resulted in the discovery of several new taxa from the district. Nagendran *et al.* (1976-77) studied the *Podostemaceae*, Bhaskar (1981) and Bhaskar and Razi (1978, 1981) studied the *Balsaminaceae*. Mohanan *et al.* (1984) reported some rare and interesting plants from the Idukki Hydro-electric Project Area. Balasubramanyam *et al.* (1989) listed out some rare and interesting plants from the Pooyamkutty Hydro-electric Project Area. Jomy Augustine (2000) conducted study on the angiosperm flora and the ethnobotany of Periyar Tiger Reserve and Rajesh (2001) on the pteridophyte flora. Swarupanandan *et al.* (2001) conducted some studies on the sholas of Idukki district.

It is a well-known fact that taxonomic studies are required for assessing the biotic resources and their management in an ecologically and scientifically sound and sustainable way. In this sense, taxonomic studies should precede ecological studies. The scope of floristic accounts of the shola forests of Kerala, focusing exclusively on the vegetation type therefore cannot be over-emphasized.

2.2. ETHNOBOTANICAL STUDIES

With the establishment of 'Ethnobotany' as a branch of science, thousands of literatures are pouring into this field from all over the world, which makes the review a Herculean task. A large proportion of the current research in ethnobotany remains possessed with USA, where the modern approach to the science of Ethnobotany evolved, with about 41% of the total studies carried out all over the world (Shah, 1987 and Cotton, 1996). According to Ford (1978), a total of 904 studies had been published on the ethnobotany of native North Americans before 1977.

2.2.1. Studies in India - general

India is one of the countries where ethnobotanical knowledge existed from time immemorial. Our land with 53 million tribal people it is perhaps the largest country possessing a good treasure of accumulated indigenous tribal knowledge (Pushpangadan, 1994). There are three major sources of ethnobotany knowledge in India. They are *Archaeological sources* - enshrined in archeological finds ranging from about 10,000 BC to 1000 AD in cave paintings and excavations in many points of the country; *Traditional sources* - which include ethnobotany of indigenous religions and medical practices, of arts and crafts, social customs and trade that are based on old works in Sanskrit; *Tribal sources* - examining, investigating or substantiating claims of tribal botanicals (Bole, 1980).

Written records of the use of plants for both human and animal diseases can be traced back to the *Rigveda* (5000 - 1600 BC), the earliest scripture of the Hindus (Jain, 1994). The Vedic Aryans were familiar with a lot of medicinal plants. The Indian indigenous system of medicine named *Ayurveda*, dating back to the Vedic ages (1500 – 800 BC) has been an integral part of our culture (Weiss, 1987). *Atharva Veda* also describes several plants. *Charak Samhita* (1000 - 800 BC), *Sushrutha Samhita* (800 – 700 BC) and Vagbhatta's *Ashtanga Hridaya* are some other ancient monumental works. *Yunani*, another system of medicine, which originated in Greece in about 400 BC came to India through Arab physicians, who accompanied Mughal invaders and came to be known as *Yunani-Tibb*. The *Siddha* system, which is believed to have originated from Lord Shiva (at about 2000 BC) and passed to his wife Parvathi and finally to his disciples is in use mainly in Dravidian Civilization (Lalramnghinglova and Jha, 1999). Later on, there have been a number of workers from time to time who have described the medicinal importance of plants, namely Charak, Watts, Kirtikar and Basu, Chopra, Nadkarni, etc.

The earliest book of any real importance on the ethnobotany of India is van Rheede's '*Hortus Malabaricus*' published during 1678-1703 (Warner, 1920), which dealt with about 780 species of the most important plants of Malabar supported with 794 excellent illustrations (Manilal, 1980a, b). The unique position of this spectacular work in the social and cultural history of ethnic groups in peninsular India is well known (Mohammed, 1968; Manilal, 1978).

Our present day knowledge of *Indian Materia Medica* accounts for nearly 3500 species under various crude drugs, both of indigenous and exotic origin. The scientific study of Indian indigenous drugs was initiated in the early part of the 18th century when John Fleming published *A catalogue of Indian Medicinal Plants and Drugs* (1810). Ainslie published the *Materia Medica of Hindoostan* in 1813 and Fluckiger and Hanbury published the *Pharmacographia* in 1879. But the study of indigenous drugs gained momentum with the publication *Indigenous Drugs of India* (Chopra, 1933) and *Indigenous Drugs of India* (Dey, 1973, repr. ed.). *Bazzar Medicines and Common Medicinal Plants of India* (Waring, 1897) is a little different contribution and contains many folk remedies. Today there is an increasing desire to unravel the centuries old secrets of traditional medicine (Maheswari, 1995, Kapoor and Chopra, 1961).

Even though Ethnobotany had a glorified past in India, organised study is of recent origin. It was E. K. Janaki Ammal, who actually initiated organised works in this field in India (Ammal, 1956). She is considered as the *'Father of Indian ethnobotany'*. Inspired by Janaki Ammal, S. K. Jain started intensive field works among the tribes of central India and brought forward several dozens of publications. *Glimpses of Indian Ethnobotany* (Jain, 1981), *Bibliography of Ethnobotany* (Jain *et al.*, 1984), *A Manual of Ethnobotany* (Jain, 1987a), Methods *and Approaches in Ethnobotany* (Jain, 1989b), *Dictionary of Indian Folk Medicine and Ethnobotany* (Jain, 1991b) etc. are some of his prominent works.

These studies triggered ethnobotanical activities among several botanists, anthropologists and ayurvedic medical practitioners. Several research organizations also started to organize various studies in this area and this resulted in hundreds of publications dealing with several sub-disciplines of ethnobotany. Several compilation works are also now available. *Bibliography of Ethnobotany* by Jain *et al.* (1984) contains about 2000 references covering all the major publications on ethnobotany, Indian as well as foreign. After three years Mudgal (1987) made another compilation. During the last decade a few other works on the related aspect by Binu *et al.* (1992), Chandra (1996), Lalramnghinglova and Jha (1999) etc. were also published, mainly detailing the Indian scenario. Here I am attempting to review only those works carried out in Kerala and our neighbouring state Tamil Nadu, since the tribal culture of both of the these areas are often intertwined.

2.2.2. Studies in Tamil Nadu

In Tamil Nadu, ethnobotanical investigations of any significance were carried out only in the beginning of late seventies. Raghunathan (1976) investigated medicinal flora of different tribal pockets in Nilgiris. Ethnobotany of *Irular* tribes was studied by Ramachandran and Nair (1981a), while Abraham (1981) studied *Irulars, Kodas* and *Kotas.* Ammal and Nagendra Prasad (1984) investigated the ethnobotany of *Costus speciosus* with special reference to *Kanikkar* tribes of the state. Anandan and Veluchamy (1986) reported the folk medicinal claims from North Arcot district. Chelladurai (1987) gave an account of the folk medicinal value of *Dolichos falcatus* (*Minnikizahangu*) among the tribes of Point Calimere. Lakshmanan and Narayanan (1988 and 1990) carried out studies on the folklore medicine and anti-fertility drugs used by the tribals of Anaikkatty hills in Coimbatore. Viswanathan (1989) studied the Ethnobotany of the *Malayalis* in the Yelagiri hills of North Arcot district.

Ethnomedical uses of the plants employed by the *Gounder Malayali* and *Veduvar* tribes of Salem district (Dwarakan and Ansari, 1992), Medicinal plants of Ootacamund, Nilgiris (Rajan, 1992); Ethnobotany of *Kadars, Malayans* and *Muthuvans* of the Anamalais in Coimbatore district and that of *Irulas, Kurumbar* and *Paniyans* of Nilgiris (Hosagoudar and Henry, 1996a and 1996b; Balasubramanian and Prasad, 1996), Tribal ethnobotany of Nilgiri district (Mandal and Basu, 1996), Ethno-medico botany of Southern Western Ghats (Henry *et al.*, 1996) are some of the other recent works.

A recently released book *Ethnobotany and Medicinal plants of Indian subcontinent* edited by Maheswari (2000), include the most recent works done in this state. This include botanical remedies for diabetes from the Cauvery delta; Weeds of medicinal importance in Tirunelveli District; Some traditional folklore medicinal plants of Kanyakumari District; Preliminary phyto-chemical studies on some medicinal plants of Tirunelveli Hills; Cultivated medicinal plants useful in homeopathy found in Nilgiri District; Plants used as medicine by tribals of Shevaroy hills; A survey of medicinal plants from Chitheri hills in Dharmapuri District; *'Touch me not'*- a medicinal plant of the Nilgiri tribals; Traditional crude drug resources used for human and livestock diseases in Salem District; Some flowering plants used as cosmetics among tribals of

Nilgiris. Another book, '*Recent progress in Medicinal plant's* recently released and edited by Singh *et al.* (2002) includes two works by Karuppusamy and Kumuthakalavalli on the ethnomedicinal claim on *Theriophonum fischeri* (Araceae) and on the medicinal orchids from the hilly tracts of Dindigul district.

2.2.3. Studies in Kerala

Compared to the other states of the country ethnobotanical studies in Kerala is limited and published reports are a few (Nazarudeen *et al.* 1996). Pisharoti (1935), Gnanambal (1952), Mukerjee (1953 and 1954), Kolammal (1979) and Moos (1952, 1976 and 1978) carried out some studies although in an anthropological viewpoint.

Prof. K. S. Manilal of Calicut University was the first and leading researcher who energized the field of ethnobotany in Kerala. Through some of his earlier works, he tried to give a distinction between economic botany and ethnobotany (Manilal, 1977). He was the person who made a detailed study on various aspects of *Hortus Malabaricus* (Manilal, 1979, 1980a, 1980b and 1984) and has now published the English version of the same. In 1981, he reported 26 primitive varieties of rice including medicinal varieties used by tribals in Malabar (Manilal, 1981a). He also conducted studies on Umbrella stones (*dolmens*) and their ethnobotanic connection with mushrooms (Manilal, 1981b). One of his recent works include the studies on the wild leafy vegetables used by two tribal groups of Attappady in Palakkad District (Manilal *et al.*, 2002).

In 1986, scientists at Kerala Forest Research Institute (KFRI), Peechi brought forward a research report on the medicinal plants of Kerala forest (Nambiar *et al.*, 1985). Prasad and Abraham (1984) studied the plants used by the *Nayadis* of North Kerala.

Dr. Pushpangadan of Tropical Botanical Garden and Research Institute (TBGRI), Thiruvananthapuram is another leading ethnobotanist in Kerala. He and his colleagues have contributed a lot to this field through a series of publications. Pushpangadan and Atal (1984) carried out ethno-medico-botanical investigation on seven primitive tribals living in the densely forested

highlands of the Western Ghats in Kerala and recorded the uses of 79 species. They also studied ethno-medico-botanical culture prevalent among different tribals and scheduled castes in the state (Pushpangadan and Atal, 1986). Detailed ethnobotanical investigations were carried out on species such as *Trichopus zeylanicus* (Pushpangadan *et al.*, 1989; Sharma *et al.*, 1989) and *Janakia arayalpatra* (Pushpangadan *et al.*, 1990).

Ramachandran and Nair (1981) carried out ethnobotanical studies in Kannur district of northern Kerala. Bhat and Nesamani (1981) studied the folklore medicinal practice among the tribals of Idukki district. Nair *et al.* (1987) conducted study on the techno-economic aspects on the forest wealth of Silent valley. Sankaranarayanan (1988), studied folklore medicines for jaundice from Coimbatore and Palghat districts. He along with Sashiraj carried out Sociocultural and ethnobotanical studies on *Irula* tribes of Sholayur Panchayat in Attapady (Sankaranarayanan and Sashiraj, 1988). Choondal (1988) studied some folk medicines used for livestock in Kerala. Rajasekharan *et al.* (1989) gave an account of the ethnomedical importance of two species of *Aristolochia* namely *A. indica* and *A. tagala* with reference to Kani tribes of Agastiar Hills. Gopalakrishnan and Krishnaprasad (1992) studied folklore medicines of the tribals (*Irulars*) of Attapady region. Sivarajan and Balachandran (1994) give an account of ayurvedic drugs and their plant resources. Raveendran (1996) described a few lesser-known edible plants used by the tribals of Kerala. Rajasekharan *et al.* (1996) conducted study on the traditional folk healing art and its practitioners. Radhakrishnan *et al.* (1996) discussed the ethnobotanical aspects of several wild edible plants of Kerala. Nazarudeen *et al.* (1996) conducted study on the *Paniyar* community in North Kerala. Manilal (1988a) described a few medicinal *Compositae* mentioned in some ancient palm leaf manuscripts of Malabar. Thomas and Britto (1999) conducted an ethnobotanical survey of Naduvil Panchayat in Kannur district. Nair and Jayakumar (1998 and 1999) and Sajeev and Sasidharan (1999) conducted ethnobotanical studies in Chinnar Wildlife Sanctuary. Four rare and ethnobotanically important ferns were reported by this student from the same sanctuary (Kumar and Madhusoodhanan, 1998). *A Manual of NWFP Plants of Kerala* published by Nair (2000) also contains ethnobotanically relevant information.

From the literature cited so far, it is becoming clear that there is not even a single comprehensive ethnobotanical study conducted in the high altitude shola forest regions of our state or among the *Muthuva* tribals and other native/aboriginal people inhabiting these regions, except for some of this student's earlier works (Kumar *et al.*, 1999 and 2000; Kumar and Sasidharan, 2002) and two other works dealing with general aspects (Bhat and Nesamani, 1981; Nair and Jayakumar, 1998).

2.3. ECOLOGICAL STUDIES

2.3.1. Studies conducted during the pre-independence period

Sholas had been a centre of attraction, their unique characteristics and occurrence being a mystery. Perhaps this may be due to their remote access, restricted extent and the hostile climate so that the researchers kept away from these forests. Earliest records on any aspects about this mysterious vegetation lay hidden in various tour reports, floristic expedition reports and in the biographies of several Europeans who climbed up the steep hills either as explorers or as hunters.

In 1602, a Jesuit priest named Rev. Jacome Finicio, ascended the Nilgiris (which were then called Todamala) from Mannarkad in Kerala. Father Finicio's report about the adventurous visit to the mountains, which is still preserved in the British Museum, is the first ever recorded account of the Nilgiris. It speaks of idyllic environs, clean water and hospitable tribes who co-existed peacefully in the area and also indicates that the appearance of the landscape in the Nilgiris were much the same even four centuries back (The Hindu Daily, 2003).

Reports of foresters and plant explorers are also a good source of information. Mention about these forests can be seen in earlier floras such as those of Bourdillon (1893), Hooker (1872-1897), Gamble and Fischer (1915-1936) and Fyson (1932). Bourdillon in his *'Report on the Forests of Travancore'* has given an account on the physiographic features of Anamudi hills, about the shola-grassland ecosystem, the climate and soil properties of the area and the tribes inhabiting the area.

Ramaswamy (1912) has given an interesting description about the sholas of Tinnelvely Hills. But here the altitude is comparatively less (often less than 1500 m) indicated by the presence of species such as *Artocarpus hirsutus, Tectona grandis, Bombax malabaricum,* etc. Aiyyar (1932 and 1935) has conducted studies on the ecology and silvicultural aspects in the sholas of Palghat division. But he dealt with low altitude shola regions only. The species recorded from the area include *Mesua ferrea, Palaquium ellipticum, Calophyllum elatum, Acrocarpus fraxinifolius, Dysoxylum malabaricum, etc.* that do not comprise a typical shola composition.

It was Ranganathan (1938) who first conducted an in-depth study on the shola forests. He has clearly mentioned about the physiognomy, species composition, various factors governing the occurrence and distribution of sholas and grasslands. It was he who first raised the question about the dual climax theory on shola-grassland ecosystem, which still remains a matter of debate among ecologists. He opined that both the sholas and grasslands are two distinct climatic climaxes in ecological equilibrium, whose relative distribution is topographic determined. This hypothesis, which seems difficult to fit into Clement's system of ecology naturally, became a matter of controversy among ecologists.

First person who questioned this hypothesis was Bor (1938). He was of the opinion that grasslands are biotic climaxes only rendered stable by fire and grazing. According to him sholas are the relict of an evergreen forest climax, which has been pushed back to its last stronghold by fire and grazing. Champion (1935 and 1936) also supported this view. He was of the belief that it is the periodic firing of grasslands by graziers that had caused the present distribution of the grasslands and that in the past, clearings have been made in these areas. Experiments conducted in the grasslands of Nilgiris to find out their ecological status by planting various exotic and indigenous tree species also supported this view. When grazing and fire were prevented, the experimental areas slowly got converted to forests.

2.3.2. Studies conducted during the post-independence period

Nair (1955) pointed out that afforestation of the grassland with shola species tried from 1934 onwards indicate that shola species can grow and

regenerate under a forest cover provided by *Cytisus scoparius*. This also lends support to Champion's view that the grasslands followed removal of forest vegetation.

Jayadev (1957) was of the opinion that grasslands represent a pre-climax stage. Puri (1960) also disagreed with Ranganathan and supported Clement's (1928) monoclimax theory. Gupta and Sankaranarayan (1962) ascertain that South Indian grasslands are not the climatic climax but a subclimax governed by a set of biotic and other factors, which do not admit easy passage towards the final climax. Gupta (1960a and 1960b) studied the ecological aspects of the Kodaikanal vegetation. He also pointed out the relic features of the sholas and the uniqueness of this ecosystem.

Rajasingh (1961) conducted some ecological and silvicultural studies in the sholas of Papanasam hills of Madras state. But the altitude of the area was below 1600 m as indicated by the species composition (*Gluta travancorica, Balanocarpus utilis, Cullenia excelsa, Mesua ferrea,* etc.). Kadambi (1950) has made exhaustive ecological cum floristic cum silvicultural studies in the evergreen montane forests of Western Ghats in Mysore state. He describes how the ecological factors determine the structure and distribution of species composition of the vegetation. Agrawal *et al.* (1961) carried out successional studies in Nilgiris. Meher-Homji (1965a, 1965b, 1969, 1986 and 1990) is another ecologist who conducted detailed ecological studies on the shola-grassland ecosystem of Nilgiris and Palnis. He considers the climate of hill stations as tropical montane and not temperate based on the diurnal temperature regimes. According to him, shola when destroyed form a scrub savanna which on further degradation gives rise to grassland and ultimately to barren rocks. Chandrasekharan (1962a, 1962b, 1962c and 1962d) and Noble (1967) gave the grasslands a biotic subclimax status, largely owing to fire.

Disputes on the origin of sholas also were going hand in hand. Razi's studies (1950, 1954 and 1955) on the dispersal mechanism of shola species helped in understanding the distribution pattern of sholas. According to Blasco (1970a), the occurrence of Himalayan and Srilankan species in South Indian hills is mainly through dispersal by migratory birds. He ruled out any chances of physical continuity of mountains or the effect of large topographic or climatic changes, which may have favoured their migration. He also opined

that the ecology of high rainfall savannas (> 5000 mm/annum) of Nilgiris is not conducive to the growth of trees.

Regarding the regeneration of the sholas also, several views emerged. Bor (1938) and Meher-Homji (1969) observed that majority of shola tree species possessed drupaceous fruits and their seeds are not produced in large quantities nor they are capable of rapid successful migration or aggregation. Vishnu-Mittre and Gupta (1968) and Theagarajan (1971) were of the opinion that natural regeneration of shola species is very poor. But Puri *et al.* (1989) found that they regenerate under forest cover eventhough regeneration in open areas is poor. Silvicultural studies conducted by Kumar and Chacko (1999) are also indicative of the recalcitrant nature of the shola tree seeds, which lose their viability within a few months of time, thereby providing stresses on germination.

Vishnu-Mittre (1971) and Vasanthy (1988) gave evidences for the occurrence of both shola forests and grasslands in the Nilgiris plateaus even before 30,000 years through their paleopalynological studies. This information gave support to the older hypothesis of Ranganathan and again brought up the issue for active discussion. According to Dabadghao and Sankaranarayan (1973), grasslands rarely occur as climatic climax in India and they are generally represented as secondary 'seres'. They treated stable grasslands as biotic climaxes which under the influence of fire and grazing gets converted to disclimaxes.

Pascal (1988) discussed the role of frost in maintaining high altitude grasslands. Puri *et al.* (1989) believed that it is the low humidity and frequent fire that eliminate seedlings of forest species, which have germinated in the savannas. Nair (1994) also supported the role of recurrent fire, which changes the local edaphic conditions thereby promoting the spread of grasslands at high altitudes.

2.3.3. Studies conducted during the last decade

Srivastava (1994) conducted studies on the invasion of shola species into grassland in different locations at Kodaikanal and Madikettan. Jose *et al.* (1994) conducted studies on the structural, floristic and edaphic attributes of

the shola-grassland vegetation in Eravikulam National Park. But they studied only the low altitude shola regions around the tourist zone Rajamala (< 1800 m), while sholas are found even at altitudes of 2680 m (at Anamudi region) in the park. So the study failed in providing an overall idea about the vegetation. This becomes clear because species such as, *Pithecellobium subcoriaceum, Ixora notoniana,* etc., which are not typical shola members were listed as the most dominant species of the area.

Karunakaran (1997) and Karunakaran *et al.* (1997) during their study on the grasslands at Eravikulam made certain observations on plant species associations along shola-grassland ecotones.

Ecological studies on the sholas of the state gained momentum in late nineties when the Forest department started funding several projects upon systematic studies on the biodiversity and other aspects of shola forests. Several research institutions of the state came up with various projects. At Kerala Forest Research Institute, Menon (1997) mapped and analysed the vegetation of Eravikulam using remote sensing techniques; Swarupanandan *et al.* (1998 and 2000) studied the vegetation dynamics of grassland forest ecosystem of Western Ghats and the ecological and floristic aspects of Eravikulam and Mannavan Shola regions; Nair and Menon (2001) analysed the population and regeneration status of the endemic arborescent flora; Nair and Baburaj (2001) conducted biodiversity mapping through remote sensing techniques; Chandrasekhara *et al.* (2001) conducted studies on the disturbed shola forests. Several other projects on the soil features, runoff, soil micro flora, insect and macro-invertebrate fauna, etc. were also undertaken.

At the Forestry College, Kerala Agricultural University, Sudhakara (2001) conducted an inventory on shola trees and prepared a computerized herbaria; Vidyasagaran and Gopikumar (2001) conducted studies on the phytosociology and litter dynamics of the sholas of Wayanad district. All the above-mentioned works and several other studies on other aspects were recently compiled into the form of a book (Nair *et al.*, 2001).

STUDY AREA

K. Kishore kumar "Taxonomic and ecological studies on the shola forests of Kerala" Thesis. Kerala Forest Research Institute Thrissur, University of Calicut, 2004



STUDY AREA

"The High Range with its deeply dissected valleys and massive peaks is surpassingly grand and incomparably beautiful"

Gen. Douglas Hamilton (1892)
(One of the first visitors to High ranges)

3. STUDY AREA

In Kerala, sholas are mainly located in the *'High Ranges'* (situated approximately between 9° 20' to 10° 20' N Lat. and 76° 30' to 77° 30' E Long.) of Idukki district in the Western Ghats. It is a series of high hills, the highest point of the region being the Anaimudi peak (2695 m.), the tallest peak south of Himalayas. Fortunately, most of the sholas in the high ranges now lie protected in the *Eravikulam National Park*, where a major part of the study was conducted. The other study areas are *Mannavan Shola* (the largest shola forest of the state), *Pullaradi Shola, Pambadam Shola* and several patchy sholas in the Idli mottai region, all situated in the Marayur Forest Range of Munnar Forest Division, Idukki District, Kerala State. In addition to this, a few botanical expeditions were carried out at *Vellarimala Sholas*, situated in the Kozhikode District. Brief details of the study sites including the nearby settlements are tabulated below (also see Plate 3.1).

Table 3.1. Study sites and the nearby settlements

Location		Area (km^2)	Altitude (in m.)	Muthuva Settlements	Other Settlements
1.	**Mannavan Shola**	5.18 **	1600-2400	Kulachivayal and Gudalar	Perumala, Puthur, Kanthallur and Kilandur
2.	**Idli Mottai**	***	2100-2500	Kulachivayal and Gudalar	Chundavurrai Tea Estate, Perumala, Puthur and Kanthallur.
3.	**Eravikulam National Park**	97.0 *	1600-2695	Lakkam, Nooradi, Parappayar, Anakulam and Mankulam	Vaguvarai, Thalayar, Nyamakkad, Pettimudi, Rajamala,Chatta Munnar Kadalar etc. (all are Tea estates)
4.	**Pullaradi Shola**	1.62 **	1600-2200	Gudalar	Puthur and Kanthallur
5.	**Pambadam Shola**	1.30 **	1800-2400	Nil	Top Station, Oorkkad
6.	**Vellari Mala Sholas**	Not known	1500-2240	Nil	Muthappan Puzha

* Total area of the Park out of which only about 26 km^2 is occupied by forests (Menon, 1997).

** As per the notification of the Dewan, Sri. K. Krishna Swamy Rao, Huzur Cutcherry, Trivandrum, 22-10-1908.

*** Part of the Mannavan Shola Reserve.

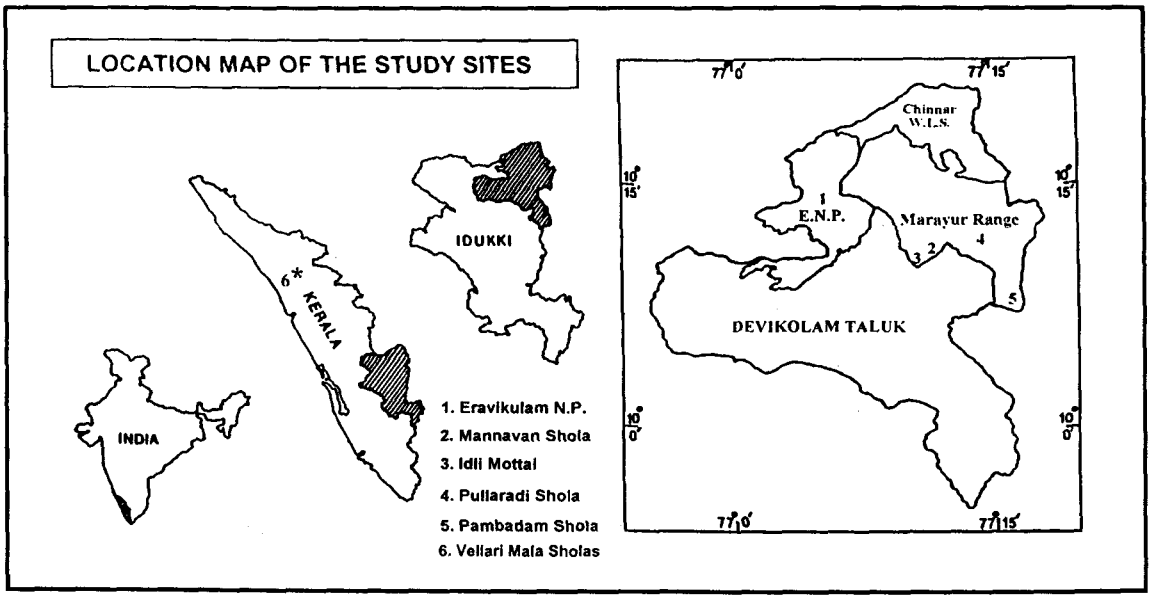


Fig. 3.1. Location map of the six study sites

3.1. MANNAVAN SHOLA

Physiography: The Mannavan Shola forms the largest shola forest patch in the Kerala State, with an approximate size of 5.18 km^2. This forest patch is situated in the Idukki District, falling within the Marayur Forest Range of Munnar Division. The shola is located within 10^0 10' 00" to 10^0 12' 18" N latitude and 77^0 09' 50" to 77^0 12' 18" E longitude. The altitude ranges between 1600-2400 m. The forest is seen as a continuous patch from 1600 upto 2000 m., above which it is seen as small patches (in Idlimottai region) dispersed among the grasslands. Three other major sholas, *Pambadam Shola, Pullaradi Shola* and *Idivara Shola* lie adjacent to the *Mannavan Shola.*

Climate: A weather station was maintained at Perumala, Mannavan Shola and the rainfall and temperature data were gathered for more than a year starting from 1st January 1998. The area receives both South-West and North-East monsoon, the South-West being the prominent one. The average annual rainfall ranges between 2,000-2,500 mm. During 1998, the area received a total rainfall of 2118 mm (Fig. 3.2). A decade's weather data maintained by the P. R. Division of Chundavurrai Tea estate, lying adjacent to Mannavan Shola also indicate that the maximum annual rainfall obtained was 2300 mm (during 1992) while the minimum value obtained was 1467 mm (during 1995). It has to be borne in mind that Mannavan Shola lies just to the east of the

Eravikulam where precipitation is maximum and the rain clouds travelling further east becomes relatively barren which accounts for a lesser rainfall.

The coldest months are December and January when the minimum temperature inside forests falls upto 6° C even at lower elevations. Weather station established near the shola indicated a minimum temperature of 9.4° C during December 1998, while the maximum temperature (in April) never exceeded 30° C (Fig. 3.3). There are 4-5 dry months, spanning between December to March.

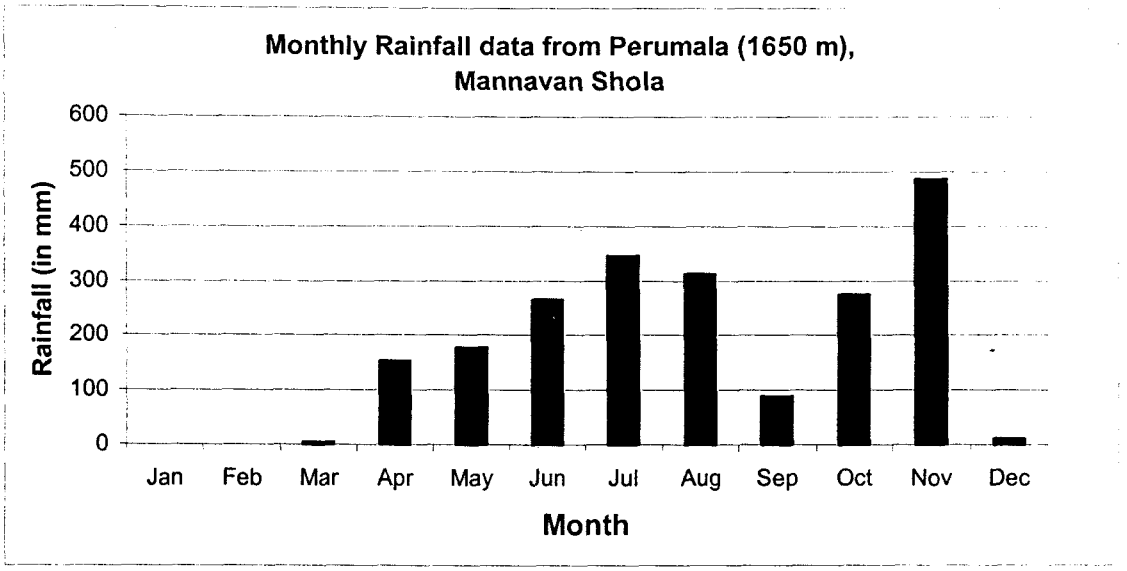


Fig. 3.2. Monthly rainfall data of the year 1998 obtained from Perumala, Mannavan Shola.

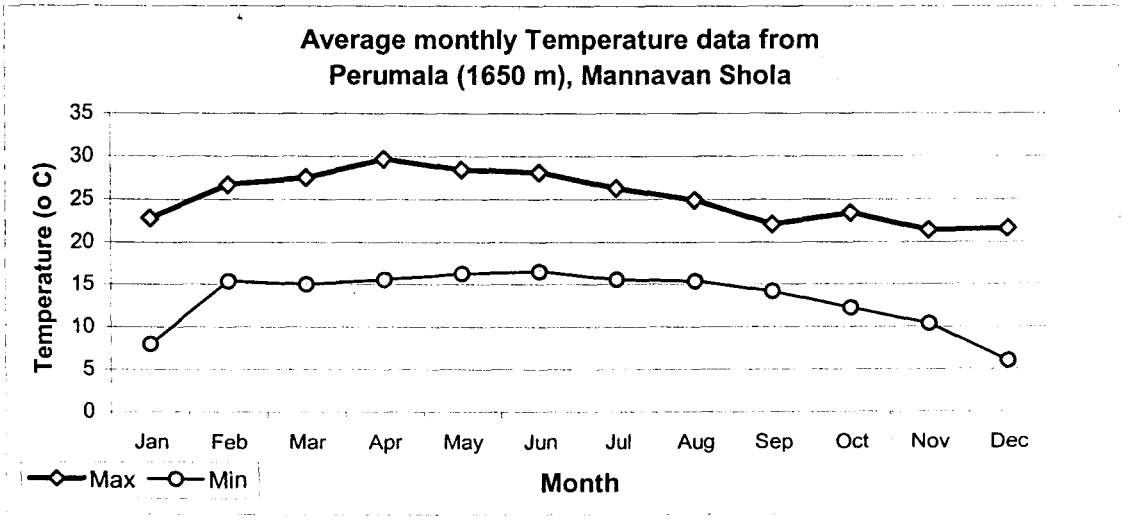


Fig. 3.3. Average monthly temperature data of the year 1998 obtained from Perumala.

Vegetation: The vegetation comprises mostly of *Southern Sub-tropical Hill Forests,* which gradually transform to the *Southern Montane Wet Temperate Forests* (Champion and Seth, 1968) towards the top (Idlimottai regions). At the lower altitude (1600 m) the average height of the forest is 20-25 m (with species such as *Elaeocarpus tuberculatus, Gordonia obtusa, Persea macrantha,* etc), while a maximum height of 28-31 m is observed at 1800-1900 m altitude, contributed by different species of *Syzygium* such as *S. densiflorum, S. gardneri, S. caryophyllatum, S. cumini, Elaeocarpus glandulosus,* etc.

Habitations: There is a Muthuva tribal colony at *'Gudalar'* situated along the north-eastern borders of Mannavan Shola and another at *'Kulachivayal'* situated to the north-western side. Three other colonies namely, Perumala, Puthur and Kanthallur, inhabited mainly by Tamilian people are also situated on the outskirts of the Shola. In total there are about 631 houses in these 7 settlements (*Kanthallur,* 160*; Kanthallur,* 137*; Puthur,* 80*; Perumala,* 120*; Gudalar,* 77*; Kulachivayal,* 57), as per the Kanthallur Panchayath office records, with an average population density of 4.37.

Some areas in the Mannavan Shola were given on lease for establishing housing colonies during 1960s. This is evidenced by remnants of a number of foundations of houses, presence of the planted economic species like pepper, orange, apple, pears, etc., in the Perumala, Kalipettumala and Thalachor Kadavu regions. The habitations were later translocated to other areas by a court order. About seven kilometers of the Kanthalloor - Sethu Parvathipuram (S. P. Puram) road traverses the shola and hence the accessibility is good. The right of way to Devikulam (via. Kanthalloor - Sethu Parvathipuram road), the right of water and the right of cutting small timber for agricultural purposes are the claims admitted to the local people. The local residents of the various colonies are wholly dependent on Mannavan shola for firewood, timber and wood for various agricultural purposes.

3.2. IDLIMOTTAI SHOLAS

Physiography: Idlimottai sholas form the higher reaches of Mannavan Shola itself (2100-2400 m), where shola forests are found as small patches. The tamil term *'Idlimottai'* itself reflects the nature of the terrain (*'Idli'* like *'mottai'*=hills). Most of the grasslands in this region were converted to

Eucalyptus and Wattle plantations. Remnants of Pine plantations are also seen in some areas. A great amount of sholas were destroyed in this region. (Plate 3.2.2 & 3.2.3).

Climate: The climate is almost similar to Mannavan Shola. Since an authentic weather data is not available from the area, the only reliable source of information is that from the P.R. Division of Chundavurrai Tea estate, lying adjacent to Mannavan Shola. The average annual rainfall recorded for about ten years (1990-2000) from the region indicate that it is lesser than 2000 mm. The average minimum temperature during the coldest months (December-January) at Mannavan Shola was recorded as 6^0 C. It is assumed that the minimum temperature in the patchy shola forests at Idlimottai at this time may go 3-5^0 C below than this, while subzero temperatures are reported in the grasslands.

Vegetation: The vegetation comprises of stunted patchy shola forests (*Southern Montane Wet Temperate* Forests of Champion and Seth, 1968), with an average height less than 15 m.

3.3. PULLARADI SHOLA

Physiography: This shola lies east of Mannavan Shola and is a large triangular patch found in a hill valley (Plate 3.2.4). It is situated in the Kottakambur village of the Anjanad Taluk and occupies an area of 1.62 sq. m.

Climate: The climate is almost similar to Mannavan Shola. An authentic weather data is not available from the area. The only reliable source of information is that from the P.R. Division of Chundavurrai Tea estate, lying in between Mannavan Shola and Pullaradi Shola.

Vegetation: The highest altitude is around 1800 m. only and the vegetation consists mostly of *Southern Sub-tropical Hill Forests.*

3.4. PAMBADAM SHOLA

Physiography: This shola lies on the way to Vattavada. A motorable road from Munnar to Kodaikanal traverses through this shola and the Kerala border region is called Vandaravu.

Climate: The only reliable data is from the Chundavurrai Tea Estate situated near to the shola. Analysis of the rainfall data for a decade (1987-1997)

indicates that the average annual rainfall is around 1650 mm. Highest amount of rainfall was recorded during 1996 (2051 mm), while during 1991 only 1334 mm was obtained. The figures obtained from the *'Travancore State Manual'* (1940) also indicate that all the above mentioned sholas (Mannavan, Idlimottai, Pullaradi and Pambadam sholas) come in the rainfall tract of 80-100" (1600-2000 mm) (see Fig. 3.5)

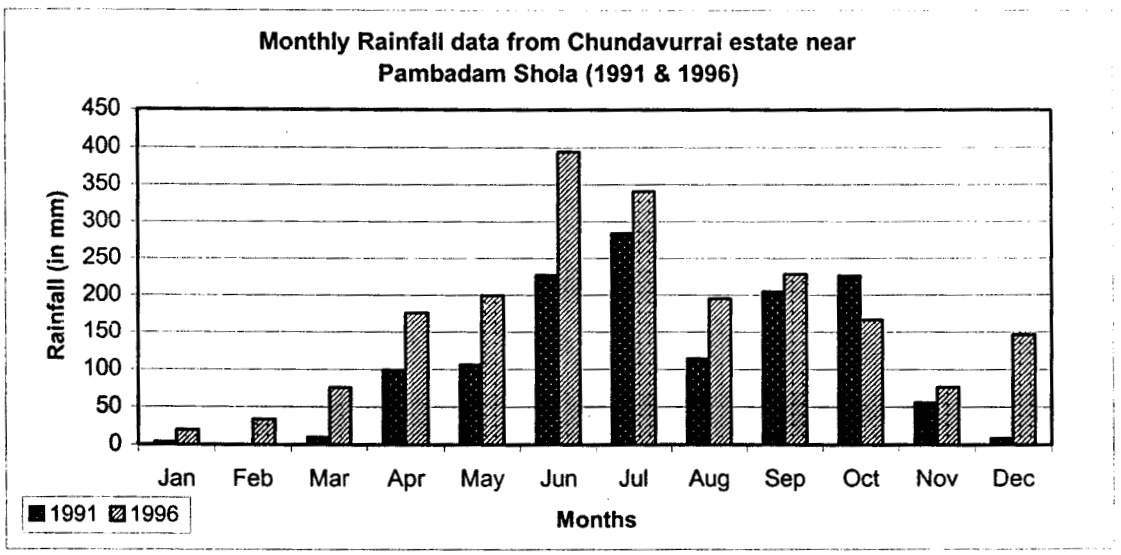


Fig. 3.4. Monthly rainfall data of the years 1991 & 96 from Chundavurrai, Pambadam Shola.

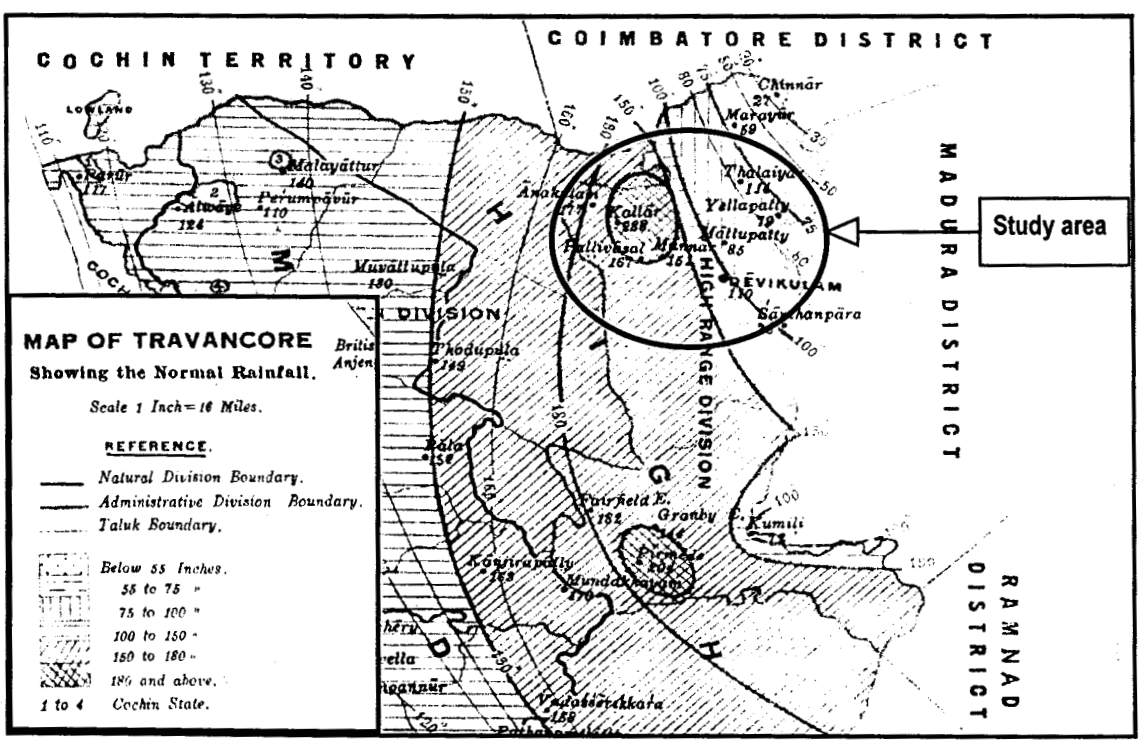


Fig. 3.5. Map of the Travancore region showing the High Range area and rainfall
(Reproduced from: *'The Travancore State Manual'* by T. K. Velu Pillai - 1940)

Vegetation: The vegetation consists mostly of *Southern Sub-tropical Hill Forests,* even though patchy sholas and grasslands are found at higher altitudes (Plate 3.2.5.)

3.5. ERAVIKULAM NATIONAL PARK

Physiography: The Eravikulam National Park is situated at an average elevation of 2,100 m., between the latitudes 10° 05' to 10° 20' N and 77° 00' to 77° 10' E longitudes (Rice, 1984). Peaked by Anamudi (2,695 m), the highest peak South of Himalayas, Eravikulam National Park forms the highest regions of the Western Ghats. On the north, it is bordered by the Anamalai Sanctuary (Tamil Nadu) and south by the Tata Tea Estates and the west by the Malayattur Forest Division and in east by the Chinnar Wildlife Sanctuary and the Munnar Forest Division.

Geology and soil: The rock formations in the region have been dated to the Archean igneous series consisting of gneiss with minerals like silica, feldspars, muscovite, biotite, etc. (*cf.* Karunakaran *et al.*, 1997). The soils are basically loam, acidic and with high contents of organic carbon (often in the form of peat in grasslands) and nitrogen.

Climate: The region receives a very heavy rainfall ranging from 5,200-6000 mm per annum. Figures obtained from the Travancore State Manual indicate that the region lies in the rainfall tract of 100-150 inches (2500-3800 mm), while there are regions obtaining highest rainfalls (288 inches/7320 mm) such as Kallar. The high rainfall swathed with fog and chilly winds make the rainy season very hostile. The elevated position of the Park (average 2,000 m) has a remarkable influence on the atmospheric temperature. The absolute diurnal temperature oscillates between – 3 to 27° C. The mean maximum temperature is found to be 15.3° C, and the mean minimum - 3° C (Rice, 1984). January is the coldest month and May, the warmest.

Vegetation: The Park landscape consists of hundreds of patchy montane forests sandwiched in the vast panoramic expanses of high elevational grasslands. In addition, the park also subtends smaller extent of subtropical hill forests in some portions of the foothills where the elevation is low. A vegetal map of the park is also available (Menon, 1997).

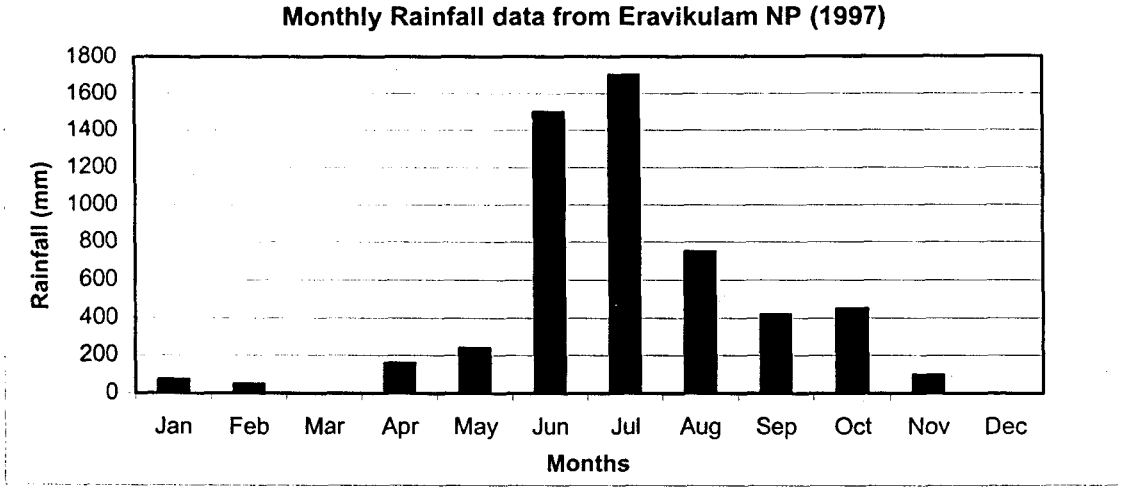


Fig. 3.6. Monthly rainfall data of the year 1997 obtained from Eravikulam National Park

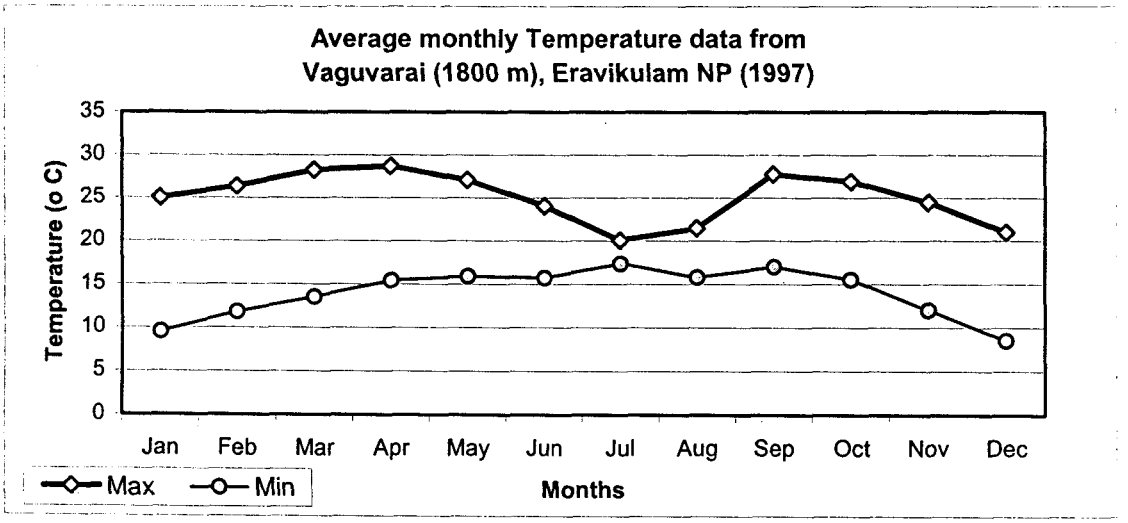


Fig. 3.7. Average monthly temperature data of the year 1997 obtained from Vaguvarai, ENP.

3.6. VELLARI MALA SHOLAS

Physiography: Vellari mala is the second highest peak (2240 m) within the district of Kozhikode and one among the fourteen peaks of elevation above 1800 m on the Western Ghats of Kerala. It is located between 11° 25' 47" - 11° 26' 14" North Latitude and 76° 06' 44" - 76° 07' 26" East Longitude (see Plates 3.1 and 3.2.7). According to Pradeep (1999) who was one of the first explorers in this region, it is the difficult terrain, steep valleys with dripping cliffs, gorgeous waterfall at different places along the treck route and frequent landslides towards the upper hills, which made this hill peak inaccessible and consequently little explored.

Climate: It is a typical tropical montane one. The area receives an annual rainfall of 3500 mm, mainly contributed by the Southwest monsoon. During the hottest months (March-May) the average temperature recorded was about 24^0 C and during the cold season (December-February) it was about 15^0 C. Strong winds start about the beginning of November and end by April.

Vegetation: The high altitude regions comprise of large shola forest patches and grasslands. However at low elevations Subtropical hill forests and Evergreen forests are met with, where the forest is found as a large continuous patches.

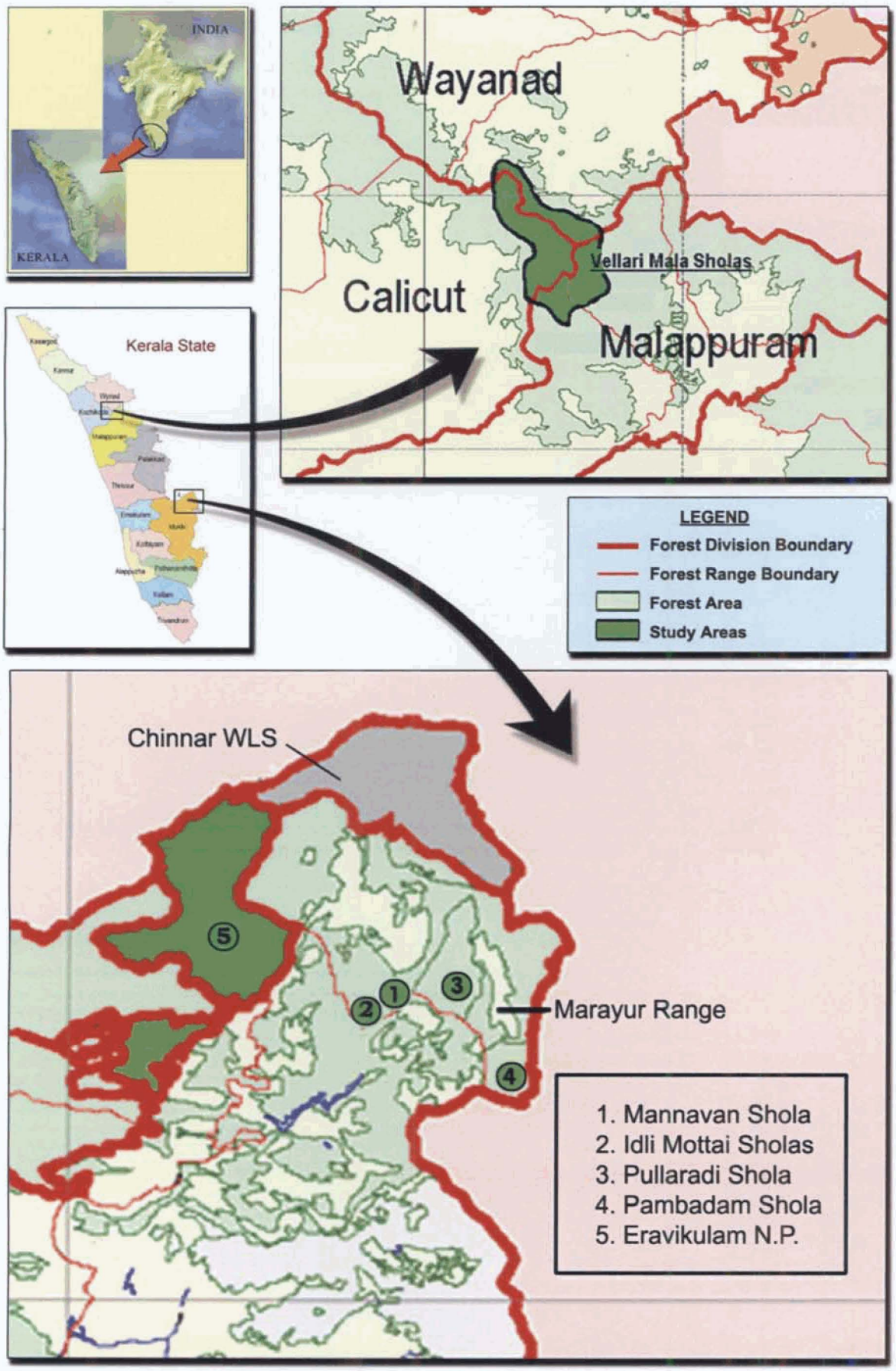

INDIA
KERALA
Kerala State
Wayanad
Vellari Mala Sholas
Calicut
Malappuram
LEGEND
Forest Division Boundary
Forest Range Boundary
Forest Area
Study Areas
Chinnar WLS
Marayur Range
1. Mannavan Shola
2. Idli Mottai Sholas
3. Pullaradi Shola
4. Pambadam Shola
5. Eravikulam N.P.

Plate 3.1



1. Bird's eye view of Mannavan Shola and the neighbouring wattle plantations



2. Idlimottai sholas



3. Wattle plantations at Idlimottai



4. Pullaradi Shola and Gudalar colony



5. Pambadam Shola



6. Eravikulam Sholas



7. Vellarimala Sholas

Plate 3.2

13

31 B

TAXONOMICAL STUDIES

K. Kishore kumar "Taxonomic and ecological studies on the shola forests of Kerala" Thesis. Kerala Forest Research Institute Thrissur, University of Calicut, 2004



TAXONOMICAL STUDIES

"It is ironical to note that the satellite missions are for searching the possible occurrence of extra terrestrial life, when most species of the earth are becoming extinct even before they are properly identified and named"

S. L. Pimm & P. Raven (2000)
(Ecologists)

4. TAXONOMICAL STUDIES

4.1. INTRODUCTION

4.1.1. Taxonomy and its significance in the present age

Probably the first scientific study of plants was an attempt to classify them. Classification, here means identification, naming and grouping of organisms into a formal system based on similarities such as, internal and external anatomy, physiological functions, genetic makeup, or evolutionary history. With an estimated 10 million to 13 million species on earth, the diversity of life is immense. Determining an underlying order in the complex web of life is a difficult undertaking that encompasses advanced scientific methods as well as fundamental philosophical issues about how to view the living world and that is here the role of a taxonomist arises.

Plant taxonomy, one of the basic scientific disciplines was set aside during the middle of the present century, due to the diversion of interests into more advanced vistas of science. With the result, when we went in search for the possible occurrence of extra terrestrial life through various satellite missions, several species on our earth were becoming extinct even before they have been properly identified and named (Pimm and Raven, 2000; Mc Cann, 2000).

It is rather satisfactory to see that due to the world appeal for the conservation of Tropical Forests Biodiversity, Plant taxonomy is now showing signs of resurrection. We know tropical forests are facing great threats from various anthropogenic activities. It is these forests, which harbour more than 70% of living organisms of the whole world. Out of these more than 50,000 plant species are confined as exclusive endemics in 25 areas throughout the tropical forests (Myers *et al.*, 2000). It is shocking to know that these twenty-five '*Hotspots*' which holds 44 percent of vascular plant species and 35 percent of all species in four vertebrate groups, represent only around 1.4 % of the total land area of the world and are under severe threat of habitat destruction. Chatterjee (1995) has estimated that around 7500 species of organisms are becoming extinct every year, including many unknown species and according to IUCN, around 10% of the world floras are facing the danger of extinction.

This is a highly alarming rate and so the important role of taxonomists and conservationists become evident here.

4.1.2. Status of the taxonomy of Shola forests

For most vegetation types in India, pioneering botanical studies emerged out of the amature botanical interests of the foresters. However, the shola forests were largely neglected because: (i) they were considered as of no timber value, (ii). the extent of the shola forests is small and so the study on it too, and (iii). the sholas mostly occupy less accessible and hostile climatic regions. Therefore, it would not be surprising at all to see that the studies on shola forests is few, compared to other vegetal types.

4.2. METHODOLOGY

From 1994 onwards, regular field trips were organized to Mannavan Shola, Idlimottai Sholas, Pullaradi Shola, Pambadam Shola and Eravikulam National Park for collecting plant specimens. A few trips were carried out to Silent Valley (Palakkad) and Vellarimala (Kozhikode) regions. Repeated collections were made for certain tree specimens to get both the flowering and fruiting specimens or the male and female flowers of the plant. Usually 4 specimens of each species were collected from all available habitats to study the range of variation.

Field characters like the height, pattern of branching, colour and nature of bark (inside and outside), presence and colour of latex and other exudates, presence of buttress, odour and colour of vegetative and floral parts wherever applicable, associated species, local names and the uses, etc. were carefully recorded in the field book. Separate collections were made for dioecious plants and when parasites were collected the details of the host plants were also recorded. Special attention was given when the collection of delicate materials like, *Impatiens* spp., were made. Collections were brought to the field stations and herbaria prepared as per standard procedure (Fosberg and Sachet, 1965; Bridson and Forman, 1991). Flowers and fruits of almost all specimens or even the whole plants (if small) were preserved either in Formalin Aceto Alcohol (FAA) or Kew mixture (9 parts of 70 % Ethyl alcohol, ½ part of 40% Formaldehyde and ½ part of Conc. Acetic acid) for further microscopical

studies. Large fruits were dried and poisoned separately to keep the shape unchanged. All the herbarium specimens are deposited in Kerala Forest Research Institute Herbarium (KFRI), Peechi.

The specimens were critically studied and identifications were made initially with the help of the *Flora of the Presidency of Madras* (Gamble, 1915-1936), *Flora of British India* (Hooker, 1872-1897), Fyson's *Flora of the Nilgiri and Pulney Hill-tops* (1915-1921), *Flora of South Indian Hill Stations* (1932), *Flora of Palni Hills* (Matthew, 1999). Illustrations of the species available in Wight's *Icones Plantarum Indiae Orientalis* (1838-1853), both the works of Fyson (1915-21; 1932) and those in *Illustrations of Palni Hills* (Matthew, 1996) and the *Supplementary Illustrations of Palni Hills* (Matthew, 1998) were referred for identification. Available monographs and revisions were also consulted. Several literature on phytogeographical studies and the internet cites of IPNI (www.ipni.org) were also referred to get the world distribution of each species. Specimens were also taken to the Madras Herbarium (MH) at Coimbatore and the Calicut University Herbarium (CALI) for verification and confirmation. Those, which needed further confirmation, were referred to experts in the concerned groups in India and abroad. Apart from those collected during the study period, specimens collected earlier from the study area by others and available at MH, CALI and KFRI were also referred to for the present study.

Since pteridophytes form a major part of the flora of shola forests, systematic collection of the pteridophytes was also done. Most of the plants were collected in full including the rhizomes by uprooting them. For larger plants and tree ferns only the parts necessary for identification such as, fronds including stipes, sporophylls with sporangia, rhizome scales, etc. were collected. Data on the habit, habitat and other ecological details were noted down to facilitate identification. Identification of the specimens was done mainly using pertinent literature such as Beddome (1863-1864, 1865-70, 1876, 1883 and 1892), Manickam (1986, 1989, 1995), Manickam and Ninan (1984), Manickam and Irudayaraj (1992), Nayar and Geevarghese (1993), various monographs, M. Phil. and Ph. D. dissertations and hundreds of other publications on pteridophytes. Doubtful specimens were sent to experts and got confirmed. Details of the species collected, such as the scientific name, local name (if available), family, locality, altitude and collection numbers,

distributional and conservational status, etc. are given as a table (Appendix 1). Ethnobotanically important species and endemics are denoted with an 'asterisk' (*) mark.

Format of the Flora

In this work the Angiosperm families are arranged according to the classification of Bentham and Hooker (1862-1883) with necessary modifications according to Hutchinson (1926, 1934, 1959 and 1973) and in accordance with the ICBN, 2000. Keys for identification of genera under each family and that for the species under each genus are given in respective places. The genera under each family are arranged in alphabetical sequence. Full name of the authors and citation of the original publication of the generic name are also given. Dichotomous bracketed type keys for identification of species and infraspecific taxa, if any, are also provided.

The species under genera are also arranged in alphabetic order. The correct name of the species is given in bold letters followed by the author citation and full reference of the original publication. Basionyms, important synonyms and citation of the names included in the important national and regional floras are also given. The floras cited are: *Flora of British India* (Hooker, 1872-1897), *Flora of the Presidency of Madras* (Gamble, 1915-1936), *Flora of South Indian Hill Stations* (Fyson, 1932), *Flora of Palni Hills* (Matthew, 1999) and the *Flora of India* series published by the Botanical Survey of India till date (Vols. 1, 2, 3, 4, 5, 12 and 13). Synonyms relevant to the above mentioned floras only are given in italics. All the relevant monographs and revision works are also cited. The local names used by the Muthuva tribesmen are given in bold italics and those of the natives are given as bold non-italics at the end of the nomenclature citations. Ethnobotanically important species are denoted as (EBIS) given after the local name. The number of the illustrations or plates, if any, is given next. This is followed by a brief description of the species highlighting the most striking features. The characters already given in the identification keys are not given under the species description which is in following sequence: 'Habit; branchlets; leaves; inflorescence; flowers; calyx; corolla; stamens; ovary; fruit and seed'. The flowering (*Fl.*) and fruiting (*Fr.*) periods are given after the species description. The geographical distribution,

the status of the species in relation to the conservation point of view, the abundance in the study area indicating the type of vegetation and name of the locality followed by the name of the collector(s) and collection number(s) are given in a single separate paragraph. Taxonomic and/or nomenclatural notes and conservation or distribution aspects, new records if any, are also given at the end of the above details of each species. Enumeration of the pteridophytes is restricted to a table given as Appendix 1, with pertinent information regarding various species.

Abbreviations used in the flora part of the thesis

BBSI	-	Bulletin of the Botanical Society of India
CALI	-	Calicut University Herbarium
FBI	-	Flora of British India
FNPHT	-	Flora of Nilgiri and Palni Hill Tops
FPH	-	Flora of Palni Hills
FPM	-	Flora of the Presidency of Madras
FSIHS	-	Flora of South Indian Hill Stations
JETB	-	Journal of Economic and Taxonomic Botany
JBNHS	-	Journal of Bombay Natural History Society
KFRI	-	Kerala Forest Research Institute Herbarium
ca.	-	about
diam.	-	diameter
Distr.	-	distribution
Fl.	-	flowering
Fr.	-	fruiting
KKK	-	K. Kishore Kumar
MS	-	Mannavan Shola
ENP	-	Eravikulam National Park
PUS	-	Pullaradi Shola
PAS	-	Pambadam Shola
VMS	-	Vellari Mala Sholas
K-3, K-5.5, etc.	-	Kanthallur-3 km, Kanthallur-5.5 km, etc.
T. K.	-	Thalachor Kadavu

4.3. TAXONOMIC TREATMENT

I. ANGIOSPERMS

DICOTYLEDONS

1. RANUNCULACEAE

1. Climbing shrubs; leaves opposite ..... **Clematis**
1. Erect or trailing herbs; leaves radical or alternate **2**
2. Petals and sepals present ..... **Ranunculus**
2. Petals absent; sepals often petalloid **3**
3. Flowers 2.5-3 cm across, bracts involucrate ..... **Anemone**
3. Flowers 0.7 cm across, not involucrate ..... **Thalictrum**

ANEMONE Linnaeus

Sp. Pl. 538. 1753.

Anemone rivularis Buch.- Ham. *ex* DC., Syst. 1: 211. 1817; Hook. f., FBI 1: 9. 1872; Dunn in Gamble, FPM 4. 1915; Fyson, FSIHS 5. t. 2. 1932; Rau in Sharma *et al.*, Fl. Ind. 1: 35. 1993; Matthew, Ill. FPH t. 1. 1996 & FPH 2. 1999. *A. wightiana* Wall. *ex* Wight & Arn., Prodr. 3. 1834; Ic. t. 936. 1845.

Tufted herbs. Leaves radical, to 10-12 cm wide; leaflets 3-5. Flowers solitary, 2.5-3 cm across; sepals petalloid, usually 5 or more, to 12 x 7 mm, obovate, golden yellow; stamens many; pistils many, styles hooked. Achenes ovoid, evenly pitted, compressed.

Fl. & Fr.: June-July.

Distr.: India, Sri Lanka, Myanmar and China. Rare along shola ecotones and scrublands at higher altitudes. MS, Gudalar road, *KKK 18565.*

Note: The present collection is a new record to Kerala. From South India, so far reported from Tamil Nadu only (Sharma *et al.*, 1993).

CLEMATIS Linnaeus

Sp. Pl. 543. 1753.

1. Leaves 1 foliolate ..... **C. smilacifolia**
1. Leaves 3-7 foliolate **2**
2. Leaves 3 foliolate ..... **C. munroiana**
2. Leaves 7 foliolate ..... **C. wightiana**

Clematis munroiana Wight, Ill. Indian Bot. 1: 5, t. 1. 1831; Dunn in Gamble, FPM 3. 1915; Fyson, FSIHS 3. 1932; Rau in Sharma *et al.*, Fl. Ind. 1: 71. 1993; Matthew, Ill. FPH t. 2. 1996 & FPH 4. 1999. *Clematis. smilacifolia* Hook. f. & Thoms. in Hook. f., FBI 1: 3. 1872, p.p, non Wall., 1820.

Stems glabrous. Leaflets to 10 x 4 cm, ovate or ovate-lanceolate. Inflorescence 1-6 flowered. Flowers nodding, 4 cm across, sepals spreading, 25 x 6 mm, velvety

tomentose and purple coloured with whitish margins on outside. Achenes ovate, compressed, hairy with *ca.* 6 cm long feathery tails.

Fl. & Fr.: September–January

Distr.: Endemic to Southern Western Ghats. Rare, found in interior forest regions at medium altitudes. MS, K-6, *KKK 18507*; K-6, *KKK 18118.*

Clematis smilacifolia Wall., Asiat. Res. 13: 402. 1820; Hook. f. & Thoms. in Hook. f., FBI 1: 3. 1872; Dunn in Gamble, FPM 3.1915; Rau in Sharma *et al.*, Fl. Ind. 1: 75. 1993. *C. loureiriana* Merr., Trans. Amer. Phil. Soc. 24: 154. 1935. p.p., non DC.

Stems glabrous. Leaves to 10 x 5 cm, ovate-acuminate, base cordate, chartaceous, purplish beneath; petiole twining. Cymes 3-few flowered, trichotomous. Flowers 3.5 cm across, creamy-white; sepals ovate. Achenes to 11 x 5 mm, with *ca.* 7 cm long feathery tails.

Fl. & Fr.: September-December

Distr.: India. Rare, found in shola interiors at medium altitudes. MS, K-5, *KKK 18098.*

Note: The present collection is a new record to Kerala.

Clematis wightiana Wall. *ex* Wight & Arn., Prodr. 2. 1834; Wight Ic. t. 935. 1845; Hook. f. & Thoms., FBI 1: 5. 1834; Dunn in Gamble, FPM 3. 1915; Fyson, FSIHS 3, t. 1. 1932; Rau in Sharma *et al.*, Fl. Ind. 1: 80. 1993.

Stems pubescent. Leaves to 20 x 16 cm; leaflets to 7 x 5 cm, ovate or ovate-lanceolate. Inflorescence few flowered. Flowers nodding, sepals spreading, velvety tomentose, glabrous inside; staminal filaments linear, to 10 mm long. Fruit not seen.

Fl.: December-January

Distr.: Endemic to Western Ghats. Very rare, found along shola borders at lower altitudes. MS, K-3, *KKK 18126.*

RANUNCULUS Linnaeus

Sp. Pl. 548. 1753.

1. Erect perennial herbs; leaves deeply divided; achenes compressed ..... **R. wallichianus**
1. Trailing perennial herbs; leaves entire; achenes not compressed ..... **R. reniformis**

Ranunculus reniformis Wall. *ex* Wight & Arn., Prodr. 3. 1834; Wight, Ic. t. 75. 1838; Hook. f. & Thoms. in Hook. f., FBI 1: 16. 1872; Dunn in Gamble, FPM 5. 1915; Fyson, FSIHS 7. t. 4. 1932; Rau in Sharma *et al.*, Fl. Ind. 1: 126. 1993; Matthew, Ill. FPH t. 5. 1996 & FPH 9. 1999. *R. peninsularis* Sald., Fl. Karnataka 1: 91. 1984.

Radical leaves to 5 x 7 cm, ovate, base truncate or cordate, coarsely crenate; cauline leaves ovate-elliptic or elliptic-lanceolate. Flowers 2 cm across; sepals to 7 x 5 mm, ovate, emarginate; petals 8-9, lobes 9 x 6 mm, obovate. Achenes in globose head.

Fl. & Fr.: June-August

Distr.: Endemic to Western Ghats. Rare, found along shola ecotones and grasslands at higher altitudes. MS, Idlimottai, *KKK 16437*; *KKK 16604*; *KKK 18186.* PAS, Vandaravu, *KKK 18595.*

Note: The specimen (*KKK 18595*), with larger leaves (6 x 12 cm; petioles 20 cm) is likely to be a polyploid form.

Ranunculus wallichianus Wight & Arn., Prodr. 4. 1834; Wight, Ic. t. 937. 1845; Hook. f. & Thoms. in Hook. f., FBI 1: 20. 1872; Dunn in Gamble, FPM 5. 1915; Fyson, FSIHS 8. t. 6. 1932; Rau in Sharma *et al.*, Fl. Ind. 1: 131. 1993; Matthew, Ill. FPH t. 6. 1996 & FPH 9. 1999.

Radical leaves 3-partite, dissected, 5-8 cm across, margins crenate or deeply incised; cauline leaves stalked, 3-lobed; flowering scapes 7-9 cm. Flowers 1 cm across; sepals 5 x 3 mm, elliptic, reflexed. Petals 7 x 4 mm, elliptic. Achenes rounded, tubercled with an incurved beak.

Fl. & Fr.: June-August

Distr.: Endemic to Western Ghats. Common, along shola borders and roadsides at medium altitudes. MS, K-3.5, *KKK 16502*; K-5, *KKK 16411.*

THALICTRUM Linnaeus

Sp. Pl. 545. 1753.

Thalictrum javanicum Blume, Bijdr. 2. 1825; Hook. f. & Thoms. in Hook. f., FBI 1: 13. 1872; Dunn in Gamble, FPM 4. 1915; Fyson, FSIHS 6. t. 3. 1932; Rau in Sharma *et al.*, Fl. Ind. 1: 136. 1993; Matthew, Ill. FPH t. 7. 1996 & FPH 10. 1999. *T. glyphocarpum* Wight & Arn., Prodr. 2. 1834; Wight, Ic. t. 48. 1838.

Perennial herbs, to 50 cm higher. Leaves ternately decompound, leaflets 5-9, 1.5 x 2 cm, obovate, base rounded, margins crenate. Flowers 7 mm across, in terminal panicled cymes; sepals 4, ovate, obtuse, white; stamens many. Achenes few, 3-6 mm long, 9-ribbed, sessile, ellipsoid, with hooked style.

Fl. & Fr.: August-October

Distr.: Peninsular India, Sri Lanka, Himalaya, Tibet, China and Java. Rare; found along shola margins at higher altitudes. MS, Idlimottai, *KKK 18170.*

Note: The present collection is a new record to Kerala.

2. MAGNOLIACEAE

MICHELIA Linnaeus

Sp. Pl. 536. 1753.

Michelia nilagirica Zenk., Pl. Ind. 21. t.20. 1835; Wight, Ic. t. 938. 1845; Hook. f. & Thoms. in FBI 1: 44. 1872; Dunn in Gamble FPM 9. 1915; Fyson, FSIHS 10. t. 8. 1932; Raju in Sharma *et al.*, Fl. Ind. 1: 179. 1993; Matthew, Ill. FPH t. 11. 1996 & FPH 15. 1999; *M. pulneyensis* Wight, Ill. t. 14. 1840; *M. ovalifolia* Wight, Ill. t. 13. 1840. **Chembakam.**

Small trees. Leaves to 11 x 5 cm, elliptic, coriaceous; stipules spathaceous. Flowers yellowish-white; sepals and petals alike, 10-12, to 5 x 1.5 cm, oblanceolate; stamens crowded at the base of gynophore; gynoecium stipitate, 2 x 1 cm. Fruit a 4-6 cm long dense spike of coriaceous carpels.

Fl. & Fr.: October-February

Distr.: Endemic to Western Ghats. Rare; found along stream sides at higher altitudes only. ENP, Umayamala, *KKK 17529*; V-point, *KKK 18009.*

Note: New record to Kerala. From South India, so far reported from Karnataka and Tamil Nadu only (Sharma *et al.*, 1993).

3. MENISPERMACEAE

1. Erect shrubs; leaves cuneate at base, not peltate ..... **Cocculus**
1. Slender climbers; leaves truncate at base, peltate ..... **Stephania**

COCCULUS A. P. de Candolle

Syst. Nat. 1: 515. 1817.

Cocculus laurifolius DC., Syst. Nat. 1: 530. 1817; Hook. f. & Thoms. in Hook. f., FBI 1: 101. 1872; Gamble, FPM 29. 1915; Pramanik & Gangop. in Sharma *et al.*, Fl. Ind. 1: 319. 1993. **Marpingi, *Aadukolli* (EBIS).**

Leaves to 11 x 5 cm, elliptic, stiffly chartaceous, 3-ribbed. Flowers yellow, in axillary branched cymes; sepals 4, 1.2 x 1 mm, ovate; petals 4, 2 x 1.5 mm, broadly ovate, emarginate at apex; stamens 6 in male flowers, free; staminodes present; carpels 3, free. Drupes 5 mm across, globose, glabrous.

Fl. & Fr.: December-June

Distr.: Indo-Malesia and East Asia. Common in disturbed and exposed regions at lower altitudes. MS, Thalachorkadavu, *KKK 16036.*

Note: New record to Kerala. From South India, so far reported from Karnataka and Tamil Nadu only (Sharma *et al.*, 1993).

STEPHANIA Loureiro

Fl. Cochinch. 608. 1790.

Stephania japonica (Thunb.) Miers, Ann. Mag. Nat. Hist. ser.3, 13: 14. 1866; Dunn in Gamble, FPM 29. 1915; Fyson, FSIHS 13. t. 9. 1932; Pramanik & Gangop. in Sharma *et al.*, Fl. Ind. 1: 335. 1993; Matthew, FPH 27. 1999. *Menispermum japonicum* Thunb., Fl. Japan 193. 1784. *Cissampelos hernandifolia* Willd., Sp. Pl. 4: 861. 1806. *Stephania hernandifolia* (Willd.) Walp., Rep. Bot. Syst. 1: 96. 1842; *sensu* Hook. f. & Thoms. in Hook. f., FBI 1: 103. 1872, *p.p.*, non Walp., 1842. *Cyclea hernandifolia* (Willd.) Wight & Arn., Prodr. 14. 1834; Wight, Ic. t. 939. 1845. **Pasi chedi.**

Leaves to 9 x 7 cm, ovate to ovate-triangular, chartaceous. Cymes umbellate; male flowers greenish yellow; sepals 6-8 in 2 whorls; petals 3-5, free; stamens 6-8, synandrous; female flowers yellow, carpels solitary. Drupes orange, subglobose, transversely ridged and grooved. Seeds reniform.

Fl. & Fr.: July-October

Distr.: Indo-Malesia and East Asia. Common along shola borders at lower altitudes. MS, Thalachorkadavu, *KKK* 16752; K-3, *KKK 16652*; K-4, *KKK 16503.*

4. BERBERIDACEAE

1. Leaves simple, entire ..... **Berberis**
1. Leaves pinnate, spinous serrate ..... **Mahonia**

BERBERIS Linnaeus

Sp. Pl. 330. 1753.

Berberis tinctoria Lesch., Mem. Mus. Paris 9: 306. 1822; Dunn in Gamble, FPM 32. 1915; Fyson, FSIHS 15. t. 10. 1932; Rao & Naithani in Sharma *et al.*, Fl. Ind. 1: 386.

1993; Rao *et al.* 8(1): 11. 1998; Matthew, Ill. FPH t. 14. 1996 & FPH 29. 1999. **Kozhikkal Mullu. Plate. 4.1.1.**

Bushy shrubs, 2 m tall; stem spiny; spines 3-fid, 1-1.5 cm long. Leaves to 5.5. x 2 cm, obovate, base cuneate, apex obtuse, mucronate. Racemes 8-12 flowered; sepals 3 whorled; petals yellow, 6 x 4 mm, obovate, clawed with glands at the base; stamens 6. Berries 10 x 5 mm, elliptic-oblong, pinkish blue.

Fl. & Fr.: February-June

Distr.: India, Afghanistan and Bhutan. Rare along shola borders at lower altitudes. MS, Perumala, *KKK 18142*; Perumala, *KKK 18511*; Puthur, *KKK 16198.*

Note: New record to Kerala. From South India, so far reported from the Nilgiris of Tamil Nadu only (Sharma *et al.*, 1993; Rau *et al.*, 1998).

MAHONIA Nuttall

Gen. 1: 211. 1918. *nom. cons.*

Mahonia leschenaultii (Wall. *ex* Wight & Arn.) Takeda *ex* Gamble, Dunn in Gamble, FPM 32. 1915; Fyson, FSIHS 16. t. 11. 1932; Guha in Sharma *et al.*, Fl. Ind. 1: 410. 1993; Matthew, Suppl. Ill. FPH t. 955. 1998 & FPH 30. 1999. *Berberis leschenaultii* Wall. *ex* Wight & Arn., Prodr. Fl. Ind. Orient. 1: 16. 1834; Wight, Ic. t. 940. 1845. *B. nepalensis* Spreng. in L., Syst. Veg. (ed.16) 2: 120. 1825, var. *leschenaultii* (Wall. *ex* Wight & Arn.) Hook. f. & Thoms. in Hook. f., FBI 1: 109. 1872. **Manjanathi (EBIS).**

Shrubs to small trees. Leaves crowded at apex, 30-40 cm long; leaflets to 9 x 5 cm, obliquely ovate, base rounded, apex acuminate, margins spinous serrate, recurved. Flowers yellow, in a bunch of racemes; sepals 2-whorled; petals 6, 6 x 3 mm, elliptic, emarginate; stamens 6; stigma peltate. Berries 7 mm across, globose, purple.

Fl. & Fr.: February-March

Distr.: Endemic to Southern Western Ghats. Common along shola borders at higher altitudes. MS, Methappu, *KKK 16005.* ENP, Amarachola, *KKK 17511.*

Note: New record to Kerala. From South India, so far reported from the Nilgiris of Tamil Nadu only (Sharma *et al.*, 1993).

5. BRASSICACEAE

1. Pods linear and dehiscent ..... **Cardamine**
1. Pods globular and indehiscent ..... **Coronopus**

CARDAMINE Linnaeus

Sp. Pl. 654. 1753.

1. Perennial herbs; branches decumbent; leaves trifoliolate ..... **C. africana**
1. Annual herbs; branches procumbent; leaves 5 to more foliolate ..... **C. hirsuta**

Cardamine africana L., Sp. Pl. 655. 1753; Hook. f. & T. Anders. in Hook. f., FBI 1: 137. 1872; Dunn in Gamble, FPM 38. 1915; Fyson, FSIHS 21. t. 12. 1932; Henry & Janarthanam in Sharma & Balakr., Fl. Ind. 2: 109. 1993; Matthew, Ill. FPH t. 20. 1996 & FPH 39. 1999. *C. borbonica* Pers., Syn. 2: 195. 1806; Wight, Ic. t. 941. 1845.

Plants to 30 cm higher. Leaflets to 5 x 2.5 cm, lyrate; petiole 5-10 cm long. Flowers 8 mm across; sepals linear; petals 5 x 1 mm, clawed; stamens 6, tetradynamous. Siliqua 4 x 0.2 cm; seeds 2 x 1 mm, elliptic, brownish black.

Fl. & Fr.: Throughout the year

Distr.: Asia, Malesia, Africa, Americ*a*. Common in exposed regions at medium altitudes. MS, K-5, *KKK 16164*; K-4, *KKK 16508*.

Note: New record to Kerala. From South India, so far reported from Karnataka and Tamil Nadu only (Sharma & Balakrishnan, 1993).

Cardamine hirsuta L., Sp. Pl. 655. 1753; Hook. f. & T. Anders. in Hook. f., FBI 1: 138. 1872; Dunn in Gamble, FPM 38. 1915; Fyson, FSIHS 22. t. 13. 1932; Henry & Janarthanam in Sharma & Balakr., Fl. Ind. 2: 112. 1993; Matthew, Ill. FPH t. 10. 1996 & FPH 40. 1999.

Plants to 25 cm higher. Leaves to 4 cm long; leaflets orbicular, deeply crenate, lyrate. Flowers 5 mm across; sepals 4, 3 x 1 mm, oblong; petals 4, as long as the sepals; stamens 4. Siliqua 2 x 0.15 cm, flat; seeds 7-8, 1.5 x 1 mm, oblong, smooth, brown.

Fl. & Fr.: December-January

Distr.: Cosmopolitan. Occasional in forest ecotones or in other exposed regions at medium altitudes. ENP, Nilagiri Teri, *KKK 18063*.

Note: New record to Kerala. From South India, so far reported from Tamil Nadu only (Sharma & Balakrishnan, 1993).

CORONOPUS Zinn

Cat. Pl. Gott. 325. 1757.

Coronopus didymus (L.) Smith, Fl. Britain 2: 691. 1800; Fyson, FSIHS 24. 1932; Henry & Janarthanam in Sharma & Balakr., Fl. Ind. 2: 192. 1993; Matthew, FPH 41. 1999. *Lepidium didymum* L., Mant. Pl. 92. 1767 (Syst. Nat. 2: 433. 1759). *Senebiera didyma* (L.) Pers. Syn. 2: 185. 1800; Dunn in Gamble, FPM 39. 1915.

Procumbent herbs to 35 cm long. Leaves 2-6 cm long, deeply lobed; lobes 1 mm broad, oblong. Flowers white in terminal or axillary racemes; sepals 4, orbicular; petals absent; stamens 2; ovary 2-celled. Capsules 1.2 x 2 mm; seeds oblong, pitted and mucilaginous when wet.

Fl. & Fr.: September-December

Distr.: Probably native of South America, but wide spread; a cosmopolitan weed of cultivation. Occasionally found in exposed areas at lower altitudes. MS, Pallang mala, *KKK 16695*.

Note: The present collection is a new record to Kerala.

6. VIOLACEAE

VIOLA Linnaeus

Sp. Pl. 833. 1753.

1. Erect herbs; leaves triangular-lanceolate, not deeply cordate.....**V. betonicifolia**
1. Prostrate herbs; leaves ovate, deeply cordate, sinuate; caulescent herbs.....**V. pilosa**

Viola betonicifolia Smith in Rees, Cyclop. 37 (1): n. 7. 1817, subsp. **nepalensis** (Ging.) Becker in Engl., Bot. Jahrb. 54: Beibl. 120, 166. 1917; Banerjee & Pramanik in Sharma & Balakr., Fl. Ind. 2: 355. 1993. *V. patrinii* var. *nepalensis* Ging. in DC. Prodr. 1: 293. 1824. *V. patrinii* auct. non Ging. 1824; Hook. f. & Thoms. in Hook. f., FBI 1: 183. 1872; Dunn in Gamble, FPM 48. 1915; Fyson, FSIHS 26. t. 16. 1932. *V. walkeri* Wight, Ill. 1: 42. t. 18. 1838.

Leaves to 5 x 1.5 cm, base decurrent to the petiole, tip acute, shallowly serrate, pubescent. Flowers white with violet streaks; sepals 4 mm long, lanceolate; petals spreading, lower petal pouched at base; anthers connate; ovary 2.5 mm. Capsule straight; seeds globose.

Fl. & Fr.: May- June

Distr.: India, Sri Lanka, Bangladesh, China, Japan to Australia. Occasionally found along shola borders and grasslands at higher altitudes. MS, Idlimottai, *KKK 18178.*

Viola pilosa Blume, Cat. Gew. Buitenz. 57. 1823; Banerjee & Pramanik in Sharma & Balakr., Fl. Ind. 2: 371. 1993; Matthew, Ill. FPH t. 30. 1996 & FPH 56. 1999. *V. serpens* Wall. *ex* Ging. in DC., Prodr. 1: 296. 1824; Hook. f. & Thoms. in Hook. f., FBI 1: 184. 1872; Dunn in Gamble, FPM 48. 1915; Fyson, FSIHS 27. t. 17. 1932. *V. wightiana* Wall. *ex* Wight, Ic. t. 943. 1845.

Leaves to 6 x 5 cm, pubescent; petiole 3-18 cm. Flowers lilac with violet streaks; sepals 6 x 2 mm, ovate-lanceolate; petals oblong-obovate, lower petal 13 x 3 mm; ovary 1 celled. Capsule 5 x 4 mm, globose; seeds ovoid, black.

Fl. & Fr.: January-May

Distr.: Indo-Malesia and China. Common along shola borders, roadsides and ecotones at medium and higher altitudes. MS, K-3, *KKK 16120*; K-9, *KKK 17502*; Idlimottai, *KKK 18184.*

7. FLACOURTIACEAE

1. Trees armed with spines ..... **Scolopia**
1. Unarmed trees **2**
2. Flowers unisexual; petals present, fruit a globose berry ..... **Hydnocarpus**
2. Flowers bisexual; petals absent; fruit an ellipsoid or oblong capsule ..... **Casearia**

CASEARIA N. J. Jacquin

Enum. Pl. Carib. 4: 21. 1760.

1. Leaves obovate, coriaceous; stamens 10; capsule ellipsoid ..... **C. thwaitesii**
1. Leaves elliptic-oblong, sub-coriaceous; stamens 5; capsule oblong ..... **C. zeylanica**

Casearia thwaitesii Briq., Ann. Cons. Jard. Bot. Geneve 62. 1898; Mitra in Sharma & Balakr., Fl. Ind. 2: 397. 1993; Matthew, Ill. FPH t. 33. 1996 & FPH 61. 1999. *C. coriacea* sensu Thw., Enum. Pl. Zeyl. 20. 1858, non Vent. 1803; Clarke in Hook. f., FBI 2: 592. 1879; Dunn in Gamble, FPM 521. 1915; Fyson, FSIHS 238. 1932.

Small trees. Leaves 8 x 5 cm, base cuneate, apex rounded or emarginate. Flowers greenish yellow, 6-9 per cluster; sepals orbicular, recurved; anthers triangular; staminodes oblong, apex hairy; ovary 1.5 mm long. Capsule 1.3 x 0.8 cm, 2 valved, bright yellow, smooth when dry.

Distr.: Peninsular India and Sri Lanka. Common at higher altitudes. ENP, Umayamala, *KKK 17538*. PUS, *KKK 18567*.

Note: New record to Kerala. From Peninsular India, so far reported from Nilgiris & Palni hills of Tamil Nadu only (Mukherjee, 1972; Sharma & Balakrishnan, 1993).

Casearia zeylanica (Gaertn.) Thw., Enum. Pl. Zeyl. 19. 1858; Mitra in Sharma & Balakr., Fl. Ind. 2: 399. 1993; Matthew, Ill. FPH t. 34. 1996 & FPH 61. 1999. *Vareca zeylanica* Gaertn., Fruct. 290, t. 60. 1788. *Casearia esculenta* Roxb., Fl. Ind. 2: 422. 1832; Clarke in Hook. f., FBI 2: 592. 1879 p.p.; Dunn in Gamble, FPM 521. 1919.

Small trees. Leaves 9 x 4 cm, base cuneate, apex acute, acuminate or rounded. Flowers greenish white to yellowish; sepals 3 mm across, ovate; staminodes unequal, oblong. Capsule 1.8 x 0.8 cm, orange coloured, ribbed when dry.

Fl. & Fr.: June-August

Distr.: India, Nepal, Burma and Sri Lanka. Common at medium altitudes. PUS, *KKK 18580*.

HYDNOCARPUS Gaertner

Fruct. 1: 288, t. 60, f. 3. 1788

Hydnocarpus alpina Wight, Ic. t. 942. 1845; Hook. f. & Thoms. in Hook. f., FBI 1: 197. 1872; Dunn in Gamble, FPM 52. 1915; Fyson, FSIHS 29. t. 19. 1932; Mitra in Sharma & Balakr., Fl. Ind. 2: 418. 1993. **Vila Maram, Marotti, *Vilan* (EBIS). Plate 4.1.2.**

Large trees with zigzag branches. Leaves to 18 x 5 cm, ovate-lanceolate or elliptic-lanceolate, base obtuse, apex acuminate, young leaves brilliant red. Flowers in short axillary spikes; sepals ovate; petals 5, white, 18 x 3 mm, linear, margins folded, fimbriate; stamens 5; ovary globose. Berry 6 cm across, rind hard, coriaceous.

Fl. & Fr.: January-May

Distr.: Endemic to Peninsular India and Sri Lanka. Common; usually found below 1900 m only. MS, Puthur, *KKK 16078*.

SCOLOPIA Schreber

Gen. 1: 335. 1789.

Scolopia crenata (Wight) Clos, Ann. Sci. Nat. Bot. 4, 8: 250. 1857; Hook. f. & Thoms. in Hook. f., FBI 1: 191. 1872; Dunn in Gamble, FPM 52. 1915; Fyson, FSIHS 28. t. 18. 1932; Mitra in Sharma & Balakr., Fl. Ind. 2: 430. 1993; Matthew, FPH 64. 1999. *Phoberos crenatus* Wight in Wight & Arn., Prodr. 29. 1834. **Mullu Kara, Karim Kara (EBIS). Plate 5.3.7.**

Leaves alternate, to 15 x 6 cm, elliptic, base cuneate, apex acuminate, margins crenate, subcoriaceous, glossy. Panicles terminal, to 8 cm, dense; flowers bisexual, 1.5

cm across; sepals 5, oblong, ciliate; petals 5, white, ovate, ciliate; stamens many; ovary globose. Berry 1.5 cm across, globose.

Fl. & Fr.: March-July

Distr.: Endemic to Southern Western Ghats. Common at lower and medium altitudes only. MS, K-4, *KKK 31053.*

8. PITTOSPORACEAE

PITTOSPORUM Banks *ex* Solander

in Gaertner, Fruct. 1: 286, t. 59. 1788.

1. Racemes umbellate, glabrous, < 8 flowered; capsule ovoid ..... **P. neilgherrense**
1. Racemes corymbose, tomentose, > 20 flowered; capsule globose ..... **P. tetraspermum**

Pittosporum neilgherrense Wight & Arn., Prodr. 154. 1834; Hook. f. & Thoms. in Hook. f., FBI 1: 198. 1872, "*nilghirensis*"; Dunn in Gamble, FPM 55. 1915; Fyson, FSIHS 31. 1932; Nayar & Giri, Fl. Ind. Fasc. 6: 9. 1980 & in Sharma & Balakr., Fl. Ind. 2: 446. 1993; Matthew, Ill. FPH t. 37. 1996 & FPH 66. 1999. **Plate. 4.1.3.**

Small trees with umbelled branches. Leaves to 10 x 3.5 cm, elliptic-lanceolate, base attenuate, apex acuminate. Flowers greenish-yellow; sepals 2.5 x 2 mm, ovate-acute; petals 11 x 3 mm, oblong-lanceolate; ovary whitish brown tomentose. Capsule 9 x 8 mm, 2 valved; seeds subtrigonous.

Fl. & Fr.: March-August

Distr.: Endemic to shola forests of Southern Western Ghats. Occasional along shola margins at higher altitudes. MS, Methappu, *KKK 16009*; Idlimottai, *KKK 16601.*

Pittosporum tetraspermum Wight & Arn., Prodr. 154. 1834; Wight, Ic. t. 971. 1845; Hook. f. & Thoms. in Hook. f., FBI 1: 198. 1872; Dunn in Gamble, FPM 55. 1915; Fyson, FSIHS 31. t. 20. 1932; Nayar & Giri, Fl. Ind. Fasc. 6: 11. 1980 & in Sharma & Balakr., Fl. Ind. 2: 447. 1993; Matthew, Ill. FPH t. 38. 1996 & FPH 67. 1999.

Small trees. Leaves subverticillate, elliptic or oblanceolate, coriaceous. Flowers pale yellow; sepals small, pubescent; petals 10 x 2.5 mm, linear-oblong; stamens 5 mm long. Capsule 2 valved, 9 mm across, orange coloured; seeds subtrigonous, red.

Fl. & Fr.: April-October

Distr.: Endemic to shola forests of Southern Western Ghats and Sri Lanka. Rare along shola margins at higher altitudes. ENP, Bhiman Odai Shola, *KKK 18034.*

9. POLYGALACEAE

POLYGALA Linnaeus

Sp. Pl. 701. 1753.

1. Large erect shrubs; flowers yellow, in extra-axillary racemes ..... **P. arillata**
1. Perennial herbs; flowers pink, in axillary racemes **2**
2. Caruncle 3 fid to the base; seeds elliptic ..... **P. persicariaefolia**
2. Caruncle cup shaped; seeds oblong ..... **P. sibirica**

Polygala arillata Buch.-Ham. *ex* D. Don, Prodr. Fl. Nep. 199. 1825,. var. **chartacea** (Mukherjee) Giri in Bull. Bot. Surv. India 26: 5. 1984 (1985); Banerjee in Sharma & Balakr., Fl. Ind. 2: 457. 1993. *P. arillata* forma *chartacea* Mukherjee in Bull. Bot. Soc. Bengal 12: 32. 1958. **Plate. 4.1.4.**

Leaves to 15 x 6 cm, oblanceolate, base cuneate, apex cuspidate, chartaceous. Flowers drooping; outer sepals 5 x 3 mm, ovate-obtuse, inner sepals yellow, 15 x 6 mm, oblong, emarginate; petals 14 mm long, wings decurrent at base, lower one crested at tip. Capsule 15 x 8 mm, compressed; seeds 7 x 6 mm, black, rounded.

Fl. & Fr.: June-August

Distr.: Endemic to Kerala and Tamil Nadu parts of Western Ghats. Common along shola margins at lower and medium altitudes. MS, K-4, *KKK 16408.*

Polygala persicariifolia DC., Prodr. 1: 326. 1824; Bennet in Hook. f., FBI 1: 202. 1872 "*persicariaefolia*"; Dunn in Gamble, FPM 58. 1915; Banerjee in Sharma & Balakr., Fl. Ind. 2: 480. 1993; Matthew, FPH 72. 1999.

Leaves to 2 x 0.4 cm, elliptic-oblong, base attenuate, apex subacute, slightly hairy. Racemes to 4 cm long; outer sepals 4 x 1 mm, lanceolate, inner sepals 6 x 3 mm, elliptic, acute; wing petals 4 mm long, obovate; dorsal petals 7 mm long, crest fimbriate, not stalked. Capsule 4 x 4 mm; seeds 3 x 1.5 mm, brownish black, hairy.

Fl. & Fr.: March-April

Distr.: Indo-Malesia, North Australia and Tropical East Afric*a.* Occasional along shola margins at higher altitudes. MS, Idlimottai, *KKK 17597.*

Polygala sibirica L., Sp. Pl. 702. 1753; Bennet in Hook. f., FBI 1: 205. 1872; Dunn in Gamble, FPM 58. 1915; Fyson, FSIHS 35. t. 23. 1932; Banerjee in Sharma & Balakr., Fl. Ind. 2: 481. 1993; Matthew, Ill. FPH t. 42. 1996 & FPH 73. 1999. *P. sibirica* L. var. *heyneana* (Wall. *ex* Wight & Arn.) Bennet in Hook. f., FBI 1: 205. 1872. *P. heyneana* Wall. *ex* Wight & Arn., Prodr. 38. 1834.

Leaves 2 x 0.5 cm, elliptic-oblong, base acute, apex acuminate. Racemes to 2 cm long; outer sepals 3 x 1.5 mm, lanceolate, inner sepals, 6 x 3 mm, ovate, acute; wing petals 8 mm long, obovate, dorsal petals 6 mm long, crest fimbriate. Capsule 2 x 2 mm; seeds hairy.

Fl. & Fr.: March-August

Distr.: Indo-Malesia extending to Europe. Occasional along shola borders and grasslands at higher altitudes. MS, Idlimottai, *KKK 16017* & *KKK 16643.*

10. CARYOPHYLLACEAE

1. Erect herbs; leaves whorled ..... **Spergula**
1. Prostrate herbs; leaves opposite 2
2. Leaves ovate-lanceolate ..... **Cerastium**
2. Leaves orbicular ..... **Drymaria**

CERASTIUM Linnaeus

Sp. Pl. 437. 1753

Cerastium indicum Wight & Arn., Prodr. 43. 1834; Edgew. & Hook. f. in Hook. f., FBI 1: 227. 1874; Dunn in Gamble, FPM 61. 1915; Fyson, FSIHS 39. t. 25. 1932; Majumdar in Sharma & Balakr., Fl. Ind. 2: 524. 1993; Matthew, Ill. FPH t. 44. 1996 & FPH 76. 1999.

Leaves 2.5-1.5 cm, sessile, tomentose. Flowers white, in terminal dichotomous cymes; sepals 5, 6 x 1.5 mm, lanceolate, margins scarious; petals 5, 8 x 4 mm, elliptic, deeply bifid; stamens 10, filaments 4 mm long; styles 3, filiform; ovary 3 valved, 1 mm long.

Fl. & Fr.: August-September

Distr.: South India and Sri Lanka. Occasional in grasslands and ecotones at higher altitudes. MS, Idlimottai, *KKK 16613.*

Note: The present collection is a new record to Kerala.

DRYMARIA Willdenow *ex* J. A. Schultes

in J.J. Roemer *et* J. A. Schultes, Syst. Veg. 5: 31, 406. 1819-1820.

Drymaria cordata (L.) Willd. ex Roem. & Schult. subsp. **diandra** (Blume) Duke, Ann. Miss. Bot. Gard. 48: 253. 1961; Matthew, FPH 78. 1999. *D. diandra* Blume, Bijdr. 62. 1825; Majumdar in Sharma & Balakr., Fl. Ind. 2: 533. 1993. *D. cordata* sensu Edgew. & Hook. f. in Hook. f., FBI 1: 244.1874 p.p.; Dunn in Gamble, FPM 63. 1915. *Cerastium cordifolium* Roxb., Fl. Ind. 2: 458. 1832.

Leaves to 1.8 x 1.5 cm, base cordate or subtruncate, chartaceous, puberulus. Cymes branched, axillary or terminal; peduncle to 15 cm; sepals 5, 3.5 x 1.5 mm, lanceolate; petals 5, 3 x 1 mm, bifid at apex; stamens 3-5; ovary globose, 1 mm across. Capsule 2.5 mm, ovoid; seeds 0.5 mm across, orbicular, muricate, brown.

Fl. & Fr.: Throughout the year

Distr.: Paleotropics. Common along roadsides at medium altitudes. ENP, Vaguvarai, *KKK 31092.*

SPERGULA Linnaeus

Sp. Pl. 440. 1753.

Spergula arvensis L., Sp. Pl. 440. 1753; Edgew. & Hook. f. in Hook. f., FBI 1: 243. 1874; Dunn in Gamble, FPM 63. 1915; Fyson, FSIHS 43. t. 27. 1932; Majumdar in Sharma & Balakr., Fl. Ind. 2: 578. 1993; Matthew, Ill. FPH t. 51. 1996 & FPH 82. 1999.

Leaves narrow, linear, 20-30 x 0.5 mm, whorled at nodes. Inflorescence in regular trichotomous cymes; sepals 5, 3 x 2 mm, ovate, acute; petals 5, 2 x 1.5 mm, elliptic-acute, white; stamens 5; ovary 1 mm long, ovate; styles 5, recurved. Capsule subglobose, 5 x 3 mm; seeds 1 mm across, black, orbicular, discoid, papillose.

Fl. & Fr.: October-December

Distr.: Cosmopolitan. Occasionally found in the grassland marshes at lower altitudes. MS, Puthur, *KKK 16722.*

11. PORTULACACEAE

PORTULACA Linnaeus
Sp. Pl. 445. 1753.

Portulaca oleracea L., Sp. Pl. 445. 1753; Dyer in Hook. f., FBI 1: 246. 1874; Dunn in Gamble, FPM 66. 1915; Rao in Sharma & Sanj., Fl. Ind. 3: 4. 1993; Matthew, FPH 86. 1999.

Erect or prostrate herbs. Leaves alternate, sub-opposite or pseudo-whorled, to 3 x 1.5 cm, obovate, base cuneate, apex truncate. Flowers 3-4 together; sepals 2, 5 mm across; petals 6 x 6 mm, yellow; stamens 12; ovary 1 celled. Capsule 5 mm across, ovoid; seeds 0.8 mm across, reniform, tubercled, black.

Fl. & Fr.: August-November

Distr.: Pantropical. Common in lower altitude grasslands, way sides and disturbed shola regions. MS, Pallang mala, *KKK 16696.*

12. HYPERICACEAE

HYPERICUM Linnaeus
Sp. Pl. 783. 1753.

1. Slender herbs; flowers < 1 cm across, tetramerous ; stamens monadelphous ..... **H. japonicum**
1. Stout shrubs; flowers to 5 cm across, pentamerous; stamens arranged in 5 bundles ..... **H. mysorense**

Hypericum japonicum Thumb. *ex* Murr. in L., Syst. Veg. 702. 1784; Dyer in Hook. f., FBI 1: 256. 1874; Dunn in Gamble, FPM 70. 1915; Fyson, FSIHS 48. t. 32. 1932; Biswas in Sharma & Sanj., Fl. Ind. 3: 69. 1993; Matthew, FPH 92. 1999.

Leaves sessile, to 5 x 2 mm, ovate-lanceolate, base cordate, apex obtuse. Sepals 4 x 1.5 mm, oblong, mucronate; petals yellow, shorter than sepals, elliptic; ovary 2-3 mm long, ovoid, unilocular. Capsule 4 mm long, 3-valved, ovoid, red.

Fl. & Fr.: November-December

Distr.: Indo-Malesia to Australia and New Zealand and East Asia. Common along shola margins and roadsides at higher altitudes. ENP, Amarachola, *KKK 18076.*

Hypericum mysurense Heyne *ex* Wight & Arn., Prodr. 99. 1834; Dyer in Hook. f., FBI 1: 253. 1874; Dunn in Gamble, FPM 70. 1915; Fyson, FSIHS 46. t. 29. 1932; Biswas in Sharma & Sanj., Fl. Ind. 3: 69. 1993; Matthew, Ill. FPH t. 55. 1996 & FPH 92. 1999. *Norysca mysurensis* (Heyne *ex* Wight & Arn.) Wight, Ic. t. 56. 1838. **Avaram Kola (EBIS) Plate 5.2.7.**

Leaves to 3.5 x 0.6 cm, lanceolate, closely packed. Flowers 2-3 together; sepals 10 x 3 mm, lanceolate; petals yellow, 2 x 1 cm, obtuse; ovary 6 x 3 mm, 5-celled.. Capsule 1.5 cm long, ellipsoid.

Fl. & Fr.: January-March

Distr.: Tropical Asia and Africa. Common along shola borders and scrublands from lower to higher altitudes. MS, Puthur, *KKK 16053.* VMS, Masthakappara, *KKK 31133.*

13. CLUSIACEAE (Guttiferae)

GARCINIA Linnaeus

Sp. Pl. 443. 1753.

Garcinia gummi-gutta (L.) Robs., Brittonia 20: 103. 1968. var. **papilla** (Wight) Singh in Sharma & Sanj., Fl. Ind. 3: 111. 1993. *G. papilla* Wight Ic. t. 96. 1839. *Cambogia gummi-gutta* L., Gen. Pl. (ed. 5) 522. 1754. *Garcinia cambogia* (Gaertn.) Desv. in Lam., Encycl. 3: 701. 1792, var. *papilla* (Wight) T. Anders. in Hook. f. FBI 1: 261. 1874. *Mangostana cambogia* Gaertn., Fruct. 2: 106. 1790. *Garcinia cambogia* var. *conicarpa* (Wight) T. Anders. in Hook. f., FBI 1: 262. 1874. *Garcinia conicarpa* Wight, Ic. t. 121. 1839. **Kodampuli (EBIS).**

Medium sized trees with yellow latex. Leaves 9 x 4.5 cm, elliptic, base cuneate, apex acute. Flowers orange red; male flowers in short axillary fascicles; bisexual flowers 1-3; sepals 4, obovate, coriaceous, margins scarious; petals 4, obovate, concave, longer than sepals; stamens about 25, united; ovary subglobose, 6-8 locular. Berry 4 x 3 cm, ovate-oblong, grooved, tip umbonate; seeds sub-triangular.

Fl. & Fr.: May-February

Distr.: Endemic to Southern Western Ghats. Occasional along shola borders and stream sides at medium altitudes. ENP, Mampallam chola, *KKK 17552.*

Note: The present collection is a new record to Kerala.

14. THEACEAE (Ternstroemiaceae)

1. Large trees; leaves entire; flowers yellow ..... **Ternstroemia**
1. Shrubs to small trees; leaves serrate or crenate; flowers white **2**
2. Flowers < 0.5 cm across, in axillary fascicles; fruit a berry; seeds 1 mm long, angular ..... **Eurya**
2. Flowers to 3.5 cm across, solitary; fruit a capsule; seeds 5 mm long, ellipsoid ..... **Gordonia**

EURYA Thunberg

Nova Gen. Pl. 67. 1783.

1. Anthers longer than filaments; style less than 1 mm long ..... **E. japonica**
1. Anthers shorter than filaments; style 1.5-2.5 mm long ..... **E. nitida**

Eurya japonica Thunb., Fl. Jap. 191. t. 25. 1784; Dyer in Hook. f., FBI 1: 284. 1874; Dunn in Gamble, FPM 79. 1915; Fyson, FSIHS 53. t. 35. 1932; Chauhan & Paul in Sharma & Sanj., Fl. Ind. 3: 184. 1993. **Koora Mar (EBIS).**

Leaves to 6 x 2.5 cm, elliptic or oblanceolate, base acute to cuneate, apex obtuse to sub-acute, undulate to bluntly serrate, coriaceous. Sepals 2 mm long, broadly ovate to orbicular; petals 2-2.5 mm long, orbicular; stamens unequal; ovary 3-4 mm long. Berries subglobose, brown, warty.

Fl. & Fr.: December-February

Distr.: South India and Japan. Common along shola margins and grassland ecotones at all altitudes. MS, K-3, *KKK 16128.* ENP, Amarachola, *KKK 17546*; Anamudi, *KKK 18536.*

Note: New record to Kerala. So far reported from Karnataka and Tamil Nadu only (Sharma & Sanjappa, 1993).

Eurya nitida Korth. in Temminck, Verh. Nat. Gesch. Bot. 3: 115, t. 17. 1840; Chauhan & Paul in Sharma & Sanj., Fl. Ind. 3: 184. 1993; Fyson, FSIHS 53. t. 35. 1932; Matthew, Suppl. Ill. FPH t. 961. 1998 & FPH 98. 1999. *Eurya japonica* Thunb. var. *thunbergii* Thw., Enum. Pl. Zeyl. 41. 1858; Dyer in Hook. f., FBI 1: 284. 1874. *Eurya japonica* Thunb. var. *nitida* (Korth.) Dyer in Hook. f., FBI 1: 284. 1874. **Koora Mar (EBIS) Plate 5.3.5.**

Leaves to 6 x 2 cm, narrowly elliptic-lanceolate, base cuneate, apex acute or acuminate, upper 2/3rd portion closely sharply serrate, thinly coriaceous. Sepals 1.5 mm across, orbicular; petals 2.5 x 1.5 mm, oblong to orbicular; stamens connate at base; ovary 3.5 mm across. Berries ovoid, brown.

Fl. & Fr.: June-August

Distr.: Indo-Malesia and China. Common along shola margins and grasslands ecotones at all altitudes. MS, Methappu, *KKK 16413*. VMS, *KKK 31134*.

GORDONIA Ellis

Phil. Trans. 60: 520. 1771, *nom. cons.*

Gordonia obtusa Wall. *ex* Wight & Arn., Prodr. 87. 1834; Dyer in Hook. f., FBI 1: 291. 1874; Dunn in Gamble, FPM 79. 1915; Fyson, FSIHS 54. t. 36. 1932; Chauhan & Paul in Sharma & Sanj., Fl. Ind. 3: 162. 1993; Matthew, Ill. FPH t. 60. 1996 & FPH 99. 1999. ***Chembarasan.* Plate 4.1.5.**

Leaves alternate, to 13 x 4 cm, elliptic-lanceolate, base cuneate, apex acuminate, margins serrate to crenate. Sepals 7 x 6 mm, orbicular; petals 2 x 1.2 cm, obovate; stamens numerous, yellow, connate at base; ovary 3-5 mm long, ovoid, pubescent; stigma 4 or 5 lobed. Capsules oblong with a short acumen, 5 angled; seeds winged.

Fl. & Fr.: March-May

Distr.: Endemic to Western Ghats. Occasional, found along streamside at lower altitudes. MS, Chengalar, *KKK 17666*; Thalachorkadavu, *KKK 18152*.

TERNSTROEMIA Mutis *ex* Linnaeus f.

Suppl. 39, 264. 1782, *nom. cons.*

Ternstroemia gymnanthera (Wight & Arn.) Beddome, Fl. Sylv. 91, t. 91. 1871; Chauhan & Paul in Sharma & Sanj., Fl. Ind. 3: 190. 1993. *Cleyera gymnanthera* Wight & Arn., Prodr. 87. 1834; Wight, Ic. t. 47. 1838. *C. japonica* Thunb., Fl. Jap. 224. 1784. *Ternstroemia japonica* auct. Non. Thunb. 1794; Dyer in Hook. f., FBI 1: 280. 1874; Dunn in Gamble, FPM 78. 1915; Fyson, FSIHS 52. t. 34. 1932. *T. wightii* Choisy, Mem. Ternstroem. Camell. 19. 1855. *T. japonica* Thunb. var. *wightii* (Choisy) Dyer in FBI 1: 281. 1874. **Plate 4.1.6.**

Leaves to 8 x 3 cm, obovate, base cuneate, apex acute, coriaceous, midrib reddish below. Flowers solitary; sepals 5, 6 x 5 mm, ovate-obtuse, persistent; petals 5, 1.5 cm long, obovate; stamens numerous, free, adnate to the base of petals; ovary 2 celled, ovoid. Berry 18 x 14 mm, ovoid, red; seeds 4, 12 x 7 mm, elliptic, convex.

Fl. & Fr.: August-December

Distr.: South East Asia and China. Common along shola margins at all altitudes. MS, Chengalar, *KKK 16570*; K-3.5, *KKK 16781*.

15. MALVACEAE

1. Perennial herbs; leaves ovate or rhomboid; flowers yellow ..... **Sida**
1. Subshrubs; leaves ovate or shallowly 3-5 lobed; flowers white or pink **2**
2. Flowers large, white with deep purple centre ..... **Abelmoschus**
2. Flowers small, pink with purple centre ..... **Urena**

ABELMOSCHUS Medikus

Malvenfam. 45. 1787.

Abelmoschus angulosus Wall. *ex* Wight & Arn., Prodr. 53. 1834; Wight, Ic. t. 951. 1845; Paul & Nayar, Fl. Ind. Fasc. 19: 68. 1988; Paul in Sharma & Sanj., Fl. Ind. 3: 301. 1993; Sivar. & Pradeep, Malv. South. Pen. India 52. 1996; Matthew, Ill. FPH t. 62. 1996 & FPH 105. 1999. *Hibiscus angulosus* (Wight & Arn.) Steud., Nomencl. Bot. (ed. 2) 1: 758. 1840; Masters in Hook. f., FBI 1: 341. 1874; Dunn in Gamble, FPM 97. 1915; Fyson, FSIHS 60. t. 40. 1932. **Kattu Sembarathi.**

Leaves 12 cm across, lobes triangular ovate, apex acute, crenate, stiff hairy. Flowers in the upper axils; epicalyx 4-5 parted; sepals 3 x 1 cm, ovate-lanceolate, hairy; petals 5 x 2 cm, obovate, glabrous; ovary 6 x 4 mm, conical. Capsule 3 x 1.5 cm, ovate-oblong, densely hispid; seeds 2.5 x 2 mm, ovate, discoid, black.

Fl. & Fr.: December-February

Distr.: South and South East Asia. Common along roadsides at lower and medium altitudes. MS, K-6, *KKK 16184*; K-3.5, *KKK 16780.*

SIDA Linnaeus

Sp. Pl. 683. 1753.

Sida rhombifolia L., Sp. Pl. 684. 1753; Masters in Hook. f., FBI 1: 323. 1874, in part; Gamble, FPM 90. 1915; Fyson, FSIHS 59. 1932; Paul & Nayar, Fl. Ind. Fasc. 19: 212. 1988; Paul in Sharma & Sanj., Fl. Ind. 3: 290. 1993; Sivar. & Pradeep, Malv. South. Pen. India 245. 1996; Matthew, FPH 121. 1999. *Sida rhombifolia* subsp. *rhombifolia* Borss., Blumea 14: 193. 1966. *Sida rhombifolia* subsp. *rhombifolia* var. *rhombifolia* Paul & Nayar, Fasc. Fl. Ind. 19: 214. 1988. *Sida alba* Cav., Diss. I. 22. t. f. 3. 8. 1785, non L., 1763.

Leaves alternate, 5 x 3 cm, ovate to rhomboid, base obtusely acute, apex acute to acuminate, crenate in upper half. Calyx campanulate, lobes 7 x 3 mm, triangular; corolla 1.8 cm across, petals oblique, base cuneate, apex emarginate; staminal tube divided; ovary conical. Mericarps 6, with 2 short awns, each 1-2 mm long; seeds 2 mm across, flattened, glabrous, reniform, black.

Fl. & Fr.: December-February

Distr.: Pantropical. Common along roadsides at lower altitudes. MS, Puthur, *KKK 16189.*

URENA Linnaeus

Sp. Pl. 692. 1753.

Urena lobata L., Sp. Pl. 692. 1753; Mast. in Hook. f., FBI 1: 329. 1874; Dunn in Gamble, FPM 92. 1915; Fyson, FSIHS 59. t. 39. 1932; Paul & Nayar, Fl. Ind. Fasc. 19: 228. 1988; Paul in Sharma & Sanj., Fl. Ind. 3: 380. 1993; Sivar. & Pradeep, Malv. South. Pen. India 181. 1996; Matthew, FPH 123. 1999. *Urena lobata* L. subsp. *lobata* Borss., Blumea 14: 140. 1966, var. *lobata*; Paul in Sharma & Sanj., Fl. Ind. 3: 336. 1993. **Cheeli, Kuruva Chedi.**

Leaves 2-6 x 1-6 cm, base rounded, apex acute, margins serrate, densely stellate hairy. Epicalyx 5, 6 x 1 mm, linear-lanceolate; calyx tubular, lobes 5 x 1.5 mm, lanceolate; corolla 2.5 cm across; petals 13 x 0.5 cm, obovate, apex rounded. Schizocarps 6 mm across, globose; mericarp 4-5 mm; seeds 3 mm, reniform, glabrous.
Fl. & Fr.: December-February
Distr.: Pantropical. Common along shola borders and roadsides at lower altitudes. MS, Puthur, *KKK 16190.*

16. TILIACEAE

1. Climbing shrubs; flowers white, in axillary or terminal umbellate cymes ..... **Grewia**
1. Erect herbs; flowers yellow, in axillary or leaf opposed cymes ..... **Triumfetta**

GREWIA Linnaeus

Sp. Pl. 964. 1753.

Grewia umbellifera Bedd., For. Man. Bot. 37. 1871; Mast. in Hook. f., FBI 1: 393. 1874; Dunn in Gamble, FPM 117. 1915; Daniel & Chandr. in Sharma & Sanj., Fl. Ind. 3: 513. 1993. **Kokki Valli. Plate 4.1.7.**

Leaves to 8 x 3 cm, elliptic or elliptic-ovate, base rounded, apex acute or acuminate, glandular-serrate, glabrescent, 3-nerved. Sepals 1.2 cm long, narrowly lanceolate, acute, pubescent; petals 7-10 mm long, ovate-oblong, sub-acute; androphore cylindric, 8 x 2 mm, pubescent; stamens many; ovary subglobose. Drupe 1.8 cm across, distinctly 4-lobed, fleshy, purple; seeds 7 mm across, discoid.
Fl. & Fr.: August-February
Distr.: Endemic to Western Ghats. Common along scrublands and ecotones usually at lower altitudes. MS, K-4, *KKK 16542*; K-3, *KKK 17506.*

TRIUMFETTA Linnaeus

Sp. Pl. 444. 1753.

Triumfetta pilosa Roth, Nov. Pl. Sp. 223. 1821; Mast. in Hook. f., FBI 1: 394. 1874; Dunn in Gamble, FPM 120. 1915; Fyson, FSIHS 62. 1932; Daniel & Chandr. in Sharma & Sanj., Fl. Ind. 3: 519. 1993; Matthew, FPH 143. 1999. **Erumachappu (EBIS).**

Leaves to 13 x 6 cm, ovate-oblong to elliptic-lanceolate, base rounded, apex acute, margins serrate, stellate hairy. Sepals 1 cm long, lorate; petals 8 x 2 mm,

oblanceolate, obtuse, apex dentate; stamens 10, bright yellow; ovary globose, 4 loculed, hairy. Capsules 1 cm across, subglobose, densely glochidiate-bristled; seeds 2.5 x 2 mm, ovate, plano-convex, glabrous, black.

Fl. & Fr.: October-February.

Distr.: Tropical Africa, Central and East Asia. Common along shola borders and roadsides at lower altitudes. MS, Puthur, *KKK 16191*; K-3, *KKK 16662*.

17. ELAEOCARPACEAE

ELAEOCARPUS Linnaeus

Sp. Pl. 515. 1753.

1. Leaves obovate; drupes ovoid, laterally compressed ..... **E. tuberculatus**
1. Leaves not obovate; drupes elliptic or elliptic-oblong 2
2. Anthers not awned; ripe drupe > 3 x 1.5 cm ..... **E. glandulosus**
2. Anthers awned; ripe drupe < 2 x 1 cm 3
3. Leaves small, ovate-lanceolate, crenate-serrate, glandular; crowded at apex ..... **E. munronii**
3. Leaves large, oblong or elliptic, recurved, shallowly serrate; not crowded ..... **E. recurvatus**

Elaeocarpus glandulosus Wall. *ex* Merr., J. Arn. Arbor. 32: 194. 1951; Murti, J. Econ. Tax. Bot. 17(2): 288. 1993 & in Sharma & Sanj., Fl. Ind. 3: 539. 1993. Matthew, Ill. FPH t. 79. 1996 & FPH 146. 1999. *E. oblongus* sensu Wight, Ic. t. 46. 1838, non Gaertn., 1788 & Smith, 1809; Mast. in Hook. f., FBI 1: 403. 1874; Dunn in Gamble, FPM 124. 1915; Fyson, FSIHS 65. t. 41. 1932. **Kotlam Pazham (EBIS). Plate 5.2.6.**

Large trees. Leaves to 9 x 6 cm, broadly ovate or elliptic, base rounded, apex acute or acuminate, crenate-serrate, coriaceous. Racemes puberulus. Sepals 4 x 1.5 mm long, lanceolate, minutely pubescent outside, glandular inside; petals 7 x 4 mm long, cuneate at base; anthers puberulus; ovary densely hairy. Drupes 3.3 x 1.6 cm, fleshy, rugose; pyrenes oblong, 2 locular, 2 seeded.

Fl. & Fr.: December-March

Distr.: South Asia. Common; along shola borders at medium altitudes. MS, Perumala, *KKK 18144*.

Elaeocarpus munronii (Wight) Mast. in Hook. f., FBI 1: 407. 1874; Dunn in Gamble, FPM 124. 1915; Fyson, FSIHS 66. t. 43. 1932; "*munroii*"; Murti, J. Econ. Tax. Bot. 17(2): 290. 1993 & in Sharma & Sanj., Fl. Ind. 3: 546. 1993; Matthew, Ill. FPH t. 80. 1996 & FPH 147. 1999. *Monocera munroii* Wight, Ill. Ind. Bot. 1: 83. 1840 & Ic. t. 952. 1845. **Shiru Kodala. Plate 4.1.8.**

Medium sized trees. Leaves to 8 x 3 cm, base rounded, apex acuminate, sub-coriaceous. Sepals 8 x 1.5 mm long, linear-lanceolate, glabrous; petals 7 x 3 mm, elliptic-oblong, white with reddish lines at base, apex broad, laciniate; stamens 25-30, awns curved; ovary 2 mm long, conical, silky pubescent, 2 celled. Drupe 2 x 0.8 cm, glabrous, glaucous, unilocular, 1 seeded.

Fl. & Fr.: August-December

Distr.: Endemic to Western Ghats. Rare; along shola borders at medium altitudes. MS, K-5, *KKK 16713*; Coupe Road, *KKK 16584*.

Elaeocarpus recurvatus Corner in Gard. Bull. Str. Settl. 10. 319. 1939; Murti in Sharma & Sanj., Fl. Ind. 3: 549. 1993; Matthew, Ill. FPH t. 81. 1996 & FPH 148. 1999. *E. ferrugineus* (Wight) Bedd. Fl. Sylv. t. 112. 1871; non (Jack) Steudel 1840; Masters in Hook. f., FBI 1: 406. 1874; Dunn in Gamble, FPM 124. 1915; Fyson, FSIHS 65. t. 42. 1932; *Monocera ferruginea* Wight, Ic. t. 205. 1839; non Jack 1830. **Rudraksham (EBIS). Plate 5.4.5.**

Medium sized trees, young parts rusty grey tomentose. Leaves to 12 x 8 cm, base narrowed, apex acute or acuminate, coriaceous, wooly tomentose below. Racemes 6-9 cm. Sepals 10 x 2 mm, lanceolate, densely tomentose outside; petals 9 x 3 cm, oblong-cuneate, broader at apex, long hairy; anthers oblong; ovary 3 x 2 mm, ovoid-oblong, densely hairy. Drupes 1.8 x 0.9 cm, fleshy, green.

Fl. & Fr.: February-March

Distr.: Endemic to Southern Western Ghats. Rare; along shola borders at higher altitudes. MS, Idlimottai, *KKK 16027*; K-3, *KKK 16124*.

Note: Young leaves and those found at lower branches or plants found at lower altitude regions do not show prominent tomentum or recurved nature (Plate 6.5.2).

Elaeocarpus tuberculatus Roxb., Fl. Ind. 2: 594. 1832; Mast. in Hook. f., FBI 1: 404. 1874; Dunn in Gamble, FPM 124. 1915; Murti, J. Econ. Tax. Bot. 17(2): 292. 1993 & in Sharma & Sanj., Fl. Ind. 3: 559. 1993; Matthew, Ill. FPH t. 82. 1996 & FPH 148. 1999. *Monocera tuberculata* (Roxb.) Wight & Arn., Prodr. 83. 1834; Wight, Ic. t. 62. 1838. ***Koduvasi Maram*, Shembara Maram (EBIS). Plate 6.3.1.**

Large trees, prominently buttressed. Leaves to 18 x 5 cm, base narrowed, rounded or truncate, apex retuse or acute, obscurely crenate-dentate or sub-entire, coriaceous, rufous hairy beneath. Racemes ferruginous tomentose. Sepals 15 x 3 mm, linear-lanceolate; petals 20 x 5 mm, oblong; anthers oblong, thinly tomentose; ovary 4 x 3 mm, ovoid-oblong, silky tomentose. Drupes 3.5 x 2.5 cm, smooth.

Fl. & Fr.: March-August

Distr.: India and Malesia. Rare; along shola borders at lower altitudes. MS, Puthur, *KKK 16565*.

18. GERANIACEAE

GERANIUM Linn.

Sp. Pl. 676. 1753

Geranium nepalense Sweet, Gerania. 1: t. 12. 1820; Edgew. & Hook. f. in Hook. f., FBI 1: 430. 1874; Dunn in Gamble, FPM, 131. 1915; Fyson, FSIHS 70, t. 45. 1932; Malhothra in Hajra *et al.*, Fl. Ind. 4: 75. 1997; Matthew, Ill. FPH t. 85. 1996 & FPH 155. 1999.

Diffuse perennial herbs. Leaves opposite, to 5 cm across, orbicular, palmately 5 lobed, lobes sub equal, irregularly incised pubescent. Flowers solitary or in pairs, axillary; sepals 7 x 2.5 mm, lanceolate, mucronate; petals pink with deep purple veins, to 10 x 5 mm, obovate, base cuneate, apex emarginate; stamens 10; ovary oblong, 5 loculed; stigma 5 lobed. Schizocarp beaked; mericarps subglobular.

Fl. & Fr.: August-September

Distr.: South East Asia. Occasional; in grasslands and along roadsides at higher altitudes. MS, Idlimottai, *KKK 16614.*

19. OXALIDACEAE

1. Leaves pinnate; capsule valves detaching from axis ..... **Biophytum**
1. Leaves digitate; capsule valves cohering with axis ..... **Oxalis**

BIOPHYTUM A. P. de Candolle

Prodr. 1: 689. 1824.

1. Perennial herbs; stems branched; sepals linear; seeds ellipsoid ..... **B. intermedium** var. **pulneyensis**
1. Annual herbs; stems simple; sepals ovate-lanceolate; seeds ovoid .. **B. sensitivum** var. **candolleanum**

Biophytum intermedium Wight, Ill. Indian Bot. 1: 162. 1840; Edgew. & Hook. f. in Hook. f., FBI 1: 438. 1874, incl. var. **pulneyensis**; Dunn in Gamble, FPM 133. 1915; Fyson, FSIHS 76. t. 53. 1932; Manna in Hajra *et al.* , Fl. Ind. 4: 232. 1997; Matthew, FPH 161. 1999.

Leaves 3-4 cm; leaflets 14-16 pairs, apical ones 8 x 3 mm, oblong, falcate, base truncate, apex obliquely-apiculate, glabrous. Flowers yellow, 1 cm across; sepals 5 x 0.5 mm, linear, villous; petals 7 x 4 mm, obovate. Seeds ellipsoid, tubercled, ridged.

Fl. & Fr.: January-June

Distr.: India and Sri Lanka. Occasional; along stream sides at lower altitudes. MS, Thalachorkadavu, *KKK* 16756; Chengalar, *KKK 18127.*

Biophytum sensitivum (L.) DC., Prodr. 1: 690. 1824, var. **candolleanum** (Wight) Edgew. & Hook. f., FBI 1: 437. 1874; Manna in Hajra *et al.* , Fl. Ind. 4: 238. 1997. *B. candolleanum* Wight, Ill. Indian Bot. 1: 161. t. 62. 1840; Dunn in Gamble, FPM 133. 1915; Fyson, FSIHS 77. 1932.

Leaves sensitive, 4-5 cm long; leaflets 12-25 pairs, apical ones 7 x 4 mm, oblong, apex obliquely apiculate, strigose hairy. Flowers yellow; sepals 5 x 1.5 mm, acute, ridged; petals 6 x 2 mm, lanceolate; ovary 0.5 mm long. Seeds ovoid, tubercled.

Fl. & Fr.: February-September

Distr.: Peninsular India and Sri Lanka. Common; along shola borders at lower altitudes. MS, Perumala, *KKK 16060.*

OXALIS Linnaeus

Sp. Pl. 433.1753.

1. Caulescent, creeping herbs; leaflets broadly elliptic-obcordate; umbels 2 flowered ..... **O. corniculata**
1. Acaulescent herbs; leaflets fishtail shaped, broadly deltoid; umbels 10 or 11 flowered ..... **O. latifolia**

Oxalis corniculata L., Sp. Pl. 435. 1753; Wight, Ic. t. 18. 1838; Edgew. & Hook. f. in Hook. f., FBI 1: 436. 1874; Dunn in Gamble, FPM 132. 1915; Fyson, FSIHS 73. t. 47. 1932; Manna in Hajra *et al.*, Fl. Ind. 4: 242. 1997; Matthew, FPH. 163. 1999. *O.*

corniculata L. var. *hispida* Blatt., J. Bombay Nat. Hist. Soc. 34: 898. 1931. **Pulichan, Kottampulichan (EBIS).**

Leaves 2-4 cm across; leaflets to 2.5 x 2 cm, paler and pubescent beneath. Sepals 8 x 2 mm, pubescent, with narrow paler margins; petals 1 cm long, oblong, yellow; stamens united; ovary 3 x 1 mm, puberulus. Capsule to 15 x 2.5 mm; seeds 6-7, 1.5 x 7 mm, flattened-ovoid.

Fl. & Fr.: July-August.

Distr.: Cosmopolitan. Occasionally found along shola borders and roadsides at lower altitudes. MS, Chengalar, *KKK 16576.*

Oxalis latifolia Kunth, Nov. Gen. Sp. 5. 237. t. 467. 1821; Fyson, FSIHS 75, t. 51. 1932. *O. intermedia* A. Rich., Ess. Fl. Cuba 315. 1845, non Steud. 1841. *O. dehradunensis* Raiz., Suppl. Fl. Upp. Gang. Plain 37-38. 1976; Manna in Hajra *et al.*, Fl. Ind. 4: 246. 1997; Matthew, Ill. FPH. t. 92 1996 & FPH 164. 1999. **Pulichan.**

Roots filiform; bulbs 10 x 8 mm, ovoid, with numerous basal erect stolons. Leaves long petiolate; leaflets 4 x 1.5 cm, subbilobed with divergent lobes, base cuneate, apex acute. Sepals 5 x 1.5 mm, lanceolate, glabrous; corolla 1.5 cm long, infundibuliform, petals oblanceolate; ovary 5 lobed, to 2.5 mm long, glabrous. Fruits not seen

Fl.: August-September

Distr.: Native of Mexico and West Indies; introduced and naturalised in other areas. Occasional; along roadsides in lower altitudes. MS, Chengalar, *KKK 31093.*

Note: The present collection is a new record to Kerala.

20. BALSAMINACEAE

IMPATIENS Linnaeus

Sp. Pl. 937. 1753.

1. Epiphytic plants ..... **I. parasitica**
1. Terrestrial plants 2
2. Scapigerous herbs; leaves all radical ..... **I. modesta**
2. Herbs or shrubs; leaves cauline 3
3. Flowers solitary 4
3. Flowers in umbels or racemes 11
4. Leaves all opposite 5
4. Leaves opposite, alternate or whorled 7
5. Spur of lip slender, usually longer than wings 6
5. Spur of lip very short ..... **I. herbicola**
6. Stem stiff, simple ..... **I. chinensis**
6. Stem slender, flaccid ..... **I. tenella**
7. Leaves opposite, alternate and whorled on same plant 8
7. Leaves all alternate 9
8. Basal lobes of wings smaller than the distal; spur of the lip 15 mm ..... **I. latifolia**
8. Basal lobes of wings equalling or larger than distal; spur of lip 20 mm ..... **I. cuspidata**
9. Leaves, standard petal and lip glabrous ..... **I. balsamina**
9. Leaves, standard petal and lip tomentose 10

10. Flowers small; wings short ..... **I. munronii**
10. Flowers very large; wings large ..... **I. hensloviana**
11. Flowers in umbels 12
11. Flowers in racemes 19
12. Shrubs or large branching herbs 13
12. Annual herbs 14
13. Leaves alternate ..... **I. campanulata**
13. Leaves opposite and whorled ..... **I. verticillata**
14. Leaves all opposite 15
14. Leaves all alternate 16
15. Peduncle many flowered; leaves petioled ..... **I. goughii**
15. Peduncle 1 flowered; leaves subsessile ..... **I. parvifolia**
16. Leaves scattered on stems and branches 17
16. Leaves rosulate at the stem tip ..... **I. anaimudica**
17. Spur of lip present 18
17. Spur of lip absent ..... **I. elegans**
18. Spur of lip long, slender ..... **I. cordata**
18. Spur of lip short, tip incurved ..... **I. sp.1**
19. Leaves long petioled, ovate 20
19. Leaves sub-sessile, lanceolate ..... **I. tangachee**
20. Lip tubiform or deeply cylindric-saccate 21
20. Lip cymbiform or funnel shaped 22
21. Spur trumpet shaped, incurved with swollen tip ..... **I. phoenicea**
21. Spur tubular, blunt, upcurved with apex appressed to front of sac ..... **I. coelotropis**
22. Lip cymbiform or shortly funnel shaped; spur short, straight of upcurved ..... **I. wightiana**
22. Lip deeply funnel shaped; spur tubular, blunt, curved upwards in a semicircle ..... **I. platyadena**

Impatiens anaimudica Fischer, Kew Bull. 1935: 92-93 & in Gamble, FPM 1871. 1936; Vivek. *et al.* in Hajra *et al.*, Fl. Ind. 4: 117-118. 1997; Biju, Rheedea 11(2): 109-113. 2001.

Herbs, to 20 cm tall; stems terete, reddish green. Leaves rosulate at tip, to 3 x 2 cm, ovate-acuminate, margins with serrations ending in cilia, slightly pilose on veins. Umbels 3-4 flowered. Flowers scarlet red; lip cymbiform, small; spur reduced to a small rounded projection at base; lateral sepals ovate-acuminate; standard orbicular; not spurred; wings with 2 subequal lobes, obtuse; stamens 5; ovary ovate-elliptic. Capsule to 1 cm long, obliquely elliptic, aristate.

Fl. & Fr.: October-December

Distr.: Endemic to Southern Western Ghats. Very rare and endangered; along roadsides and grassland ecotones at high altitudes. ENP, Umayamala, *KKK 18015.*

Note: This species which was considered as *'possibly extinct'* (Nayar & Sastry, 1988) since it was not collected after the type collection by Barnes (1933) from Anamudi, was recently relocated by Biju (2001) from the same locality.

Impatiens balsamina L., Sp. Pl. 938. 1753; Hook. f., FBI 1: 453. 1874; Gamble, FPM 142. 1915; Fyson, FSIHS 91. 1932; Vivek. *et al.* in Hajra *et al.*, Fl. Ind. 4: 123. 1997; Matthew, FPH. t. 96. 1996 & FPH 170. 1999. **Thottachinungi (EBIS).**

Annual herbs, highly branched. Leaves to 11 x 1 cm, lanceolate, acute on both sides, margins deeply serrate. Flowers rosy pink, axillary, pedicellate; lip saccate, cuspidate, densely hairy, spur to 3 cm, hairy; lateral sepals 2 x 0.5 mm, linear; standard petals 10 x 8 mm, orbicular, cuspidate; wings 17 x 10 mm, 2 lobed, terminal lobe notched at apex, basal smaller. Capsule tomentose.

Fl. & Fr.: September-December

Distr.: Indo-Malesia; introduced into many countries. Occasional; along roadsides at lower altitudes. MS, K-3, *KKK 16653.*

Impatiens campanulata Wight, Madras J. Lit. Sci. ser. 1. 5: 11. t. 7. 1837; Hook. f., FBI 463. 1874; Gamble, FPM 143. 1915; Fyson, FSIHS 94. t. 74. 1932; Vivek. *et al.* in Hajra *et al.*, Fl. Ind. 4: 130. 1997; Matthew, Ill. FPH. t. 97. & FPH 171. 1999. **Thottachinungi.**

Tall herbs. Leaves to 14 x 6 cm, elliptic, apex acuminate, margins serrate. Racemes sub-umbellate, 2-3 flowered. Flowers white and yellow with purple spots; lip cymbiform, 1.5 cm long; spur 5 mm, stout; lateral sepals 1 x 0.5 cm, ovate; standard 13 mm long, orbicular, keeled at back; wings 2.5 cm long, bilobed; ovary elliptic, pointed at both ends, glabrous. Fruit not seen.

Fl.: July-August

Distr.: Endemic to Southern Western Ghats. Occasional; along roadsides at medium altitudes. MS, Gudalar road, *KKK 18596.*

Note: The present collection is a new record to Kerala.

Impatiens chinensis L., Sp. Pl. 937. 1753; Hook. f., FBI 1: 444. 1874; Gamble, FPM 139. 1915; Fyson, FSIHS 86, t. 63. 1932; Vivek. *et al.* in Hajra *et al.*, Fl. Ind. 4: 131. 1997; Matthew, Ill. FPH. t. 98. 1996 & FPH 171. 1999. *I. fasciculata* Lam., Dict. 1: 359. 1873; Wight, Ic. t. 748. 1844. **Plate 4.2.1.**

Unbranched herbs, stems to 40 cm tall, reddish. Leaves to 10 x 1 cm, linear-oblong, base cordate, distantly crenate, glabrous. Flowers binate, axillary, pedicelled; lip 8 mm long, acuminate and curved back at apex; spur 15 mm long, slender; standard 4 x 6 mm, orbicular, emarginate; terminal lobe of wing ovate, pink; dorsal auricle slender. Capsule 10 mm long, elliptic, glabrous.

Fl. & Fr.: August-January

Distr.: India and China. Common along stream sides at medium altitudes. MS, K-5, *KKK 31085.*

Impatiens coelotropis Fischer, Kew Bull. 1934: 390-391. 1934; Gamble, FPM 1871. 1936; Vivek. *et al.* in Hajra *et al.*, Fl. Ind. 4: 134. 1997.

Erect undershrubs. Leaves 10 x 2.5 cm, ovate to narrowly lanceolate, base cuneate, apex acute, margins distantly serrate. Racemes 3-4 flowered. Flowers 2.5 cm long; lateral sepals ovate-lanceolate; lip deeply cylindric-saccate; spur to 10 mm long,

tubular, blunt, upcurved, glossy green with scarlet mouth; standard 15 mm long suborbicular, scarlet; wings sessile, oblong falcate, scarlet. Capsule 15 mm long, ellipsoid-fusiform, glossy.

Fl. & Fr.: August-December

Distr.: Endemic to Southern Western Ghats. Rare; on rocks along stream sides in grasslands. ENP, Rajamala, *KKK 31094.*

Impatiens cordata Wight, Madras J. Lit. Sci. ser.1. 5: 10. 1837; Hook. f., FBI 1: 462. 1874; Gamble, FPM 144. 1915; Vivek. *et al.* in Hajra *et al.,* Fl. Ind. 4: 135. 1997. **Thottachinungi (EBIS) Plate 4.2.2.**

Procumbent herbs. Leaves to 8 x 5 cm, ovate, base cordate, shallowly serrate, chartaceous. Racemes subumbellate, axillary. Flowers rose with purple centre; lip 8 x 8 mm, concave, obtuse, mucronate; spur 35 mm long, pointed; lateral sepals ovate, mucronate; standard 11 x 8 mm, emarginate; wings 2 x 1 cm. Capsule 15 x 5 mm, elliptic, cuspidate, glabrous; seeds 3 x 2 mm, obovate, pilous.

Fl. & Fr.: July-December

Distr.: Endemic to Southern Western Ghats. Common in exposed regions, along water sources and roadsides at lower altitudes. MS, K-4, *KKK 16510* & *KKK 16511*; K-5, *KKK 17688.*

Impatiens cuspidata Wight & Arn., Comp. Bot. Mag. 1: 321. 1835; Wight, Ic. t. 741. 1844; Gamble, FPM 142. 1915; Fyson, FSIHS 91. 1932; Vivek. *et al.* in Hajra *et al.,* Fl. Ind. 4: 137. 1997. *I. latifolia* sensu Hook. f., FBI 1: 450. 1874, p.p. non L., 1753. **Thottachinungi. Plate 4.2.3.**

Shrubs to 1.2 m tall. Leaves opposite or alternate, crowded at tip, to 13 x 4.5 cm, elliptic, base acute, apex acuminate, sparsely pilose above. Flowers pale rose, 2.5 cm across, axillary; lip 10 x 6 mm, funnel shaped; spur to 20 x 1 mm, stout; lateral sepals linear; standard 15 x 13 mm, orbicular, bilobed above, strongly cuspidate; ovary ellipsoid. Capsule 2.5 x 1 cm, elliptic; seeds 4 x 3 mm, ovate.

Fl. & Fr.: October-December

Distr.: Endemic to Southern Western Ghats. Occasional; along shola borders at higher altitudes. ENP, Umayamala, *KKK 18061.*

Impatiens elegans Bedd., Madras J. Lit. Sci. ser. 2. 78: 67. 1859; Hook. f., FBI 1: 465. 1875; Vivek. *et al.* in Hajra *et al.,* Fl. Ind. 4: 144. 1997. **Thottachinungi.**

Herbs, to 30 cm tall. Leaves to 5.5 x 3.5 cm, ovate, apex acuminate, serrate, membranous. Racemes sub-umbellate. Flowers pale rosy white with a purple eye; lip cymbiform; spur absent; dorsal sepals ovate; standard orbicular-ovate, apiculate with a green dorsal ridge; terminal wing lobe obliquely-ovate, sessile; laterals small, rounded. Capsule to 12 mm long, ellipsoid, beaked; seeds hairy, subglobose.

Fl. & Fr.: October-December

Distr.: Endemic to Southern Western Ghats. Rare; along stream sides at lower and medium altitudes. ENP, Nilgiri Teri, *KKK 18059.*

Note: This species is closely allied to *I. cordata,* except in the absence of spur.

Impatiens goughii Wight, Ill. 1: 160. 1840; Wight, Ic. t. 1603. 1850; Hook. f., FBI 1: 452. 1874; Gamble, FPM 144. 1915; Fyson, FSIHS 95. t. 75. 1932; Vivek. *et al.* in Hajra *et al.*, Fl. Ind. 4: 152. 1997; Matthew, Ill. FPH t. 99. 1996 & FPH 172. 1999.

Herbs to 20 cm tall. Leaves to 2.5 x 1.25 cm, elliptic, acute at both ends, serrate. Flowers small, pink; lip 3 x 5 mm, boat shaped, acute, cuspidate; spur 2 mm long, cylindric, curved; lateral sepals acute; standard 2 x 2 mm, orbicular; wings 3 lobed, lobes shallow; dorsal auricle produced into a spur; ovary elliptic, acuminate. Capsule to 5 x 2.5 mm, oblique-ellipsoid, acuminate, glabrous.

Fl. & Fr.: September-December

Distr.: Endemic to Western Ghats. Common along exposed regions and roadsides at medium altitudes. MS, Coupe road, *KKK 16592*; K-4, *KKK 16659.*

Note: Since this plant is usually found on wet rocks, extremely stunted mature plants < 5 cm height are also often found.

Impatiens hensloviana Arn., Comp. Bot. Mag. 1: 322. 1836; Hook. f., FBI 1: 458. 1874; Gamble, FPM 143. 1915; Fyson, FSIHS 93. t. 71. 1932; Vivek. *et al.* in Hajra *et al.*, Fl. Ind. 4: 155. 1997; Matthew, Ill. FPH t. 100. 1996 & FPH 173. 1999. *I. albida* Wight, Madras J. Lit. Sci. ser. 1. 5: 7. t.1. 1837 & Ic. t. 743. 1844. **Plate 4.2.4.**

Bushy undershrubs with scars of fallen leaves. Leaves crowded at tip, to 12 x 5 cm, elliptic, base acute, apex acuminate, tomentose. Flowers white with rosy tinge in centre, to 4 cm across, solitary; lip 1.8 x 0.8 cm, funnel shaped; spur 40 mm long, hairy; lateral sepals 10 x 6 mm, ovate-cuspidate; standard broadly ovate; wings bilobed; ovary elliptic-acuminate. Capsule 3 cm long, slender, pubescent.

Fl. & Fr.: August-February

Distr.: South India and Sri Lanka. Commonly found as dense patches along shola borders and stream sides at lower and medium altitudes. Chengalar, *KKK* 16532; Thalachorkadavu, *KKK 18123*; ENP, Mampallam Chola, *KKK 18062.*

Impatiens herbicola Hook. f., Kew Bull. 1911: 354. 1911; Gamble, FPM 141. 1915; Vivek. *et al.* in Hajra *et al.*, Fl. Ind. 4: 156. 1997.

Branched herbs to 25 cm tall, stems pink. Leaves to 3 x 1 cm, lanceolate, base cordate, apex acute, serrate, pubescent. Flowers rose, in axillary fascicles; lip 10 x 5 cm, saccate, cuspidate; spur 1 mm long, curved; lateral sepals lanceolate; standard to 6 mm across, orbicular; wings 12 x 8 mm, unequally 2 lobed; ovary 2 x 1.5 mm. Capsule to 10 x 3 mm, elliptic, acute; seeds 1 x 0.5 mm, ellipsoid.

Fl. & Fr.: July-September

Distr.: Endemic to Southern Western Ghats. Common in grassland bogs at higher altitudes. MS, Idlimottai, *KKK 16641.*

Impatiens latifolia L. Sp. Pl. 937. 1753; Hook. f., FBI 1: 450. 1874 & o.c. 47. 1906, excl. syn. *I. cuspidata* Wight & Arn.; Gamble, FPM 141. 1915; Fyson, FSIHS 91. t. 69. 1932; Vivek. *et al.* in Hajra *et al.*, Fl. Ind. 4: 169. 1997; Matthew, Ill. FPH. t. 101. & FPH 173. 1999.

Erect shrubs. Leaves alternate, subopposite or whorled, crowded at apex, to 8 x 2.5 cm, ovate-lanceolate, apex caudate-acuminate, crenate-serrate, membranous. Flowers solitary, binate or in fascicles, white or purple; lateral sepals ovate; lip cymbiform;

spur 15 mm long, slightly incurved; standard larger than wings. Capsule 2 cm long, ellipsoid; seeds obovoid.

Fl. & Fr.: July-September

Distr.: Endemic to Southern Western Ghats. Occasional; found in moist, rocky regions at low altitudes. ENP, Rajamala, *KKK 31142.*

Impatiens modesta Wight, Madras J. Lit. Sci. ser. 1. 5: 13. 1837 & Ic. t. 968. 1844; Hook f., FBI 1: 442. 1874; Gamble, FPM 138. 1915; Fyson, FSIHS 83. t. 57. 1932; Vivek. *et al.* in Hajra *et al.*, Fl. Ind. 4: 182. 1997.

Stemless herbs. Leaves to 4 x 5 cm, broadly ovate, base cordate, apex acute, serrate, pubescent below. Scapes to 20 cm long. Flowers 8-9 mm across, confined to the tip of the scape; lip 4 x 2.5 mm, ovate, obtuse; spur 4 mm long, straight, cylindrical; sepals 2 x 1 mm, ovate; standard 3.5 x 4 mm, broadly ovate, obtuse, glabrous, entire; wing lobes subequal, oblong, obtuse. Capsule not seen.

Fl.: June

Distr.: Endemic to Southern Western Ghats. Occasional; as lithophyte or epiphytes in shady regions at medium altitudes. ENP, Rajamala, *KKK 31091.*

Impatiens munronii Wight, Ill. Ind. Bot. 1: 160. 1840 & Ic. t. 1049. 1846; Hook. f., FBI 1: 456. 1874; Fyson, FSIHS 92. 1932; Vivek. *et al.* in Hajra *et al.*, Fl. Ind. 4: 183. 1997.

Under shrubs. Leaves alternate, to 7 x 3 cm, elliptic, apex acuminate, shallowly serrate, scaly tomentose. Flowers white, with rosy tinge in centre, axillary, solitary; lip cymbiform; spur 1 cm long, incurved, yellow, tomentose; lateral sepals ovate, cuspidate, small; standard cucullate, small, hairy; wings small, bilobed, lobes ovate-oblong; ovary elliptic. Fruits not seen.

Fl.: December

Distr.: Endemic to Southern Western Ghats. Fairly common along shola borders at medium altitudes. MS, K-7, *KKK 18140.*

Note: New record to Kerala. So far reported from Tamil Nadu only (Hajra *et al.*, 1997).

Impatiens parasitica Bedd., Madras J. Lit. Sci. ser. 2. 20: 66. t. 7. f. 2. 1859 & Ic. t. 140. 1868-1874; Gamble, FPM 139. 1915; Vivek. *et al.* in Hajra *et al.*, Fl. Ind. 4: 191. 1997. *I. jerdoniae* Wight var. *parasitica* (Bedd.) Hook. f., FBI 1: 460. 1874. **Plate 4.2.5.**

Epiphytic perennial herbs, to 30 cm higher. Leaves alternate, fascicled at the ends of branches, 4 x 3 cm, ovate, apex acuminate, margins shallowly crenate. Umbels few flowered, terminal. Flowers yellowish green; lip scarlet, 2 x 0.5 cm, trumpet shaped; lateral sepals 10 x 3 mm, elliptic-acuminate; standard 8 x 14 mm, hood shaped; wings 10 x 8, bilobed, conical; ovary elliptic. Capsule to 15 x 4 mm, ellipsoid.

Fl. & Fr.: October-December

Distr.: Endemic to Southern Western Ghats. Rare; found on tree trunks along stream sides at higher altitudes. ENP, Amarachola, *KKK 18004.*

Impatiens parvifolia Bedd., Madras J. Lit. Sci. ser. 2. 20: 66. t. 7. f. 1. 1859 & Ic. t. 29, t. 142. 1868-74; Hook. f., FBI 1: 453. 1874; Gamble, FPM 144. 1915; Vivek. *et al.*

in Hajra *et al.*, Fl. Ind. 4: 191. 1997. *I. omissa* Hook. f., Rec. Bot. Surv. India 4: 48. 1906; Fyson, FSIHS 95. 1932.

Herbs to 20 cm tall. Leaves to 1.5 x 1 cm, elliptic, apex acute, serrate. Flowers pale pink with crimson blotches; peduncles 1 flowered; lip to 4 x 6 mm, boat shaped, acute, cuspidate; spur 4 x 1 mm, cylindric, curved; lateral sepals 2 x 1 mm, acute; standard 3 x 4 mm, orbicular; wings 8 x 4 mm, unequally 3 lobed; dorsal auricle produced into the spur; ovary 2 x 1 mm, elliptic-acuminate. Capsule ellipsoid.

Fl. & Fr.: September-December

Distr.: Endemic to Southern Western Ghats. Occasionally found on wet rocks along stream sides. ENP, Amarachola, *KKK 18014.*

Note: The present collection is a new record to Kerala.

Impatiens phoenicea Bedd., Madras J. Lit. Sci. ser. 2. 19: 175. 1858 & Ic. t. 30. t. 148. 1868-74; Hook. f., FBI 1: 466. 1875; Fyson, FSIHS 96. t. 76. 1932; Vivek. *et al.* in Hajra *et al.*, Fl. Ind. 4: 193. 1997; Matthew, FPH t. 103. 1996 & FPH 175. 1999 **Thottachinungi. Plate 4.2.6.**

Erect suffruticose herb, to 45 cm. Leaves alternate, to 10 x 3 cm, elliptic, acute at both ends, serrate. Flowers scarlet red with yellow in center; lip tubiform, acuminate; spur 1.5 cm long, trumpet shaped, fully curved with swollen tip; lateral sepals 6 x 4 mm, ovate, acuminate; wings 2 lobed, unequal, terminal lobe oblong, lateral one cordate; standard cup shaped; ovary elliptic. Capsule elliptic, cuspidate.

Fl. & Fr.: May-August

Distr.: Endemic to Southern Western Ghats. Occasional in shola interiors along stream sides at medium and higher altitudes. MS, Idlimottai, *KKK 18160*; K-4, *KKK 16409*; Chengalar, *KKK 16535.*

Impatiens platyadena Fischer, Kew Bull. 1934: 393. 1934; Gamble, FPM 1871. 1936; Vivek. *et al.* in Hajra *et al.*, Fl. Ind. 4: 193. 1997.

Undershrubs. Leaves alternate, to 15 x 5 cm, elliptic-lanceolate, apex acuminate, crenate-serrate, petiole with 6-8 flattened green tipped white glands on margins. Racemes with drooping peduncles, to 4 cm long. Flowers 1.5 cm long; lateral sepals suborbicular, cream coloured; lip funnel shaped; spur tubular; standard 7 mm long, ovate; wings 15 mm long, distal lobes scarlet. Capsule 6 mm long, ovoid, acute.

Fl. & Fr.: July-October

Distr.: Endemic to Idukki District of Kerala State. Very rare and endangered; found along stream sides at medium altitudes. ENP, Nilagiri Teri, *KKK 31089.*

Notes: This species was considered *'possibly extinct'* by Ahmedullah & Nayar (1987) and Hajra *et al.* (1997). The present collection forms a rediscovery after the type collection by Barnes from the Nyamakkad gap of Idukki District during 1933. The species can be easily identified by the green tipped white glands on the petiole.

Impatiens tangachee Bedd., Madras J. Lit. Sci. ser. 2. 20: 66. 1859 & Ic. t. 30. t. 147. 1868-74; Hook. f., FBI 1: 467. 1875; Fyson, FSIHS 97. 1932; Vivek. *et al.* in Hajra *et al.*, Fl. Ind. 4: 215. 1997; Matthew, FPH 175. 1999. **Aattalanji. Plate 4.2.7.**

Procumbent herbs. Leaves alternate, crowded at apex, to 12 x 2 cm, oblanceolate, apex acuminate, shallowly serrate. Flowers bright rose; lip 8 mm long, shallowly cymbiform, apex mucronate, abruptly constricted to a 20 mm long, filiform spur; lateral sepals 5 x 2.5 mm, ovate, oblique, acuminate; standard petal cucullate; wings 2 lobed, terminal oblong-ovate, lateral ovate; ovary elliptic. Capsule elliptic-acuminate, glabrous.

Fl. & Fr.: December-February

Distr.: Endemic to Southern Western Ghats. Common; found as dense patches on rocks along stream sides at lower altitudes. MS, Thalachorkadavu, *KKK 16113.*

Impatiens tenella Heyne *ex* Hook. f., FBI 1: 47. 1874, incl. var. *brachycarpa* Hook. f.; Gamble, FPM 140. 1915; Fyson, FSIHS 87, t. 64. 1932; Vivek. *et al.* in Hajra *et al.*, Fl. Ind. 4: 215. 1997. *I. rosmarinifolia* Retz., Obs. Bot. 5: 29. 1789; Wight, Ic. t. 750. 1844. *I. debilis* Turcz., Bull. Soc. Imp. Natur. Moscow. 32 (1): 271. 1859; Hook. f. FBI 1: 483. 1875.

Erect slender herbs. Leaves subsessile, opposite, to 5 cm long, oblong or lanceolate, serrate. Flowers pink, solitary or fascicled; lateral sepals linear; standard short; wings sessile, distal lobes clawed; dorsal auricle small, decurved; spur shorter. Capsule 1 cm long, clavate, pointed at tip.

Fl. & Fr.: August-January

Distr.: Endemic to Southern Western Ghats. Rare; along roadsides at medium altitudes. ENP, Rajamala, *KKK 31092.*

Impatiens verticillata Wight, Madras J. Lit. Sci. ser. 1, 5: 15. 1837; Hook. f., FBI 1: 452. 1874; Gamble, FPM 144. 1915; Vivek. *et al.* in Hajra *et al.*, Fl. Ind. 4: 225. 1997.

Perennial herbs, to 30 cm tall; stem reddish. Leaves opposite and whorled, to 5 x 1 cm, elliptic-lanceolate, base attenuate, apex acuminate, shallowly serrate. Racemes sub-umbellate, 3-6 flowered. Flowers rosy pink; lip shallowly cymbiform, 1 cm long, abruptly constricted to 35 mm long, filiform spur; lateral sepals ovate-lanceolate; standard petal shallowly cucullate; wings 2 lobed; terminal lobe of wing oblong, ovate, lateral ones elliptic obovate; ovary glabrous. Fruits not seen.

Fl.: October-December

Distr.: Endemic to Southern Western Ghats. Occasionally found on wet rocks along streamside at higher altitudes. ENP, Bhiman Odai, *KKK 18027.*

Impatiens wightiana Bedd., Madras J. Lit. Sci. ser. 2. 20: 67. 1859 & Ic. t. 146. 1868-1874; Hook. f., FBI 1: 467. 1875; Gamble, FPM 145. 1915; Vivek. *et al.* in Hajra *et al.*, Fl. Ind. 4: 229. 1997. **Plate 4.2.8.**

Erect suffruticose herb, 20-90 cm; stem woody. Leaves to 8 x 3 cm, elliptic-acuminate, base acute; margins serrate. Racemes axillary. Flowers white, mottled with pink; lip 8 mm long, cymbiform, acuminate; spur trumphet shaped, incurved, tip bulbous; lateral sepals 6 x 3 mm, obliquely ovate, acuminate; wings 2 lobed, unequal; standard orbicular, dorsal auricle produced into spur; ovary elliptic-acuminate. Capsule 1 x 0.5 cm, elliptic-acuminate; seeds 2 x 2 mm, ovate.

Fl. & Fr.: June-October

Distr.: Endemic to Southern Western Ghats. Rare; in exposed regions and road sides at higher altitudes. MS, Gudalar road, *KKK 18598*. ENP, Mampallam, *KKK 18064*.

Impatiens sp. 1

Small herbs; stems pink, to 30 cm. Leaves opposite or alternate, to 4 x 2.5 cm, ovate-elliptic, serrate, nerves 3 pairs, base glabrous, except on nerves; petioles 1-3 cm. Flowers small, pink; peduncles 8-9 cm, glabrous; lip 3 x 2 cm, boat shaped, acute, cuspidate; lateral sepals 2 x 1 mm, acute; standard orbicular, wings 6 x 2 mm, 2 lobed; lobes equal, dorsal auricle slender, produced into 3 mm long, cylindric spur; ovary 1 mm long, elliptic. Capsule elliptic, acuminate.

Fl. & Fr.: September-December

Distr.: Occasional; along shola borders and roadsides at medium altitudes. MS, K-4, *KKK 16659*.

Note: Allied to *I. uncinata* Wight, but differ in the shape of spur.

21. RUTACEAE

1. Medium sized trees; leaves simple ..... **Acronychia**
1. Erect shrubs, stragglers or woody climbers; leaves simple or compound **2**
2. Erect shrubs, thorny or unarmed **3**
2. Stragglers or woody climbers, armed with recurved prickles **4**
3. Thorny shrubs ; leaves simple ..... **Atalantia**
3. Unarmed shrubs; leaves pinnately 3-5 foliolate ..... **Murraya**
4. Leaves trifoliolate only; fruit a drupe ..... **Toddalia**
4. Leaves usually 5-7 foliolate (rarely 3); fruit a capsule ..... **Zanthoxylum**

ACRONYCHIA J. R. Forster & G. Forster

Charact. Gen. 53, t. 27. 1776, *nom. cons.*

Acronychia pedunculata (L.) Miq., Fl. Ind. Bot. Suppl. 532. 1861; Nair & Nayar in Hajra *et al.*, Fl. Ind. 4: 392. 1997; Matthew, Ill. FPH t. 106. 1996 & FPH 179. 1999. *Jambolifera pedunculata* L., Sp. Pl. 349. 1753. *Acronychia laurifolia* Blume, Cat. Gen. Buitens. 63. 1823; Hook. f., FBI 1: 498. 1875; Gamble, FPM 152. 1915; Fyson, FSIHS 103. t. 79. 1932. *A. barberi* Gamble, Kew Bull. 1915: 345. 1915 & Gamble, FPM 152. 1915. **Veruku Theeni, Kari Maram, *Chakki Maram, Mavurinji* (EBIS).**

Leaves opposite, to 10 x 4 cm, elliptic, base cuneate, apex obtusely acute. Panicles axillary, cymose. Flowers cream yellow; sepals 4, 1 mm long, ovate, obtuse; petals 4, 6 x 2 mm, linear-oblong, apex obtuse; stamens 8, didynamous; ovary 3-4 mm long, 4 lobed, tomentose. Drupe 1-1.2 cm across, subglobose; seeds 2-4, ovoid.

Fl. & Fr.: February-August.

Distr.: Indo-Malesia. Common; at lower and medium altitudes. MS, K-4, *KKK 16167*; Chengalar, *KKK 16522*.

ATALANTIA Correa

Ann. Mus. Natl. Hist. Nat. 6: 383. 1805, *nom. cons.*

Atalantia wightii Tanaka, Bull. Soc. Bot. France 75: 714. 1928; Nair & Nayar in Hajra *et al.*, Fl. Ind. 4: 274. 1997; Matthew, Ill. FPH t. 107. 1996 & FPH 181. 1999. *A. ceylanica* sensu Hook. f., FBI 1: 512. 1875, non (Arn.) Oliver, 1861; Gamble, FPM 160. 1915. **Kattu Elumachan, Kara (EBIS).**

Leaves to 3 x 4 cm, elliptic or elliptic-lanceolate, base obtuse or rounded, apex acute, emarginate. Racemes axillary, 1.5 cm long. Flowers creamy white, aromatic; calyx deeply 4 lobed, lobes 1.5 mm long, ovate, acute, margins ciliate; petals 4, 7 x 4 mm, elliptic-ovate; stamens 8, free; ovary 2 x 1.5 mm, ovoid. Berries 1 mm across, ellipsoid, glandular, yellowish when ripe; seeds 2-4 oblong ellipsoid.

Fl. & Fr.: April-September.

Distr.: Endemic to Western Ghats. Rare; along shola borders at lower altitudes. MS, Chengalar, *KKK 16525.*

MURRAYA J. G. Koenig *ex* Linnaeus

Mant. 2: 554, 563. 1771 *nom. cons.*

Murraya paniculata (L.) Jack., Malay. Misc. 1(5): 31. 1820; Nair & Nayar in Hajra *et al.*, Fl. Ind. 4: 352. 1997; Matthew, FPH 187. 1999. *Chalcas paniculata* L., Mant. Alt. Pl. 1: 68. 1767 *"Murraea". Murraya exotica* L., Mant. Pl. 2: 563. 1771; Hook. f., FBI 1: 502. 1875; Gamble, FPM 155. 1915; Fyson, FSIHS 102. 1932. **Paanamar, Kattu Mulla, *Palakanni, Vellakkal Thirukan* (EBIS).**

Leaves alternate; leaflets 3-9 x 1-3 cm, terminal ones bigger, elliptic-acuminate or obovate, base acute to cuneate. Panicle axillary, few flowered. Flowers white, 3.5 mm across; calyx lobes 5, 1 mm long, deltoid, acute at apex; petals 5, to 20 x 7 mm, elliptic-oblong; stamens 10, 2 seriate; disk annular; ovary elliptic, 2 x 1.5 mm. Berry 20 x 8 mm, ellipsoid, end tapering, reddish when ripe; seeds 1 or 2, ellipsoid.

Fl. & Fr.: March-December.

Distr.: Indo-Malesia and Australia. Occasional; in disturbed sholas at lower altitudes. MS, Thalachorkadavu, *KKK 16731*; K-3, *KKK 18151*; Chengalar, *KKK 17673.*

TODDALIA A. L. Jussieu

Gen. 371. 1789, *nom. cons.*

Toddalia asiatica (L.) Lam., Tabl. Encycl. 2: 116. 1797; Gamble, FPM 150. 1915; Fyson, FSIHS 100. t. 78. 1932; Nair & Nayar in Hajra *et al.*, Fl. Ind. 4: 403. 1997. *Paullinia asiatica* L., Sp. Pl. 365. 1753, *typ. cons. Toddalia aculeata* (Smith) Pers., Syn. Pl. 1: 249. 1805, *nom. superfl.*; Hook. f., FBI 1: 497. 1875. *Scopalia aculeata* Smith, Pl. Ic. Hact. ed. 1, 2: t. 34. 1790. *nom.superfl. Toddalia floribunda* Wall. Pl. As. Rar. 3: 17, t. 232. 1832. *T. asiatica* (L.) Lam. var. *floribunda* (Wall.) Kurz in J. Asiat. Soc. Bengal pt. 2, Nat. Hist. 44. 130. 1875; Gamble FPM 151. 1915; Matthew, FPH 189. 1999. *T. asiatica* (L.) Lam. var. *gracilis* Gamble, l.c. *T. asiatica* (L.) Lam. var. *obtusifolia* Gamble, *l.c.*, 151. 1915. **Kantha Mullu, Kantham Kolunthu, Kurangu Mullu (EBIS).**

Leaflets to 9 x 4.5 cm, variable, elliptic-obovate, apex obtuse or obtusely acute, entire or crenulate. Panicles axillary or terminal. Flowers creamy white; sepals 4 or 5, lobes triangular in male flowers, broadly deltoid in females; petals 4 or 5, oblong; stamens 5; ovary subglobose, gland dotted. Drupes 10 x 12 mm across, depressed-globose, orange when ripe; seeds, 6 x 4 mm, reniform, brownish-black, shiny.

Fl. & Fr.: February-June

Distr.: Indo-Malesia and Africa. Fairly common; found along shola edges at lower and medium altitudes. MS, Thalachorkadacu, *KKK 16044*. ENP, Mampallam Chola, *KKK 17555*. PAS, Vandaravu, *KKK 18194*.

Note: Matthew (1999) has segregated two varieties for this species. But here they are treated as single, following Nair & Nayar (1997).

ZANTHOXYLUM Linnaeus

Sp. Pl. 270. 1753.

Zanthoxylum tetraspermum Wight & Arn., Prodr. 1: 148. 1834; Hook. f., FBI 1: 494. 1875; Gamble, FPM 150. 1915; Fyson, FSIHS 99. 1932 *'Xanthoxylum'*; Babu, Bull. Bot. Surv. India 16(1-4): 63. 1974; Nair & Nayar in Hajra *et al.*, Fl. Ind. 4: 389. 1997. *Fagara tetrasperma* (Wight & Arn.) Engl. in Engl. & Prantl, Nat. Pflanzenfam. 3(4): 118. 1897. **Kokki Mullu (EBIS).**

Leaves alternate; petiole and rachis prickly; leaflets 5-9 x 2-5 cm, ovate to elliptic-oblong, base rounded, apex retuse, sinuate-crenate. Panicles 6-10 cm long. Flowers unisexual, 4-merous; sepals 1 mm long, ovate-deltoid, acute; petals 3 x 2 mm, ovate-elliptic, obtuse; ovary ovoid. Capsule to 8 mm across; seeds 4 mm across, suborbicular, discoid, black.

Fl. & Fr.: June-August

Distr.: South India and Sri Lanka. Rare; along stream sides at lower and medium altitudes. MS, K-4, *KKK 16545*.

22. MELIACEAE

1. Shrubs to small trees; fruit a berry or drupe **2**
1. Medium to large trees; fruit a capsule **3**
2. Small trees; young parts covered with brown fimbriate scales ..... **Aglaia**
2. Shrubs; young parts silky pubescent ..... **Cipadessa**
3. Large trees; seeds more than 10, winged ..... **Chukrasia**
3. Medium sized trees; seeds to 10, wingless ..... **Trichilia**

AGLAIA Loureiro

Fl. Cochinch.173. 1790, *nom. cons.*

Aglaia apiocarpa (Thw.) Hiern in Hook. f., FBI 1: 555. 1875; Pannell, Kew Bull. (Add. ser. XVI) 173. 1992; Jain & Bennet in Hajra *et al.*, Fl. Ind. 4: 456. 1997. *Milnea apiocarpa* Thw., Enum. Pl. Zeyl. 60. 1858. **Plate 4.3.1.**

Leaves 3-5 foliolate; leaflets opposite, to 12 x 4 cm, elliptic or oblanceolate, base cuneate, apex acuminate. Panicles 6-8 cm long, axillary, densely rusty-lepidote;

Flowers unisexual; calyx 1 mm long, 5 lobed, lobes obtuse; petals 2 x 1.5 mm, oblong, thick; anthers 5; ovary globose. Berry 2 x 1.5 cm subglobose, densely scaly.

Fl. & Fr.: March-August

Distr.: South India and Sri Lanka. Rare; in the shola borders at medium altitudes. MS, K-6, *KKK 17614*.

Note: New record to Kerala. So far reported from Tamil Nadu only (Hajra *et al.*, 1997).

CHUKRASIA A. Jussieu

Mem. Mus. Hist. Nat. 19. 251. 1830.

Chukrasia tabularis A. Juss., Mem. Mus. Hist. Nat. 19: 251, t. 22. 1830; Hiern in Hook. f., FBI 1: 568. 1875; Gamble, FPM 186. 1915; Jain & Bennet in Hajra *et al.*, Fl. Ind. 4: 481. 1997; Matthew, FPH 201. 1999. **Chandana Vembu, Vella Nangu (EBIS).**

Leaves to 30 cm long; leaflets to 5 pairs, subopposite, to 13 x 6 cm, ovate, base sharply unequal, apex acute. Panicles terminal. Flowers yellowish-white; calyx 6 mm across, campanulate; petals 5-6, 10 mm long, oblong; staminal tube cylindrical, anthers 10; ovary densely hairy. Capsule, 5 x 4 cm, 4-5-valved, glabrous.

Fl. & Fr.: January-February

Distr.: Indo-Malesia. Rare; in low altitude sholas. MS, Thalachorkadavu, *KKK 31095*.

CIPADESSA Blume

Bijdr. 162. 1825.

Cipadessa baccifera (Roth) Miq., Ann. Mus. Bot. Lugd.-Bat. 4: 6. 1868; Gamble, FPM 176. 1915; Fyson, FSIHS 103. 1932; Jain & Bennet in Hajra *et al.*, Fl. Ind. 4: 482. 1997; Matthew, FPH 201. 1999. *Melia baccifera* Roth, Nov. Pl. Sp. 215. 1821. *Cipadessa fruticosa* Blume, Bijdr. 162. 1825; Hiern in Hook. f., FBI 1: 545. 1875. **Potti (EBIS).**

Leaflets 7-13, opposite, to 8 x 4 cm, elliptic, base acute to cuneate, apex acuminate, entire or coarsely serrate. Panicles 10-12 cm long. Flowers white; calyx lobes 5, 1 mm long, obtuse; petals 3 x 1 mm, oblong; stamens 10; ovary truncate. Drupes 5 mm across, globose, reddish; seeds 3 x 1.5 mm, reniform.

Fl. & Fr.: Throughout the year

Distr.: Indo-Malesia. Common along shola borders at lower and medium altitudes. MS, Gudalar, *KKK 16086*; K-3, *KKK 16473*.

TRICHILIA P. Browne

Civ. Nat. Hist. Jamaica 278. 1756, *typ. cons.*

Trichilia connaroides (Wight & Arn.) Bentv., Acta Bot. Neerl. 11: 13. 1962; Jain & Bennet in Hajra *et al.*, Fl. Ind. 4: 515. 1997; Matthew, FPH 203. 1999. *Zanthoxylum connaroides* Wight & Arn., Prodr. 148. 1834, "*Zanthoxylon*". *Walsura trijuga* (Sims) Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 44: 148. 1875. *Heynea trijuga* sensu Roxb. *ex* Sims, Bot. Mag. 41: t. 1738. 1815; Hiern in Hook. f., FBI 1: 565. 1872; Gamble, FPM 183. 1915; Fyson, FSIHS 104. t. 80. 1932. **Karimaram, Pili Maram, Dedumbu, *Kozhipenali* (EBIS).**

Leaves crowded at tip, 20-30 cm long; leaflets 7-9, to 10 x 4 cm, ovate or ovate-oblong, base oblique, apex acuminate. Panicle corymbose, to 25 cm long. Flowers pale cream; calyx 5 lobed, pubescent; petals 5, 3 x 1 mm, oblong; anthers 10; ovary globose. Capsule 1.3 cm across, globose, red; seeds globose.

Fl. & Fr.: April-October.

Distr.: Indo-Malesia. Occasionally found along shola borders at lower altitudes. MS, Puthur, *KKK 16716*; Thalachorkadavu, *KKK 17670.*

23. ICACINACEAE

1. Petals connate into a tube; flowers in axillary cymes ..... **Gomphandra**
1. Petals free; flowers in terminal panicles **4**
2. Petals densely hairy within; filaments adnate to corolla ..... **Nothapodytes**
2. Petals glabrous; filaments free ..... **Apodytes**

APODYTES E. Meyer *ex* Arnott

Hooker's J. Bot. 3: 155. 1840.

Apodytes dimidiata E. Meyer *ex* Arn., Hook. J. Bot. 3: 155. 1840; Matthew, Suppl. Ill. FPH t. 967. 1998 & FPH 207. 1999; Mathur in Singh *et al.,* Fl. Ind. 5: 18. 2000. *Apodytes beddomei* Mast. in Hook. f., FBI 1: 588. 1875; Gamble, FPM 195. 1915. *A. benthamiana* Wight, Ic. t. 1153. 1846; Mast. in Hook. f. FBI 1: 588. 1875.

Trees, to 20 m higher. Leaves to 10 x 4 cm, oblong. Panicles 3-5 cm across; calyx cupular, 5-toothed; petals 5 x 1.5 mm, oblong, acute; stamens 5, filaments broadened at base; ovary oblique, gibbous at base, 1-celled; stigma oblique. Drupe ellipsoid, 1-seeded.

Fl. & Fr.: March-May

Distr.: Africa, eastward to Asia and Australia. Rare; in lower and medium altitude sholas. ENP, Umayamala, *KKK 17539.*

GOMPHANDRA Wallich *ex* Lindley

Nat. Syst. ed. 2, 439. 1876.

Gomphandra coriacea Wight, Ill. 1: 103. 1840; Bedd., Ic. t. 61. 1868-1874; Gamble, FPM 195. 1915; Fyson, FSIHS 107. t. 82. 1932; Matthew, Ill. FPH t. 114. 1996 & FPH 209. 1999; Mathur in Singh *et al.,* Fl. Ind. 5: 22. 2000. *G. polymorpha* Wight, Ill. 1: 103. 1840, p.p. & Ic. tt. 953, 954. 1843; Mast. in Hook. f., FBI 1: 586. 1875. **Chotta, Shotta, *Chakki Maram* (EBIS) Plate 4.3.2.**

Trees to10 m tall; branchlets brown. Leaves to 12 x 5 cm, elliptic, base acute to rounded, apex abruptly acuminate. Cymes peduncled. Flowers 5-9 together; calyx cup truncate; corolla 4 mm long; lobes acute; pistillode in male flowers pubescent. Drupe 15 x 8 mm, oblong, terete.

Fl. & Fr.: August-November

Distr.: Endemic to Western Ghats. Common; in lower and medium altitude sholas. MS, K-4, *KKK 16776*; K-5, *KKK 16501.* VMS, *KKK 31080.*

NOTHAPODYTES Blume

Mus. Bot. Lugd.-Bat. 1: 248. 1850.

Nothapodytes nimmoniana (Grah.) Mabber. in Manilal, Bot. Hist. Hort. Malab. 88. 1980; Matthew, Ill. FPH t. 115. 1996 & FPH 209. 1999; Mathur in Singh *et al.*, Fl. Ind. 5: 31. 2000. *Premna nimmoniana* Grah., Cat. Pl. Bombay 155. 1839. *Stemonurus foetidus* Wight, Ic. t. 955. 1845. *Mappia foetida* (Wight) Miers, Ann. Mag. Nat. Hist. (Ser. 2) 9: 395. 1852; Mast. in Hook. f., FBI 1: 589. 1875; Gamble, FPM 196. 1915; Fyson, FSIHS 106. t. 81. 1932. *Nothapodytes foetida* (Wight) Sleumer, Notizbl. Bot. Gart. Berlin-Dahlem 15: 247. 1940 & Blumea 17: 232. 1969. **Pulippacha.**

Small trees. Leaves to 17 x 9 cm, broadly ovate or elliptic, apex acuminate, base unequal. Flowers creamy yellow, foul smelling; calyx cupular, 1 mm long, 5-lobed; petals connate, apex inflexed; stamens 5, filaments as long as petals; staminodes 5, hairy; ovary 1-celled, hairy. Drupe 8 x 4 mm, oblong, reddish-brown, glabrous.

Fl. & Fr.: November-March

Distr.: Indo-Malesia and China. Occasionally found in the ecotones of lower and medium altitude sholas. MS, Idlimottai, *KKK 17595.* ENP, Mampallam Chola, *KKK 17554*; Amara Chola, *KKK 18071.* PUS, *KKK 18572.*

Note: Mathur (2000) has treated *Mappia oblonga, M. wightiana, M. tomentosa* and *M. ovata* as synonymous to this species.

24. AQUIFOLIACEAE

ILEX Linnaeus

Sp. Pl. 125. 1753

1. Leaf margins denticulate ..... **I. denticulata**
1. Leaf margins entire **2**
2. Large trees; flowers 6 merous ..... **I. malabarica**
2. Small or medium sized trees; flowers 5 merous **3**
3. Leaves mucronate or emarginate at apex; umbellules sessile ..... **I. walkeri**
3. Leaves acuminate at apex; umbellules subsessile ..... **I. wightiana**

Ilex denticulata Wall. *ex* Wight, Ill. Ind. Bot. t. 149. 1850; Hook. f., FBI 1: 600. 1875; Gamble, FPM 200. 1915; Fyson, FSIHS 108. t. 83. 1932; Matthew, FPH 211. 1999; Basu in Singh *et al.*, Fl. Ind. 5: 53. 2000. **Noola.**

Medium sized trees. Leaves 3.5-7 x 2-4 cm, elliptic, apex acuminate, denticulate-serrate. Flowers dioecious, tetramerous, 8-10 together; sepals ovate; petals 4 x 2 mm, ovate, obtuse; filaments 2 mm long; ovary 4 celled, free. Drupe 8 mm across, glabrous, red when ripe.

Fl. & Fr.: March-May

Distr.: Peninsular India, Sri Lanka and China. Common; along shola borders at higher altitudes. MS, Idlimottai, *KKK 16029*; *KKK 17601*; *KKK 18165* & *KKK 18175.*

Ilex malabarica Bedd., Fl. Sylv. t. 143. 1871; Hook. f., FBI 1: 600. 1875; Gamble, FPM 200. 1915; Basu in Singh *et al.*, Fl. Ind. 5: 63. 2000. **Aattu Njaval.**

Large trees. Leaves 3-10 x 1-2.5 cm, lanceolate, acute at both ends. Flowers in shortly peduncled cymes or umbels; sepals 1.5 x 1.5 mm, ovate, acute, ciliate; petals 3 x 2 mm, oblong, obtuse; anthers 1.5 x 1 mm, sagittate at base; ovary 4 celled; stigma stipitate, 3-4 furcated. Drupe globose.

Fl. & Fr.: March-May.

Distr.: Endemic to Western Ghats. Common; along streamside at lower altitudes. MS, Thalachorkadavu, *KKK 16033* & *KKK 18150.*

Note: The present collection is a new record to Kerala.

Ilex walkeri Wight & Gard. *ex* Thw., Enum Pl. Zeyl. 184. 1860; Hook. f., FBI 1: 600. 1875, p.p. Basu in Singh *et al.*, Fl. Ind. 5: 72. 2000. *I. thwaitesii* Loes. *ex* Gamble, Gamble, FPM 200. 1915. **Noola (EBIS). Plate 6.5.3.**

Medium sized trees. Leaves 3-6 x 1.5-3 cm, elliptic-obovate, apex mucronate or emarginate, pale beneath. Flowers in sessile umbellules; pedicel 1 cm; corolla rotate; ovary 5 celled. Drupe 5 mm across, red when ripe.

Fl. & Fr.: March-May.

Distr.: India and Sri Lanka. Common along shola borders and streamside at higher altitudes. MS, Methappu, *KKK 16013*; Idlimottai, *KKK 17632.* ENP, Estate border, *KKK 17655.*

Ilex wightiana Wall. *ex* Wight, Ic. t. 1216. 1848, var. **peninsularis** Hook. f., FBI 1: 603. 1875; Matthew, Ill. FPH t. 118. 1996 & FPH 211. 1999; Basu in Singh *et al.*, Fl. Ind. 5: 73. 2000. **Aattu Njaval, *Parasal* (EBIS).**

Small trees. Leaves 3-6 x 1.5-3 cm, elliptic, base narrowed, apex acuminate, midrib slightly impressed, highly coriaceous. Flowers 5 mm across, in sub-sessile umbellules; sepals ovate, acute, ciliate; petals 2 x 1 mm, oblong; ovary 4 celled. Drupe red.

Fl. & Fr.: March-May.

Distr.: Peninsular India and Sri Lanka. Common along shola borders and streamside at all altitudes. MS, K-4, *KKK 16486.* ENP, Mampallam Chola, *KKK 17556*; Anamudi, *KKK 18537.*

25. CELASTRACEAE

1. Large trees; leaves alternate ..... **Bhesa**
1. Small trees; leaves usually opposite **2**
2. Flowers in axillary clusters ..... **Microtropis**
2. Flowers in cymose panicles ..... **Euonymus**

BHESA Hamilton *ex* Arnott

Edinburgh New Philos. J. 16: 315. 1834.

Bhesa indica (Bedd.) Ding Hou, Blumea Suppl. 4: 152. 1958; Ramamurthy in Singh *et al.*, Fl. Ind. 5: 77. 2000. *Trochisandra indica* Bedd., Fl. Sylv. t. 120. 1872. *Kurrimia bipartita* Lawson in Hook. f., FBI 1: 622. 1875. *K. indica* (Bedd.) Gamble, FPM 207. 1918. *K. paniculata* sensu Lawson in Hook. f., FBI 1: 622. 1875 p.p. **Penali (EBIS) Plate 4.3.3.**

Leaves to 16 x 8 cm, elliptic obtuse, coriaceous, nerves parallel. Panicle rosy red, axillary, on terminal branches; calyx 5 lobed, free; petals 3 x 1 mm, oblong, deflexed; stamens 5, filaments united at base; ovary 2 celled. Capsule brown, leathery, 2 valved; one seed in each lobe; one lobe frequently abortive.

Fl. & Fr.: March-April.

Distr.: Indo-Malesia. Common in lower and medium altitude sholas. MS, K-4.5, *KKK 18149.*

EUONYMUS Linnaeus

Sp. Pl. 197. 1753, *orth. cons.*

Euonymus crenulatus Wall. *ex* Wight & Arn., Prodr. 161. 1834; Wight, Ic. t. 973. 1845; Lawson in Hook. f., FBI 1: 608. 1875; Gamble, FPM 203. 1918; Fyson, FSIHS 110. t. 85. 1932; Matthew, Ill. FPH t. 123. 1996 & FPH 219; Ramamurthy in Singh *et al.*, Fl. Ind. 5: 97. 2000.

Leaves often 3 at a node, to 8 x 4.5 cm, elliptic, rarely ovate, acute at both ends, coriaceous. Flowers 3-7 in a panicle; peduncles often in pairs in the upper leaf axils; sepals rounded; petals 5 x 5 mm, obovate, purplish brown; stamens 5; ovary sunk in the fleshy disc; stigma 5 lobed. Capsule 5 celled, valves slightly obcordate.

Fl. & Fr.: February-October.

Distr.: Endemic to Southern Western Ghats. Occasional; along shola borders at higher altitudes. ENP, Umayamala, *KKK 18008*; Anamudi slope, *KKK 18545.*

MICROTROPIS Wallich *ex* Meisner

Gen. 1: 68. 1837, *nom cons.*

Microtropis ramiflora Wight, Ic. t. 977. 1845; Lawson in Hook. f., FBI 1: 613. 1875; Gamble, FPM 207. 1918; Fyson, FSIHS 112. t. 86. 1932; Matthew, Ill. FPH t. 127. 1996 & FPH 221. 1999; Ramamurthy in Singh *et al.*, Fl. Ind. 5: 131. 2000. **Plate 4.4.1.**

Leaves 8 x 5 mm, broadly elliptic or obovate, rounded at both ends, coriaceous, margins revolute. Flowers cream, 5 mm across; sepals 5, 4 x 3 mm, obovate, margins scarious; petals 3.5 x 2.5 mm, obovate; stamens 5; ovary free, ovoid. Capsule 20 x 8 cm, oblong, beaked, 2 valved, brown; seeds 15 x 5 mm, oblong.

Fl. & Fr.: February-October.

Distr.: Peninsular India and Sri Lanka. Common; found along shola borders at higher altitudes. MS, Idlimottai, *KKK 17588.* ENP, Umaya mala, *KKK 17534*; Bhiman odai, *KKK 18037.* VMS, *KKK 31135.*

26. RHAMNACEAE

1. Leaves alternate; 3-5 ribbed from base ..... **Ziziphus**
1. Leaves alternate or subopposite; penninerved **2**
2. Unarmed shrubs; flowers in axillary fascicles ..... **Rhamnus**
2. Straggling shrubs with large recurved thorns; flowers in spicate panicles ..... **Sageretia**

RHAMNUS Linnaeus

Sp. Pl. 193. 1753

Rhamnus wightii Wight & Arn., Prodr. 1: 164. 1834; Wight, Ic. t. 159. 1839; Lawson in Hook. f. FBI 1: 639. 1875; Gamble, FPM 222. 1915; Fyson, FSIHS 120. t. 92. 1932; Matthew, Ill. FPH t. 131. 1996 & FPH 228. 1999; Bhandari & Bhansali in Singh *et al.*, Fl. Ind. 5: 197. 2000. **Kokkuvalli.**

Leaves to 10 x 4 cm, elliptic or elliptic-oblong, base acute or rounded, apex acuminate, serrate. Flowers 3-5 mm across; sepals 5, 3 mm across, triangular; petals 5, flat; stamens 5; ovary globose, 3 celled. Drupe 6-7 mm across, globose, beaked, purple; pyrenes 2-4; seeds 5 x 3 mm, obovoid, brown.

Fl. & Fr.: August-December.

Distr.: Peninsular India, Sri Lanka and Nepal. Rare; found along shola margins at higher altitudes. MS, Methappu, *KKK 17699.*

Note: The present collection is a new record to Kerala.

SAGERETIA A. T. Brongniart

Ann. Sci. Nat. 10: 359. 1827.

Sageretia hamosa (Wall.) Brongn., Mem. Fam. Rham. 53. 1826 & in Ann. Sci. Nat. Bot. Ser. 1, 10: 360. 1827; Lawson in Hook. f., FBI 1: 641. 1875; Gamble, FPM 223. 1918; Nayar, Thoth. & Sanj., Fl. Ind. Fasc. 20: 63. 1990; Matthew, Ill. FPH t. 132. 1996 & FPH 228. 1999; Bhandari & Bhansali in Singh *et al.*, Fl. Ind. 5: 200. 2000. **Kokki Mullu.**

Leaves to 12 x 6 cm, elliptic-oblong, base rounded, apex bluntly acuminate, serrulate. Panicle to 10 x 6 cm, pubescent. Flowers 2.5 mm across, greenish-white, sessile; sepals 5, 2 x 1 mm, ovate, connate at base; petals 5, 1 x 0.5 mm, ovate, concave and clawed, stamens 5, free; ovary 3-celled. Drupe 6 mm across, globose.

Fl. & Fr.: August-January.

Distr.: India, Sri Lanka, Nepal and Taiwan. Occasional; in disturbed low altitude shola regions. MS, Thalachorkadavu, *KKK 31096.*

ZIZIPHUS P. Miller

Gard. Dict. Abr. ed. 4. 1754.

Zizyphus rugosa Lam., Encycl. 3: 319. 1789; Lawson in Hook. f., FBI 1: 636. 1875; Gamble, FPM 221. 1918; Fyson, FSIHS 117. t. 90. 1932; Nayar, Thoth. & Sanj., Fl. Ind. Fasc. 20: 108. 1990; Matthew, FPH 232. 1999; Bhandari & Bhansali in Singh *et al.*, Fl. Ind. 5: 240. 2000. **Kotta Mullu (EBIS).**

Leaves to 10 x 6 cm, elliptic, closely serrate, densely brownish tomentose below. Inflorescence a cymose panicle. Flowers 5 mm across, greenish yellow; sepals 5, 2.5 x 1.5 mm, triangular, tomentose; petals absent; anthers 2 mm long; ovary 1 mm long, ovoid, tomentose. Drupe 7 mm across, ovoid, glabrous.

Fl. & Fr.: March-May

Distr.: South Asia. Occasional; along shola borders at lower altitudes. MS, Thalachorkadavu, *KKK 17663.*

27. VITACEAE

1. Flowers pentamerous ..... **Parthenocissus**
1. Flowers tetramerous **2**
2. Stem tuberculate; flowers polygamous; seeds deeply furrowed ..... **Tetrastigma**
2. Stem not tuberculate; flowers bisexual; seeds deeply pitted ..... **Cayratia**

CAYRATIA A. L. Jussieu

Dict. Sci. Nat.10: 103. 1818, *nom. cons.*

Cayratia pedata (Lam.) Juss. *ex* Gagnep. in Lecomte, Notul. Syst. (Paris) 1: 346. 1911; Gamble, FPM 236. 1915; Fyson, FSIHS 125. t. 97. 1932; Matthew, FPH 237. 1999; Shetty & Singh in Singh *et al.*, Fl. Ind. 5: 271. 2000. *Cissus pedata* Lam., Encycl. 1: 31. 1783. *Vitis pedata* (Lam.) Wall. *ex* Wight, Cat. 26. 1833 & Wight & Arn., Prodr. 128. 1834; Lawson in Hook. f., FBI 1: 661. 1875.

Large vines; tendrils leaf opposed. Leaves pedately 5-7 foliolate; leaflets to 18 x 8 cm, elliptic-lanceolate, base oblique rounded, apex acuminate, margin crenate. Corymbs axillary; calyx cupular, obscurely 4 lobed; petals hood shaped; ovary 2 celled. Berry globose, 2 seeded, beaked; seeds 6 x 6 mm, rugose.

Fl. & Fr.: December-February.

Distr.: Indo-Malesia. Common along steam sides and shola borders at lower altitudes. MS, Chengalar, *KKK 18094.*

PARTHENOCISSUS Planchon

in Alph. de Candolle *et* A. C. de Candolle, Monogr. Phan. 5: 447. 1887, *nom. cons.*

Parthenocissus semicordata (Wall.) Planch. in DC. Monogr. Phan. 5: 451. 1887; Shetty & Singh in Singh *et al.*, Fl. Ind. 5: 302. 2000. *Vitis semicordata* Wall. in Roxb., Fl. Ind. 2: 481. 1824. *Ampelopsis himalayana* Royle, Ill. Himal. Bot. 149. 1835. *V. himalayana* (Royle) Brandis var. *semicordata* (Wall.) Lawson in Hook. f., FBI 1: 656. 1875. *Parthenocissus himalayana* (Royle) Planch. in DC. Monogr. Phan. 5: 450. 1887. *P. neilgherriensis* (Wight) Planch. in DC., Monogr. Phan. 5: 2. 1887; Gamble, FPM 231. 1918; Fyson, FSIHS 123. t. 96. 1932; Matthew, Ill. FPH t. 137. 1996 & FPH 240.1999. *Vitis neilgherriensis* Wight, Ic. t. 965. 1845. *V. anamalayana* Bedd. in Trans. Linn. Soc. London 25: 213. 1865-1866; Lawson in Hook. f., FBI 1: 656. 1875. **Plate 4.3.4.**

Lianas; bark thick furrowed; tendrils branched, with sticky tips. Leaves trifoliolate, subcoriaceous, middle leaflet obovate, lateral leaflets to 15 x 10 cm, obliquely ovate-acuminate, cuspidate-serrate. Cymes dichotomous, to 15 cm, ending in umbellules. Flowers bisexual, 4 mm wide; calyx tube cupular; petals to 3 x 1 mm, oblong, yellowish, fleshy, apically bifid; ovary ovoid, 2 celled. Berry 1-2 seeded.

Fl. & Fr.: August-September.

Distr.: India. Common in lower altitude shola regions. MS, K-4, *KKK 16534.*

TETRASTIGMA (Miquel) Planchon

in Alph. de Candolle *et* A. C. de Candolle, Monogr. Phan. 5: 320, 423. 1887

Tetrastigma nilagiricum (Miq.) B. V. Shetty, Kew Bull. 44: 477. 1989; Matthew, Ill. FPH t. 138. 1996 & FPH 241. 1999; Shetty & Singh in Singh *et al.*, Fl. Ind. 5: 315.

2000. *Cissus nilagirica* Miq., Linnaea 26: 221. 1854. *Vitis muricata* sensu Wight & Arn., Prodr. 128. 1834, non Wall., 1832; Wight, Ic, t. 740. 1844. *V. lanceolaria* sensu Lawson in Hook. f., FBI 1: 660. 1875 *p.p.*, non Wall., 1932. *Tetrastigma muricatum* sensu Gamble, FPM 229. 1918; Fyson, FSIHS 123. t. 95. 1932. **Pashala Kodi (EBIS).**

Lianas. Leaves trifoliolate, rarely 4, subcoriaceous; leaflets to 5 x 3 cm, obovate, base rounded, apex acute, margin distantly serrate. Cymes dichotomously corymbose; calyx cupular, 1 mm wide; petals 2 x 1 mm, lanceolate; disk persistent; ovary 2 celled. Berry to 1 cm across, globose, 2-4 seeded; seeds 7 mm across, pyriform.

Fl. & Fr.: July-August.

Distr.: South India and Sri Lanka. Common in the ecotones of lower altitude sholas. MS, Thalachorkadavu, *KKK 16037*; Conical patch, *KKK 16478.*

Note: The present collection is a new record to Kerala.

28. STAPHYLEACEAE

TURPINIA Ventenat

Mem. Cl. Sci. Math. Inst. Natl. France 1807(1): 3. 1807, *nom. cons.*

Turpinia cochinchinensis (Lour.) Merr., J. Arnold Arbor. 19: 43. 1938; Pant in Singh *et al.*, Fl. Ind. 5: 415. 2000. *Triceros cochinchinensis* Lour., Fl. Cochinch. 184. 1790. *Turpinia nepalensis* Wall. *ex* Wight & Arn., Prodr. 156. 1834; Wight, Ic. t. 972. 1845; Gamble, FPM 241. 1918; Fyson, FSIHS 126. t. 98. 1932; Matthew, Ill. FPH t. 144. 1996 & FPH 258. 1999. *T. pomifera* sensu Hiern in Hook. f., FBI 1: 698. 1895 p.p., non (Roxb.) DC., 1825. **Kanali (EBIS).**

Medium trees. Leaves to 20 cm; leaflets 3-5, to 10 x 5 cm, elliptic, apex acuminate, crenate-serrate. Panicles to 10 cm long. Flowers to 5 mm across, shortly pedicelled; sepals 1.5 mm long, ovate, obtuse; petals 3 mm long, ovate, acute. Berry globose, glabrous, with a knot at apex

Fl. & Fr.: February-April

Distr.: India, China and Sri Lanka. Common; along shola borders at all altitudes. MS, K-4, *KKK 16126*; K-5.5, *KKK 16156*; Conical patch, *KKK 16477*; Methappu, *KKK 16798.*

29. SAPINDACEAE

1. Shrubs to small trees; leaves simple ..... **Dodonaea**
1. Stragglers; leaves 3-foliolate ..... **Allophylus**

ALLOPHYLUS Linnaeus

Sp. Pl. 348. 1753

Allophylus concanicus Radlk., Sitzungsber. Math.-Phys. Cl. Koenigl. Bayer. Akad. Wiss. Muenchen 20: 230. 1890, var. **lanceolatus** Gamble, FPM 246. 1918; Mukh., Indian For. 496. 1972 & J. Econ. Tax. Bot. 1: 79. 1980; Matthew, Ill. FPH t. 140. 1996 & FPH 246. 1999.

Leaflets to 13 x 6 cm, lanceolate or oblanceolate, apex acuminate, serrate towards the apex; midrib pubescent; domatia hairy. Raceme branched, hispid. Flowers solitary or paired, 2 mm across; sepals orbicular, ciliate; petals 5 mm across, densely white hairy within; filaments hairy, reddish; disk lobes 4, globular. Fruits not seen.

Fl.: October-December

Distr.: Endemic to Southern Western Ghats. Occasionally found in lower altitude shola forest regions. MS, K-5, *KKK 31097.*

Note: New record to Kerala. Only the variety *concanicus* was reported from Kerala before, while *lanceolatus*, was considered endemic to Tamil Nadu (Pant, 2000).

DODONAEA P. Miller

Gard. Dict. Abr. ed. 4. 28. 1754.

Dodonaea angustifolia L. f., Suppl. Pl. 218. 1782. *D. viscosa* Jacq. var. *angustifolia* (L. f.) Benth., Fl. Austral 1: 476. 1863; Matthew, FPH 249. 1999. *D. viscosa* (L.) Jacq., Enum. Pl. Carib. 19. 1760 *p.p.*; Hiern in Hook. f., FBI 1: 697. 1875; Gamble, FPM 253. 1918; Fyson, FSIHS 128. t. 100. 1932; Mukherjee, J. Econ. Tax. Bot. 1: 80. 1980; Leenh., Blumea 28(2): 285. 1983. *Ptelea viscosa* L., Sp. Pl. 118. 1753. **Vrali (EBIS) Plate 5.3.1.**

Branchlets gland dotted, sap sticky. Leaves to 8 x 1.5 cm, elliptic-lanceolate, base attenuate, apex acute. Racemes 3-7 cm. Flowers polygamous; sepals 4, 3 x 2 mm, ovate, ciliate; petals absent; stamens 8, 2 x1 mm; pistillode minute; ovary globose, 2-4 celled. Capsule 1.5 x 2 cm, 3-4 winged; seeds 4 x 3 mm, discoid.

Fl. & Fr.: July-August

Distr.: Pantropical. Common along shola borders and grassland ecotones at lower altitudes. MS, K-6, *KKK 16474.*

30. SABIACEAE

MELIOSMA Blume

Cat. Buitensorg 10. 1823.

1. Leaves simple; panicles terminal and axillary 2
1. Leaves imparipinnate; panicles terminal ..... **M. pinnata** subsp. **barbulata**
2. Leaves, petioles and peduncles tomentose ..... **M. simplicifolia** subsp. **pungens**
2. Leaves, petioles and peduncles glabrous ..... **M. simplicifolia** subsp. **simplicifolia**

Meliosma pinnata (Roxb.) Maxim. Bull. Acad. Sci. St. Pet. Ser. 3. 12; 64 in Obs. 1867. subsp. **barbulata** (Cufod.) Beus. in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 3: 384. 1981; Nayar *et al.*, Fl. Ind. Fasc. 20: 120. 1990; Majumdar in Singh *et al.*, Fl. Ind. 5: 423. 2000. *Meliosma rhoifolia* Maxim., subsp. *barbulata* Cufod., Oest. Bot. Zeit. 88. 254. 1939. *Millingtonia pinnata* Roxb., Fl. Ind. 1: 103. 1820. *Millingtonia arnottiana* Wight, Ill. t. 53. 1840. *Meliosma arnottiana* (Wight) Walp., Repert. 1: 423. 1842; Hook. f., FBI 2: 6. 1876; Gamble, FPM 256. 1918; Fyson, FSIHS. 131. t. 102. 1932. **Thakiri (EBIS) Plate 4.3.5.**

Medium sized trees; branchlets thickly tomentose. Leaves 10-16 foliolate; leaflets opposite, to 13 x 3.5 cm, elliptic, apex acuminate, densely hairy. Panicles 30 cm across, densely tomentose. Flowers 4 mm across, sessile; sepals ovate, hairy; petals orbicular, pale yellow; ovary densely hairy. Drupe 7 mm across, globose.

Fl. & Fr.: May-August

Distr.: South East Asia. Common; in low altitude disturbed sholas. MS, K-3, *KKK 31003.*

Meliosma simplicifolia (Roxb.) Walp. Rep. 1: 103. 1842 subsp. **pungens** (Wall. *ex* Wight & Arn.) Beus., Blumea 19: 466. 1971; Matthew, FPH 260. 1999; Majumdar in Singh *et al.,* Fl. Ind. 5: 427. 2000. *Millingtonia pungens* Wall. *ex* Wight & Arn., Edinb. New Phil. J. 15: 178. 1833; Wight, Ic. t. 964/3. 1845. *Meliosma pungens* (Wall. *ex* Wight & Arn.) Walp. Rep. 1: 423. 1842; Hook. f., FBI 2: 4. 1876. *M. wightii* Planch. *ex* Brandis, For. Fl. 116. 1874; Hook. f., FBI 2: 4. 1876; Gamble, FPM 256. 1918; Fyson, FSIHS 130. t. 101. 1932.

Medium sized trees. Leaves to 16 x 6 cm, elliptic-lanceolate, apex acuminate. Flowers cream coloured; sepals 1 mm across, ovate, ciliate; petals 0.5 mm across, orbicular; stamens 2 fertile; ovary 0.5 mm, globose; style short. Fruit not seen.

Fl.: April.

Distr.: Indo-Malesia and China. Occasional found along shola borders at higher altitudes. ENP, Anamalai route, *KKK 17637.*

Meliosma simplicifolia (Roxb.) Walp. Rep. 1: 103. 1842, subsp. **simplicifolia**: Hook. f., FBI 2: 5. 1876; Gamble, FPM 256. 1918; Nayar, Thoth. & Sanj., Fl. Ind. Fasc. 20: 122. 1990; Majumdar in Singh *et al.,* Fl. Ind. 5: 427. 2000. *Millingtonia simplicifolia* Roxb., Pl. Corom. 3: 50. t. 254. 1820, *p.p.* **Kolakkatta, *Chengoini* (EBIS) Plate 4.3.6.**

Medium sized trees. Leaves to 20 x 8 cm, oblanceolate, apex acute, scabrid. Panicles to 20 x 12 cm, puberulous. Flowers white, 2 mm across; sepals ovate, ciliate; petals 1 mm across, orbicular; anthers globose; 3 sessile deformed; disk annular; ovary sessile, conical, 2 celled. Drupe 5 mm across, sub globose.

Fl. & Fr.: February-August.

Distr.: Indo-Malesia and China. Common along shola borders at lower altitudes. MS, Puthur, *KKK 16140*; Thalachorkadavu, *KKK 16567.*

31. ANACARDIACEAE

NOTHOPEGIA Blume

Mus. Bot. 1: 203. 1850, *nom. cons.*

1. Leaves lanceolate, acuminate; nerves 20 pairs; petiole slender ..... **N. beddomei**
1. Leaves obovate, bluntly apiculate; nerves to 15 pairs; petiole stout ..... **N. monadelpha**

Nothopegia beddomei Gamble, FPM 265. 1918 & in Kew Bull. 1918. 227. 1918; Chandra & Mukherjee in Singh *et al.,* Fl. Ind. 5: 473. 2000. *N. colebrookeana* (Wight) Blume, Mus. Bot. Lugd. Bot. 1: 203. 1850; Hook. f., FBI 2: 40. 1876, *p.p. Pegia colebrookeana* Wight, Ic. t. 230. 1839. p.p. **Era (EBIS).**

Small trees. Leaves to 12 x 4 cm; petiole 1 cm long. Racemes to 5 cm long, often paniculate; calyx 4 lobed; petals 4, 1 x 0.5 mm, oblong, glabrous; stamens 4, glabrous. Drupes 10 mm across, ovoid, deep purple.

Fl. & Fr.: March-July

Distr.: Southern Western Ghats of India & Sri Lanka. Occasional; in lower altitude shola regions. MS, K-3, *KKK 31099.*

Nothopegia monadelpha (Roxb.) Forman, Kew Bull. 53. 754. 1998; Chandra & Mukherjee in Singh *et al.,* Fl. Ind. 5: 474. 2000. *Blackburnia monadelpha* Roxb. Fl. Ind. 1: 435. 1820. *N. colebrookeana* (Wight) Blume, Mus. Bot. Lugd. Bot. 1: 203. 1850; Hook. f., FBI 2: 40. 1876, *p.p.*; Gamble, FPM 265. 1918; Matthew, Ill. FPH t. 145. 1996 & FPH 265. 1999. *Pegia colebrookeana* Wight, Ic. t. 230. 1839. *p.p.* **Era (EBIS).**

Small trees; branchlets dark, lenticellate. Leaves to 20 x 6 cm, base acute, pale white beneath, coriaceous; petiole 1 cm long. Racemes axillary, 3-4 cm long. Flowers cream; calyx 4 lobed, densely pubescent; petals 4, 1 x 0.5 mm, oblong, reflexed; stamens 4, glabrous; disc 0.5 mm across. Drupes 10 mm across, ovoid.

Fl. & Fr.: December-January

Distr.: Western Ghats of India & Sri Lanka. Occasional; in lower altitude shola regions. MS, K-4, *KKK 31098.*

32. CONNARACEAE

CONNARUS Linnaeus

Sp. Pl. 675. 1753

Connarus wightii Hook. f., FBI 2: 51. 1876; Gamble, FPM 27. 1918; Mondal in Singh *et al.*, Fl. Ind. 5: 532. 2000. *C. ritchei* Hook. f., FBI 2: 51. 1876; Gamble, FPM 273. 1918. **Karinkodi (EBIS).**

Large climbing shrubs. Leaves 3 foliolate; leaflets 15 x 5 cm, elliptic-oblong, base rounded, apex abruptly acuminate. Panicles pyramidal, axillary on old branches, ferrugineous hairy. Flowers subsessile, few-together; sepals 4 x 1 mm, elliptic, hispid; petals 4 x 1.5 mm, oblanceolate, puberulus outside; stamens united at base, filaments unequal; ovary densely hairy. Fruits not seen.

Fl.: December-January

Distr.: Endemic to Western Ghats. Occasional; in lower and medium altitude sholas. MS, K-5, *KKK 31100.*

33. FABACEAE

Key to the subfamilies

1. Flowers irregular 2
1. Flowers regular ..... **Mimosoideae**
2. Petals papilionaceous; stamens united ..... **Faboideae**
2. Petals not papilionaceous; stamens free ..... **Caesalpinioideae**

Subfamily: **FABOIDEAE**

1. Anthers dimorphic ..... **Crotalaria**
1. Anthers uniform 2
2. Stamens 9+1; vexillary stamen always free 3
2. Stamens monadelphous or isodiadelphous (9, 10 or 5 + 5) 15
3. Plants covered with laterally adnated hairs ..... **Indigofera**
3. Plants not covered with laterally adnated hairs 4
4. Leaves more than 3-foliolate (rarely 3); lianas ..... **Derris**
4. Leaves 1-3-foliolate; not lianas 5
5. Pods turgid. ..... **Flemingia**
5. Pods not turgid 6
6. Pods twisted so as the joints face each other ..... **Uraria**
6. Pods not as above 7
7. Leaves 1-foliolate ..... **Desmodium**
7. Leaves 3-foliolate 8
8. Leaves digitately 3-foliolate; trailing herbs 9
8. Leaves pinnately 3-foliolate; climbers or erect shrubs 10
9. Flowers solitary or 2-3 together on axillary peduncles; corolla blue ..... **Parochetus**
9. Flowers in terminal, capitate, compact racemes; corolla pinkish ..... **Leptodesmia**
10. Keel petal twisted; stigma oblique ..... **Vigna**
10. Keel petal not twisted; stigma terminal 11
11. Calyx truncate; lobes obscure ..... **Dumasia**
11. Calyx not as above 12
12. Pods 1 or 2-seeded ..... **Rhynchosia**
12. Pods few, many-seeded 13
13. Climbing shrubs; pods falcate ..... **Lablab**
13. Twining herbs; pods straight 14
14. Pods membranous, not depressed between seeds ..... **Shuteria**
14. Pods coriaceous, depressed between seeds ..... **Cajanus**
15. Standard smaller than wings; stem armed ..... **Erythrina**
15. Standard equal to or larger than wings; stems unarmed 16
16. Stamens isodiadelphous ..... **Smithia**
16. Stamens monadelphous 17
17. Flowers white, densely packed; pods deflexed, depressed between seeds ..... **Neonotonia**
17. Flowers pink; loosely packed; pods erect continuous ..... **Canavalia**

CAJANUS A. P. de Candolle

Cat. Hort. Monspel. 85. 1813. *nom. cons.*

Cajanus rugosus (Wight & Arn.) Measen, Agri. Univ. Wageningen Pap. 85-4: 179. 1985; Sanj., Leg. India 102. 1991; Matthew, FPH 288. 1999. *Atylosia rugosa* Wight & Arn., Prodr. 257. 1834; Baker in Hook. f., FBI 2: 215. 1876; Gamble, FPM 369. 1918; Fyson, FSIHS 171. t. 132. 1932.

Leaves trifoliolate; leaflets to 4 x 3 cm, obovate, base acute, apex obtuse, glaucous, densely tomentose below; velvety pubescent above. Racemes lax, to 16 cm long.

Flowers 3-5; calyx to 7 mm long, lobes ovate, acute, densely hairy outside; standard retuse, auricled, yellow with red lines; wings obovate; keel 9 mm long, gibbous to one side. Capsule 1.8 x 0.6cm, flat, 2-3 seeded.

Fl. & Fr.: November-January

Distr.: South India and Sri Lanka. Occasional; along roadsides and ecotones. MS, Puthur, *KKK 16061.*

CANAVALIA A. P. de Candolle

Prodr. 2: 403. 1825, *nom. cons.*

Canavalia cathartica Thouars, J. Bot. Agric. 1: 81. 1813; Sanj., Leg. India 107. 1991; Matthew, FPH 289. 1999. *Dolichos virosus* Roxb., Hort. Beng. 55. 1814 & Fl. Ind. 3: 301. 1832 *p.p. Canavalia turgida* Grah. *ex* A. Gray, Bot. U.S. Expl. Exped. 1: 440. 1854. *Canavalia virosa* (Roxb.) Wight & Arn. Prodr. 253. 1834. *p.p.*; Gamble, FPM 359. 1918; Fyson, FSIHS 167. t. 130. 1932. *Canavalia stocksii* Dalz. & Gibs., Bombay Fl. 69. 1861. *Canavalia ensiformis* (L.) DC. var. *turgida* (Grah. *ex* A. Gray) Baker in Hook. f., FBI 2: 196. 1876.

Climbing shrubs; stem glabrescent. Leaves 3-foliolate; leaflets to 12 x 6 cm, ovate, apex acuminate, base rounded, sparsely hairy below. Racemes to 30 cm long, 10-15 flowered. Flowers 4 cm long; calyx 12 mm long, 2-lipped; standard orbicular, pink, auricled at base; wings oblong, obtuse; keel 18 x 7 mm, upcurved; stamens 10. Pods 12 x 2 cm, compressed; seeds 5, ellipsoid, biconvex.

Fl. & Fr.: December-January

Distr.: South East Asia, Africa, Australia & Pacific Islands. Common along ecotones at lower altitudes. MS, Kulachivayal, *KKK 16678.*

CROTALARIA Linnaeus

Sp. Pl. 714. 1753

1. Leaves digitately 3 or more foliolate ..... **C. pallida**
1. Leaves simple 2
2. Stipules decurrent as a persistent wing to the branches 3
2. Stipules absent or small, not decurrent 5
3. Erect shrubs; leaves more than 7 cm long ..... **C. wightiana**
3. Erect or prostrate herbs or undershrubs; leaves to 5 cm long 4
4. Small procumbent herbs, minutely hairy ..... **C. ovalifolia**
4. Bushy undershrubs, densely pubescent ..... **C. scabrella**
5. Racemes lateral, few or even 1 flowered ..... **C. fysonii**
5. Racemes terminal, rarely leaf opposed, many flowered 6
6. Diffuse annual herbs; calyx prominent, inner side brownish black ..... **C. calycina**
6. Erect undershrubs or shrubs; calyx not as above 7
7. Undershrubs; leaves to 3 cm broad 8
7. Stout shrubs; leaves more than 7 cm broad 9
8. Leaves >10 cm long, oblanceolate; flowers infinite ..... **C. spectabilis**
8. Leaves to 6 cm long, elliptic; flowers 4-5 ..... **C. sp. 1**

9. Leaves elliptic-obovate; racemes to 15 flowered ..... **C. beddomei**
9. Leaves ovate; racemes to 10 flowered ..... **C. sp. 2**

Crotalaria beddomeana Thoth. & Ansari, Bull. Bot. Surv. India 20: 180. 1979; Sanj., Leg. India 117. 1991; Matthew, Ill. FPH t. 154. 1996 & FPH 297. 1999. *C. lanata* Bedd., Madras J. Lit. Sci. 3: 178. 1858. *non* Thunb. 1796; Baker in Hook. f., FBI 2: 77. 1876; Gamble, FPM 297. 1918.

Shrubs; branches villous. Leaves to 12 x 8 cm, elliptic-obovate, base rounded, apex obtuse, villous below. Racemes lax, terminal. Flowers distant, 2.5 cm long; calyx to 2 cm long, lobes acuminate; standard 25 x 35 mm, yellow, glabrous outside; wings 30 x 12 mm. Pods to 6 x 2 cm, broadly oblong-clavate, glabrous.

Fl. & Fr.: August-October

Distr.: Peninsular India, Sri Lanka, Africa, New Guinea & Australia. Common along roadsides at higher altitudes. MS, Idlimottai, *KKK 16607.*

Crotalaria calycina Schrank, Pl. Rar. Hort. Monac. t. 12. 1817; Baker in Hook. f., FBI 2: 72. 1876; Gamble, FPM 295. 1918; Fyson, FSIHS 146. t. 110. 1932; Sanj., Leg. India 118. 1991; Matthew, Ill. FPH tt. 155-158. 1996 & FPH 298. 1999.

Annual herbs; stems adpressed hairy. Leaves to 4 x 0.5 cm, oblong, densely hairy below. Racemes terminal, 3-6 flowered. Flowers distant; calyx 1.5 cm long, lobes linear, densely hairy without, inner side brownish black; standard 15 mm long, yellow, hairy on back. Pods to 2 cm long, oblong, glabrous; seeds many.

Fl. & Fr.: August-December

Distr.: Paleotropics. Common; in grasslands. MS, Thalachorkadavu, *KKK 16747*; K-6, *KKK 31070.*

Note: This is a highly polymorphic species. Gamble and Matthew (1999) have attempted to group the species into 4 ecotypes, according to their size and altitude at which they are found. But here it is not attempted, since a clear-cut demarcation according to size is not possible always.

Crotalaria fysonii Dunn, Kew Bull. 1914: 26. 1914; Gamble, FPM 292. 1918; Fyson, FSIHS 144. t. 108. 1932. var. **glabra** Gamble, FPM 292. 1918; Sanj., Leg. India 120. 1991; Ansari, J. Econ. Tax. Bot. 16(1): 162. 1992; Matthew, FPH 301. 1999.

Trailing, perennial subshrubs. Leaves to 2.5 x 1.5 cm, ovate, base rounded, apex obtuse, adpressed pubescent below. Racemes terminal and leaf opposed. Flowers to 1 cm long; calyx 8 mm long, lobes acuminate, hispid; standard 8 x 6 mm, obovate, glabrous; wings to 9 x 4 mm; keel 11 mm long, glabrous; ovary dark brown-villous. Pods 2 x 0.7 cm, oblong, densely fulvous hairy.

Fl. & Fr.: August-November

Distr.: Southern Western Ghats. Rare; along ecotones and in grasslands. MS, Idlimottai route, *KKK 16589.*

Note: This species was considered as endemic to Palni hills of Tamil Nadu (Sanjappa, 1991). Thus the present collection forms a new record to the state of Kerala and also extends the distribution of the species.

Crotalaria ovalifolia Wall. *ex* Fyson, Kew Bull. 1914: 184. 1914; Gamble, FPM 291. 1918; Fyson, FSIHS 142. t. 106. 1932; Sanj., Leg. India. 126. 1991. *C. scabrella* Wight & Arn. Prodr. 181. 1834; Matthew, FPH 305. 1999. *C. rubiginosa* Baker in Hook. f., FBI 2: 69. 1876 p.p. *non* Willd. 1802.

Procumbent herbs. Leaves simple, subsessile, to 3 x 1.5 cm, elliptic, apex rounded, mucronate, densely pubescent below. Racemes axillary, to 3 cm, 3 flowered. Flowers yellow, to 2 x 1.5 cm; calyx 12 mm long, lobes lanceolate; standard 22 x 18 mm, orbicular; wings 12 x 5 mm, obovate; keels 15 x 6 mm long. Pods to 25 x 8 mm long, oblong; seeds many, 5 mm wide, reniform.

Fl. & Fr.: September-January

Distr.: Peninsular India. Common along shola borders and roadsides at lower altitudes. MS, Puthur, *KKK 16057.*

Notes: Matthew (1993 & 1999) has reduced this species to *C. scabrella*, justifying this as an ecotype found at lower altitude. However here it is treated as separate species. This species was considered endemic to Karnataka & Tamil Nadu parts of Western Ghats only (Sanjappa, 1991). Hence the present collection forms a new record to Kerala.

Crotalaria pallida Dryand. in Ait., Hort. Kew. ed. 1. 3: 20. 1789; Sanj., Leg. India. 126. 1991; Matthew, Ill. FPH t. 165. 1996 & FPH 304. 1999. *C. mucronata* Desv., J. Bot. 3: 76. 1814. *C. striata* DC., Prodr. 2: 131. 1825; Baker in Hook. f., FBI 2: 84. 1876; Gamble, FPM 301. 1918; Fyson, FSIHS 153. 1932.

Shrubs. Leaves 3-foliolate; leaflets to 9 x 3.5 cm, elliptic, acute at both ends, apex mucronate, thinly hairy below. Raceme terminal, to 26 cm long. Flowers yellow striped with red, to 15 mm long; pedicels to 3 mm long; calyx 8 mm long; lobes acuminate; standard to 12 x 6 mm, orbicular; wings 9 mm long, falcate; keel 15 mm long. Pods to 4 x 1 cm long, cylindrical; thinly hairy; seeds 20-30.

Fl. & Fr.: September-January

Distr.: Pantropical. Common in disturbed forest areas at lower altitudes. MS, Kulachivayal, *KKK 16672.*

Crotalaria scabrella Wight & Arn., Prodr. 181. 1834; Gamble, FPM 291. 1918; Fyson, FSIHS 141. t. 105. 1932; Sanj., Leg. India. 128. 1991; Ansari, J. Econ. Tax. Bot. 15(2): 455. 1991; Matthew, Ill. FPH t. 167. 1996 & FPH 305. 1999. *C. rubiginosa* Willd. var. *scabrella* (Wight & Arn.) Baker in Hook. f., FBI 2: 70. 1876.

Undershrubs. Leaves 4 x 2 cm, elliptic to obovate, apex obtuse, mucronate. Flowers yellow, 1-3 together in axillary racemes; calyx 12 mm long, lobes acuminate, standard 20 mm across, orbicular; wings 12 mm long, oblong; keel 15 mm long, apex twisted. Pods 3.5 x 1.2 cm, oblong; seeds 3.5 x 2.5 mm, reniform, black.

Fl. & Fr.: September-December

Distr.: South India and Sri Lanka. Occasional; in grasslands at medium altitudes. MS, Kalipettu Mala, *KKK 16746.*

Notes: Matthew (1993 & 1999) has attempted for extensive reduction merging *C. conferta* Fyson, *C. ovalifolia* Wall. *ex* Fyson, *C. bourneae* Fyson, *C. rubiginosa* Willd.,etc., into *C. scabrella*. But here the treatment of Sanjappa (1991) is followed. From South India the species is so far reported from Karnataka and Tamil Nadu only (Sanjappa, 1991). Hence the collection is a new distributional record to Kerala.

Crotalaria spectabilis Roth., Nov. Pl. Sp. 341. 1821; Sanj., Leg. India. 130. 1991; Matthew, FPH 306. 1999. *C. sericea* Retz., Obs. Bot. 5: 26. 1789 *non* Burm. f. 768; Baker in FBI 2: 75. 1876. *C. leschenaultii* DC., Prodr. 2: 125. 1825; Baker in Hook. f., FBI 2: 76. 1876; Gamble, FPM 293. 1918; Fyson, FSIHS 147. t. 111. 1932.

Under shrubs. Leaves sessile, to 10 x 2 cm, oblanceolate, base cuneate, apex rounded, hairy below. Racemes terminal, to 36 cm long. Flowers to 20 mm long; calyx 12 mm long, lobes acuminate; standard to 18 x 12 mm, orbicular, yellow; wings 17 x 10 mm long, falcate; keel 15 mm long. Pods to 5 x 2 cm long.

Fl. & Fr.: August-December

Distr.: Pantropical. Common along roadsides at lower altitudes. MS, Thalachorkadavu; *KKK 16710*; K-3, *KKK 16143*.

Crotalaria wightiana Grah. *ex* Wight & Arn., Prodr. 181. 1834; Gamble, FPM 291. 1918; Fyson, FSIHS 141. 1932; Sanj., Leg. India. 131. 1991; Matthew, Ill. FPH t. 172. 1996 & FPH 309. 1999. *C. rubiginosa* Willd. var. *wightiana* (Grah. *ex* Wight & Arn.) Baker in Hook. f., FBI 2: 70. 1876.

Shrubs. Leaves to 7 x 4 cm, obovate, base acute, apex obtuse to retuse; densely fulvous hairy. Raceme axillary. Flowers 3-5, yellow, to 25 mm long; calyx 17 x 5 mm, lobes lanceolate, unequal; standard 17 mm across, orbicular, thinly pubescent along back; keel pubescent along the margins. Pods 4.5 x 1.3 cm, oblong.

Fl. & Fr.: November-January

Distr.: South India and Sri Lanka. Occasional; along shola borders and scrublands at low altitudes. MS, Puthur, *KKK 16063*.

Note: From South India the species is so far reported from Tamil Nadu only (Sanjappa, 1991). Hence the collection is a new distributional record to Kerala.

Crotalaria sp. 1

Undershrubs, to 90 cm higher; stem terete, sparsely hairy. Leaves simple, to 6 x 3 cm, acute at both ends, tip mucronate, glabrous; stipules auricled; petiole 3-4 mm. Racemes terminal; bracts lanceolate. Flowers 20 mm long; calyx to 8 mm, lobes lanceolate, hairy; standard yellow with brown nerves, to 18 mm across, orbicular, thinly pubescent at back; wings 15 x 5 mm, falcate; keel to 18 mm. Fruit not seen.

Fl.: August

Distr.: Rare; along shola borders and grasslands at higher altitudes. MS, Idlimottai, *KKK 16618*.

Note: The species is allied to *C. spectabilis*, but differs in smaller elliptic leaves and less number of flowers.

Crotalaria sp. 2

Shrubs, to 1.5 m higher; stem terete, ribbed, glabrescent. Leaves simple, to 10 x 8 cm, base truncate, apex obtuse or rounded; fulvous hairy below; stipules 8 mm, auricled; petiole 8 mm. Racemes terminal or subterminal; bracts ovate. Flowers 25 mm long; calyx to 12 mm, lobes lanceolate, hairy; standard 20 mm across, orbicular; wings 15 x 5 mm, slightly falcate; keel 2.5 mm long. Fruit not seen.

Fl.: July-August

Distr.: Rare; along roadsides at higher altitudes. MS, Methappu, *KKK 16431.*

Note: The species is allied to *C. beddomeana*, but differs in ovate leaves with truncate base and less number of flowers.

CYTISUS Linnaeus

Sp. Pl. 739. 1753

Cytisus scoparius (L.) Link., Enum. Pl. Hort. Berol. 2: 241. 1823; Fyson, FSIHS 138. t. 104. 1932; Sanj., Leg. India. 133. 1991; Matthew, Ill. FPH t. 173. 1996 & FPH 310. 1999. *Spartium scoparius* L., Sp. Pl. 709. 1753.

Bushy shrubs; stem 5 ribbed. Leaves 3-foliolate at base, simple above; leaflets to 10 x 3 mm, elliptic-oblong. Raceme 3-5-flowered, axillary. Flowers yellow, solitary, to 30 mm long; calyx 6 mm, lobes 2 toothed; standard 20 mm across, orbicular; wings and keels 20 x 10 mm; stamens 10, dimorphic; ovary 1 cm, pubescent. Pods 3.5 x 1 cm, oblong, black, hairy along sutures.

Fl. & Fr.: October-March

Distr.: Native of Western Europe; naturalized in the hill stations of India. Occasional; along roadsides at higher altitudes. MS, Methappu, *KKK 18105.*

DERRIS Loureiro

Fl. Cochinch. 2: 432. 1790, *nom. cons.*

Derris brevipes (Benth.) Baker in Hook. f., FBI 2: 244. 1878; Gamble, FPM 388. 1918; Sanj., Leg. India. 144. 1991; Matthew, Ill. FPH t. 175. 1996 & FPH 314. 1999. *D. heyneana* Benth. var. *brevipes* Benth., J. Linn. Soc. 4 (Suppl.): 110. 1860. **Karinkodi (EBIS).**

Leaves to 20 x 13 cm; leaflets to 6 x 3.5 cm, elliptic, base acute, apex abruptly acuminate, coriaceous. Panicles axillary, brown rusty tomentose. Flowers white tinged pink, to 14 x 6 mm; calyx cupular, 4 mm long, hispid, black; standard 11 x 7 mm, obovate, emarginate; wings 9 x 3 mm, oblong; keels oblong to obovate; stamens monadelphous; ovary densely hairy. Pods 5 x 2.5 cm, ovate, obtuse at either ends, densely dark brown-hispid; seeds 2.

Fl. & Fr.: March-August

Distr.: Endemic to Peninsular India. Common at medium and higher altitudes. MS, Methappu, *KKK 18105.*

DESMODIUM Desvaux

J. Bot. Agric. 1: 122. 1813, *nom. cons.*

1. Erect undershrubs ..... **D. repandum**
1. Prostrate herbs or undershrubs **2**
2. Racemes axillary; flowers 3-5 ..... **D. triflorum**
2. Racemes terminal; flowers many, usually more than 5 ..... **3**
3. Herbs; silvery marking along midrib of leaves above; flowers pink; pods to 35 mm long ..... **D. uncinatum**
3. Undershrubs; leaves without any marks; flowers pale blue; pods to 12 mm long ..... **D. microphyllum**

Desmodium microphyllum (Thunb.) DC., Prodr. 2: 337. 1825; Sanj., Leg. India. 157. 1991; Matthew, Ill. FPH t. 179. 1996 & FPH 319. 1999. *Hedysarum microphyllum* Thunb., Fl. Jap. 284. 1784. *Desmodium parvifolium* DC., Prodr. 2: 334. 1825; Baker in Hook. f., FBI 2: 174. 1876; Gamble, FPM 348. 1918; Fyson, FSIHS 162. t. 125. 1932.

Leaves trifoliolate, elliptic; leaflets to 10 x 6 mm, obovate, apex mucronate. Racemes on the lateral branches, to 5 cm long, filiform, to 10-flowered. Standard 4 x 4 mm, orbicular; wings 3 mm, rounded at apex; keel spurred at base, glabrous; stamens monadelphous. Pods to 12 x 3 mm, 3 jointed, crenate along both sutures, hispid; seeds broad elliptic.

Fl. & Fr.: August-December

Distr.: India, China to Malesia. Common along shola borders at lower altitudes. MS, Conical patch, *KKK 16737.*

Desmodium repandum (Vahl) DC., Prodr. 2: 334. 1825; Sanj., Leg. India 161. 1991; Matthew, FPH 321. 1999. *Hedysarum repandum* Vahl, Symb. Bot. 2: 82. 1791. *Desmodium scalpe* DC., Prodr. 2: 334. 1825; Baker in Hook. f., FBI 2: 165. 1876; Gamble, FPM 345. 1918; Fyson, FSIHS 162. t. 124. 1932. **Kattu Avam Poovu. Plate 4.4.2.**

Leaves trifoliolate; leaflets to 4 x 3 cm, middle one rhomboid, lateral ones ovate, base rounded, apex acute, glabrous above, adpressed pubescent below. Racemes terminal, lax; calyx 4-lobed, campanulate; standard 10 mm across, reddish, orbicular. Pod to 1.5 x 0.6 cm, 2-3 jointed, falcate, covered with hooked hairs.

Fl. & Fr.: November-February

Distr.: Africa, eastward to Asia and Australia. Common along roadsides at medium altitudes. MS, K-5, *KKK 16154.*

Desmodium triflorum (L.) DC., Prodr. 2: 334. 1825; Wight, Ic. t. 292. 1839; Baker in Hook. f., FBI 2: 173. 1876; Gamble, FPM 347. 1918; Sanj., Leg. India 163. 1991; Matthew, FPH 321. 1999. *Hedysarum triflorum* L., Sp. Pl. 249. 1753.

Leaves trifoliate; leaflets to 15 x 10 mm, elliptic, mucronate, pubescent below. Racemes axillary. Flowers 3-5, 3 mm across; calyx 3 mm long, 5-lobed; standard 3 mm across, orbicular, pink; wings obovate; keel glabrous. Pod to 10 mm long, straight; joints 4-6, squarish, hooked-pubescent.

Fl. & Fr.: August-February

Distr.: India, Malesia to Australia, Africa and America. Common in scrublands at lower altitudes. MS, Conical patch, *KKK 16458.*

Desmodium uncinatum (Jacq.) DC., Prodr. 2: 331. 1825; Thulin, Opera Botanica 68: 114. 1983; Sasidh., Rheedea 6(2): 71. 1996. *Hedysarum uncinatum* Jacq., Hort. Schoenb. 3: 27. 1798. **Moschio, Pottu Kola, Kolagu Kola (EBIS).**

Stem covered with sticky, hooked hairs. Leaves trifoliate; leaflets to 6 x 2 cm, ovate, base acute, apex cuspidate, pubescent. Racemes terminal, to 50 cm long, lax; calyx 3 mm long, ovate, hairy; standard 10 mm long, glabrous. Pods 20-35 x 4 mm, deeply indented along the ventral suture; joints 3-10, hooked-hairy, pendulous.

Fl. & Fr.: November-January

Distr.: Tropical Africa and Asia. Common in waste lands and along roadsides at lower altitudes. MS, Perumala, *KKK 16597.*

Note: This plant, perhaps an accidental introduction along with the fodder grasses introduced by the Regional Live Stock Dept., Munnar, has now colonized in the higher ranges. However, this plant also finds its use as a green manure in plantations.

DUMASIA A. P. de Candolle

Ann. Sci. Nat. (Paris) 4: 96. 1825.

Dumasia villosa DC., Ann. Sci. Nat. (Paris) ser. 1. 4: 96. 1825 & Prodr. 2: 241. 1825; Baker in Hook. f., FBI 2: 183. 1876; Gamble, FPM 351. 1918; Fyson, FSIHS 165. t. 128. 1932; Sanj., Leg. India 167. 1991; Matthew, FPH 322. 1999. *D. congesta* Grah. *ex* Wight & Arn., Prodr. 206. 1834; Wight, Ic. t. 445. 1841.

Twining herbs. Leaves 3-foliolate; leaflets unequal, to 3.5 x 2.5 cm, rhomboid, acute or obtuse, adpressed-hairy. Racemes axillary, to 3 cm long. Flowers 2-6, golden yellow; calyx 7 mm long, tubular, black; standard to 20 mm long, obovate, clawed; wings obovate, long-clawed; keel brown at apex; stamens 9+1; ovary villous. Pods 4 x 0.6 cm, linear-oblong, stalked; seeds 3-5, 3 x 2 mm, subglobose, black.

Fl. & Fr.: December-January

Distr.: South East Asia to Tropical Africa and Malesia. Occasional; along shola borders at higher altitudes. MS, Idlimottai, *KKK 16602.*

FLEMINGIA Roxburgh *ex* W. Aiton *et* E. T. Aiton

Hortus Kew. ed. 2, 4: 349. 1812, *nom. cons.*

1. Leaves 3-foliolate, obliquely elliptic; racemes 5-7 cm long; standard obovate ..... **F. grahamiana**
1. Leaves simple, ovate-lanceolate; racemes to 22 cm long; standard orbicular ..... **F. strobilifera**

Flemingia grahamiana Wight & Arn., Prodr. 242. 1834; Baker in Hook. f., FBI 2: 228. 1876; Gamble, FPM 378. 1918; Fyson, FSIHS 173. t. 133. 1932; Sanj., Leg. India 175. 1991; Matthew, Ill. FPH t. 183. 1996 & FPH 327. 1999.

Shrubs. Leaflets 13 x 6 cm, apex obtusely acute, grey-tomentose beneath. Racemes densely yellowish brown hairy. Flowers dense; calyx 8 mm long, densely red-glandular, lobes lanceolate; standard 9 x 6 mm, acute, pinkish; wings 8 x 1.5 mm, linear-oblong; ovary densely hairy. Pod to 12 x 7 mm, oblong.

Fl. & Fr.: December-March

Distr.: Africa extending to South India. Common; along shola borders at lower altitudes. MS, Thalachorkadavu, *KKK 16041.*

Flemingia strobilifera (L.) R. Br. *ex* Ait., Hort. Kew. ed. 2, 4: 350. 1812; Wight, Ic. t. 267. 1840; Baker in Hook. f., FBI 2: 227. 1876; Gamble, FPM 377. 1918; Sanj., Leg. India 178. 1991. *Hedysarum strobiliferum* L., Sp. Pl. 746. 1753. *Flemingia bracteata* (Roxb.) Wight, Ic. t. 268. 1840. var. *bracteata* Baker in Hook. f., FBI 2: 227. 1876.

Shrubs. Leaves 7 x 4 cm, apex acute to acuminate, glabrate. Racemes distichous, axis zig-zag; floral leaves 25 x 14 mm, orbicular, cuspidate. Flowers 3-6-together in short cymes; calyx 5 mm long, hairy, one lobe larger; standard 5 x 6 mm, pinkish; wings 4.5 x 1 mm, white; keel 6.5 x 2 mm, clawed. Pod 8 x 5 mm, oblique.

Fl. & Fr.: September-January.

Distr.: Tropical Asia introduced in Micronesia, Polynesia, Mauritius and West Indies. Common in grasslands and shola borders at lower altitudes. MS, Kulachivayal, *KKK 16677.*

INDIGOFERA Linnaeus

Sp. Pl. 751. 1753

1. Shrubs; leaflets 10-12 pairs; flowers pink; pods glabrous ..... **I. cassioides**
1. Subshrubs; leaflets to 8 pairs; flowers brick red; pods hairy ..... **I. spicata**

Indigofera cassioides Rottl. *ex.* DC., Prodr. 2: 225. 1825; Sanj., Leg. India 186. 1991 & in Fl. Ind. Fasc. 21: 29. 1995; Matthew, FPH 334. 1999. *I. pulchella* Roxb., Fl. Ind. 3: 382. 1832; Wight, Ic. t. 367. 1874; Baker in Hook. f., FBI 2: 101. 1876; Gamble, FPM 313. 1918; Fyson, FSIHS 156. t. 119. 1932.

Leaves to 10 cm long; leaflets to 2 x 1 cm, obovate, emarginate, cuspidate. Racemes 8-13 cm long, axillary, many-flowered; bracts lanceolate, subulate above. Flowers to 13 mm across; calyx 3.5 mm long, lobes acuminate, hairy; standard 10 x 7 mm, obovate, glabrous; wings 10 mm long, oblanceolate; keel ciliate at apex. Pods 30 x 5 mm, oblong, compressed, cuspidate, many-seeded.

Fl. & Fr.: November-February .

Distr.: South and South East Asia. Common; along shola borders and other disturbed regions at lower altitudes. MS, Puthur, *KKK 16062.*

Indigofera spicata Forssk., Fl. Aegypt.-Arab. 138. 1775; Sanj., Leg. India 195. 1991 & Fl. Ind. Fasc. 21: 123. 1995; Matthew, Ill. FPH t. 188. 1996 & FPH 336. 1999. *I. endecaphylla* Jacq., Ic. Pl. Rar. 3(3): t. 570. 1789, "*hendecaphylla*"; Baker in Hook. f., FBI 2: 98. 1876; Gamble, FPM 311. 1918; Fyson, FSIHS 156. 1932.

Leaves to 5 cm long; leaflets 18 x 6 mm, oblanceolate, obtuse, shortly mucronate, sessile. Racemes to 13 cm long, slender. Flowers 6 mm across; calyx lobes subulate; standard hispid outside. Pods 30 x 2 mm, compressed, marginate, rugose, seeds 5-10.

Fl. & Fr.: August-December

Distr.: South Africa to Malaya. Rare; in disturbed areas and grasslands at lower altitudes. MS, Pallang Mala, *KKK 16694*; Thalachorkadavu, *KKK 16708.*

LABLAB Adanson

Fam. Pl. 2: 325. 1763

Lablab purpureus (L.) Sweet, Hort. Brit. ed. 1: 481. 1827; Sanj., Leg. India 199. 1991; Matthew, FPH 331. 1999. *Dolichos purpureus* L., SP. Pl. ed. 2: 1021. 1763. *D. lablab* L., Sp. Pl. 725. 1753; Baker in Hook. f., FBI 2: 209. 1876; Gamble, FPM 367. 1918. **Kattavara (EBIS).**

Climbing shrub. Leaves alternate, 3 foliolate, to 18 x 16 cm; terminal leaflet to 10 x 7 cm, ovate-deltoid; laterals to 8 x 5 cm, ovate, base obtuse, apex acuminate. Racemes to 30 cm. Flowers 2 cm across, purplish; calyx tube campanulate; standard to 1.5 x 2.5 cm, orbicular; wings 1.2 x 0.8 cm, obovate; keels 2 x 0.5 cm, oblong; ovary pubescent. Pod to 5x 2 cm, oblong-falcate, compressed; seeds ovoid.

Fl. & Fr.: December-March

Distr.: Paleotropical. Occasional; along shola borders and scrublands at lower altitudes. MS, Puthur, *KKK 16194.*

Note: This widely cultivated species has now run wild in the high ranges.

LEPTODESMIA (Bentham) Bentham & Hooker. f.

Gen. Pl. 1: 522. 1865.

Leptodesmia congesta (Wight) Benth. *ex* Baker in Hook. f., FBI 2: 152. 1876; Gamble, FPM 332. 1918; Fyson, FSIHS 160. 1932; Sanj., Leg. India 202. 1991; Matthew, Ill. FPH t. 191. 1996 & FPH 339. 1999. *Nicolsonia congesta* Wight, Ic. t. 1056. 1846.

Diffuse herb; branchlets wiry, pubescent. Leaves 1-3 foliolate; middle leaflet to 15 x 8 mm, oblong, obtuse at both ends; laterals 6 x 4 mm, obovate, sessile. Racemes terminal, capitate, to 1.5 cm across; calyx tube short, lobes 5; corolla pinkish; standard 2 mm wide, orbicular; wings 1 mm, oblong; keels 1 mm; ovary sessile, globose. Pod 3 x 2.5 mm, oblong, flattened.

Fl. & Fr.: October-March

Distr.: Endemic to Southern Western Ghats. Occasional; in disturbed regions and roadsides at lower and medium altitudes. MS, Puthur, *KKK 16077.*

Note: This species was considered endemic to Nilgiri and Palni hills of Tamil Nadu (Sanjappa, 1991). Hence this collection is a new distributional record to Kerala.

NEONOTONIA Lackey

Phytologia 37: 210. 1977.

Neonotonia wightii (Wight & Arn.) Lackey, Phytologia 37: 209. 1977; Sanj., Leg. India 219. 1991; Matthew, FPH 345. 1999. *Notonia wightii* Wight & Arn., Prodr. 208. 1834. *Glycine javanica* L., Sp. Pl. 754. 1753: Baker in Hook. f., FBI 2: 183. 1876; Gamble, FPM 351. 1918.

Stout climbers. Leaves 3-foliolate, to 14 x 12 cm; midleaflet 7 x 5, rhomboid, laterals 6 x 4 cm, ovate. Racemes to 13 cm long, velvety pubescent. Flowers 8 mm long, white; calyx 5 mm long, tube campanulate, lobes lanceolate; standard 5 mm wide, obovate; wings oblong; keels falcate; ovary densely hairy. Pods 4 x 0.6 cm, oblong, deflexed, densely hairy, depressed between seeds; seeds 5 x 4 mm, oblong.

Fl. & Fr.: October-January

Distr.: India, Tropical Africa and Indonesia. Common in lower altitude sholas, mostly in disturbed regions. MS, Thalachorkadavu, *KKK 16734.*

PAROCHETUS Buchanan-Hamilton *ex* D. Don

Prodr. Fl. Nep. 240. 1825.

Parochetus communis Buch.-Ham. *ex* Don, Prodr. Fl. Nep. 240. 1825; Baker in Hook. f., FBI 2: 86. 1876; Gamble, FPM 303. 1918; Fyson, FSIHS 154. t. 117. 1932: Sanj., Leg. India 227. 1991; Matthew, Ill. FPH t. 197. 1996 & FPH 346. 1999. *P. major* D. Don, Prod. Fl. Nepal 241. 1825; Wight, Ic. t. 483. 1840-43.

Leaflets to 13 x 15 mm, obcordate, base cuneate-obcordate, apex emarginate, margin obscurely lobed, pubescent below. Flowers blue; calyx 6 mm long, campanulate, 5-lobed; upper two lobes connate; standard 13 x 13 mm, obovate; wings 10 x 3 mm long, obovate, long-spurred at base; keel not spurred; stamens 9+1; ovary oblong, glabrous. Pods 2 x 0.5 cm, oblong; seeds many, globose.

Fl. & Fr.: October-February

Distr.: South-East Asia and Africa. Occasional along roadsides, shola borders and grasslands at medium and higher altitudes. MS, K-5, *KKK 16151.*

RHYNCHOSIA Loureiro

Fl. Cochinch. 425, 460. 1790, *nom. cons.*

Rhynchosia rothii Benth. *ex* Aitch. Cat. Pl. Punj. Sindh 50. 1869; Sanj., Leg. India 240. 1991; Matthew, FPH 355. 1999. *R. sericea* Span., Linnaea 15: 195. 1841, *non* Guil. *ex* Hook. & Arn. 1833; Baker in Hook. f., FBI 2: 225. 1876; Gamble, FPM 375. 1918.

Climbing shrubs; stem pink, soft silky pubescent. Leaflets 6.5 x 4 cm, rhomboid to ovate, base rounded, apex acute. Racemes, 5 cm long; calyx 3 mm long, lobes ovate, acute; petals pink turning blue; standard 6 mm across, orbicular, glabrous; wings 5 mm long, oblong; keels curved. Pods 7 x 5 mm, ovoid, tawny villous.

Fl. & Fr.: October-January

Distr.: Indo-Malesia. Common in grasslands at lower altitudes. MS, Pallang Mala, *KKK 16692.*

SHUTERIA R. Wight & Arnott

Prodr. Fl. Pen. Ind. Or. 1: 207. 1834, *nom. cons.*

1. Stems villous; racemes to 20 cm long; flowers purple ..... **S. involucrata**
1. Stems glabrescent; racemes to 6 cm long; flowers yellow ..... **S. vestita**

Shuteria vestita Wight & Arn., Prodr. 207. 1834; Wight, Ic. t. 165. 1839; Baker in Hook. f., FBI 2: 181. 1876; Gamble, FPM 350. 1918; Fyson, FSIHS 165. t. 127. 1932; Sanj., Leg. India 245. 1991. *Glycine vestita* Grah. in Wall., Cat. 5512. 1831-32 *nom. nud.* var. *vestita* forma *vestita*. *Shuteria glabrata* Wight & Arn., Prodr. 207. 1834. *S. vestita* (Wall.) Wight & Arn. var. *glabrata* (Wight & Arn.) Baker in Hook. f., FBI 2: 182. 1876. *S. involucrata* (Wall.) Wight & Arn., Prodr. 207. 1834. var. *glabrata* (Wight & Arn.) Ohashi, J. Jap. Bot. 50: 305. 1975.

Leaves 3-foliolate, leaflets to 5 x 3.5 cm, middle one rhomboid, lateral ones ovate, obtuse, base rounded, chartaceous, villous. Racemes to 6 cm long. Flowers dense;

calyx 4 mm long, lobes acuminate; standard 7 x 5 mm, orbicular, wings 8 mm long, spurred at base; keel 8 x 3 mm, oblong; ovary densely hairy. Pods 4 x 0.5 cm, linear-oblong, flat, densely hispid; seeds many, cubical.

Fl. & Fr.: November-March

Distr.: South and South-East Asia. Common; along roadsides at lower altitudes. MS, Thalachorkadavu, *KKK 16762.*

Shuteria involucrata (Wall.) Wight & Arn. Prodr. 207. 1834; Sanj., Leg. India 245. 1991; Matthew, FPH 358. 1999. *Glycine involucrata* Wall., Pl. Asiat. Rar. 3: 22, t. 241. 1832. *Shuteria vestita* Wight & Arn., Prodr. 207. 1834. var. *involucrata* (Wall.) Baker in Hook. f., FBI 2: 182. 1876.

Leaves 3-foliolate, leaflets to 4.5 x 3 cm, middle one rhomboid, lateral ones ovate, base rounded, apex obtuse, villous. Racemes to 20 cm long. Flowers lax; calyx 4 mm long, lobes ovate; standard to 8 x 5 mm, orbicular, wings 8 mm long, oblique-oblong, spurred; keel 8 x 3 mm, oblong, apex obtuse; ovary densely hairy. Pods 4.5 x 0.5 cm, linear-oblong, flat, densely hispid; seeds many, cubical.

Fl. & Fr.: November-March

Distr.: South and South-East Asia. Common along roadsides and ecotones at medium altitudes. MS, K-5, *KKK 31071.*

SMITHIA W. Aiton

Hortus Kew. 3: 496. 1789, *nom. cons.*

Smithia gracilis Benth., Linnaea 24; 642. 1851; Baker in Hook. f., FBI 2: 150. 1876; Gamble, FPM 330. 1918; Fyson, FSIHS 159. 1932; Sanj., Leg. India 247. 1991; Matthew, Suppl. Ill. FPH t. 976. 1998 & FPH 360. 1999.

Slender, branched, diffuse herbs. Leaflets 3 pairs, to 11 x 5 mm, obovate-oblong, ciliate along margins and midribs. Racemes to 1.5 cm long. Flowers pedicelled; calyx 5 mm long, 2-lipped, hairy, upper lip truncate; standard to 6 x 5 mm, obovate, emarginate, mucronate, yellow with red lines; wings 5 x 1.5 mm, yellow; keel spurred. Pods jointed; joints 2 x 2 mm, orbicular, biconvex, dark brown.

Fl. & Fr.: July-November

Distr.: Endemic to Peninsular India. Common along roadsides and disturbed forest floors. MS, Coupe road, *KKK 16591.*

TEPHROSIA Persoon

Syn. Pl. 2: 328. 1807, *nom. cons.*

Tephrosia tinctoria Pers., Syn. 2: 329. 1807; Wight, Ic. t. 388. 1840; Baker in Hook. f., FBI 2: 111. 1876; Gamble, FPM 319. 1918; Fyson, FSIHS 158. 1932; Sanj., Leg. India 259. 1991; Matthew, FPH 364. 1999. *T. pulcherrima* (Baker) Gamble, FPM 319. 1918. *T. tinctoria* Pers. var. *pulcherrima* Baker in Hook. f., FBI 2: 112. 1876.

Erect shrubs; golden brown pubescent. Leaves 3-7 foliolate; middle leaflet to 4.5 x 2.5 cm, oblong, obtuse; laterals to 2.5 x 1 cm, base acute, densely white-tomentose below. Racemes axillary. Flowers red; calyx 6 mm long, lobes lanceolate; standard

narrowed to the base; wings to 17 x 5 mm; keel obovate; Pods to 5 x 0.5 cm, oblong, flat, curved at tip, minutely hirsute, 8-10 seeded.

Fl. & Fr.: October-March

Distr.: India and Sri Lanka. Common along shola margins at lower altitudes. MS, Perumala, *KKK 17631*.

URARIA Desvaux

J. Bot. 1: 122, 1813.

Uraria rufescens (DC.) Schindl., Fedde, Rep. 21: 14. 1925; Sanj., Leg. India 268. 1991; Matthew, Ill. FPH t. 214. 1996 & FPH 369. 1999. *Desmodium rufescens* DC., Ann. Sci. Nat. 4: 101. 1825; Baker in Hook. f., FBI 2: 171. 1876; Gamble, FPM 346. 1918; Fyson, FSIHS 161. t. 123. 1932.

Erect subshrubs, stem reddish brown. Leaves 3-foliolate; leaflets to 4 x 2 cm, obovate, mucronate, base acute. Raceme to 12 cm long, terminal, densely flowered at top. Flowers light pink; calyx 5 mm long, hairy; standard 7 mm across, clawed; keel small. Pod 2 x 0.6 cm, oblong, divided, scabrous, straight.

Fl. & Fr.: January-May

Distr.: South to South East Asia. Common along roadsides at lower altitudes. MS, K-3, *KKK 16102*.

VIGNA Savi

Pisa Nuov. Giorn. Lett. 8: 113. 1824, *nom. cons.*

1. Scandent herbs; leaflets > 5 cm long ..... **V. bourneae**
1. Slender climbers; leaflets < 5 cm long **2**
2. Stipules basifixed; flowers violet-purple ..... **V. grahamiana**
2. Stipules peltately fixed; flowers yellow ..... **V. sublobata**

Vigna bourneae Gamble, FPM 365. 1918 & Kew Bull. 1919: 229. 1919; Sanj., Leg. India 272. 1991; Matthew, Suppl. Ill. FPH t. 978. 1998 & FPH 373. 1999.

Leaves to 18 x 13 cm; leaflets to 8.5 x 5 cm, ovate, base obtuse, apex acuminate; middle one deltoid. Racemes axillary; peduncle to 15 cm, stout; calyx 5 mm long, campanulate; corolla to 1.5 cm, yellow; standard 1.5 x 2 cm, auriculate; wings broad, 1.2 x 1 cm, obtuse; keels 1.5 x 0.5 cm; ovary villous. Pod to 7 x 0.7 cm, densely fulvous, glabrescent.

Fl. & Fr.: October-March

Distr.: Endemic to Southern Western Ghats. Occasional; along shola borders at lower altitudes. MS, Thalachorkadavu, *KKK 16035*; Chengalar, *KKK 18124*.

Note: This species was considered endemic to Tamil Nadu (Sanjappa, 1991). Present collection forms a new distributional record for Kerala.

Vigna grahamiana (Wight & Arn.) Verdc., Kew Bull. 24: 562. 1970; Sanj., Leg. India 273. 1991; Matthew, FPH 374. 1999. *Phaseolus grahamianus* Wight & Arn., Prodr. 244. 1834; Baker in Hook. f., FBI 2: 201. 1876; Gamble, FPM 362. 1918.

Leaflets to 4.5 x 3 cm, middle one deltoid, laterals smaller, ovate, apex acute, sparsely hispid. Flowers 3-5, small, in umbellate racemes; peduncle to 3 cm; calyx lobes 5 mm, acute, ciliate; corolla to 15 mm long; standard 14 x 8 mm; wings 12 x 5 mm. Pods 6 x 0.5 cm, flat, densely brown-strigose.

Fl. & Fr.: November-January

Distr.: Southern Western Ghats & Sri Lanka. Common; in disturbed forest areas at lower altitudes. MS, Puthur, *KKK 16721*.

Note: From Southern Western Ghats, this species is so far reported to Tamil Nadu only (Sanjappa, 1991). Present collection forms a new distributional record for Kerala.

Vigna sublobata (Roxb.) Babu & Sharma, Bull. Bot. Surv. India 27: 21. 1987; Sanj., Leg. India 276. 1991. *Phaseolus sublobatus* Roxb., Fl. Ind. 3: 288. 1832; Gamble, FPM 363. 1918; Fyson, FSIHS 168. 1932. *P. trinervius* Heyne *ex* Wight & Arn., Prodr. 245. 1834; Baker in Hook. f., FBI 2: 203. 1876. *Vigna brachycarpa* Kurz., J. Asiat. Soc. Beng. 43. 185. 1874; Baker in Hook. f., FBI 2: 206. 1876. *Phaseolus mungo* L. var. *radiatus* (L.) Baker in Hook. f., FBI 2: 203. 1876 p.p. *Vigna radiata* (L.) Wilczek., Fl. Congo Belge. 6: 386. 1954, var. *sublobata* (Roxb.) Verdc., Kew Bull. 24: 559. 1970; Matthew, Ill. FPH t. 220. 1996 & FPH 375. 1999.

Leaflets to 4.5 x 3 cm, middle one rhomboid, laterals smaller, obliquely ovate, acuminate at apex, sparsely hispid. Flowers densely packed, subsessile; calyx lobes 7 x 3 mm, ovate, acute, ciliate. Pods 3-5 x 0.5 cm, densely brown-strigose; seeds 3 x 2.5 mm, rectangular, longitudinally rugose.

Fl. & Fr.: November-March

Distr.: Indo-Malesia. Common; along roadsides and shola borders at lower and medium altitudes. MS, Gudalar, *KKK 16085*.

Subfamily: **CAESALPINIOIDEAE**

CASSIA Linnaeus

Sp. Pl. 376. 1753.

1. Erect shrubs to small trees; leaves > 25 cm; leaflets 3 pairs ..... **C. floribunda**
1. Suberect undershrubs; leaves < 5 cm; leaflets 16-22 pairs ..... **C. mimosoides**

Cassia floribunda Cav., Descr. 132. 1802; Sanj., Leg. India 15. 1991; Matthew, FPH 395. 1999. *C. laevigata* Willd., Enum. Hort. Berol. 441. 1809; Gamble, FPM 402. 1919; Fyson, FSIHS 181. t. 140. 1932. **Kattu Konna (EBIS).**

Leaves to 30 cm long; leaflets to 7 x 3.5 cm, ovate-acuminate, glabrous. Corymbs to 8 mm long; sepals 10 x 4 mm, elliptic; petals yellow, to 20 x 15 mm, obovate, obtuse; stamens unequal; anthers dimorphic. Pods to 9 x 1 cm oblong, cylindric, glabrous, brown; seeds many, biconvex, brown.

Fl. & Fr.: September-January

Distr.: Introduced from Tropical America and now running wild. Rare; in lower altitude sholas especially in disturbed regions. MS, Puthur, *KKK 16718*.

Cassia mimosoides L., Sp. Pl. 379. 1753; Baker in Hook. f., FBI 2: 266. 1878. var. **leschenaultiana** (DC.) Ohashi, J. Jap. Bot. 50: 308. 1975; Sanj., Leg. India 17. 1991. *C. leschenaultiana* DC., Mem. Soc. Phys. Geneve 2: 123. 1824; Gamble, FPM 403. 1919. *C. wallichiana* DC., Mem. Soc. Phys. Geneve 2: 122. 1824. *C. mimosoides* L. var. *wallichiana* (DC.) Baker in Hook. f., FBI 2: 266. 1878.

Leaves 4 x 0.5 cm long; leaflets to 5 x 1 cm, oblong, glabrous. Racemes to 30 cm long. Flowers solitary, axillary, to 8 x 1 mm, linear, glabrous; petals to 9 x 3 mm, obovate, yellow with brown striations. Pods 4 x 0.5 cm, oblong, flat, scabrous.

Fl. & Fr.: September-December

Distr.: South to South East Asia. Occasional; along roadsides and ecotones at lower altitudes. MS, K-4, *KKK 31068.*

Subfamily: **MIMOSOIDEAE**

1. Pods twisted ..... **Archidendron**
1. Pods straight ..... **Acacia**

ACACIA P. Miller

Gard. Dict. Abr. ed. 4. 28. 1754.

1. Leaves bipinnate **2**
1. Leaves reduced to phyllodes in older trees ..... **A. melanoxylon**
2. Foliage silvery; 1 gland on rachis between each pair of opposite pinnules ..... **A. dealbata**
2. Foliage dark green; 2 glands on rachis between each pair of opposite pinnules ..... **A. mearnsii**

Acacia dealbata Link., Enum. Pl. Hort. Berol 445. 1822; Gamble, FPM 429. 1919; Fyson, FSIHS 186. t. 144. 1932; Sanj., Leg. India 47. 1991; Matthew, Ill. FPH t. 230. 1996 & FPH 403. 1999. **Silver Wattle, Karuva (EBIS).**

Trees. Leaves to 10 x 4 cm long; pinnae 18-20 pairs, each to 5 x 1 cm; a gland present on rachis between each pair of opposite pinnae; pinnules opposite, to 40 pairs. Panicles to 25 cm long. Flowers yellow, to 8 mm wide in globose heads; calyx 5 lobed, lobes yellow; ovary oblong. Pod to 8 x 1 cm, flattened, straight or curved.

Fl. & Fr.: August-December

Distr.: Native of Australia, introduced to India. Common in shola borders and scrublands; often entering disturbed sholas. MS, K-5, *KKK 16552.*

Note: This species is extensively cultivated in the high altitude grasslands.

Acacia mearnsii de Wilde., Pl. Bequeart. 3: 61. 1925 *"mearnsi"*; Matthew, Rec. Bot. Surv. India 20(1): 80. 1969; Sanj., Leg. India 50. 1991; Matthew, Ill. FPH t. 236. 1996 & FPH 407. 1999. *A. decurrens* (Wendl.) Willd. var. *mollis* Lindl., Bot. Reg. 5. t. 371. 1819. **Black Wattle, Karuva (EBIS).**

Trees. Leaves to 13 x 10 cm; pinnae 14-18 pairs, each 5 x 0.5 cm, 2 glands present on the rachis between opposite pinnae; pinnules to 40-50 pairs, each 5 mm long, linear. Panicles to 10 cm long, with 10 mm wide heads. Flowers cream; calyx 5 lobed, lobes yellowish; ovary pubescent. Pod to 6 x 0.8 cm, linear, constricted in between.

Fl. & Fr.: August-March

Distr.: Native of Australia, introduced to India. Common in shola borders and scrublands. MS, K-5, *KKK 16552.*

Note: This species is extensively cultivated in the high altitude grasslands.

Acacia melanoxylon R. Br., Ait. f. Hort. Kew. ed. 2. 5: 462. 1813; Baker in Hook. f., FBI 2: 292. 1878; Gamble, FPM 429. 1919; Fyson, FSIHS 186. t. 143. 1932; Sanj., Leg. India 50. 1991; Matthew, Ill. FPH t. 237. 1996 & FPH 408. 1999. **(EBIS).**

Trees; branchlets angular; bark furrowed. Phyllodes to 8 x 1.2 cm, coriaceous. Racemes axillary, shorter than phyllodes; heads to 6 mm wide, globose; calyx 5 lobed; corolla cream, 5 lobed, obovate; ovary greenish. Pod to 12-16 x 0.8 cm, narrow-oblong, coiled and twisted; seed 10-12 per pod, black.

Fl. & Fr.: March-May

Distr.: Native of Australia, introduced to India. Common in the shola margins at higher altitudes. MS, Methappu, *KKK 16003.*

Note: This species is cultivated in the high altitude grasslands.

ARCHIDENDRON F. H. Jacob von Mueller

Fragm. 5: 59. 1865.

Archidendron clypearia (Jack) Nielsen, Adansonia 19: 15. 1979; Sanj., Leg. India 6`0. 1991; Gang. & Chakrab., J. Econ. Tax. Bot. 17(3): 686. 1993. *Inga clypearia* Jack, Malayan Misc. 2: 78. 1822. *Pithecellobium subcoriaceum* Thw., Enum. Pl. Zeyl. 100. 1859; Baker in Hook. f., FBI 2: 305. 1878; Gamble, FPM 434. 1919. **Pulivaka (EBIS). Plate 4.3.7.**

Small trees. Leaves bipinnate, dark green and glossy above, pale below; leaflets 8 x 3 mm, trapezoid-oblong, base oblique, apex acute. Flowers white, to 10 mm wide globose heads on axillary peduncles; calyx 3 mm long, campanulate; corolla yellowish-white, 8 mm long, tubular, lobes 5. Pods twisted, to 10 x 1.5 cm, hispid; dorsal suture coriaceous; seeds many, 5 mm across, compressed.

Fl. & Fr.: September-March

Distr.: India, Sri Lanka and South East Asia. Common along stream sides at lower and medium altitudes. MS, Chengalar, *KKK 16529.* ENP, Rajamala, *KKK 17693.*

34. ROSACEAE

1. Climbing shrubs with prickles; ovaries many, free 2
1. Trees or shrubs; ovaries 1-3, united 3
2. Ovary superior; fruit a drupe ..... **Rubus**
2. Ovary inferior; fruit an achene ..... **Rosa**
3. Flowers solitary, in racemes, or in axillary fascicles; calyx tube free from the ovary ..... **Prunus**
3. Flowers in terminal corymbose panicles; calyx tube adnate to the ovary ..... **Photinia**

PHOTINIA Lindley

Trans. Linn. Soc. 13: 103, t. 10. 1821.

Photinia integrifolia Lindl., Trans. Linn. Soc. London 13: 103. 1821, var. **sublanceolata** Miq., Fl. Ind. Bat. 1: 387. 1857; Matthew, Ill. FPH t. 252. 1996 & FPH

431. 1999. *P. notoniana* Wight & Arn., Prodr. Fl. Ind. Orient. 1: 302. 1834; Hook. f., FBI 2: 380. 1878; Gamble, FPM 445. 1919; Fyson, FSIHS 201. t. 154. 1932. **Choluvan (EBIS) Plate 4.3.8.**

Small trees. Leaves to 14 x 7 cm, ovate or elliptic, base obtuse, apex acute or acuminate, coriaceous. Panicles compound, to 6-12 cm long. Flowers 0.5 cm across; calyx tube campanulate, lobes 5, triangular; petals 5, white, 2 x 1.5 mm, obovate; stamens 15-20; filaments sub equal; ovary inferior, ovoid, villous at apex. Drupe 6 mm across, globose, red; seeds 4, to 4 x 2 mm, elliptic, black.

Fl. & Fr.: July-October.

Distr.: India and Sri Lanka. Common; along ecotones at medium and higher altitudes. MS, Puthur, *KKK 16075*; K-3, *KKK 16485*; K-4, *KKK 16547*; Conical patch, *KKK 16561*. ENP, Near Hut, *KKK 18022*. VMS, Vattappara, *KKK 31136*.

PRUNUS Linnaeus

Sp. Pl. 473. 1753

1. Large trees; flowers in axillary racemes; petals white; drupe transversely oblong ..... **P. ceylanica**
1. Small trees; flowers solitary or in fascicles; petals rose; drupe ovoid ..... **P. persica**

Prunus ceylanica (Wight) Miq., Fl. Ind. Bot. 1: 366. 1855; Matthew, FPH 437. 1999. *Polydontia zeylanica* Wight, Ill. Indian Bot. 1: 203. 1840, "*Polyodontia*". *Pygeum zeylanicum* Gaertn., Fruct. 218. t. 46. 1788. *Pygeum acuminatum* Colebr., Trans. Linn. Soc. London 12: 300. t. 18. 1818; Wight, Ic. t. 993. 1845; Hook. in Hook. f., FBI 2: 318. 1878; Gamble, FPM 439. 1919, non *Prunus acuminata* (Wall.) Dietr. 1803. *Pygeum wightianum* Blume *ex* Muell. in Walp., Ann. 4: 642. 1857; Hook. f., FBI 2: 319. 1878; Gamble, FPM 439. 1919. *P. gardneri* Hook. f., FBI 2: 321. 1878; Gamble, FPM 439. 1919; Fyson, FSIHS 190. t. 146. 1932. *P. sisparense* Gamble, Kew Bull. 238. 1918 & FPM 438. 1919. **Poochapiddukku, Vedipottan (EBIS). Plate 4.4.4.**

Leaves to 16 x 7 cm, elliptic or ovate lanceolate, base obtuse or obliquely rounded, apex acuminate, coriaceous, glabrescent. Flowers 6 mm across; calyx tube 3 mm long, pubescent, lobes 2 mm, lanceolate; petals ovate, pubescent; stamens many; ovary 1 celled, ovoid. Drupe 2.3 x 1.5 cm, 2 lobed; seeds globose.

Fl. & Fr.: August-September.

Distr.: Indo-Malesia. Occasional; along stream sides at lower and medium altitudes. MS, K-4, *KKK 16544*. ENP, Mampallam chola, *KKK 17549*.

Prunus persica (L.) Batsch, Beytr. Entw. Pragm. Gesch. Natur. 30. 1801; Hook. in Hook. f., FBI 2: 313. 1878; Gamble, FPM 439. 1919; Fyson, FSIHS 189. 1932; Matthew, Ill. FPH t. 258. 1996 & FPH 438. 1999. *Amygdalus persica* L., Sp. Pl. 472. 1753. **Pears** (*English*), **Pikkees** (*Tamil*) **(EBIS).**

Leaves to 12.5 x 2.5 cm, oblong-lanceolate, base acute, apex acuminate, margin serrate, chartaceous; petiole with 2 glands near leaf base. Flowers 30 mm across; calyx lobes 5 x 3 mm, spathulate, villous; petals 1.5 x 1 cm, obovate, margins undulate; stamens in 2 whorls; ovary ovoid, hirsute. Drupe 5 x 4 cm, hairy.

Fl. & Fr.: February-March.

Distr.: China, widely cultivated in Asia and Europe. Occasional; along roadsides at lower altitudes. MS, Puthur, *KKK 16188.*

Note: New record to the flora of Kerala. This exotic and cultivated plant, an escape from the orchards, has now established in lower altitude and disturbed shola pockets.

ROSA Linn.

Sp. Pl. 491. 1753

Rosa leschenaultiana Red. & Thory *ex* Wight & Arn., Prodr. Fl. Ind. Orient. 301. 1834; Wight, Ic. t. 38. 1838; Hook. f., FBI 2: 368. 1878; Gamble, FPM 444. 1919; Fyson, FSIHS 200. t. 152. 1932; Matthew, Ill. FPH t. 262. 1996 & FPH 440. 1999. **Kattu Roja (EBIS). Plate 4.4.5.**

Leaves alternate, imparipinnate, to 15 x 12 cm; leaflets 3-4 pairs, to 6 x 2.5 cm, oblong-ovate to elliptic-ovate, sub sessile. Flowers in terminal or axillary corymbs; calyx 5, 4 mm wide, flask-shaped, glandular, lobes 2 x 0.6 cm, oblong-lanceolate, margins reflexed, often serrate; corolla white, petals 5, 3 x 2 cm, obcordate; stamens infinite, filaments 1 cm; pistils infinite, superior, hairy; ovary 1 celled. Achenes ovoid.

Fl. & Fr.: June-July

Distr.: Endemic to Southern Western Ghats. Rare; found along shola borders at higher altitudes. MS, Gudalar road, *KKK 18510.*

RUBUS Linnaeus

Sp. Pl. 492. 1753

1. Leaves simple, shallowly 5 lobed, coriaceous; flowers in panicles; drupes red ..... **R. fairholmianus**
1. Leaves pinnately compound, chartaceous; flowers in corymbs; drupes not red **2**
2. Leaves 3-foliolate; leaflets elliptic or rounded; petals white; drupes orange red ..... **R. ellipticus**
2. Leaves 7-foliolate; leaflets ovate; petals pink; drupes pink ..... **R. niveus**

Rubus ellipticus Smith in Rees, Cyclop. 30: n.16. 1815; Hook. f., FBI 2: 336. 1878; Gamble, FPM 441. 1919; Fyson, FSIHS 193. 1932; Matthew, Ill. FPH t. 263. 1996 & FPH 443. 1999. *R. gowreephul* Roxb., Fl. Ind. 2: 517. 1832. *R. wallichianus* Wight & Arn., Prodr. 298. 1834; Wight, Ic. t. 230. 1839. **Vella Cheechi (EBIS).**

Shrubs; prickles sharply recurved. Leaves to 12 x 8 cm; terminal leaflets 6 x 6 cm, lateral ones 4.5 x 3.5 cm, wooly tomentose below, margins irregularly serrate. Flowers white; sepals 5 x 3 mm, ovate, base united, tomentose; petals to 5 x 3 mm, obovate; ovary globular, glabrous. Drupes 1.5 mm across, glabrous.

Fl. & Fr.: February-March.

Distr.: India, Sri Lanka and Myanmar. Common; along shola borders and ecotones at all altitudes. MS, K-3.5, *KKK 16131.*

Rubus fairholmianus Gard., Calcutta J. Nat. Hist. 8: 6. 1847; Gamble, FPM 441. 1919; Fyson, FSIHS 193. 1932; Matthew, Ill. FPH t. 264. 1996 & FPH 444. 1999. *R. moluccanus* sensu Hook. f., FBI 2: 330. 1878, p.p., non L. 1753. **Eruma Cheechi, Vettila Mullu (EBIS). Plate 4.4.3.**

Straggling shrubs; prickles few, small, slightly recurved. Leaves to 11 x 8 cm, ovate, base subcordate, apex obtuse, margins fine serrate, rugose above, white tomentose below. Flowers white; sepals to 8 x 4 mm, lanceolate, margins laciniate; petals to 6 x 5 mm, obovate; ovary glabrous. Drupes 1.5 x 1 cm, globose.

Fl. & Fr.: February-April.

Distr.: Indo-Malesia. Common along shola borders and roadsides at all altitudes. MS, K-3, *KKK 16135.*

Rubus niveus Thunb., Diss. Rub. 9. t. 1. f. 3. 1813; Gamble, FPM 442. 1919; Fyson, FSIHS 194. 1932; Matthew, FPH 444. 1999. *R. lasiocarpus* Smith in Rees, Cyclop. 30: n. 6. 1815; Wight, Ic. t. 232. 1839; Hook. f., FBI 2: 339. 1878. *R. niveus* Thunb. var. *subglaber* (Thw.) Gamble, FPM 442. 1919. **Karim Cheechi (EBIS). Plate 4.4.6.**

Rambling shrubs; prickles plenty, recurved. Leaves to 20 x 10 cm; leaflets 5 x 4 cm, base rounded or oblique, apex acute, sharply and irregularly toothed along margins; prickles on the midrib, petioles and rachis. Flowers 3-4; sepals to 1.5 x 0.4 cm, lanceolate, tip cuspidate, prickly outside, white inside; petals 6 x 5 mm, obovate; ovary villous. Drupes 1.5 cm across, ovate.

Fl. & Fr.: February-April.

Distr.: Indo-Malesia and China; Common along shola borders and ecotones at all altitudes. MS, K-6, *KKK 16187.*

35. SAXIFRAGACEAE

PARNASSIA Linnaeus

Sp. Pl. 273. 1753

Parnassia mysorensis Heyne *ex* Wight & Arn., Prodr. 35. 1834; Clarke in Hook. f., FBI 2: 402. 1878; Gamble, FPM 448. 1919; Fyson, FSIHS 206. t. 157. 1932; Matthew, Ill. FPH t. 267. 1996 & FPH 448. 1999.

Perennial, scapigerous herbs. Leaves entire, radical, to 1.5 x 2.5 cm, orbicular, cordate; sepals 5, lobes 5 x 2 mm, oblong; petals 5, white, 6 x 3 mm, obovate, 3 nerved, slightly fimbriate on the margins; stamens 5; staminodes 5, clavate, entire; ovary superior, 1 celled, 2.5 x 2 mm, ovoid. Fruit a capsule.

Fl. & Fr.: October-December.

Distr.: Peninsular India and Eastern Himalayas. Occasional; in grasslands at higher altitudes. ENP, Mesthirikettu, *KKK 18031.*

36. CRASSULACEAE

KALANCHOE Adanson

Fam. 2: 248. 1763.

Kalanchoe grandiflora Wall. *ex* Wight & Arn., Prodr. 359. 1834; Clarke in Hook. f., FBI 2: 415. 1878; Gamble, FPM 451. 1919; Fyson, FSIHS 208. t. 158. 1932; Matthew, Ill. FPH t. 275. 1996 & FPH 456. 1999. **Plate 4.4.7.**

Erect, fleshy herbs. Leaves opposite, sessile, thick, to 7 x 3.5 cm, obovate, obtuse, crenate. Flowers yellow, in erect, terminal, paniculate cymes; sepals free, to 6 x 3 mm, ovate, acuminate, red-streaked; petals 4, connate into a tube, lobes 6 x 4 mm, obovate, cuspidate; stamens 8, biseriate; carpels 4, free, with 4 hypogynous scales; ovules many, parietal. Fruit of 4 free follicles; seeds many, oblong, ribbed.

Fl. & Fr.: December-May

Distr.: Endemic to Southern Western Ghats. Occasional; in grasslands near streamlets. ENP, Anamudi slope, *KKK 18541.*

Note: The present collection is a new record to Kerala.

37. DROSERACEAE

DROSERA Linnaeus

Sp. Pl. 218. 1753

Drosera peltata Sm. in Willd., Sp. Pl. 1: 1546. 1797; Clarke in Hook. f., FBI 2: 424. 1878; Gamble, FPM 452. 1919; Fyson, FSIHS 211. t. 160. 1932; Matthew, FPH 458. 1999. **Koshukotti Pullu, Azhukanni. (EBIS) Plate 5.3.2.**

Erect, slender insectivorous herb, 20-35 cm tall, with a bulbous root stock. Leaves radical or cauline; basal ones rosulate, cauline leaves semi-lunate, with viscid stipulate glands above, those on the margin longer and spreading. Racemes terminal, 4-6 flowered. Flowers white, 1 cm across; sepals 5, 3 x 2 mm, ovate-elliptic, margins ciliate; petals 5, 6 x 3 mm, spathulate-obovate; stamens 5, sub equal; ovary 2 mm across, globose. Capsule 3 valved, membranous; seeds many, ovoid, black.

Fl. & Fr.: July-December.

Distr.: Indo-Malesia to Australia and East Asia. Common in grasslands and ecotones at medium and higher altitudes. MS, Coupe road, *KKK 16586.*

38. HALORAGACEAE

LAUREMBERGIA P. J. Bergius

Descript. Pl. Cap. 350. 1767

Laurembergia coccinea (Blume) Kan. in Mart., Fl. Bras. 13 (2): 377, t. 68. 1882; Matthew, FPH 461. 1999. *Epilithes coccinea* Blume, Bijdr. 734. 1826. *Serpicula brevipes* Wight & Arn., Prodr. 338. 1834; Gamble, FPM 453. 1919; Fyson, FSIHS 212. t. 161. 1932; *S. hirsuta* Wight & Arn., Prodr. 338. 1834; Wight, Ic. t. 1001. 1845; Gamble, FPM 453. 1919.

Small decumbent herbs. Leaves to 1 x 0.5 cm, oblanceolate, dentate, hairy. Flowers unisexual, axillary, tetramerous. Female flowers sessile, 3-5-together; sepals 0.5 mm long, hispid; petals pinkish-red, 2.5 x 0.5 mm, oblong-oblanceolate; ovary 1-celled. Male flowers pedicelled; petals 3 mm long, yellow; stamens 8, yellow. Capsule 1 mm long, subglobose, hispid.

Fl. & Fr.: Throughout the year

Distr.: Peninsular India and Sri Lanka. Common; found in marshy grasslands and ecotones at higher altitudes. MS, Idlimottai, *KKK 16639.*

39. MYRTACEAE

1. Shrubs to small trees; flowers large 2
1. Large trees; flowers small 3
2. Leaves 3 ribbed, tomentose; inflorescence a terminal or axillary cyme ..... **Rhodomyrtus**
2. Leaves not ribbed, glabrous; inflorescence an axillary fascicle ..... **Eugenia**
3. Leaves opposite only; fruit a berry ..... **Syzygium**
3. Leaves opposite in younger parts, alternate in older; fruit a hardened capsule ..... **Eucalyptus**

EUCALYPTUS L'Heritier de Brutelle

Sertum Angl. 18. 1789.

1. Umbels solitary; juvenile leaves sessile, opposite, glaucous ..... **E. globulus**
1. Umbels 4-6-flowered; juvenile leaves petiolate, alternate, not glaucous ..... **E. grandis**

Eucalyptus globulus Labill., Rel. Voy. Rech. Perouse 1: 153, t. 13. 1799; Gamble, FPM 486. 1919; Fyson, FSIHS 217. t. 164. 1932; Matthew, Ill. FPH t. 292. 1996 & FPH 479. 1999. **Eucali (EBIS).**

Large tree. Younger leaves to 9 x 3.5 cm, ovate to ovate-lanceolate, glaucous; mature leaves petiolate, alternate, 20 x 3 cm, lanceolate. Umbels axillary; buds 20 x 15 mm, turbinate, angled. Flowers white, operculum hemispherical, warty. Capsule 2 x 2.5 cm, obconical, ribbed, warty; seeds flattened-ellipsoid, brownish-black.

Fl. & Fr.: July-December

Distr.: Native of Tasmania; widely cultivated in Sri Lanka and India. Common; cultivated in grasslands and ecotones at higher altitudes. MS, Methappu, *KKK 18091.*

Note: This tree is cultivated widely in the grasslands of higher altitudes from where it has entered into the shola fringes and even inside disturbed sholas.

Eucalyptus grandis Hill *ex* Maid. Forest Fl. N. S. Wales 1: 79. 1903 & Crit. Rev. Eucalyptus 4: 338. 1920; Matthew, Ill. FPH t. 293. 1996 & FPH 479. 1999. **Grandis (EBIS).**

Large tree. Young leaves to 12 x 4 cm, lanceolate; mature leaves 20 x 2.5 cm, lanceolate. Umbels 4-6 flowered, axillary; buds 9 x 5 mm, ovoid, operculum conical. Flowers yellowish white; stamens 6 mm long. Capsule 8 x 6 mm, obconical, valves 4-5; seeds pyramidal, brown.

Fl. & Fr.: July-December

Distr.: Native of Australia. Common; cultivated in grasslands and ecotones at lower altitudes. MS, Puthur, *KKK 16197*; Thalachorkadavu, *KKK 16463.*

Note: Widely cultivated in plantations; often found inside sholas at lower altitudes.

EUGENIA Linnaeus

Sp. Pl. 470. 1753

1. Leaves 4-5 cm long, narrowly elliptic; calyx tube globose ..... **E. bracteata**
1. Leaves 8-9 cm long, broadly elliptic, obovate or orbicular; calyx tube campanulate 2
2. Leaves elliptic to obovate; flowers to 2.5 cm across, usually in pairs ..... **E. calcadensis**
2. Leaves elliptic to orbicular; flowers to 1.8 cm across, usually in fascicles ..... **E. sp. 1.**

Eugenia bracteata (Willd.) Roxb. *ex* DC., Prodr. 3: 264. 1828; Duthie in Hook. f., FBI 2: 502. 1879; Gamble, FPM 484. 1919. *Myrtus bracteata* Willd., Sp. Pl. 2: 969. 1799. *Eugenia willdenowii* Wight, Ic. t. 545. 1842 & Ill. 2: 13. 1850, non DC. 1828. *Syzygium bracteatum* (Willd.) Raizada, Indian For. 74: 336. 1948, non Korth. 1847. *Eugenia rothii* Panigrahi, J. Econ. Tax. Bot. 5: 994. 1984. *Myrtus latifolia* Heyne in Roth, Nov. Pl. Sp. 332. 1821.

Large shrubs to small trees. Leaves to 5 x 2.5 cm, base acute, apex acute to acuminate. Flowers white, 1.5 cm wide, in axillary, 2-3 flowered fascicles; calyx lobes to 5 x 4 mm, ovate, obtuse, brown tomentose; petals 9 x 6 mm, obovate, glandular; stamens plenty; disc 5 mm, not enlarged; ovary 2-celled. Fruit not seen.

Fl.: January-February

Distr.: Peninsular India and Sri Lanka. Occasional; in fairly exposed shola regions. ENP, Mampallam Chola, *KKK 17560.*

Eugenia calcadensis Bedd., Ic. t. 273. 1868-1872; Duthie in Hook. f., FBI 2: 502. 1879; Gamble, FPM 484. 1919.

Small trees. Leaves to 8 x 3 cm, base acute, apex acute to shortly acuminate. Flowers white, to 2.5 cm across; calyx tube 4 mm long, lobes 4 x 5 mm, orbicular, tomentose outside; petals 10 x 8 mm, orbicular, slightly scarious and recurved at margins. Fruits not seen.

Fl.: February-March

Distr.: Endemic to Southern Western Ghats. Occasional; in fairly exposed shola regions at higher altitudes. Anamudi slope, ENP, *KKK 18551.*

Eugenia sp. 1.

Small trees. Leaves to 9 x 5 cm, base acute, apex abruptly acuminate, glabrous, veins distant, prominent beneath, reticulated in between; petiole 0.5 cm. Flowers creamy white, to 1.8 cm across, rarely in pairs or solitary; calyx tube 5 x 6 mm, lobes 4 x 5 mm, orbicular, tomentose outside; petals 6 x 5 mm, orbicular, margisns scarious; staminal disc broad; filaments to 7 mm; style 7 mm. Fruits not seen.

Fl.: February-March

Distr.: Rare; found along streamside at higher altitudes. ENP, Umayamala, *KKK 17520.*

Note: This species is very much allied to *E. calcadensis* in general appearance, but differs in the fascicled inflorescence, smaller flowers borne on longer pedicels and elliptic to orbicular leaves.

RHODOMYRTUS (DC.) Reichenbach

Nom. 117. 1841.

Rhodomyrtus tomentosa (Ait.) Hassk., Flora 25(2): 35. 1842; Duthie in Hook. f., FBI 2: 469. 1878; Gamble, FPM 471. 1919; Fyson, FSIHS 218. t. 166. 1932; Matthew, Ill. FPH t. 316. 1996 & FPH 492. 1999. *Myrtus tomentosa* Ait., Hort. Kew (ed. 1) 2: 159. 1789; Wight, Ic. t. 522. 1842. **Kirattan (EBIS). Plate 5.6.5.**

Leaves opposite, decussate, to 5 x 3 m, elliptic, base acute, apex acute to obtuse, coriaceous, grey-tomentose below, softly puberulus above. Cymes 2-3 flowered. Flowers 2 cm across; calyx cupular, lobes 5, 6 x 4 mm, obtuse, tomentose; petals 5, pink, to 10 x 5 mm, obovate, tomentose, apex rounded; stamens rose coloured; ovary inferior, to 6 x 5 mm, subglobose, tomentose. Berry 1 cm across, subglobose.

Fl. & Fr.: June-July

Distr.: Indo-Malesia and China. Occasional; along shola borders at higher altitudes. MS, Methappu, *KKK 16415.*

SYZYGIUM R. Brown *ex* Gaertner

Fruct. 1: 166. 1788, *typ. cons.*

1. Cymes terminal or axillary, < 6 cm long; leaves small or medium sized 2
1. Cymes lateral, > 10 cm long; leaves large ..... **S. cumini**
2. Petals free, deciduous; branchlets tetragonous ..... **S. densiflorum**
2. Petals calyptrate; branchlets terete 3
3. Leaves membranous, elliptic-ovate; nerves close and regular ..... **S. gardneri**
3. Leaves coriaceous, obovate; nerves distant, reticulate in between ..... **S. caryophyllatum**

Syzygium caryophyllatum (L.) Alston in Trimen, Handb. Fl. Ceylon 6: (Suppl.) 116. 1931; Matthew, Ill. FPH t. 318. 1996 & FPH 495. 1999. *Myrtus caryophyllata* L., Sp. Pl. 472. 1753. *Syzygium caryophyllaeum* (L.) Gamble, FPM 480. 1919, non Gaertn. 1788. *Eugenia caryophyllaea* (L.) Wight, Ic. t. 540. 1842; Duthie in Hook. f., FBI 2: 490. 1878. **Potti Njaval (EBIS). Plate 4.5.1.**

Leaves to 9 x 4 cm, obovate, base attenuate, apex obtusely acute to acuminate, coriaceous. Cymes corymbose. Flowers 4 mm wide; calyx tube to 4 x 3 mm, ovoid, lobes ovate; petals cream, suborbicular. Berry to 1 cm across, globose, red.

Fl. & Fr.: April-August

Distr.: Western Ghats and Sri Lanka. Common; found at lower and medium altitudes. MS, Coupe road, *KKK 16580*; Chengalar, *KKK 17671.*

Syzygium cumini (L.) Skeels, U. S. D. A. Bur. Pl. Industr. Bull. 248: 2. 1912; Matthew, FPH 495. 1999. *Myrtus cumini* L., Sp. Pl. 471. 1753. *Eugenia jambolana* Lam., Encycl. 3: 198. 1789; Wight, Ic. t. 535. 1842; Duthie in Hook. f., FBI 2: 499. 1879. *Syzygium jambolanum* (Lam.) DC., Prodr. 3: 259. 1828; Gamble, FPM 481. 1919; Fyson, FSIHS 222. t. 170. 1932. **Valiya Njaval (EBIS) Plate 4.5.2.**

Leaves to 13 x 5.5 cm, elliptic, base acute, apex acuminate, coriaceous, minutely punctate. Cymes on the axils of leaf scars, to 16 cm long; calyx tube turbinate, obscurely 4-lobed; petals white, deciduous. Berry to 2 x 1.5 cm, oblong, purple.

Fl. & Fr.: March-August

Distr.: Indo-Malesia. Common; at lower altitudes and in disturbed regions only. MS, Kolathuvada, *KKK 16050*; Thalachorkadavu, *KKK 16452*; K-3.5, *KKK 16571.*

Syzygium densiflorum Wall. *ex* Wight & Arn., Prodr. 329. 1834; Matthew, Ill. FPH t. 319. 1996 & FPH 496. 1999. *Syzygium arnottianum* Walp. Rep. 2: 180. 1843; Gamble,

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FPM 478. 1919; Fyson, FSIHS 219. t. 167. 1932. *Eugenia arnottiana* (Walp.) Wight, Ic. t. 999. 1845; Duthie in Hook. f., FBI 2: 483. 1878. **Pilla Njaval (EBIS). Plate 4.5.3.**

Leaves to 6 x 2.5 cm, elliptic, base acute, apex caudate-acuminate, subcoriaceous. Cymes corymbose, to 6 cm long. Flowers to 6 mm wide; calyx tube 4 x 4 mm, turbinate, lobes ovate; petals free, cream, 3 x 2.5 mm, obovate; stamens to 6 mm long; ovary oblong. Berry oblong, red.

Fl. & Fr.: February-May

Distr.: Endemic to Southern Western Ghats. Common; usually found at higher altitudes only. ENP, Amarachola, *KKK 17507* & *KKK 18531*. VMS, *KKK 31137*.

Syzygium gardneri Thw., Enum. Pl. Zeyl. 117. 1859; Gamble, FPM 479. 1919. *Eugenia gardneri* (Thw.) Bedd., For. Man. Bot. FBI 108. 1874; Duthie in Hook. f., FBI 2: 489. 1878. *E. cymosa* Lam. var. *rostrata* Duthie in Hook. f., FBI 2: 482. 1878. **Venkal Njaval (EBIS).**

Leaves to 8 x 4 cm, elliptic-ovate, base rounded to acute, apex caudate-acuminate, membranous. Cymes to 8 cm long. Flowers globose; calyx tube 2 x 3 mm, obconical, lobes obtuse; petals calyptrate. Berry oblong, purple.

Fl. & Fr.: December-February

Distr.: Western Ghats & Sri Lanka. Rare; in medium and higher sholas. MS, Idlimottai, *KKK 31102*.

40. MELASTOMATACEAE

1. Epiphytic, subscandent shrubs ..... **Medinilla**
1. Terrestrial herbs, shrubs or trees **2**
2. Herbs or shrubs; leaves 3-5 ribbed from base **3**
2. Small trees; leaves penninerved ..... **Memecylon**
3. Succulent herbs; flowers trimerous ..... **Sonerila**
3. Herbs or shrubs, not succulent; flowers tetra or pentamerous ..... **Osbeckia**

MEDINILLA Gaudinchaud *ex* A. P. de Candolle

in Freyc., Voy. Uranie Bot. 484. 1830.

Medinilla malabarica Bedd., Ic. t. 157. 1868-1874; Clarke in Hook. f., FBI 2: 548. 1879; Gamble, FPM 496. 1919; Fyson, FSIHS 229. 1932.

Petiole, leaf base, peduncle and flowers crimson red. Leaves to 7 x 3 cm, elliptic-lanceolate, base rounded, apex acute, thinly fleshy. Fascicles axillary, 1-3 flowered; calyx 4, tube 7 x 5 mm long, truncate; petals 4, to 12 x 10 mm, ovate, obtuse; stamens 8; ovary enclosed in the calyx tube. Berry, crowned by the calyx limb.

Fl. & Fr.: November-December

Distr.: Endemic to Southern Western Ghats. Rare; along stream sides or shola borders at higher altitudes. ENP, Bhiman Odai, *KKK 18040*.

MEMECYLON Linnaeus

Sp. Pl. 349. 1753.

Memecylon flavescens Gamble, Kew Bull. 1919: 226. 1919 & FPM 503. 1919; Fyson, FSIHS 232. 1932.

Leaves opposite, alternate at base, to 5 x 3 cm, elliptic-obovate, obtuse, coriaceous, yellowish green when dry. Flowers borne on axillary tubercles, 2.5 mm across; calyx tube campanulate, lobes 4, triangular; petals 4, ovate, acute, pale pink; stamens 8, filaments 2.5 mm long. Fruit not seen.

Fl.: February-March

Distr.: Endemic to Southern Western Ghats. Very rare and endangered; found along shola borders at medium altitudes. ENP, Mampallam Chola, *KKK 17561.*

OSBECKIA Linnaeus

Sp. Pl. 345. 1753

1. Herbs; flowers 4-merous; stamens 8 ..... **O. parvifolia**
1. Shrubs; flowers 5-merous; stamens 10 2
2. Subshrubs to bushy shrubs; branchlets and leaves short, stiff hairy 3
2. Large shrubs; branchlets and leaves ferruginous hairy ..... **O. reticulata**
3. Shrubs > 2m; leaves 5 ribbed; petal margins serrate 4
3. Subshrubs; leaves 3 ribbed; petal margins entire ..... **O. leschenaultiana**
4. Calyx tube with simple bristles only ..... **O. aspera** var. **aspera**
4. Calyx tube with conspicuous tufts of bristles with elongate stalks ..... **O. aspera** var. **wightiana**

Osbeckia aspera (L.) Blume, Bijdr. Natuurk. Wetensch. 6: 220. 1831; Wight, Ic. t. 377. 1840; Clarke in Hook. f. FBI 2: 519. 1879; Gamble, FPM 492. 1919. var. **aspera** Hansen, Ginkgoana 4: 82. 1977; Matthew, Ill. FPH t. 323. 1996 & FPH 503. 1999. *Melastoma asperum* L., Sp. Pl. 389. 1753. *Osbeckia kleinii* Wight & Arn., Prodr. 323. 1834; Gamble, FPM 492. 1919. *O. aspera* var. *kleinii* (Wight & Arn.) Clarke in Hook. f. FBI 2: 519. 1879. *O. courtallensis* Gamble, Kew Bull. 1918: 242. 1918; Gamble, FPM 492. 1919. *O. lawsonii* Gamble, Kew Bull. 1918: 242. 1918 & FPM 492. 1919.

Leaves to 3 x 2 cm, elliptic-oblong, base obtuse to rounded, apex acute. Cymes to 4 cm, 4-5 flowered. Flowers 2 x 3 cm; calyx tube 1 x 0.8 cm, lobes 4 x 2.5 cm; petals 17 x 12 mm, obovate, rose; stamens and filaments yellow. Capsule 10 mm across.

Fl. & Fr.: March-June

Distr.: South India and Sri Lanka. Common; in shola ecotones and scrub-lands at higher altitudes. MS, Idlimottai, *KKK 16432.*

Osbeckia aspera (L.) Blume, Bijdr. Natuurk. Wetensch. 6: 220. 1831, var. **wightiana** (Benth. *ex* Wight & Arn.) Trimen, Handb. Fl. Ceylon 2: 196. 1894; Matthew, Ill. FPH t. 324. 1996 & FPH 503. 1999. *O. wightiana* Benth. *ex* Wight & Arn., Prodr. 1: 323. 1834; Wight, Ic. t. 998. 1845; Clarke in Hook. f. FBI 2: 519. 1879; Gamble, FPM 493. 1919; Fyson, FSIHS 226. t. 173. 1932.

Leaves subsessile, to 3 x 1.5 cm, ovate-oblong, base rounded, apex acute, whitish or pale below. Flowers 1-3 together; calyx tube 8 mm long, subglobose, lobes acute, hairy at apex; petals purple, 2 cm long, obovate; style curved at tip. Capsule 11 mm across.

Fl. & Fr.: March-May

Distr.: Endemic to South India. Common; along shola borders and scrublands at lower altitudes. MS, K-6, *KKK 31018.*

Osbeckia leschenaultiana DC., Prodr. 3: 142. 1828; Clarke in Hook. f., FBI 2: 520. 1879; Gamble, FPM 493. 1919; Fyson, FSIHS 227. t. 174. 1932; Matthew, Ill. FPH t. 327. 1996 & FPH 505. 1999. *O. gardneriana* Wight, Ic. t. 997. 1843-45.

Leaves sessile, to 2.5 x 1.5 cm, ovate-oblong, base rounded, apex acute. Flowers in dense trichotomous heads; calyx tube 8 mm long, subglobose, lobes acute, hairy, bristles stalked, brown; petals purple, to 1.5 cm long, obovate; stamens yellow. Capsule to 10 x 13 mm, subglobose, hairy.

Fl. & Fr.: March-April

Distr.: Endemic to Southern Western Ghats. Common along shola edges and scrub lands at higher altitudes. MS, Methappu, *KKK 16002.*

Osbeckia parvifolia Arn. in Hook., Comp. Bot. Mag. 2: 308. 1837; Clarke in Hook. f., FBI 2: 515. 1879. *O. cupularis* D. Don *ex* Wight & Arn., Prodr. 1: 323. 1834 p.p.; Gamble, FPM 494. 1919; Fyson, FSIHS 224. t. 171. 1932; Matthew, FPH 504. 1999. *O. rosea* Fyson, J. Ind. Bot. Soc. 11: 49. 1932; Gamble, FPM 1873. 1936.

Stem yellow. Leaves to 4 x 2 cm, elliptic or elliptic-ovate, acute, hairy on both sides. Flowers in close branches; calyx tube deep red, to 5 x 4 mm, lobes acute; petals to 7 x 6 mm, obovate, white blotched with pink on outside, margins hairy; style stout. Capsule to 6 x 5 mm, campanulate.

Fl. & Fr.: August-September

Distr.: South India and Sri Lanka. Occasional; in grasslands at higher altitudes. MS, Idlimottai, *KKK 16636.*

Note: The present collection is a new record to Kerala.

Osbeckia reticulata Bedd., Trans. Linn. Soc. London 25: 216. 1865; Clarke in Hook. f., FBI 2: 520. 1879; Gamble, FPM 493. 1919; Fyson, FSIHS 227. t. 175. 1932; Matthew, Ill. FPH t. 328. 1996 & FPH 506. 1999. **Plate 4.5.4.**

Leaves to 4.5 x 2.5 cm, ovate or ovate-lanceolate, base obtuse, apex acute, reticulate. Flowers in terminal umbellate clusters of 3 or 4; calyx tube to 11 mm across, hemispherical, lobes oblong, obtuse, ciliate and tipped by a large stellate hair, bristles stalked; petals deep purple, 2 x 1.5 cm, obovate; anthers with two small semi-circular flap like appendages at base. Capsule 17 x 12 mm, urceolate.

Fl. & Fr.: July-August

Distr.: Endemic to Southern Western Ghats. Common along shola borders and scrub lands at higher altitudes. MS, Methappu, *KKK 16417.*

Note: The present collection is a new record to Kerala.

SONERILA Roxburgh

Fl. Ind. 1: 180. 1820, *nom. cons.*

Sonerila grandiflora R. Br. *ex* Wight & Arn., Prodr. 322. 1834; Wight, Ic. t. 995. 1845; Clarke in Hook. f., FBI 2: 535. 1879; Gamble, FPM 499. 1919; Fyson, FSIHS 230. t. 177. 1932.

Stem reddish. Leaves opposite, to 5.5 x 3.5 cm, elliptic-ovate, rounded or shortly auricled at base, acute at apex, 3-nerved, sharply serrate. Flowers pink, in terminal

scorpioid cymes; calyx tube funnel shaped, glabrous, teeth 4 mm long, acute; petals 13 x 10 mm, obovate, acute; ovary inferior. Capsule 10 x 10 mm, funnel shaped; seeds 1 mm across, plenty, brown.

Fl. & Fr.: March-April

Distr.: Endemic to Southern Western Ghats. Rare; found along stream sides at medium altitudes. MS, K-6, *KKK 17603.*

41. LYTHRACEAE

ROTALA Linnaeus

Mant. 143, 175. 1771.

Rotala indica (Willd.) Koehne, Bot. Jahrb. 1: 172. 1880; Gamble, FPM 508. 1919; Joseph & Sivar., Proc. India Acad. Sci. (Pl. Sci.) 99: 184. 1989; Matthew, FPH 513. 1999. *Peplis indica* Willd., Sp. Pl. 2: 244. 1799. *Ammannia peploides* Spreng., Syst. 1: 444. 1825; Clarke in Hook. f., FBI 2: 566. 1879.

Erect or procumbent herbs; stems winged. Leaves to 10 x 7 mm, obovate-oblong, apex obtusely acute. Racemes lax; calyx 3 mm long, campanulate, lobes ovate, acuminate; petals 0.5 mm, elliptic, acute; stamens borne at the middle of calyx tube.

Fl. & Fr.: November-January

Distr.: India, Malaya to Philippines. Common; in grasslands bogs and other moist places at lower altitudes. MS, Kulachivayal, *KKK 16673.*

42. ONAGRACEAE

1. Very small annual herbs; flowers white; sepals and petals 2; fruit a berry ..... **Circaea**
1. Bushy herbs; flowers yellow; sepals and petals 4; fruit a capsule ..... **Oenothera**

CIRCAEA Linnaeus

Sp. Pl. 9. 1753

Circaea alpinia L., Sp. Pl. 9. 1753, subsp. **imaicola** (Asch. & Magn.) Kitam., Fl. Afghanistan 279. 1960; Matthew, Ill. FPH t. 332. 1996 & FPH 515. 1999. *C. alpina* L. var. *imaicola* Asch. & Magn., Bot. Zitung (Berlin) 28: 750. 1870. *C. alpina* L. var. *himalaica* Clarke in Hook. f., Hook. f., FBI 2: 589. 1879. *C. alpina* sensu Wight, Ill. Indian Bot. 2: t. 101. 1850, non L. 1753; Gamble, FPM 518. 1919; Fyson, FSIHS 237. t. 184. 1932.

Leaves alternate, to 2 x 2 cm, ovate, base truncate or broadly cuneate, apex acuminate, sinuate-serrate. Racemes axillary or terminal. Flowers 3 mm across; calyx tube ovoid, lobes 1 mm across; petals 1.5 x 1 mm, obcordate; stamens 2; ovary inferior. Berry 2.5 x 2 mm, pyriform, hispid; seeds ellipsoid.

Fl. & Fr.: July-September.

Distr.: Temperate north hemisphere. Rare; in interior sholas at higher altitudes. MS, Idlimottai, *KKK 16612.*

Note: New record to the flora of Kerala.

OENOTHERA Linnaeus

Sp. Pl. 346. 1753.

Oenothera laciniata Hill, Syst. Veg. 12 (App.): 64, pl. 10. 1767; Dietrich & Wagner, Syst. Bot. Monogr. (Onagraceae) 24: 41-43. 1988. *Raimannia laciniata* (Hill) Rose *ex* Britton & A. Br, Ill. Fl. N. U. S., ed. 2, 2: 59. 1913. *Oenothera sinuata* L., Mant. 2: 228. 1771. *Onagra sinuata* (L.) Moench., Methodus 676. 1794. *Oenothera repanda* Medikus, Act. Acad. Theod. Palat. 3: 198, t. 8. 1775. *O. minima* Pursh, Fl. Amer. Sept. 1: 262, t. 15. 1814. *O. sinuata* var. *minima* (Pursh) Nuttall, Gen. N. Amer. Pl. 1: 245. 1818.

Plants 30-60 cm tall; stem terete, pilose. Leaves alternate, sessile, 3-5 x 0.7-1.5 cm, elliptic-lanceolate, pinnately dissected in the lower half, upper half undulate or dentate, apex acute or obtuse, apiculate, pubescent. Flowers solitary, axillary; calyx tube 15 x 1.5 mm, lobes 10 x 2 mm, lanceolate, pilose; petals yellow, 8 x 4 mm, ovate-oblong; stamens 8, 4 x 1 mm long, versatile; filaments 6 mm; ovary 20 x 2 mm, 4 celled, cylindrical, scabrous-hispid; style 2 cm long; stigma 4 fid, spreading. Capsule 5 x 0.4 cm, 4 angled, cylindric, opening by 4 valves; seeds 2 x 1 mm, conical, angular, brownish-black, glabrous, plenty, in 4 rows.

Fl. & Fr.: March-April.

Distr.: Native of North America; introduced in many parts of the world such as Australia, Austria, Belgium, British Isles, France, Germany, Italy, Japan, Paraguay, South Africa, etc. (Dietrich & Wagner, 1988). Occasional; in scrublands adjoining sholas at lower altitudes. MS, Perumala, *KKK 17628*.

Notes: Matthew (1999) has reported five *Oenothera* species from South India so far, either growing in gardens or naturalised in the wild. They are *O. odorata* Jacq, *O. tetraptera* Cav., *O. rosea* Ait., *O. biennis* L. and *O. stricta* Ledeb. This species, perhaps an accidental introduction along with the fodder grasses introduced by the Regional Live Stock Dept., Munnar, has now established in lower altitude scrubland regions. The identity of this species was confirmed by Dr. Peter C. Hoch, Curator, Missouri Botanical Gardens, St. Louis, USA. Since this species is nowhere else reported from India so far, the present collection forms a new record to our country.

43. PASSIFLORACEAE

PASSIFLORA Linnaeus

Sp. Pl. 955. 1753

1. Leaves simple, entire **2**
1. Leaves palmately 3-lobed **3**
2. Leaves semi-orbicular, base rounded, apex broadly truncate ..... **P. leschenaultii**
2. Leaves ovate, base cordate, apex acuminate ..... **P. ligularis**
3. Hypanthium more than 5 cm long; petals rose ..... **P. mollissima**
3. Hypanthium to 1 cm long; petals white ..... **P. edulis**

Passiflora edulis Sims in Curtis, Bot. Mag. t. 1989. 1818; Gamble, FPM 524. 1919; Fyson, FSIHS 241. t. 187. 1932; Matthew, FPH 524. 1999. **Passion Fruit** (*English*), **Thattu Pootan, *Kodikkai, Poonakkai* (EBIS)**

Leaves to 14 x 12 cm, lobes to 9 x 5 cm, ovate, median one larger, base truncate to cordate, subcoriaceous, margins serrate. Flowers solitary, to 5 cm across; hypanthium lobes 3.5 x 1 cm; petals 5, 2 x 0.5 cm, oblong; corona in 4-5 whorls, filaments to 2.5 cm, violet at apex and white at base. Berry to 7 x 6 cm, ovoid, shell hard, pulp sweet, orange coloured; seeds 6 x 4 mm, black.

Fl. & Fr.: June-October

Distr.: Originally from America; introduced in India. Occasional; along shola borders at lower altitudes. MS, Chengalar, *KKK 16699.* PUS, *KKK 18574.*

Note: This exotic and cultivated species has now colonized in the wild. Birds, squirrels and monkeys are the active agents of seed dispersal.

Passiflora leschenaultii DC., Prodr. 3: 326. 1828; Wight, Ic. t. 39. 1838; Masters in Hook. f., FBI 2: 599. 1879; Gamble, FPM 524. 1919; Fyson, FSIHS 240. t. 185. 1932; Matthew, Ill. FPH t. 340. 1996 & FPH 525. 1999. **Murumurukkan Kodi (EBIS).**

Leaves to 9 x 7 cm, chartaceous, puberulus beneath. Flowers 4 cm across, axillary, in pairs; hypanthium 1 cm wide, lobes 2 x 0.6 cm, oblong, apex obtuse, petalloid; petals to 1.5 x 0.5 cm, oblong; coronal filaments to 1.5 cm; androgynophore 8 mm; ovary glabrous. Berry 4 x 3.5 cm, ovoid; seeds 5 x 3 mm.

Fl. & Fr.: February-June

Distr.: Endemic to Southern Western Ghats. Common; along shola borders at lower and medium altitudes. MS, K-3, *KKK 16132.* PAS, Vandaravu, *KKK 18592.*

Passiflora ligularis Juss., Ann. Mus. Natl. Hist. Nat. 6: 113. t. 40. 1865; Matthew, FPH 526. 1999. **Sweet Granadilla** (*English*) **(EBIS).**

Leaves to 16 x 12 cm, ovate, 6-7 nerved, glabrous; petiole with 4-6 thread like glands, each 6-7 mm long near the base of the lamina. Flowers solitary, 5 cm wide; hypanthium lobes 5, to 4 x 2 cm, ovate-acuminate; petals 5 x 1 cm long, oblong; coronal filaments to 4 cm long; Berry 9 x 6 cm, ovoid; seeds 8 x 4 mm.

Fl. & Fr.: June-December

Distr.: Native of Central America to Western South America; introduced to India. Rare; along shola borders at lower altitudes. MS, Perumala, *KKK 31035.*

Notes: New record to the flora of Kerala. This exotic and cultivated plant is now running wild in the higher ranges.

Passiflora mollissima (H. B. K.) L. H. Bailey, Rhodora 18: 156. 1916; Matthew, Ill. FPH t. 341. 1996 & FPH 526. 1999. *Tacsonia mollissima* H.B.K. Nov. Gen. Sp. 2: 144. 1817; Fyson, FSIHS 241. t. 188. 1932. **(EBIS).**

Leaves to 9 x 15 cm; lobes 8 x 4 cm, ovate-lanceolate, margins serrate. Flowers solitary, to 9 cm wide, pendulous; hypanthium to 6 x 1 cm, swollen below; sepals to 4.5 x 1.2 cm, oblong-acuminate, apex mucronate, pinkish; petals to 4.5 x 1.8 cm, oblong-lanceolate, rose; staminal filaments to 1.5 cm; ovary 10 x 3 cm, pubescent. Berry to 8 x 3 cm, oblong-ovoid, tomentose outside; seeds 6 x 5 mm.

Fl. & Fr.: June-September

Distr.: Native of South America; cultivated in Europe and other regions. Occasional; along shola borders at lower altitudes. MS, K-3.5, *KKK 31034*.

Note: New record to the flora of Kerala. This exotic and cultivated plant is now running wild in the higher ranges.

44. CUCURBITACEAE

1. Leaves palmately 5-7 lobed; petals fimbriate ..... **Trichosanthes**
1. Leaves palmately 3-5 lobed; petals not fimbriate **2**
2. Leaves entire or shallowly 3-lobed **3**
2. Leaves deeply palmately 5-lobed ..... **Diplocyclos**
3. Leaves amplexicaule; flowers dioecious only ..... **Solena**
3. Leaves not amplexicaule; flowers monoecious and dioecious ..... **Zehneria**

DIPLOCYCLOS Post & O. Kuntze

Lex. 178. 1903.

Diplocyclos palmatus (L.) Jeffrey, Kew Bull. 15: 352. 1962; Matthew, FPH 536. 1999. *Bryonia palmata* L., Sp. Pl. 1012. 1753. *B. laciniosa* L., Sp. Pl. 1013. 1753, p.p. excl. *typus*; Wight, Ic. t. 500. 1841; Clarke in Hook. f., FBI 2: 622. 1879. *Bryonopsis laciniosa* sensu Naucl., Ann. Sci. Nat. Bot. Ser. 4. 12: 141. 1859; Gamble, FPM 534. 1919. **Pambu kodi.**

Slender climbers; tendrils bifid. Leaves to 13 x 12 cm, serrate. Flowers monoecious, fascicled, 3-6 together; calyx tube 3 mm long, broadly campanulate, lobes 5; corolla campanulate, lobes 5, to 6 x 3 mm, obovate; ovary globose. Berry 2 cm across, globose, dark green with white longitudinal parallel bands; seeds 6 x 5 mm, pyriform, compressed, thinly rugose.

Fl. & Fr.: October-December

Distr.: Indo-Malesia, China and Africa. Occasional; along shola margins at lower altitudes. MS, Pallang mala, *KKK 16688*; Puthur, *KKK 16720*.

SOLENA Lourerio

Fl. Cochinch. 477, 514. 1790.

Solena amplexicaulis (Lam.) Gandhi in Sald. & Nicols., Fl. Hassan Distr. 179. 1976. *Bryonia amplexicaulis* Lam., Encycl. 1: 496. 1785. *Solena heterophylla* Lour., Fl. Cochinch. 514. 1790. *Zehneria umbellata* Thw., Enum. Pl. Zeyl. 125. 1859; Clarke in Hook. f., FBI 2: 625. 1879. *Melothria heterophylla* (Lour.) Cogn. in DC., Monogr. Phan. 3: 618. 1881; Gamble, FPM 539. 1919; Chakravarthy, Fl. Ind. Fasc. 11: 79. 1982.

Slender, scabrous climbers. Leaves to 15 x 7.5 cm, ovate, base hastate, coriaceous. Male flowers in axillary racemes; calyx tube 6 mm long, campanulate, lobes minute; petals 1.5 mm long, triangular; stamens 3, erect. Female flowers solitary, pedicellate. Berry to 2 x 2.5 cm, globose, smooth; seeds 8 x 8 mm, globose, rugose along the margins, dark brown.

Fl. & Fr.: December-May

Distr.: Indo-Malesia and Pakistan. Common; found along shola margins at lower altitudes. MS, K-3, *KKK 31132*.

TRICHOSANTHES Linnaeus

Sp. Pl. 1008. 1753

Trichosanthes lobata Roxb., Fl. Ind. 3: 703. 1832; Clarke in Hook. f., FBI 2: 610. 1879; Matthew, Suppl. Ill. FPH t. 991. 1998 & FPH 543. 1999. *T. perrottetiana* Cogn. in DC., Monogr. Phan. 3: 362. 1881; Gamble, FPM 529. 1919. *T. villosula* Cogn. in DC., Monogr. Phan. 3: 362. 1881; Gamble, FPM 529. 1919; Fyson, FSIHS 242. t. 189. 1932. **Kovan Kodi, Pepparal Kodi, Kattu Padavalam (EBIS).**

Villous climber. Leaves to 15 x 13 cm, lobes cuspidate, densely pubescent beneath, margins serrate. Flowers white, dioecious. Male racemes to 20 cm; flowers about 10-12; calyx tube 1.5 x 0.5 cm, lobes 0.5 cm, linear; petals 5, to 2.5 x 0.5 cm; stamens 3. Female flowers solitary, axillary; ovary ovoid. Berry 8 x 3 cm, glabrous, green with white lines; seeds 13 x 6 mm, oblong, rugose along margins.

Fl. & Fr.: October-December

Distr.: Endemic to Peninsular India. Occasional; along shola margins. MS, Pallang mala, *KKK 16697.*

ZEHNERIA Endlicher

Prodr. Fl. Norfolk. 1: 69. 1833.

1. Leaves ovate, deltoid; flowers monoecious; petals glabrous .....**Z. maysorensis** var. **umbellata**
1. Leaves triangular; flowers dioecious; petals villous within.....**Z. scabra**

Zehneria maysorensis (Wight & Arn.) Arn in Hook.'s, J. Bot. (Hook.) 3: 275. 1841, var. **umbellata** (Chakravarthy) Kumari in Nair & Henry, Fl. Tamil Nadu , 1: 175. 1983. *Melothria mucronata* var. *umbellata* Chakravarthy, Monog. Indian Cucurb. 150. 1959. *Bryonia maysorensis* Wight & Arn., Prodr. 345. 1834; Wight, Ic. t. 1609. 1850. *M. perpusilla* var. *subtruncata* Cogn. in DC., Monogr. Phan 3: 606. 1881; Gamble, FPM 538. 1919. *M. perpusilla* sensu Gamble, FPM 538. 1919, non (Blume) Cogn. 1881; Fyson, FSIHS 243. t. 190. 1932. **Musumusukkan Chedi.**

Scabrous climber. Leaves to 6 x 5 cm, base truncate or shallowly cordate, puberulus along the nerves at lower side, glandular toothed. Male flowers small, white; petals glabrous. Female flowers slightly yellowish; calyx cup 4 mm; petals 4 x 2 mm, ovate; ovary 3 mm across, globose. Berry 8 mm across.

Fl. & Fr.: January-March

Distr.: Endemic to Southern Western Ghats. Rare; along shola borders at medium and higher altitudes. MS, Methappu, *KKK 16011*; Gudalar, *KKK 16083.*

Note: This species was considered endemic to Tamil Nadu (Ahmedullah & Nayar, 1987). Present collection thus forms a new distributional record to Kerala.

Zehneria scabra (L. f.) Sond. in Harv. & Sond., Fl. Cap. 2: 486. 1862; Matthew, FPH 545. 1999. *Bryonia scabra* L. f., Suppl. Pl. 423. 1781. *Zehneria hookeriana* Arn. in Hook., J. Bot. 3: 275. 1841; Clarke in Hook. f., FBI 2: 624. 1879. *Melothria perpusilla* sensu Chakravarthy, Monogr. India Cucurb. 146. 1959 p.p. *M. mucronata* sensu Gamble, FPM 538. 1919, non (Blume) Cogn. 1881; Fyson, FSIHS 244. 1932.

Glabrous climber. Leaves to 11 x 9 cm, base cordate, glandular toothed. Umbels 3-5 flowered; flowers white, 7 mm across; calyx tube 2 mm long; petals obovate; stigma 3 lobed; ovary 2 mm across. Berry 10 mm across; seeds 3 x 3 mm, obovate.

Fl. & Fr.: July-November

Distr.: Tropical Africa, India and South East Asia. Common along shola borders at lower and medium altitudes. MS, K-6, *KKK 16180*; K-4, *KKK 16513*; K-7, *KKK 16711*.

45. BEGONIACEAE

BEGONIA Linnaeus

Sp. Pl. 1056. 1753

Begonia malabarica Lam., Encycl. 1: 393. 1785; Clarke in Hook. f., FBI 2: 655. 1879; Gamble, FPM 546. 1919; Fyson, FSIHS 245. 1932; Matthew, FPH 546. 1999. *Diploclinium lindleyanum* Wight, Ic. t. 1817. 1852. *Begonia fallax* A.DC. Prodr. 15(1): 329. 1864; Clarke in Hook. f., FBI 2: 643. 1879. *B. dipetala* Wight, Ic. t. 1813. 1852. ***Minukki* (EBIS).**

Branching shrubs. Leaves alternate, to 11 x 6 cm, obliquely ovate, toothed and serrate, hispid. Cymes axillary, dichotomously branched. Flowers pale rose, monoecious. Male flowers: sepals 13 mm across, orbicular; stamens 3 mm long. Female flowers: sepals 9 x 5 mm, reniform; ovary 8 x 4 mm, inferior. Capsule 2.5 x 2 cm, ovate-elliptic, winged; seeds brown, numerous.

Fl. & Fr.: April-June.

Distr.: Peninsular India and Sri Lanka. Occasional; in low altitude sholas near stream sides. MS, Thalachorkadavu, *KKK 17660*. PUS, *KKK 18573*.

46. APIACEAE

1. Umbels simple 2
1. Umbels compound 4
2. Leaves simple, orbicular-reniform; mericarps unarmed 3
2. Leaves tri-foliolate; mericarps prickled ..... **Sanicula**
3. Leaf margin dentate; base sheathing; stipules absent ..... **Centella**
3. Leaf margin lobed; base not sheathing; stipules present ..... **Hydrocotyle**
4. Leaf (basal) simple 5
4. Leaves compound or lobed 6
5. Petals yellow; leaves filiform ..... **Bupleurum**
5. Petals white; leaves (basal) ovate-cordate ..... **Pimpinella**
6. Erect herbs; leaves pinnate ..... **Heracleum**
6. Trailing herbs; leaves pedately 3-7 lobed ..... **Vanasushava**

BUPLEURUM Linnaeus

Sp. Pl. 236. 1753

1. Small grass like herbs; lower leaves crowded near base ..... **B. distichophyllum**
1. Tall, well branched herbs; lower leaves not crowded near base 2

2. Lower leaves to 30 x 1 cm, linear-oblong, apex acute ..... **B. mucronatum**
2. Lower leaves to 10 x 0.5 cm, linear, apex obtuse ..... **B. wightii**

Bupleurum distichophyllum Wight & Arn., Prodr. 370. 1834 & Wight, Ic. t. 1006. 1845; Clarke in Hook. f. FBI 2: 677. 1879; Gamble, FPM 558. 1919; Fyson, FSIHS 251. t. 199. 1932; Mukh. & Const., Umbell. India 59. 1993; Matthew, Ill. FPH t. 344. 1996 & FPH 557 1999.

Basal leaves to 20 x 3 mm, oblong-ovate, lower cauline leaves distichous, to 5 x 0.5 cm, linear-subulate, apex acuminate. Umbels terminal and in upper axils; umbellules 5 mm across, 15-20 flowered; petals obovate; stylopodium conical. Mericarps to 2 mm.
Fl. & Fr.: July-October
Distr.: Endemic to Southern Western Ghats. Common; in grassland ecotones at higher altitudes. MS, Idlimottai, *KKK 16620.*

Bupleurum mucronatum Wight & Arn., Prodr. 370. 1834; Gamble, FPM 558. 1919; Fyson, FSIHS 250. t. 198. 1932; Mukh. & Const., Umbell. India 57. 1993; Matthew, FPH 557. 1999. *B. ramosissimum* Wight & Arn., Prodr. 370. 1834. *B. falcatum* var. *ramosissimum* (Wight & Arn.) Dalz. & Gibs., Bombay Fl. 108. 1861. *B. mucronatum* var. *ramosissimum* (Wight & Arn.) Clarke in Hook. f., FBI 2: 676. 1879. *B. wightii* Mukh., Indian For. 95: 567. 1969, non Kozo-Polj. 1913

Leaves cauline, basal ones to 30 x 1 cm, linear-oblong. Umbellules 5 mm across, 5-10 flowered. Flowers yellow; involucral bracts 5, lanceolate; petals to 1 mm, apex emarginate; ovary conical, ribbed. Mericarps 3 x 2 mm, elliptic, sub-pentagonal.
Fl. & Fr.: February-March
Distr.: Peninsular India and Sri Lanka. Common along shola borders at higher altitudes. MS, Methappu, *KKK 18561.*

Bupleurum wightii Kozo-Polj., Epitome Bupleurorum Rossiae 166. 1913, non Mukh. 1969; Mukh. & Const., Umbell. India 64. 1993. *B. virgatum* Wight & Arn., Prodr. 370. 1834; Gamble, FPM 558. 1919; *B. mucronatum* Wight & Arn. var. *virgatum* (Wight & Arn.) Clarke in Hook.-f., FBI 2: 676. 1879; Fyson, FSIHS 251. 1932, non. *B. virgatum* Cav., 1827.

Basal leaves to 10 x 0.4 cm, linear. Umbels long peduncled with many rays. Involucral bracts 5, 10 x 1 mm, mucronate acuminate. Umbellules 7 mm across. petals to 1 mm; ovary conical, ribbed. Mericarps to 2 mm across, elliptic.
Fl. & Fr.: February-March
Distr.: Peninsular India and Sri Lanka. Occasional; found along shola fringes MS, K-3, *KKK 16562.*

CENTELLA Linnaeus

Sp. Pl. ed. 2, 1393. 1763.

Centella asiatica (L.) Urban in Mart., Fl. Bras. 11(1): 287. t. 78. f. 1. 1879; Gamble, FPM 556. 1919; Fyson, FSIHS 248. t. 195. 1932; Mukh. & Const., Umbell. India 15. 1993; Matthew, FPH 559. 1999. *Hydrocotyle asiatica* L., Sp. Pl. 234. 1753; Wight, Ic. t. 565. 1842; Clarke in Hook. f., FBI 2: 669. 1879. **Kuthirakkulambu Chedi, Vallara (EBIS).**

Prostrate herbs rooting at nodes. Leaves rosetted at base, to 4 x 3.5 cm, base cordate, apex rounded. Umbels 3 flowered. Flowers 2 mm wide; calyx tube 1 mm long, lobes 5, triangular; petals 5, 1 mm long, oblong, purplish; stamens 5; ovary 2 celled. Mericarps 2.5 x 1.5 mm, ovoid, laterally flattened, 7-9 ribbed.

Fl. & Fr.: January-February.

Distr.: Tropical Asia and Africa. Common along roadsides and stream sides at lower altitudes. MS, Chengalar, *KKK 18095.*

HERACLEUM Linnaeus

Sp. Pl. 249. 1753

1. Densely hirsute herb found in marshes; leaves ovate; mericarps ovoid-obovate..... **H. ceylanicum**
1. Slightly hirsute herb of open places; leaves oblong-obovate; mericarps elliptic..... **H. sprengelianum**

Heracleum ceylanicum Gardn. *ex.* Clarke in Hook. f. FBI 2: 716. 1879; Gamble, FPM 565. 1919; Fyson, FSIHS 256. t. 203. 1932, *"zeylanicum"*; Mukh. & Const., Umbell. India 243. 1993; Matthew, Ill. FPH t. 347. 1996 & FPH 562. 1999.

Leaves pinnate, to 25 x 15 cm; leaflets 5-6 pairs, to 10 x 6 cm, ovate-oblong. Umbels terminal or in upper axils, involucre absent; umbellules 10-15 flowered; calyx teeth small, aristate; petals 5, oblong-ovate, one larger, emarginate, 3-5 mm long. Mericarps to 10 x 3 mm long.

Fl. & Fr.: June-August.

Distr.: Peninsular India and Sri Lanka. Common in grassland bogs at higher altitudes. MS, Idlimottai, *KKK* 18185.

Note: From India, this species is so far reported from Palni hills of Tamil Nadu only (Mukh. & Const., 1993). Present collection is a new distributional record for Kerala.

Heracleum sprengelianum Wight & Arn., Prodr. 372. 1834; Clarke in Hook. f. FBI 2: 716. 1879; Gamble, FPM 565. 1919; Fyson, FSIHS 257. t. 204. 1932; Mukh. & Const., Umbell. India 241. 1993; Matthew, Ill. FPH t. 348. 1996 & FPH 564. 1999. *Pastinaca sprengeliana* (Wight & Arn.) Wight, Ic. t. 1008. 1845. **Plate 4.6.1.**

Leaves 3 pinnate, to 30 x 20 cm, ovate, hirsute; leaflets ovate, middle one often divided again; base rounded, apex acuminate, margin crenate-serrate; cauline leaves many. Umbels terminal or in upper axils; umbellules 16-18 flowered; calyx absent; petals small; ovary hairy; styles curved. Mericarps to 6 x 3 mm.

Fl. & Fr.: October-December.

Distr.: Endemic to Western Ghats. Common in grassland ecotones at higher altitudes. ENP, Mesthirikettu, *KKK 18003.*

HYDROCOTYLE Linnaeus

Sp. Pl. 234. 1753

Hydrocotyle javanica Thunb., Diss. Hydroc. n. 17. t. 2. 1798; Clarke in Hook. f. FBI 2: 667. 1879; Gamble, FPM 556. 1919; Fyson, FSIHS 247. t. 192. 1932; Mukh. & Const., Umbell. India 11. 1993; Matthew, Ill. FPH t. 350. 1996 & FPH 565. 1999. *H. polycephala* Wight & Arn., Prodr. 366. 1834; Wight, Ic. t. 1003. 1845. **Vaite Kala, Vella Vaite.**

Prostrate herbs, rooting at nodes. Leaves alternate, 7 x 5 cm, 8-9 palmately lobed, lobes triangular, softly pilose. Umbels small, pedicellate. Flowers 20-30 together, white, 1 mm across; calyx teeth absent; petals 5, to 0.6 mm long, ovate, acute, inflexed; stamens 5. Mericarps 1.5 x 2 mm, suborbicular.

Fl. & Fr.: Throughout the year

Distr.: Tropical Asia. Common undergrowth in lower and medium altitude sholas, particularly in disturbed regions. MS, Puthur, *KKK 16448.*

PIMPINELLA Linnaeus

Sp. Pl. 263. 1753

1. Leaves palmately 5 nerved 2
1. Leaves palmately 8 nerved ..... **P. pulneyensis**
2. Leaves broadly cordate, chartaceous, basal ones never tripartite ..... **P. leschenaultii**
2. Leaves orbicular-cordate, coriaceous, basal ones often tripartite ..... **P. candolleana**

Pimpinella candolleana Wight & Arn., Prodr. 369. 1834; Wight, Ic. t. 341. 1840; Clarke in Hook. f. FBI 2: 687. 1879; Gamble, FPM 560. 1919; Fyson, FSIHS 253. t. 200. 1932; Mukh. & Const., Umbell. India 148. 1993; Matthew, Ill. FPH t. 352. 1996 & FPH 567. 1999.

Tall, tawny pubescent herbs. Lower leaves 3 x 3 cm, sharply toothed, pubescent; passing in cauline ones to deeply pinnatifid and finally to a sheath with pinnatifid blade. Flowers small, 9-16 in an umbellule; calyx teeth minute; petals 5, 1 mm across, obovate, emarginate, hairy. Fruit 3 x 2 mm, ovate, densely villous, rugose.

Fl. & Fr.: November-January

Distr.: Endemic to Western Ghats. Common along grassland ecotones at lower altitudes. MS, K-4, *KKK 16775.*

Pimpinella leschenaultii DC. Prodr. 4: 122. 1830; Wight, Ic. t. 1005. 1845; Clarke in Hook. f. FBI 2: 687. 1879; Gamble, FPM 560. 1919; Fyson, FSIHS 254. 1932; Mukh. & Const., Umbell. India 141. 1993; Matthew, Ill. FPH t. 353. 1996 & FPH 567. 1999. **Plate 4.6.2.**

Scapigerous herbs; branchlets softly pubescent. Basal leaves simple, 4-5 cm wide, apex acute, margin dentate; cauline ones 3 foliolate; upper deeply pinnatifid or reduced to a sheath with pinnatifid blade. Flowers small; calyx teeth absent; petals 5, to 1 mm wide, obovate with a curved beak; ovary smooth, 1 mm long. Fruit not seen.

Fl.: July.

Distr.: Peninsular India and Sri Lanka. Common in grasslands at higher altitudes. MS, Idlimottai, *KKK 18187.*

Note: New record to the flora of Kerala.

Pimpinella pulneyensis Gamble, Kew Bull. 228. 1919 & FPM 560. 1919; Fyson, FSIHS 253. t. 201. 1932; Mukh. & Const., Umbell. India 141. 1993; Matthew, Ill. FPH t. 354. 1996 & FPH 568. 1999.

Tall herbs; branchlets hispid pubescent. Leaves simple at base, to 5 x 5.5 cm wide, broadly cordate, apex acute, margin denticulate, pubescent below; cauline leaves 3-foliolate, often dissected. Umbels 4 cm wide; rays 10-12; umbellules 10-12. Flowers 3 mm wide; sepals absent; petals 1.2 mm wide, emarginate; stylopodium subconical; ovary ovoid. Fruits not seen.

Fl.: August-September.

Distr.: Endemic to Southern Western Ghats. Occasional; along grassland ecotones at higher altitudes. MS, Idlimottai, *KKK* 16603.

Note: This species was so far reported from it's type locality (Palni hills) and was considered *'possibly extinct'* (Nayar, 1997; Matthew, 1999). Present collection thus forms both a rediscovery and extension of distribution of the species to Kerala.

SANICULA Linnaeus

Sp. Pl. 235. 1753

Sanicula elata Buch.-Ham. *ex* D. Don, Prodr. Fl. Nep. 183. 1825; Wight, Ic. t. 334. 1840; Mukh. & Const., Umbell. India 17. 1993; Matthew, Ill. FPH t. 356. 1996 & FPH 569. 1999. *S. hermaphrodita* Buch.-Ham. *ex* D. Don, Prodr. Fl. Nep. 183. 1825. *S. europaea* sensu Clarke in Hook. f., FBI 2: 670. 1879, non L. 1753; Gamble, FPM 557. 1919; Fyson, FSIHS 249. t. 196. 1932.

Perennial herbs; rootstock horizontal. Leaves to 10 x 6 cm, chartaceous; leaflets to 6 x 3.5 cm, ovate, base cuneate, apex acuminate, margins serrate. Umbels cymose, terminal, also in upper axils, to 25 cm. Flowers white, unisexual; sepals 5, 1 mm long, lanceolate, pointed; petals 5, to 1 mm long, obovate, apex emarginate; stamens 5. Mericarps to 3 x 2.5 mm, ovoid-oblong, covered with uncinate bristles.

Fl. & Fr.: January-March.

Distr.: Indo-Malesia and South Eastern Africa. Common along roadsides at lower and medium altitudes. MS, K-5, *KKK 16155*; K-4, *KKK 31037*.

VANASUSHAVA Mukherjee & Constance

Kew Bull. 29: 595. 1974

Vanasushava pedata (Wight) Mukh. & Const., Kew Bull. 29: 595. 1974 & Umbell. India 90. 1993; Matthew, Ill. FPH t. 357. 1996 & FPH 569. 1999. *Heracleum pedatum* Wight, Ic. t. 342. 1840; Clarke in Hook. f., FBI 2: 716. 1879; Gamble, FPM 565. 1919; Fyson, FSIHS 257. t. 205. 1932.

Leaves to 10 cm wide, orbicular to obovate, 3-7 foliolate; terminal leaflet lobed, base cuneate, apex acuminate, margins serrate. Umbels compound, terminal or in upper axils; umbellules 6-8 flowered. Flowers white, polygamous; sepals 5, 1 mm long, lanceolate; petals 5, subequal; stamens 5, free; ovary 1.5 mm, conical. Mericarps unequally winged.

Fl. & Fr.: July-October

Distr.: Endemic to Southern Western Ghats. Occasional; along roadsides at medium altitudes. MS, K-5, *KKK 31037*.

47. ARALIACEAE

1. Climbing shrubs to small trees; leaves bristly serrate; inflorescence a compound umbel..... **Pentapanax**
1. Small trees; leaves entire; inflorescence a panicle of umbel or raceme..... **2**
2. Leaves digitate; pedicels continuous ..... **Schefflera**
2. Leaves imparipinnate; pedicels jointed ..... **Polyscias**

PENTAPANAX B.C. Seeman

J. Bot. 2: 290, 294. 1864.

Pentapanax leschenaultii (DC.) Seem., J. Bot. 2: 296. 1864; Clarke in Hook. f., FBI 2: 724. 1879; Gamble, FPM 567. 1919; Fyson, FSIHS 259. 1932; Matthew, Ill. FPH t. 359. 1996 & FPH 572. 1999. *Panax leschenaultii* DC., Prodr. 4: 254. 1830. *Hedera trifoliata* Wight & Arn., Prodr. 377. 1834; Wight, Ic. t. 307. 1840.

Leaves simple pinnate or digitate; leaflets 3-5, to 15 x 10 cm, ovate-acuminate, glabrous, highly reticulate. Umbels 2-3 cm across. Flowers 3-4 mm across, plenty; calyx lobes 5, acute; petals 5, yellow; stamens 5; ovary inferior; styles connate. Drupe 4-5 celled, obscurely angled.

Fl. & Fr.: April-July

Distr.: Peninsular India, Himalayas to West China. Rare; along shola fringes at higher altitudes. MS, Idlimottai, *KKK 18162.*

Note: New record to the flora of Kerala.

POLYSCIAS J. R. Forster & G. Forster

Charact. Gen. 63, t. 32. 1776.

Polyscias acuminata (Wight) Seem., J. Bot. 3: 181. 1865; Clarke in Hook. f., FBI 2: 727. 1879; Gamble, FPM 568. 1919. *Hedera acuminata* Wight, Ic. t. 1062. 1846.

Leaves 30-35 cm long; leaflets 5-6 pairs, 5-9 x 3-4 cm, opposite, elliptic-oblong, base obtuse, apex cuspidate; petiole sheathing at base. Panicles umbelled, 30-40 cm long. Flowers 3-5 together, 3-4 mm across; petals 3 x 2 mm, ovate-acute; ovary 5 celled, inferior. Berry 5 angled, globose, purple coloured.

Fl. & Fr.: January-April.

Distr.: India and Sri Lanka. Occasional; along stream sides. MS, K-5, *KKK 17613.*

SCHEFFLERA J. R. Forster & G. Forster

Charact. Gen. 45. t. 23. 1776.

1. Flowers in umbelled panicles; leaflets not glaucous; nerves conspicuous..... **S. rostrata**
1. Flowers in racemose panicles; leaflets glaucous; nerves not conspicuous..... **S. racemosa**

Schefflera racemosa (Wight) Harms in Engl. & Prantl, Pflanzenf. 3: 38. 1894; Gamble, FPM 570. 1919; Fyson, FSIHS 260. t. 107. 1932; Matthew, FPH 573. 1999. *Hedera racemosa* Wight, Ic. t. 1015. 1845. *Heptapleurum racemosum* (Wight) Bedd., Fl. Sylv. t. 214. 1872; Clarke in Hook. f., FBI 2: 729. 1879. **Kappa Maram, Kottathunikkan.**

Leaves 30-35 cm across; leaflets 6-10, to 16 x 5 cm, oblong-lanceolate, apex acuminate. Panicles to 30 cm long, arising laterally from stout, old terminal branches. Flowers white, 8 mm across. Drupe 6 mm across; seeds ovoid.

Fl. & Fr.: February-June.

Distr.: Peninsular India and Sri Lanka. Common in exposed regions and shola fringes. MS, Puthur, *KKK 16076.*

Schefflera rostrata (Wight) Harms in Engl. & Prantl, Pflanzenf. 3: 38. 1894; Gamble, FPM 569. 1919; Fyson, FSIHS 262. 1932; Matthew, FPH 573. 1999. *Hedera rostrata* Wight, Ic. tt. 1013 & 1014. 1845, p.p. *Heptapleurum rostratum* (Wight) Bedd., For. Man. Bot. 122. 1874; Clarke in Hook. f., FBI 2: 729. 1879. ***Pullu Maram.***

Leaves to 30 cm across; leaflets 5-6, 6-14 x 3-5 cm, ovate-lanceolate, base acute, tip acuminate, nerves forming a loop at the margins. Panicles 12-14 cm long, young parts scurfy tomentose; umbels 1.5-2 cm across. Flowers white, 8-10, small; stamens exerted. Drupe 8 mm across, black; seeds compressed sideways.

Fl. & Fr.: February-March.

Distr.: Endemic to Southern Western Ghats. Very rare; along shola margins. ENP, Anamudi slope, *KKK 18544.*

Note: This species is so far reported from Nilgiris (Coimbatore) only (Ahmedullah & Nair, 1987). Present collection is a new distributional record for Kerala.

48. CORNACEAE

MASTIXIA Blume

Bijdr. 13: 654. 1825.

Mastixia arborea (Wight) Bedd., Fl. Sylv. t. 216. 1872; Clarke in Hook. f. FBI 2: 745. 1879; Gamble, FPM 573. 1919; Matthew, Blumea 23(1): 88. 1976 & Fl. Ind. Fasc. 19: 25. 1988. *Bursinopetalum arboreum* Wight, Ic. t. 956. 1845. **Eramba Maram, Kunthirikkam (EBIS). Plate 5.2.1.**

Large trees with resinous glands. Leaves alternate, to 14 x 5 cm, elliptic, suddenly narrowed in a twisted acumen; one row of glands present on either sides of mid rib. Panicle terminal, 7 cm across. Flowers greenish-white; calyx tube 3.5 mm across, campanulate, limb 5 lobed; petals 5, to 6 mm across, ovate, coriaceous, apex inflexed; stamens 5; disk 5 lobed; ovary 1 celled. Drupe 1 x 0.5 cm, ellipsoid.

Fl. & Fr.: March-July

Distr.: Endemic to Southern Western Ghats. Common in sholas at lower and medium altitudes. MS, K-4, *KKK 16581*; Chengalar, *KKK 31032.* ENP, Amarachola, *KKK 31065.*

49. CAPRIFOLIACEAE

VIBURNUM Linnaeus

Sp. Pl. 267. 1753

1. Small trees; flowers in terminal corymbose cymes 2
1. Shrubs to small trees; flowers in drooping panicles ..... **V. erubescens**

2. Corolla rotate; leaves elliptic ..... **V. punctatum**
2. Corolla tubular; leaves ovate-lanceolate ..... **V. coriaceum**

Viburnum coriaceum Blume, Bijdr. 656. 1826; Clarke in Hook. f., FBI 3: 5. 1880; Gamble, FPM 576. 1919; Fyson, FSIHS 263. t. 210. 1932. *V. hebanthum* sensu Wight, Ic. t. 1023. 1845. **Mottu Mookan (EBIS) Plate 4.5.5.**

Leaves to 15 x 6 cm, apex acuminate, glabrous, pale beneath. Inflorescence 8-10 cm across. Flowers white, 3 mm across, pedicelled; calyx tube 2 mm long, lobes obtuse; corolla tube 4 mm long, glabrous, lobes ovate-obtuse. Drupes 8 x 5 mm, elliptic, ribbed, beaked, reddish brown; seeds 6 x 4 mm, elliptic.

Fl. & Fr.: February-August

Distr.: India, Bhutan, Myanmar and Indonesia. Common along shola borders and other exposed regions. MS, Puthur, *KKK 16066*; K-4, *KKK 16150*; Methappu, *KKK 16439*; Thalachorkadavu, *KKK 16460.*

Viburnum erubescens Wall. *ex* DC., Prodr. 4: 329. 1830; Clarke in Hook. f., FBI 3: 7. 1880; Gamble, FPM 576. 1919; Fyson, FSIHS 265. t. 212. 1932; Matthew, Ill. FPH t. 365. 1996 & FPH 581. 1999. *V. wightianum* Wight & Arn., Prodr. 388. 1834; Wight, Ic. t. 1024. 1845.

Leaves to 8 x 4 cm, ovate, apex acuminate, serrate, thickly villous below. Inflorescence 3 cm across, pubescent; peduncle red. Flowers white, 6 mm across; calyx tube 3 mm, villous, lobes salvar shaped, obtuse; corolla tube 5 x 4 mm, glabrous, lobes salvar shaped, obtuse. Drupe ovoid-oblong.

Fl. & Fr..: February-June.

Distr.: India, Sri Lanka, China and Myanmar. Rare; along stream sides at lower altitudes. MS, K-6, *KKK 16181* & *KKK 17615*; Gudalar, *KKK 18509.*

Note: New record to the flora of Kerala.

Viburnum punctatum Buch.- Ham *ex* D. Don, Prodr. Fl. Nepal 142. 1825; Hook. f., FBI 3: 5. 1880; Matthew, FPH 581. 1999. *V. acuminatum* Wall. *ex* DC., Prodr. 4: 325. 1830; Gamble, FPM 575. 1919; Fyson, FSIHS 262. t. 209. 1932. *V. punctatum* Buch.-Ham *ex* D. Don var. *acuminatum* (Wall. *ex* DC.) Clarke in Hook. f., FBI 229. 1981. **Konakkara (EBIS). Plate 4.5.6.**

Young parts tomentose. Leaves to 11 x 4 cm, coriaceous, glabrous. Inflorescence 8-9 cm across. Flowers white, 5 mm across; calyx tube 1 mm long, lobes 5, obtuse; corolla lobes 2.5 mm long, ovate-obtuse; anthers yellow; ovary 1 celled. Drupes to 12 x 6 mm, elliptic, ribbed, beaked; seeds 7 x 4 mm, elliptic, compressed.

Fl. & Fr.: March-August.

Distr.: Indo-Malesia. Common along shola borders and other exposed regions at low altitudes. MS, Thalachorkadavu, *KKK 16040*; Puthur, *KKK 16442*; K-4, *KKK 16572.*

50. RUBIACEAE

1. Herbs 2
1. Trees, shrubs or lianas 8

2. Climbers; leaves whorled; pedicels jointed 3
2. Erect, diffuse or prostrate; leaves opposite; pedicels not jointed 4
3. Leaves sessile, 1 nerved; flowers 4-merous ..... **Galium**
3. Leaves petiolate, 5 or 7 nerved; flowers 5-merous ..... **Rubia**
4. Ovules 1 per cell 5
4. Ovules numerous 6
5. Flowers in terminal corymbs; corolla lobes incurved ..... **Knoxia**
5. Flowers in axillary fascicles or terminal heads; corolla lobes spreading ..... **Spermacoce**
6. Calyx teeth 4 7
6. Calyx teeth 5 ..... **Ophiorrhiza**
7. Leaf base truncate to rounded ..... **Neanotis**
7. Leaf base acute or decurrent ..... **Oldenlandia**
8. Leaves distichous; corolla lobes beaked ..... **Lasianthus**
8. Leaves decussate; corolla lobes not beaked 9
9. Corolla lobes twisted or imbricate in bud 10
9. Corolla lobes valvate in bud 12
10. Corolla 4-merous 11
10. Corolla 5-merous ..... **Wendlandia**
11. Styles as long as corolla tube; stigma 2-fid ..... **Ixora**
11. Styles much longer than corolla tube; stigma fusiform ..... **Pavetta**
12. One calyx lobe unequal, leafy, white; fruit a berry ..... **Mussaenda**
12. Calyx lobes equal; fruit a capsule or drupe 13
13. Ovules numerous; fruit a capsule ..... **Hedyotis**
13. Ovules 1 per cell; fruit a drupe 14
14. Inflorescence axillary 15
14. Inflorescence terminal 16
15. Branches with(out) spines; leaves chartaceous to subcoriaceous, not foetid ..... **Canthium**
15. Branches unarmed; leaves coriaceous, foetid ..... **Saprosma**
16. Corolla short and straight ..... **Psychotria**
16. Corolla long and curved ..... **Chassalia**

CANTHIUM Lamarck

Encycl. Meth. Bot. 1: 602. 1785.

1. Shrubs armed with recurved, supra-axillary thorns; domatia hairy 2
1. Unarmed shrubs; domatia glandular ..... **C. rheedii**
2. Flowers in sub-umbellate clusters; leaves obtusely acute ..... **C. neilgherrense** var. **chartaceum**
2. Flowers in axillary umbels; leaves caudate-acuminate ..... **C. dicoccum** var. **umbellatum**

Canthium dicoccum (Gaertn.) Teijsm. & Binn., Cat. Hort. Bog. 113. 1866. var. **umbellatum** (Wight) Sant. & Merch. in BBSI 3: 107. 1961. *C. umbellatum* Wight, Ic. t. 1034. 1845; Hook. f., FBI 3: 132. 1880. *Plectronia didyma* (Gaertn. f.) Kurz., var. *umbellatum* (Wight) Gamble, FPM 624. 1921; Fyson, FSIHS 282. 1932. *Psydrax umbellata* (Wight) Bridson, Kew Bull 48: 762. 1993; Matthew, FPH 628. 1999.

Leaves to 9 x 6 cm, elliptic to ovate, subcoriaceous. Flowers white, 3-12 together; calyx 3 mm long, obconical, lobes triangular, glabrous; corolla tube 6 mm long, campanulate, densely reflexed hairy below the stamens and erect hairy above the stamens in side; lobes 3 x 1.5 mm, oblong. Drupe 13 x 7 mm, obovoid.

Fl. & Fr.: February-April

Distr.: Endemic to Southern Western Ghats. Common at lower and medium altitudes. MS, K-5, *KKK 31066.*

Canthium neilgherrense Wight, Ic. t. 3(4): 4. t. 1064. 1846; Hook.f. FBI 3: 133. 1880, var. **chartaceum** (Gamble) Swamin. Boil. Mem., Angiosp. Taxon. Ser. 2 (1 & 2): 67. 1977; Matthew, Ill. FPH t. 367. 1996 & FPH 588. 1999. *Plectronia neilgherrensis* (Wight) Bedd., Forest Man. Bot. 134/6. 1873, var. *chartacea* Gamble, FPM 625. 1921; Fyson, FSIHS 283. t. 230. 1932. **Edali Maram.**

Leaves to 11 x 5 cm, elliptic-oblong, subcoriaceous. Flowers white, 4-6; calyx 2 mm long, cupular, lobes triangular, glabrous; corolla 8 mm across, tube 3 mm long, urceolate, villous, lobes 3 x 2 mm, ovate; ovary globose. Drupe 13 x 9 mm, obovate.

Fl. & Fr.: February-April

Distr.: Endemic to Southern Western Ghats. Occasional; found along shola borders. PAS, *KKK 18594.*

Canthium rheedii DC., Prodr. 4: 474. 1830; Hook. f., FBI 3: 134. 1880. *Plectronia rheedii* (DC.) Bedd., For. Man. Bot. 134/5. 1872; Gamble, FPM 625. 1921; Matthew, Ill. FPH t. 368. 1996 & FPH 589. 1999.

Leaves to 5 x 4 cm, broadly ovate, apex acute. Flowers greenish-white, 10 mm long, in axillary fascicles; calyx 2 mm, obconical, teeth minute; corolla tube 5 mm long, globose, lobes 7 x 3 mm, lanceolate, spreading; style bearded at middle. Drupe 15 x 12 mm, obovoid, compressed, black; seeds rugose, hard.

Fl. & Fr.: February-April

Distr.: Southern Western Ghats and Sri Lanka. Occasional; at medium altitudes. ENP, Mampallam Chola, *KKK 17557.*

CHASSALIA Commerson *ex* Poiret

in Dict. Sc. Nat. 8: 198. 1817.

Chassalia curviflora (Wall.) Thw., Enum. Pl. Zeyl. 150. 1864; Hook. f., FBI 3: 176. 1880, p.p.; Gamble, FPM 643. 1921. var. **ophioxyloides** (Wall.) Deb & Krishna, BBSI 24: 222. 1982 (1983). *Psychotria curviflora* Wall. in Roxb., Fl. Ind. 2: 167. 1824. *P. ophioxyloides* Wall. in Roxb., Fl. Ind. 2: 167. 1824; Sant. & Merch., BBSI 3(2): 108. 1961. *Psychotria ambigua* Wight & Arn., Prodr. 433. 1834. *Chassalia ophioxyloides* (Wall.) Craib, Gard. Bull. Straits Settlem. 6: 474. 1930.

Shrubs. Leaves variable, to 22 x 10 cm, oblanceolate, abruptly acuminate. Cymes 9 x 5 cm, terminal, panicled, glabrous. Flowers white, 8-10 mm long, subsessile; calyx 1.5 mm long, globose, lobes 5, ovate; corolla 8 mm long, curved, lobes ovate, obtuse; ovary 2-celled. Drupe 6 mm across, globose, glabrous, 2-seeded.

Fl. & Fr.: January-July

Distr.: Indo-Malesia. Common under growth in lower and medium altitude sholas. MS, Puthur, *KKK 16070*; Chengalar, *KKK 16115*; K-5, *KKK 16172*; Thalachorkadavu, *KKK 16741*. PUS, *KKK 18568*.

GALIUM Linnaeus

Sp. Pl. 105. 1753

Galium asperifolium Wall. in Roxb., Fl. Ind. 1: 381. 1820; Gamble, FPM 656. 1921; Fyson, FSIHS 295. t. 241. 1932; Matthew, FPH 594. 1999. *G. mollugo* Hook. f., FBI 3: 207. 1881, non L.

Diffuse herbs, stem 4-angled, scabrous. Leaves whorled, 6 per node, to 18 x 3 mm, oblanceolate, apex acute, lineolate-serrate, subsessile. Umbels axillary or terminal. Flowers 2-3, 5 mm long; calyx cupular, 2 mm long, lobes ovate, serrate; corolla white, 2 mm wide. Capsule 2 x 2 mm, globose, opening apically; seeds many.

Fl. & Fr.: Throughout the year

Distr.: India, Afghanistan and Thailand. Common; along shola ecotones and disturbed regions. MS, Conical patch, *KKK 16481*; K-7, *KKK 16560*.

HEDYOTIS Linnaeus

Sp. Pl. 101. 1753

1. Stipules rounded or elongate, not sheathing **2**
1. Stipules triangular dentate, lower ones sheathing ..... **H. anamalayana**
2. Stipules rounded, margins simply pectinate **3**
2. Stipules elongate, margins pinnatisect **4**
3. Subshrubs; leaves narrowly lanceolate, nerves thick; panicles large, many flowered ..... **H. articularis**
3. Stiff shrubs; leaves ovate, nerves obscure; cymes short, few flowered ..... **H. buxifolia**
4. Large shrubs; stipules pubescent; flowers pink; capsule ovoid, glabrous ..... **H. leschenaultiana**
4. Low shrubs; stipules glabrous; flowers pale lilac; capsule globose, pubescent ..... **H. swertioides**

Hedyotis anamalayana (Gamble) Rao & Hemadri, Ind. For. 99: 378. 1973; Henry *et al*, JBNHS 75(3): 689 1979. *Oldenlandia anamalayana* Gamble, Kew Bull. 1920: 67. 1920 & FPM 599. 1921. *Hedyotis lessertiana sensu* Bedd., Ic. t. 31. 1868-1874, non Arn. 1836.

Small, glabrous shrubs. Leaves to 10 x 3.5 cm, elliptic or ovate-lanceolate, base cuneate, apex acuminate, shining above. Panicles terminal, 8 x 3 cm. Flowers 7 mm long, tetramerous; calyx 2 mm, lobes ovate, obtuse; corolla white, lobes 5 mm, oblong, obtuse, tube densely villous within. Capsule 4 x 4 mm, ovoid; seeds black.

Fl. & Fr.: August-March

Distr.: Endemic to Southern Western Ghats. Common; along shola borders at low and medium altitudes. MS, Perumala, *KKK 16104*; K-4, *KKK 16402*; K-4.5, *KKK 16526*; K-7, *KKK 16558*.

Hedyotis articularis R. Br. *ex* Wight & Arn., Prodr. 407. 1834; Wight, Ic. t. 1028. 1845; Hook. f., FBI 3: 51. 1880; Matthew, FPH 597. 1999, subsp. **santapaui** (Shetty &

Vivek.) Deb. & Dutta, Taxon 32: 284. 1983. *Hedyotis santapaui* Shetty & Vivek. in BBSI 11: 447. ff. 1-11. 1969. *Oldenlandia articularis* (R. Br. *ex* Wight & Arn.) Gamble, FPM 597. 1921; Fyson, FSIHS 272. t. 218. 1932.

Stem articulated by persistent stipules. Leaves crowded at apex, to 18 x 8 mm, very coriaceous, nearly sessile, margins recurved. Cymes 1.5-3 cm across, hirsute. Flowers 9 mm long, sessile, 10-20 in a cyme; calyx 4 mm, campanulate, lobes 4, 1 mm, acute; corolla 5 mm across, tube slender, lobes oblong, lilac, margin recurved. Capsule 6 x 4 mm, obovate, pubescent; seeds obovoid, black.

Fl. & Fr.: August-March

Distr.: Endemic to Southern Western Ghats. Occasional; found along shola borders at lower altitudes. MS, Idlimottai, *KKK 16414*.

Hedyotis buxifolia Bedd., Ic. t. 1. 1868-1864; Hook. f., FBI 3: 52. 1880. *Oldenlandia buxifolia* (Bedd.) O. Ktze., Rev. Gen. Pl. 1: 292. 1891; Gamble, FPM 598. 1921; Nair *et al*, BBSI 22(1-4): 205. 1980.

Leaves to 13 x 6 mm, acute at both ends, coriaceous, scabrous above. Panicles 2.5 cm across. Flowers subsessile, 8 mm long; calyx 5 mm long, lobes 3 mm long, ovate; corolla tube 3 mm long, villous within, lobes oblong; anthers sessile, attached at the middle of the corolla tube. Capsule 4 mm long, obovoid.

Fl. & Fr.: August-December

Distr.: Endemic to Southern Western Ghats. Rare; found in grasslands near streams at higher altitudes. ENP, Bhiman Odai, *KKK 18086*.

Hedyotis leschenaultiana DC., Prodr. 4: 422. 1830; Matthew, Ill. FPH t. 375. 1996 & FPH 598. 1999. *H. stylosa* R. Br. *ex* Wight & Arn., Prodr. 407. 1834; Wight, Ic. t. 1027. 1845; Hook. f., FBI 3: 51. 1880. *Oldenlandia stylosa* (R. Br. *ex* Wight & Arn.) O. Ktze., Rev. Gen. Pl. 1: 292. 1891; Gamble, FPM 598. 1921; Fyson, FSIHS 272. t. 217. 1932.

Leaves ovate-lanceolate, base rounded, apex acuminate, glabrous. Cymes 12 x 5 cm, panicled; calyx limb 2 mm long, lobes obtuse, glabrous; corolla 8 mm long, tube slender, villous within, lobes 4 mm long, oblong, spreading; anthers sessile, adnated by the centre; stigma pink. Capsule 5 mm long.

Fl. & Fr.: February-May

Distr.: Endemic to Southern Western Ghats. Occasional; found along shola borders and road sides at higher altitudes. MS, Idlimottai, *KKK 16436*; Methappu, *KKK 31067*.

Hedyotis swertioides Hook. f., FBI 3: 42. 1880; Matthew, Ill. FPH t. 376. 1996 & FPH 599. 1999. *Oldenlandia swertioides* (Hook. f.) O. Ktze., Rev. Gen. Pl. 1: 292. 1891; Gamble, FPM 598. 1921; Fyson, FSIHS 273. t. 219. 1932. **Thavalakkal Chedi.**

Leaves to 6 x 2.5 cm, ovate-lanceolate, acute at both ends, glabrous. Cymes corymbose, to 12 cm across. Flowers to 10 mm long, sessile; calyx 4 mm long, lobes acute, densely puberulus; corolla tube 8 mm long, densely villous within, puberulus outside, lobes 2.5 x 1 mm, oblong, obtuse. Capsule 4 x 3 mm; seeds angled, light brown.

Fl. & Fr.: December-February

Distr.: Endemic to Southern Western Ghats. Common along shola borders and road sides at higher altitudes. MS, Puthur, *KKK 16193.* ENP, Way to hut, *KKK 18030*; Mesthirikkettu, *KKK 18042.*

IXORA Linnaeus

Sp. Pl. 110. 1753

Ixora notoniana Wall. *ex* G. Don, Gen. Syst. 3: 571. 1834; Hook. f., FBI 3: 51. 1880; Fyson, FSIHS 284. t. 231. 1932; Matthew, Ill. FPH t. 377. 1996 & FPH 600. 1999. *I. saulierei* Gamble, Kew Bull. 1920: 247. 1920 & FPM 630. 1921. **Plate 4.5.7.**

Small trees. Leaves to 17 x 7 cm, elliptic to oblanceolate, base attenuate, apex abruptly acuminate. Inflorescence lax, to 10 cm wide, ultimate corymbs 4 cm. Flowers pedicelled; calyx 2.5 mm long, lobes 1.5 mm long, acuminate; corolla tube 12 x 1 mm long, lobes 5 x 2 mm, ovate, acute. Drupe 10 mm wide, subglobose.

Fl. & Fr.: March-May

Distr.: Endemic to Southern Western Ghats. Occasional; in shola margins at higher altitudes. ENP, Anamudi route, *KKK 17638.*

KNOXIA Linnaeus

Sp. Pl. 104. 1753

Knoxia sumatrensis (Retz.) DC., Prodr. 4: 570. 1830; Matthew, FPH 602. 1999, var. **hookeriana** Bhattacharjee & Deb. in JETB. 6: 92. 1985. *Spermacoce sumatrensis* Retz., Obs. 4: 23. 1786. *Knoxia corymbosa* sensu Wight, Ill. Ind. t. 128. 1850, non Willd., 1798; Hook. f., FBI 3: 128. 1880; Gamble, FPM 622. 1921.

Straggling herbs, stem 4-angled, scabrous. Leaves to 5 x 2.5 mm, ovate to elliptic, acute at both ends, scabrous hispid. Corymbs terminal, 3-4 cm across, dense. Flowers 5 mm long; calyx tube 2 mm long, lobes 4, triangular, serrate; corolla white to purple, tube 5 mm, lobes 4, 3 mm. Capsule 4 x 4 mm, ellipsoid.

Fl. & Fr.: July-September

Distr.: South India and Sri Lanka. Common; at lower altitudes in disturbed regions. MS, Conical patch, *KKK 16454*; K-3, *KKK 16761.*

LASIANTHUS W. Jack

Trans. Linn. Soc. London 14: 125. 1823 *nom. cons.*

1. Cymes sessile; transverse nervules parallel **2**
1. Cymes with short, stout peduncles; transverse nervules reticulate ..... **L. venulosus**
2. Calyx limb and teeth glabrous ..... **L. blumeanus**
2. Calyx limb and teeth hairy **3**
3. Leaves elliptic or elliptic-obovate, abruptly acuminate; nerves 3-4 pairs ..... **L. acuminatus**
3. Leaves lanceolate or oblong-lanceolate, acuminate; nerves 6-9 pairs ..... **L. coffeoides**

Lasianthus acuminatus Wight, Calcutta J. Nat. Hist. 6:511.1846; Hook. f., FBI 3:185. 1880,p.p.; Gamble, FPM 647. 1921; Fyson, FSIHS 292. 1932; Matthew, Ill. FPH t. 379. 1996 & FPH 604. 1999. **Peenari, Theettanari, *Mootu Maram* (EBIS) Plate 4.5.8.**

Large shrubs. Leaves evil smelling, to 8 x 3.5 cm, base acute, glossy. Flowers 1-3 together; calyx tube 4 mm, lobes triangular, villous; corolla white, 8 mm long, tube slender, lobes ovate, obtuse, densely villous. Drupe 5 mm across, globose, glabrous.
Fl. & Fr.: August-March
Distr.: Endemic to Southern Western Ghats. Common undergrowth inside low and medium altitude sholas. MS, K-4, *KKK 16111.*

Lasianthus blumeanus Wight, Calcutta J. Nat. Hist. 6: 507. 1846; Hook. f., FBI 3: 184. 1880; Gamble, FPM 646. 1921.

Bushy shrubs. Leaves to 7 x 2.5 cm, elliptic, base acute, apex caudate- acuminate; nerves 5 pairs, prominent. Cymes 2-3 cm across. Flowers 8-10 mm long, sessile; calyx 4 mm long, lobes 4-5, lanceolate; corolla tube campanulate, glabrous; ovary 4-celled. Drupe 6 x 6 mm, obovoid, glabrous.
Fl. & Fr.: October-March
Distr.: Endemic to Southern Western Ghats. Occasional undergrowth inside medium altitude sholas. ENP, Mampallam Chola, *KKK 17547.*

Lasianthus coffeoides Fyson, Kew Bull. 1914: 1845. 1914; Gamble, FPM 647. 1921; Fyson, FSIHS 291. t. 237. 1932.

Erect, unbranched shrubs with long, slender, horizontal branches. Leaves 12 x 2.5 cm, base cuneate, apex acuminate, glabrous, glossy. Flowers 2-3 together, sessile; calyx 2 mm, teeth triangular, ciliate; corolla white, ciliate within, tube 5 mm, lobes 5, 2 mm long, acute; anthers shortly stalked.
Fl. & Fr.: June-December
Distr.: Endemic to Southern Western Ghats. Occasional; found in medium altitude sholas. PAS, Vandaravu, *KKK 18590.*

Lasianthus venulosus (Wight & Arn.) Wight, Ic. t. 1032. 1845; Hook. f., FBI 3: 190. 1880; Gamble, FPM 648. 1921; Fyson, FSIHS 290. t. 236. 1932; Matthew, Ill. FPH t. 381. 1996 & FPH 606. 1999.

Well branched shrubs. Leaves to 8 x 3 cm, elliptic-oblong, base acute, apex abruptly apiculate; nerves 6 pairs, oblique. Flowers 8 mm long, in axillary cymes; calyx tube 3 mm, lobes 4, lanceolate, hirsute; corolla yellowish white, 8 mm long, tube short, lobes hairy; stamens 4. Drupe 5 mm across, subglobose, dark blue.
Fl. & Fr.: : February-May
Distr.: Endemic to Southern Western Ghats. Occasional; in medium and higher altitude sholas. MS, K-4.5, *KKK 18110.* VMS, *KKK 31138.*

MUSSAENDA Linnaeus

Sp. Pl. 177. 1753

Mussaenda hirsutissima (Hook. f.) Hutch. *ex* Gamble, FPM 610. 1921; Fyson, FSIHS 279. t. 226. 1932; Matthew, FPH 610. 1999. *M. frondosa* L. var. *hirsutissima* Hook. f., FBI 3: 90. 1880. **Chandrakala Sooryakala (EBIS). Plate 4.6.3.**

Scandent shrubs. Leaves to 9 x 4 cm, broadly elliptic, acuminate at either ends, densely hispid. Cymes terminal, congested. Flowers densely arranged; calyx lobes 5, one lobe foliaceous, white, 7 x 3.5 cm, ovate, base cuneate, apex mucronate; corolla golden yellow, 2 cm wide, tube 3 cm long, narrow, densely hispid, lobes 10 x 8 mm, cuspidate; stamens 5. Berry globose, 1 cm across, sparsely hirsute, black.

Fl. & Fr.: December-February

Distr.: Endemic to Southern Western Ghats. Common along shola borders at lower and medium altitudes. MS, Puthur, *KKK 16069*; K-3.5, *KKK 16142*; K-5, *KKK 16476*.

NEANOTIS W. H. Lewis

Ann. Missouri Bot. Gard. 53: 34. 1966.

1. Corolla pink 2
1. Corolla white 3
2. Procumbent annual herbs; leaves acute at both ends ..... **N. indica** var. **affinis**
2. Straggling herbs; leaves rounded or obtuse at base ..... **N. indica** var. **indica**
3. Erect perennial subshrubs; leaves ovate-lanceolate, base obtuse; capsule elliptic ..... **N. hutchinsonii**
3. Prostrate annual herbs; leaves ovate, base truncate to attenuate; capsule subglobose . **N. monosperma**

Neanotis indica (DC.) W. H. Lewis, Ann. Missouri Bot. Gard. 53: 38. 1966, var. **affinis** (Wall. *ex* Wight & Arn.) W. H. Lewis, Ann. Missouri Bot. Gard. 53: 39. 1966; Matthew, Suppl. Ill. FPH t. 1004. 1998 & FPH 613. 1999. *Hedyotis affinis* Wall. *ex* Wight & Arn., Prodr. 411. 1834; Wight , Ic. t. 1030. 1845. *Anotis leschenaultiana* (Wall. *ex* Wight & Arn.) Hook. f. var. *affinis* (Wall. *ex* Wight & Arn.) Hook. f., FBI 3: 72. 1880; Gamble, FPM 604. 1921; Fyson, FSIHS 275. t. 221. 1932.

Procumbent annual herbs; shoots rooting at nodes. Leaves to 4 x 2 cm, ovate, acute at both ends, densely strigose. Corymbs 4 x 2.5 cm; calyx 3 mm long, lobes ovate, acute, glabrous; corolla tube 4 mm long, lobes 2 x 1 mm, ovate. Capsule 3 x 2.5 mm, subglobose.

Fl. & Fr.: August-December

Distr.: Indo-Malesia. Common; along shola borders at lower altitudes. MS, K-3, *KKK 16761*.

Neanotis indica (DC.) W. H. Lewis, Ann. Missouri Bot. Gard. 53: 38. 1966, var. **indica**. *Putoria indica* DC., Prodr. 4: 577. 1830. *Anotis leschenaultiana* (Wall. *ex* Wight & Arn.) Hook. f., FBI 3: 72. 1880; Gamble, FPM 604. 1921; Fyson, FSIHS 275. t. 221. 1932. *Hedyotis leschenaultiana* Wall. *ex* Wight & Arn., Prodr. 411. 1834.

Straggling herbs; branchlets ascending, villous. Leaves 3.5 x 2 cm, ovate, base rounded or obtuse, apex acute. Corymbs trichotomous, hirsute; calyx 3 mm, lobes ovate, acute; corolla 8 mm long, tube 4 mm long, lobes 3 x 1 mm, ovate. Capsule 3 x 2 mm, subglobose.

Fl. & Fr.: August-December

Distr.: Endemic to Western Ghats. Common; in grasslands and shola borders at higher altitudes. MS, Idlimottai, *KKK 16616*.

Neanotis hutchinsonii Deb. & R. Dutta, J. Bombay Nat. Hist. Soc. 87: 333. 1990; Matthew, Ill. FPH t. 387. 1996 & FPH 612. 1999. *Anotis longiflora* Hutch., Kew Bull. 1916: 35. 1916, *non* Benth. 1893; Gamble, FPM 604. 1921; Fyson, FSIHS 276. t. 222. 1932.

Erect perennial subshrub; stems scabrous. Leaves to 5 x 2.5 cm, apex acute, strigosely villous. Flowers many, in terminal corymbs; calyx lobes 4 mm, lanceolate, villous; corolla 9 mm long, tube 5 mm long, lobes 3 x 1 mm, ovate, ciliate. Capsule 4 x 3 mm.

Fl. & Fr.: October-December

Distr.: Endemic to Southern Western Ghats. Fairly common in shola borders at higher altitudes. ENP, Vattachirambu Chola, *KKK 18082*.

Neanotis monosperma (Wall. *ex* Wight & Arn.) W. H. Lewis, Ann. Missouri Bot. Gard. 53: 39. 1966; Matthew, Ill. FPH t. 388. 1996 & FPH 614. 1999. *Hedyotis monosperma* Wall. *ex* Wight & Arn., Prodr. 410. 1834. *Anotis monosperma* (Wall. *ex* Wight & Arn.) Hook. f., FBI 3: 75. 1880; Gamble, FPM 605. 1921.

Prostrate annual herbs; stems sparsely strigose. Leaves to 3.5 x 2 cm, apex acute, minutely villous. Cymes corymbose, lax, 3 x 1.5 cm; calyx lobes 4, lanceolate; corolla 3 mm wide, tube 2 mm long, lobes 2 x 1 mm, strigose. Capsule 2 mm wide.

Fl. & Fr.: July-December

Distr.: Endemic to Peninsular India. Common along shola borders at lower altitudes. MS, K-3, *KKK 16514*.

OLDENLANDIA Linnaeus

Sp. Pl. 119. 1753.

Oldenlandia corymbosa L., Sp. Pl. 119. 1753; Hook. f., FBI 3: 64. 1880; Gamble, FPM 600. 1921; Matthew, FPH 616. 1999. *Hedyotis corymbosa* (L.) Lam., Encycl. 1: 272. 1792; Sivar. & Biju, Taxon 39: 671. 1990.

Diffuse herbs, stem 4-angled, scabrous. Leaves to 10 x 1.5 mm, lanceolate, acute, lineolate-serrate, subsessile. Umbels axillary. Flowers 2-3, 5 mm long; calyx 3 mm long, cupular, lobes ovate, serrate; corolla white, 3 mm wide, tube 2 mm. Capsule 3 x 3 mm, globose; seeds many, angled.

Fl. & Fr.: Throughout the year

Distr.: Tropical Asia, Africa & America. Common; along shola margins at lower altitudes. MS, K-3.5, *KKK 16790*.

OPHIORRHIZA Linnaeus

Sp. Pl. 150. 1753

1. Leaves elliptic, base cuneate or attenuate ..... **O. brunonis**
1. Leaves elliptic-lanceolate, acuminate at both ends **2**
2. Nerves to 7 pairs; stipules lanceolate ..... **O. grandiflora**
2. Nerves to 10 pairs; stipules ovate ..... **O. roxburghiana**

Ophiorrhiza brunonis Wight & Arn., Prodr. 404. 1834: Hook. f., FBI 3: 79. 1880; Gamble, FPM 608. 1921; Fyson, FSIHS 278. t. 225. 1932. **Plate 4.6.4.**

Erect undershrubs. Leaves to 9 x 4 cm, base attenuate, apex acuminate, glabrous except the nerves. Cymes to 4 cm across, corymbose. Flowers densely arranged; calyx lobes 2 mm long, hairy; corolla tube 8 mm long, hispid, lobes ovate, obtuse. Capsule to 5 x 10 mm, obcordate, compressed.

Fl. & Fr.: August-December

Distr.: Endemic to Southern Western Ghats. Occasional; found near stream sides at medium altitudes. MS, K-4, *KKK* 18563. ENP, Mampallam Chola *KKK 18068.*

Ophiorrhiza grandiflora Wight, Ic. t. 1069. 1846; Hook. f., FBI 3: 80. 1880; Gamble, FPM 608. 1921.

Undershrubs; stems glabrous. Leaves to 10 x 4.5 cm, pale beneath. Cymes 3-6 cm broad, terminal, peduncled, sparsely villous. Flowers to 3.5 cm long; calyx 3 x 2 mm, ovoid, hispid, lobes 3-4 mm long, lanceolate; corolla tube 20 mm long, villous within, lobes 10 x 7 mm, ovate, acute. Capsule 4 x 8 mm, obcordate, compressed.

Fl. & Fr.: August-December

Distr.: Endemic to Southern Western Ghats. Occasional; at medium altitudes along stream sides. MS, Puthur, *KKK 16079.*

Ophiorrhiza roxburghiana Wight, Ic. t. 1068. 1846; Hook. f. FBI 3: 81. 1880; Gamble, FPM 608. 1921; Fyson, FSIHS 278. 1932; Matthew, Ill. FPH t. 392. 1996 & FPH 619. 1999.

Erect under shrubs, pubescent. Leaves to 10 x 5 cm, glabrous above, villous on nerves below. Cymes to 4 cm broad; calyx 3 mm long, lobes ovate; corolla 18 mm wide, tube 22 mm long, puberulous without, lobes 8 x 5 mm, ovate, acute. Capsule 4 x 10 mm, 2-winged.

Fl. & Fr.: August-February

Distr.: Endemic to Peninsular India. Occasional; found at medium altitudes. MS, K-5, *KKK 16095*; K-5.5, *KKK 16170.*

Note: This species was reported to be found restricted to Palni hills only (Ahmedullah & Nayar, 1987). Hence this forms a new record for Kerala.

PAVETTA Linnaeus

Sp. Pl. 110. 1753

Pavetta breviflora DC., Prodr. 4: 491. 1830; Hook. f., FBI 3: 151. 1880 p.p.; Gamble, FPM 633. 1921; Fyson, FSIHS 285. t. 232. 1932; Matthew, Ill. FPH t. 393. 1996 & FPH 621. 1999.

Large shrubs to small trees; branchlets glabrous. Leaves to 11 x 3 cm, elliptic, base attenuate, apex acuminate, drying black, gland dotted. Cymes compact, 6-10 cm across, hispidulous. Flowers dull white, pedicelled; calyx 2 mm long, obconical, lobes 4, ciliate; corolla tube 10 mm long, slender, glabrous outside, villous inside, lobes 4, 8 x 3 mm, oblong. Berry 10 mm across, globose.

Fl. & Fr.: February-May

Distr.: Endemic to Southern Western Ghats. Occasional; in higher altitude sholas. ENP, Amarachola, *KKK 17513*; Anamudi slope, *KKK 18550.*

PSYCHOTRIA Linnaeus

Syst. Nat. ed. 10, 929. 1364. 1759, *nom. cons.*

1. Inflorescence branches whorled; leaves to 8 cm long 2
1. Inflorescence branches decussate; leaves more than 12 cm long 3
2. Cymes dense; leaves obovate; nerves 7-8 pairs ..... **P. nilgiriensis** var. **nilgiriensis**
2. Cymes lax; leaves oblong to oblanceolate; nerves 10-13 pairs ..... **P. nilgiriensis** var. **astephana**
3. Leaves obovate; nerves 14-16 pairs; flowers pentamerous ..... **P. glandulosa**
3. leaves elliptic to oblanceolate; nerves 10-13 pairs; flowers tetramerous ..... **P. nudiflora**

Psychotria glandulosa (Dennst.) Suresh in Nicolson, D. H. *et al* Interpret. Hort. Malab. 229. 1988; Matthew, FPH 624. 1999. *Baldingera glandulosa* Dennst. Schlussel Hort. Malab. 9, 13, 31. 1818. *P. elongata* (Wight) Hook. f., FBI 3: 163. 1880; Gamble, FPM 641. 1921; Fyson, FSIHS 288. t. 234. 1932. *Grumilea elongata* Wight, Ic. t. 1036.1845.

Shrubs. Leaves to 15 x 8 cm, base cuneate, apex abruptly acute to acuminate. Cymes simple, to 8 cm, terminal. Flowers white, 5 mm long; calyx cupular, lobes 5, triangular, ciliate; corolla 5 mm across, tube 5 mm, villous at throat, lobes 5, 3 mm, oblong; stamens 5; style 5 mm; stigma bifid. Drupe 6 mm across, globose, black.

Fl. & Fr.: March-June

Distr.: Peninsular India and Sri Lanka. Fairly common at lower altitudes. MS, K-4, *KKK 16475*; Thalachorkadavu, *KKK 17665*.

Psychotria nilgiriensis Deb & M. G. Gangop., Taxon 31: 546. 1982, var. **astephana** (Hook. f.) Deb. & M. G. Gangop., Taxon 31: 546. 1982; Matthew, Ill. FPH t. 397. 1996 & FPH 625. 1999. **Pavadakkambu.**

Shrubs. Leaves to 8 x 2.5 cm, base cuneate, apex acute, dull green when dried. Cymes 3 cm across, terminal. Flowers 5 mm long; calyx cupular, lobes 4, obtuse, ciliate; corolla 7 mm across, tube shorter, lobes 4; stamens 4. Drupe 5 mm wide, ovoid.

Fl. & Fr.: August-December

Distr.: Endemic to Southern Western Ghats. Common undergrowth inside sholas at higher altitudes only. MS, Idlimottai, *KKK 16606*.

Psychotria nilgiriensis Deb & M.G. Gangop., Taxon 31: 546. 1982, var. **nilgiriensis**; Matthew, Ill. FPH t. 396. 1996 & FPH 625. 1999. *P. congesta* (Wight & Arn.) Hook. f., FBI 3: 162. 1880, non Spreng. *ex* DC., 1830; Gamble, FPM 640. 1921 p.p.; Fyson, FSIHS 287. t. 233. 1932. *Grumilea congesta* Wight & Arn., Prodr. 432. 1834; Wight, Ic. t. 1037. 1845. **Kottappoovu, Pavadakkambu (EBIS).**

Shrubs to small trees. Leaves to 8 x 3.5 cm, base cuneate, apex abruptly acute, green when dried. Cymes to 2.5 cm across, terminal. Flowers 5 mm long; calyx 2 mm long, cupular, lobes 5, obtuse, ciliate; corolla 5 mm across, tube 2 mm, lobes 5, 3 mm, ovate, puberulous within. Drupe 11 x 7 mm, ellipsoidal, glabrous.

Fl. & Fr.: December-March

Distr.: Endemic to Southern Western Ghats. Common undergrowth in medium altitude sholas. MS, Methappu, *KKK 16010*; K-5, *KKK 16153*.

Psychotria nudiflora Wight & Arn., Prodr. 434. 1834; Hook. f., FBI 3: 175. 1880; Gamble, FPM 641. 1921.

Shrubs. Leaves to 13 x 4 cm, apex acuminate, base narrowed, reddish brown when dried. Cymes 4 cm across, peduncled, rusty puberulus, branches whorled. Flowers sessile; calyx 1 mm long, membranous; corolla 5.5 mm long, lobes 4, short; style 2-fid at apex. Fruits not seen.

Fl.: December-January

Distr.: Endemic to Southern Western Ghats. Rare; at medium and higher altitudes. MS, Idlimottai, *KKK 18166.*

RUBIA Linnaeus

Sp. Pl. 109. 1753

Rubia cordifolia L., Syst. Nat. (ed. 12) 3: 229. 1768; Hook. f., FBI 3: 202. 1880; Gamble, FPM 655. 1921; Fyson, FSIHS 294. t. 239. 1932; Matthew, FPH 630. 1999.

Scabrous climber, stem 4-angled, articulate. Leaves whorled, 4 in each node, equal or unequal, to 5 x 3 cm, ovate, base cordate, apex acuminate, 5-ribbed from base. Flowers 3 mm across; in axillary dichotomous cymes; calyx tube turbinate, lobes 4, 1 mm long; corolla white, lobes ovate, valvate, spreading; styles 2, stigmas capitate. Drupe 8 mm across, globose, fleshy, deep blue.

Fl. & Fr.: December-March

Distr.: Asia, Africa and Europe. Rare; along shola ecotones at higher altitudes. ENP, Umayamala, *KKK 17535.*

SAPROSMA Blume

Bijdr. 956. 1826.

Saprosma foetens (Wight) K. Schum. in Engl. & Prantl, Pflanzenf. 4(4): 122. 1891. *Lasianthus foetens* Wight, Calcutta J. Nat. Hist. 6: 517. 1846. *Dysodidendron ceylanica* Gard., Calcutta J. Nat. Hist. 7: 2. 1847. *Serissa wightii* Bedd., Ic. t. 15. 1868-1874. *Saprosma ceylanicum* (Gard.) Bedd., For. Man. Bot. 134/5. 1872; Hook. f., FBI 3: 193. 1880; Gamble, FPM 649. 1921. **Theetanari (EBIS). Plate 4.6.5.**

Small trees; branchlets white. Leaves evil smelling, to 8 x 3.5 cm, elliptic, acute at both ends, black on drying. Flowers 1-3 together on short axillary cymes; calyx 4 mm long, campanulate, teeth 4, short; corolla tube 8 x 2.5 mm, lobes 4, 6 x 3 mm, triangular, spreading, dull white, purplish outside. Drupe 8 mm, deep blue.

Fl. & Fr.: August-December

Distr.: Endemic to Southern Western Ghats. Common undergrowth in low and medium altitude sholas. MS, Puthur, *KKK 16447.*

SPERMACOCE Linnaeus

Sp. Pl. 102. 1753

Spermacoce ocymoides Burm. f., Fl. Ind. 34. t. 13. f. 1.1768; Hook. f., FBI 3: 300. 1881; Fyson, FSIHS 293. t. 238. 1932; Matthew, FPH 632. 1999. *Borreria ocymoides* (Burm. f.) DC., Prodr. 4 : 544. 1830; Gamble, FPM 654. 1921.

Erect herbs, stems pink, quadrangular. Leaves subsessile, to 2 x 0.8 cm, elliptic to oblong, base acute, apex mucronate, glabrous. Flowers many, fascicled; calyx 3 mm, lobes acute, glabrous; corolla white. Capsule 3 x 2 mm, obcordate, glabrous; seeds black.

Fl. & Fr.: December-March

Distr.: Indo-Malesia and Tropical Africa. Common along shola borders. MS, K-3, *KKK 16772.*

WENDLANDIA Bartling *ex* A. P. de Candolle

Prodr. 4: 411. 1830, *typ. cons.*

Wendlandia thyrsoidea (Roemer & Schult.) Steud., Nomencl. ed. 2, 2: 786. 1841; Matthew, FPH 633. 1999. *Canthium thyrsoideum* Schult. in Roem. & Schult., Syst. 6: 207. 1820. *Wendlandia notoniana* Wall. *ex* Wight & Arn., Prodr. 403. 1834; Wight, Ic. t. 1033. 1845; Hook. f., FBI 3: 40. 1880; Gamble, FPM 588. 1921; Fyson, FSIHS 270. t. 215. 1932.

Large stiff shrubs. Leaves ternate, to 12 x 4 cm, oblanceolate, base cuneate, apex acute to acuminate. Panicles to 10 cm across, hispid. Flowers 6 mm long, many, sessile; calyx 2 mm, globose, hispid, lobes 5, ovate; corolla white to cream, 3.5 mm across, tube slender, villous within, lobes orbicular, spreading; stamens 5, exserted; style slender, stigma bifid. Capsule 1.5 x 1 mm, globose; seeds many, reticulate.

Fl. & Fr.: March-June

Distr.: Peninsular India and Sri Lanka. Rare; along shola borders at lower altitudes. MS, Puthur, *KKK 16058.*

51. VALERIANACEAE

VALERIANA Linnaeus

Sp. Pl. 31. 1753

1. Leaves radical; stem condensed ..... **V. hookeriana**
1. Leaves cauline; stem elongate **2**
2. Leaves simple or with 1-2 leaflets; flowers pink ..... **V. leschenaultii**
2. Leaves imparipinnate with 3-5 leaflets; flowers white ..... **V. arnottiana**

Valeriana arnottiana Wight, Ic. t. 1045-6. 1845; Gamble, FPM 657. 1921; Fyson, FSIHS 296. t. 242. 1932; Matthew, Ill. FPH t. 401. 1996 & FPH 635. 1999. *V. hardwickii* Wall. in Roxb, Fl. Ind. 1: 166.1820, var. *arnottiana* (Wight) Clarke in Hook. f., FBI 3: 213.1880.

Perennial herbs. Leaflets to 5 x 4 cm, ovate, base cuneate-truncate, apex acuminate, margin serrate-dentate, chartaceous, pubescent below; radical leaves absent on flowering. Cymes 3-4 cm across. Flowers 10-16 in a group; calyx limb small; corolla 4 mm across, lobes broadly ovate; ovary 2 x 1 mm. Fruit not seen.

Fl.: October-December.

Distr.: India, Bhutan, North Burma, East to West China, Java and Sumatra. Rare; along shola ecotones at higher altitudes. ENP, Way to Hut, *KKK* 18045.

Valeriana hookeriana Wight & Arn., Prodr. 444.1834; Clarke in Hook.f., FBI 3: 214.1881; Gamble, FPM 657. 1921; Fyson, FSIHS 296. t. 243. 1932; Matthew, Ill. FPH t. 402. 1996 & FPH 636. 1999. *V. microphylla* Bedd., Madras J. Lit. Sci. (ser. 3) 1: 50. 1869, non H. B. K. *V. beddomei* Clarke in Hook.f., FBI 3: 214. 1881; Gamble, FPM 657. 1921.

Perennial herbs. Leaves 10-15 cm long; leaflets many, linear, end ones 1-1.5 cm, ovate, softly puberulus, entire or a few dentate, apex acute. Cymes terminal, 4 x 2.5 cm; calyx limb small; corolla pale rose, to 4 mm wide; ovary ribbed. Fruit not seen.

Fl.: May-July.

Distr.: Endemic to Southern Western Ghats. Occasional; in grasslands at higher altitudes. MS, Idlimottai, *KKK 18177.*

Valeriana leschenaultii DC., Prodr. 4: 640. 1840; FBI 3: 214. 1881, incl. var. *brunoniana*; Wight, Ic. t. 1044. 1845; Clarke in Hook. f., FBI 3: 214. 1881; Gamble, FPM 657. 1921; Fyson, FSIHS 297. t. 244. 1932. *V. brunoniana* Wight & Arn. 443; Wight, Ic. t. 1043. 1845.

Perennial herbs. Leaves chartaceous; terminal leaflets to 6 x 4 cm, ovate, softy pubescent above, glabrous below, margins undulate-serrate. Cymes 2 cm wide; calyx small; corolla to 4 mm wide; ovary 1.5 mm long. Fruit not seen.

Fl.: June - July.

Distr.: Endemic to Southern Western Ghats. Occasional; along shola borders at medium altitudes. PAS, *KKK 18587.*

52. ASTERACEAE

1. Capitula discoid, disciform or radiate (ligules 3 toothed) with some bilabiate flowers; sap watery 2
1. Capitula ligulate; flowers all perfect (ligules 5 toothed); sap milky 27
2. Capitula mostly radiate or sometimes disciform, rarely discoid 3
2. Capitula discoid, with some corolla bilabiate 22
3. Leaves (at least basal) generally opposite 4
3. All leaves alternate 9
4. Achenes of ray florets alone fertile 5
4. Achenes of disc florets fertile 7
5. Achenes trigonous or laterally compressed 6
5. Achenes flat, dorsally compressed ..... **Moonia**
6. Leaves divided to the base, lobes pinnate; capitula not spiny ..... **Parthenium**
6. Leaves simple; capitula spiny ..... **Acanthospermum**
7. Disc achenes rounded or laterally compressed 8
7. Disc achenes dorsally compressed or angular and hardly compressed 9
8. Outer bracts of involucre clavate and glandular ..... **Sigesbeckia**
8. Outer bracts of involucre erect, not conspicuously glandular ..... **Acmella**
9. Pappus absent or consisting of 2-3 bristles ..... **Bidens**
9. Pappus consisting of 10 bristles ..... **Galinsoga**
10. Phyllaries mostly in several series, imbricate, (sub) equal, rarely 1 seriate 11
10. Phyllaries 1 (-2) seriate, equal 18

11. Anthers basally obtuse to strongly sagittate; style generally not truncate 12
11. Anthers basally strongly caudate; style subtruncate or apically rounded 16
12. Leaves not dissected; plants not scented 13
12. Leaves dissected; plants scented ..... **Artemisia**
13. Capitula disciform or with inconspicuous florets 14
13. Capitula distinctly radiate 15
14. Erect plants; leaves neither lobed nor pinnatifid, entire or serrate ..... **Conyza**
14. Decumbent or prostrate plants; leaves pinnatifid ..... **Dichrocephala**
15. Leaves ovate; pappus absent ..... **Myriactis**
15. Leaves dimorphic (obovate-attenuate to oblanceolate); pappus of fine hairs ..... **Erigeron**
16. Female florets infinite; bisexual florets a few (to 10) ..... **Gamochaeta**
16. Female florets generally fewer than bisexual ones 17
17. Phyllaries ovate-acute, spreading ..... **Anaphalis**
17. Phyllaries spathulate, obtuse, not spreading ..... **Helichrysum**
18. Capitula yellow 19
18. Capitula other than yellow 20
19. Capitula homogamous; ligules absent ..... **Cissampelopsis**
19. Capitula heterogamous; ligules present ..... **Senecio**
20. Leaves entire ..... **Kleinia**
20. Leaves variously serrate 21
21. Involucre with several smaller bracts at base 22
21. Involucre without smaller bracts at base ..... **Emilia**
22. Leaves mostly cauline; capitula brick red ..... **Crassocephalum**
22. Leaves mostly basal; capsule yellow/orange ..... **Gynura**
23. Leaves unarmed; anthers obtuse to sagittate at base 24
23. Leaves armed; anthers caudate at base ..... **Cirsium**
24. Style branches obtuse, clavate; anthers basally obtuse 25
24. Style branches attenuate; anthers basally sagittate 27
25. Panicles lax, cymose; achenes curved ..... **Adenostemma**
25. Panicles dense; achenes straight 26
26. Phyllaries multi-seriate; receptacle epaleaceous; achenes 5 angled ..... **Ageratina**
26. Phyllaries biseriate; receptacle paleaceous; achenes ribbed ..... **Ageratum**
27. Outer bracts leafy; pappus short ..... **Phyllocephalum**
27. Bracts similar; pappus long ..... **Vernonia**
28. Achenes beaked 29
28. Achenes not beaked ..... **Sonchus**
29. Achenes fusiform or oblong with short beak; corolla yellow ..... **Youngia**
29. Achenes flattened, beak ending in a circular disc; corolla pale yellow ..... **Cicerbita**

ACANTHOSPERMUM Schrank

Pl. Rar. Hort. Acad. Monac. 53. 1820.

Acanthospermum hispidum DC., Prodr. 5: 522. 1836; Gamble, FPM 704. 1921; Chowdhery in Hajra *et al*, Fl. Ind. 12: 361. 1995; Matthew, FPH 678. 1999. **Musu Musu.**

Erect, dichotomously branched, hispid herbs, 20-35 cm higher. Leaves 2-4 x 1-2 cm, ovate, acute. Heads 4-5 mm long, axillary, sessile; receptacle paleate. Outer flowers female, yellow, 3-lobed at apex; inner ones bisexual; corolla 2 mm long, tubular, 5-toothed at apex. Achenes 5 x 3 mm, obovate, with two diverging long spines at apex, densely covered with hooks; pappus absent.

Fl. & Fr.: October-January

Distr.: Native of South America, introduced to other tropical countries. Occasional; in disturbed low altitude shola regions. MS, K-3, *KKK 16654.*

ACMELLA L.C. Richard ex Persoon

Syn. Pl. 2: 472. 1807.

Acmella calva (DC.) R. K. Jansen, Syst. Acmella Syst. Bot. Monogr. 8: 41. 1988; Matthew, FPH 679. 1999. *Spilanthes calva* DC. in Wight, Contr. Bot. India 19. 1834 & Ic. t. 1109. 1846; Chowdhery in Hajra *et al,* Fl. Ind. 12: 409. 1995. *S. acmella* L., var. *calva* (DC.) Clarke Comp. Ind. 139. 1876. *S. acmella* sensu Hook. f., FBI 3: 307. 1881, non (L.) Murr. 1844; Fyson, FSIHS 338. t. 281. 1932. **Nai Koppu, Nai Manjal (EBIS). Plate 5.4.4.**

Procumbent scabrid herbs. Leaves to 4 x 2.5 cm, ovate, base truncate, apex acute, chartaceous. Heads 10 x 7 mm, solitary, conical. Flowers bisexual; corolla yellow, 2.5 mm long, tubular, campanulate above; lobes 0.5 mm long, ovate, acute, glabrous. Achenes 2 x 1 mm, obovate, biconvex, dark brown, glandular.

Fl. & Fr.: Throughout the year

Distr.: Indo-Malesia. Common along roadsides at lower altitudes. MS, K-3, *KKK 16133.*

ADENOSTEMMA J. R. Forster & G. Forster

Charact. Gen. 89, t. 45. 1776.

Adenostemma lavenia (L.) O. Ktze., Rev. Gen. Pl. 1: 304. 1891; Gamble, FPM 677. 1921; Fyson, FSIHS 315. t. 255. 1932; Uniyal in Hajra *et al,* Fl. Ind. 12: 346. 1995; Matthew, FPH 648. 1999. *Verbesina lavenia* L., Sp. Pl. 902. 1753. *Adenostemma viscosum* Forst., Char. Gen. 90, t. 45. 1776; Clarke, Comp. India 28.1876; Hook. f., FBI 3: 242. 1881. *A. latifolium* D. Don, Prodr. Fl. Nepal 181. 1825. *A. viscosum* Forst. var. *lavenia* (L.) Hook. f., FBI 3: 242. 1881, p.p.

Annual herbs; stems viscid. Leaves to 12 x 7 cm, broadly ovate, apex acute, base cuneate, crenate-serrate. Heads many, to 8 x 5 mm, hemi-spherical. Flowers white; corolla 2.5 mm long; tube puberulus; lobes hairy. Achenes 4 mm long, curved-obovoid, 3-angled, black; pappus of 3-4 glandular bristles.

Fl. & Fr.: October-January

Distr.: Paleotropics. Common along roadsides at lower and medium altitudes. MS, K-5, *KKK 16176*; K-3, *KKK 16500.*

AGERATINA Spach

Hist. Nat. Veg. Phan. 10. 286. 1841.

Ageratina adenophora (Spreng.) King & Robins., Phytologia 19: 211. 1970; Uniyal in Hajra *et al,* Fl. Ind. 12: 348. 1995; Matthew, FPH 648. 1999. *Eupatorium adenophorum* Spreng., Syst. Veg. (ed. 16) 3: 420. 1826. *E. glandulosum* sensu Kunth, Nov. Gen. Sp.

4: 122, t. 346. 1820, non Michaux, 1803; Fyson, FSIHS 316. 1932; Matthew, Rec. Bot. Surv. India 20: 135. 1969. **Thravada, Nilagiri (EBIS) Plate 5.4.3.**

Subshrubs, 1-1.5 m tall; glandular hairy; stems violet-blue. Leaves to 8 x 4 cm, ovate, acute, serrate. Heads 7 mm across, in terminal corymbose panicles. Outer florets bisexual, 4 mm long; corolla white, 5-lobed, hispid; inner florets female. Achenes 2 mm long, curved, ellipsoid, brown; pappus 5-10, 4 mm long, barbed.

Fl. & Fr.: December-May

Distr.: Originally from South America, now introduced in Peninsular India. Abundant; found along shola borders, scrublands and ecotones at all altitudes. MS, K-3, *KKK 16122*; Idlimottai, *KKK 16421*. VMS, *KKK 31139*.

AGERATUM Linnaeus

Sp. Pl. 839. 1753

Ageratum houstonianum Mill., Gard. Dict. (ed. 8) n. 2. 1768; Uniyal in Hajra *et al*, Fl. Ind. 12: 349. 1995; Matthew, Ill. FPH t. 411. 1996 & FPH 650. 1999. **Kaliyamman Pathiri Chedi, Michangala (EBIS) Plate 4.6.6.**

Herbs, viscid hairy. Leaves to 7 x 5 cm, ovate, base rounded, apex acute, margins crenate. Heads bluish-white, to 7 mm across, in terminal corymbose panicle. Flowers all bisexual; corolla 2.5 mm long, tubular, white, glabrous, 5-lobed at apex. Achenes 2 mm long, linear, 5-angled, hirsute; pappus 3-4 mm long, setaceous.

Fl. & Fr.: Throughout the year

Distr.: Native of Tropical America, now naturalized in Tropical Asia. Abundant in shola margins usually at lower altitudes. MS, K-3, *KKK 16751*.

ANAPHALIS A. P. de Candolle

Prodr. 6: 271. 1837

1. Subshrubs, more than 1 m tall; leaves 3 or 5 ribbed from base, > 1 cm wide ..... **A. travancorica**
1. Herbs, to 1 m tall; leaves 1 ribbed from base, < 6 mm wide 2
2. Leaves to 2 cm long, crowded; stem profusely branched 3
2. Leaves more than 2.5 cm long, not crowded; stem sparingly branched 4
3. Capitula white ..... **A. bournei**
3. Capitula yellow ..... **A. meeboldii**
4. Leaf margins folded back 5
4. Leaf margins not folded 7
5. Leaves soft cottony on both surfaces; heads large, in subumbellate terminal corymbs ..... **A. leptophylla**
5. Leaves not soft cottony on both surfaces; heads small and not as above 6
6. Heads in dense single or branched corymbs; flowers yellow ..... **A. marcescens**
6. Heads in few flowered compact clusters; flowers yellow turning white ..... **A. aristata**
7. Leaves linear-oblong; capitula pink tinged; achenes papillose ..... **A. subdecurrens**
7. Leaves oblong to oblanceolate; capitula white; achenes scaly ..... **A. lawii**

Anaphalis aristata DC., Prodr. 6:274.1838; Wight, Ic. t. 119.1846; Hook.f., FBI 3:285.1881; Gamble, FPM 696. 1921; Kumar & Pant in Hajra *et al*, Fl. Ind. 13: 55. 1995. Fyson, FSIHS 332. t. 273. 1932; Matthew, Ill. FPH t. 419. 1996 & FPH 661. 1999. **Panji Poovu (EBIS).**

Leaves 2-4 x 0.3 cm, linear- lanceolate, base broad amplexicaule or cordate, apex acuminate, scabrous above. Heads 3 mm wide, hemispherical. Bisexual flowers central, 10-15; corolla 2.5 mm long, broader above; female flowers <10; corolla 1.5 mm long, slender. Achenes cylindrical, brown, papillose; pappus 2 mm long.
Fl. & Fr.: July-December
Distr.: Endemic to Southern Western Ghats. Rare; in grasslands at lower altitudes. MS, Puthur, *KKK 16072*; Methappu, *KKK 31072*.

Anaphalis bournei Fyson, Kew Bull. 1914: 209. 1914; Gamble, FPM 697. 1921; Fyson, FSIHS 333. t. 275. 1932; Kumar & Pant in Hajra *et al,* Fl. Ind. 13: . 1995; Matthew, Ill. FPH t. 421. 1996 & FPH 663. 1999. **Panji Poovu (EBIS).**

Leaves 1-2 x 0.4 cm, linear to oblanceolate, acute. Heads 3 x 6 mm, sessile, collected in terminal congested cymes. Bisexual flowers 30-40, central; corolla broader; female flowers 10-20. Achenes ovoid brown, papillose; pappus 3 mm long.
Fl. & Fr.: July-November
Distr.: Endemic to Southern Western Ghats. Rare; in higher altitude grasslands. ENP, Way to hut, *KKK 18028*.

Anaphalis lawii (Hook. f.) Gamble, FPM 696. 1921; Fyson, FSIHS 330. t. 272. 1932; Kumar & Pant in Hajra *et al,* Fl. Ind. 13: 66. 1995; Matthew, FPH 663. 1999. *A. oblonga* DC. var. *lawii* Hook. f., FBI 3: 283. 1881. **Panji Poovu (EBIS).**

Leaves 4-5 x 0.7 cm, base amplexicaule, apex acute. Heads 4 mm across, in densely branched corymbose cymes. Bisexual flowers 5-7, central; corolla 2.5 mm long, white, 5-toothed at apex. Achenes minute, cylindrical, scaly, brown.
Fl. & Fr.: August-December
Distr.: Endemic to Peninsular India. Occasional; found in grasslands and shola borders at all altitudes. MS, Puthur, *KKK 16065*; Idlimottai, *KKK 16609*.

Anaphalis leptophylla (DC) DC., Prodr. 6: 273. 1838; Hook.f. FBI 3: 285. 1881; Gamble, FPM 696. 1921; Fyson, FSIHS 333. 1932; Kumar & Pant in Hajra *et al,* Fl. Ind. 13: 67. 1995; Matthew, FPH 663. 1999. *Helichrysum leptophyllum* DC. in Wight, Contr. Bot. India 20. 1834. **Panji Poovu (EBIS).**

Leaves 3-6 x 0.4 cm, linear-oblanceolate, apex acute. Heads to 8 mm wide. Bisexual flowers 40-60, central; corolla broader, tube 2.5 mm; female flowers 30-40; corolla glabrous. Achenes ovoid-oblong, brown, papillose; pappus 3 mm long, white.
Fl. & Fr.: July-November
Distr.: Endemic to Southern Western Ghats. Occasional; in higher altitude grassland regions. MS, Methappu, *KKK 31073*.

Anaphalis marcescens (Wight) Clarke, Comp. Ind. 110. 1876; Hook. f., FBI 3: 286. 1881; Gamble, FPM 696. 1921; Fyson, FSIHS 331. 1932; Kumar & Pant in Hajra *et al,* Fl. Ind. 13: 67. 1995. *Gnaphalium marcescens* Wight, Ic. t. 1115. 1856.

Leaves 3-4 x 0.4 cm, linear, apex acute, dark green and glabrous above. Heads 3 x 6 mm. Bisexual flowers 4-6, central; corolla broader; female flowers many. Achenes brown, papillose; pappus 2 mm long, white.
Fl. & Fr.: July-November

Distr.: South India and Sri Lanka. Occasional; in shola borders and waysides. MS, K-9, *KKK 16796.*

Anaphalis meeboldii W.W. Sm., Rec. Bot. Surv. India 4: 282. 1911; Gamble, FPM 696. 1921; Kumar & Pant in Hajra *et al,* Fl. Ind. 13: 69. 1995; Matthew, Ill. FPH t. 422. 1996 & FPH 664. 1999. **Panji Poovu (EBIS).**

Leaves 2 x 0.3 cm, lanceolate, apex acute. Heads 4-5 mm wide, sessile, collected in terminal congested corymbs. Bisexual flowers 16-20, central; female flowers 8-16; corolla yellow, slender, 4 lobed. Achenes brown, papillose; pappus 2 mm long.

Fl. & Fr.: July-November

Distr.: Endemic to Western Ghats. Rare; in higher altitude grassland regions. MS, Idlimottai, *KKK 16619.*

Anaphalis subdecurrens (DC.) Gamble, FPM 695. 1921; Kumar & Pant in Hajra *et al,* Fl. Ind. 13: 75. 1995; Matthew, Ill. FPH t. 423. 1996 & FPH 664. 1999. *Gnaphalium subdecurrens* DC. in Wight, Contrib. 21. 1834. *Anaphalis oblonga* DC., Prodr. 6: 274. 1837; Hook. f., FBI 3: 283. 1881. p. p. **Panji Poovu (EBIS).**

Leaves 3-4 x 0.6 cm. Heads 5-6 mm wide, sessile, collected in terminal branched corymbs. Bisexual flowers 4-6, central; female flowers many; corolla rose turning white, slender, glabrous. Achenes brown, papillose; pappus 2 mm long.

Fl. & Fr.: July-November

Distr.: South India and Sri Lanka. Common; found in low and medium altitude grasslands. MS, Puthur, *KKK 16068.*

Anaphalis travancorica W.W. Sm., Rec. Bot. Surv. India 4: 284. 1911; Gamble, FPM 695. 1921; Fyson, FSIHS 329. t. 271. 1932; Kumar & Pant in Hajra *et al,* Fl. Ind. 13: 76. 1995; Matthew, Ill. FPH t. 424. 1996 & FPH 665. 1999. **Panji Poovu (EBIS) Plate 5.4.1.**

Leaves 5-6 x 1 cm, elliptic to oblanceolate, apex acute, dense wooly. Heads 6 mm across, white with yellowish centre, collected in terminal corymbs. Bisexual flowers plenty, central; corolla broader; female flowers 30-40; corolla tube 3 mm, slender, glabrous. Achenes 1 mm, brown, papillose; pappus 3 mm long.

Fl. & Fr.: July-November

Distr.: Endemic to Southern Western Ghats. Occasional; in higher altitude grasslands. MS, Methappu, *KKK 17503.*

ARTEMISIA Linnaeus

Gen. Pl. ed. 5. 367. 1754.

Artemisia nilagirica (Clarke) Pamp. in Nuovo., Giorn. Bot. Ital. 33: 452. 1926; Sant., BBSI 3(1): 12. 1961; Naithani in Hajra *et al,* Fl. Ind. 12: 36. 1995; Matthew, Ill. FPH tt. 454-455. 1996 & FPH 699. 1999. *A. vulgaris* L. var. *nilagirica* Clarke, Comp. India 162. 1876. *A. indica* sensu Wight, Ic. t. 112. 1846. non Willd., 1803. *A. vulgaris* auct. non L., 1753: Hook. f., FBI 3: 325. 1881; Gamble, FPM 713. 1921; Fyson, FSIHS 342. 1932. **Velipathiri (EBIS).**

Perennial subshrubs. Leaves to 20 x 10 cm, oblong-lanceolate, dissected, lobes oblong, acute. Panicles leafy, terminal and in upper axils,. Heads 3-4 mm long, globose. Female flowers many; corolla white, narrow. Bisexual flowers 4-6; corolla broader, glabrous. Achenes 1.5 mm long, oblong, glabrous.

Fl. & Fr.: August-December

Distr.: Endemic to Peninsular India. Very common; along way sides at lower altitudes. MS, Puthur, *KKK 16196.*

BIDENS Linnaeus

Sp. Pl. 831. 1753

Bidens pilosa L., Sp. Pl. 832. 1753; Hook. f., FBI 3: 309. 1881; Gamble, FPM 709. 1921; Fyson, FSIHS 339. t. 282. 1932; Chowdhery in Hajra *et al,* Fl. Ind. 12: 372. 1995; Matthew, FPH 680. 1999. *B. chinensis* auct non Willd., Hook. f., FBI 3: 309. 1881.

Erect subshrubs; stem ribbed. Leaves pinnate or bipinnate, to 16 cm long; leaflets 6-8 x 3 cm, ovate, acuminate, serrate. Heads radiate, 1-1.5 cm across, oblong, in loose corymbose panicles or solitary. Outer flowers ligulate; limb 5 x 3 mm, oblong, 3-lobed, white; inner flowers bisexual; corolla tubular, 5-lobed, yellow, lobes obtuse. Achenes 16 mm long, linear, glabrous; pappus 3, retrorsely barbed, spinescent.

Fl. & Fr.: July-September

Distr.: Pantropical. Very common along roadsides at lower altitudes. MS, K-4, *KKK 16497*; Puthur, *KKK 16691.*

CICERBITA Wallroth

Sched. Crit. 433. 1822.

Cicerbita cyanea (D. Don) Beauv., Bull. Soc. Bot. Geneve, ser. 2, 2: 132. 1910; Mamgain & Rao in Hajra *et al.,* Fl. Ind. 12: 268. 1995. *Sonchus cyaneus* D. Don, Prodr. 164. 1825. *Lactuca hastata* DC., Prodr. 7: 139. 1838; Hook. f., FBI 3: 407. 1881; Gamble, FPM 731. 1921; Fyson, FSIHS 357. t. 302. 1932. *Mulgedium neilgheryense* Wight, Ic. t. 1144. 1846.

Tall hispid, perennial herbs. Leaves radical and alternate, polymorphous, usually pinnatifid with a large hastate terminal lobe; petiole winged and auricled at base. Heads 2 x 1 cm, subcampanulate, in terminal paniculate racemes. Flowers yellow; outer bracts 6 x 2 mm, oblong-ovate; inner linear-oblong, ligules bluish-purple. Achenes 10 mm, ovoid-oblong, dark brown, flattened, 3 ribbed; pappus black.

Fl. & Fr.: June-August

Distr.: India, Nepal, China and Tibet. Fairly common in high altitude grasslands or ecotones. ENP, Bhiman Odai, *KKK 18018.*

CIRSIUM P. Miller

Gard. Dict. Abr. Ed. 4. 28. 1754.

Cirsium wallichii DC., Prodr. 6: 643. 1838; Hajra in Hajra *et al.,* Fl. Ind. 12: 171. 1995, var. **wightii** (Hook. f.) Vivek., Biol. Mem., Angiosp. Taxon. ser. 2 (1 & 2): 77.

1977; Matthew, FPH 720. 1999 & Ill. FPH t. 472. 1996. *Cnicus wallichii* DC. var. *wightii* Hook. f., FBI 3: 364. 1881; Gamble, FPM 725. 1921. *C. wallichii* auct. non DC., Fyson, FSIHS 352. t. 297. 1932. *Cirsium argyracanthum* Wight, Ic. tt. 1137 & 1138. 1846; Hook. f., FBI 3: 364. 1881. **Chakku Mullu (EBIS).**

Erect thistle; branchlets ribbed. Leaves alternate, clasping, to 10 x 4 cm, lanceolate, deeply pinnatisect, segments irregularly toothed and spiny. Corymbs terminal or in upper axils. Heads 4-5 cm wide, ovoid, cream. Outer phyllaries spiny, inner ones incurved near apex. Florets to 2 cm long, lobes 5. Achenes ovoid, 4 angled, papillose; pappus to 10 mm long, feathery.

Fl. & Fr.: July-September

Distr.: Himalayas down to Western Ghats. Occasional; along roadsides, scrublands and ecotones at medium and higher altitudes. MS, Coupe road, *KKK 16579.*

CISSAMPELOPSIS (A. P. de Candolle) Miquel

Fl. Ind. Batav. 2: 102. 1856.

1. Leaves deltoid, base truncate, apex acute, densely tomentose, coriaceous.....**C. corymbosa**
1. Leaves ovate, base cordate, apex acuminate, glabrous, chartaceous.....**C. walkeri**

Cissampelopsis corymbosa (Wall. *ex* DC.) C. Jeffrey & Y. L. Chen, Kew Bull. 39(2): 341. 1984; Mathur in Hajra *et al*, Fl. Ind. 13: 199. 1995; Matthew, Ill. FPH t. 458. 1996 & FPH 707. 1999. *Senecio corymbosus* Wall. *ex* DC. in Wight, Contr. Bot. India 22. 1834; Wight, Ic. t. 1130. 1846; Hook. f., FBI 3: 351. 1881; Gamble, FPM 723. 1921; Fyson, FSIHS 350. 1932. **(EBIS) Plate 4.6.7.**

Large lianas. Leaves to 7 x 8 cm, deltoid, base truncate, apex acute, margin denticulate, cinnamomeous tomentose below (purple in younger leaves). Corymbs terminal or in upper axils. Heads 6 mm across, discoid, cream. Corolla 2.5 mm wide, lobes 5. Achenes 1.5 mm long, cylindrical, ribbed; pappus 8 mm long, white.

Fl. & Fr.: January-May

Distr.: Peninsular India and Sri Lanka. Common; along shola borders at all altitudes. MS, Idlimottai, *KKK 16008*; K-4, *KKK 16148.*

Cissampelopsis walkeri (Arn.) C. Jeffrey & Y. L. Chen, Kew Bull. 39(2): 341. 1984; Mathur in Hajra *et al*, Fl. Ind. 13: 200. 1995; Matthew, Ill. FPH t. 459. 1996 & FPH 707. 1999. *Senecio walkeri* Arn. Pug. P. Ind. Or. 349. 1836; Wight, Ic. t. 1131. 1846; Gamble, FPM 723. 1921; Fyson, FSIHS 350. 1932. **Vettuva Marunnu Chedi (EBIS).**

Slender climber. Leaves to 9 x 7.5 cm, ovate, base cordate, apex abruptly acuminate, cottony but glabrous when old. Heads with 9-12 florets. Corymbs to 10 cm wide, terminal or in upper axils. Heads 5 mm across, discoid, cream. Corolla 2 mm wide, tube 4 mm, lobes 5. Achenes 2.5 mm, cylindrical; pappus 8 mm long, white.

Fl. & Fr.: December-March

Distr.: Peninsular India and Sri Lanka. Common at medium altitudes. MS, Gudalar, *KKK 16087.*

CONYZA Lessing

Syn. Gen. Comp. 203. 1832, *typ. cons.*

Conyza stricta Willd., Sp. Pl. 3: 1922. 1803; Hook. f., FBI 3: 258. 1881; Gamble, FPM 683. 1921; Fyson, FSIHS 321. t. 263. 1932; Hajra in Hajra *et al,* Fl. Ind. 12: 108. 1995; Matthew, FPH 654. 1999.

Erect woody herbs; stem terete or ridged, pubescent. Leaves to 5 x 1 cm, oblanceolate to spathulate, obtuse, entire or serrate, pubescent. Heads 3 x 3 mm, in dense corymbose panicle. Corolla 2.5 mm long, bright yellow. Achenes 1 mm long, ribbed, hairy; pappus 3 mm long, yellow.

Fl. & Fr.: Throughout the year

Distr.: Africa, India and China. Common along road sides at lower altitudes. MS, Puthur, *KKK 16055.*

CRASSOCEPHALUM Moench

Meth. 516. 1794

Crassocephalum crepidioides (Benth) S. Moore, J. Bot. 50: 211. 1912; Matthew, Suppl. Ill. FPH t. 1009. 1998 & FPH 708. 1999. *Gynura crepidioides* Benth in Hook., Niger Fl. 438. 1849. *Erechtites valerianifolia* sensu Fischer in Gamble, FPM 1882. 1936, non (Wolf) DC. 1838.

Stout, erect herbs; branchlets striate. Leaves cauline, to 25 x 12 cm, oblong, base attenuate; segments 5-9, elliptic, deeply and irregularly dentate. Racemes terminal. Heads 5 mm wide, discoid, cylindrical, brick red. Florets 1 cm long; corolla tubular, lobes 5. Achenes cylindrical, brown; pappus 12 mm, white.

Fl. & Fr.: Throughout the year

Distr.: Pantropical weed of American origin; Distributed in India, Sri Lanka, China, Africa and Madagascar. Occasional; along waysides at lower altitudes. K, *KKK 16496.*

DICHROCEPHALA L' Heritier *ex* A. P. de Candolle

Arch. Bot. (Paris) 2: 517. 1833.

1. Leaves sessile, base auricled and stem clasping, margin coarsely serrate ..... **D. chrysanthemifolia**
1. Leaves petiolate, base neither auricled or stem clasping, margin crenate-serrate..... **D. integrifolia**

Dichrocephala chrysanthemifolia (Blume) DC., Prodr. 5: 372. 1836; Wight, Ic. t. 1095. 1851; Hook. f., FBI 3: 245. 1881; Gamble, FPM 679. 1921; Fyson, FSIHS 317. tt. 257 & 259. 1932; Hajra in Hajra *et al,* Fl. Ind. 12: 114. 1995; Matthew, Ill. FPH t. 415. 1996 & FPH 655. 1999. *Cotula chrysanthemifolia* Blume, Bijdr. 918. 1826.

Erect herbs, hispid. Leaves to 5 x 2 cm, lyrate-pinnatifid, obtuse. Heads 4 mm across, globose, in terminal panicles. Flowers cream; female flowers in several outer rows; corolla tubular, 2-4-toothed at apex, glabrous; bisexual flowers few, central; corolla 4-lobed, white. Achenes 1 mm long, obovate, compressed, 4-ribbed, glabrous; pappus with 2 deciduous bristles.

Fl. & Fr.: October-February

Distr.: Paleotropics. Occasional; in grasslands and waysides at higher altitudes. MS, Methappu, *KKK 16418.* ENP, Way to hut, *KKK 18035.*

Dichrocephala integrifolia (L. f.) O. Ktze., Rev. Gen. Pl. 333. 1891; Hajra in Hajra *et al,* Fl. Ind. 12: 114. 1995; Matthew, FPH 655. 1999. *Hippia integrifolia* L. f., Suppl. Pl. 1781. *Dichrocephala latifolia* DC. in Wight, Contrib. India Bot. 11. 1834 & Ic. t. 1096. 1851; Hook. f., FBI 3: 245. 1881; Gamble, FPM 679. 1921; Fyson, FSIHS 317. t. 259. 1932.

Diffuse herbs, hispid. Leaves to 6 x 4 cm, obovate, obtuse; terminal lobes larger. Heads 3 mm across, globose, in terminal panicles. Flowers yellow; female flowers in several outer rows; corolla narrowly tubular, curved; bisexual flowers few, central; corolla 4-lobed at apex, white. Achenes 1 mm long, obovate, compressed, 4-ribbed, glabrous; pappus with 2-3 deciduous bristles.

Fl. & Fr.: July-September

Distr.: Tropical Asia, China and Africa. Occasional; along waysides at lower altitudes. MS, K-4, *KKK 16504.*

EMILIA Cassini

Bull. Sci. Soc. Philom. Paris 68. 1817.

1. Leaves chiefly radical or for a short way up the stems ..... **E. scabra**
1. Leaves chiefly cauline; radical leaves few **2**
2. Stout herb, to 60 cm; flowers scarlet ..... **E. javanica**
2. Slender herb, to 30 cm; flowers purple ..... **E. zeylanica** var. **paludosa**

Emilia javanica (Burm. f.) C. B. Rob., Phillipp. J. Sci. 3: 217. 1908; Mathur in Hajra *et al,* Fl. Ind. 13: 210. 1995; Matthew, Ill. FPH t. 460. 1996 & FPH 709. 1999. *Hieracium javanicum* Burm. f., Fl. Indica 174, t. 57. f. 1. 1768. *Emilia flammea* Cass. in F. Cuvier, Dict. Sci. Nat. 14: 406. t. 5. 1819; Hook. f., FBI 3: 336. 1881; Gamble, FPM 716. 1921.

Stems hirsute. Leaves 4-5 x 1.5-2 cm, obovate, entire or lyrate, crenate, base auricled, crispately pubescent. Heads few, 1.5 cm wide, on 5-6 cm long solid peduncles. Flowers bisexual; corolla tubular, 1.5 mm, glandular, lobes acute. Achenes 3 mm long, 5 ribbed.

Fl. & Fr.: August-December

Distr.: Endemic to Western Ghats. Fairly common in grasslands at higher altitudes. ENP, Amarachola, *KKK 18049.*

Emilia scabra DC., Prodr. 6: 303. 1838; Wight, Ic. t. 1123. 1846; Gamble, FPM 716. 1921; Fyson, FSIHS 344. t. 287. 1932; Mathur in Hajra *et al,* Fl. Ind. 13: 211. 1995. *E. sonchifolia* (L.) DC. var. *scabra* (DC.) Hook. f., FBI 3: 336. 1881. **Poosha Thala (EBIS).**

Stems hirsute. Leaves to 4 x 1 cm, oblong, entire or lyrate, crenate, base auricled, crispately pubescent. Heads large, 1.2-1.5 cm long. Flowers bisexual; corolla 7 mm long, glandular, bright red, lobes acute. Achenes 3 mm long, ribbed, angles hispid.

Fl. & Fr.: Throughout the year

Distr.: Peninsular India. Common in sholas at lower altitudes. MS, K-3, *KKK 16770.*

Emilia zeylanica Clarke, Compos. Ind. 175. 1876; Hook. f. FBI 3: 336. 1881, var. **paludosa** Gamble, FPM 2: 716. 1921; Fyson, FSIHS 344. t. 288. 1932; Mathur in Hajra *et al*, Fl. Ind. 13: 215. 1995; Matthew, Ill. FPH t. 462. 1996 & FPH 711. 1999.

Stem glabrous. Leaves 4 x 0.5 cm, linear, entire, apex acute. Heads 1.5 cm wide, few, on 5 cm long peduncles. Flowers bisexual; corolla 6 mm long; lobes oblong, glandular. Achenes 2 mm long, tetrangular, hispid along the angles.

Fl. & Fr.: August-December

Distr.: Endemic to Western Ghats. Fairly common along marshy roadsides at higher altitudes. ENP, Bhiman Odai, *KKK 18084.*

ERIGERON Linnaeus

Sp. Pl. 863. 1753

Erigeron karvinskianus DC., Prodr. 5: 285. 1836; Hajra in Hajra *et al*, Fl. Ind. 12: 122. 1995; Matthew, FPH 656. 1999. *E. mucronatus* DC., Prodr. 5: 285. 1836; Gamble, FPM 682. 1921; Fyson, FSIHS 321. t. 262. 1932. **Pottu Poovu (EBIS) Plate 5.4.2.**

Spreading, perennial herbs. Leaves dimorphic, 2-3 x 1 cm, elliptic, acute at either ends, dentate, lower ones 3 lobed. Heads heterogamous, 1 cm wide, solitary, peduncled. Female flowers ligulate, peripheral; limb 4 mm long, narrow, entire, white turning purple. Bisexual flowers inner, tubular; corolla 3 mm long, 5-lobed, yellow. Achenes 1.2 mm, compressed, hairy at base; pappus barbed, white.

Fl. & Fr.: Throughout the year

Distr.: Native of Mexico, introduced to India, Malesia, S. Europe and Japan. Common along shola borders and roadsides at medium and higher altitudes. MS, K-3, *KKK 16117*; K-5.5, *KKK 16174.*

GALINSOGA Ruiz & Pavon

Prodr. 110. t. 24. 1794.

Galinsoga parviflora Cav., Ic. 3: 41, t. 281. 1796; Hook. f., FBI 3: 311. 1881; Gamble, FPM 711. 1921; Fyson, FSIHS 340. t. 284. 1932; Chowdhery in Hajra *et al*, Fl. Ind. 12: 388. 1995; Matthew, Ill. FPH t. 441. 1996 & FPH 685. 1999.

Annual herbs. Leaves opposite, 3-5 x 2 cm, ovate, apex acute, serrate, 3-ribbed from base. Heads 4 x 3 mm, on peduncled cymes; peduncles dichotomous, slender. Outer row of flowers ligulate, limb deeply 3-lobed, white. Inner flowers tubular, bisexual; corolla 1.5 mm long, 5-toothed. Achenes 2 mm long, obovoid, truncate, black, 3-4 angled, scabrid; pappus of 3-4 fimbriate hyaline scales.

Fl. & Fr.: September-December

Distr.: Native of South America. Common in sholas at lower altitudes. MS, K-3, *KKK 16786.*

GAMOCHAETA Weddel

Chlor. Andina 1: 151. 1856.

1. Leaf surfaces discolourous; panicles > 8 cm long, leafy ..... **G. coarctata**
1. Leaf surfaces concolorous; panicles < 5cm long, not leafy ..... **G. purpurea**

Gamochaeta coarctata (Willd.) M. Kerguelen, Lejeunia 120: 104. 1987; Matthew, Ill. FPH t. 429. 1996 & FPH 669. 1999. *Gnaphalium coarctatum* Willd., Sp. Pl. 3: 1886. 1800; Kumar & Pant in Hajra *et al,* Fl. Ind. 13: 85. 1995. **Plate 4.6.8.**

Stout, perennial herbs, 35-45 cm higher. Basal leaves larger, 9 x 2 cm, oblanceolate, obtuse, narrowed to the base, softly white wooly below; cauline leaves 4-5 x 0.8 cm, spathulate, obtuse. Heads heterogamous, 3 x 2 mm, in leafy clusters, sessile. Bisexual flowers 1 or 2, central; corolla 2 mm long, filiform, glabrous. Achenes 5 mm long, 3-angled, black, hirsute; pappus 2.5 mm long, setaceous.

Fl. & Fr.: Throughout the year

Distr.: Native of South America, now wide spread. Occasional; found along roadsides at lower to higher altitudes. MS, Idlimottai, *KKK 16012*; Chengalar, *KKK 18139.*

Gamochaeta purpurea (L.) Cabrera, Bol. Soc. Argent. Bot. 9: 377. 1961; Matthew, Ill. FPH t. 430. 1996 & FPH 670. 1999. *Gnaphalium purpureum* L. Sp. Pl. 854. 1753; Kumar & Pant in Hajra *et al,* Fl. Ind. 13: 92. 1995.

Erect herbs. Basal leaves larger, 3 x 1.5 cm, spathulate to oblanceolate, base truncate, apex obtuse, tomentose below, glabrescent above; cauline leaves 3 x 1.5 cm, lanceolate, obtuse. Heads 3 mm wide, in terminal panicles. Bisexual flowers 3-4, central; corolla 2 mm long, glabrous. Achenes 0.5 mm long, ellipsoid; pappus 2 mm long, setaceous.

Fl. & Fr.: Throughout the year

Distr.: North and South America, Europe; adventive in New Zealand, India & Pakistan. Occasional along road sides at lower altitudes. MS, K-3, *KKK 16785.*

GYNURA Cassini

Dict. Sci. Nat. 34: 391. 1825.

1. Plants glabrous; leaves oblanceolate; heads yellow ..... **G. nitida**
1. Plants hirsute or tomentose; leaves elliptic to obovate; heads orange ..... **G. travancorica**

Gynura nitida DC. in Wight, Contrib. 24. 1834; Wight, Ic. t. 1121. 1846; Hook. f., FBI 3: 333. 1881; Gamble, FPM 714. 1921; Fyson, FSIHS 343. t. 286. 1932; Mathur in Hajra *et al,* Fl. Ind. 13: 221. 1995; Matthew, FPH 712. 1999.

Stout herbs. Leaves to 15 x 4 cm, oblanceolate, entire, apex obtusely-acute, base narrowed and amplexicaule. Heads 16 x 12 mm, cylindrical, 10-20 together, in panicled cymes; peduncle 2-4 cm long. All flowers not fertile; corolla 10 mm long, lobes obtuse, glandular. Achenes 3.5 x 1 mm, ellipsoid, 11-ribbed, truncate, black; pappus 14 mm long, white.

Fl. & Fr.: August-January

Distr.: Endemic to Western Ghats. Common; along roadsides at medium altitudes. MS, K-5, *KKK 16543.*

Gynura travancorica Smith, Rec. Bot. Surv. India 6: 29. 1914; Gamble, FPM 714. 1921; Fyson, FSIHS 343. 1932; Mathur in Hajra *et al,* Fl. Ind. 13: 224. 1995; Matthew, FPH 713. 1999. **Moyalu Kola, Koppu Chedi (EBIS).**

Erect herbs. Leaves 10-13 x 3.5 cm, elliptic to obovate, acute at either ends, sharply and distantly serrate; upper ones amplexicaule. Heads homogamous, to 18 x 7 mm, in terminal panicled cymes; corolla 13 mm long, lobes acute, glandular. Achenes 4 mm, oblong, ribbed, pubescent, black; pappus 12 mm long, white.

Fl. & Fr.: August-December

Distr.: Endemic to Western Ghats. Common along roadsides at higher altitudes. MS. Idlimottai, *KKK 16015* & *KKK 16420*; K-9, *KKK 16795*. ENP, Mesthiri kettu, *KKK 18020*.

HELICHRYSUM P. Miller

Gard. Dict. Abr. ed. 4. 1754, orth. cons.

Helichrysum buddleioides DC. in Wight, Contrib. Bot. India 20. 1834; Wight, Ic. t. 1113. 1846; Hook. f., FBI 3: 290. 1881; Gamble, FPM 699. 1921; Fyson, FSIHS 335. t. 278. 1932; Pant in Hajra *et al,* Fl. Ind. 13: 98. 1995; Matthew, Ill. FPH t. 433. 1996 & FPH 673. 1999. *H. hookerianum* Wight & Arn. in DC. Prodr. 6: 201. 1838; Fyson, FSIHS 336. 1932. *H. buddleioides* DC. var. *hookerianum* (Wight & Arn.) Hook. f., FBI 3: 291. 1881. **Panji Poovu (EBIS). Plate 5.2.8.**

Stout herbs, densely cottony wooly. Leaves to 10 x 2 cm, elliptic-oblong, apex acute, base narrowed and amplexicaule, sparsely cottony above, 5-7-ribbed. Heads 4 x 4 mm, globose, heterogamous, densely packed. Bisexual flowers 10-15; corolla 2 mm long, tubular, glabrous, yellow. Female flowers many; corolla 3 mm long. Achenes oblong, 3-angled, scabrid; pappus white.

Fl. & Fr.: November-March

Distr.: Peninsular India and Sri Lanka. Common in the ecotones at higher altitudes. MS, Idlimottai, *KKK 16021*; K-3, *KKK 16127*; Idlimottai, *KKK 17599*. ENP, Mampallam Chola, *KKK 18067*.

KLEINIA P. Miller

Gard. Dict. Abr. ed. 4. 1754.

Kleinia grandiflora (DC.) N. Rani in Matthew, Fl. Tamilnadu Carnatic 2: t. 381. 1982, 3: 801. t. 56d. 1983; Mathur in Hajra *et al,* Fl. Ind. 13: 226. 1995; Matthew, Ill. FPH tt. 463-464. 1996 & FPH 713. 1999. *Notonia grandiflora* Wall. *ex* DC. in Guill., Arch. Bot. (Paris) 2: 518. 1833; Hook. f., FBI 3: 336. 1881; Gamble, FPM 717. 1921.

Subshrubs; branchlets angled above. Leaves alternate, to 14 x 8 cm, obovate to oblanceolate, base cuneate, apex obtuse, entire. Corymbs terminal. Heads homogamous, cylindric, 1.5 cm. Florets to 2.5 cm long; corolla cream or yellowish, tube to 18 mm. Achene linear or oblong, to 5.5 mm, ribbed; pappus 1.5 cm.

Fl. & Fr.: December-May

Distr.: South India, Nepal and Sri Lanka. Rare; along rocky stream sides. MS, Kalippettu Mala, *KKK 17622*.

MOONIA Arnott

Nova Acta Phys.-Med. Acad. Caes. Leop.-Carol. Nat. Cur. 18: 348. 1836

Moonia heterophylla Arn., Nova Acta Nat. Cur. 18: 349. 1836; Gamble, FPM 704. 1921; Fyson, FSIHS 337. t. 279. 1932; Chowdhery in Hajra *et al,* Fl. Ind. 12: 401.

1995; Matthew, Ill. FPH t. 443. 1996 & FPH 689. 1999. *Chrysogonum heterophyllum* (Arn.) Benth. *ex* Clarke, Compos. Ind. 132. 1876; Hook. f., FBI 3: 303. 1881. *Moonia arnottiana* Wight, Ic. t. 1105. 1846; Gamble, FPM 704. 1921; Fyson, FSIHS 337. 1932. *Chrysogonum arnottianum* (Wight) Benth. *ex* Clarke, Compos. Ind. 132. 1876; Hook. f., FBI 3: 303. 1881.

Erect subshrubs. Leaves opposite, to 8 x 7 cm; lowers 1-pinnately compound or divided; lobes elliptic, acuminate, serrate; hirsute below. Heads 10 x 8 mm, solitary, pedunculate, upper axillary. Outer flowers female, ligulate; limb deeply divided into 3 lobes, yellowish white; bisexual flowers central; corolla 4 lobed, tubular. Achenes 3.5 x 2 mm, biconvex, puberulus, black; pappus absent.

Fl. & Fr.: November-February

Distr.: South India and Sri Lanka. Fairly common along roadsides at higher altitudes. ENP, Way to hut, *KKK 18021.*

MYRIACTIS Lessing

Linnaea 6:127.1831

Myriactis wightii DC. in Wight, Contrib. 10. 1834; Ic. t. 1091. 1846; Hook. f., FBI 3: 247. 1881; Gamble, FPM 680. 1921; Fyson, FSIHS 319. t. 260. 1932; Hajra in Hajra *et al,* Fl. Ind. 12: 135. 1995; Matthew, Ill. FPH t. 417. 1996 & FPH 658. 1999.

Erect herbs. Leaves to 4 x 2 cm, obovate, obtuse, hispid, coarsely serrate, shortly petioled. Heads 4 mm long, cylindrical, solitary, on long peduncles. Female florets outside; tube 1 mm long, white; limbs 2.5 x 0.5 mm, oblong, recurved. Inner florets bisexual; corolla tube 2 mm long, yellow, lobes acute. Achenes 3 x 1 mm, ellipsoid, compressed, obtusely 3-angled, acute at both ends, smooth; pappus absent.

Fl. & Fr.: March-May

Distr.: South India and Sri Lanka. Common along road sides at medium altitudes. MS, K-5, *KKK 16162.*

Note : This species hitherto has not reported from Kerala. Hence the present collection forms a new distributional record for Kerala.

PARTHENIUM Linnaeus

Sp. Pl. 988. 1753.

Parthenium hysterophorus L., Sp. Pl. 988. 1753; Ellis & Swamin. in J. Bombay Nat. Hist. Soc. 66: 233. 1969; Chowdhery in Hajra *et al,* Fl. Ind. 12: 403. 1995; Matthew, FPH 690. 1999.

Erect herbs; branchlets puberulus. Leaves alternate, deeply pinnatisect, lobes to 10 x 1 cm, oblong-lanceolate, entire, base decurrent, apex acute. Heads terminal, in lax panicles. Outer florets 5, rayed, female; corolla ligulate, white, limb short, entire. Inner florets bisexual; corolla tubular, white. Achenes 2 x 1.5 mm, broadly ovoid, compressed, puberulus; pappus absent or with two short hooks.

Fl. & Fr.: August-February

Distr.: Native of America, now a Pantropical weed. Common along road sides at lower altitudes. MS, K-3, *KKK 16704.*

PHYLLOCEPHALUM Blume

Bijdr. 888. 1826

1. Perennial herbs of higher altitudes; leaves white wooly tomentose, margins crenulate ..... **P. indicum**
1. Annual herbs of low altitudes; leaves loosely white felted, margins serrate ..... **P. scabridum**

Phyllocephalum indicum (Less.) K. Kirkman, Rhodora 83: 12. 1981; Uniyal in Hajra *et al*, Fl. Ind. 13: 340. 1995; Matthew, Ill. FPH t. 404. 1996 & FPH 641. 1999. *Ampherephis indica* Less. Linnaea 6: 686. 1831. *Decaneurum reticulatum* DC. in Wight, Contr. Bot. India 3. 1834 & Ic. t. 1080. 1846. *Centratherum reticulatum* (DC.) Benth. in Benth. & Hook. f., Gen. Pl. 2: 225. 1873; Hook. f. FBI 3: 227. 1881; Gamble, FPM 666. 1921; Fyson, FSIHS 306. t. 246. 1932.

Leaves 9-12 x 3-4 cm, ovate, apex acuminate, nerves brown beneath. Heads 1.8 x 1 cm, peduncled. Flowers 10-12, tubular; corolla 8-10 mm long, lobes acute, glabrous. Achenes 2 mm long, 10-ribbed, glabrous, brown; pappus 2 mm long, many, setaceous.

Fl. & Fr.: August-December

Distr.: India and Sri Lanka. Occasional; along shola borders and waysides at higher altitudes. ENP, Amarachola, *KKK 18048*.

Phyllocephalum scabridum (DC.) K. Kirkman, Rhodora 83: 10. 1981; Uniyal in Hajra *et al*, Fl. Ind. 13: 344. 1995. *Decaneurum scabridum* DC. in Wight, Contrib. 7. 1834. *D. molle* DC., Prodr. 5 67. 1838. *D. courtallense* Wight, Ic. t. 1081. 1846. *Centratherum molle* (DC.) Benth. in Benth & Hook. f., Gen. Pl. 2: 225. 1873; Hook. f., FBI 3: 227. 1881; Gamble, FPM 666. 1921. *C. courtallense* (Wight) Benth *ex* Hook. f., FBI 3: 227. 1881. *Phyllocephalum courtallense* (Wight) Narayana, Curr. Sci. 51: 438. 1982.

Leaves 15 x 6.5 cm, elliptic, acuminate at both ends, thinly scabrid above, deeply serrate. Heads 1.3 x 1 cm, few. Flowers 12-15; corolla 8 mm long, tube broadening up; lobes oblong, glabrous. Achenes 1.5 mm long, 12-ribbed, glabrous; pappus few, 2.5 mm long.

Fl. & Fr.: August-December

Distr.: Endemic to Western Ghats. Common along roadsides at lower altitudes. MS, K-4, *KKK 16528*.

SENECIO Linnaeus

Sp. Pl. 866. 1753.

1. Erect herbs or subshrubs **2**
1. Climbing shrubs ..... **S. scandens**
2. Hispid herbs; leaves oblong to broad lanceolate; heads heterogamous ..... **S. lavandulaefolius**
2. Fleshy subshrubs; leaves elliptic; heads homogamous ..... **S. stylosus**

Senecio lavandulaefolius DC. in Wight, Contr. Bot. India 23. 1834; Wight, Ic. t. t. 1133. 1846; Hook. f. FBI 3: 343. 1881; Gamble, FPM 721. 1921; Fyson, FSIHS 347. t. 292. 1932; Matthew, Ill. FPH t. 465. 1996 & FPH 714. 1999. *Pseudojacoboea lavendulaefolius* (DC.) Mathur in Rao *et al*, Fl. Ind. Enum. Aster. 59. 1988 & in Hajra *et al*, Fl. India 13: 304. 1995.

Leaves alternate, to 3 x 1 cm, base cuneate, apex acute, margin strongly reflexed, fluffy below. Corymbs terminal, 5 cm wide. Heads 5 cm wide, campanulate. Outer ray florets 1.2 cm, ligule 3 fid. Inner disc florets 7 mm; corolla tube 4.5 mm, lobes 5. Achenes linear, 1.5 mm long.

Fl. & Fr.: December-April

Distr.: Endemic to Western Ghats. Rare; in grasslands at very higher altitudes. ENP, Anamudi top, *KKK 18533.*

Senecio scandens Buch.-Ham. *ex* D. Don, Prodr. Fl. Nep. 178. 1825; Hook. f., FBI 3: 352. 1881; Matthew, FPH 715. 1999. *S. wightianus* DC. in Wight, Contrib. 22. 1834; Wight, Ic. t. 1136. 1846; Gamble, FPM 724. 1921; Fyson, FSIHS 350. t. 296. 1932; Mathur in Hajra *et al,* Fl. Ind. 13: 280. 1995. **Pomburi Kodi (EBIS) Plate 4.7.1.**

Stems ridged, zig-zag, glabrous. Leaves to 10 x 4 cm, ovate, base hastate, apex acute, serrate, decurrent and auricled at the base of the petiole. Heads 7 x 5 mm, many, in axillary panicle with zig-zag branches. Female flowers peripheral; corolla 7 mm long, limb 3-lobed, yellow. Bisexual flowers central; corolla 4 mm long, tubular. Achenes ribbed, hairy between the ribs; pappus white, 3-4 mm long.

Fl. & Fr.: December-February

Distr.: Indo-China. Common in shola borders at lower and medium altitudes. MS, Puthur, *KKK 16094*; Kalipettu Mala, *KKK 16759.* PAS, Topstation, *KKK 18591.*

Senecio stylosus Balakr., J. Bombay Nat. Hist. Soc. 67: 62. 1970. *Gynura walkeri* Wight, Ic. t. 1122. 1846. *Notonia walkeri* (Wight) Clarke, Comp. India 176. 1876; Hook. f., FBI 3: 337. 1881; Gamble, FPM 717. 1921; Fyson, FSIHS 345. t. 289. 1932. *Kleinia walkeri* (Wight) Uniyal in Rao, Fl. Ind. Enum. Aster. 49. 1988; Mathur in Hajra *et al,* Fl. Ind. 13: 227. 1995.

Stem glabrous. Leaves to 13 x 4 cm, alternate, acuminate at either ends, crenate-serrate, glabrous. Heads 14 x 8 mm in terminal corymbose panicle; bracteolate. Flowers all bisexual, tubular; corolla 8 mm long, 5-lobed, white or pale yellow. Achenes 5 mm long, oblong, 10-ribbed; pappus many, cottony, white, setaceous.

Fl. & Fr.: December-March

Distr.: South India and Sri Lanka. Fairly common at medium and higher altitudes. ENP, MPCA plot, *KKK 17522.*

SIGESBECKIA Linnaeus

Sp. Pl. 900. 1753

Sigesbeckia orientalis L., Sp. Pl. 900. 1753; Hook. f., FBI 3: 304. 1881; Gamble, FPM 704. 1921; Fyson, FSIHS 338. t. 280. 1932; Chowdhery in Hajra *et al,* Fl. Ind. 12: 407. 1995; Matthew, FPH 690. 1999.

Erect subshrubs; stem scabrous and viscid. Leaves to 15 x 10 cm, ovate, base cuneate and decurrent, apex acute, pubescent, dentate. Heads 8 x 4 mm, solitary, terminal, on slender, densely hairy peduncles. Outer florets ligulate, female, corolla tubular; limb 2 mm long, 3-lobed, yellow. Inner disc florets 2 mm long. Achenes 4 mm long, curved, 4-angled, black; pappus absent.

Fl. & Fr.: October-January

Distr.: Throughout Tropical Countries. Occasionally along road sides and scrublands at lower altitudes. MS, K-3.5, *KKK 16783.*

SONCHUS Linnaeus

Sp. Pl. 793. 1753.

Sonchus oleraceus L., Sp. Pl. 794. 1753; Hook. f., FBI 3: 414. 1881; Gamble, FPM 732. 1921; Mamgain & Rao in Hajra *et al,* Fl. Ind. 12: 321. 1995; Matthew, Suppl. Ill. FPH t. 1014. 1998 & FPH 725. 1999. *S. ciliatus* Lam., Fl. Franc. 287. 1805; Wight, Ic. t. 1141. 1846. **Palkkola, Varapputhanal (EBIS).**

Annuals, to 90 cm higher; stems reddish, glandular hairy. Leaves to 15 x 6 cm, runcinate-pinnatifid, with a wide hastate terminal lobe, base auricled and amplexicaule; lobes spinulose-serrate. Heads 15 x 8 mm, in panicled cymes. Flowers all ligulate; corolla 12 mm long, limb yellow, 5-lobed; lobes obtuse. Achenes 3 x 1 mm, base narrowed, apex truncate, muriculate; pappus 10 mm long, white, cottony.

Fl. & Fr.: July-December

Distr.: Cosmopolitan. Occasional; along roadsides at lower altitudes. MS, K-3, *KKK 16655.*

VERNONIA Schreber

Gen. 2: 541. 1791, *nom. cons.*

1. Small trees ..... **V. arborea**
1. Shrubs, undershrubs or tall herbs **2**
2. Achenes 10 ribbed **3**
2. Achenes 3-5 angled ..... **V. bourneana**
3. Involucral bracts obtuse, mucronate ..... **V. fysonii**
3. Involucral bracts sharply acuminate, often aristate **4**
4. Flower heads small; leaves crenate-serrate ..... **V. saligna** var. **nilghirensis**
4. Flower heads large; leaves crenate ..... **V. peninsularis**

Vernonia arborea Buch.-Ham., Trans. Linn. Soc. London 14: 218. 1824, var. **arborea**; Hook. f., FBI 3: 329. 1881; Uniyal in Hajra *et al,* Fl. Ind. 13: 359. 1995; Matthew, FPH 644. 1999. *Monosis wightiana* DC. in Wight, Contrib. Ind. Bot. 1. 1834 & Ic. t. 1085. 1846. *Vernonia monosis* Benth. *ex* Clarke, Compos. India 24. 1876, non. Schultz.-Bip., 1847; Gamble, FPM 672. 1921; Fyson, FSIHS 308. t. 247. 1932. *V. arborea* Buch.-Ham. var. *wightiana* (DC.) Hook. f., FBI 3: 239. 1881. **Shengurinji.**

Branchlets densely brown silky hairy. Leaves 15-17 x 7-10 mm, obovate, apex abruptly acuminate, densely pubescent. Panicle 25 x 20 cm, terminal, densely pubescent. Heads many, 10 x 2 mm. Flower solitary; corolla 9 mm long, glabrous, purple; lobes acute. Achenes 4 mm long, 10-ribbed, hairy between the ribs; pappus similar, 9 mm long, bent at base, setaceous, white.

Fl. & Fr.: February-May

Distr.: Indo-Malesia. Common along roadsides and ecotones at higher altitudes. MS, Methappu, *KKK 16001*; Idlimottai, *KKK 16438.*

Vernonia bourneana W.W. Sm., Rec. Bot. Surv. India 6: 101. 1914; Gamble, FPM 675. 1921; Fyson, FSIHS 312. t. 253. 1932; Uniyal in Hajra *et al,* Fl. Ind. 13: 364. 1995; Matthew, Ill. FPH t. 406. 1996 & FPH 644. 1999.

Undershrubs to shrubs; branches grey wooly-tomentose. Leaves to 14 x 4 cm, lanceolate, apex acute, base cuneate, subentire, soft golden tomentose below, glabrous above. Cymes to 15 x 15 cm, terminal, corymbose. Heads 9 x 5 mm, peduncled. Flowers to 12, similar; corolla 5-6 mm long, lobes oblong, recurved. Achenes 2.5 mm long, 4-angled, glandular; pappus dull yellow.

Fl. & Fr.: March-May

Distr.: Endemic to Peninsular India. Occasional along stream sides at medium altitudes. MS, K-6, *KKK 17612.*

Vernonia fysonii Calder, Rec. Bot. Surv. India 6: 343. t. 10. 1919; Gamble, FPM 673. 1921; Fyson, FSIHS 311. t. 250. 1932; Uniyal in Hajra *et al,* Fl. Ind. 13: 371. 1995; Matthew, Ill. FPH t. 409. 1996 & FPH 646. 1999.

Undershrubs; stems densely cottony-hairy. Leaves to 8 x 3 mm, elliptic-lanceolate, base attenuate, apex acuminate, minutely serrate, densely hairy below, glabrous above. Cymes 5-8 cm across, corymbose. Heads 13 mm long, densely packed. Flowers 12-15; corolla 8 mm long, purple, lobes 5, oblong, recurved. Achenes 3 x 1 mm, smooth; pappus biseriate, similar, 8 mm long.

Fl. & Fr.: November-March

Distr.: Endemic to Southern Western Ghats. Common along roadsides at lower altitudes. MS, K-4, *KKK 16784.*

Note: This species was reported to be found restricted to Palni hills only (Ahmedullah & Nayar, 1987). Hence this forms a new record for Kerala.

Vernonia peninsularis (Clarke) Clarke *ex* Hook. f., FBI 3: 233. 1881; Gamble, FPM 674. 1921; Fyson, FSIHS 311. t. 251. 1932; Uniyal in Hajra *et al,* Fl. Ind. 13: 378. 1995; Matthew, Ill. FPH t. 410. 1996 & FPH 646. 1999. *V. bracteata* Wall. var. *peninsularis* Clarke, Compos. India 18. 1876. *Decaneurum silhetense* Wight, Ic. t. 1083. 1846, non DC. 1838. **Plate 4.7.2.**

Subshrubs; stems ribbed, pectinate-hairy. Leaves to 10 x 5 cm, elliptic, base acute, apex crenate, pectinate-hairy below. Heads 15 x 13 mm, globose, in terminal loose corymbose cymes, long-peduncled; corolla 10 mm long, pale pink. Achenes glabrous; outer pappus setaceous, 6-9 mm long, white.

Fl. & Fr.: December-March

Distr.: Endemic to Southern Western Ghats. Fairly common along shola borders at medium altitudes. MS, K-6, *KKK 16177.*

Vernonia saligna DC., Prodr. 5: 33. 1836 var. **nilghirensis** Hook. f., FBI 3: 235. 1881; Gamble, FPM 674. 1921; Uniyal in Hajra *et al,* Fl. Ind. 13: 383. 1995. *V. saligna* sensu Fyson, FSIHS 312. t. 252. 1932, non DC. 1836.

Undershrubs; stem terete, wooly-tomentose. Leaves to 12 x 3 cm, elliptic-lanceolate, acuminate at both ends, pubescent along the nerves beneath. Panicle

terminal, lax, to 25 cm across. Heads 5-6 x 7 mm. Flowers few, similar; corolla 5 mm long, glabrous. Achenes 1.5 mm long, glandular between ribs; pappus reddish-white, to 0.5 mm long, setaceous.

Fl. & Fr.: January-May

Distr.: Endemic to Southern Western Ghats. Occasional; along road sides at higher altitudes. MS, Methappu, *KKK 31074.*

YOUNGIA Cassini

Ann. Sci. Nat. (Paris) 23: 88. 1831.

Youngia japonica (L.) DC., Prodr. 7: 194. 1838; Mamgain & Rao in Hajra *et al,* Fl. Ind. 12: 329. 1995; Matthew, FPH 727. 1999. *Prenanthes japonica* L., Mant. Pl. 107. 193. 1767. *Youngia napifolia* DC., Prodr. 7: 193. 1838; Wight, Ic. t. 1846. *Lactuca napifolia* DC., in Wight, Contrib. 27. 1834. *Crepis japonica* (L.) Benth., Fl. Hong. 194. 1861; Hook. f., FBI 3: 395. 1881; Gamble, FPM 730. 1921.

Slender scapigerous herbs. Leaves mostly radical, to 15 x 3.5 cm long, oblanceolate, membranous, lyrate-pinnatifid, margin sinuate-dentate. Heads 6 x 3 mm, in terminal panicles. Flowers yellow, all ligulate; corolla 5 mm long, tube slender, limb 5-toothed. Achenes 2 x 1 mm, ribbed, beaked, scabrous, brown.

Fl. & Fr.: October-February

Distr.: South-East Asia. Common along road sides at lower altitudes. MS, K-4, *KKK 16505.*

53. CAMPANULACEAE

1. Corolla actinomorphic; anthers free 2
1. Corolla zygomorphic; anthers connate ..... **Lobelia**
2. Capsule dehiscence loculicidal; corolla rotate ..... **Wahlenbergia**
2. Capsule dehiscence by valves; corolla campanulate ..... **Campanula**

CAMPANULA Linnaeus

Sp. Pl. 163. 1753

Campanula alphonsii Wall. *ex* A. DC. in DC., Prodr. 7: 473. 1839; Clarke in Hook. f., FBI 3: 440. 1881; Gamble, FPM 740. 1921; Fyson, FSIHS 362. t. 307. 1932; Matthew, Ill. FPH t. 479. 1996 & FPH 730. 1999.

Diffusely branched villous herb. Leaves to 1.4 x 0.5 cm, obovate, acute at both ends, glaucous below, chartaceous, margin sub-crenate. Flowers blue, solitary, 10 mm wide, in upper axils; calyx lobes 5, 5 mm long, ovate; corolla campanulate, tube 6 mm, lobes 6 x 4 mm; stamens 5; ovary 3 celled. Capsule 5 mm long, obovoid.

Fl. & Fr.: November-December.

Distr.: Endemic to Western Ghats. Rare; in grasslands at higher altitudes. ENP, Bhiman Odai, *KKK 18085.*

Note: New record to the flora of Kerala.

LOBELIA Linnaeus

Sp. Pl. 929. 1753

1. Erect or prostrate herbs; branchlets trigonous, not hollow 2
1. Erect subshrubs; branchlets terete, hollow when mature 3
2. Prostrate herbs; all anthers penicillate at apex ..... **L. alsinoides**
2. Erect herbs; only 2 anthers penicillate at apex ..... **L. heyneana**
3. Shoots usually unbranched; leaves glaucous below; spikes dense; flowers purple ..... **L. leschenaultii**
3. Shoots branched; leaves not glaucous below; racemes lax; corolla white ..... **L. nicotianiifolia**

Lobelia alsinoides Lam., Encycl. 3: 588. 1792; Harid. & Mukh., Fasc. Fl. Ind. 19: 42. 1988; Matthew, FPH 732. 1999. *L. trigona* Roxb., Fl. Ind. 2: 111. 1824; Clarke in Hook. f., FBI 3: 423. 1881; Gamble, FPM 736. 1921; Fyson, FSIHS 359. t. 303. 1932.

Leaves to 1.5 x 1 cm, ovate, base cordate, apex obtusely-acute, serrate. Flowers solitary, in upper axils; calyx 5 x 1 mm, linear; corolla blue, 7 mm long, cauducous. Capsule 2 valved; seeds trigonous.

Fl. & Fr.: February-March

Distr.: Indo-Malesia. Common in grasslands at higher altitudes. ENP, Umayamala, *KKK 17572.*

Lobelia heyneana Roem. & Schult., Syst. Veg. 5: 50. 1819-1820; Harid. & Mukh., Fasc. Fl. Ind. 19: 51. 1988; Matthew, Ill. FPH t. 482. 1996 & FPH 732. 1999. *L. trialata* Buch.-Ham. *ex* D. Don, Prodr. Fl. Nepal. 157. 1825; Clarke in Hook. f., FBI 3: 425. 1881; Gamble, FPM 736. 1921.

Leaves to 1.8 x 1.4 cm, ovate, base rounded, apex obtusely acute, margin serrate. Flowers solitary in upper axils; calyx 5 x 1 mm, filiform; corolla blue, bilabiate, 7 mm long. Capsule not seen.

Fl.: February.

Distr.: Indo-Malesia, China and Africa. Common along stream sides and shola borders at lower altitudes. MS, Mattukkulam, *KKK 18131.*

Lobelia leschenaultiana (Presl.) Skottsb., Act. Hort. Bot. Gothob. 4: 4, f. 2-7. 1928; Harid. & Mukh., Fasc. Fl. Ind. 19: 52. 1988; Matthew, Ill. FPH t. 483. 1996 & FPH 733. 1999. *Rapuntium leschenaultianum* Presl., Prodr. Monogr. Lobel. 24. 1836. *Lobelia excelsa* Roxb., Fl. Ind. 2: 114. 1824, non Bonpl., 1813; Wight, Ic. tt. 1173 & 1174. 1848; Clarke in Hook. f., FBI 3: 427. 1881 p.p.; Gamble, FPM 737. 1921; Fyson, FSIHS 359. t. 304. 1932. *L. aromatica* Moon *ex* Wight, Ic. t. 1172. 1848. **Thonnali (EBIS) Plate 4.7.3.**

Leaves to 25 x 3 cm, elliptic-lanceolate, base attenuate, apex acuminate, serrate. Spikes terminal, to 60 cm long, 7 cm wide; calyx tube cupular, lobes 10 mm long, lanceolate; corolla tube to 20 mm, constricted below the lobes, lobes unequal, 10-15 mm. Capsule 1 cm long, cupular; seeds oblong.

Fl. & Fr.: February-March.

Distr.: India and Sri Lanka. Common along roadsides and shola margins. MS, Puthur, *KKK 16067.*

Lobelia nicotianiifolia Roth *ex* Schult. in Roem. & Schult., Syst. Veg. 5: 47. 1819; Clarke in Hook. f., FBI 3: 427. 1881; Gamble, FPM 736. 1921; Fyson, FSIHS 360. 1932; Harid. & Mukh., Fasc. Fl. Ind. 19: 53. 1988; Matthew, Ill. FPH t. 484. 1996 & FPH 733. 1999. *L. trichandra* Wight, Ic. t. 1171. 1848.

Leaves distant, 17 x 4 cm, elliptic, base attenuate, tip acuminate, chartaceous, margin inconspicuously serrate. Racemes terminal or in upper axils, to 50 cm; calyx tube 3 mm, lobes 12 x 2 mm, lanceolate; corolla tube 15 mm, constricted below lobes, upper lobe 15 mm, lower 5 mm. Capsule 0.8 x 0.6 cm, cupular; seeds broad-elliptic.

Fl. & Fr.: March-April.

Distr.: Indo-Malesia. Common along road sides a low altitudes. MS, Kolathuvada, *KKK 16052*; Thalachorkadavu, *KKK 16742.*

WAHLENBERGIA H. A. Schrader *ex* A. W. Roth

Novae Pl. Sp. 399. 1821 *(nom. cons.)*

1. Leaves elliptic-lanceolate; often > 0.5 cm wide; flowers lilac; capsule 5 nerved ..... **W. erecta**
1. Leaves lanceolate or oblanceolate; < 0.3 cm wide; flowers light blue; capsule 10 nerved..**W. marginata**

Wahlenbergia erecta (Roth *ex* Schult.) Moeliono & Tuyn in Steenis, Fl. Males. I. 6: 113.1960; Matthew, FPH 735. 1999. *Dentella erecta* Roth *ex* Schult. in Roem. & Schult., Syst. Veg. 5: 25.1819. *Cephalostigma schimperi* Hochst. *ex* A. Rich., Tent. Fl. Abyss. 2: 2.1851; Clarke in Hook.f., FBI 3: 428. 1881; Gamble, FPM 738. 1921. *Wahlenbergia perotifolia,* Wight & Arn., Prodr. 405. 1834, *nom. illeg.*; Wight, Ic. t. 842. 1844-45.

Prostrate, slightly pubescent herb. Leaves highly variable, 1-4 x 0.3-1 cm, sessile. Flowers solitary, pentamerous; calyx 5 x 1 mm, lanceolate; corolla campanulate, lobes obovate; ovary 3 celled. Capsule 4 mm wide, hairy.

Fl. & Fr.: October-December.

Distr.: Indo-Malesia and Tropical East Africa. Common in grasslands at higher altitudes. ENP, Hut 9 km, *KKK 18032*; Mampallam Chola, *KKK 18055.*

Wahlenbergia marginata (Thunb.) A. DC., Monog. Campan. 143. 1830; Matthew, Ill. FPH t. 485. 1996 & FPH 735. 1999. *Campanula marginata* Thunb., Fl. Jap. 89. 1784. *Wahlenbergia gracilis* (Forst. f.) Schrader *ex* A. DC., Monog. Campan. 142. 1830; Clarke in Hook.f., FBI 3: 429. 1881; Gamble, FPM 738. 1921; Fyson, FSIHS 361. t. 305. 1932. *Campanula gracilis* Forst. f., Insul. Austr. Prodr. 84. 1786. *Wahlenbergia agrestris* A. DC., Monog. Campan. 145. 1830; Wight, Ic. t. 1175. 1848.

Small herbs; rootstock perennial. Leaves to 6 x 0.8 cm, bigger at base, minutely toothed or entire, strongly one-nerved, strigose below. Flowers solitary or in binate cymes; calyx tube 4-5 mm long, ribbed, lobes erect, linear-lanceolate; corolla widely campanulate; petals 10 x 4 mm. Capsule obconical; seeds ellipsoid, dark brown.

Fl. & Fr.: August-November.

Distr.: Asia, Africa, Australia and New Zealand. Common along shola borders and road sides. MS, Coupe road, *KKK 16588*; Idlimottai, *KKK 16611.* ENP, Bhiman Odai, *KKK 18032*; Mampallam Chola, *KKK 18055.*

54. ERICACEAE

1. Bushy shrubs, aromatic; flowers white tinged with pink; leaves gland dotted ..... **Gaultheria**
1 Trees; non aromatic; flowers crimson red; leaves not gland dotted ..... **Rhododendron**

GAULTHERIA Linnaeus

Sp. Pl. 395. 1753.

Gaultheria fragrantissima Wall., Asiat. Res. 13:397.1820; Wight, Ic. t. 1196. 1848; Clarke in Hook.f., FBI 3: 457.1882; Gamble, FPM 743. 1921; Fyson, FSIHS 366. t. 311. 1932; Matthew, Ill. FPH t. 486. 1996 & FPH 738. 1999. *G. leschenaultii* DC., Prodr. 7: 593. 1839; Wight, Ic. t. 1195. 1848. **Kolgatte Chedi (EBIS) Plate 5.3.4.**

Leaves to 8 x 4 cm, elliptic, acute to obtuse at both ends, thick coriaceous, reddish gland dotted, aromatic, serrulate. Racemes to 8 cm long in upper axils. Calyx 5 lobed, lobes 4 mm, triangular, margins hairy; corolla 5 mm wide, urceolate, tube 5 mm long, lobes 5, round, reflexed; stamens 10; ovary 3 mm wide. Capsule 8 x 6 mm, cupular, blue with red stalk.

Fl. & Fr.: February-March.

Distr.: Indo-Malesia. Very common in scrublands, grassland ecotones and along road sides at all altitudes. MS, K-3, *KKK 16101.*

RHODODENDRON Linnaeus

Sp. Pl. 392. 1753.

Rhododendron arboreum Smith, Exot. Bot. 1: 9. t. 6. 1805, subsp. **nilagiricum** (Zenk.) Tagg., Stevenson, Sp. Rhodod. 15. 1930; Matthew, Ill. FPH t. 487. 1996 & FPH 740. 1999. *R. nilagiricum* Zenk., Amer. Sci. Nat. ser. 2, 6: 150. 1836; Gamble, FPM 743. 1921; Fyson, FSIHS 368. t. 312. 1932. *R. arboreum* Smith var. *nilagiricum* (Zenk.) Clarke in Hook. f., FBI 3: 466. 1881. **Alangi (EBIS) Plate 5.4.6.**

Leaves alternate, to 10 x 4 cm, oblong-elliptic, base obtuse, apex rounded, coriaceous, glabrous and rugose above, spongy below, margin reflexed. Racemes 6-12 flowered. Calyx to 2 mm, lobes 5, rounded; corolla tubular-campanulate, lobes 3.5 x 2 cm, orbicular; stamens 10; ovary conical, 0.5 cm, densely tomentose. Capsule 2 x 1 cm, oblong, valves separating from placentas; seeds small, plenty.

Fl.& Fr. : January-March.

Distr.: Endemic to Southern Western Ghats. Common along shola borders at all altitudes. MS, K-4, *KKK 16130.*

55. VACCINIACEAE

VACCINIUM Linnaeus

Sp. Pl. 349. 1753

1. Leaves ovate-elliptic, margins crenate; corolla glabrous outside ..... **V. leschenaultii**
1. Leaves lanceolate, margins serrate; corolla pubescent outside ..... **V. neilgherrense**

Vaccinium leschenaultii Wight, Ic. t. 1188. 1848; Clarke in Hook. f., FBI 3: 455. 1882; Gamble, FPM 742. 1921; Fyson, FSIHS 364. t. 309. 1932; Matthew, Ill. FPH t. 488. 1996 & FPH 742. 1999. **Kela Maram (EBIS) Plate 4.7.4.**

Small trees. Leaves to 6 x 3 cm, ovate-elliptic, base attenuate, apex acute to acuminate, margin crenate with minute spines, glabrous, coriaceous. Racemes dense, 8-20 flowered. Flowers 1 x 0.5 cm, white to pink, fleshy and glabrous; calyx 4 mm, lobes 5, margins ciliate; corolla to 9 x 6 mm, urceolate. Berry 8 mm wide, globular, tinged red.

Fl. & Fr.: February-March.

Distr.: Endemic to Southern Western Ghats. Common; found along shola margins at all altitudes. MS, Puthur, *KKK 16059*; K-4, *KKK 16125*. ENP, Umayamala, *KKK 17519*; Amara Chola, *KKK 18529*; Anaimudi slope, *KKK 18543*; Anamudi, *KKK 18547*. VMS, *KKK 18133*.

Notes: Several morphological variations are exhibited by this species with regard to general habit, size and shape of leaves and flowers etc. Many people have attempted to categorize the species into several varieties, but here it is not attempted.

Vaccinium neilgherrense Wight, in Calcutta J. Nat. Hist. 8: 173.1847 & Ic. t. 1189. 1848; Clarke in Hook. f., FBI 3: 454. 1882; Gamble, FPM 741. 1921; Fyson, FSIHS 365. t. 310. 1932; Matthew, Ill. FPH t. 488. 1996 & FPH 743. 1999. **Kela Maram (EBIS).**

Small trees. Leaves to 8 x 2 cm, ovate-lanceolate to lanceolate, base attenuate, distantly serrate, subcoriaceous. Racemes lax, to 6 cm long, 8-10 flowered; calyx 4 mm, lobes 5, margins glabrous, often with a few laciniate outgrowths; corolla rosy white, 8 x 4 mm, slightly pubescent outside; stamens 10 in a ring. Berry 6 mm wide, globose, red, glabrous.

Fl. & Fr.: February-March

Distr.: Endemic to Southern Western Ghats. Common along shola margins at lower altitudes. MS, Puthur, *KKK 16056*; K-4, *KKK 16145*.

56. PRIMULACEAE

LYSIMACHIA Linnaeus

Sp. Pl. 146. 1753.

Lysimachia procumbens Baudo, Ann. Sci. Nat. Bot. 2: 20. 1843; Matthew, Ill. FPH t. 490. 1996 & FPH 748. 1999. *L. deltoidea* Wight, Ill. Ind Bot. t. 144. 1841-1850; Hook. f., FBI 3: 505. 1882; Gamble, FPM 746. 1921; Fyson, FSIHS 370. t. 314. 1932.

Trailing, pubescent herb. Leaves decussate, to 2 x 1.5 cm, deltoid, base cordate, apex acute, apex apiculate, chartaceous, crispate-pubescent. Flowers 1 or 2, axillary; calyx to 8 mm wide, with orange brown dots, lobes 5, 7 x 2 mm, lanceolate; corolla yellow, rotate, tube 2 mm, lobes 6 x 3 mm, broad-obovate, orange dotted; stamens 5; ovary 1.5 mm, globose, 1 celled. Capsule 3 mm wide, seeds many, trigonous.

Fl. & Fr.: October-December.

Distr.: Peninsular India, Sri Lanka, Himalyas and Assam. Rare; in grasslands at higher altitudes. ENP, Amara Chola, *KKK 18007*.

57. MYRSINACEAE

1. Straggling shrubs ..... **Embelia**
1. Erect shrubs or trees **2**
2. Leaf margin serrate; fruit fleshy, many-seeded ..... **Maesa**
2. Leaf margin entire; fruit not fleshy, 1-seeded **3**
3. Leaves rhomboid; flowers in stalked umbels ..... **Ardisia**
3. Leaves obovate, elliptic or oblanceolate; flowers clustered around leafless branchlets ..... **Myrsine**

ARDISIA O. Swartz

Prodr. 3, 48. 1788, *nom. cons.*

Ardisia rhomboidea Wight, Ic. t. 1213. 1848; Clarke in Hook. f., FBI 3: 529. 1882; Gamble, FPM 755. 1921; Fyson, FSIHS 376. 1932; Matthew, Ill. FPH t. 491. 1996 & FPH 750. 1999.

Large shrub. Leaves to 6 x 2.5 cm, acuminate at both ends, chartaceous, margin very obscurely crenulate. Umbels to 3.5 cm wide, 2-7 flowered. Flowers nodding; calyx campanulate, lobes 5, 1.5 mm, lanceolate; corolla whitish pink, 1 cm wide, lobes 5 x 3 mm, broad-ovate, gland dotted; stamens 5; ovary globose. Berry 1 cm wide, subglobose; seed only one, 6 mm wide, subglobular.

Fl. & Fr.: February-March.

Distr.: Endemic to Southern Western Ghats. Common undergrowth inside sholas. MS, K-3, *KKK 16108*; Idlimottai, *KKK 17581*; Idlimottai, *KKK 18171*. ENP, V-point, *KKK 17527*; Anamudi, *KKK 18549*.

EMBELIA N. L. Burman

Fl. Ind. 62. 1768.

1. Leaves coriaceous; inflorescence racemose; flowers orange; drupe blood-red ..... **E. tsjeriam-cottam**
1. Leaves chartaceous; inflorescence panicle; flowers greenish white; drupe bluish-black ..... **E. ribes**

Embelia ribes Burm. f., Fl. Ind. 62, t.23. 1768; Clarke in Hook. f., FBI 3: 513. 1882; Gamble, FPM 752. 1921; Fyson, FSIHS 375. t. 317. 1932; Matthew, FPH 751. 1999.

Lianas; branchlets slender, white, without lenticels. Leaves to 7 x 3 cm, elliptic, acute at both ends. Panicles 15 cm wide, glabrous, branches long, slender. Flowers many; calyx lobes 5, 0.5 mm, triangular, tomentose; corolla 2 mm long, ovate, puberulous; stamens 5, exserted; ovary ribbed. Drupe 3 mm across, globose.

Fl. & Fr.: January-May

Distr.: Indo-Malesia and South China. Occasional; along shola borders at lower altitudes. MS, K-4, *KKK 31011*; Chengalar, *KKK 31062*.

Embelia tsjeriam-cottam (Roem. & Schult.) A. DC., Trans. Linn. Soc. London 17: 131. 1834; Wight, Ic. t. 1209. 1848; Gamble, FPM 753. 1921; Matthew, Ill. FPH t. 318. 1996 & FPH 751. 1999. *Ardisia tsjeriam-cottam* Roem. & Schult., Syst. Veg. 4: 518. 1819. *E. villosa* Wall. *ex* Roxb., Fl. Ind. 2: 289. 1824; Gamble, FPM 753. 1921. *E. robusta* sensu Clarke in Hook. f., FBI 3: 515. 1882, non Roxb. 1832. *Embelia basaal* (Roem. &

Schult.) A. DC., Trans. Linn. Soc. London 17: 131. 1834; Gamble, FPM 753. 1921; Fyson, FSIHS 376. t. 318. 1932. *Ardisia basaal* Roem. & Schult., Syst. Veg. 4: 517. 1819. *Embelia viridifolia* sensu (A. DC.) Hook. f., FBI 3: 516. 1882, non Scheff. 1867. *Chloripetalum aurantiacum* A. DC., Wight, Ic. t. 1210. 1848. *Samara rheedii* Wight, Ic. t. 1591. 1850.

Straggler. Leaves to 12 x 5.5 cm, broadly obovate to oblong. Racemes axillary, to 4 cm. Flowers usually 4-merous; calyx lobes 4(5), 1 mm, coriaceous; corolla 3.5 mm wide, lobes 3 mm; stamens 4(5), exserted. Drupe 8 mm wide, crowned with persistent style.

Fl. & Fr.: January-May

Distr.: Indo-Malesia. Occasional; along shola borders at lower altitudes. MS, Chengalar, *KKK 18101.*

Note: *E. tsjeriam-cottam* and *E. basaal* are treated here as synonyms following Nicolson (1988) and Matthew (1999)

MAESA Forsskal

Fl. Aegypt.-Arab. 66. 1775.

Maesa indica (Roxb.) A. DC., Trans. Linn. Soc. London 17: 134. 1834; Wight, Ic. t. 1206. 1848; Matthew, FPH 752. 1999. *Baeobotrys indica* Roxb., Fl. Ind. 2: 230. 1824. *Baeobotrys dubia* Wall. in Roxb., Fl. Ind. 2: 235. 1824. *Maesa dubia* (Wall.) DC., Trans. Linn. Soc. London 17: 134. 1834; Clarke in Hook. f., FBI 3: 510. 1882; Gamble, FPM 749. 1921. *M. perrottetiana* A. DC. in DC., Prodr. 8: 80. 1844; Gamble, FPM 749. 1921; Fyson, FSIHS 372. 1932. *M. indica* (Roxb.) A. DC. var. *perrottetiana* (A. DC.) Clarke in Hook. f., FBI 3: 509. 1882. **Kattu Malli, *Vallara.***

Shrub to small tree. Leaves to 12 x 6 cm, elliptic to ovate, base rounded to acute, apex acuminate, subcoriaceous, glabrous. Panicles to 8 cm long; calyx lobes 5, 1 mm, ovate, acute, persistent; corolla white, 3 mm wide; ovary glabrous, adnate to calyx. Drupe fleshy, 0.8 x 0.6 cm, globose, yellowish green; seeds angular.

Fl. & Fr.: February-July.

Distr.: Indo-Malesia and Pakistan. Common; found along shola borders at lower and medium altitudes. MS, K-4, *KKK 16149*; Puthur, *KKK 16444.*

MYRSINE Linnaeus

Sp. Pl. 196. 1753

1. Flowers sessile, leaves elliptic or obovate ..... **M. capitellata** var. **sessilis**
1. Flowers pedicelled; leaves obovate or oblanceolate **2**
2. Pedicels 1-2 mm; branchlets not short leaves oblanceolate, narrow ..... **M. wightiana**
2. Pedicels 4-5 mm; branchlets stout; leaves obovate, wide ..... **M. thwaitesii**

Myrsine capitellata Wall. in Roxb. Fl. Ind. 2 : 295. 1824; Matthew, FPH 753. 1999, var. **sessilis** Gamble, FPM 750. 1921; Clarke in Hook. f. FBI 3: 512, p.p., 1882. *Rapanea capitellata* (Wall.) Mez. in Engl. Pflanzenr. 9: 356. 1902, var. *sessilis* Gamble, FPM 750. 1921. **Cheera Maram (EBIS).**

Small trees; branchlets stout, rough. Leaves to 12 x 5 cm, elliptic or obovate, base acute, apex obtusely acute, coriaceous. Flowers sessile; calyx 3 mm wide, lobes acute; corolla greenish-brown, lobes 4 x 1.5 mm, gland dotted; stamens sessile; ovary ovoid. Berry 5 mm across, globose, purple; seeds 4 mm wide, globose.

Fl. & Fr.: February-March.

Distr.: Endemic to Southern Western Ghats. Common along shola borders at higher altitudes. ENP, Umayamala, *KKK 17540*; Umayamala, *KKK 17541.*

Note: New record to the flora of Kerala.

Myrsine wightiana Wall. *ex* DC. in Trans. Linn. Soc. London 17: 106. 1834; Matthew, Suppl. Ill. FPH t. 1021. 1998 & 753. 1999. *M. capitellata* Wall. var. *lanceolata* Clarke in Hook. f., FBI 3: 512. 1882. *M. capitellata* sensu Wight, Ic. t. 1211. 1848, non Wall. 1824. *Rapanea wightiana* (Wall. *ex* DC.) Mez in Engl. Pflanzenr. 9: 360. 1902; Gamble, FPM 751.1921; Fyson, FSIHS 374. t. 316. 1932. **Cheera Maram (EBIS) Plate 4.7.5.**

Small trees; branchlets not very stout. Leaves to 8 x 1.5 cm, oblanceolate, base attenuate, apex acute, coriaceous, veins obscure. Flowers 4 mm across, shortly stalked; calyx 3 mm wide, lobes 1 mm long, acute; corolla lobes 3 x 1 mm, gland dotted; stamens sessile; ovary ovoid. Berry 3 mm wide, subglobose.

Fl. & Fr.: February-March.

Distr.: South India and Sri Lanka. Common along shola margins at lower and medium altitudes. MS, K-4, *KKK 16129.*

Myrsine thwaitesii (Mez) B. M. Wadhwa in M.D. Dassanayake & W.D. Clayton, eds., Revised Handb. Fl. Ceylon, 13: 159. 1999. *Rapanea thwaitesii* Mez in Engl., Pflanzenr., Myrsin. IV 236(9): 357. 1902; Gamble, FPM 751. 1921; Fyson, FSIHS 373. 1932. **Cheera Maram (EBIS).**

Small trees; branchlets thick. Leaves to 8 x 3 cm, obovate on oblanceolate, base attenuate, apex acute, rounded or emarginate. Flowers 3 mm across; calyx 3 mm wide, lobes acute, tip ciliate; corolla lobes 3 x 1.5 mm, sparsely gland dotted; ovary 1 mm. Fruit not seen.

Fl. & Fr.: February-March.

Distr.: Endemic to Western Ghats. Common along shola borders at higher altitudes. MS, Idlimottai, *KKK 16014*; Idlimottai, *KKK 17583.*

58. SAPOTACEAE

1. Thorny trees; calyx lobes 1-seriate, imbricate; stamens 5 ..... **Xantolis**
1. Thornless trees; calyx lobes 2-seriate, outer series valvate; stamens 6 or more ..... **Isonandra**

ISONANDRA Wight

Ic. t. 359. 1840.

1. Leaves 8-18 cm long, margins not recurved, berry ellipsoid ..... **I. lanceolata**
1. Leaves 6-7 cm long, margins recurved; berry oblong ..... **I. perrottetiana**

Isonandra lanceolata Wight, Ic. t. 359. 1840; Clarke in Hook. f., FBI 3: 539. 1882; Gamble, FPM 761.1921. **Vella Pala (EBIS) Plate 4.7.6.**

Large shrubs to small trees. Leaves highly variable, 8-18 x 3-6 cm, elliptic to oblanceolate, base acute to cuneate, apex acuminate, glabrous and glossy. Flowers in axillary and extra axillary fascicles; calyx lobes 3 mm long, ovate, acute, brown tomentose; corolla yellow, 7 mm long, lobes acute; stamens 8; ovary 4 celled. Berry to 1.5 x 1 cm, ellipsoid, orange-yellow, smooth.

Fl. & Fr.: Throughout the year

Distr.: South India and Sri Lanka. Occasional in medium altitudes. MS, K-5, *KKK 31049.*

Isonandra perrottetiana A. DC. in DC., Prodr. 8: 188. 1844; Wight, Ic. t. 1219. 1848; Clarke in Hook. f., FBI 3: 539. 1882; Gamble, FPM 761. 1921; Fyson, FSIHS 379. 1932; Matthew, Ill. FPH t. 492. 1996 & FPH 756. 1999. *I. candolleana* Wight, Ic. t. 1220.1848; Fyson, FSIHS 379. t. 320. 1932. **Karimbala (EBIS) Plate 4.7.7.**

Medium sized trees. Leaves to 7 x 3 cm, elliptic or oblanceolate, base cuneate to attenuate, apex obtusely acute. Flowers subsessile; calyx campanulate, lobes 1 mm, triangular; corolla cream, tubular-campanulate, lobes 3.5 mm, spathulate; anthers obtuse, tip black-hairy; ovary globose. Berry 1.5 cm long, orange turning red.

Fl. & Fr.: January-March

Distr.: Endemic to Southern Western Ghats. Common; in lower and medium altitudes. MS, K-4, *KKK 17505*; K-5, *KKK 31021.*

XANTOLIS Rafinesque

Sylva Tell. 36. 1838.

Xantolis tomentosa (Roxb.) Raf. Sylva Tellur. 36. 1838, var. **elengioides** (A. DC.) Vajr., Biol. Mem. Angiosp. Taxon. ser. 2: 86. 1977; Matthew, Ill. FPH t. 493. 1996 & FPH 759. 1999. *Sideroxylon tomentosum* Roxb., Pl. Corom. t. 28. 1795 & Fl. Ind. 1: 602. 1832; Clarke, FBI 3: 538. 1882, var. *elengioides* (A. DC.) Gamble, FPM 759. 1921. Fyson FSIHS 377. t. 319. 1932. *Sapota elengioides* A. DC. in DC., Prodr. 8: 176. 1844; Wight, Ic. t. 1218. 1848. **Kara (EBIS).**

Medium sized trees; trunk irregularly fluted; thorns elongate. Leaves to 7 x 3 cm, elliptic, subcoriaceous, glabrous, base narrowly cuneate, apex acute. Fascicles subsessile, in upper axils of leaves. Flowers cream; calyx campanulate, lobes 5, to 6 x 3 mm, ovate, margins fimbriate; corolla campanulate, lobes 5, to 10 mm, lanceolate; stamens and staminodes 5 each; ovary globose. Berry 3.5 x 2 cm, ovoid; seeds black.

Fl. & Fr.: March-June

Distr.: Endemic to South India. Common; in lower and medium altitudes. MS, K-4, *KKK 31116.*

59. SYMPLOCACEAE

SYMPLOCOS N. J. Jacquin

Enum. Pl. Carib. 5: 24. 1760.

1. Filaments more or less pentadelphous; corolla tube divided nearly to the base **2**
1. Filaments adnate to the corolla tube; corolla tube elongate ..... **S. pendula**

2. Stamens about 12, in pairs or 3-4 together or solitary ..... **S. oligandra**
2. Stamens usually > 40, in several rows in a ring or in bundles at corolla base 3
3. Drupe ampulliform, globose ..... **S. cochinchinensis** subsp. **laurina**
3. Drupe ovoid-oblong, not ampulliform 4
4. Inflorescence 4-many flowered 5
4. Inflorescence to 4 flowered 8
5. Drupe glabrous 6
5. Drupe villous ..... **S. macrophylla** subsp. **macrophylla**
6. Leaves coriaceous 7
6. Leaves submembranous ..... **S. macrophylla** subsp. **rosea**
7. Whole plant glabrous ..... **S. obtusa**
7. Young branchlets, leaf midribs beneath and inflorescence fulvous-villous ..... **S. foliosa**
8. Leaves coriaceous, small 9
8. Leaves membranous, fairly large ..... **S. pulchra** var. **villosa**
9. Flower on slender recurved peduncle; leaves elliptic, serrulate ..... **S. anamallayana**
9. Flower sessile or shortly peduncled; leaves elliptic or lanceolate, minutely toothed ..... **S. monantha**

Symplocos anamallayana Bedd., Fl. Sylv. S. India, For. Man. 150. 1872 & Ic. t. 116. 1868-74; Clarke, FBI 3: 581. 1882; Gamble, FPM 784. 1923; Matthew, Suppl. Ill. FPH t. 1023. 1998 & FPH 764. 1999.

Shrubs. Leaves to 5 x 3 cm, broadly ovate to oblong, base acute to obtuse, apex acute, subcoriaceous, margin serrate, glabrous. Flowers white, solitary on recurved stalks; calyx lobes 5, puberulous; corolla lobes 4 x 2.5 mm, obovate, connate at base; stamens numerous; ovary 3 celled. Drupe 8 mm, oblong.

Fl. & Fr.: May-August

Distr.: Endemic to Southern Western Ghats. Rare and threatened species; found in shola borders at higher and very higher altitudes only. MS, Idlimottai, *KKK 16025*; Idlimottai, *KKK 18168.*

Symplocos cochinchinensis (Lour.) Moore J. Bot. 52. 148. 1914, subsp. **laurina** (Retz.) Nooteb., Leiden Bot. ser. 1: 156; Hore, Fl. India Fasc. 20: 146. 1990; Matthew, FPH 765. 1999. *Drupatris cochinchinensis* Lour., FL. Cochinch. 1: 314. 1790. *Myrtus laurinus* Retz., Obs. Bot. 4: 26. 1786. *Symplocos laurina* (Retz.) Wall. *ex* G. Don, Gen. Syst. 4: 3. 1837. *S. spicata* Roxb. var. *laurina* (Retz.) Clarke in Hook. f., FBI 3: 573. 1882; Gamble, FPM 782. 1923; Wight, Ic. t. 150. 1839. *S. spicata* Roxb. var. *malasica* Clarke in Hook. f., FBI 3: 573. 1882. *S. spicata* Roxb. var. *attenuata* (A.DC.) Clarke in Hook. f., FBI 3: 573. 1882. **Kaatukappi, Parala (EBIS) Plate 5.3.8.**

Small trees. Leaves to 13 x 6 cm, elliptic, acute at both ends, dentate-crenulate, coriaceous, glabrous. Spikes to 7 cm long, solitary or branched. Flowers white, sessile; sepals rounded, 1 mm across, hairy; corolla 7 mm across, glabrous, lobes orbicular; stamens numerous. Drupe 5 mm long, ampulliform, glabrous, blue.

Fl. & Fr.: December-January

Distr.: South East Asia and Australia. Common; along shola borders at medium and higher altitudes. MS, K-4, *KKK 16406*; K-5, *KKK 16098*; Thalachorkadavu, *KKK* 18154; Idlimottai, *KKK 18167.* ENP, Amarachola, *KKK 17516*; Pannithavarnai, *KKK 18556.*

Symplocos foliosa Wight, Ic. t. 1234. 1848; Clarke in Hook. f., FBI 3: 582. 1882; Gamble, FPM 783. 1923; Fyson, FSIHS 382. t. 322. 1932; Hore, Fl. India Fasc. 20: 150. 1990; Matthew, Ill. FPH t. 494. 1996 & FPH 765. 1999. *S. nervosa* Wight, Ic. t. 1235. 1848, non DC., 1844. **Parala (EBIS).**

Medium sized trees; branchlets fulvous tomentose, glabrous when mature. Leaves to 15 x 4 cm, oblong or elliptic, base acute, apex acuminate, crenate-serrate, coriaceous, tomentose below. Spikes unbranched, densely fulvous tomentose. Flowers 10 mm across, white; sepals glabrous, roundish; corolla lobes 6 x 3 mm, orbicular, ciliate; stamens numerous; ovary 3 celled. Drupe 10 x 5 mm, ovoid, dark blue when ripe.

Fl. & Fr.: November-January

Distr.: Endemic to Southern Western Ghats. Fairly common at high altitudes. MS, Idlimottai, *KKK 18163.* ENP, Hut 9 km, *KKK 18036.*

Symplocos macrophylla Wall. *ex* A. DC. in DC., Prodr. 8: 257. 1844, subsp. **macrophylla** Nooteb., Rev. Symplocac. Old World, 226. 1975, var. **macrophylla** Nooteb., Rev. Symplocac. Old World, 227. 1975; Clarke in Hook. f., FBI 3: 578. 1882. *S. gardneriana* Wight, Ic. t. 1213. 1848; Clarke in Hook. f., FBI 3: 582. 1882; Gamble, FPM 782. 1923.

Small trees; branchlets densely fulvous-tomentose. Leaves to 13 x 6 cm, elliptic, acute at base and apex, coriaceous, crenate, margins recurved, yellow when dry, densely hairy above and below. Spike 3-5 cm long, stout, tomentose. Flowers sessile; sepals ovate, acute, densely hairy. Drupe 12 x 7 mm, oblong, brown.

Fl. & Fr.: February-April

Distr.: Endemic to Southern Western Ghats. Occasional at high altitudes. MS, Idlimottai, *KKK 31088.*

Symplocos macrophylla Wall. *ex* A. DC. in DC., Prodr. 8: 257. 1844, subsp. **rosea** (Bedd.) Nooteb., Rev. Symplocac. Old World, 229. 1975; Hore, Fl. India Fasc. 20: 159. 1990. *S. rosea* Bedd., Trans. Linn. Soc. London 25: 219. 1866; Clarke in Hook. f., FBI 3: 583. 1882; Gamble, FPM 783. 1923. *S. barberi* Gamble, Kew Bull. 1921: 219. 1921 & FPM 783. 1923.

Shrubs; branchlets hispid. Leaves oblanceolate, bluntly acuminate, spinous serrate, coriaceous, glabrous, midrib hairy below. Spikes 4 cm long, unbranched, hispid. Flowers few, shortly pedicelled; sepals rounded, densely hairy; corolla 10 mm across, glabrous, lobes roundish; stamens 50, unequal; disk hairy. Drupe 15 x 4 mm, cylindrical, blue.

Fl. & Fr.: February-April

Distr.: Endemic to Southern Western Ghats. Common; in shola ecotones at high altitudes. MS, Idlimottai, *KKK 31110.* ENP, Mampallam Chola, *KKK 17548*: Pannithavarnai, *KKK 18555.*

Symplocos monantha Wight, Ic. t. 1236. 1848; Clarke in Hook. f., FBI 3: 581. 1882; Gamble, FPM 784. 1923; Hore, Fl. India Fasc. 20: 160. 1990.

Shrubs; branchlets tomentose. Leaves to 5 x 2 cm, ovate, apex acuminate, serrate, coriaceous; nerves obscure, glabrous. Flowers sessile or shortly pedicelled, axillary; sepals 1.5 mm long, triangular, acute, ciliate; corolla lobes 4 x 3 mm, united at base, obtuse, glabrous; stamens 30-40 in 5-6 bundles, attached at the base of the corolla; ovary hairy at apex. Drupe 12 x 5 mm, ovoid, truncate at apex, white.

Fl. & Fr.: November-January

Distr.: Endemic to Southern Western Ghats. Rare; in shola ecotones at higher altitudes. MS, Idlimottai, *KKK 31111.*

Note: This species was considered as *'possibly extinct'* (Nayar, 1997), until it was relocated from Periyar Tiger Reserve after 150 years since the type collection (Sasidharan, 1998). Present collection extends the distribution of the species to Mannavan Shola.

Symplocos obtusa Wall. *ex* G. Don, Gen. Hist. 4: 3. 1838; Wight, Ic. t. 1233. 1848; Clarke in Hook. f., FBI 3: 583. 1882; Gamble, FPM 783. 1923; Fyson, FSIHS 383. t. 323. 1932. *S. laeta* var. *pedicellata* Clarke in Hook. f., FBI 3: 583. 1882. *S. obtusa* Wall. *ex* G. Don, var. *pedicellata* (Clarke) Nooteb., Rev. Symplocac. Old World, 244. 1975.

Small trees. Leaves to 7 x 2.5 cm, elliptic, acuminate at either ends, closely serrate, dark grey when dry, glabrous. Racemes 2-3 cm long, unbranched, hispid. Flowers white, few, distant; pedicels slender; sepals 1.5 x 1 mm, obtuse, hairy. Drupe 12 x 5 mm, terete, yellowish-green, minutely hispid towards the apex.

Fl. & Fr.: April-May

Distr.: South India and Sri Lanka. Rare; at medium altitudes. MS, Gudalar road, *KKK 18599*; Idlimottai, *KKK 31117.* VMS, *KKK 31141.*

Symplocos oligandra Bedd., For. Man. Bot. 150. 1872 & Ic. t. 272. 1868-1874; Clarke in Hook. f., FBI 3: 574. 1882; Gamble, FPM 782. 1923.

Small trees. Leaves to 9 x 4 cm, elliptic, base cuneate, apex acute, subcoriaceous, serrate, greenish-black when dry. Racemes to 1 cm long, pubescent. Flowers small, 3-6; sepals 1.5 mm long; petals red, small, tube divided to the base; stamens 12. Fruit not seen.

Fl.: January-February

Distr.: Endemic to Southern Western Ghats. Rare; in medium altitude sholas. MS, K-5, *KKK 18096.*

Symplocos pendula Wight, Ic. t. 1237. 1848; Clarke in Hook. f., FBI 3: 587. 1882; Gamble, FPM 784. 1923; Fyson, FSIHS 384. t. 324. 1932; Matthew, FPH 766. 1999. *S. sessilis* Clarke, FBI 3: 587. 1882; Gamble, FPM 784. 1923.

Trees. Leaves to 8 x 4 cm, elliptic-obovate, base acute, apex obtuse or rounded, coriaceous, glabrous. Flower solitary, pendulous; calyx lobes 5, rounded, margin puberulous; corolla white tinged pink, 1 cm wide, tube to 6 mm, puberulous within; stamens numerous; ovary 2-celled. Drupe 1.2 cm, oblong, sessile.

Fl. & Fr.: August-December

Distr.: South East Asia, Malay Peninsula. Rare; at medium and higher altitudes. MS, Chengalar, *KKK 16531.* PAS, vandaravu, *KKK 18588.*

Symplocos pulchra Wight, Ic. t. 1230. 1848, var. **villosa** (Brand.) Nooteb., Rev. Symplocac. Old World. 266. 1975; Hore, Fl. India Fasc. 20: 165. 1990. *S. villosa* Brand. in Engl., Pflanzenr. Heft 6: 63. 1901; Gamble, FPM 784. 1921.

Shrubs; branchlets densely villous. Leaves elliptic-lanceolate, apex acuminate, base cuneate, densely adpressed-hairy below, distantly spineus-serrate; nerves 7 pairs, slender, looping below the margin, green when dry; petiole 6 mm long. Flowers shortly peduncled; sepals acute, hairy; corolla 7 mm across, white. Drupe 12 mm long, oblong, white-villous

Fl. & Fr.: March-April

Distr.: Endemic to Southern Western Ghats. Rare; along shola borders at higher altitudes. MS, Idlimottai, *KKK 31112.*

60. OLEACEAE

1. Climbing or erect subshrubs; fruit a didymous berry ..... **Jasminum**
1. Small shrubs or trees; fruit a drupe 2
2. Corolla split to the base in paired lobes; inflorescence dichasial, axillary ..... **Chionanthus**
2. Corolla with a clear tube; inflorescence in terminal panicles 3
3. Flowers polygamous; corolla tubular; drupe 1 cm or longer ..... **Olea**
3. Flowers all bisexual; corolla funnel shaped; drupe < 1 cm long ..... **Ligustrum**

CHIONANTHUS Linnaeus

Sp. Pl. 8. 1753.

1. Flowers in few branched cymose clusters; drupe small, < 2 cm long ..... **C. linocieroides**
1. Flowers in panicles; drupe large, 5 cm long ..... **C. ramiflorus** var. **peninsularis**

Chionanthus linocieroides (Wight) Bennet & Raizada, Indian J. For. 4: 68.1981; Srivastava & Kapoor, J. Econ. Tax. Bot. 15: 133. 1991. *Olea linocieroides* Wight, Ic. t. 1241. 1850. *Linociera wightii* Clarke in Hook. f., FBI 3: 608. 1882; Gamble, FPM 794. 1923.

Medium sized trees. Leaves to 9 x 4 cm, elliptic, base acute or rounded, apex acute to acuminate, coriaceous. Calyx lobes rounded, ciliate; corolla white, petals short, elliptic-oblong. Drupe 1.5 x 0.8 cm, smooth.

Fl. & Fr.: July-August.

Distr.: Endemic to Southern Western Ghats. Common in low and medium altitudes. MS, Coupe Road, *KKK* 16582. ENP, Mampallam Chola, *KKK 18062.*

Chionanthus ramiflorus Roxb., Fl. Ind. 1: 106. 1820, var. **peninsularis**, Ravikumar & Lakshmanan in Bull. Bot. Surv. India 31: 163. 1989; Matthew, Ill. FPH t. 497. 1996 & FPH 769. 1999. **Kattu Chakkalathi, *Vella Edali* (EBIS).**

Medium sized trees. Leaves to 12 x 4 cm, elliptic to oblanceolate, base narrowly attenuate, apex acute, sub-coriaceous. Panicles, to 10 cm; calyx lobes small, acute; corolla cream, 4 mm across, lobes 4 x 1.5 mm, elliptic-oblong, acute; ovary 1 mm. Drupe 5 x 2.5 cm, ellipsoid, smooth, often slightly curved.

Fl. & Fr.: March-May.

Distr.: Endemic to Southern Western Ghats. Common; in shola interiors at medium altitudes. MS, K-5, *KKK 17633.*

Note: New record to the flora of Kerala.

JASMINUM Linnaeus

Sp. Pl. 7. 1753.

1. Erect subshrubs; leaves paripinnate; flowers yellow; berry paired ..... **J. bignoniaceum**
1. Woody lianas; leaves 3-foliolate; flowers white tinged pink; berry single ..... **J. brevilobum**

Jasminum bignoniaceum Wall. *ex* DC., Prodr. 8: 313. 1844; Gamble, FPM 791. 1923; Fyson, FSIHS 387. t. 327. 1932; Matthew, Ill. FPH t. 498. 1996 & 771. 1999. *J. humile* auct. non L., Clarke in Hook. f. FBI 3: 602. 1882, p.p. *J. revolutum* auct non Sims., Wight, Ic. t. 1258. 1848.

Branchlets glabrous, angular. Leaves glabrous; leaflets 3-5 pairs, to 2 x 1 cm, elliptic, base attenuate, apex acute. Cymes leaf-opposed, sub umbellate, to 5 flowered. Flowers nodding; calyx tube 2 mm, lobes 1 mm, triangular; corolla lobes 1.5 x 1 mm, ovate, recurved. Berry 7 mm, sub globose.

Fl. & Fr.: April-May

Distr.: Native of Europe; now widely cultivated in Nilgiris. Common; found along shola borders and scrublands at higher altitudes. ENP, V-Point, *KKK 17656.* PAS, Vandaravu, *KKK 18195.*

Jasminum brevilobum. A.DC., in DC. Prodr. 8: 307. 1844; Clarke in Hook. f. FBI 3: 600. 1882; Gamble, FPM 791. 1923; Fyson, FSIHS 387. t. 326. 1932; Matthew, Ill. FPH t. 499. 1996 & 772. 1999. **Kattu Mulla (EBIS).**

Branchlets tawny pubescent, rusty. Odd leaflet to 5 x 4.5 cm, deltoid, base truncate, apex mucronate, lateral leaflets reduced, 1 cm across, orbicular, fulvous tomentose. Cymes corymboid. Flowers fragrant, sessile; calyx tube 3 mm, lobes 2 mm, ovate, pubescent; corolla 2 cm wide, tube 2.5 cm, lobes 1 cm, obovate, apiculate; ovary tomentose above. Berry globose.

Fl. & Fr.: June-August.

Distr.: Endemic to Peninsular India. Occasional; along shola borders at lower altitudes. MS, K-3, *KKK 16483.*

Note: New record to the flora of Kerala.

LIGUSTRUM Linnaeus

Sp. Pl. 7. 1753.

Note: Green (1990) merged all the South Indian species of *Ligustrum* into one species (*L. perrottetii* A. D.C). But here I treat my collections into two distinct species, owing to their significant differences.

1. Leaves chartaceous; flowers extremely small in lax cymose panicles ..... **L. robustum** var. **walkeri**
1. Leaves subcoriaceous; flowers comparatively large in dense cymose panicles ..... **L. perrottetii**

Ligustrum perrottetii DC., Prodr. 8: 294. 1844; Clarke in Hook. f., FBI 3: 615. 1882; Gamble, FPM 797. 1923; Fyson, FSIHS 390. t. 329. 1932; Matthew, FPH 776. 1999. *L. neilgherrense* Wight, Ic. t. 1243. 1848; Clarke in Hook. f., FBI 3: 615. 1882. **Pingan, Pingi (EBIS) Plate 4.7.8.**

Small trees. Leaves to 7x 3cm, elliptic, base cuneate, apex acute; petiole often red. Inflorescence to 9 cm, glabrous; calyx truncate, 3 mm across, tube 2 mm, lobes 3 x 2 mm, ovate-acute, reflexed; stamens 2; ovary 2 celled. Drupes 8 x 5 mm, ellipsoid, glabrous, pink coloured with persistent calyx.

Fl. & Fr.: October-November.

Distr.: Endemic to Western Ghats. Common along shola borders at all altitudes. MS, Mattukulam, Idlimottai, *KKK 16599*; Kulachivayal, *KKK 16665*. ENP, Amarachola, *KKK 17517*; Umayamala, *KKK 17533*.

Ligustrum robustum (Roxb.) Blume, Mus. Bot. Lugd.-Bat. 1: 313. 1849, subsp. **walkeri** (Decne.) Green, Kew Bull. 40: 130. 1985. *Phillyrea robusta* Roxb., Fl. Ind. 1: 101. 1820. *Ligustrum walkeri* Decne., Nov. Arch. Mus. Hist. Nat. 2: 27. 1879; Clarke in Hook. f., FBI 3: 614. 1882; Gamble, FPM 797. 1923.

Small trees. Leaves 9 x 3.5 cm, elliptic-lanceolate, base acute, apex acuminate. Inflorescence to 20 cm, puberulous; calyx tube 1.5 mm long, 5 toothed; corolla 5 mm wide, lobes longer than tube, ovate, reflexed; stamens 2; ovary 2 celled. Drupes 7 mm long, obovoid, glabrous.

Fl. & Fr.: June-December

Distr.: Peninsular India and Sri Lanka. Common along shola borders at lower altitudes. MS, K-4, *KKK 31038*.

OLEA Linnaeus

Sp. Pl. 8. 1753

Olea paniculata R.Br., Prodr. 523. 1810; Mathew, FPH 778. 1999. *O. glandulifera* Wall. *ex* G. Don, Gen. Syst. 4: 49. 1838; Clarke in Hook. f., FBI 3: 612. 1882; Gamble, FPM 796.1923; Fyson, FSIHS 389. t. 328. 1932. *O. bournei* Fyson, Kew Bull. 1914: 186. 1914.

Medium trees; branchlets glabrous. Leaves to 6.5 x 3 cm, obovate, base acute, apex acuminate, chartaceous, glabrous. Panicles cymose, terminal. Calyx gland dotted, lobes 4, triangular; corolla white, 4 mm across, tube 1 mm, lobes 2 mm long; stamens 2. Drupe 10 x 6 mm, pyriform, brownish-black when ripe.

Fl. & Fr.: April-June.

Distr.: Peninsular India, Himalaya and Nepal. Common; found in medium altitude sholas. MS, K-4, *KKK 31039*.

61. APOCYNACEAE

1. Fruit a follicle; leaves lanceolate, 4 per node, nerves numerous, close ..... **Alstonia**
1. Fruit a drupe; leaves obovate, 7-many at each node, nerves a few, distantly spaced ..... **Rauvolfia**

ALSTONIA R. Brown

Wern. Nat. Hist. Soc. 1: 75. 1811, *nom. cons.*

Alstonia venenata R. Br., Mem. Wern. Nat. Hist. Soc. 1: 77. 1811; Wight, Ic. t. 436. 1841; Hook. f., FBI 3: 642. 1882; Gamble, FPM 810. 1923; Matthew, Ill. FPH t. 505. 1996 & FPH 784. 1999. **Thippili (EBIS)**

Shrubs to small trees. Leaves to 8 x 3 cm, acuminate at both ends, slightly pale beneath, membranous. Flowers white, in corymbose cymes; calyx tube 1 mm, lobes lanceolate, ciliate; corolla lobes 13 mm long, oblong, twisted; stamens included, villous; ovary 2 mm, oblong. Follicle 8-16 cm long, 2-angled, acute; seeds smooth.

Fl. & Fr.: February-May

Distr.: Tropical Asia. Occasional; along shola fringes at lower altitudes. MS, K-4, *KKK 16088.*

RAUVOLFIA Linnaeus

Sp. Pl. 208. 1753.

Rauvolfia densiflora (Wall.) Benth. *ex* Hook. f., FBI 3: 633. 1882; Gamble, FPM 808. 1923; Fyson, FSIHS 393. t. 331. 1932; Matthew, Ill. FPH t. 508. 1996 & FPH 790. 1999. *Tabernaemontana densiflora* Wall. in Edward's Bot. Reg. 15: t. 1273. 1829. *Ophioxylon neilgherrense* Wight, Ic. t. 1292. 1848. *Rauvolfia verticillata* (Lour.) Baill, Bull. Soc. Linn. Paris 1: 768. 1888; Markgraf, Blumea 30: 160. 1984. *Dissolena verticillata* Lour., Fl. Cochinch. 137. 1790. **Plate 4.7.9.**

Shrubs. Leaves to 18 x 9 cm, base cuneate , apex abruptly acuminate, lateral nerves 12-14 pairs. Cymes corymbose, 3-6 cm long; calyx lobes 5, 6 mm long, lanceolate, acuminate; corolla white, salvar shaped, tube 7 mm; disk annular. Pyrenes 10 x 6 mm, ellipsoid, crustaceous, blue when ripe.

Fl. & Fr.: March-May

Distr.: India, Sri Lanka and South East Asia. Common; along shola borders at lower and medium altitudes. MS, K-3.5, *KKK 16471*; Idlimottai route, *KKK 16590.*

62. ASCLEPIADACEAE

1. Slender, twining herbs; leaves chartaceous; follicles narrowly lanceolate, not woody ..... **Tylophora**
1. Lianas; leaves cordiform, subcoriaceous; follicles ovate-oblong, woody ..... **Wattakaka**

TYLOPHORA R. Brown

Mem. Wern. Nat. Hist. Soc. 1: 28. 1811.

Tylophora mollissima Wight & Arn. in Wight, Contrib. Bot. India 49. 1834; Wight, Ic. t. 1275. 1848; Hook. f., FBI 4: 48. 1883; Gamble, FPM 843. 1923; Fyson, FSIHS 398. t. 336. 1932; Matthew, Ill. FPH t. 513. 1996 & 816. 1999.

Leaves to 6 x 3 cm, elliptic-oblong or ovate, base rounded, apex acute, apiculate or mucronate, chartaceous. Flowers pinkish, 5 mm across; sepals 1 x 0.5 mm, ovate, acute; corolla lobes 3 x 1.5 mm, ovate-oblong, obtuse; corona shallowly 5-lobed. Follicles to 6 cm long, narrowly lanceolate.

Fl. & Fr.: September-December

Distr.: Endemic to South India. Common in shola borders at lower altitudes. MS, Kulachivayal, *KKK 16661.*

WATTAKAKA Hasskarl

Flora 40: 99. 1857.

Wattakaka volubilis (L. f.) Stapf in Curtis, Bot. Mag. 148: sub. t. 8976. 1923; Matthew, FPH 819. 1999. *Asclepias volubilis* L. f., Suppl. 170. 1782. *Dregea volubilis* (L. f.) Benth. *ex* Hook. f., FBI 4: 46. 1883. *D. volubilis* var. *lacuna* (Ham.) Hook. f. FBI 4: 46. 1883. *Marsdenia volubilis* (L. f.) Cooke, Fl. Pres. Bombay 2: 166. 1904; Gamble, FPM 846. 1923; Fyson, FSIHS 399. t. 338. 1932. **Kakklan Kodi (EBIS) Plate 4.8.1.**

Leaves to 10 x 7 cm, ovate, base cordate, apex acuminate, glabrous. Umbels 5-6 cm long, axillary; calyx lobes unequal, 2 mm, lanceolate; corolla rotate, tube 3 mm, lobes 4 x 4 mm, orbicular; corona single, staminal with 2 globular masses above anthers; pollinia erect. Follicles 10 x 3 cm, ribbed, blunt at apex.

Fl. & Fr.: February-September.

Distr.: Indo-Malesia and China. Occasional; in exposed regions at lower altitudes. MS, K-3, *KKK 16663.*

63. LOGANIACEAE

1. Small trees, epiphytic when young; leaves obovate, coriaceous; flowers large, cream ..... **Fagraea**
1. Climbers; leaves elliptic to lanceolate, subcoriaceous; flowers small, yellow ..... **Gardneria**

FAGRAEA Thunberg

Vet. Acad. Handl. Stockh. 125. 1782.

Fagraea ceylanica Thunb., Vetensk. Acad. Handl. 3: 132. 1782; Clarke in Hook. f., FBI 4: 83. 1883 "*zeylanica*"; Gamble, FPM 865. 1923. *F. obovata* Wall. in Roxb., Fl. Ind. 2: 33. 1824; Clarke in Hook. f., FBI 4: 83. 1883; Gamble, FPM 865. 1923; Fyson, FSIHS 406. t. 345. 1932. **Maruthanka Maram. Plate 4.8.2.**

Branchlets with persistent leaf scars. Leaves alternate, to 20 x 8 cm, base cuneate, apex obtuse, fleshy, glabrous, glossy above. Flowers in stout, terminal cymes; calyx tube 1 cm, lobes 5, 7 mm long, ovate; corolla 6-7 cm across, tube 4 cm, funnel shaped, lobes 3 x 2.5 cm, obovate; stamens 5; ovary 2 celled. Berry 2 celled, 3.5 x 3 cm, ovoid, with a beak, glossy; seeds many.

Fl. & Fr.: October-March.

Distr.: Indo-Malesia. Common; along stream sides at lower altitudes. MS, K, *KKK 16051*; Chengalar, *KKK 16650.*

GARDNERIA Wallich *ex* Roxburgh

Fl. Ind. 1: 400. 1820.

Gardneria ovata Wall. in Roxb., Fl. Ind. 1: 400. 1820; Clarke in Hook. f., FBI 4: 93. 1883; Gamble, FPM 869. 1923; Fyson, FSIHS 405. t. 344. 1932; Matthew, Suppl. Ill. FPH t. 1033. 1998 & FPH 820. 1999.

Branchlets terete, glabrous. Leaves opposite, to 11 x 5 cm, base acute, apex acuminate. Cymes axillary, 3 flowered; to 2.5 cm long; calyx lobes 4, 2 mm, obtuse; corolla rotate, lobes 5 x 2 mm, lanceolate; stamens 4, nearly sessile, connivent to form a hard cone in the centre; ovary 2 celled. Berry deep red, 1 cm wide, globose, with a persistent mucro; seeds 2, cup shaped.

Fl. & Fr.: February-June.

Distr.: Indo-Malesia. Common; along shola margins at all altitudes. MS, K-5, *KKK 16169*; K-4, *KKK 16499*. ENP, Umayamala, *KKK 17531*; Idlimottai, *KKK 18189*.

64. GENTIANACEAE

1. Ovary 2 celled; stamens connivent around a filiform style ..... **Exacum**
1. Ovary 1 celled; stamens away from style **2**
2 Basal leaves rosetted; corolla lobes without nectaries ..... **Gentiana**
2. Basal leaves not rosetted; corolla lobes with 1 glandular nectary at base ..... **Swertia**

EXACUM Linnaeus

Sp. Pl. 112. 1753.

1. Tufted herbs; stems terete; leaves broadly elliptic, thick coriaceous ..... **E. anamallayanum**
1. Erect subshrubs; stems quadrangular; leaves ovate-lanceolate, chartaceous ..... **E. wightianum**

Exacum anamallayanum Bedd., Ic. t. 154. 1868-1874; Gamble, FPM 874. 1923; Klack., Opera Bot. 84: 69. 1985; Matthew, Ill. FPH t. 515. 1996 & FPH 827. 1999. *E. atropurpureum* Bedd. var. *anamallayanum* (Bedd.) Clarke in Hook. f., FBI 4: 97. 1883; Fyson, FSIHS 408. t. 347. 1932. *E. saulierei* Dunn, Kew Bull. 1914: 30. 1914.

Leaves sessile, to 5 x 3.5 cm, base stem-clasping, apex acute. Cymes to 3 cm, terminal, 1-3 flowered. Flowers bright blue; calyx lobes 8 x 4 mm, lanceolate, glabrous; corolla to 4 cm wide, tube 8 mm, lobes 3 x 1.3 cm, broad elliptic; anthers linear-oblong, yellow. Capsule 1 x 0.8 cm, broadly ovoid.

Fl. & Fr.: October-February.

Distr.: Endemic to Southern Western Ghats. Very rare; in grassland ecotones at higher altitudes. ENP, Anamudi slope, *KKK 18547*.

Exacum wightianum Arn., Ann. Sci. Nat. Bot. 11: 176. 1839; Wight, Ic. t. 840. 1844; Clarke in Hook. f., FBI 4: 97. 1883; Gamble, FPM 873. 1923; Fyson, FSIHS 407. t. 346. 1932; Matthew, Ill. FPH t. 517. 1996 & FPH 828. 1999. *E. atropurpureum* Bedd. var. *palghatense* Gamble, FPM 874. 1923. **Vella Thavalakkal Chedi (EBIS).**

Leaves to 8 x 3 cm, base abruptly cuneate, apex acuminate, glabrous, subsessile. Cymes to 4 cm; calyx lobes 12 x 4 mm, lanceolate, broadly winged, tip acuminate; corolla deep blue, 4 cm wide, tube 6 mm, lobes 2.5 x 1.2 cm, obovate, apiculate; anthers linear-oblong. Capsule 1.2 x 1 cm, broadly ovoid to sub orbicular.

Fl. & Fr.: October-February.

Distr.: Endemic to Southern Western Ghats. Common; along shola borders at lower and medium altitudes. MS, K-3, *KKK 16146*; K-5, *KKK 31040*. ENP, Amarachola, *KKK 18024*.

GENTIANA Linnaeus

Sp. Pl. 227. 1753

Gentiana pedicellata (D. Don) Griseb., Gen. Sp. Gent. 274. 1839, var. **wightii** Kusn. Trudy, Imp. S.-Peterburgsk. Bot. Sada 15: 401. 1895; Gamble, FPM 876. 1923; Fyson, FSIHS 409. t. 349. 1932; Matthew, Ill. FPH t. 518. 1996 & FPH 829. 1999. *Ericala pedicellata* D. Don, Edinburgh New Philos J. 8: 76. 1836.

Tufted herb; stem terete. Leaves opposite, base connate; basal rosetted leaves to 3 x 1 cm, broadly elliptic; stem leaves decussate, to 1.2 x 0.5 cm, ovate-elliptic, sessile. Cymes to 1.5 cm. Flowers 1-3; calyx lobes 5, 3 mm wide, linear, apiculate, keeled; corolla blue, 4 mm wide, tube 5 mm long, lobes 1 x 1.5 mm, oblanceolate, apiculate; stamens 5; ovary 1 celled. Capsule 4 x 2.5 mm, broad-oblong.

Fl. & Fr.: March-August.

Distr.: Indo-Malesia and China. Common; along shola margins and grasslands at higher altitudes. MS, Idlimottai, *KKK 16642* & *KKK 18173*; Methappu, *KKK 17594*.

SWERTIA Linnaeus

Sp. Pl. 226. 1753

1. Small, branched herb; leaves broadly elliptic to ovate-elliptic; corolla pale blue ..... **S. corymbosa**
1. Tall, erect herb; leaves elliptic-lanceolate; corolla white with deep blue streaks ..... **S. lawii**

Swertia corymbosa (Griseb.) Wight *ex* Clarke in Hook. f., FBI 4: 126. 1883; Gamble, FPM 881. 1923; Fyson, FSIHS 410. t. 350. 1932. *Ophelia corymbosa* Griseb., Gen. Sp. Gent. 317. 1839; Wight, Ic. t. 1329. 1848.

Leaves sessile, to 2.5 x 1.5 mm, base cuneate and stem-clasping, apex acute or apiculate, chartaceous, 3-5 ribbed. Corymbs to 4 cm long, of compact terminal cymules; calyx lobes 8 mm, lanceolate; corolla 10 x 4 mm, lobes elliptic; nectary basal, single, fimbriate at mouth; stamens 4. Capsule 2-valved; seeds many.

Fl. & Fr.: October-December.

Distr.: Endemic to Western Ghats. Common; in grasslands at higher altitudes. ENP, Amarachola, *KKK 18006*; Mesthirikkettu, *KKK 18023*.

Swertia lawii (Wight *ex* Clarke) Burkill in J. Asiat. Soc. Beng. n. s. 2: 379.1906; Gamble, FPM 881. 1923. *S. corymbosa* Wight var. *lawii* Wight *ex* Clarke in Hook. f., FBI 4: 126. 1883.

Leaves to 3.5 x 1 cm, elliptic-lanceolate, base stem clasping, apex acuminate. Flower cymules lax; calyx lobes to 8 mm long, lanceolate; corolla to 10 x 3 mm; nectary large, ciliate, covered with a fimbriate scale. Capsule to 10 x 3 mm, oblong.

Fl. & Fr.: December-February.

Distr.: Endemic to Peninsular India. Occasional; along road sides and shola margins at lower altitudes. MS, K-3, *KKK 16112*; K-4, *KKK 16769*.

65. BORAGINACEAE

CYNOGLOSSUM Linnaeus

Sp. Pl. 134. 1753

Cynoglossum zeylanicum (Vahl *ex* Hornem.) Thunb. *ex* Lehm, Neue Schriften Naturf. Gen. Halle 3(2): 20. 1817; Matthew, FPH 839. 1999. *Anchusa zeylanica* Vahl *ex* Hornem., Enum. Pl. Hort. Hafn. 3. 1807. *Cynoglossum denticulatum* A. DC. var. *zeylanicum* (Vahl *ex* Hornem.) Clarke in Hook.f., FBI 4: 157. 1883; FPM 900. 1923. *C. furcatum* Wall. *ex* Roxb., Fl. Ind. 2: 6. 1824; Wight, Ic. t. 1395. 1848; Clarke in Hook. f., FBI 4: 155. 1883; Gamble, FPM 900. 1923; Fyson, FSIHS 413. t. 352. 1932. **Plate 4.8.3.**

Annual herbs, softly adpressed grey-pubescent. Leaves alternate, to 6 x 2 cm, oblong-lanceolate, base cuneate, apex acute. Racemes 10-25 cm, tawny villous. Flowers deep blue, sessile; sepals 5, 2 mm long; corolla 2 x 1 mm, campanulate; stamens 5, included; ovary 4 celled. Fruit of 4 nutlets, 3-5 mm across, glochidiate.

Fl. & Fr.: Throughout the year.

Distr.: Indo-Malesia and China. Common along roadsides, ecotones and other regions, mainly at lower altitudes. MS, Idlimottai, *KKK 16099*; K-5, *KKK 16492*.

66. CONVOLVULACEAE

1. Climbing shrubs; leaves alternate; flowers purple in corymbose cymes; fruit a berry ..... **Argyreia**
1. Twining parasitic herbs; leafless; flowers cream in short racemes; fruit a capsule ..... **Cuscuta**

ARGYREIA Loureiro

Fl. Cochinch. 95, 134. 1790.

Argyreia hirsuta Wight & Arn., Nova Acta Phys.-Med. Acad. Caes. Leop.-Carol. Nat. Cur. 18: 356. 1836; Clarke in Hook. f., FBI 4: 189. 1883; Gamble, FPM 909. 1923; Fyson, FSIHS 415. t. 353. 1932; Matthew, Ill. FPH t. 526. 1996 & FPH 846. 1999. *Rivea hirsuta* (Wight & Arn.) Wight, Ic. t. 891. 1845.

Leaves 9 x 8 cm, ovate-cordate, apex abruptly acuminate, pubescent. Inflorescence to 10 cm long; sepals 10 x 6 mm, ovate, acute, slightly pubescent, persistent; corolla to 5.5 cm long, funnel shaped; stamens 5; ovary 4 celled. Berry, orange coloured, 13 x 10 mm, depressed-globose; seed one, 1 x 8 mm, brown.

Fl. & Fr.: September-February.

Distr.: South India and Sri Lanka. Common along shola borders at lower altitudes. MS, Puthur, *KKK 16093*.

CUSCUTA Linnaeus

Sp. Pl. 124. 1753.

Cuscuta reflexa Roxb., Pl. Corom. t. 104. 1798; Clarke in Hook. f., FBI 4: 225. 1883; Gamble, FPM 931. 1923; Matthew, Suppl. Ill. FPH t. 1039. 1998 & FPH 848. 1999.

Stems yellow to reddish, to 5 mm across. Flowers cream; calyx cupular, lobes 2 x 2 mm, orbicular, obtuse; corolla campanulate-tubular, 6-8 mm long, lobes triangular-

ovate, acute, entire, spreading; stamens 5; ovary 2 celled, ovoid. Capsule, 10 x 7 mm, globose-conical, tip beaked; seeds 4 x 4 mm, discoid, black.

Fl. & Fr.: August-April

Distr.: Indo-Malesia and China. Common along shola borders at lower altitudes. MS, Thalachorkadavu, *KKK 16034*; Chengalar, *KKK 16577*; Methappu, *KKK 17700*. ENP, Mampallam Chola, *KKK 17565*;

67. SOLANACEAE

1. Anther dehiscence porous 2
1. Anther dehiscence longitudinal 3
2. Anther tips sterile; berry ovoid ..... **Cyphomandra**
2. Anthers fertile throughout; berry globose ..... **Solanum**
3. Fruiting calyx inflated, larger than berry 4
3. Fruiting calyx not inflated, smaller than berry ..... **Lycopersicon**
4. Fruiting calyx cordate-ovate; corolla blue ..... **Nicandra**
4. Fruiting calyx angular; corolla yellow with 5 dark purple blotches at base ..... **Physalis**

CYPHOMANDRA C. F. P. Martius *ex* Sendtner

Flora 28: 162. 1845.

Cyphomandra betacea (Cav.) Sendtn., Flora 28: 172. t. 4. 1845; Fyson, FSIHS 422. 1932; Matthew, FPH 863. 1999. **Seemakkathiri, Mara Thakkali (EBIS)**

Shrubs to small trees; branchlets puberulous. Leaves to 30 x 26 cm, cordate-ovate, apex acuminate, subcoriaceous, very lightly pubescent. Cymes scorpioid, drooping, to 4 cm long; calyx tube 6 mm, lobes 5, orbicular; corolla pinkish-white, 2 cm across, lobes 1 x 0.5 cm, lanceolate; stamens 5, filaments pinkish; ovary conical, 2 celled. Berry 6.5 x 4 cm; seeds many.

Fl. & Fr.: June-October

Distr.: Native of Peru, Brazil; introduced. Occasional; a cultivated plant running wild in low altitude shola regions and other exposed lands. MS, Puthur, *KKK 16461*.

Note: New record to the flora of Kerala.

LYCOPERSICON P. Miller

Gard. Dict. Abr. ed. 4. 1754.

Lycopersicon lycopersicum (L.) Karsten, Deut. Fl., 996. 1881; Matthew, FPH 866. 1999. *Solanum lycopersicum* L., Sp. Pl. 185. 1753. *Lycopersicon esculentum* Mill., Gard. Dict. ed. 8, 1768; Clarke in Hook. f., FBI 4: 237. 1883; Gamble, FPM 941. 1923. **Chirangu Thakkali, Cheru Thakkali (EBIS) Plate 4.8.4.**

Sticky pubescent herb. Leaves 15-20 cm long, pinnatisect, lobes triangular-ovate. Flower yellow, solitary, axillary; calyx lobes 5, 5 mm, lanceolate; corolla 1.3 cm wide, lobes 0.8cm, ovate; stamens 5, connivent; ovary 2 celled. Berry to 2 cm wide, depressed-globose, 4-6 lobed, pulp juicy; seeds discoid, numerous.

Fl. & Fr.: Throughout the year

Distr.: East and South America, Mexico, widely cultivated. Occasional; found growing along roadsides, in scrublands and near tribal settlements at lower altitudes; often cultivated. MS, Perumala, *KKK 31020.*

Note: It is interesting to note that this wild variety has comparatively smaller berries and has several medicinal uses, especially in treating skin diseases.

NICANDRA Adanson

Fam. Pl. 2: 219. 1763, *nom. cons.*

Nicandra physalodes (L.) Gaertn., Fruct. 2: 237, t. 131, f. 2. 1791, "*physaloides*"; Clarke in Hook. f., FBI 4: 240. 1883; Gamble, FPM 941. 1923; Fyson, FSIHS 423. t. 362. 1932; Matthew, FPH 2: 867. 1999. **Oomathan.**

Herbs; branchlets grooved. Leaves to 18 x 10 cm, ovate, base attenuate, apex acute, sinuate-dentate. Flowers solitary, extra-axillary, nodding; calyx 5 angled, inflated, 5 lobed, lobes to 1.5 x 1 cm, cordate-ovate; corolla 3.5 cm wide, campanulate, 5 lobed; stamens 5; ovary 3 mm across, globose. Berry 2 cm across, globose, enveloped in inflated calyx; seeds plenty, compressed.

Fl. & Fr.: Throughout the year.

Distr.: Native of Andes; now widely naturalised in the tropics. Common in grassland ecotones at lower altitudes. MS, Kulachivayal, *KKK 16683.*

PHYSALIS Linnaeus

Sp. Pl. 183. 1753

Physalis peruviana L., Sp. Pl. ed. 2, 1670. 1762; Clarke in Hook. f., FBI 4: 238. 1883; Gamble, FPM 939. 1923; Fyson, FSIHS 423. t. 361. 1932; Matthew, Suppl. Ill. FPH t. 1048. 1998 & FPH 869. 1999. **Pottipalam, Perungunni, Malathakkali Keera (EBIS) Plate 4.8.5.**

Tall herbs, densely pubescent. Leaves alternate or sub-opposite, to 10 x 7 cm, ovate, base cordate, apex acute, margin entire. Flowers solitary, axillary; calyx campanulate, lobes 5, 5 x 3 mm, ovate-acute; corolla campanulate, 1.5 cm wide, softly pubescent, lobes 5; stamens 5; ovary globose. Berry 1.5 cm wide, globose, orange-yellowish, enveloped in sac like inflated calyx; seeds plenty, compressed.

Fl. & Fr.: July-November

Distr.: Tropical South America. Common; along roadsides at lower and medium altitudes. MS, K-5, *KKK 16410.*

SOLANUM Linnaeus

Sp. Pl. 184. 1753

1. Armed plants **2**
1. Unarmed plants ..... **S. nigrum**
2. Leaves sinuately or pinnatifidly lobed, with prickles **3**
2. Leaves entire, without prickles ..... **S. giganteum**
3. Leaves shallowly lobed with small prickles; flowers in racemes or spikes **4**
3. Leaves deeply lobed with large prickles; flowers in extra-axillary cymes ..... **S. virginianum**

4. Leaves shallowly sinuate, chartaceous; racemes lax, unbranched ..... **S. anguivi** var. **anguivi**
4. Leaves deeply sinuate, subcoriaceous; racemes spicate, branched ..... **S. anguivi** var. **multiflora**

Solanum nigrum L., Sp. Pl. 186. 1753; Clarke in Hook. f., FBI 4: 229. 1883; Gamble, FPM 936. 1923; Fyson, FSIHS 419. 1932; Matthew, FPH 874. 1999. *S. rubrum* Roxb., Wight, Ic. t. 344. 1840. **Eeradakukkeera (EBIS).**

Branchlets pink, glabrescent. Leaves simple, to 6 x 3 cm, ovate-elliptic, base rounded, apex acuminate, margin entire, greenish black. Umbels extra-axillary, 2-4 flowered. Flowers white, small; calyx lobes 1.5 mm, ovate; corolla 6 mm wide, lobes 4 mm long; ovary globose. Berry 8 mm, orange to blue when ripe.

Fl. & Fr.: June-September

Distr.: Cosmopolitan. Occasional; found along roadsides at medium and higher altitudes. MS, Methappu, *KKK 16424*; K-4, *KKK 16494.*

Solanum giganteum Jacq., Coll. Bot. 4: 125. 1791; Wight, Ic. t. 893. 1844-45; Clarke in Hook. f., FBI 4: 233. 1883; Gamble, FPM 937. 1923; Fyson, FSIHS 422. 1932; Matthew, Suppl. Ill. FPH t. 1049. 1998 & FPH 872. 1999.

Large shrub to small trees; densely white stellate tomentose; stem prickles conical. Leaves to 20 x 6 cm, elliptic-lanceolate, base acute, apex abruptly acuminate. Flowers in dense, stellately woolly, lateral or sub terminal corymbose cymes; calyx lobes 2.5 mm long, triangular; corolla bluish-violet, 8 mm long; ovary globose. Berry 1 cm across, globose, red when ripe; seeds many, flat.

Fl. & Fr.: April-June.

Distr.: South India and Sri Lanka. Occasional; along stream sides at lower altitudes. MS, Thalachorkadavu, *KKK 17662.*

Solanum anguivi Lam., Encycl. 2: 23. 1794, var. **anguivi**. *S. indicum* sensu Hook. f., FBI 4: 234. 1883; Gamble, 938. 1923. *S. violaceum* Ortega, Hort. Matr. Dec. 56. 1798, subsp. *violaceum* Matthew, Kew Bull. 46: 545. 1991, Ill. FPH t. 544. 1996 & FPH 876. 1999. **Kandanka Mullu. Plate 4.8.7.**

Armed shrub; prickles small, flattened, recurved. Leaves to 13 x 10 cm, base obliquely truncate, apex acute. Racemes extra-axillary, lax, to 12 flowered; calyx lobes 6 mm, triangular; corolla 1.2 cm wide. Tomentose; stamens 5. Berry 0.8 cm wide, orange when ripe; seeds minutely pitted.

Fl. & Fr.: September-February

Distr.: Indo-Malesia. Common; along shola margins at lower altitudes. MS, Perumala, *KKK 18560.*

Note: New record to the flora of Kerala.

Solanum anguivi Lam., Encycl. 2: 23. 1794, var. **multiflora** (Roth. *ex* Roem. & Schult.) Chitra in Henry *et al*, Fl. Tamilnadu 2: 115. 1987. *S. multiflorum* Roth. *ex* Roem. & Schult., Syst. Veg. 4: 669. 1819. *S. indicum* L. var. *multiflora* (Roth. *ex* Roem. & Schult.) Clarke, FBI 4: 235. 1883; Gamble, FPM 938. 1923: Fyson, FSIHS 421. t. 358. 1932. *S. ferox* L. var. *minus* Wight, Ic. t. 1400. 1848. *S. violaceum* Ortega, Hort.

Matr. Dec. 56. 1798, subsp. *multiflorum* (Clarke) Matthew, Kew Bull. 46: 545. 1991 & Ill. FPH t. 545. 1996 & FPH 877. 1999. **Kanda Mullu.**

Armed shrub; prickles large, flattened, recurved. Leaves to 15 x 12 cm, base obliquely truncate, apex acute. Racemes 12-16 flowered. Flowers purplish, sessile; calyx lobes 8 x 2 mm, lanceolate; corolla 1.8 cm wide. Berry 1.3 cm wide, red when rip; seeds pitted.

Fl. & Fr.: February-April.

Distr.: Endemic to Western Ghats. Common; found along shola margins at higher altitudes. MS, K-6, *KKK 16183.*

Solanum virginianum L., Sp. Pl. 187. 1753; Matthew, FPH 877. 1999. *S. surattense* Burm. f., Fl. Ind. 57. 1768. *S. xanthocarpum* Schrad. & Wendl., Sert. Hannov. 1: 8, t. 2. 1795; Clarke in Hook. f., FBI 4: 236. 1883; Gamble, FPM 938. 1923. *S. jacquinii* Willd., Sp. Pl. 1: 1041. 1798; Wight, Ic. t. 1401. 1848. **Kandam Kathiri (EBIS) Plate 4.8.6.**

Armed, perennial subshrubs; prickles on leaves to 2 cm, straight, yellow, those on stems small, recurved. Leaves to 12 x 9 cm, ovate, deeply sinuate, base obtuse, tip acute. Cymes 2-4 flowered, shortly stalked; calyx lobes ovate, abruptly acute; corolla blue-purple, 2 cm across, lobes lanceolate; stamens yellow. Berry to 4 cm across, yellow or white with green streaks; seeds 2.5 mm across.

Fl. & Fr.: Throughout the year.

Distr.: Peninsular India, Himalaya, South-east Asia, Malesia, Australia, Polynesia. Common, along roadsides and shola borders at lower and medium altitudes. MS, K-4, *KKK 18559.*

68. SCROPHULARIACEAE

1. Leaves all alternate ..... **Pedicularis**
1. Leaves, opposite, whorled or upper ones only alternate **2**
2. Leaves divided into linear lobes ..... **Sopubia**
2. Leaves entire or toothed **3**
3. Small herbs parasitic on grasses ..... **Striga**
3. Non parasitic herbs **4**
4. Corolla deep yellow, upper lip saccate, lower lip inflated, bag like; branchlets succulent ..... **Calceolaria**
4. Corolla blue or lilac; subrotate, neither saccate nor inflated; branchlets not succulent **5**
5. Erect, densely branched herbs; leaves linear-oblong; corolla blue with white tips ..... **Dopatrium**
5. Decumbent herbs, rooting at nodes; leaves elliptic-oblong; corolla blue to purple ..... **Lindernia**

CALCEOLARIA Linnaeus

Vet. Acad. Handl. Stockholm 31: 286. 1770 *nom. cons.*

Calceolaria gracilis Kunth. in H. B. K. Nov. Gen. Sp. 2: 339. 1818; Matthew, Suppl. Ill. FPH t. 1056. 1998 & FPH 883. 1999. *C. mexicana* Benth, Benth., Pl. Hartw. 47. 1840; Gamble, FPM 973. 1923; Fyson, FSIHS 426. t. 365. 1932. **Nettipottu Chedi. Plate 4.8.8.**

Annual herbs; branchlets reddish brown. Leaves decussate; basal pair simple, sinuate; upper ones to 8 x 6 cm, ovate-lanceolate, 5-7 times pinnatifid; leaflets to 3 x 1.5 cm, deeply serrate. Cymes in upper axils; calyx 4 lobed, glandular hairy, lobes 6 x 4 mm, ovate; upper lip of corolla ascending, lower lip 1.5 x 1 cm; stamens 2, situated in upper lip; ovary 2 celled. Capsule 9 x 6 mm, ovoid; seeds plenty.

Fl. & Fr.: June-September.

Distr.: Mexico to Bolivia; introduced. Common; along roadsides at higher altitudes. MS, K-6, *KKK 31044.*

Note: This exotic plant has now naturalised in the wild.

DOPATRIUM F. Hamilton *ex* Bentham

in Lindley, Edward's Bot. Reg. Ad. t. 1770(4). 1835.

Dopatrium nudicaule (Willd.) Benth., Scroph. Ind. 31. 1835; Hook. f., FBI 4: 274. 1884; Gamble, FPM 954. 1923; Matthew, FPH 888. 1999. *Gratiola nudicaulis* Willd., Ges. Naturf. Freunde Berlin Neue Schriften 4: 193. 1803. *G. cuneifolia* Roxb., Fl. Ind. 1: 142. 1832.

Herbs; stems quadrangular. Leaves decussate, 1 x 0.2 cm, apex acute, sessile. Racemes lax; calyx free, lobes 5, 3 x 1 mm, linear; corolla bilabiate, to 1.5 x 0.5 cm; stamens 2, syngenesious; ovary ovoid. Capsule 6 mm long, elliptic-oblong, with persistent style at apex.

Fl. & Fr.: October -December.

Distr.: South India, Sri Lanka and Philippines. Common; in grasslands at lower altitudes. MS, Kulachivayal, *KKK 16674.*

LINDERNIA Allioni

Melanges Philos. Math. Soc. Roy. Turin. (Misc. Taur.) 3(1): 178. 1766.

Lindernia ruellioides (Colsm.) Pennell, Brittonia 2: 182. 1936; Philcox, Kew Bull. 17: 484. 1964; Matthew, FPH 893. 1999. *Gratiola ruellioides* Colsm, Prodr. Desc. Grat. 12. 1793. *G. reptans* Roxb., Fl. Ind. 1: 140. 1820. *Bonnaya reptans* (Roxb.) Spreng., Syst. 1: 41. 1824; Hook. f., FBI 4: 284. 1884. *Ilysanthes reptans* (Roxb.) Urban, in Ber. Deutsch. Bot. Ges. 2: 436. 1884; Gamble, FPM 962. 1923.

Leaves to 2 x 0.6 cm, base attenuate, apex obtusely acute, margin serrate. Racemes terminal; calyx 5 lobed, lobes 5 x 1 mm; corolla to 8 mm long, bilabiate, with 2 anterior and 3 posterior petals; stamens 2, yellow; ovary elliptic. Capsule 1.7 cm long, linear, acuminate; seeds trigonous, 0.5 mm long, rugose, brown.

Fl. & Fr.: August-September.

Distr.: Tropical and Subtropical Asia. Common; near watercourses at medium altitudes. MS, Coupe road, *KKK 16593.*

PEDICULARIS Linnaeus

Sp. Pl. 607. 1753

1. Flowers solitary; corolla white, tube to 10 cm long; calyx > 2 cm ..... **P. perrottetii**
1. Flowers in compact racemes; corolla rose-pink, tube to 1.5 cm long; calyx < 1 cm ..... **P. zeylanica**

Pedicularis perrottetii. Benth. in DC., Prodr. 10: 565. 1846; Wight, Ic. t. 1418. 1849; Hook. f., FBI 4: 317. 1884; Gamble, FPM 973. 1924; Fyson, FSIHS 434. t. 375. 1932. **Plate 4.9.1b.**

Perennial herbs. Leaves 3 x 1 cm, oblanceolate, pinnatifid, cut more than half may to the midrib, lobes crenate, glandular hairy. Calyx tubular, 2 x 0.5 cm, teeth crested; corolla tube 10 x 0.4 cm, upper lip erect, hooded, 1.5 cm long, obtusely acute, lower lip 2.5 cm long; ovary elliptic. Capsule 2.5 cm long, falcate.

Fl. & Fr.: October-March

Distr.: Endemic to Southern Western Ghats. Fairly common in grassland ecotones at all altitudes. ENP, Mesthirikkettu, *KKK 18005.*

Pedicularis zeylanica Benth., Scroph. Ind. 54. 1835; Wight, Ic. t. 1419. 1849; Hook. f., FBI 4: 317. 1884; Gamble, FPM 972. 1924; Fyson, FSIHS 433. t. 374. 1932; Matthew, Suppl. Ill. FPH t. 1073. 1998 & FPH 896. 1999. **Plate 4.9.1a.**

Perennial herb; branchlets glabrous. Leaves whorled below, pinnatisect, to 6 x 1 cm, elliptic-oblong to oblanceolate, base attenuate, apex rounded, crenate, coriaceous. Calyx spathaceous, split down on one side, lobes 2+3, crested; corolla tube 1.5 cm, limb 1.5 cm, upper lip 1 cm long, erect, hooded, lower lip 3 lobed, spreading, lobes 1.2 cm long, ovate; ovary elliptic. Capsule 6 x 4 mm, ovate-falcate.

Fl. & Fr.: February-March.

Distr.: Peninsular India and Sri Lanka. Occasional; along shola grassland ecotones from low to higher altitudes. MS, Puthur, *KKK 16064.*

SOPUBIA F. Hamilton *ex* D. Don

Prodr. Pl. Nepal. 88. 1825.

1. Corolla tubular, purple, pink at base; calyx tube 5 ribbed; capsule oblong..... **S. delphiniifolia**
1. Corolla rotate, yellow with purple centre; calyx tube not ribbed; capsule subglobose..... **S. trifida**

Sopubia delphiniifolia (L.) G. Don, Gen., Syst. 4:560.1837, "*delphinifolia*"; Hook. f., FBI 4: 302. 1885; Gamble, FPM 970. 1924; Fyson, FSIHS 432. t. 372. 1932; Matthew, Suppl. Ill. FPH t. 1074. 1998 & FPH 898. 1999. *Gerardia delphiniifolia* L., Cent. Pl. 2:21.1756.

Branched herbs, stem quadrangular. Leaves to 4 cm long, pinnatifid below, 3-fid to linear above, progressively reduced upwards. Racemes lax; calyx tube 4 mm long, lobes 4 cm long, linear; corolla 1 cm wide, tube 1 cm, lobes 6 mm, broad ovate; staminal filaments twisted. Capsule 7 x 4 mm.

Fl. & Fr.: October-December

Distr.: India and Sri Lanka. Occasional; in low altitude grassland ecotones. MS, Kulachivayal, *KKK 16679.*

Sopubia trifida Buch.-Ham. *ex* D. Don, Prodr. 88. 1825; Hook. f., FBI 4: 302. 1884; Gamble, FPM 970. 1924; Fyson, FSIHS 433. t. 373. 1932; Matthew, FPH 898. 1999.

Coarse herbs. Leaves to 2 cm long, trifid below, linear above, hairy. Racemes terminal, to 13 cm long; calyx tube 3 mm, lobes 2.5 mm, triangular, ciliate; corolla 1 cm wide, tube 3 mm; anthers bearded at base. Capsule 5 mm wide; seeds brown.

Distr.: Indo-Malesia and China. Occasional; in grassland ecotones at higher altitudes. ENP, Amarachola, *KKK 18011.*

STRIGA Loureiro

Fl. Cochinch. 17, 22. 1790.

Striga asiatica (L.) O. Ktze., Rev. Gen. Pl. 2: 466. 1891; Matthew, FPH 900. 1999. *Buchnera asiatica* L., Sp. Pl. 1630. 1753. *Striga lutea* Lour., Fl. Cochinch. 1: 22. 1790; Hook. f., FBI 4: 299. 1884; Gamble, FPM 968. 1924; Fyson, FSIHS 431. t. 371. 1932.

Leaves 8 x 1 mm long, narrow-oblong, rough. Spikes terminal, to 8 cm long; calyx tube 4 mm long, 10 ribbed, lobes 5, 3.5 mm long; corolla 6 mm wide, bright yellow, bilabiate; upper lip with 2 lobes, lower lip 3 lobed; stamens 4, didynamous; ovary many ovuled. Capsule 4 x 3 mm, ovoid; seeds oblong, plenty.

Fl. & Fr.: October-December.

Distr.: South East Asia and Africa. Common in grasslands. K-4, *KKK 16179*; ENP, Mampallam Chola, *KKK 18057.*

69. OROBANCHACEAE

1. Calyx spathaceous, split in front nearly to the base ..... **Aeginetia**
1. Calyx tubular-campanulate ..... **Christisonia**

AEGINETIA Linnaeus

Sp. Pl. 632. 1753

Aeginetia pedunculata (Roxb.) Wall., Pl. Asiat. Rar. 2: t. 219. 1831; Wight, Ic. t. 1421. 1849; Hook. f., FBI 4: 320. 1884; Gamble, FPM 974. 1924. *Orobanche pedunculata* Roxb., Hort. Beng. 45. 1829.

Herbs, 10-15 cm tall, reddish, parasitic on grasses. Scapes scaly, short, stout, bracteate. Corymbs terminal; calyx orange, 3.5 x 1.5 cm; corolla 4 x 3 cm, tube yellow, mouth blue, lobes 5, broad, spreading; stamens 4, didynamous, to 2.5 cm; ovary 1 celled. Capsule partially 2 valved.

Fl. & Fr.: September-November.

Distr.: Indo-Malesia. Occasional; in low altitude grasslands. MS, Kulachivayal, *KKK 31045.*

CHRISTISONIA G. Gardner

Calcutta J. Nat. Hist. 8: 153. 1897.

1. Anthers 1 celled; flowers > 10, crowded apically; corolla hirsute; stigma clavate..... **C. neilgherrica**
1. Anthers 2 celled; flowers < 8, distant on the shoot; corolla glabrous; stigma peltate **2**
2. Stems elongate, 15-20 cm long; peduncles long; racemes lax ..... **C. tubulosa**
2. Stems short, < 12 cm long; peduncles short, stout, corymbosely arranged..... **C. bicolor**

Christisonia neilgherrica Gardner, Calcutta J. Nat. Hist. 8: 157. 1847; Hook. f. FBI 4: 322. 1884; Matthew, Suppl. Ill. FPH t. 1058.1998 & FPH 884.1999. *Campbellia cytinoides* Wight, Ic. t. 1425.1849; Gamble FPM 976. 1924; Fyson, FSIHS 435. t. 377.1932. **Plate 4.9.2.**

Stout, subsucculent herb with thick rootstock; shoots yellowish, scales imbricating. Calyx tube 2 cm, campanulate, lobes 4 mm; corolla funnel shaped, hirsute, tube 3 cm, cream, lobes subequal, crimson; stamens exserted, 2+2; ovary 1 celled. Capsule 1.5 x 1.3 cm, globose

Fl. & Fr.: June-November

Distr.: South India and Sri Lanka. Rare; on shola floors at higher altitudes. MS, K-7, *KKK 17695*; Methappu, *KKK 18566.*

Christisonia bicolor Gard., Calcutta J. nat. Hist. 8: 160. 1847; Hook. f., FBI 4: 322. 1884; Gamble, FPM 976. 1924; Fyson, FSIHS 435. 1932; Matthew, Suppl. Ill. FPH t. 1057. 1998 & FPH. 884. 1999. *C. aurantiaca* Wight, Ic. t. 1486. 1849.

Short, tuberous plants; scales imbricate. Flowers large, on short peduncles; calyx lobes acute; corolla 4 x 2 cm, tubular, tube dull yellowish with bluish limb, yellow within, upper lobes erect, lower horizontal shorter; anthers one fertile, other long spurred, 6 mm long. Capsule not seen.

Fl.: February

Distr.: South India and Sri Lanka. Rare; in medium altitude sholas. MS, K-5, *KKK 16173.*

Christisonia tubulosa (Wight) Benth. *ex* Hook. f., FBI 4: 321 1884; Gamble, FPM 975. 1924; Fyson, FSIHS 435. 1932; Matthew, Suppl. Ill. FPH t. 1060. 1998 & FPH 885. 1999. *Oligopholis tubulosa* Wight, Ic. t. 1422. 1849. **Plate 4.9.3.**

Slender herbs; stem branched, light brown; scales small, distant. Flowers in lax racemes; pedicels stout; bracts 1 x 0.4 cm, oblong; calyx 2.3 x 1.2 cm, tubular, lobes 5, sub equal, yellow; corolla yellowish white, glabrous, 5 x 3 cm at mouth, with a pink tinge at the borders; stamens 2+2, imperfect cell reduced to a spur. Capsule ovoid.

Fl. & Fr.: November-February.

Distr.: Endemic to Southern Western Ghats. Occasional; at medium altitude sholas. MS, K-4, *KKK 18116*; K-5, *KKK 31046.*

70. LENTIBULARIACEAE

UTRICULARIA Linnaeus

Sp. Pl. 18. 1753

1. Foliar organs orbicular; seeds with appendages ..... **U. striatula**
1. Foliar organs linear or spathulate; seeds without appendages **2**
2. Bracts medifixed; foliar organs spathulate ..... **U. roseopurpurea**
2. Bracts basifixed; foliar organs linear **3**
3. Corolla blue to violet; racemes to 30 cm; traps subglobose ..... **U. graminifolia**
3. Corolla white to violet; racemes to 8 cm; traps globose ..... **U. nayarii**

Utricularia graminifolia Vahl, Enum. Pl. 1: 195. 1804; Gamble, FPM 981. 1924; Fyson, FSIHS 437. t. 378a. 1932; Janarthanam & Henry, Fl. India ser. 4. 57. 1992; Matthew, Suppl. Ill. FPH t. 1081. 1998 & FPH 905. 1999. *U. pedicellata* Wight in

Hook.'s J. Bot. Kew Gard. Misc. 1: 373. 1849 & Ic. t. 1578, f. 2. 1850. *U. uliginoides* Wight in Hook.'s J. Bot. Kew Gard. Misc. 1: 372. 1849 & Ic. t. 1573. 1850. *U. conferta* Wight, Ic. t. 1575. 1850.

Terrestrial herbs. Foliar organs, linear, to 2.5 x 0.2 cm, base cuneate, apex acute, 3-nerved. Traps 2-3 mm across, subglobose, mouth basal, appendages 2, simple. Racemes to 30 cm long, 1-5 flowered. Calyx lobes 2, unequal, to 3.5 x 2 mm, ovate; corolla to 10 x 5 mm, upper lip 4 x 2.5 mm, linear-oblong, lower lip 6 x 5 mm, obovate; spur to 5 mm. Capsules 3 mm long, ovoid.

Fl. & Fr.: June-August

Distr.: South India, Sri Lanka, China, Burma & Thailand. Common along stream sides and in grassland marshes at higher altitudes. MS, Idlimottai, *KKK 18190.* ENP, Mesthirikettu, *KKK 18078*; Rajamala, *KKK 31028.*

Utricularia nayarii Janarthanam & Henry, Bull. Bot. Surv. India 28: 195. 1986 & Fl. India ser. 4, 77. 1992.

Small, terrestrial herbs. Foliar organs to 2.5 x 0.1 cm, linear, 3-nerved. Traps 1-1.5 mm across, globose, mouth basal; appendages 2, subulate. Racemes to 8 cm long, 1-5 flowered. Flowers to 8 mm long; calyx lobes to 3.5 mm long, unequal, ovate; upper lip of corolla 4 x 2 mm, oblong, lower lip 6 x 5 mm, obovate; spur 3 mm long, conical, acute; stamens 2. Capsule 3 x 2 mm, ovoid.

Fl. & Fr.: August-December

Distr.: Endemic to Southern Western Ghats. Rare; on wet rocks at higher altitudes. ENP, Mesthirikettu, *KKK 18046.*

Utricularia roseopurpurea Stapf. *ex* Gamble in Herb. Kew. 235. 1924 & FPM 983. 1924; Fyson, FSIHS 437. t. 378c. 1932. *Utricularia racemosa* sensu Wight, Ic. t. 1584. f. 1. 1850, non Wall. *ex* Walp. 1843. *U. rosea* Clarke in Hook. f., FBI 4: 333, non Edgew. 1847.

Terrestrial herbs. Foliar organs to 1 x 0.2 cm, spathulate, 1 nerved. Traps 1-2 mm across, globose, mouth terminal. Racemes to 10 cm tall, erect, 1-5 flowered. Flowers 8-10 mm long; calyx lobes 2-3 mm, hooded; corolla pink, upper lip 5 mm long, linear, lower lip 7 mm long, suborbicular, apex rounded; spur 3 mm long; stamens 2. Capsule 2-3 mm across, globose.

Fl. & Fr.: October-December

Distr.: Endemic to Peninsular India. Occasional; along stream sides at higher altitudes. ENP, Eravikulam lake, *KKK 18077.*

Utricularia striatula Sm. in Rees, Cyclop. 37. n. 17. 1819; Gamble, FPM 983. 1924; Fyson, FSIHS 438. t. 378d. 1932; Janarthanam & Henry, Fl. Ind. ser. 4. 106. 1992; Matthew, Suppl. Ill. FPH t. 1083. 1998 & FPH 906. 1999. *U. orbiculata* Wall. *ex* A. DC. in DC., Prodr. 8: 18. 1844; Clarke in Hook. f., FBI 4: 334. 1884. *U. glochidiata* Wight, Hook.'s J. Bot. Kew Gard. Misc. 1: 373. 1849 & Ic. t. 1581. 1850

Terrestrial herbs. Foliar organs to 4 x 3 mm, orbicular, rostrate at base; scape scattered, filiform. Traps to 1.5 mm across, globose, mouth lateral. Scape to 8 cm

long, 4-5-flowered. Flowers to 1 cm long; calyx unequal, papillose; corolla white to pink, upper lip 2 x 2 mm, semiorbicular, lower lip 5 mm, ovate, 3 lobed; spur 3 mm long, conical; stamens 2. Capsule 3 mm long, obliquely ovoid.

Fl. & Fr.: July-December

Distr.: Tropical Africa and South East Asia. Common in grassland bogs at higher altitudes. MS, Idlimottai, *KKK 18191.*

71. GESNERIACEAE

1. Epiphytic, branched undershrubs; leaves entire; flowers scarlet red ..... **Aeschynanthus**
1. Terrestrial, scapigerous herbs; leaves irregularly crenate-serrate; flowers lilac ..... **Henckelia**

AESCHYNANTHUS Jack

Trans. Linn. Soc. London 14: 42. t. 2. f. 3. 1823, nom. *cons.*

Aeschynanthus perrottetii A. DC. in DC., Prodr. 9: 261. 1845; Clarke in Hook. f., FBI 4: 339. 1884; Gamble, FPM 985. 1923; Fyson, FSIHS 440. t. 379. 1932; Matthew, Suppl. Ill. FPH t. 1084. 1998 & FPH 908. 1999. *A. ceylanica* sensu Wight, Ic. t. 1347. 1848, non Gard., 1846. *A. perrottetii* A. DC. var. *planiculmis* Clarke in Hook. f., FBI 4: 340. 1884, *'platyculmis'*. *A. planiculmis* (Clarke) Gamble, FPM 985. 1924.

Leaves entire, opposite, fleshy, to 10 x 1.5 cm, linear-lanceolate, base acute, apex acuminate. Flowers in fascicles, on terminal peduncles, rarely solitary; calyx 5 partite, lobes 8 x 1 mm, linear; corolla scarlet red, with purple spots, to 3.5 x 0.5 cm, tubular-ventricose, curved, widening above, lobes ovate, obtuse; stamens 4; ovary oblong, stipitate. Capsule to 18 cm long, narrow-linear.

Fl. & Fr.: August-November.

Distr.: Endemic to Western Ghats. Rare; along shola borders at medium altitudes. MS, K-5, *KKK 16644.*

HENCKELIA K. P. J. Sprengel

Anleit. (ed. 2) 2(1): 402. 1817.

Henckelia incana (Vahl) Spreng., Syst. Veg. 1: 38. 1824; Matthew, FPH 909. 1999. *Rottlera incana* Vahl, Enum. Pl. 1: 88. 1804. *Didymocarpus rottlerianus* Wall., Cat, no. 778. 1829, nom. illegit. *D. tomentosus* Wight, Ic. t. 1349. 1848; Clarke in Hook. f., FBI 4: 353. 1884; Gamble, FPM 989. 1924; Fyson, FSIHS 440. t. 380. 1932.

Leaves in a basal rosette, to 10 x 6 cm, obovate or spathulate, base attenuate, apex rounded, densely bullose above, fulvous tomentose below. Cymes sub-umbellate to 12 cm long, glandular hairy; calyx small, narrow, 5- fid; corolla 12 cm long, campanulate, lobes 5, rounded; stamens 4, 2 are staminodes; ovary 1 celled, densely glandular, hairy. Capsule to 2 x 0.2 cm, linear, densely glandular hairy.

Fl. & Fr.: June-September.

Distr.: Endemic to Peninsular India. Occasional; in exposed regions, mainly on rocky road cuttings. MS, Conical patch, *KKK 16455.*

72. ACANTHACEAE

1. Twiners, calyx filiform ..... **Thunbergia**
1. Herbs or shrubs, calyx 4 or 5 partite **2**
2. Corolla lobes nearly equal; stamens 2 or 4 ..... **3**
2. Corolla strongly two lipped; stamens 2 ..... **5**
3. Corolla lobes twisted to the left in bud ..... **Strobilanthes**
3. Corolla lobes imbricate in bud **4**
4. Calyx 4-partite ..... **Barleria**
4. Calyx 5-partite ..... **Asystasia**
5. Stamens exserted; spike normal **6**
5. Stamens included, spike one sided ..... **Rungia**
6. Small procumbent or branching herbs ..... **Justicia**
6. Large erect herbs ..... **Andrographis**

ANDROGRAPHIS Wallich *ex* C. G. D. Nees

in Wallich, Pl. Asiat. Rar. 3: 77, 116. 1832.

Andrographis neesiana Wight, Ic. t. 1561. 1850; Clarke in Hook. f., FBI 4: 504. 1884; Gamble, FPM 1049. 1924; Fyson, FSIHS 454. t. 395. 1932; Matthew, Suppl. Ill. FPH t. 1089. 1998 & FPH 928. 1999.

Branches tetragonous, strigose. Leaves 2-6 x 1-2 cm, elliptic, base acute, apex acute or acuminate, glabrous. Panicles terminal; calyx lobes 5 mm long, lanceolate, glandular hairy; corolla 1.5 cm, brownish-purple, lobes obtuse, hairy. Capsule 18 x 4 mm, linear-oblong, hairy; seeds 1.5 x 1 mm, elliptic.

Fl. & Fr.: December-February

Distr.: Endemic to Western Ghats. Common along shola borders and road sides at lower altitudes. MS, K-2.5, *KKK 16138*; K-3, *KKK 16777*.

ASYSTASIA Blume

Bijdr. 796. 1826.

Asystasia crispata Benth., Linnaea 24: 647.1852; Clarke in Hook. f., FBI 4: 494. 1884; Gamble, FPM 1063. 1924; Fyson, FSIHS 454. t. 394. 1932; Matthew, FPH 929. 1999. *A. coromandeliana* Wight, Ic. t. 1506, 1850. not of Nees.

Small shrubs. Leaves to 9 x 4, ovate, base obtuse, apex acuminate, crispate. Racemes, lax, terminal, 2 branched. Flowers lilac with violet spots; calyx deeply 5 partite; lobes 5 x 1 mm, lanceolate; corolla 3.5 x 2 cm, tube short, funnel shaped; stamens 4, didynamous; ovary 2 celled. Capsule elliptic, compressed.

Fl. & Fr.: October-December

Distr.: Endemic to Western Ghats. Common along shola borders at lower altitudes. MS, Pallang Mala, *KKK 16689*.

BARLERIA Linnaeus

Sp. Pl. 636. 1753

Barleria involucrata Nees in Wall., Pl. Asiat. Rar. 3: 92. 1832, var. **elata** (Dalz.) Clarke in Hook. f., FBI 4: 486. 1884; Gamble, FPM 1060. 1924; Fyson, FSIHS 453. t.

393. 1932; Matthew, FPH 932. 1999. *B. elata* Dalz. in Hook.'s J. Bot. Kew. Gard. Misc. 3: 227. 1851.

Shrubs. Leaves opposite, to 20 x 8 cm, elliptic, acuminate at both ends, glabrous above, pubescent on nerves below. Racemes in terminal axils. Calyx 4 lobed, in 2 opposite pairs; outer lobes 3 x 1 cm, ovate-lanceolate, inner lobes smaller, tawny pubescent; corolla blue, 7-8 cm long, tube 4-6 cm long, thinly hairy; stamens 2; ovary 2 celled. Capsule oblong; seeds 4, compressed, hairy.

Fl. & Fr.: December-March

Distr.: Endemic to Southern Western Ghats, Occasional; along stream sides at lower altitudes. MS, K-3.5, *KKK 16779*; Chengalar, *KKK 18111*.

JUSTICIA Linnaeus

Sp. Pl. 15. 1753

1. Diffuse branching herbs; calyx lobes scarious margined, ciliate ..... **J. japonica**
1. Procumbent herbs; calyx lobes pectinately ciliate ..... **J. latispica**

Justicia japonica Thunb., Fl. Jap. 20. 1784. *J. simplex* D. Don, Prodr. 118. 1825; Clarke in Hook. f., FBI 4: 539. 1884; Gamble, FPM 1080. 1924; Fyson, FSIHS 457. t. 398. 1932; Matthew, FPH 943. 1999. *Rostellularia japonica* (Thunb.) Ellis, Bull. Bot. Surv. India 22: 196. 1966.

Leaves to 3.5 x 1.2 cm, elliptic, base rounded, hirsute. Spikes 30 x 7 mm. Flowers 0.9 cm long; calyx lobes 4, scarious margined, corolla 0.8 x 0.3 cm, lilac with pink spots; style hairy. Capsule 3 x 1.5 mm, elliptic, tip mucronate.

Fl. & Fr.: December-February

Distr.: Indo-Malesia and East Africa. Common along shola borders and road sides at lower altitudes. MS, Puthur, *KKK 16195*.

Justicia latispica (Clarke) Gamble, FPM 1080. 1924; Fyson, FSIHS 456. 1932. *J. procumbens* L., var. *latispica* Clarke in Hook. f., FBI 4: 539. 1885. *Rostellularia procumbens* sensu Wight, Ic. t. 1539. 1850, non Nees, 1832. *R. latispica* (Clarke) Bremek., Verh. Kon. Ned. Akad. Wetensch., Natuurk., Tweede Sect. 45: 71. 1948.

Leaves to 3 x 1.5 cm, elliptic, apex obtusely acute. Spikes to 3 x 1 cm, cylindrical; bracts and bracteoles ciliate. Flowers 1.2 cm long; calyx lobes 4 x 0.5 mm, pectinately ciliate; corolla 1 x 0.5 cm, pale lilac; ovary hairy at apex; style hairy. Capsules papery.

Fl. & Fr.: October-February.

Distr.: Peninsular India and Sri Lanka. Common along shola ecotones and road sides at higher altitudes. ENP, Amarachola, *KKK 17509* & *KKK 18026*.

RUNGIA C. G. D. Nees

in Wallich, Pl. Asiat. Rar. 3: 77, 109. 1832.

Rungia laeta Clarke in Hook. f., FBI 4: 550. 1885; Gamble, FPM 1071. 1924; Fyson, FSIHS 458. t. 399. 1932; Matthew, Suppl. Ill. FPH t. 1094. 1998 & FPH 947. 1999.

Shrubs, often rooting at lower nodes; stems terete, zigzag. Leaves opposite, 11 x 4.5 cm, elliptic, acute or acuminate at both ends. Spikes axillary, 5 x 2 cm, peduncled; floral bracts pale green, 2 x 1 cm, elliptic, acute, tip mucronate, scarious margined; sepals 7 x 1 mm, aristate; corolla 2 cm long, white with brown or pink streaks; stamens 2; ovary 2 celled. Capsule 7 mm, oblong.

Fl. & Fr.: December-February

Distr.: Endemic to Southern Western Ghats. Common along exposed regions or along road sides at higher altitudes. MS, K-6.5, *KKK 16097*; K-9, *KKK 17501*; K-7, *KKK 18115*.

STROBILANTHES Blume

Bijdr. 781, 796. 1826.

Note: The broad generic concept of *Strobilanthes* is followed here.

1. Fertile stamens 2; filaments not basally united 2
1. Fertile stamens 4; filaments basally united 4
2. Racemes condensed with 2 or 4 foliaceous bracts; seeds glabrous when wetted ..... **S. foliosus**
2. Racemes elongate, foliaceous bracts 0; seeds hairy when wetted 3
3. Flowers in dense, broad spikes ..... **S. kunthianus**
3. Flowers in narrow spikes ..... **S. cuspidatus**
4. Inflorescence elongate, in terminal, lax, leafy, panicled spikes; no floral bracts 5
4. Inflorescence condensed, in heads or short cymose spikes; bracts usually rounded and concave 8
5. Leaves oblong-lanceolate, blade decurrent and ending in an auricle 6
5. Leaves ovate, acute, abruptly rounded at base and shortly decurrent on the petiole ..... **S. violaceus**
6. Whole plant densely glandular pubescent ..... **S. sp. 1**
6. Whole plants not pubescent 7
7. Spike stout; nodal bracts large; bracteoles spathulate ..... **S. homotropus**
7. Spikes slender; nodal bracts small; bracteoles linear ..... **S. gracilis**
8. Flowers in capitate heads or short spikes 9
8. Flowers in strobilate often cymose spikes or heads 18
9. Seeds glabrous 10
9. Seeds hairy ..... **S. tristis**
10. Flowers in heads 11
10. Flowers in spikes 16
11. Heads very hairy, short and dense, elongating in fruit; involucral bracts 2 or more, leaf-like 12
11. Heads softly rufous hairy, elongate, clavate; involucral bracts small ..... **S. perrottetianus**
12. Corolla tube shorter than the urceolate upper part; filaments and their sheaths glabrous 13
12. Corolla tube long and slender, as long as the much curved ventricose part; filaments white hairy 14
13. Filaments nearly equal; bracts lanceolate, acute; calyx lobes acuminate ..... **S. wightianus**
13. Filaments unequal; bracts obovate, obtuse, crenate; calyx lobes linear-obtuse ..... **S. urceolaris**
14. Heads small, densely white hairy 15
14. Heads large, densely bristly hirsute ..... **S. neilgherrensis**
15. Bracts suborbicular; leaf base acute, margins serrate ..... **S. pulneyensis**
15. Bracts lanceolate; leaf base shortly cuneate, margins callous-serrate ..... **S. papillosus**

16. Spikes erect, oblong; mouth of corolla ventricose 17
16. Spikes deflexed, oblong; mouth of corolla campanulate ..... **S. micranthus**
17. Leaves pilose; corolla pale yellow ..... **S. calycina**
17. Leaves glabrescent; corolla blue to violet ..... **S. zenkerianus**
18. Flowers on younger braches, axillary or lateral; flowers blue ..... **S. asperrimus**
18. Flowers from the old wood; flowers white ..... **S. luridus**

Strobilanthes asperrimus Nees in DC., Prodr. 11: 183. 1847; Clarke in Hook. f., FBI 4: 443. 1884; Gamble, FPM 1041. 1924.

Shrubs; branches hirsute. Leaves to 10 x 7 cm, broadly elliptic, base attenuate, apex bluntly acuminate, crenate, hairs bulbous based. Spikes 3-4 together, axillary, on trichotomous peduncles. Flowers blue; sepals 6 x 2.5 mm, oblong, emarginate, connate a little above the base; corolla 2.5 cm long, tube stout; staminal filaments and sheath hairy. Capsule 1 x 0.4 cm, glabrous; seeds winged.

Fl. & Fr.: September-January

Distr.: South India and Sri Lanka. Common; along forests margins. ENP, Amarachola, *KKK 17542.*

Note: New record to the flora of Kerala.

Strobilanthes calycina Nees in Hook., Companion Bot. Mag. 2: 321. 1836 & in DC., Prodr. 11: 186. 1847; Clarke in Hook.f., FBI 4: 450. 1885. *S. colorata* Nees in Hook., Companion Bot. Mag. 2: 312. 1836. **Muttakkannikurinji.**

Shrubs 2 m tall; stem densely pilose. Leaves 18 x 10 cm, broadly ovate-elliptic, base rounded, apex acuminate, crenate, pilose. Spikes to 8 x 4 cm, cylindrical; bracts to 2.5 x 1.5 cm, ovate; calyx 1.5 cm long, lobes oblong-elliptic; corolla 2 cm long, pale yellow, tube cylindrical, lobes 4 x 6 mm, ovate. Capsule 2 x 0.7 cm, elliptic-oblong, glabrous; seeds 7 x 6 mm, suborbicular.

Fl. & Fr.: November-February

Distr.: Southern India and Sri Lanka. ENP, Amarachola, *KKK 18527.*

Note: This species was so far considered endemic to Sri Lanka. Present collection is the first report from India.

Strobilanthes cuspidatus (Benth.) T. Anders., J. Linn. Soc. Bot. 9: 465. 1867; Clarke in Hook. f., FBI 4: 435. 1884; Gamble, FPM 1036. 1924; Fyson, FSIHS 446. t. 385. 1932; Matthew, Ill. FPH t. 562. 1996 & FPH 952. 1999, *"cuspidata". Endopogon cuspidatus* Benth., Linnaea 24: 646. 1851. *E. versicolor* Wight, Ic. t. 1497. 1849. *Phlebophyllum versicolor* (Wight) Bremek., Verh. Kon. Ned. Akad. Wetensch. 41: 170. 1944. **Kannarakurinji (EBIS).**

Large shrubs; stems terete; branchlets adpressed-white woolly. Leaves to 15 x 6 cm, ovate, base acute, apex acuminate. Spikes 3-5 cm long, interrupted, on trichotomously branched peduncle. Flowers few; calyx 7 mm long, lobes subulate, glandular-hairy; corolla 2.5 cm long, blue; staminal filaments glabrous. Capsule 1.6 cm long, stalked, glabrous; seeds orbicular, hairy.

Fl. & Fr.: November-February

Distr.: Endemic to Southern Western Ghats. Common along shola margins at medium altitudes. ENP, Amarachola, *KKK 18530.*
Note: New record to the flora of Kerala.

Strobilanthes foliosus (Wight) T. Anders., J. Linn. Soc. 9: 467. 1867; Clarke in Hook. f., FBI 4: 433. 1884; Gamble, FPM 1035. 1924; Fyson, FSIHS 445. t. 383. 1932; Matthew, Ill. FPH t. 563. 1996 & FPH 952. 1999, *"foliosa". Endopogon foliosus* Wight, Ic. t. 1501. 1849. *Nilgirianthus foliosus* (Wight) Bremek., Verh. Kon. Ned. Akad. Wetensch. 41: 173. 1944. **Kallukurinji, Vettilakurinji (EBIS).**

Shrubs; branchlets terete, glabrous, reddish. Leaves to 7 x 3 cm, elliptic, acute at either ends, coriaceous, whitish below, serrate. Spikes 3-4 cm long, lanceolate, axillary and terminal; floral bracts 2 x 0.6 cm, lanceolate. Flowers few; calyx 17 mm, lanceolate, glabrous; corolla 4.5 cm, blue, tube cylindrical at lower part. Capsule 1.8 cm long; seeds 8 x 7 mm, yellowish, glabrous.
Fl. & Fr.: December-May
Distr.: Endemic to Southern Western Ghats. Common along shola margins at low altitudes. MS, Chengalar, *KKK 18129.* VMS, Olichuchattam, *KKK 31142.*

Strobilanthes gracilis Bedd., Trans. Linn. Soc. London 25: 222. 1865 & Ic. t. 207. 1868-1874; Clarke in Hook. f., FBI 4: 474. 1884; Gamble, FPM 1043. 1924; Matthew, Suppl. Ill. FPH t. 1096. 1998 & FPH 953. 1999. *Mackenziea gracilis* (Bedd.) Bremek., Verh. Kon. Ned. Akad. Wetensch. 41: 182. 1944. **Thoka Kurinji. (EBIS) Plate 4.9.4a.**

Very large shrubs, 5-12 m tall; stems quadrangular. Leaves to 15 x 6 cm, elliptic, base decurrent and auricled, apex acuminate, serrate. Spikes panicled, terminal and upper axillary; sepals 1 x 0.2 cm, tube 0.15 cm long, lobes oblanceolate; corolla 3 cm long; tube narrow below, ventricose above, hairy; staminal filaments hairy. Capsule 1.4 x 0.7 cm, elliptic, compressed; seeds 3.5 x 3 mm, orbicular, flat.
Fl. & Fr.: April-June
Distr.: Endemic to Southern Western Ghats. Common undergrowth in medium and high altitude sholas. MS, K-5.5, *KKK 18107.* ENP, Amarachola, *KKK 18528.*

Strobilanthes homotropus Nees in DC., Prodr. 11: 187. 1847; Clarke in Hook. f., FBI 4: 474. 1884; Gamble, FPM 1043. 1924; Fyson, FSIHS 452. t. 392. 1932. *S. sexennis* sensu Bedd., Ic. t. 206. 1868-1874, non Nees, 1847. *Mackenziea homotropa* (Nees) Bremek., Verh. Kon. Ned. Akad. Wetensch. 41: 182. 1944. **Thoka Kurinji.**

Large shrubs or small trees; young branches glandular-hairy. Leaves to 20 x 8 cm, elliptic, base attenuate and auricled, apex acuminate. Spikes 1-3 flowered, in terminal panicles, tomentose; bracts leafy, bracteoles spathulate, glandular-hairy; sepals 1.3 x 0.2 cm, spathulate, hairy; corolla 2.8 cm long, pale blue; staminal filaments hairy. Capsule 1.5 x 0.7 cm, glabrous; seeds 5 x 4 mm, compressed.
Fl. & Fr.: April-June
Distr.: Endemic to Southern Western Ghats. Occasional in shola borders at high altitudes. PAS, Topstation, *KKK 18593.*

Strobilanthes kunthianus (Nees) T. Anders. *ex.* Benth., Fl. Hongk. 262. 1861; Clarke in Hook. f., FBI 4: 434. 1884; Gamble, FPM 1036. 1924; Fyson, FSIHS 445. t. 384. 1932; Matthew, Ill. FPH t. 564. 1996 & FPH 954. 1999. *Phlebophyllum kunthianum* Nees in Wall., Pl. Asiat. Rar. 3: 83. 1832; Wight, Ic. t. 448. 1841. **Neelakkurunji. Plate 4.9.5.**

Bushy shrubs; branches quadrangular, reddish. Leaves to 6 x 3 cm, elliptic, thick-coriaceous, dark green, and scabrid above, reticulate and white villous below, crenate-serrate. Spikes 2-5, 3-5 cm long, on axillary peduncles; floral bracts 1.2 x 0.4 cm, ovate-acuminate, tawny pubescent; calyx 1 cm long, lobes acuminate; corolla 2.5 cm long, pale blue, hairy. Capsule 1.5 x 0.4 cm; seeds 4.

Fl. & Fr.: September-January

Distr.: Endemic to Southern Western Ghats. Common in grasslands and shola ecotones at medium and high altitudes. MS, Thalachorkadavu, *KKK 16754*; K-5, *KKK 16551*

Strobilanthes luridus Wight, Ic. tt. 1515 & 1516. 1850; Clarke in Hook. f., FBI 4: 450. 1884; Gamble, FPM 1042. 1924; Fyson, FSIHS 451. t. 391. 1932; Matthew, Ill. FPH t. 565. 1996 & FPH 955. 1999. *Didyplosandra lurida* (Wight) Bremek., Verh. Kon. Ned. Akad. Wetensch. 41: 178. 1944. **Muttakannikurinji. Plate 4.9.6.**

Large straggling shrubs; branchlets grey-pubescent. Leaves to 25 x 15 cm, broadly elliptic, acute at both ends, hispid, serrulate. Spikes to 15 x 5 cm, cylindrical, axillary; floral bracts 2.5 x 3 cm, orbicular, reddish brown; calyx 2.5 cm long, lobes elliptic, margins ciliate; corolla 3.5 cm long, campanulate, purplish white, lobes orbicular. Capsule 2 x 0.6 cm, ellipsoid, glabrous; seeds orbicular.

Fl. & Fr.: November-January

Distr.: Endemic to Southern Western Ghats. Common along shola borders at medium altitudes. MS, Chengalar, *KKK 18104*; K-5, *KKK 18108.*

Strobilanthes micranthus Wight, Ic. t. 1519. 1850; Clarke in Hook. f., FBI 4: 444. 1884; Gamble, FPM 1040. 1924; Fyson, FSIHS 451. 1932; Matthew, Ill. FPH t. 566. 1996 & FPH 956. 1999, "*micrantha*". *Taeniandra micrantha* (Wight) Bremek., Verh. Kon. Ned. Akad. Wetensch. 41: 175. 1944. **Kallankurinji. Plate 4.9.7.**

Large shrubs; branchlets quadrangular. Leaves to 15 x 8 cm, elliptic, base attenuate, decurrent, apex acuminate, serrulate, glabrous. Spikes 5-10 cm, ovoid to oblong, solitary, axillary; bracts 27 x 12 mm, lanceolate, hirsute. Calyx 17 mm long, lobes acuminate; corolla 1.8 cm long, campanulate, lobes recurved, reddish brown outside, pale white inside. Capsule 1.4 x 0.5 cm, oblong; seeds 6 x 4 mm, oblong.

Fl. & Fr.: November-January

Distr.: Endemic to Southern Western Ghats. Common along shola borders at medium altitudes. MS, K-6, *KKK 18106.* PAS, Vandaravu, *KKK 18586.*

Strobilanthes neilgherrensis Bedd., Ic. t. 196. 1868-1874; Clarke in Hook. f, FBI 4: 438. 1884; Gamble, FPM 1038. 1924. *Nilgirianthus neilgherrensis* (Bedd.) Bremek., Verh. Acad. Wet. afd. Natuurk. Sect. 2, 41: 174. 1944.

Large shrubs; stems subtetragonous. Leaves to 13 x 8 cm, ovate, base rounded, apex acuminate, rugose with bulbous-based hairs, scabrous-hispid, subcoriaceous, crenate. Flowers white, in large, dense, bristly hirsute heads; calyx lobes lanceolate; corolla tube longer than the ventricose mouth; stamens 2+2. Fruits not seen.

Fl.: December

Distr.: Endemic to Southern Western Ghats. MS, K-5, *KKK 18112*

Strobilanthes papillosus T. Anders., J. Linn. Soc. Bot. 9: 468. 1867; Clarke in Hook.f., FBI 4: 445. 1884; Gamble, FPM 1039. 1924; Fyson, FSIHS 448. 1932

Large shrubs; whole plant bulbous-based hairy. Leaves to 6 x 4 cm, ovate, base cuneate, apex acute, serrate. Heads erect, close; involucral bracts with leafy tips. Flowers blue; corolla large, tube 1.5 cm, mouth 2 cm, lobes large. Capsule 1.2 x 0.6 cm, elliptic; seeds 6 x 4 mm, elliptic, glabrous.

Fl. & Fr.: January-March

Distr.: Endemic to Southern Western Ghats. Occasional; along shola borders at low altitudes. MS, Thalachorkadavu, *KKK 18153.*

Note: New record to the flora of Kerala.

Strobilanthes perrottetianus Nees in DC., Prodr. 11: 179. 1847; Clarke in Hook. f., FBI 4: 439. 1884; Gamble, FPM 1039. 1924; Fyson, FSIHS 448. t. 387. 1932. *Nilgirianthus perrottetianus* (Nees) Bremek., Verh. Acad. Wet. afd. Natuurk. Sect 2, 41: 174. 1944. **Chonakurinji.**

Large shrub; stem and leaves reddish-purple hairy. Leaves 9 x 6 cm, ovate, apex acute to acuminate, crenate. Heads clavate, deflexed. Flowers pale blue or lilac; calyx lobes linear; corolla 2.2 cm long, tube short, enclosed by ovate bracts, upper part infundibular; ovary glabrous. Capsule 2 seeded.

Fl. & Fr.: January-March

Distr.: Endemic to Southern Western Ghats. Common; in low and medium altitude sholas. MS, Thalachorkadavu, *KKK 18153.* ENP, Amarachola, *KKK 18532.*

Note: New record to the flora of Kerala.

Strobilanthes pulneyensis Clarke in Hook. f., FBI 4: 438. 1884; Gamble, FPM 1038. 1924; Fyson, FSIHS 447. t. 386. 1932; Matthew, Ill. FPH t. 567. 1996 & FPH 957. 1999. *S. punctatus* Bedd., Ic. t. 204. 1868-1874, non Nees, 1847. *Xenacanthus pulneyensis* (Clarke) Bremek., Verh. Kon. Ned. Akad. Wetensch. 41: 176. 1944. **Chonayamkallu Kurinji.**

Well branched shrubs; branchlets densely hispid. Leaves to 8 x 5 cm, elliptic, base cuneate, apex acute, margin serrate. Spikes flattened, 1-3 in axils; bracts 1-3 x 1.2 cm, ovate to orbicular, serrate, densely white hairy at base. Flowers blue to violet; sepals 1 cm long, lobes acute, hairy; corolla 1.5 x 0.5 cm long, tube narrow, 1 cm long, thinly hairy outside. Capsule 0.8 x 0.4 cm, oblong; seeds elliptic.

Fl. & Fr.: October-January

Distr.: Endemic to Southern Western Ghats. Common; along shola margins at medium altitudes. ENP, Amarachola, *KKK 18017.*

Strobilanthes tristis (Wight) T. Anders., J. Linn. Soc. Bot. 9: 470. 1867; Clarke in Hook. f., FBI 4: 441. 1884; Gamble, FPM 1040. 1924. *Goldfussia tristis* Wight, Ic. t. 1508. 1850.

Shrubs; branchlets glabrous. Leaves to 20 x 10 cm, acuminate at both ends, glabrous. Spikes to 4 cm long, lanceolate, 1-2-flowered, deflexed, in axillary clusters; bracts 2.5 x 0.5 cm, lanceolate, acuminate, margins ciliate; sepals 1.5 x 0.3 cm, acuminate, hairy; corolla 3 cm long, narrowed to the base, glabrous, bluish-white; staminal sheath glabrous. Capsule 1 x 0.3 cm; seeds orbicular.

Fl. & Fr.: November-January

Distr.: Endemic to Southern Western Ghats. Rare; in low altitude sholas. Mattupatty Shola, *KKK 31131.*

Strobilanthes urceolaris Gamble, Kew Bull. 1923: 374. 1923 & FPM 1038. 1924; Fyson, FSIHS 449. 1932; Matthew, FPH 957. 1999. *Nilgirianthus urceolaris* (Gamble) Bremek., Verh. Kon. Ned. Akad. Wetensch. 41: 173. 1944. **Panjikurinji.**

Shrubs; branchlets densely hirsute. Leaves to 9 x 5 cm, ovate, base rounded, apex acute, densely scabrous, crenate. Spikes to 2 cm long, ovoid, 5-8 together on short lateral branches; bracts 0.8 x 0.4 cm, obovate, densely hirsute. Flowers few; calyx lobes 0.9 cm long, linear, united above, densely hairy; corolla 1.7 cm long, glabrous, pale blue. Capsule 1 cm long, obovoid, glabrous; seeds 4 x 3 mm, oblong.

Fl. & Fr.: December-January

Distr.: Endemic to Southern Western Ghats. Common along shola margins at higher altitudes. ENP, Umayamala, *KKK 17542.*

Strobilanthes violaceus Bedd., Ic. t. 205. 1872; Clarke in Hook. f., FBI 4: 474. 1884; Gamble, FPM 1044. 1924; Fyson, FSIHS 452. 1932. *Mackenziea violacea* (Bedd.) Bremek., Verh. Nederl. Akad. Wetensch., Amst., Afd. Natuurk., sect. 2, 1: 182. 1944. **Plate 4.9.8.**

Large shrub. Leaves to 10 x 4 cm, elliptic-oblong, base narrowed and sheathing, apex acute, puberulous, chartaceous. Spikes glandular, terminal and axillary; bracts oblanceolate; sepals 6-8 x 1.5 mm, oblanceolate-oblong; corolla bluish-purple, to 3 x 2.5 cm, ventricose; stamens 4. Fruit not seen.

Fl.: December-February

Distr.: Endemic to Southern Western Ghats. Occasional; in shola borders at medium altitudes. ENP, Amarachola, *KKK 18552.*

Note: New record to the flora of Kerala.

Strobilanthes wightianus Nees in Wall., Pl. Asiat. Rar. 3: 86. 1832; Wight, Ic. t. 1514. 1850; Clarke in Hook. f., FBI 4: 438. 1884; Gamble, FPM 1037. 1924; Fyson, FSIHS 449. t. 388. 1932. *Nilgirianthus wightianus* (Nees) Bremek., Verh. Kon. Ned. Akad. Wetensch. 41: 174. 1944.

Shrubs; branches hirsute. Leaves 7 x 4 cm, ovate, acuminate, serrate, densely hirsute. Spikes 1.5 x 2.5 cm, obconical; involucral bracts 2-4, leafy, to 3 x 1.5 cm; floral bracts densely hairy at base. Flowers pale blue; calyx 10 mm long, hairy, united

below the middle; corolla 2 cm long, tube 5 mm long, villous inside. Capsule 1 x 0.3 cm, glabrous; seeds 3 x 3 mm, orbicular, oblique at base.

Fl. & Fr.: October-January

Distr.: Endemic to Western Ghats. Common along shola margins at low and medium altitudes. MS, K-4, *KKK 18113.*

Strobilanthes zenkerianus (Nees) T. Anders, J. Linn. Soc. Bot. 9: 467. 1867; Clarke in Hook. f., FBI 4: 439. 1884; Gamble, FPM 1039. 1924; Fyson, FSIHS 451. t. 390. 1932; Matthew, Ill. FPH t. 568. 1996 & FPH 958. 1999, "*zenkeriana*". *Goldfussia zenkeriana* Nees in DC. Prodr. 11: 172. 1847. *Endopogon strobilanthes* Wight, Ic. t. 1500. 1849. *Xenacanthus zenkerianus* (Nees) Bremek, Verh. Kon. Ned. Akad. Wetensch. 41: 176. 1944.

Gregarious shrub; branchlets angled. Leaves to 12 x 4cm, elliptic-ovate, base cuneate, apex acuminate, margin serrulate, subcoriaceous. Spikes erect, to 6 cm, oblong; bracts ovate, spathulate below. Flowers blue to violet; calyx 18 mm long, lobes 5, 1.6 cm , lanceolate; corolla 1.5 cm, tube 1.2 cm, lobes 4. Capsule 2 x 0.5 cm, ellipsoid; seeds 4.

Fl. & Fr.: October-January

Distr.: Endemic to Southern Western Ghats. Common undergrowth species found at higher altitudes. MS, Idlimottai, *KKK 31113.*

Strobilanthes sp. 1. Chonayamkallu Kurinji. Plate 4.9.4b.

Shrub to 3 m tall; whole plant glandular-pubescent. Leaves to 22 x9 cm, elliptic, base narrowed and sheathing, apex acuminate, serrate, deeply veined. Spikes dense panicled, terminal or axillary; bracts oblanceolate. Sepals 2 x 0.2 cm, subulate; petals 3.5 cm long, tube narrowing below, ventricose above. Capsule 2.5 x 1 cm, elliptic, glabrous; seeds 5x 4 mm, suborbicular, discoid.

Fl. & Fr.: December-February

Distr.: Rare; in shola borders at medium and higher altitudes. ENP, Amarachola, *KKK* 18526; Umayamala, *KKK 18553.*

THUNBERGIA Retzius

Physiogr. Salsk. Handl. 1(3): 163. 1780, *nom. cons.*

Thunbergia tomentosa Wall. *ex* Nees in Wall., Pl. Asiat. Rar. 3: 78. 1832; Clarke in Hook. f., FBI 4: 391. 1884; Gamble, FPM 1008. 1924; Fyson, FSIHS 443. t. 382. 1932; Matthew, Suppl. Ill. FPH t. 1098. 1998 & FPH 960. 1999.

Climbing herbs. Leaves 5 x 3 cm, ovate, cordate to hastate, lobes spreading at base, tomentose when young. Flowers axillary, large; bracts leafy; calyx teeth 8 mm long, filiform, villous; corolla white, to 5 cm across, ventricose, curved, limb oblique; stamens 4, didynamous; ovary 2 celled. Capsule 2.3 x 1 cm, globose below, beaked above; beak 1.5 cm long, sword shaped; seeds 5 x 3 mm, discoid.

Fl. & Fr.: January-March.

Distr.: Endemic to Southern Western Ghats. Common along shola borders and road sides at medium altitudes. MS, Gudalar, *KKK 16082.*

73. VERBENACEAE

1. Inflorescence a paniculate cyme; fruit a drupe ..... **Clerodendrum**
1. Inflorescence a spike; fruit a pyrene ..... **Lantana**

CLERODENDRUM Burman *ex* Linnaeus

Sp. Pl. 637. 1753

1. Subshrubs; leaves elliptic; calyx subtruncate; corolla blue ..... **C. serratum**
1. Shrubs to small trees; leaves ovate to orbicular; calyx deeply lobed; corolla cream ..... **C. viscosum**

Clerodendrum serratum (L.) Moon, Cat. Pl. Ceylon 46. 1824; Clarke in Hook. f., FBI 4: 592. 1885; Gamble, FPM 1100. 1924; Fyson, FSIHS 461. t. 401. 1932; Matthew, FPH 965. 1999. *Volkameria serrata* L., Mant. Pl. 1: 90. 1767.

Leaves verticillate, 3 at a node, to 18 x 9 cm, base decurrent, apex shortly acuminate, coarsely serrate, sub-coriaceous. Panicles to 15 cm; calyx 0.4 cm, cupular, sub truncate; corolla 2 cm wide, tube 1 cm, limb 2 lipped, lobes spathulate; stamens 4; ovary globose. Drupe 4 lobed, 1 cm wide.

Fl. & Fr.: August-December.

Distr.: India, Nepal, Myanmar and Sri Lanka. Common in shola borders and disturbed regions at lower altitudes. MS, Pallang Mala, *KKK 16687.*

Clerodendrum viscosum Vent., Jard. Mal. 1: t. 25. 1803; Matthew, Ill. FPH t. 569. 1996 & FPH 966. 1999. *C. infortunatum* Wight, Ic. t. 1471. 1849, "*infortunata*", non L.; Clarke in Hook. f., FBI 4: 594. 1885; Gamble, FPM 1100. 1924. **Kattu Padappa (EBIS).**

Leaves to 20 x 16 cm, base cordate, apex acuminate, margin denticulate, tawny villous. Cymes panicled, diffuse, terminal or in upper axils; calyx 1 cm long, lobes 5, lanceolate, acute; corolla 1 cm wide, funnel shaped, tube 1.5 cm, lobes oblanceolate; stamens 4; ovary 4 celled. Drupe 8 mm wide, globose.

Fl. & Fr.: February-March.

Distr.: Indo-Malesia. Common along road sides and shola borders at lower and medium altitudes. MS, Idlimottai, *KKK 16578.*

LANTANA Linnaeus

Sp. Pl. 626. 1753

1. Armed plants with recurved prickles; spikes condensed; leaves ovate, margin serrate ..... **L. camara**
1. Unarmed plants; spikes elongate; leaves elliptic-oblong, margin crenate ..... **L. indica**

Lantana camara L., Sp. Pl. 627. 1753; Clarke in Hook. f., FBI 4: 562. 1885; Matthew, FPH 969. 1999. *L. aculeata* L., Sp. Pl. 627. 1753; Gamble, FPM 1087. 1924; Fyson, FSIHS 459. 1932. **Unni Mullu, Sankutheva Mullu (EBIS).**

Leaves to 8 x 5 cm, ovate, base cordate-attenuate, apex acute, margin serrate, scabrid. Spikes to 4 cm wide, capitate ovoid, terminal or in upper axils,. Flowers 15-

20; calyx bilabiate, 3 mm; corolla white or rose, tube 1 cm, narrow, hairy, limb 1 cm wide, 5 lobed; ovary 0.75 mm. Berry 5 mm wide, globose, black when ripe.

Fl. & Fr.: Throughout the year

Distr.: Native of Tropical America, naturalized in the tropics and subtropics. Common along shola borders and roadsides at lower altitudes. MS, Perumala, *KKK 18501.*

Lantana indica Roxb., Fl. Ind. 3: 89. 1832; Clarke in Hook. f., FBI 4: 562. 1885; Gamble, FPM 1087. 1924; Matthew, Suppl. Ill. FPH t. 1101. 1998 & FPH 969. 1999. **Kuzhaloothi Palam (EBIS).**

Leaves to 7 x 3.5 cm, elliptic-oblong, base rounded, apex acute, margin crenate, sub-coriaceous, densely sericeus below. Spikes to 3 cm, cylindric; calyx 1.2 mm long; corolla pink, 4 mm wide, lobes 5, tube 5 mm long; stamens 4; ovary 2 celled. Berry 0.5 cm wide, globose, red when ripe.

Fl. & Fr.: August-September.

Distr.: India, Nepal and Thailand. Occasional; along shola borders and in scrublands. MS, Idlimottai, *KKK 16598.*

74. LAMIACEAE (Lamiaceae)

1. Calyx 8-10 toothed; upper lip of corolla hooded ..... **Leucas**
1. Calyx 5 toothed; upper lip of corolla straight or spreading **2**
2. Calyx lobes (sub) equal, not 2 lipped **3**
2. Calyx lobes unequal, clearly 2 lipped **4**
3. Corolla lobes 4; stamens (sub) equal ..... **Pogostemon**
3. Corolla lobes 5; stamens didynamous ..... **Anisomeles**
4. Upper lip of calyx 1 lobed, broader than lower lobes **5**
4. Upper lip of calyx 3 lobed with scutellum, nearly as broad as lower lobes ..... **Scutellaria**
5. Calyx oblique, lower lip truncate ..... **Anisochilus**
5. Calyx equally 2 lipped, lower lip 2-4 toothed **6**
6. Stamens ascending to the upper lip, projecting straight forward **7**
6. Stamens descending, lying upon or enclosed in the lower lip **9**
7. Calyx tube straight ..... **Prunella**
7. Calyx tube inwardly curved **8**
8. Calyx equally 5 toothed; erect herbs ..... **Micromeria**
8. Calyx distinctly 2 lipped; trailing herbs ..... **Clinopodium**
9. Calyx conspicuously 2-lipped ..... **Plectranthus**
9. Calyx with 5 subequal teeth ..... **Isodon**

ANISOCHILUS Wallich *ex* Bentham

in Lindley, Edward's Bot. Reg. 15: t. 1300. 1830.

Anisochilus argenteus Gamble, Kew Bull. 1924: 265. 1924 & FPM 1127. 1924; Matthew, Ill. FPH t. 571. 1996 & FPH 982. 1999. **Seethakkorali.**

Bushy shrubs; branchlets silvery, base terete, apex angular. Leaves sessile, whorled, to 3 x 0.7 cm, oblanceolate, base cuneate, apex acute, thick coriaceous, dense silvery tomentose. Spikes terminal, to 6.5 x 0.8 cm; calyx 2 lipped, upper lip 2 x

1 mm, rounded; corolla purplish, upper lip 0.6 x 0.2 mm, obovate, lower lip 1 x 0.5 mm, oblanceolate; stamens 4. Nutlets 1 x 0.5 mm, ovoid, compressed.

Fl. & Fr.: February-March

Distr.: Endemic to Southern Western Ghats . Rare; found along shola borders and scrublands at medium altitudes. MS, Mattukulam, K-3, *KKK 18134.*

Note: New record to the flora of Kerala.

ANISOMELES R. Brown

Prodr. 503. 1810

Anisomeles indica (L.) O. Ktze., Rev. Gen. Pl. 512. 1891; Gamble, FPM 1140. 1924; Fyson, FSIHS 478. 1932; Matthew, Suppl. Ill. FPH t. 1104. 1998 & FPH 985. 1999. *Nepeta indica* L., Sp. Pl. 571. 1753. *Anisomeles ovata* Aiton f. in Ait., Hort. Kew. 3: 364. 1811; Wight, Ic. t. t. 865. 1844-45; Clarke in Hook. f., FBI 4: 672. 1885, var. *mollissima* Benth. in DC. Prodr. 12: 456. 1848.

Subshrubs; branchlets 4 angled. Leaves decussate, to 7 x 5 cm, ovate, base abruptly acute, apex acute, crenate, pubescent. Spikes to 13 x 6 cm; calyx tubular-campanulate, hairy, tube 0.6 cm, lobes 3 x 1.5 mm, acuminate; corolla white, 1.3 x 0.4 cm, tube 0.8 cm, upper lip erect, lower lip 3 lobed, spreading; stamens 6-8 mm, brown; ovary 1.2 cm. Nutlets 4, lenticulate.

Fl. & Fr.: December-May.

Distr.: Indo-Malesia and China. Occasional; along shola borders and road sides at lower altitudes. MS, Chengalar, *KKK 18143.*

CLINOPODIUM Linnaeus

Sp. Pl. 587. 1753

Clinopodium umbrosoum (M. Bieb.) K. Koch, Linnaea 11: 673. 1848; Matthew, Suppl. Ill. FPH t. 1105. 1998 & FPH. 986. 1999. *Melissa umbrosa* M. Bieb., Fl. Taur.-caucas 2: 63. 1808; Wight, Ic. t. 1447. 1849. *Calamintha umbrosa* (M. Bieb). Reich., Fl. Germ. Excurs. 1: 329. 1821; Hook. f., FBI 4: 650. 1885; Gamble, FPM 1139. 1924; Fyson, FSIHS 475. t. 412. 1932.

Branchlets quadrangular, hairy. Leaves decussate, to 2.5 x 2 cm, ovate, base truncate, apex acute, serrate, puberulous. Inflorescence verticillate, to 2.5 cm wide; calyx tubular-campanulate, tube 5 x 2 mm, upper lip 3 lobed, lower 2 lobed, longer; corolla pink to purple, tube 0.5 cm, upper lip 2 lobed, lower 3 lobed, mid lobe larger; stamens 4, didynamous; ovary 5 celled. Nutlets 4, erect.

Fl. & Fr.: August-September.

Distr.: Indo-Malesia. Occasional; along waysides and grasslands at higher altitudes. MS, Idlimottai, *KKK 16617.*

Note: New record to the flora of Kerala.

ISODON (Schrader *ex* Bentham) Spach

Hist. Nat. Veg. Phn. 9: 162. 1840

Isodon nilgherricus (Benth.) H. Hara, J. Jap. Bot. 60: 236. 1985; Matthew, FPH 991. 1999. *Plectranthus nilgherricus* Benth. in DC., Prodr. 12: 57. 1848; Hook. f., FBI 4: 619. 1885; Gamble, FPM 1121. 1924; Fyson, FSIHS 466. 1932.

Tall herbs; whole plant tawny villous. Leaves to 4 x 2.5 cm, ovate, base broadly cuneate, apex acuminate, margin serrate. Panicles to 9 cm long. Flowers to 8 mm long; calyx teeth subequal, 2 mm long; petals white with red spots, 2 lipped, tube straight; stamens to 10 mm long; style to 1 cm. Nutlets ovoid.

Fl. & Fr.: December-January.

Distr.: Endemic to Southern Western Ghats. Common in lower altitude sholas. MS, K-4, *KKK 16771.*

LEUCAS R. Brown

Prodr. 504. 1810.

1. Leaves ovate 2
1. Leaves linear to lanceolate 3
2. Erect herbs; stem silvery, deflexed hairy; inflorescence an axillary verticillate ..... **L. chinensis**
2. Straggling herbs; stem tawny villous; inflorescence in terminal whorls ..... **L. lamifolia**
3. Calyx mouth oblique ..... **L. zeylanica**
3. Calyx mouths straight 4
4. Leaves entire 5
4. Leaves serrate or crenate 8
5. Leaves small, 2-3 cm long, narrow, coriaceous and with distinct revolute margins 6
5. Leaves large, 10-12 cm long, broad, chartaceous, margin very slightly revolute ..... **L. lancifolia**
6. Branches fulvous; leaves white tomentose below 7
6. Branches greenish grey; leaves grey villous beneath ..... **L. rosmarinifolia**
7. Stems and leaves scaly and hispid; bracts setaceous ..... **L. suffruticosa**
7. Stems and leaves closely adpressed villous; bracts subulate ..... **L. ternifolia**
8. Leaf margin crenate-serrate, distinctly tomentose; calyx mouth straight ..... **L. vestita**
8. Leaf margin distinctly obscurely serrate, slightly pubescent; calyx mouth oblique ..... **L. zeylanica**

Leucas chinensis (Retz.) R. Br., Prodr. 504. 1810; Hook. f., FBI 4: 681. 1885; Gamble, FPM 1151. 1924; Matthew, Ill. FPH t. 1109. 1998 & FPH 995. 1999. *Phlomis chinensis* Retz., Obs. Bot. 2: 19. 1781.

Stout herbs. Leaves to 4 x 3.5 cm, ovate, base truncate, apex acute, crenate-serrate, silvery green. Calyx 1.5 x 0.5 cm, funnel shaped, mouth straight, lobes 10, 2 x 1.5 mm, triangular, acute; corolla white, 12 x 3 mm, tube 1 cm, oblique, upper lip 8 mm, hairy, lower lip 6 mm, glabrous; stamens 4. Nutlets 4.

Fl. & Fr.: Throughout the year.

Distr.: Peninsular India and China. Common; along shola borders and waysides at lower altitudes. MS, Kulachivayal, *KKK 16680.*

Leucas lamifolia Desf., Mem. Mus. Nat. Hist. 11: t. 2. 1824; Hook. f., FBI 4: 686. 1885; Gamble, FPM 1153. 1924; Fyson, FSIHS 483. t. 421. 1932. **Perum Thumba (EBIS).**

Straggling herbs. Leaves to 6 x 3 cm, ovate, base rounded, apex acute, margin crenate, tawny villous above, whitish pubescent below. Inflorescence 2.5 cm across; calyx tubular, tube 7 x 3 mm, teeth slender, tubular, stellately spreading, throat

villous; corolla white, upper lip densely covered with white hairs, lower lip trilobed, middle lobe large, 7 x 4 mm; stamens 4. Nutlets 4.
Fl. & Fr.: February-March.
Distr.: Endemic to Western Ghats. Common; along shola borders at lower altitudes. MS, K-3, *KKK 16144.*
Note: New record to the flora of Kerala.

Leucas lancifolia Desf., Mem. Mus. Nat. Hist. 11: 5, t. 2. f. 2. 1824; Wight, Ic. t. 1452. 1849, *"lanceaefolia"*; Hook. f., FBI 4: 685. 1885; Gamble, FPM 1153. 1924; Fyson, FSIHS 482. t. 419. 1932; Matthew, Suppl. Ill. FPH t. 1111. 1998 & FPH 996. 1999.

Subshrubs; branchlets densely tomentose. Leaves to 12 x 3 cm, lanceolate, base acute to cuneate, apex apiculate, scaberulous above, glaucous below. Verticils in upper axils, to 2.5 cm wide; calyx 1.1 x 0.5 cm, ribs and teeth 10, mouth straight; corolla white, tube 1 cm, bilipped, lower lip 8 x 4 mm, glabrous; upper lip white hairy; stamens 4. Nutlets 4, to 3 x 1.5 mm, oblong, brown.
Fl. & Fr.: July-December.
Distr.: Endemic to Peninsular India. Common; along shola borders and grasslands at higher altitudes. MS, Methappu, *KKK 16422*; Idlimottai, *KKK* 16434; K-9, *KKK 16797.*

Leucas rosmarinifolia Benth. in Wall. Pl. Asiat. Rar. 1: 61. 1830; Wight, Ic. t. 1455. 1849; Hook. f., FBI 4: 685. 1885; Gamble, FPM 1152. 1924; Fyson, FSIHS 480. t. 416. 1932.

Small bushy shrub, grey-green in colour. Leaves to 18 x 4 mm, linear, tip obtuse, grey villous beneath, many, fascicled at nodes. Flower whorls usually 1 (2); calyx tube 6 x 4 mm, teeth triangular, shorter than the rim of hairs; corolla white, 9 x 4 mm, tube 5 x 1.5 mm upper lip white hairy, lower lip 4 x 3.5 mm.
Fl. & Fr.: June-August.
Distr.: Endemic to Southern Western Ghats. Occasional; along grassland ecotones. MS, K-4, *KKK 31042.*
Note: New record to the flora of Kerala.

Leucas suffruticosa Benth., Labiat. Gen. Sp. 611. 1834; Hook. f., FBI 4: 685. 1885; Gamble, FPM 1152. 1924; Fyson, FSIHS 480. t. 417. 1932. **Plate 4.10.1.**

Bushy undershrub, rootstock perennial. Leaves 2 x 0.5 cm, linear, base cuneate, apex acute to obtuse, subsessile, white tomentose beneath. Flower whorls 1-2 at the top of branches; calyx tube to 5 x 4 mm, obconical, teeth minute as long as the throat ring of hairs; corolla white, tube 6 x 1 mm, upper lip dense white tomentose, lower lip glabrous. Nutlets 2 x 1 mm, oblong.
Fl. & Fr.: August-September.
Distr.: Endemic to Peninsular India. Common; in grasslands at higher altitudes. MS, Idlimottai, *KKK 16610.*

Leucas ternifolia Desf., Mem. Mus. Hist. Nat. 11: 4. t. 1. f. 2. 685. 1824; Gamble, FPM 1152. 1924; Fyson, FSIHS 482. 1932; Matthew, Suppl. Ill. FPH t. 1112. 1998 & FPH 997. 1999. *L. helianthemifolia* Hook. f., FBI 4: 685. 1885, non Desf. 1824.

Subshrubs with woody rootstock; branchlets golden hairy. Leaves 3 per node, to 2.5 x 0.5 cm, oblong or oblanceolate, base cuneate, apex acute, margin recurved, densely white tomentose below, subsessile. Verticils 2-3, subterminal; calyx tube 5 x 4 mm, teeth 10, minute; corolla tube 7 x 1.5 mm, upper lip shorter, densely white hairy, lower lip 5 mm long. Nutlets 1 x 0.5 mm, oblong, black.

Fl. & Fr.: July-September

Distr.: Endemic to Peninsular India. Occasional; along shola borders and grasslands at higher altitudes. MS, Idlimottai, *KKK 16435.*

Leucas vestita Benth. in Wall., Pl. Asiat. Rar. 1: 61. 1830; Hook. f., FBI 4: 686. 1885; Gamble, FPM 1153. 1924; Fyson, FSIHS 482. t. 420. 1932; Matthew, Ill. FPH t. 575. 1996 & FPH 998. 1999. **Hanuman Pal.**

Stout herbs; densely tawny villous. Leaves golden brown, to 5 x 1.5 cm, lanceolate, base cuneate, apex acute, densely tomentose. Verticils terminal, to 2.5 cm wide; calyx tube 8 x 4 mm, teeth 10, 2.5 mm long; corolla white, tube 10 mm, curved, bilipped, upper and lower lips 4 x 4 mm, brown, hairy, lower lip 3 lobed.

Fl. & Fr.: February-March.

Distr.: Endemic to Southern Western Ghats. Common along shola borders and in grasslands. MS, K-4, *KKK 16100.*

Leucas zeylanica (L.) R. Br., Prodr. 504. 1810; Hook. f., FBI 4: 689. 1885; Gamble, FPM 1150. 1924; Fyson, FSIHS 484. 1932. *Phlomis zeylanica* L., Sp. Pl. 586. 1753.

Stout herbs; hispid. Leaves to 7 x 2 cm, linear-lanceolate, base cuneate, apex acute, slightly puberulous. Verticils in upper axils; calyx tube erect, 7 mm long, upper tooth long 3 mm, rest smaller; corolla white, upper lip 6 mm, pubescent, lower lip 10 x 5 mm, midlobe broad, tube 8 mm.

Fl. & Fr.: October-December.

Distr.: South and South East Asia. Occasional; in open places and ecotones at lower altitudes. MS, K-3, *KKK 16656.*

MICROMERIA Bentham

Edwards's Bot. Reg. 15: (4) Post. t. 1282. 1829.

Micromeria biflora (Buch.-Ham. *ex* D. Don.) Benth., Lab. Gen. Sp. 378. 1834; Wight, Ic. t. 1446. 1849; Hook. f., FBI 4: 650. 1885; Gamble, FPM 1138. 1924; Fyson, FSIHS 474. t. 411. 1932; Matthew, Suppl. Ill. FPH t. 1114. 1998 & FPH 999. 1999. *Thymus biflorus* Buch.-Ham. *ex* D. Don, Prodr. Fl. Nep. 112. 1825.

Tufted herbs; rootstock woody; branchlets wiry, pubescent. Leaves to 6 x 4 mm, ovate, base cordate to obtuse, apex acute, margins thickened, gland dotted below. Cymes in upper axils, 2-3 flowered; calyx tube narrow, 3 x 1.5 mm, teeth 5, 1.5 mm, hairy; corolla rose, tube 5 mm, limb 2 lipped, upper one 5 mm long, emarginate, lower one longer; ovary 4 celled. Nutlets 1 mm, oblong, brown.

Fl. & Fr.: December-February.

Distr.: West Asia, India and South Africa. Common; along shola borders at all altitudes. MS, Puthur, *KKK 16054*; Way to Hut, *KKK 18053.*

PLECTRANTHUS L' Heritier

Stirp. Novae 84. 1788. *nom. cons.*

1. Floral bracts closely imbricate; filaments connate into a staminal sheath; calyx villous within 2
1. Floral bracts laxly imbricate; filaments free; calyx tube glabrous within 3
2. Calyx throat with a ring of white hairs; leaves subcoriaceous, white, hairy, glaucous beneath ..... **P. barbatus**
2. Calyx throat glabrous within; leaves membranous, glabrous ..... **P. malabaricus**
3. Lower lip of calyx longer than the upper; nutlets brown ..... **P. mollis**
3. Calyx lobes equal; nutlets black, shining ..... **P. coleoides**

Plectranthus barbatus Andr., Bot. Repos. t. 594.1809; Matthew, FPH 1005.1999. *Coleus barbatus* (Andr.) Benth. in Wall., Pl. Asiat. Rar. 2: 15. 1830; Wight, Ic. t. 1432. 1849; Hook. f., FBI 4: 625. 1885; Gamble, FPM 1124. 1924; Fyson, FSIHS 468. t. 406. 1932.

Herbs; hirsute. Leaves to 5 x 3 cm, ovate, base obtuse to rounded, apex acute, margin crenate. Thyrses axillary or terminal, to 25 cm; upper lip of calyx 3 x 2 mm, ovate-acuminate, lower lip 4 lobed, teeth lanceolate, tube 2 mm, hairy; corolla blue, lower lip 1.5 x 0.6 cm, boat shaped, upper lip 0.8 cm, reflexed. Nutlets brown.

Fl. & Fr.: August-September.

Distr.: India, Sri Lanka and Tropical East Africa. Occasional; along shola borders and roadsides at lower altitudes. MS, K-3, *KKK 16553.*

Plectranthus coleoides Benth. in DC., Prodr. 12: 64. 1848; Hook. f., FBI 4: 622. 1885; Gamble, FPM 1122. 1924; Fyson, FSIHS 466. t. 404. 1932; Matthew, FPH 1006. 1999. *Coleus wightii* Benth., Labiat. Gen. Sp. 58. 1832; Wight, Ic. t. 1433. 1849, non *Plectranthus wightii* Benth. 1832; Wight, Ic. t. 1429. 1849. **Padappayila (EBIS).**

Succulent herbs; stem terete, purple. Leaves to 15 x 12 cm, orbicular-ovate, base cordate to rounded, apex acute, dentate, pubescent, whitish beneath. Panicles terminal, to 25 x 12 cm; calyx 8 mm long, upper lip entire, lower 4 lobed; corolla lilac, 1.2 cm long, lower lip elongate, acute, ciliate; stamens didynamous; ovary 4 partite.

Fl. & Fr.: July-August.

Distr.: Endemic to Peninsular India. Occasional; along stream sides and shola borders at lower altitudes. MS, Chengalar, *KKK 31043.*

Note: New record to the flora of Kerala.

Plectranthus malabaricus (Benth.) Willemse, Blumea 25: 509. 1979; Matthew, Ill. FPH t. 576.1996 & FPH 1007.1999. Coleus malabaricus Benth. in Wall., Pl. Asiat. Rar. 2: 16. 1830; Hook. f., FBI 4: 626. 1885; Gamble, FPM 1124. 1924; Fyson, FSIHS 468. 1932.

Succulent herbs; branchlets purplish. Leaves to 16 x 12 cm, ovate, base rounded to cuneate, apex acuminate, dentate, purplish below. Panicles terminal, in cymose whorls; calyx tube 4 mm, upper lip rounded and reflexed, lobes of lower lip acuminate; corolla blue, tube 7 mm, throat inflated, upper lip 7 x 5 mm, crenate, lower lip boat shaped, smaller. Seeds 2.5 x 2 mm, elliptic, discoid, black.

Fl. & Fr.: January-February.

Distr.: South India and Sri Lanka. Common along stream banks and roadsides at all altitudes. MS, K-2.5, *KKK 16090.*

Plectranthus mollis (Ait.) Spreng., Syst. Veg. 2: 690. 1825; Matthew, FPH 1007. 1999. *Ocimum molle* Ait., Hort. Kew 2: 322. 1789. *Plectranthus incanus* Link., Enum. Hort. Berol. 2: 120. 1822; Hook. f., FBI 4: 621. 1885; Gamble, FPM 1121. 1924.

Bushy herbs. Leaves, to 7 x 6 cm, ovate, base cordate, apex acuminate, margin crenate to double crenate, pubescent. Thyrsus terminal, branched, to 25 x 4 cm; calyx tube 6 mm, upper lip entire, 3 x 2 mm, ovate, lower lip 4 lobed, 3 x 1 mm; corolla blue, 8 mm long, lower lip large. Nutlets 2 x 1.5 mm, discoid, brown.

Fl. & Fr.: November-December.

Distr.: Sri Lanka, India and Himalaya. Common in lower altitude shola borders and roadsides. MS, Thalachorkadavu, *KKK 16749.*

POGOSTEMON Desfontaines

Mem. Mus. Hist. Nat. 2: 154. 1815.

1. Spikes or racemes of clusters terminal and axillary, forming a panicled inflorescence **2**
1. Spikes or racemes of clusters terminal or axillary, solitary, not panicled 3
2. Stems and leaves nearly glabrous ..... **P. pubescens**
2. Stems hoary-puberulous, leaves also on the under surface ..... **P. benghalensis**
3. Filaments of the stamens bearded ..... **P. wightii**
3. Filaments of the stamens not bearded but slightly villous at base ..... **P. atropurpureus**

Pogostemon atropurpureus Benth. in DC., Prodr. 12: 154. 1848; Hook. f., FBI 4: 636. 1885; Gamble, FPM 1134. 1924; Fyson, FSIHS 473. 1932. **Kuzhaloothi Pazham (EBIS).**

Erect shrubs; branches velvety tawny. Leaves to 5 x 3 cm, ovate, base cuneate, apex acuminate, crenate, dark green and puberulous above, densely pubescent below. Racemes spicate, to 15 cm; calyx 5 toothed, tube 3.5 mm, teeth 1.5 mm, densely pilose; corolla dark purple, upper lip 3 lobed; ovary 4 partite. Fruit not seen.

Fl.: February

Distr.: Endemic to Southern Western Ghats. Rare; along shola edges at higher altitudes. ENP, Anamudi, *KKK 18534.*

Pogostemon benghalensis (Burm. f.) O. Ktze., Rev. Gen. Pl. 2: 517. 1891; Matthew, FPH 1009. 1999. *Origanum benghalense* Burm. f., Fl. Ind. 128, t. 38, f. 3. 1768. *Pogostemon plectranthoides* Desf., Ann Mus. Hist. Nat. 2: 156. t. 6. 1808; Hook. f., FBI 4: 632. 1885; Gamble, FPM 1133. 1924.

Subshrubs; branchlets pubescent. Leaves to 8 x 4 cm, ovate to elliptic, base cuneate, apex acute, margin double serrate. Racemes spicate, branched, to 10 cm; calyx lobes subequal, tube 4 mm, lobes 1 mm, pubescent; corolla pinkish, 4 mm wide, lobes 4, 2 lipped; stamens purplish. Nutlets 0.7 mm across, discoid.

Fl. & Fr.: February-May

Distr.: Endemic to India. Common along shola edges at medium altitudes. ENP, Mampallam Chola, *KKK 17553.*

Pogostemon pubescens Benth. in DC., Prodr. 12: 142. 1848; Gamble, FPM 1133. 1924; Fyson, FSIHS 471. t. 408. 1932; Matthew, Suppl. Ill. FPH t. 1119. 1997 & FPH 1010. 1999. *Pogostemon parviflorus* Benth. in Wall., Pl. Asiat. Rar. 1: 31. 1830, p.p.; Hook. f., FBI 4: 632. 1885, p.p..

Subshrubs; branchlets pink, glabrescent. Leaves to 10 x 6 cm, ovate, base attenuate, apex acute, margin crenate-serrate. Panicles to 6 cm, terminal or in upper axils, dense; calyx 5 mm, tube 4 mm, teeth sub equal; corolla white, 4 mm wide, tube 3 mm, limb 2 lipped, upper one with rose spots, lower white; stamens 4. Nutlets 4, ovoid.

Fl. & Fr.: March-May

Distr.: India and Sri Lanka. Common; along shola margins and roadsides at lower altitudes. MS, K-3, *KKK 16091.*

Pogostemon wightii Benth. in Wall., Pl. Asiat. Rar. 1: 31. 1830; Hook. f., FBI 4: 635. 1885; Gamble, FPM 1134. 1924; Fyson, FSIHS 472. 1932; Matthew, Suppl. Ill. FPH t. 1120. 1997 & FPH 1011. 1999.

Diffuse herbs; stem reddish, pubescent. Leaves to 6 x 3.5 cm, ovate, base cuneate, apex acute, double crenate, hispid, membranous. Racemes spicate, interrupted towards base, to 10 x 1.5 cm; calyx tube 4 x 2 mm, lobes 1 mm long, ciliate; corolla white tinged pink, 4 mm wide, limb 2 lipped; staminal filaments pinkish hairy. Nutlets 0.5 mm, black, constricted at mouth.

Fl. & Fr. February-April

Distr.: Endemic to Southern Western Ghats. Common in sholas at medium altitudes. MS, K-4, *KKK 16159.*

PRUNELLA Linnaeus

Sp. Pl. 600. 1753

Prunella vulgaris L., Sp. Pl. 600. 1753; Wight, Ic. t. 1448. 1849, "*Brunella*"; Hook. f., FBI 4: 670. 1885; Gamble, FPM 1143. 1924; Fyson, FSIHS 477. t. 414. 1932; Matthew, Suppl. Ill. FPH t. 1121. 1997 & FPH 1011. 1999. **Plate 4.10.2.**

Perennial herbs; rhizome creeping; branchlets ascending, purplish, hispid. Leaves to 4 x 3 cm, base cuneate, apex obtuse, margin subentire, pilose. Spikes terminal, verticillate, to 4 x 2 cm; calyx tube straight, 5 x 3 mm long, 2 lipped, upper 3 mm broad, lower ones lanceolate; corolla violet, tube 6 mm, limb 2 lipped, lower lip 3 lobed, spreading, side lobes oblong; stamens 4. Nutlets 4, oblong.

Fl. & Fr.: June-August.

Distr.: America, Europe, North temperate zone of Indian subcontinent, Australia and Sri Lanka. Occasional; in grassy bogs at higher altitudes. MS, Idlimottai, *KKK 18188.*

SCUTELLARIA Linnaeus

Sp. Pl. 598. 1753

1. Slender herbs; leaves green on either side, drying green ..... **S. violacea**
1. Stout herbs; leaves purplish below, drying black ..... **S. wightiana**

Scutellaria violacea Heyne *ex* Benth. in Wall., Pl. Asiat. Rar. 1: 66. 1830; Hook. f., FBI 4: 668. 1885; Gamble, FPM 1142. 1924; Fyson, FSIHS 476. t. 413. 1932; Matthew, Ill. FPH t. 582. 1996 & FPH 1016. 1999. *S. violacea* var. *sikkimensis* Hook. f., FBI 4: 668. 1885.

Branchlets soft-pubescent. Leaves to 6 x 4 cm, ovate, base cordate, apex acute, membranous, margin crenate. Racemes lax, terminal, to 17 cm; calyx 2 lipped, 3 mm long; corolla bluish-violet, tube 8 mm, limb 2 lipped; stamens 4. Nutlets 4.

Fl. & Fr.: June-August

Distr.: South India and Sri Lanka. Common; along roadsides at lower altitudes. MS, K-3, *KKK 16404*; K-4.5, *KKK 16512.*

Scutellaria wightiana Benth. in Wall., Pl. Asiat. Rar. 1: 67. 1830; Gamble, FPM 1142. 1924; Matthew, Ill. FPH t. 582. 1996 & FPH 1016. 1999. *S. violacea* Heyne *ex* Benth. var. *hispidior* Benth. in DC., Prodr. 12: 418. 1848; Hook. f., FBI 4: 668. 1885.

Branchlets soft pubescent. Leaves ovate, to 5 x 3 cm, base cordate, apex acute, membranous, margin crenate. Racemes terminal, to 10 cm; calyx 2 lipped, 2 mm long; corolla purple to violet, tube 8 mm, limb 2 lipped; stamens 4. Nutlets 4.

Fl. & Fr.: June-August

Distr.: Endemic to Peninsular India. Occasional; along shola borders and roadsides at very high altitudes. ENP, Anamudi top, *KKK 31103.*

75. PLANTAGINACEAE

PLANTAGO Linnaeus

Sp. Pl. 112. 1753

Plantago erosa Wall. in Roxb., Fl. Ind. 1: 423. 1820; Matthew, FPH 1019. 1999. *P. major* sensu Hook. f., FBI 4: 705. 1885, p.p., non L. 1753. *P. asiatica* sensu Wight, Ill. Indian Bot. t. 177. 1841-1850, non L.; Gamble, FPM 1160. 1923; Fyson FSIHS 485. t. 425. 1932. **Nilachakka, Njaramboori (EBIS) Plate 5.3.6.**

Perennial, scapigerous herbs. Leaves in rosettes, to 13 x 4.5 cm, elliptic, base attenuate, apex acute, 5 nerved from base. Spikes to 10, unbranched, to 20 cm long. Flowers cream; calyx lobes 4, 2.5 mm, ovate, margin scarious; corolla salver shaped, tube 2 mm, lobes 1 mm long, lanceolate, recurved; stamens 4; ovary globose, 2 celled. Capsule 4 mm long, ellipsoid.

Fl. & Fr.: Throughout the year.

Distr.: Pantropical. Common; along road sides and shola ecotones at medium and higher altitudes. MS, Idlimottai, *KKK 16019*; K-4, *KKK 16506.*

76. AMARANTHACEAE

1. Leaves alternate 2
1. Leaves opposite ..... **Achyranthes**
2. Flowers bisexual 3
2. Flowers unisexual ..... **Amaranthus**

3. Seeds several ..... **Celosia**
3. Seeds solitary ..... **Allmania**

ACHYRANTHES Linnaeus

Sp. Pl. 204. 1753

1. Leaves ovate-lanceolate; bracteoles adnate at base; staminal tube truncate at apex ..... **A. bidentata**
1. Leaves elliptic to obovate; bracteoles entirely adnate; staminal tube semicircular at apex **2**
2. Bracts broadly ovate; mouth of staminal tube long ciliate; branches tomentose .... **A. aspera** var. **aspera**
2. Bracts lanceolate; mouth of staminal tube not ciliate; branches glabrous ..... **A. aspera** var. **pubescens**

Achyranthes aspera L., Sp. Pl. 204. 1753, var. **aspera**; Wight, Ic. t. 1777. 1852; Hook. f., FBI 4: 730. 1885; Gamble, FPM 1176. 1925; Fyson, FSIHS 487. 1932; Matthew, FPH 1025. 1999. **Nayaruvi Chedi.**

Stout, erect herbs. Leaves to 8 x 4 cm, elliptic, apex acuminate, sparingly tomentose above, dense below. Spikes to 40 cm, hispid; tepals pink, 5 x 2 mm, acute, glabrous. Achenes 2.5 x 1 mm, brown.

Fl. & Fr.: October-December

Distr.: South India and Sri Lanka. Occasional; in open regions at lower altitudes. MS, Kulachivayal, *KKK 16671.*

Achyranthes aspera L. var. **pubescens** (Miq.) Townsend, Kew Bull. 28: 145. 1973 & Kew Bull. 29: 473. 1974.

Erect herbs. Leaves 5 x 3 cm, obovate, apex acuminate, puberulous on both sides. Spike 7 cm long, hispid; wings of the bracteoles unequal, apically free; bracts lanceolate; tepals 5 mm long, acuminate; staminal tube cuneate. Achenes 2 mm long, cuspidate.

Fl. & Fr.: January-March.

Distr.: India. Common along shola borders at lower altitudes. MS, Perumala, *KKK 16103.*

Achyranthes bidentata Blume, Bijdr. 545. 1826; Wight, Ic. t. 1779. 1852; Hook. f., FBI 4: 730. 1885; Gamble, FPM 1176. 1925; Fyson, FSIHS 487. t. 426. 1932; Matthew, FPH 1025. 1999. **Nayaruvi Chedi.**

Scandent herbs. Leaves to 8 x 4 cm, ovate-elliptic, base cuneate, apex acute, thinly pubescent. Spikes 10-25 cm long, narrow. Flowers pink, 4 mm wide; tepals 7 x 1.5 mm, lanceolate, apex acute; stamens 5; ovary depressed-globose. Achenes 3 x 1.5 mm, cylindrical, reddish brown.

Fl. & Fr.: July-December.

Distr.: Asia and Africa. Occasional; found along shola borders and other open places at lower altitudes. MS, Kulachivayal, *KKK 16671.*

ALLMANIA R. Brown *ex* R. Wight

J. Bot. (Hooker) 1: 226. 1834

Allmania nodiflora (L.) R. Br. *ex* Wight in Hook. J. Bot. 1: 227. t. 128. 1834; Hook. f., FBI 4: 716. 1885; Gamble, FPM 1167. 1925; Matthew, FPH 1027. 1999. *Celosia nodiflora* L., Sp. Pl. 205. 1753. *Allmania albida* (Willd.) R. Br. *ex* Hook. f., FBI 4: 717. 1885. *Celosia albida* Willd., Sp. Pl. 1: 1197. 1798. *Chamissoa albida* (Willd.) Wight, Ic.

t. 1769. 1852. *Allmania longipedunculata* (Trimen) Gamble, FPM 1168. 1925. *A. nodiflora* (L.) R. Br. *ex* Wight var. *roxburghii* Hook. f., FBI 4: 717. 1885.

Straggling herbs, highly branched; root stock stout. Leaves to 6 x 1.5 cm, elliptic-oblong, apex acute, entire, chartaceous. Flowers in terminal or axillary globose cymes, 1.5 cm across; tepals 5, equal, 5 x 1 mm, obovate-oblong; stamens 5; ovary obovoid, 1 celled. Achenes 3 x 2 mm, ellipsoid, with a long beak, biconvex, black.

Fl. & Fr.: November-December.

Distr.: Tropical Asia. Occasional; in exposed regions along stream sides at lower altitudes. MS, Chengalar, *KKK 16664.*

AMARANTHUS Linnaeus

Sp. Pl. 989. 1753

Amaranthus viridis L., Sp. Pl. ed. 2. 1405. 1763; Hook. f., FBI 4: 720. 1885; Gamble, FPM 1171. 1925; Matthew, FPH 1030. 1999. *Euxolus caudatus* Moq. in DC., Prodr. 13(2): 274. 1849; Wight, Ic. t 1773. 1852. **Arakkeera (EBIS).**

Decumbent herbs; stem reddish. Leaves alternate, 2.5 x 2 cm, obovate, base cuneate, apex emarginate. Flowers purplish, monoecious, in axillary, globose or terminal spikes. Male flowers: tepals 3, 1 mm long, ovate-lanceolate; stamens 3. Female flowers: tepals 0.5 mm long, obovate; ovary ovoid, compressed, 1 celled. Utricle 2 x 1 mm, orbicular, compressed; seed 1 mm across, orbicular, dark brown.

Fl. & Fr.: Throughout the year

Distr.: Pantropical. Occasional; in disturbed forest areas at low altitudes. MS, Kulachivayal, *KKK 18582.*

CELOSIA Linnaeus

Sp. Pl. 205. 1753

Celosia pulchella Moq. in DC., Prodr. 13(2): 238. 1849; Wight, Ic. t. 1768. 1852; Hook. f., FBI 4: 715. 1885; Gamble, FPM 1166. 1925; Fyson FSIHS 486. 1932; Matthew, Suppl. Ill. FPH t. 1127. 1998 & FPH 1032. 1999.

Erect, glabrous herbs. Leaves alternate, to 5 x 2 cm, ovate, base cuneate, apex acute. Spikes terminal and axillary, 5-12 cm long, slender. Flowers pale rose, clustered; tepals 5, 2.5 x 1 mm, elliptic-ovate, hyaline; stamens 5; ovary globose. Utricles 4 x 3 mm, ovoid, seeds many, 1 mm across, black, muricate.

Fl. & Fr.: September-December.

Distr.: India and Sri Lanka. Rare; along shola borders at lower altitudes. MS, Kulachivayal, *KKK 16681.*

77. CHENOPODIACEAE

CHENOPODIUM Linnaeus

Sp. Pl. 218. 1753

Chenopodium ambrosioides L., Sp. Pl. 219. 1753; Wight, Ic. t. 1786. 1852; Hook. f., FBI 5: 4. 1886; Gamble, FPM 1181. 1925; Fyson, FSIHS 489. 1932; Matthew, FPH 1037. 1999. **Natta Chedi (EBIS).**

Erect, aromatic, gregarious herbs; stems pink, pubescent. Leaves alternate, lower ones large, to 9 x 3 cm, oblong-lanceolate, base attenuate, dentate. Flowers greenish, bisexual, in axillary, panicled spikes; perianth 5 lobed, 1 mm long, ovate-acute, concave, incurved; stamens 5, yellow; ovary 1 celled, globose. Utricle enclosed by the persistent perianth; seeds smooth.

Fl. & Fr.: Throughout the year

Distr.: Native of Tropical America; introduced in many tropical countries. Occasional; in marshy areas of grasslands and roadsides at lower altitudes. MS, Pallang Mala, *KKK 16693.*

78. PHYTOLACCACEAE

PHYTOLACCA Linnaeus

Sp. Pl. 441. 1753.

Phytolacca octandra L., Sp. Pl. ed. 2. 1: 631. 1762; Ghosh & Sikdar, J. Econ. Tax. Bot. 4(1): 159. 1983; Matthew, Ill. FPH t. 586. 1996 & FPH 1039. 1999.

Erect, fleshy herbs. Leaves alternate, to 10 x 3.5 cm, elliptic- lanceolate, base acute to attenuate, papillose, veins pink. Flowers 5-7 mm across, bisexual, in terminal spikes; perianth 5 lobed, 3 x 2 mm, ovate-acute; stamens 10; ovary 2 x 1 mm, 6-7 lobed, discoid. Capsule, 7 mm across, depressed, globose; seeds 6-8, 3 mm across, orbicular, discoid, black, shining.

Fl. & Fr.: August-December.

Distr.: Native of Paraguay, South America; introduced in many tropical countries. Common along roadsides, shola borders and watercourses at lower altitudes. MS, Chengalar, *KKK* 16573; Puthur, *KKK* 16725.

Note: New record to the flora of Kerala.

79. POLYGONACEAE

1. Flowers 3-5-merous; stigma capitellate ..... **Persicaria**
1. Flowers 6-merous; stigma fimbriate ..... **Rumex**

PERSICARIA (Linnaeus) P. Miller

Gard. Dict. Abr. ed. 4. 1754.

1. Inflorescence a simple or corymbose panicle **2**
1. Inflorescence a capitate spike ..... **P. nepalensis**
2. Trailing or scandent shrubs; flowers in corymbose heads; tepals white ..... **P. chinensis**
2. Stout, erect herbs; flowers in simple, subsessile racemes; tepals pink ..... **P. glabra**

Persicaria chinensis (L.) Gross, Bot. Jahrb. Syst. 49: 269, 277 & 315. 1913; Matthew, FPH 1045. 1999. *Polygonum chinense* L., Sp. Pl. 363. 1753; Wight, Ic. t. 1806. 1852; Hook. f., FBI 5: 44. 1886; Gamble, FPM 1190. 1925; Fyson, FSIHS 493. t. 429. 1932. **Mukkala, *Oduthan* (EBIS) Plate 4.10.3.**

Leaves to 12 x 6 cm, ovate, base rounded, apex acuminate. Flower heads in corymbose panicles, to 5 x 4 cm; perianth white, lobes 6, 4 x 2 mm, ovate; stamens 8; ovary 1 mm, obovate. Nutlets 5 mm long, compressed.

Fl. & Fr.: July-February

Distr.: India, China, Japan and Malesia. Common along shola borders and roadsides at lower altitudes. MS, Gudalar, *KKK 16089*; K-4, *KKK 16468*. VMS, *KKK 31143*.

Persicaria glabra (Willd.) M. Gomez, Ann. Inst. Segunda Ensef. Habana 2: 278. 1896; Matthew, FPH 1045. 1999. *Polygonum glabrum* Willd., Sp. Pl. 2: 447. 1799; Wight, Ic. t. 1797. 1852; Hook. f., FBI 5: 34. 1886; Gamble, FPM 1189. 1925; Fyson, FSIHS 491. 1932. **Cherumukkala. Plate 4.10.4.**

Leaves to 18 x 2 cm, narrow-lanceolate, glabrous. Inflorescence a terminal or axillary branched raceme; perianth lobes 5, 2.5 mm long, pink coloured; stamens 5. Nutlets 2 mm across, brown, shining.

Fl. & Fr.: November-December

Distr.: India, Africa, Eastward to Malesia. Common; found along stream sides and roadsides at lower altitudes. MS, Perumala, *KKK 31050*.

Persicaria nepalensis (Meisner) Gross, Bot. Jahrb. Syst. 49: 277. 1913; Matthew, FPH 1046. 1999. *Polygonum nepalense* Meisner, Mon. Polygon. 84. t. 7. f. 2. 1826; Wight, Ic. t. 1804. 1852. *P. alatum* Buch.-Ham. *ex* Spreng., Syst. Cur. Post. 4 (2): 154. 1827; Hook. f., FBI 5: 41. 1886. *P. punctatum* Buch.-Ham. *ex* D. Don, Prodr. Fl. Nep. 72. 1825; Gamble, FPM 1190. 1925. **Cherumukkala.**

Diffuse herbs, stem pink, rooting from lower nodes. Leaves to 3.5 x 2.5 cm, deltoid, base truncate to obtuse, abruptly narrowing to a sheathing petiole, apex acute, sparsely hairy. Spikes 1 cm across, in the axils of terminal leaves; tepals white to pink, 4 fid, 2 mm long, obtuse. Nutlets to 1.5 mm across, black, apiculate.

Fl. & Fr.: July-December

Distr.: Tropical Africa, India, east to Malesia. Common along roadsides at lower and medium altitudes. MS, K-4, *KKK 16520*. ENP, Nilgiri Teri, *KKK 18033*.

RUMEX Linnaeus

Sp. Pl. 333. 1753

Rumex nepalensis Spreng. in L., Syst. Veg. 2: 159. 1825; Wight, Ic. t. 1810. 1852; Hook. f., FBI 5: 60. 1886; Gamble, FPM 1192. 1925; Fyson FSIHS 496. t. 432. 1932; Matthew, FPH 1049. 1999. **Chethakkala (EBIS).**

Foul smelling herbs; stem grooved. Radical leaves to 20 x 8 m, oblong-lanceolate; upper leaves to 12 x 4 cm, elliptic-lanceolate, base truncate to obtuse, apex acute, margin serrulate to wavy. Racemes lax, terminal, to 65 cm. Flowers bisexual, whorled, leafy; tepals 6, biseriate, inner larger, 3 mm across, orbicular, fimbriate; stamens 6, free; ovary 3 celled. Capsule 2.5 x 1.5 mm, 3 winged, glabrous.

Fl. & Fr.: August-December

Distr.: Paleotropics. Common; along roadsides at lower altitudes. MS, Pallang Mala, *KKK 16698*.

80. PODOSTEMACEAE

1. Thallus fucoid or dimorphic; secondary shoots from the margin, with leaf bearing axes.....**Polypleurum**
1. Thallus crustaceous or ribbon like; secondary shoots found as rosettes of leaves..... **Zeylanidium**

POLYPLEURUM (Tulsane) Warming

Kongel. Danske Vidensk.-Selsk. Skr. Ser. 6, II: 64. 1901

Polypleurum stylosum (Wight) Hall, Kew Bull. 26: 131. 1971; Matthew & Satheesh, Aquatic Bot. 57: 287. 1997. *Dicraea stylosa* Wight, Ic. t. 1917, f. 2. 1852; Gamble, FPM 1196. 1925. *Podostemon stylosus* (Wight) Benth. *ex* Hook. f., FBI 5: 64. 1884.

Floral bracts 2 pairs, apex filamentous, to 7 mm long, base dilated; tepals 2, linear; stamens 2, monadelphous, as long as the ovary; ovary smooth; fruiting pedicel 5 mm long. Capsule 8 ribbed, isolobous, with persistent style base at apex; seeds very small, elliptic, numerous.

Fl. & Fr.: January-March

Distr.: India and Sri Lanka. Rare; on boulders and rocks in low altitude streams. MS, Thalachorkadavu, *KKK 18128*.

ZEYLANIDIUM (Tulasne) Engler

in Engler & Prantl, Nat. Pflanzenfam. ed. 2, 18a : 61. 1930.

1. Spathe splitting dorsally; stamens above 8 mm long; ovary elliptic..... **Z. johnsonii**
1. Spathe opening at apex; stamens up to 4 mm long; ovary globose.....**Z. olivaceum**

Zeylanidium johnsonii (Wight) Engl. & Prantl, Nat. Pflanzenf. 180: 62. 1930. *Mniopsis johnsonii* Wight, Ic. t. 191. f. 5. 1852. *Podostemon johnsonii* (Wight) Wedd. in DC., Prodr. 17: 75. 1873; Hook. f., FBI 5: 66. 1886. *Hydrobryum johnsonii* (Wight) Willis, Ann. Roy. Bot. Gard. (Peradeniya) 1: 241. 1902; Gamble, FPM 1198. 1925.

Thallus crustaceous, in circular, reddish green patches. Leaves linear, hair like, in scattered tufts, absent at flowering. Spathe boat shaped. Flowers zygomorphic; pedicel 5 mm in fruits; stamens monadelphous, anthers subequal; staminodes 2 on either side. Capsule to 3 x 2 mm, ellipsoid.

Fl & Fr.: November-December

Distr.: Endemic to Peninsular India. Occasional; in shola streams at high altitudes. ENP, Rajamala, *KKK 18079*.

Zeylanidium olivaceum (Gard.) Engl. in Engl. & Prantl, Pflanzenf. (ed. 2) 18a: 62. 1930; Matthew & Satheesh, Aquatic Bot. 57: 57: 271. 1997; Matthew, FPH 1051. 1999. *Podostemon olivaceum* Gard., Calcutta J. Nat. Hist. 7: 181. 1847; Hook. f., FBI 5: 66. 1886. *Hydrobryum olivaceum* (Gard.) Tul., Ann. Sci. Nat. Bot. ser. 3, 11: 104. 1849; Gamble, FPM 1198. 1925; Fyson, FSIHS 498. 1932.

Thallus thin, disc like, crustaceous, to 7 cm in diameter. Leaves small, subulate, all over the dorsal surface, often stalked; stalk to 5 x 0.4 cm, with several filiform segments, 4.5 cm long, secondary shoots many. Flowers one per shoot, zygomorphic,

bisexual. Spathe oblong, thin; stamens 2, staminodes 2; ovary globose, sub sessile. Capsule 3-5 mm long, 8 ribbed; seeds dark brown, ovoid..

Fl. & Fr.: November-March

Distr.: South India and Sri Lanka. Rare; in high altitude streams. ENP, Bhiman Odai, *KKK 18080.*

81. PIPERACEAE

1. Small succulent herbs; flowers bisexual..... **Peperomia**
1. Large scandent shrubs; flowers unisexual ..... **Piper**

PEPEROMIA Ruiz. *et* Pavon

Prodr. 8. 1794.

1. Leaves alternate, upper ones opposite, > 3 cm long, fleshy, 3 ribbed; spike glabrous. **P. portulacoides**
1. Leaves all whorled, < 1 cm long, coriaceous, ribs and nerves invisible; spike pubescent... **P. tetraphylla**

Peperomia portulacoides (Lam.) Dietr., Sp. Pl. ed. 6. 1: 172. 1831; Wight, Ic. t. 1922. 1853; Hook. f., FBI 5: 98. 1886; Gamble, FPM 1210. 1925. *Piper portulacoides* Lam., Encycl. 1: 82. 1791. *Peperomia courtallensis* Miq. in Hook. Lond. Journ. Bot. v. 549. 1846; Wight, Ic. t. 1923, 2. 1853.

Epiphytic or terrestrial herbs; stems succulent, glabrous. Leaves to 3.8 x 2.5 cm, almost orbicular, base cuneate, apex obtuse, glabrous, upper ones opposite, lower alternate, smaller. Spike 3 cm long, terminal and axillary; bracts orbicular, sessile, margins white. Nutlets ovoid, partially embedded in the rachis.

Fl. & Fr.: July-December

Distr.: Madagascar and India. Common at low and medium altitudes. MS, K-4.5, *KKK 16519* & *KKK 18132*; K-5, *KKK 18148.*

Peperomia tetraphylla (Forst.) Hook. & Arn., Bot. Beechy Voy. 97. 1832; Matthew, Ill. FPH t. 597. 1996 & FPH 1056. 1999. *Piper tetraphyllum* Forst., Prodr. 5. 1759. *P. reflexum* L. f., Suppl. Pl. 91. 1781. *Peperomia reflexa* (L. f.) Dietr., Sp. Pl. 1: 180. 1839; Wight, Ic. t. 1923, 1. 1853; Hook. f., FBI 5: 99. 1886; Gamble, FPM 1209. 1925; Fyson, FSIHS 501. t. 435. 1932.

Epiphytic herbs; branches diffuse, rooting at nodes; stem and leaves thinly pubescent. Leaves small, 4 at a node, to 1 cm wide, orbicular, obtuse. Spikes 2 x 0.15 cm, erect, stout; bracts sessile, with white margins. Flowers arranged densely. Nutlets 0.8 x 0.4 mm, ovoid, beaked, brown, glabrous.

Fl. & Fr.: December-February

Distr.: Pantropical. Common at low and medium altitudes. MS, K-3, *KKK 16106.*

PIPER Linnaeus

Sp. Pl. 28. 1753.

1. Fruiting spikes < 1.5 cm long, subglobose; mature spikes erect..... **P. mullesua**
1. Fruiting spikes > 4 cm long, cylindric; mature spikes pendulous..... **2**

2. Bracts forming a short cup under flowers ..... **P. nigrum**
2. Bracts does not form a cup under flowers 3
3. Leaves coriaceous 4
3. Leaves membranous 5
4. Leaves 3-5 ribbed from base; ribs, nerves and reticulations very prominent ..... **P. schmidtii**
4. Leaves 5-7 ribbed from base; reticulations not so prominent ..... **P. wightii**
5. Leaves and branchlets quite glabrous ..... **P. trioicum**
5. Leaves and branchlets hairy or scaly 6
6. Leaves pubescent with crisped hairs ..... **P. hymenophyllum**
6. Leaves beneath covered with round silvery scales, above often bullate ..... **P. argyrophyllum**

Piper argyrophyllum Miq., Syst. Piperac. 330. 1844; Wight, Ic. t. 1914. 1853; Hook. f., FBI 5: 93. 1886; Gamble, FPM 1207. 1925; Matthew, Ill. FPH t. 599. 1996 & FPH 1057. 1999. **Kattu Kurumulaku (EBIS) Plate 4.10.5.**

Leaves to 14 x 7 cm, broad-elliptic to lanceolate, base rounded to obtuse, apex acuminate, 5 nerved from base, membranous. Spikes pendulous; male spikes slender, 8 x 0.2 cm; female spikes larger, 14 x 0.35 cm; stamens 3; ovary 4 x 2.5 mm, ovate-ellipsoid, glabrous. Berry to 0.5 cm wide, globose.

Fl. & Fr.: March-May

Distr.: South India and Sri Lanka. Occasional; at high altitudes. MS, Idlimottai, *KKK 17631*; *KKK 18169.*

Piper hymenophyllum Miq., London J. Bot. 5: 554. 1846; Wight, Ic. t. 1942. 1853; Hook. f., FBI 5: 93. 1886; Gamble, FPM 1207. 1925; Matthew, Ill. FPH t. 600. 1996 & FPH 1057. 1999.

Leaves broadly ovate, to 12.5 x 7 cm, base rounded, apex abruptly acuminate, 7 ribbed, membranous, hairy beneath, along nerves and petiole. Male spikes long, slender, to 12 x 0.2 cm; peduncle 2 cm; female spikes 11 x 1 cm; ovary 3 mm long, ovoid. Berry 4 x 3 mm, ovoid.

Fl. & Fr.: Throughout the year

Distr.: Endemic to Peninsular India. Common in low altitude shola regions. MS, K-4, *KKK 16465*; Thalachorkadavu, *KKK 17623.*

Piper mullesua Buch.-Ham. *ex* D. Don, Prodr. Fl. Nep. 20. 1825; Matthew, Ill. FPH t. 601. 1996 & FPH 1058. 1999. *Chavica sphaerostachya* Miq., Syst. Piperac. 239. 1843; Wight, Ic. t. 1928. 1853. *Piper brachystachyum* Wall. *ex* Hook. f., FBI 5: 87. 1886; Gamble, FPM 1206. 1925; Fyson, FSIHS 499. t. 433. 1932. **Kattu Thippali. (EBIS) Plate 4.10.6.**

Leaves to 11 x 5 cm, elliptic-ovate to lanceolate, base acute, apex obtusely caudate-acuminate, 3 ribbed from base, glabrous. Spikes erect. Male spikes to 7 x 0.2 cm, elongate; female spikes 0.8 x 0.7 cm, globose-oblong; bracts orbicular; stamens 2; ovary to 1.5 x 1 mm, obovoid. Berry 3.5 x 2 mm, obovoid.

Fl. & Fr.: Throughout the year; peak period of flowering: June-July

Distr.: India and Bhutan. Common in medium altitude sholas. MS, K-6, *KKK 16175.* PUS, *KKK 18575 & KKK 18576.*

Piper nigrum L., Sp. Pl. 28. 1753; Hook. f., FBI 5: 90. 1886; Gamble, FPM 1206. 1925; Matthew, Ill. FPH t. 602. 1996 & FPH 1059. 1999. **Kattu Kurumulaku, Eya Kodi (EBIS).**

Leaves large, to 18 x 10 cm, broadly ovate (in females) or elliptic and narrow (in males) base rounded, apex caudate-acuminate, coriaceous, glabrous, 3 ribbed from base, another pair above. Male spikes slender, to 12 x 0.4 cm; stamens 2; female spikes 10 x 0.4 cm. Berries large, 9 x 7 mm, globose, few in a spike.

Fl. & Fr.: March-May

Distr.: Peninsular India, spread to many countries including Sri Lanka. Common; at all altitudes. MS, Methappu, *KKK* 16007; Thalachorkadavu, *KKK 17625*; Coupe road, *KKK 16583.* ENP, Mampallam Chola, *KKK 17559.*

Piper schmidtii Hook.f., FBI 5: 89. 1886; Gamble, FPM 1206. 1925; Fyson, FSIHS 500. t. 434. 1932. *P. arborescens* Miq., Syst. Piperac. 320. 1844 p.p. **Kattu Kurumulaku, Eya Kodi (EBIS). Plate 4.10.7.**

Leaves to 11 x 6 cm, elliptic-ovate or ovate-oblong, base rounded or obtuse, apex obtusely acute to acuminate, coriaceous, glabrous, margins wavy or recurved. Male spikes slender, to 5 cm long; female spikes stout, to 8 cm long. Berries to 6 x 5 mm, oblong-ovoid, yellow to orange when ripe, dense on the spike.

Fl. & Fr.: Throughout the year

Distr.: Endemic to Southern Western Ghats. Common at high altitudes only. MS, Idlimottai, *KKK 16026*; *KKK 17574*; *KKK 17591*; *KKK 18179;* K-5, *KKK 17616.* ENP, MPCA, *KKK 17523*; Plot 2, *KKK 17640*; V-Point, *KKK 17642.*

Piper trioicum Roxb., Fl. Ind. 1: 151. 1820 ; Wight, Ic. tt. 1935, 1936. 1853. *P. attenuatum* Buch.-Ham. *ex* Miq., Syst. Piperac. 306. 1843; Wight, Ic. t. 1933. 1853; Hook. f., FBI 5: 92. 1886; Gamble FPM 1207. 1925. *P. sylvestre* sensu Wight, Ic. t. 1937. 1853, non Lam. 1791; Hook. f., FBI 5: 93. 1886. **Kattu Kurumulaku (EBIS).**

Leaves to 11 x 6 cm, elliptic-ovate, ovate or sub-orbicular, base rounded or cordate, apex abruptly acuminate, 7-ribbed at base. Male spikes very slender, to 7 x 0.2 cm; female spikes to 13 cm. Berries 5 x 4 mm, fleshy, crowded.

Fl. & Fr.: February-March

Distr.: Indo-Malesia. Common in high altitude sholas. MS, Idlimottai, *KKK 17580*; *KKK 17585*; Methappu, *KKK 17593*; Thalachorkadavu, *KKK* 17624. ENP, MPCA, *KKK 17524*

Piper wightii Miq., London J. Bot. 5: 552. 1846; Wight, Ic. t. 1939. 1853; Hook. f., FBI 5: 94. 1886; Gamble, FPM 1207. 1925; Fyson, FSIHS 500. 1932; Matthew, Ill. FPH t. 603. 1996 & FPH 1059. 1999. **Kattu Kurumulaku, Eya (EBIS).**

Leaves to 17 x 11 cm, large, broadly ovate, base cordate to rounded, apex abruptly acuminate, 3-5 ribbed from base, glabrous. Male spikes slender, pendulous, to 8 cm long; stamens 3; female spikes to 9 cm; ovary to 5 mm, ellipsoid. Berry to 7 x 5 mm, ovoid-globose, smooth.

Fl. & Fr.: February-March

Distr.: Endemic to Southern Western Ghats. Common in low and medium altitude sholas. MS, K-3, *KKK 16110*; *KKK 16116*; K-4.5, *KKK 16171.*

82. LAURACEAE

1. Leaves 3-5 nerved from base 2
1. Leaves penninerved 4
2. Inflorescence an umbel; flowers unisexual 3
2. Inflorescence a panicle; flowers bisexual ..... **Cinnamomum**
3. Leaves subverticillate, fertile stamens 9 ..... **Actinodaphne**
3. Leaves alternate; fertile stamens 6 ..... **Neolitsea**
4. Inflorescence an umbel; flowers unisexual ..... **Litsea**
4. Inflorescence a panicle, flowers bisexual 5
5. Leaves alternate to sub-opposite; reticulations raised and areolate; berry oblong ..... **Beilschmiedia**
5. Leaves alternate; reticulations not raised and prominent; berry ovoid or globose 6
6. Anthers 4 celled 7
6. Anthers 2 celled 8
7. Leaves tawny pubescent below; fruiting perianth erect, persistent ..... **Phoebe**
7. Leaves glabrous to glaucous below; fruiting perianth reflexed, deciduous ..... **Persea**
8. Fruit surrounded by the enlarged perianth tube ..... **Cryptocarya**
8. Fruit not surrounded by the enlarged perianth tube ..... **Apollonias**

ACTINODAPHNE Nees

in Wallich, Pl. Asiat. Rar. 2: 68. 1831.

1. Leaves with lowest pair of opposite nerves ..... **A. bourneae**
1. Leaves penninerved; lowest pair not opposite 2
2. Leaves to 25 cm, oblanceolate; female flowers in peduncled umbels ..... **A. bourdillonii**
2. Leaves < 15 cm, elliptic-lanceolate; female flowers in sessile umbels ..... **A. malabarica**

Actinodaphne bourdillonii Gamble, Kew Bull. 1925: 129. 1925 & FPM 1231. 1925; Nair, J. Econ. Tax. Bot. 17: 266. 1993. **Vari Maram (EBIS).**

Large trees; branchlets densely tomentose. Leaves to 25 x 7 cm, acuminate at both ends, under surface grey or cinnamomeous tomentose; penninerved. Flowers 6-8; perianth tube short, lobes 5 mm long; tepals 5 mm long. Berry 9 mm across, globose.

Fl. & Fr.: February-June.

Distr.: Endemic to Southern Western Ghats (Kerala). Rare in medium altitude sholas. PAS, Top Station, *KKK 18600.*

Actinodaphne bourneae Gamble, Kew Bull. 1925: 128. 1925 & FPM 1231. 1925; Fyson, FSIHS 505. 1932; Matthew, Ill. FPH t. 605. 1996 & FPH 1065. 1999.

Medium sized trees. Leaves to 15 x 6 cm, elliptic-lanceolate, base acute, apex acuminate; branchlets, petiole, nerves and pedicels fulvous tomentose. Flowers 3-6, in sessile lateral clusters; perianth yellowish, 5 mm wide, tube 4 mm, lobes 6, ovate. Berry globose.

Fl. & Fr.: January-February.

Distr.: Endemic to Southern Western Ghats. Common in high altitude sholas. ENP, Anamudi slope, *KKK 18546.*

Notes: New record to the flora of Kerala. This species could not be collected during this century and was considered extinct (Nayar, 1997).

Actinodaphne malabarica Balakr., J. Bombay Nat. Hist. Soc. 63: 329. 1967; Matthew, Ill. FPH t. 606. 1996 & FPH 1065. 1999. *A. hirsuta* sensu Hook. f., FBI 5: 152. 1886, non Blume, 1851; Gamble, FPM 1231. 1925.

Large trees; branchlets and tender parts thickly villous. Leaves 5-6, whorled at top, to 13 x 4 cm, elliptic-lanceolate, base acute, apex long acuminate, younger leaves rusty tomentose. Flowers 5-6, in axillary, sessile clusters; perianth yellowish, to 8 mm wide, tube 2.5 mm, lobes ovate. Berry 1 cm wide, globose.

Fl. & Fr.: August-January

Distr.: Endemic to Southern Western Ghats. Occasional; in medium altitude sholas. MS, K-5, *KKK 31047.*

APOLLONIAS Nees

Laurin. Expos. 10. 1833.

Apollonias arnottii Nees, Syst. Laurin. 670. 1836; Wight, Ic. t. 1819. 1852; Hook. f., FBI 5: 121.1886; Gamble, FPM 1219. 1925. ***Chulunthu.***

Medium sized trees. Leaves scattered near the apex of branchlets, to 15 x 3 cm, lanceolate, acuminate at both ends. Flowers very small, in axillary or sub terminal racemes; perianth tube short, lobes 5, to 3 mm long, in two rows; stamens 9 perfect, stalk glandular; staminodes 3; ovary sessile, globose. Drupes ovoid, black.

Fl. & Fr.: January-March.

Distr.: Endemic to Southern Western Ghats. Common in high altitude sholas. ENP, Mampallam Chola, *KKK* 17563; Amara Chola, *KKK 18531*; Pannithavarnai, *KKK 18554.*

BEILSCHMIEDIA Nees

in Wallich, Pl. Asiat. Rar. 2: 61, 69. 1831.

Beilschmiedia wightii (Nees) Benth. *ex* Hook. f., FBI 5: 124. 1886; Gamble, FPM 1221. 1925; Matthew, Ill. FPH t. 608. 1996 & FPH 1067. 1999. *Haasia wightii* Nees, Syst. Laurin. 676. 1836; Wight, Ic. t. 1831. 1852. **Panthada, Nagara Maram (EBIS) Plate 4.11.1.**

Large trees. Leaves to 13 x 7 cm, ovate-elliptic, apex obtusely acute or acuminate, often oblique, glabrous, shining, reticulations prominent. Panicles to 8 cm long; perianth yellowish white, 5 mm wide, lobes 6, 2 mm long, ovate; stamens 9; staminodes 3. Berry 3.5 x 2 cm, smooth, purple when ripe.

Fl. & Fr.: May-July.

Distr.: Endemic to Southern Western Ghats. Common in medium altitude sholas. MS, K-4, *KKK 31001.*

CINNAMOMUM Schaeffer

Bot. Exped. 74. 1760, *nom. cons.*

1. Basal lateral nerves reaching the leaf tip ..... **C. malabatrum**
1. Basal lateral nerves not reaching the leaf tip **2**
2. Young leaves seriaceous underneath ..... **C. travancoricum**
2. Young leaves glabrous or sparingly tomentose underneath **3**

3. Flowers <2 .5 mm long, glabrous; pedicels filiform ..... **C. filipedicellatum**
3. Flowers > 2.5 mm long, seriaceous; pedicels not filiform **4**
4. Panicles long, lax **5**
4. Panicles very short ..... **C. wightii**
5. Fruit cup 5-6 mm high; bark odourless ..... **C. keralaense**
5. Fruit cup to 15 mm high; bark and leaves with clove-aniseed smell ..... **C. macrocarpum**

Cinnamomum filipedicellatum Kosterm., BBSI 25: 93. 1983(1985). *C. gracile* sensu Hook. f., FBI 5: 133. 1886; Gamble, FPM 1223. 1925, non Miq. 1864.

Small tree; branchlets slender, glabrous. Leaves to 12 x 6 cm, elliptic-ovate, base cuneate, apex obtusely acuminate, subcoriaceous, glabrous, glaucous beneath. Panicles axillary or pseudo-terminal, slender. Flowers to 2.5 mm long, glabrous; tepals 2 mm, ovate; stamens 3 whorled; staminodes aciculate; ovary ellipsoid. Berry to 1 x 0.8 cm, ellipsoid.

Fl. & Fr.: February-June

Distr.: Endemic to Southern Western Ghats. Rare; at medium altitudes. MS, K-4, *KKK 31109.*

Cinnamomum keralaense Kosterm., BBSI 25: 98. 1983. *C. litseaefolium* sensu Hook. f., FBI 5: 133. 1886, non Thw., 1861; Gamble, FPM 1225. 1925.

Medium trees; branchlets glabrous. Leaves to 11 x 5 cm, apex acuminate, base cuneate; ribs faint, subparallel. Panicles 5-10 cm long, axillary. Flowers 6 mm wide; tepals ovate, obtuse, densely tomentose; fertile stamens in second and fourth whorls, filaments sparsely tomentose; staminodes in first and third whorls, hairy.

Fl. & Fr.: December-January

Distr.: Endemic to Southern Western Ghats (Kerala). Occasional; at higher altitudes. MS, Idlimottai, *KKK 31105.*

Cinnamomum macrocarpum Hook. f., FBI 5: 133. 1886; Gamble, FPM 1225. 1925; Fyson, FSIHS 504. 1932; Kosterm, BBSI 25: 100. 1983. *C. iners* sensu Wight, Ic. tt. 122 & 130. 1839, non Reinw. *ex* Blume, 1826.

Tall trees; branchlets glabrous. Leaves to 12 x 6 cm, base cuneate, apex obtusely acute; ribs 1-1.5 cm above the base; nervules indistinct. Panicles axillary, long-peduncled, glabrous. Flowers 6 mm across; tepals hairy. Fruiting calyx 1 cm across, cupular. Berry 2 x 1 cm, ellipsoid, dark-brown.

Fl. & Fr.: January-April

Distr.: Endemic to Southern Western Ghats. Occasional; at higher altitudes. MS, Idlimottai, *KKK 31107.*

Cinnamomum malabatrum (Burm. f.) Blume, Bijdr. 568. 1826; Kosterm. in Manilal, Bot. Hist. Malab. 167. 1980 & BBSI 25: 102. 1983. *Laurus malabatrum* Burm. f., Fl. Ind. 92. 1768. *Cinnamomum iners* sensu Gamble, FPM 1224.1925, non Rainw. *ex* Blume, 1826. **Vella Kodala (EBIS).**

Medium sized trees; branchlets glabrous. Leaves to 32 x 8 cm, acute at both ends, ribbed from base or often 1.5 cm above. Panicle to 20 x 5 cm, upper axillary, densely

yellow-tomentose. Flowers 3-4 mm across; tepals ovate, acute; stamens in first and fourth whorls; staminodes in second and third whorls; ovary glabrous.

Fl. & Fr.: February-June

Distr.: Endemic to Southern Western Ghats. Rare; in low altitudes. MS, K-4, *KKK 31106.*

Cinnamomum travancoricum Gamble in Kew Bull. 1925:128.1925 & FPM 1224.1925.

Small tree; branchlets slender, angular. Leaves to 8 x 6 cm, elliptic, base acute, apex obtusely acuminate, subcoriaceous, glabrous above, thinly seriaceous glabrescent below. Racemes pseudo-terminal and axillary; perianth tube funnel shaped; tepals to 3.5 mm, oblong. Fruit not seen.

Fl. & Fr.: February-June

Distr.: Endemic to Southern Western Ghats. Rare; in low altitudes. MS, K-4, *KKK 31106.*

Cinnamomum wightii Meisner in DC., Prodr. 15(1): 11. 1864; Hook. f., FBI 5: 132. 1886; Gamble, FPM 1224. 1925; Fyson, FSIHS 503. t. 437. 1932; Kosterm., BBSI 25: 122. 1983; Matthew, Ill. FPH t. 610. 1996 & FPH 1069. 1999. **Vella Kodala, *Santha Maram* (EBIS) Plate 4.11.2.**

Tall trees. Leaves to 11 x 5 cm, slightly puberulous below, especially on the veins, nerves 1-2 pairs from base. Panicles rusty, to 8 cm; perianth yellowish, rusty, tube 3 mm, lobes 2 mm long, ovate; ovary sub globose. Berry 2.5 x 1 cm, on truncate perianth.

Fl. & Fr.: February-May

Distr.: Endemic to Southern Western Ghats. Common in medium high altitude sholas. MS, Idlimottai, *KKK* 17582; *KKK 18161.* ENP, MPCA, *KKK 17528.*

CRYPTOCARYA R. Brown

Prodr. Fl. Nov. Holland. 1: 402. 1810.

1. Medium sized trees; leaves to 11 cm long; nerves 5-6 pairs; drupes oblong, puberulus .....**C. beddomei**
1. Large trees; leaves to 16 cm long; nerves 9-10 pairs; drupes globose, smooth ..... **C. bourdillonii**

Cryptocarya beddomei Gamble, Kew Bull. 1925: 127. 1925 & FPM 1218. 1925. **Chembalava, Shembalava.**

Leaves to 11 x 6 cm, ovate or elliptic, base rounded, apex obtuse or abruptly acute, shining above, reddish glaucous and glabrous beneath. Panicles axillary or terminal, fulvous pubescent, to 8 cm long. Flowers bisexual; perianth tube ovoid; ovary sessile. Drupe 10 x 6 mm, puberulous.

Fl. & Fr.: January-April.

Distr.: Endemic to Southern Western Ghats. Common in medium altitude sholas. ENP, Pannithavarnai, *KKK 18557.*

Cryptocarya bourdillonii Gamble, Kew Bull. 1925: 125. 1925 & FPM 1218. 1925; Matthew, Ill. FPH t. 611. 1996 & FPH 1070. 1999. *C. wightiana* sensu Hook. f., FBI 5: 120. 1886 p.p., non Thw., 1861.

Leaves to 16 x 7 cm, oblong, apex abruptly acute to acuminate, glabrous. Panicle 5-7 cm across, axillary, rusty tomentose. Flowers 3-4 mm across, shortly pedicelled; perianth lobes 3 mm long, ovate, tomentose; stamens 12, filaments pubescent, outer ones with glands; ovary glabrous. Drupes with an obtuse beak, glabrous.

Fl. & Fr.: February-August

Distr.: Endemic to Western Ghats. Common; in low altitude sholas. MS, Idlimottai, *KKK 31114.*

LITSEA Lamarck

Encycl. Meth., Bot. 3: 574. 1792, *nom. cons.*

1. Leaves glabrous beneath or nearly so 2
1. Leaves pubescent or tomentose beneath 4
2. Umbellules subsessile, in axillary or lateral clusters ..... **L. coriacea**
2. Umbellules in racemes 3
3. Leaves elliptic-lanceolate, base cuneate, apex acuminate; berry ellipsoid ..... **L. glabrata**
3. Leaves obovate, base acute, apex rounded; berry depressed globose ..... **L. oleoides**
4. Leaves elliptic-lanceolate, acute at both ends; nerves 4-5 ..... **L. wightiana** var. **wightiana**
4. Leaves oblong-lanceolate, apex acuminate, narrower; nerves up to 10 .... **L. wightiana** var. **tomentosa**

Litsea coriacea (Heyne *ex* Meisner) Hook. f., FBI 5: 166. 1886; Gamble, FPM 1236. 1925. *Tetranthera coriacea* Heyne *ex* Meisner in DC., Prodr. 15(1): 186. 1864.

Small to medium trees; branchlets glabrous. Leaves to 12 x 4 cm, elliptic-obovate, base narrowed, apex shortly acute, green above, dull grey below. Umbellules 3-6 together, grey-silky in bud; perianth lobes 6; stamens 12. Berry small, ovoid in cup shaped perianth tube.

Fl. & Fr.: April-May.

Distr.: Endemic to Western Ghats. Occasional; in middle altitude sholas. MS, K-5, *KKK 31048.*

Litsea glabrata (Wall. *ex* Nees) Hook. f., FBI 5: 174. 1886; Gamble, FPM 1237. 1925; Matthew, Ill. FPH t. 614. 1996 & 1072. 1999. *Tetranthera glabrata* Wall. *ex* Nees in Wall., Pl. Asiat. Rar. 2: 67. 1831.

Small trees. Leaves to 18 x 4 cm, reddish brown beneath when dry, green above with globose galls. Umbellules axillary or lateral; perianth yellow, tube 3.5 cm, lobes 3+3; stamens 12, filaments hairy; pistillode subglobose; ovary 1.5 cm wide in female flowers. Berry 1.2 x 0.6 cm, covered by the perianth up to the middle.

Fl. & Fr.: November-February

Distr.: Endemic to Western Peninsular India. Occasional; in low and medium altitude sholas. MS, K-3, *KKK 16723*; Methappu, *KKK 31115.*

Litsea oleoides (Meisner) Hook. f., FBI 5: 175. 1886; Gamble, FPM 1236. 1925; Matthew, Ill. FPH t. 616. 1996 & FPH 1073. 1999. *Tetranthera oleoides* Meisner in DC., Prodr. 15(1): 195. 1864. **Chembalava, Shembalava (EBIS) Plate 4.11.3.**

Medium sized trees. Leaves to 13 x 6 cm, light green above, white below, nerves obscure. Umbellules axillary or lateral. Flowers 3-6 in an umbellule, pedicelled; stamens 12. Berry to 2 cm wide, on a short, undulate or cuplike perianth tube.
Fl. & Fr.: March-June.
Distr.: Endemic to Peninsular India. Common along shola borders at medium and high altitudes. ENP, Umayamala, *KKK 17641*; Rajamala, *KKK 31023*.

Litsea wightiana (Nees) Hook. f. in Benth. & Hook. f., Gen. Pl. 3: 162. 1880, var. **tomentosa** (Meisner) Gamble, FPM 1238. 1925. *Cylicodaphne wightiana* Nees var. *tomentosa* Meisner in DC., Prodr. 15: 200. 1864. **Manja Kodala (EBIS) Plate 4.10.8.**

Medium sized trees; branchlets ferruginous-tomentose. Leaves to 12 x 4 cm, subcoriaceous. Umbellules in axillary or lateral racemes; flowers 6-12; perianth rusty yellow, hairy, 7 mm wide, tube 4 mm, lobes 3+3, 3 mm long; ovary 1.5 mm wide; staminodes 12 or 16. Berry 1.7 x 0.8 cm, ellipsoid, cup deeper.
Fl. & Fr.: August-May.
Distr.: Endemic to Southern Western Ghats. Common in high altitude sholas. MS, Idlimottai, *KKK* 16023; *KKK 18183*.

Litsea wightiana (Nees) Hook. f in Benth. & Hook. f., Gen. Pl. 3: 162. 1880 & Hook. f., FBI 5: 176. 1886, p.p., var. **wightiana**; Gamble, FPM 1238. 1925; Fyson, FSIHS 507. t. 439. 1932; Matthew, Ill. FPH t. 618. 1996 & FPH 1074. 1999. *Cylicodaphne wightiana* Nees in Wall. Pl. Asiat. Rar. 2: 68. 1831. **Manja Kodala (EBIS).**

Small trees; branchlets ferruginous-tomentose. Leaves to 10 x 5 cm, coriaceous, densely rusty seriaceous below. Racemes axillary or lateral; umbellules compound; flowers 6-12; perianth rusty yellow, hairy, 7 mm wide, tube 4 mm, lobes 3+3, 3 mm long; ovary 1.5 mm wide; staminodes 12 or 16. Berry 1.3 x 0.7 cm, ellipsoid, perianth accrescent to about the middle.
Fl. & Fr.: August-May.
Distr.: Endemic to Southern Western Ghats. Common in high altitude sholas. MS, Methappu, *KKK 16006*. ENP, Mattukulam, *KKK 16600*; Amarachola, *KKK 17514*; Umayamala, *KKK 17543*.

NEOLITSEA (Bentham) Merrill

Phillip. J. Sci. 1 (Suppl.): 56. 1906. *nom. cons.*

1. Leaves > 6 cm wide, thick coriaceous, densely golden brown rusty-seriaceous below ..... **N. fischeri**
1. Leaves < 5 cm wide, subcoriaceous, glabrous or glaucous below **2**
2. Berry oblong; leaves elliptic to lanceolate, < 3 cm wide ..... **N. cassia**
2. Berry globose; leaves ovate to elliptic, 3 to 4.5 cm wide ..... **N. scrobiculata**

Neolitsea cassia (L.) Kosterm., J. Sci. Res. (Jakarta) 1: 85. 1952. *Laurus cassia* L., Sp. Pl. 369. 1753. *Litsea zeylanica* Nees in Amoen., Bot. Benn. Fasc. 1: 58. t. 5. 1823; Hook. f., FBI 5: 178. 1886. *Neolitsea zeylanica* (Nees) Merr., Philipp. J. Sci. 1 (Suppl.): 57. 1906; Gamble, FPM 1239. 1925; Fyson, FSIHS 508. t. 440. 1932; Matthew, Ill. FPH t. 620. 1996 & FPH 1077. 1999. **Mulaku Nari, *Pravari* (EBIS).**

Small trees. Leaves to 9 x 2.5 cm, elliptic to lanceolate, base cuneate, apex acute to acuminate, glaucous below. Umbellules simple, sessile; perianth cream to yellowish, tube 4 mm, silky, lobes 4 mm long; stamens 6, filaments bearded; ovary 1.5 cm. Berry 1.5 x 1 cm.

Fl. & Fr.: December-May.

Distr.: South India and Sri Lanka. Common in medium and high altitude sholas. MS, K-5, *KKK 16179*; Methappu, *KKK 17696.*

Neolitsea fischeri Gamble, Kew Bull. 1925: 132. 1925 & FPM 1239. 1925; Sharma *et al.*, J. Econ. Tax. Bot. 11: 53. 1987; Matthew, Ill. FPH t. 619. 1996 & FPH 1075. 1999. **Vari Maram (EBIS).**

Large trees. Leaves to 15 x 7 cm, broad-elliptic to obovate, base acute, apex obtusely acute to acuminate, shining above. Umbellules compound; perianth rusty yellow, 7 mm wide, tube 2 mm, hairy, lobes 4, 2+2, ovate; ovary globose. Berry 2.5 cm across, globose.

Fl. & Fr.: February-August

Distr.: Endemic to Southern Western Ghats. Common at all altitudes. MS, K-4, *KKK 16464*; K-6, *KKK 17605*; *KKK 18120*; K-8, *KKK 18137.* ENP, Umayamala, *KKK 17648.*

Note: New record to the flora of Kerala.

Neolitsea scrobiculata (Meisner) Gamble, FPM 1240. 1925; Matthew, FPH 1076. 1999. *Litsea scrobiculata* Meisner in DC., Prodr. 15(1): 223. 1864. *L. zeylanica* sensu Hook. f., FBI 5: 178. 1886 p.p., non Nees, 1823. **Vellatan, *Shantha Maram* (EBIS).**

Medium sized trees. Leaves to 9 x 4.5 cm, base acute, apex acute to acuminate, pitted on either side of the nerves (scrobiculate), glaucous below, midribs with 1-3 pairs of lateral nerves. Flowers 3-5, in axillary, sessile umbellules; ovary globose. Berry 12 x 10 mm, globose to obovoid, fruiting perianth cup shaped.

Fl. & Fr.: February-August.

Distr.: Endemic to Western Ghats. Common in medium and high altitude sholas. ENP, Amarachola, *KKK 17515.*

PERSEA P. Miller

Gard. Dict. Abr. ed. 4, 1754. *nom. cons.*

Persea macrantha (Nees) Kosterm., Reinwardtia 6: 193. 1962; Matthew, FPH 1078. 1999. *Machilus macrantha* Nees in Wall., Pl. Asiat. Rar. 2: 70. 1831; Wight, Ic. t. 1824. 1852; Hook. f., FBI 5: 140. 1886; Gamble, FPM 1227. 1925. *M. glaucescens* Wight, Ic. t. 1825. 1852. **Kulamavu (EBIS) Plate 4.11.4.**

Large trees; barks aromatic. Leaves 7-15 x 3-7 cm, obovate, elliptic or oblanceolate, base acute, rounded or cuneate, apex emarginate, rounded or acute. Flowers 6-10 mm wide; perianth tube short, lobes 6, 3 x 1.5 mm, lanceolate, greenish white; stamens 9,

3 seriate; staminodes 3; ovary sessile. Berry 2.5 cm across, globose, black, with a basal, persistent perianth rim having reflexed lobes.

Fl. & Fr.: October-June

Distr.: South India and Sri Lanka. Common at all altitudes. MS, Thalachorkadavu, *KKK* 16031; Kolathuvada, *KKK 16049*; K-4, *KKK 16660*; K-6.5, *KKK 16714* & *KKK 17630*. ENP, Amarachola, *KKK 18039*. PAS, Vandaravu, *KKK 18199*.

Note: Lower altitude specimens have large oblanceolate leaves and panicles. High altitude specimens have obovate leaves and short racemes, but bigger flowers.

PHOEBE Nees

Syst. Laurin. 98. 1836.

Phoebe wightii Meisner in DC., Prodr. 15(1): 38. 1864; Gamble, FPM 1228. 1925; Matthew, FPH 1079. 1999. *P. paniculata* auct. non Nees, 1836: Wight, Ic. t. 1820. 1852; Hook. f., FBI 5: 142. 1886. **Chudala, Mulaku Nari. Plate 4.11.5.**

Medium sized trees. Leaves to 14 x 5 cm, oblanceolate, base cuneate, apex long acuminate, rusty-tomentose below. Panicles axillary or subterminal, to 6 mm wide. Flowers 6-10, bisexual; perianth tube 2 mm, lobes 6, 3 mm long, ovate, densely hairy; stamens 9; ovary sessile, globose, thinly pubescent. Berry ovoid.

Fl. & Fr.: March-June.

Distr.: India and Burma. Common at low altitudes. MS, Chengalar, *KKK 17667*

83. PROTEACEAE

GREVILLEA R. Brown *ex* R. A. Salsibury

in J. Knight, On Cultivation Proteaceae 120. 1809 ("Grevillia") corr.
R. Brown, Trans. Linn. Soc. London 10: 167. 1810 *nom. et orth. cons.*

Grevillea robusta A. Cunn. *ex* R. Br., Proteac. Nov. 24. 1830; Gamble, FPM 1243. 1925; Matthew, FPH 1081. 1999. **Silver Oak (EBIS).**

Tall trees; branchlets rusty tomentose. Leaves bipinnatifid, to 40 x 18 cm, primary pinnae to 12 x 5 cm, lobes lanceolate, brown tomentose below, margin recurved. Racemes to 18 x 6 cm, on leafless wood. Flowers solitary or clustered; perianth tube yellowish-orange to reddish, 1 cm long, 4 lobed, recurved below the limb, expanding distally; stamens 4, sessile. Follicle 1.5 cm, boat shaped.

Fl. & Fr.: November-December

Distr.: Native of East Australia; cultivated in tropics and subtropics. Cultivated in grasslands adjacent to sholas, often found inside low altitude sholas. MS, Puthur, *KKK 16719*.

84. THYMELEACEAE

GNIDIA Linnaeus

Sp. Pl. ed. 1, 356. 1753

Gnidia glauca (Fresen.) Gilg, Bot. Jahrb. Syst. 19: 265. 1894; Matthew, Suppl. Ill. FPH t. 1133. 1998 & FPH 1083. 1999. *Lasiosiphon glauca* Fresen., Flora 21: 603.

1838. *Gnidia eriocephala* Meisner in Denkschr., Koenigl.-Baier. Bot. Ges. Regensburg 3: 292. 1841; Wight, Ic. t. 1859. 1852. *G. sisparensis* Gardner, Calcutta J. Nat. Hist. 7: 457. 1857; Wight, Ic. t. 1860. 1852. *Lasiosiphon eriocephalus* (Meisner) Decne. in Jacq., Voy. 148. 1844; Hook. f., FBI 5: 197. 1886; Gamble, FPM 1244. 1925; Fyson, FSIHS 510. t. 441. 1932. **Nachu Nar, Nanju Nar (EBIS) Plate 5.2.4.**

Small trees; branchlets purplish, striate. Leaves 8 x 1.5 cm, linear-oblong to oblanceolate, base acute or rounded, apex shortly acuminate or acute. Heads 3 cm wide, terminal. Flowers yellow drying brown; perianth tube 13 x 2 mm, cylindric, densely pilose, glabrous within, lobes 5, 5 x 2 mm, oblong, spreading; stamens 10 in 2 rows; ovary ellipsoid. Fruit 5 x 1.5 mm, ellipsoid, densely pilose, brown.

Fl. & Fr.: December-February

Distr.: Peninsular India and Sri Lanka. Occasional; found along shola borders at lower and medium altitudes. MS, Puthur, *KKK 16199*; K-4, *KKK 16788*. PAS, Vandaravu, *KKK 18196*.

85. ELAEAGNACEAE

ELAEAGNUS Linnaeus

Sp. Pl. 121. 1753

1. Leaves ovate, silvery below; < 2.5 cm wide; fascicles < 4 flowered; scales stellate ..... **E. indica**
1. Leaves elliptic, coppery below, > 3.5 cm wide; fascicles > 5 flowered; scales peltate ..... **E. kologa**

Elaeagnus indica Servett. in Bull. Herb. Boiss. ser. 2. 8: 393. 1908; Gamble, FPM 1246. 1925; Matthew, FPH 1085. 1999.

Slender straggling shrub. Leaves 4 x 2.5 cm, base rounded to obtuse, apex acute, thin, dull green above. Flowers small, 3-4, in a fascicle; perianth tube narrowly cylindric; stamens 4. Drupe 1.2 x 0.7 cm, ellipsoid-oblong.

Fl. & Fr.: November-February

Distr.: Indo-Malesia. Occasional; along shola margins. MS, Perumala, *KKK 31057*.

Elaeagnus kologa Schlecht. in DC., Prodr. 14: 611. 1857; Gamble, FPM 1246. 1925; Fyson, FSIHS 511. t. 442. 1932; Matthew, FPH 2: 1085. 1999. *E. latifolia* L., Sp. Pl. 121. 1753 p.p.; Wight, Ic. t. 1856. 1852; Hook. f. FBI 5: 202. 1886 p.p. **Poolam Palam (EBIS) Plate 5.2.5.**

Large, thorny straggling shrub. Leaves to 9 x 4.5 cm, base sub-acute, apex obtuse to acute, coriaceous, scales brown, orbicular. Flowers 5-7, in a fascicle, to 1 x 0.5 cm; perianth tube 9 mm, urceolate, lobes 3 mm long, sparsely scaly. Drupes orange, to 1.5 x 1 cm, obovoid.

Fl. & Fr.: December-March

Distr.: Indo-Malesia & China. Occasional; along shola margins. MS, K-5, *KKK 16186*.

86. LORANTHACEAE

1. Petals free; flowers actinomorphic ..... **Helixanthera**
1. Petals united; flowers zygomorphic **2**

2. Perianth lobes and stamens spirally curled ..... **Helicanthes**
2. Perianth lobes and stamens not curled **3**
3. Petals 6; inflorescence an apically crowded spike ..... **Macrosolen**
3. Petals 5; inflorescence umbellate or in sessile clusters ..... **Taxillus**

HELICANTHES Danser

Verh. Kon. Ned. Akad. Wetensch., Afd. Natuurk. Tweede Sect. 29(6): 5. 1933.

Helicanthes elastica (Desr.) Danser, Verh. Kon. Ned. Akad. Wetensch., Afd. Natuurk., Tweede Sect. 29(6): 55. 1933; Matthew, Ill. FPH t. 628. 1996 & FPH 1090. 1999. *Loranthus elasticus* Desr. in Lam., Encycl. 3: 599. 1792; Wight, Ic. t. 343. 1840; Hook. f., FBI 5: 216. 1886; Gamble, FPM 1254. 1925. *L. euphorbiae* Wight, Calcutta J. Nat. Hist. 6: 363. 1846 & Ic. t. 1063. 1846.

Erect parasitic shrubs; branches terete, thickened at nodes. Leaves opposite, to 8 x 4 cm, ovate, base and apex acute, glabrous. Flowers axillary, fascicled, subsessile; calyx red to pale pink, tube cupular, truncate; corolla greenish with red streaks, 2 cm long, lobes 5, reflexed; stamens 5. Berry 1.5 cm long, globose.

Fl. & Fr.: February-April.

Distr.: Endemic to Peninsular India. Occasional along stream sides at medium and high altitudes. ENP, Mampallam Chola, *KKK 17564*; V- Point, *KKK 17639.*

HELIXANTHERA Loureiro

Fl. Cochinch. 142. 1790.

1. Inflorescence dense; flowers < 1.5 cm. long; pedicels curved ..... **H. obtusata**
1. Inflorescence lax; flowers > 1.5 cm. long; pedicles not curved ..... **H. intermedia**

Helixanthera intermedia (Wight) Danser, Bull. Jard. Bot. Buitenzorg ser. 3, 10: 317. 1929; Matthew, Ill. FPH t. 630. 1996. *Loranthus intermedius* Wight, Calcutta J. Nat. Hist. 6: 361. 1846; Hook. f., FBI 5: 205. 1886; Gamble, FPM 1251. 1925; Fyson, FSIHS 514. 1932. **Puluri.**

Parasitic shrubs. Leaves to 16 x 8 cm, ovate, base cuneate, apex obtusely acute, glabrous. Racemes to 7 x 4 cm, to 20 flowered. Flowers pedicellate; corolla flame coloured turning red with green tip, to 2 cm long, lobes 4, 3 mm long, spathulate; stamens 4, ovary 2.5 mm long, sub globose. Drupe 7 x 4 mm, rusty.

Fl. & Fr.: March-May.

Distr.: South Western India. Rare; in high altitude sholas. PAS, Vandaravu, *KKK 18193.*

Helixanthera obtusata (Schult.) Danser, Bull. Jard. Bot. Buitenzorg ser. 3, 10: 317. 1929; Matthew, Ill. FPH t. 631. 1996 & FPH 1091. 1999. *Loranthus obtusatus* Schult. in Roem. & Schult., Syst. 7: 1650. 1830; Hook. f., FBI 5: 205. 1886; Gamble, FPM 1251. 1925; Fyson, FSIHS 514. t. 443. 1932. *L. blumeanus* Wight, Calcutta J. Nat. Hist. 6: 361. 1846, non Schult. 1829.

Parasitic shrubs; branchlets ferruginous-tomentose. Leaves to 10 x 5 cm, ovate, base cuneate, apex acute. Racemes to 7 x 3 cm, to 23 flowered; densely golden

tomentose. Flowers 1.5 cm long; calyx cupular, truncate; corolla red, 1-1.2 cm long, lobes 4, acute; stamens 4, dark brown; ovary sub globose. Drupe subglobose.

Fl. & Fr.: June-August

Distr.: Endemic to Southern Western Ghats. Common at low and medium altitudes. MS, Thalachorkadavu, *KKK 16039*; Conical patch, *KKK 16482*.

MACROSOLEN (Blume) Blume

in J. A. Schultes *et* J. H. Schultes in
J. J. Roemer *et* J. A. Schultes, Syst. Veg. 7: 1731. 1830.

1. Leaves elliptic-lanceolate; corolla < 2.5 cm long, tube not curved; drupe ovoid ..... **M. capitellatus**
1. Leaves ovate-oblong; corolla > 3 cm long, tube curved; drupe subglobose ..... **M. parasiticus**

Macrosolen capitellatus (Wight & Arn.) Danser, Blumea 2: 36. 1936; Matthew, Ill. FPH t. 633. 1996 & FPH 1093. 1999. *Loranthus capitellatus* Wight & Arn., Prodr. 382. 1834; Wight, Ic. t. 304. 1840; Hook. f., FBI 5: 221. 1886. *Elytranthe capitellata* (Wight & Arn.) Engl. in Engl. & Prantl, Pflanzenfam. 3(1): 189. 1889; Gamble, FPM 1255. 1925; Fyson, FSIHS 518. t. 451. 1932.

Parasitic shrubs. Leaves to 8 x 3 cm, acute at both ends. Spike apically crowded. Flowers 2-4 per cluster, sessile; calyx tube 5 cm; corolla 2.5 cm, tube 1.5 cm, red below, green with purple lines above, split on one side, lobes 6, longer than tube; stamens 6. Drupe 1.2 cm long.

Fl. & Fr.: March-July

Distr.: South India and Sri Lanka. Occasional in medium altitude sholas. MS, K-4, *KKK 16489*; K-6, *KKK 17636*.

Macrosolen parasiticus (L.) Danser, Blumea 2: 36. 1936; Matthew, Ill. FPH t. 633. 1996 & FPH 1093. 1999. *Lonicera parasitica* L., Sp. Pl. 175. 1753. *Loranthus loniceroides* L., Sp. Pl. ed. 2, 1: 473. 1762; Wight, Ic. t. 303. 1839; Hook. f., FBI 5: 221. 1886. *Elytranthe loniceroides* (L.) G. Don, Gen. Syst. 3: 427. 1834; Gamble, FPM 1255. 1925; Fyson, FSIHS 518. t. 450. 1932.

Parasitic shrubs, branches terete, lenticelled. Leaves to 12 x 7 cm, base obtuse to rounded, apex acute, glabrous. Spike apically crowded. Flowers 4-6 per cluster, sessile; calyx tube 7 mm, apex truncate; corolla 3.5 cm long, tube 2 cm, scarlet red turning yellow, split on one side; stamens 6, yellow. Drupe 1 cm long.

Fl. & Fr.: February-April

Distr.: South India and Sri Lanka. Occasional in low and medium altitude sholas. MS, Kolathuvada, *KKK 16048*. ENP, Mampallam Chola, *KKK 17558*.

TAXILLUS van Tieghem

Bull. Soc. Bot. France 42: 256. 1895.

1. Corolla glabrous; leaves obovate-spathulate ..... **T. cuneatus**
1. Corolla densely tomentose; leaves otherwise **2**
2. Calyx teeth regular; leaves densely floccose below ..... **T. tomentosus**
2. Calyx teeth irregular; leaves thinly grey-pubescent below ..... **T. recurvus**

Taxillus cuneatus (Heyne *ex* Roth) Danser, Bull. Jard. Bot. Buitenzorg ser. 3, 10: 354. 1929; Matthew, Ill. FPH t. 637. 1996 & FPH 1095. 1999. *Loranthus cuneatus* Heyne *ex* Roth., Nov. Pl. Sp. 193. 1821; Hook. f., FBI 5: 214. 1886; Gamble, FPM 1253. 1925; Fyson, FSIHS 515. t. 446. 1932. **Ottu Puluri.**

Bushy parasitic shrubs. Leaves to 5 x 2 cm, obovate, base cuneate, apex rounded. Flowers in decussate pairs; calyx 3 mm long, irregularly toothed; corolla yellowish green, 2.5 cm long, lobes spreading, red; stamens and filaments red; style green; stigma red. Drupe 6 mm long, ellipsoid, tomentose.

Fl. & Fr.: October-December

Distr.: South India and Sri Lanka. Common in low and medium altitude sholas growing on *Turpinia nepalensis*. MS, K-3, *KKK 16658*.

Taxillus recurvus (DC.) Teigh., Bull. Soc. Bot. France 42: 256. 1895; Matthew, Ill. FPH t. 639. 1996 & FPH 1096. 1999. *Loranthus recurvus* Wall. *ex* DC., Prodr. 4: 299. 1830; Hook. f., FBI 5: 213. 1886; Gamble, FPM 1252. 1925; Fyson, FSIHS 515. t. 445. 1932. *L. candolleanus* Wight & Arn., Prodr. 385. 1834; Wight, Ic. t. 305. 1840.

Parasitic shrubs. Leaves to 8 x 3.5 cm, ovate to obovate, base acute to cuneate, apex obtusely acute, blackish green above when dry. Cymes to 6 flowered, rusty; calyx 4 mm long, teeth long; corolla greenish-brown, to 1.5 cm, tube rusty villous, lobes silvery white; style green; stigma pinkish. Drupe 1 x 0.4 cm, oblong.

Fl. & Fr.: February-April

Distr.: Endemic to Western Ghats Occasional; at medium altitudes, usually growing on *Glochidion neilgherrense*. ENP, Mampallam Chola, *KKK 17550*.

Note: New record to the flora of Kerala.

Taxillus tomentosus (Heyne *ex* Roth) Tieghem, Bull. Soc. Bot. France 42: 256. 1895; Matthew, Ill. FPH t. 640. 1996 & FPH 1096. 1999. *Loranthus tomentosus* Heyne *ex* Roth, Nov. Pl. Sp. 191. 1821; Hook. f., FBI 5: 212. 1886; Gamble, FPM 1252. 1925; Fyson, FSIHS 514. t. 444. 1932.

Parasitic shrubs; branchlets black. Leaves to 6 x 3 cm, obovate, base cuneate, apex obtuse, black above when dry. Cymes 3-4 flowered; calyx tube 3 mm, rusty, teeth short; corolla yellow, 1.5 cm long, tube curved, split halfway, inflated below, densely rusty floccose; stamens red. Drupe 1 x 0.3 cm, ellipsoid.

Fl & Fr.: Throughout the year.

Distr.: South India and Sri Lanka. Common in low altitudes. MS, K-3, *KKK 16141*; K-4, *KKK 16487*.

87. VISCACEAE

1. Stems flattened in one plane, not ribbed; flowers not in triads; perianth 3-merous: ..... **Korthalsella**
1. Stems terete, ribbed; flowers in triads; perianth 4-merous: ..... **Viscum**

KORTHALSELLA van Tieghem

Bull. Soc. Bot. France 43: 83. 1896.

Korthalsella japonica (Thunb.) Engl. in Engl. & Prantl, Nat. Pflanzenfam. 157-158: 138. 1887; Gamble, FPM 1256. 1925; Fyson, FSIHS 519. t. 452. 1932; Matthew, FPH

1098. 1999. *Viscum japonicum* Thunb., Trans. Linn. Soc. London 2: 329. 1794; Hook. f., FBI 5: 226. 1886. *Korthalsella opuntia* (Thunb.) Merr., Bot. Mag. Tokyo 30: 68. 1916; Matthew, Ill. FPH t. 641. 1996. *Viscum opuntia* Thunb., Fl. Jap. 64. 1784. *V. moniliforme* Wight & Arn., Prodr. 380. 1834; Wight, Ic. t. 1018. 1845. **Plate 4.11.6.**

Highly clustered, small subshrubs; stems jointed, green, glabrous; internodes to 1 x 0.4 cm, obovate. Leaves absent. Flowers minute, unisexual, fascicled at the tips of internodes, sessile; tepals yellowish-green, deciduous in male and persistent in female flowers; stamens 3; ovary obovoid. Berry to 2 x 1.5 mm, obovoid, fleshy.

Fl. & Fr.: Almost throughout the year

Distr.: India, China, Mauritius and Australia. Very rare; usually found growing on ecotone tree species such as *Symplocos anamallayana* and *Microtropis ramiflora* at high altitudes. MS, Idlimottai, *KKK 16605.* ENP, Hut 10 km, *KKK 18051.*

VISCUM Linnaeus

Sp. Pl. 1023. 1753

Viscum ramosissimum Wall. *ex* Wight & Arn., Prodr. 380. 1834; Hook. f., FBI 5: 224. 1886; Gamble, FPM 1258. 1925; Fyson, FSIHS 520. 1932; Matthew, Ill. FPH t. 644. 1996 & FPH 1101. 1999. **Mara Theva. Plate 4.11.7.**

Highly branched bushy shrubs; branchlets drooping; stem terete, yellowish green, ridged when dried. Flowers 3-together, axillary; one female and 2 males, 3 female flowers or all the 3 male flowers; bracts and bracteoles orbicular. Berry ovoid, 3 mm across.

Fl. & Fr.: June-August

Distr.: South India and Sri Lanka. Common in medium altitude sholas. MS, K-4, *KKK 18099*; K-6, *KKK 31002.*

Notes: New record to the flora of Kerala. This species was once seen growing on another *Loranthaceae* member, *Taxillus tomentosus.*

88. BALANOPHORACEAE

BALANOPHORA J. R. Forster & G. Forster

Charact. Gen. 99, 100. 1776.

1. Tepals lanceolate; synandrium slightly obconical or compressed; leaves spiral 2
1. Tepals ovate; synandrium hemispherical; leaves distichous or spirally arranged ..... **B. dioica**
2. Tubers single, spherical 3
2. Tubers clustered, elongate, ovate or obovoid ..... **B. fungosa** subsp. **indica** var. **indica**
3. Very small plants, 6-8 cm tall, crimson red coloured ..... **B. sp. 1**
3. Medium sized plants, 15-17 cm tall, yellowish brown coloured ..... **B. sp. 2**

Balanophora dioica R.Br. in Wall., Cat. n. 7246. 1831 & Trans. Linn. Soc. 13: 227. 1831; Hook. f., FBI 5: 237. 1886; Gamble, FPM 1263. 1925. **Plate 4.11.8.**

Stems red-purple, to 10 cm tall; tubers usually single, to 2.5 cm wide, subspherical, granular. Leaves to 3 x 1.5 cm, apex obtuse. Male inflorescence ellipsoid; tepals 4, to 6 x 4 mm, apex acute; female inflorescence to 3 x 2 cm. Fruit not seen.

Fl.: February-March

Distr.: India and Myanmar. Occasional in lower and medium altitude sholas. MS, Perumala, *KKK 18103*; K-6, *KKK 18117.*

Balanophora fungosa J. R. & G. Forst., Charact. Gen. Pl. 100. t. 50. 1776, subsp. **indica** (Arn.) Hansen, Dansk., Bot. Ark 28: 100. ff. 20 & 21. 1972 var. **indica**; Matthew, FPH 1105. 1999. *Langsdorffia indica* Arn., Ann. Nat. Hist. 2: 37. 1838. *Balanophora indica* (Arn.) *ex* Griff., Trans. Linn. Soc. London 20: 95. 1846; Hook. f., FBI 5: 237. 1886; Gamble, FPM 1263. 1925; Fyson, FSIHS 523. 1932. **Kannukutti Madu. Plate 4.12.1.**

Root stock massive, clustered. Peduncle stout, to 15 x 2 cm, yellowish inside; covered by imbricating sheathing leaves. Leaves reddish brown. Heads globose or oblong; male and female flowers dissimilar. Male tepals 5-6, to 7 x 2 mm, oblong, yellowish; anthers 4, white, horse-shoe-shaped. Female inflorescence to 5 x 4 cm, subglobose; perianth absent; ovary globose. Capsule 1-seeded, crustaceous.

Fl. & Fr.: December-March

Distr.: India, Malesia & Australia. Occasional; along steam sides at lower altitudes (rarely at high altitudes). MS, K-3.5, *KKK 17621.* ENP, MPCA, *KKK 17521.*

Balanophora sp. 1.

Very small plant, 6-8 cm long including tuber, deep-crimson coloured; tubers < 2 cm across; stem 3 cm long. Leaves opposite decussate, to 2 x 1.5 cm, ovate, obtusely acute. Inflorescence to 3.5 x 2 cm. Flowers shortly pedicellate; tepals 5, lobes 4 x 2 mm; synandrium subglobose, shortly stalked. Fruit not seen.

Fl.: December-March

Distr.: Rare; usually found at medium altitudes. MS, K-6, *KKK 17619.*

Balanophora sp. 2

Plant yellowish to brown; 15-17 cm tall; tubers single, 3 cm across; stem 10-12 cm long. Leaves opposite decussate to spiral; upper ones to 3.5 x 2.5 cm. Female inflorescence to 5 x 4 cm, depressed-globose. Fruit not seen.

Fl.: December-March

Distr.: Occasional; at shola borders and roadsides at lower altitudes. MS, Perumala, *KKK 31058.*

89. EUPHORBIACEAE

Note: The broad family concept (ICBN, 2000) of *Euphorbiaceae* is followed, which includes *Bischofiaceae* and *Daphniphyllaceae.*

1. Herbs of shrubs 2
1. Trees 5

2. Capsule dehiscent 3
2. Capsule indehiscent ..... **Breynia**
3. Flowers in cyathea; perianth absent ..... **Euphorbia**
3. Flowers not in cyathea; perianth present 4
4. Herbs; leaves simple, penni nerved ..... **Phyllanthus**
4. Shrubs; leaves palmately lobed ..... **Ricinus**
5. Leaves compound ..... **Bischofia**
5. Leaves simple 6
6. Leaves opposite ..... **Excoecaria**
6. Leaves alternate 7
7. Fruit and indehiscent drupe 8
7. Fruit a dehiscent capsule 9
8. Leaves elliptic-lanceolate, not reticulate; tepals 3 ..... **Antidesma**
8. Leaves oblong-obovate, highly reticulate; tepals 5-9 ..... **Daphniphyllum**
9. Stamens 3-5 10
9. Stamens infinite ..... **Mallotus**
10. Leaves peltate; flowers in axillary panicles ..... **Macaranga**
10. Leaves not peltate; flowers in spike or axillary clusters 11
11. Flowers solitary or in axillary clusters ..... **Glochidion**
11. Flowers in cylindrical spikes ..... **Aporusa**

ANTIDESMA Linnaeus

Sp. Pl. 1027. 1753

Antidesma menasu (Tul.) Miq. *ex* Muell.-Arg. in DC., Prodr. 15(2): 257. 1866 p.p., Hook. f., FBI 5: 364. 1887 p.p.; Gamble, FPM 1297. 1925; Fyson, FSIHS 534. t. 466. 1932; Matthew, FPH 1114. 1999. *A. pubescens* Roxb. var. *menasu* Tul., Ann. Sci. Nat. Bot. ser. 3, 15: 215. 1851.

Small trees. Leaves to 16 x 6 cm, elliptic-lanceolate, base acute, apex acuminate. Panicles to 8 cm long, red. Flowers pedicellate, 2 mm across, reddish-green; tepals 3, ovate, free, concave, hispid; male racemes shorter; flowers sub-sessile; stamens 5; ovary globose. Drupes 6 x 3.5 mm, compressed-ellipsoid, glabrous, reddish.

Fl. & Fr.: April-October

Distr.: Endemic to Peninsular India. Occasional; along stream sides at low altitudes. MS, Pallang Mala, *KKK 16690*; Chengalar, *KKK 17668*.

APORUSA Blume

Bijdr. 514. 1824.

Aporusa fusiformis Thw., Enum. Pl. Zeyl. 288. 1861; Hook. f., FBI 5: 351. 1887; Gamble, FPM 1309. 1925; Mandal & Panigrahi, BBSI 26: 42. 1984 (1985); Chakr. & Gang., J. Econ. Tax. Bot. 17(1): 160. 1993.

Large shrubs to small trees. Leaves to 7 x 5 cm, elliptic-obovate, base acute, apex obtuse, entire, glabrous, often recurved. Male spikes 1.5 x 0.5 cm long; flowers 2 or 3

in each bract; tepals 4, free, ovate; stamens 5. Female flowers sessile, 0.5 cm long; tepals 4, ovate, acute, ciliate; ovary ellipsoid. Fruits not seen.

Fl.: February-April

Distr.: South India and Sri Lanka. Occasional; along shola margins at high altitudes. ENP, Mampallam Chola, *KKK 17551*; Anamudi route, *KKK 17643.*

BISCHOFIA Blume

Bijdr. 1168. 1826-1827

Bischofia javanica Blume, Bijdr. 1169. 1827; Bedd., Fl. Sylv. t. 259. 1872; Hook. f., FBI 5: 345. 1887; Gamble, FPM 1312. 1925; Matthew, FPH 1115. 1999. *Microelus roeperianus* Wight & Arn. in Edinburgh New Philos. J. 14: 298. 1833; Wight, Ic. t. 1880. 1852. **Thondi, Chorakkali (EBIS).**

Medium sized trees; exudation reddish; bark red inside, fibrous. Leaves 3-foliolate; leaflets to 10 x 8 cm, obovate to orbicular, base rounded, apex abruptly acuminate, serrate or entire. Racemes lax, axillary, panicled, to 20 cm long; male flowers 2 mm across, tepals 5, recurved; stamens 5, free; ovary 3-celled, globose. Berry 7 mm across, globose; seeds 3, trigonous.

Fl. & Fr.: March-October

Distr.: Indo-Malesia and Pacific Islands. Common in low and medium altitude sholas usually in disturbed sites. MS, Puthur, *KKK 16047*; Chengalar, *KKK 16668.*

BREYNIA J. R. Forster & G. Forster

Charact. Gen. 145. 1776, *nom. cons.*

Breynia retusa (Dennst.) Alston, Ann. Roy. Bot. Gard. 11: 204. 1929; Matthew, FPH 1116. 1999. *Phyllanthus retusus* Dennst., Schluess. Hort. Ind. Malab. 24. 1818. *P. patens* Roxb., Fl. Ind. 3: 667. 1832. *Melanthesa turbinata* Wight, Ic. t. 1897. 1852. *Breynia patens* (Roxb.) Rolfe, J. Bot. 11: 359. 1882; Hook. f., FBI 5: 329. 1887; Gamble, FPM 1304. 1925; Fyson, FSIHS 530. t. 461. 1932. **Aattacherukola (EBIS).**

Glabrous subshrubs. Leaves to 2.5 x 1.5 cm, elliptic-oblong, base rounded, apex obtuse, glaucous below, blackish above when dried. Male flowers solitary, axillary, to 0.4 cm across; tepals 6, retuse or bilobed at apex; stamens 3. Female flowers 3 mm across, solitary; tepals 6, obovate, thick fleshy; ovary cupular, 3 celled, 6 lobed. Capsule 0.8 cm wide, depressed-globose, pink; seeds 6, 5 x 3 mm, trigonous, white.

Fl. & Fr.: August-September

Distr.: Indo-Malesia. Common along shola ecotones at lower altitudes. MS, Kulachivayal, *KKK 16640.*

DAPHNIPHYLLUM Blume

Bijdr. 1152. 1826.

Daphniphyllum neilgherrense (Wight) K. Rosenth. in Engl., Pflanzenr. 4(147a): 7. 1919; Gamble, FPM 1311. 1925; Matthew, FPH 1149. 1999. *Goughia neilgherrensis* Wight, Ic. tt. 1878 & 1879. 1852. *Daphniphyllum glaucescens* sensu Muell.-Arg. in DC., Prodr. 16(2): 3. 1866, non Blume, 1826-1827; Hook. f., FBI 5: 353. 1887; Fyson, FSIHS 533. t. 465. 1932. **Vellakotlan, Peekkiri, *Kozhikulamavu*. Plate 4.12.2.**

Small trees with milky latex. Leaves to 10 x 4.5 cm, oblong-obovate, base acute, apex obtuse, white below with prominent reticulations. Flowers dioecious. Male flowers in axillary racemes, to 5 cm long; tepals 5, minute; stamens 12, free. Female flowers few, bracteate; perianth similar to male flowers; ovary superior, 2-celled. Drupe to 1.5 x 1 cm, reddish green; seeds oblong.

Fl. & Fr.: February-April

Distr.: India, Java and Korea. Common in lower and middle altitude shola ecotones. MS, K-3, *KKK 16136.*

EUPHORBIA Linnaeus

Sp. Pl. 450. 1753

Euphorbia rothiana Spreng. in L., Syst. Veg. 3: 796. 1826; Wight, Ic. t. 1864. 1852; Hook. f., FBI 5: 263. 1887; Gamble, FPM 1278. 1925; Fyson, FSIHS 527. t. 457. 1932; Matthew, FPH 1125. 1999. *E. laeta* sensu Heyne *ex* Roth, Nov. Pl. 230. 1821, non Ait., 1789. **Merasupal Chedi (EBIS). Plate 5.3.3.**

Stout herbs, stems glaucous. Leaves to 10 x 1 cm, linear to oblanceolate, base attenuate, apex acute to shortly apiculate, glaucous below; those on flowering shoots smaller. Cyathia 2 x 2 mm, in terminal panicled cymes. Involucre 2.5 x 3 mm, campanulate, glands 5. Male flowers 10-12, filaments glabrous. Female flowers erect; ovary 3 celled. Capsule 4 mm, cocci 3, globular; seeds 2.5 x 2 mm, obovoid.

Fl. & Fr.: July-August

Distr.: Peninsular India and Sri Lanka. Common along roadsides and other exposed regions at medium and high altitudes. MS, Methappu, *KKK 16423.*

EXCOECARIA Linnaeus

Syst. Nat. ed. 10, 2: 1288. 1759.

Excoecaria crenulata Wight, Ic. t. 1865. 1852; Hook. f., FBI 5: 473. 1888; Gamble, FPM 1345. 1925; Fyson, FSIHS 536. t. 470. 1932.

Small trees. Leaves to 10 x 3 cm, elliptic to oblanceolate, base acute, apex acuminate, serrate. Male racemes 5-6 cm long, slender. Flowers solitary, 1.5 mm, oblong; sepals 3; stamens 3; pistillode present. Female flowers 2-5 on short terminal racemes; sepals larger. Capsule 12 mm, 3 lobed, glabrous.

Fl. & Fr.: March-May

Distr.: Peninsular India and Sri Lanka. Occasional; in medium altitude sholas. MS, K-6, *KKK 17634.*

GLOCHIDION J. R. Forster & G. Forster

Charact. Gen. 113, t. 57. 1775, *nom. cons.*

1. Small trees; leaves elliptic-lanceolate, acuminate; unequal at base ..... **G. ellipticum**
1. Medium sized trees; leaves elliptic or oblong, acute; not unequal at base..... **G. neilgherrense**

Glochidion ellipticum Wight, Ic. t. 1906. 1852; Hook. f., FBI 5: 321. 1887; Gamble, FPM 1308. 1925; Chakr. & Gang., J. Econ. Tax. Bot. 10(1): 199. 1995; Matthew, FPH 1129. 1999. **Chendana, Chathakkadambu (EBIS) Plate 4.12.3.**

Leaves to 11 x 3.5 cm, base acute and oblique, apex abruptly acuminate. Flowers small, in axillary bisexual clusters. Female flowers 2 mm across, 6-10 together in an axil; sepals 6, 2 mm long, lobes obovate, obtuse, hispid inside; ovary densely hispid. Capsule 1 cm, depressed above, 5 lobed, hirsute; seeds 8, glabrous, brown.

Fl. & Fr.: February-April

Distr.: Endemic to Western Ghats. Common along shola borders and other disturbed zones. MS, K-6, *KKK 16185*; Mattupatty, Munnar, *KKK 31052*.

Glochidion candolleanum (Wight & Arn.) Chakrab. & Gangop., JETB 19: 191. 1995. *Lobocarpus candolleanus* Wight & Arn., Prodr. 1: 7. 1834. *Glochidion neilgherrense* Wight, Ic. 5: 229. 1852; Hook. f., FBI 5: 316. 1887; Gamble, FPM 1307. 1925; Fyson, FSIHS 531. t. 463. 1932; Matthew, FPH 1130. 1999. *G. arboreum* Wight, Ic. t. 1907. f. 1. 1852; Hook. f., FBI 5: 316. 1887; Gamble, FPM 1307. 1925. *G. sisparense* Gamble, FPM 1307. 1926. **Chendana, Chathakkadambu (EBIS).**

Medium sized trees, branches zigzag, glabrous. Leaves to 9 x 3 cm, base obtuse, apex acute to abruptly acuminate, black when dry. Flowers small, 2 mm across, 5-6 in a cluster; tepals obovate. Capsule 1 cm across, beaked with short, thick style.

Fl. & Fr.: July-September

Distr.: India and Sri Lanka. Common along shola borders at low altitudes. MS, K-3, *KKK 16488*.

MACARANGA Du Petit-Thouars

Gen. Nova Madag. 26. 1806.

Macaranga indica Wight, Ic. t. 1883. 1852; Hook. f., FBI 5: 446. 1887; Gamble, FPM 1326. 1925; Fyson, FSIHS 536. t. 469. 1932; Matthew, FPH 1133. 1999. **Vattakanni (EBIS).**

Trees; exudations reddish; branchlets fulvous tomentose, glaucous. Leaves to 20 cm across, orbicular, yellow-punctuate below; nerves radiating from the petiole. Panicles axillary, zigzag. Male flowers 2 mm, in globose clusters; sepals 3-5, orbicular, glandular; stamens 3, free. Female flowers solitary, in globose heads; ovary 3-celled. Capsule 0.7 cm wide, globose, pubescent.

Fl. & Fr.: August-December

Distr.: India and Sri Lanka. Common; in disturbed forest areas at low altitudes. MS, Chengalar, *KKK 31061*.

MALLOTUS Loureiro

Fl. Cochinch. 601. 1790.

1. Medium sized trees; leaves ovate-elliptic, 3 nerved, not peltate; flowers in spikes ..... **M. philippensis**
1. Small trees; leaves broadly ovate to orbicular, peltate; flowers in racemes ..... **M. tetracoccus**

Mallotus philippensis (Lam.) Muell.-Arg., Linnaea 34: 196. 1865; Hook. f., FBI 5: 442. 1887, "*philippinensis*"; Bedd., Fl. Sylv. t. 289. 1873; Gamble, FPM 1322. 1925; Fyson, FSIHS 535. t. 468. 1932; Airy Shaw, Kew Bull. 21: 392. 1968 & 26: 300. 1972; Matthew, FPH 1134. 1999. *Croton philippense* Lam., Encycl. 2: 206. 1786. **Thakiri.**

Leaves to 9 x 4 cm, base obtuse, apex acuminate, densely red-glandular beneath. Spikes rusty puberulus. Male flowers 4 mm across, sepals 3, ovate, acute, hairy. Capsule 3 valved, 1 cm across, globose, densely red-glandular; seeds 1-4, globose, glabrous, black.

Fl. & Fr.: November-February

Distr.: Indo-Malesia and Australia. Common; in shola borders and disturbed sites at lower altitudes. MS, Perumala, *KKK 31051.*

Mallotus tetracoccus (Roxb.) Kurz., J. Asiat. Soc. Bengal 16: 245. 1873; Matthew, FPH 1135. 1999. *Rottlera tetracocca* Roxb., Fl. India 3: 827. 1832. *R. peltata* Wight, Ic. t. 1873. 1852. *Mallotus albus* auct. non Muell.-Arg., Linnaea 34: 188. 1865 excl. basionym *Rottlera albus* var. *occidentalis*: Hook. f., FBI 5: 429. 1887; Gamble, FPM 1321. 1925; Fyson, FSIHS 535. 1932. **Vattakanni, Perakela (EBIS). Plate 4.12.4.**

Leaves to 17 x 13 cm, base rounded, apex abruptly acute, entire or shortly toothed; nerves prominent, densely rusty brownish tomentose beneath. Male flowers in groups of 3-6, sessile, sepals 4-5, orbicular, densely hairy. Female flowers in branched terminal panicles; sepals 5-6, ovate, stellate-tomentose; ovary globose, densely hairy. Capsule 1.5 cm across, 4-lobed, densely stellate hairy.

Fl. & Fr.: July-September

Distr.: India, Southwest China and Sri Lanka. Common; found along shola borders at lower altitudes. MS, Thalachorkadavu, *KKK 16043*; K-3, *KKK 16484.*

Note : The south Indian *Rottlera* specimens (*Rottlera alba* Roxb. and *R. tetracocca* Roxb.) were included by Mueller (1865), when he established *Mallotus albus*. But according to Croizat (1940), *R. alba* Roxb. is *Mallotus paniculatus* (Lam.) Mueller and *R. tetracocca* is *Mallotus tetracoccus* (Roxb.) Kurz.

PHYLLANTHUS Linnaeus

Sp. Pl. 981. 1753

1. Subshrubs; leaves elliptic; calyx lobes not white margined ..... **P. macraei**
1. Slender, diffuse herbs; leaves obovate; calyx lobes white margined ..... **P. rheedii**

Phyllanthus macraei Muell.-Arg., Linnaea 32: 29. 1863; Hook. f., FBI 5: 296. 1887; Gamble, FPM 1290. 1925; Fyson, FSIHS 529. t. 460. 1932. *Macraea rheedii* Wight, Ic. t. 1901. 1852, non *Phyllanthus rheedii* Wight, 1852.

Leaves to 2.5 x 1.2 cm, base obtusely acute, apex obtuse, slightly mucronate. Male flowers 3 mm across, axillary, fascicled; calyx lobes 6; stamens 3. Female flowers long pedicelled; ovary 3 celled. Capsule 3 valved.

Fl. & Fr.: November-January

Distr.: Endemic to Southern Western Ghats. Common along shola borders at low altitudes. MS, Thalachorkadavu, *KKK 16709.*

Phyllanthus rheedii Wight, Ic. t. 1895, f. 1. 1852; Hook. f., FBI 5: 293. 1887; Gamble, FPM 1289. 1925; Fyson, FSIHS 528. t. 459. 1932; Matthew, FPH 1140. 1999.

Leaves to 2.5 x 1.5 cm, base acute, apex obtusely acute, glaucous beneath. Male flowers 2 mm, in axillary clusters; calyx 6 lobed, 4 x 2 mm, obovate, obtuse, glabrous. Female flowers 8 mm across, solitary, on thickened pedicels; ovary globose. Capsule 6 mm across, glabrous, smooth; seeds 2 x 1.5 mm, trigonous.

Fl. & Fr.: October-January

Distr.: South India and Sri Lanka. Common; found in shola borders at all altitudes. MS, K-3, *KKK 16096*; K-5, *KKK 16157*; Idlimottai, *KKK 16425*; K-4, *KKK 16498*.

RICINUS Linnaeus

Sp. Pl. 1007. 1753

Ricinus communis L., Sp. Pl. 1007. 1753; Hook. f., FBI 5: 457. 1887; Gamble, FPM 1335. 1925; Matthew, FPH 1142. 1999. **Amanakku, Kotta Maram (EBIS).**

Shrubs; stem glaucous. Leaves to 40 cm across, peltate, palmately 8-9 lobed, lobes to 20 x 5 cm, lanceolate, serrate. Racemes long, terminal. Male flowers at base, 1.5 cm across; sepals 9, ovate; stamens many, free. Female flowers terminal; sepals similar to male flowers; ovary densely bristly. Capsule 1.5 cm across, 3-valved; seeds oblong, carunculate, mottled white and brown.

Fl. & Fr.: November-January

Distr.: Native of Tropical Africa and spread to other tropical countries. Occasional; along shola borders and roadsides at lower altitudes. MS, Puthur, *KKK 16717*.

90. BUXACEAE

SARCOCOCCA Lindley

Edwards's Bot. Reg. 1012. 1826.

Sarcococca saligna (D. Don) Muell.-Arg. in DC., Prodr. 16(1): 11. 1869. *Buxus saligna* D. Don, Prodr. Fl. Nepal 63. 1825. *Sarcococca pruniformis* Lindl., Bot. Reg. 12: t. 1012. 1826, p.p.; Hook. f., FBI 5: 266. 1887, p.p. *S. trinervia* Wight, Ic. t. 1877. 1852; Gamble, FPM 1265. 1925; Fyson, FSIHS 524. t. 456. 1932. **Mattu Vadi (EBIS).**

Scandent shrubs. Leaves to 14 x 4 cm, elliptic, apex acuminate, distinctly triplinerved. Male racemes 1-2 cm long, flowers densely packed; perianth lobes 4, 2 x 1.5 mm, ovate, acute, ciliate; stamens 4. Female racemes smaller; perianth lobes 6, ovate, ciliate; ovary 2 celled, globose. Berry 7 x 5 mm, ellipsoid, coriaceous, black.

Fl. & Fr.: April-July

Distr.: Indo-Malesia. Common; in ecotones and other disturbed regions at lower altitudes. MS, K-4, *KKK 16123*; K-6, *KKK 16469*.

91. URTICACEAE

1. Plants with stinging hairs 2
1. Plants without stinging hairs 3
2. Sub-shrubs; leaves pedately 5-7 lobed ..... **Girardinia**
2. Small herbs; leaves simple, elliptic to ovate-elliptic ..... **Laportea**
3. Large shrubs to trees 4
3. Herbs or sub-shrubs 5

4. Inflorescence a pendulous, elongate spike ..... **Boehmeria**
4. Inflorescence in axillary paniculate clusters ..... **Debregeasia**
5. Flowers aggregated on a fleshy receptacle **6**
5. Flowers not on a fleshy receptacle **7**
6. Lithophytic herbs; male and female flowers on receptacle; stamens 4 ..... **Elatostema**
6. Epiphytic herbs; only female flowers on receptacles; stamens 5 ..... **Procris**
7. Leaves decussate; margins serrate ..... **Pilea**
7. Leaves alternate or ternate; margins entire ..... **Pouzolzia**

BOEHMERIA Jacquin

Enum. Pl. Carib. 9. 1760.

Boehmeria macrophylla Hornem., Hort. Bot. Hafn. 2: 890. 1815; Matthew, Suppl. Ill. FPH t. 1146. 1998 & FPH 1151. 1999. *B. platyphylla* D. Don, Prodr. Fl. Nep. 60. 1825; Hook. f., FBI 5: 578. 1886, incl. var. *longissima*; Fischer in Gamble, FPM 1387. 1928.

Subshrubs; branchlets reddish. Leaves opposite-decussate, to 15 x 9 cm, broadly ovate, base obtuse to truncate, apex acuminate, crenate, pubescent below, 3-ribbed, shortly pilose along ribs. Spikes axillary, to 12 cm long, glabrous. Flowers clustered, 3-9 together; perianth-tube gibbous at base, tepals 4, ovate; stamens 4; ovary 1 celled. Achenes 2 x 1 mm, ovoid, beaked, puberulus, enveloped by tepals.

Fl. & Fr.: July-October

Distr.: South West India and Sri Lanka. Occasional along shola borders and roadsides at lower and medium altitudes. MS, K-4.5, *KKK 16509*; Methappu, *KKK 31054*.

DEBREGEASIA Gaudichaud-Beaupre

Voyage Bonite Bot. Atlas t. 90. 1844.

Debregeasia longifolia (Burm. f.) Wedd. in DC., Prodr. 16(1): 235. 1869; Matthew, FPH 1152. 1999. *Urtica longifolia* Burm. f., Fl. Ind. 197. 1768. *Debregeasia velutina* Gaud., Voy. Bonite Bot. t. 90. 1844-46; Hook. f., FBI 5: 590. 1888; Fischer in Gamble, FPM 1389. 1928. *Conocephalus niveus* Wight, Ic. t. 1959. 1853. **Neeranji, Narambili, *Vanchi* (EBIS) Plate 5.2.3.**

Small dioecious trees; tender parts hispid-pubescent. Leaves alternate, to 18 x 4 cm, ovate to oblong-lanceolate, base acute or obtuse, apex acuminate, serrulate, 3-ribbed, densely white tomentose below, scabrous above. Flowers subsessile, to 4 mm across; male perianth lobes 4, free, 1 mm long, ovate, densely woolly; stamens 4, free; ovary 1 celled. Achenes adnate to perianth.

Fl. & Fr.: December-March

Distr.: Indo-Malesia. Common along exposed stream sides at low and medium altitudes. MS, K-3.5, *KKK 16134*; K-5, *KKK 16450*.

Note: The species forms a favourite food for elephants, and they are found to move down along stream sides, especially in summer, in search of this species.

ELATOSTEMA J. R. & G. Forster

Charact. Gen. 105. 1776, *nom. cons.*

1. Leaves coriaceous; falcately linear-lanceolate; cystoliths large ..... **E. lineolatum** var. **falcigera**
1. Leaves chartaceous; obliquely lanceolate; cystoliths small ..... **E. sessile**

Elatostema lineolatum Wight, Ic. tt. 1984 & 2091. 1853, var. **falcigera** Thw., Enum. Pl. Zeyl. 260. 1861; Hook. f., FBI 5: 565. 1888; Fischer in Gamble, FPM 1377. 1928.

Bushy subshrubs; branchlets tawny tomentose. Leaves subsessile, to 6 x 1 cm, base cuneate, apex acuminate with 2-3 teeth, only midrib prominent. Flowers cream coloured, crowded in axillary, bracteate, sessile receptacles; ovary narrowly ellipsoid; stigma sessile. Achene ellipsoid, red.

Fl. & Fr.: May-August

Distr.: South India and Sri Lanka. Common; along stream sides at low altitudes. MS, K-3, *KKK 16114*; K-5, *KKK 31056.*

Elatostema sessile J.R. Forst. & G. Forst., Char. Gen. Pl., ed. 1: 53. 1775; Hook. f., FBI 5: 563. 1888; Fischer in Gamble, FPM 1376. 1928; Fyson, FSIHS 548. t. 478. 1932; Matthew, Ill. FPH t. 656. 1996 & FPH 1154. 1999.

Gregarious herb; branchlets slender, succulent, to 40 cm tall. Leaves to 13 x 5 cm, base obliquely acute, apex acuminate, margin crenate. Inflorescence axillary; flowers cream, sessile, densely crowded; perianth lobes free, 1.5 mm long, ovate, long-cuspidate. Achenes ovoid.

Fl. & Fr.: June-August

Distr.: Indo-Malesia. Common undergrowth at low and medium altitudes. MS, K-5, *KKK 16182* & *KKK 16449.*

Note: New record to the flora of Kerala.

GIRARDINIA Gaudichaud-Beaupre

in Freycinet Voyage Monde, Uranie Physicienne Bot. 498. 1830.

Girardinia diversifolia (Link) Friis, Kew Bull. 36: 145. 1981; Matthew, FPH 1155. 1999. *Urtica diversifolia* Link, Enum. Pl. Hort. Berol. 2: 385. 1822. *Girardinia heterophylla* Decne. in Jacq., Voy. 4: 151. t. 153. 1844; Hook. f., FBI 5: 551. 1888, incl. var. *palmata* Gaud; Fyson, FSIHS 544. 1932. *G. leschenaultiana* Decne. in Jacq., Voy. 4: 152. 1844; Wight, Ic. t. 1976. 1853; Fischer in Gamble, FPM 1372. 1928. *G. zeylanica* Decne. in Jacq., Voy. 4: 152. 1844; Fischer in Gamble, FPM 1373. 1928. *G. heterophylla* Decne. var. *zeylanica* (Decne.) Hook. f., FBI 5: 551. 1888. *Urtica heterophylla* Wight, Ic. t. 687. 1840. **Ana Chenthatti (EBIS) Plate 4.13.1.**

Erect shrubs; branchlets and leaves with sharp stinging hairs and shorter stiff hairs. Leaves to 15 x 20 cm, pedately 5-7 lobed, base truncate to subcordate, apex acuminate, margin inciso-crenate. Male inflorescence in dense clusters; tepals and stamens 4. Female inflorescence much branched; tepals 3; ovary 1 celled. Achenes 2.5 mm wide, biconvex, orbicular, smooth, compressed.

Fl. & Fr.: November-December

Distr.: Indo-Malesia. Common along water courses at lower and medium altitudes. MS, K-6, *KKK 16715.*

Note: Highly allergic plant. When touched, causes intolerable, painful and burning sensation associated with itching and inflammation for several hours.

LAPORTEA Gaudichaud-Beaupre

in Freycinet Voyage Monde, Uranie Physicienne Bot. 498. 1830, *nom. cons.*

Laportea terminalis Wight, Ic. t. 1972. 1853; Hook. f., FBI 5: 549. 1888; Fischer in Gamble, FPM 1373. 1928; Fyson, FSIHS 544. t. 475. 1932; Matthew, Ill. FPH t. 658. 1996 & FPH 1156. 1999. *L. bulbifera* (Sieb. & Zucc.) Wedd. in Arch., Mus. Hist. Nat. 9: 139. 1856. *Urtica bulbifera* Sieb. & Zucc., Abh. Math.-Phys. Cl. Koenigl. Bayer. Akad. Wiss. 4: 214. 1846. **Cheriya Chenthatti.**

Monoecious herbs; stinging hairs present everywhere. Leaves to 15 x 7 cm, elliptic or ovate-elliptic, base rounded, apex acuminate, margin coarsely toothed, 3 ribbed from base. Panicles terminal or in upper axils. Male flowers small in lower axils; tepals 5; stamens 5. Female ones larger in upper axils, to 20 x 8 cm; tepals 2-4, obovate; ovary oblique. Achenes to 3 mm across, obliquely obovoid, black.

Fl. & Fr.: November-February

Distr.: India and Sri Lanka. Fairly common at lower and medium altitude sholas. MS, K-7, *KKK 16559*; Conical patch, *KKK 16727.*

Note: Allergic plant, causing painful and burning itching sensation for hours.

PILEA Lindley

Collect. Bot. ad. t. 4. 1821, *nom. cons.*

1. Subshrubs; leaves to 19 cm long, nervules parallel, prominent ..... **P. melastomoides**
1. Herbs; leaves to 6 cm long, nervules not parallel **2**
2. Perianth lobes spurred; achenes narrowed at apex ..... **P. wightii**
2. Perianth lobes spurless; achenes rounded at apex ..... **P. kingii**

Pilea kingii Fischer, Kew Bull. 1927: 76. 1927 & in Gamble, FPM 1379. 1928; Fyson, FSIHS 546. 1932. *P. wightii* Wedd. var. *macrophylla* Hook. f., FBI 5: 555. 1888.

Leaves to 6 x 4 cm, broadly ovate-lanceolate, base rounded or cordate, apex acuminate with a cusp; spinous-serrate, 3-ribbed; lineoles scarce, glabrous. Cymes 2 cm across; peduncles slender, 6 cm long; perianth lobes rounded. Achenes 1 x 1 mm, suborbicular, biconvex, smooth.

Fl. & Fr.: July-December

Distr.: Endemic to Southern Western Ghats. Rare; found along water courses and shola fringes at low and medium altitudes. MS, K-5, *KKK 16158*; K-4, *KKK 16493.*

Pilea melastomoides (Poir.) Wedd., Ann. Sci. nat. Bot. ser. 4, 1: 186. 1854; Matthew, FPH 1159. 1999. *Urtica melastomoides* Poir. in Lam., Encycl. Suppl. 4: 223. 1816. *Urtica trinervia* Roxb., Fl. Ind. 3: 582.1832. *Pilea trinervia* (Roxb.) Wight, Ic. t. 1973. 1853; Hook. f., FBI 5: 557. 1888; Fischer in Gamble, FPM 1379. 1928; Fyson, FSIHS 546. t. 477. 1932. **Narali (EBIS).**

Leaves to 19 x 9 cm, ovate, base rounded, apex acuminate, sharply serrate, 3-ribbed; lineoles crowded. Male inflorescence 10 cm across, axillary; flowers sessile, 4 mm across; perianth lobes 4, ovate, acute; stamens 4. Female 2 cm across; flowers small; perianth lobes 1 mm long. Achenes 1 mm across, biconvex.

Fl. & Fr.: July-October

Distr.: Indo-Malesia. Common; found along stream sides and roadsides at lower altitudes. MS, Kulachivayal, *KKK 16682.*

Pilea wightii Wedd., Ann. Sci. Nat. Bot. ser. 4, 1: 186. 1854; Hook. f., FBI 5: 554. 1888; Fischer in Gamble, FPM 1379. 1928; Fyson, FSIHS 545. t. 476. 1932; Matthew, Ill. FPH t. 662. 1996 & FPH 1159. 1999. *P. radicans* Wight, Ic. t. 1974. 1853, non Wedd., 1852. **Valiya Narali (EBIS).**

Slender, glabrous herbs. Leaves to 3 x 2 cm, broadly ovate to suborbicular, base subcordate, apex acute, crenate, 3-ribbed. Female cymes 1-2 cm across, shortly peduncled, branches pink; perianth lobes smooth. Achenes 0.5 x 0.5 mm, ovoid, biconvex, smooth or tubercled.

Fl. & Fr.: July-December

Distr.: Indo-Malesia. Common; along roadsides and stream sides at medium altitudes. MS, K-3.5, *KKK 16119.*

POUZOLZIA Gaudichaud-Beaupre

in Freycinet, Voyage Monde Bot. 503. 1826

1. Male perianth lobes convex or gibbous; buds ovoid ..... **P. auriculata**
1. Male perianth lobes plicate and inflexed; buds truncate **2**
2. Stems running out into terminal or axillary spikes; leaves reduced upwards ..... **P. wightii** var. **scabra**
2. Stems not running out into a bracteate spike; leaves not reduced upwards ....**P. bennettiana** var. **acuta**

Pouzolzia auriculata Wight, Ic. t. 1980, f. 2. & t. 2099, f. 37. 1853; Hook. f., FBI 5: 582. 1888; Fischer in Gamble, FPM 1383. 1928; Matthew, FPH 1160. 1999.

Tall, erect herbs; stem scabrous. Leaves to 5 x 2 cm, ovate-lanceolate, acute at both ends; midrib with 2 pairs of forked, lateral nerves. Cymes in dense, sessile, axillary clusters. Male and female flowers together; male perianth lobes 1.5 mm long, oblanceolate, hispid above. Female flowers sessile; perianth tube 2-toothed at apex, pubescent; ovary 2-winged. Achenes 1.5 x 1 mm, ovoid, strigose.

Fl. & Fr.: July-October

Distr.: Peninsular India and Sri Lanka. Common in medium altitude sholas. PAS, *KKK 18569.*

Pouzolzia bennettiana Wight, Ic. t. 1978. 1853; Hook. f. FBI 5: 585. 1888, var. **acuta** (Wight) Fischer in Gamble, FPM 1385. 1928. *P. acuta* Wight, Ic. t. 2092, f. 2. 1853. *P. heterocarpa* Wight, Ic. t. 2094. f. 13. 1853. **Narali Kola, *Serathandan* (EBIS).**

Erect subshrubs; stem sparsely pubescent upwards. Leaves ternate, to 18 x 4 cm, oblong-lanceolate, base rounded or cordate, apex long acuminate, 3 ribbed, sessile. Racemes to 12 cm long, axillary. Flowers 3-5 together. Male flowers 2 mm across, truncate at apex; perianth lobes 4, transversally plicate. Female flowers smaller; perianth lobe 0.5 mm long, ciliate at apex. Achenes 1 mm long, ridged, brown.

Fl. & Fr.: June-October

Distr.: Peninsular India and Sri Lanka. Common in low and medium altitude sholas. MS, Gokanathapuram, *KKK 16533.* PAS, *KKK 18581.*

Pouzolzia wightii Benn., Pl. Jav. Rar. 1: 66. 1838; Wight, Ic. t. 2093. f. 8. 1853; Hook. f., FBI 5: 584. 1888, var. **scabra** (Wight) Fischer in Gamble, FPM 1383. 1928; Fyson, FSIHS 551. t. 481. 1932. *P. scabra* Wight, Ic. t. 2097. f. 29. 1853; Hook. f., FBI 5: 584. 1888. *P. aspera* Wight, Ic. t. 2095. f. 18. 1853. **Narali Kola (EBIS).**

Scabrid herbs. Leaves to 6.5 x 2.5 cm, ovate to elliptic, apex acuminate, 3-ribbed, hispid. Spike to 35 cm long, terminal. Flowers 3-6 together in the axils of bracts. Male and female flowers mixed. Male flowers hemispherical, truncate above, shortly pedicelled; perianth lobes 4, 2.5 mm long, ciliate. Female flowers sessile; perianth tube striate, hispid. Achenes 1.5 x 1 mm, ovoid, wingless.

Fl. & Fr.: July-October

Distr.: Endemic to South India. Occasional; along stream sides and roadsides at low altitudes. MS, Kulachivayal, *KKK 16667.*

PROCRIS Commerson *ex* Jussieu

Gen. 403. 1789.

Procris crenata Rob., Philipp. J. Sci. 5: 507. 1911; Matthew, FPH 1162. 1999. *P. wightiana* Wall. *ex* Wedd., Monog. Urtic. 336. 1856, *nom. illegit.*; Fischer in Gamble, FPM 1378. 1928. *P. laevigata* sensu Hook. f., FBI 5: 575. 1888, non Blume, 1826.

Epiphytic, succulent, herbs. Leaves to 8 x 2.5 cm, elliptic-lanceolate, crenate, penninerved, cystoliths linear. Flowers cream, monoecious, in axils of leaf scars; male flowers in small cymes; female flowers in peduncled receptacle; male tepals 5, free, fleshy; female tepals 3-5, free, fleshy, cucullate; stamens 5; ovary 1-celled, ovoid. Achenes 1 mm long, ovoid, apiculate, rugose.

Fl. & Fr.: July-October

Distr.: Africa, Eastwards to India, Eastern Asia and Philippines. Occasional; usually found on scandent tree trunks at medium altitudes. MS, K-4, *KKK 16669.* PAS, *KKK 18571.*

92. ULMACEAE

1. Leaves glaucous below, margin serrulate ..... **Trema**
1. Leaves not glaucous below, margin distantly serrate ..... **Celtis**

CELTIS Linnaeus

Sp. Pl. 1043. 1753

1. Perianth lobes 5; midrib of leaf without strong lateral nerves ..... **C. philippensis** var. **wightii**
1. Perianth lobes 4; midrib of leaf with 2 strong lateral nerves ..... **C. tetrandra**

Celtis philippensis Blanco, Fl. Filip. 197. 1837, var. **wightii** (Planch.) Soep., Fl. Males. ser. 1, 8: 62. 1977; Matthew, FPH 1164. 1999. *C. wightii* Planch., Ann. Sci. Nat. Bot. ser. 3, 10: 307. 1948; Wight, Ic. t. 1969. 1853; Hook. f., FBI 5: 483. 1888; Fischer in Gamble, FPM 1349. 1928; Fyson, FSIHS 538. t. 471. 1932. **Vellakkuyyan (EBIS).**

Medium sized trees; branchlets lenticellate, pubescent. Leaves to 9 x 5 cm, ovate, base rounded, apex long-acuminate, coriaceous, reddish brown below when dry. Cymes 3 x 2 cm, on new shoots. Flowers greenish yellow; sepals 2 x 1 mm, ovate, ciliate; stamens 5, free; ovary ovoid. Drupes 7 x 5 mm, ovoid, green turning orange-red.

Fl. & Fr.: April-July

Distr.: Indo-Malesia, Australia, Oceana and Tropical Africa. Common; in low altitude sholas. MS, Chengalar, *KKK 31063.*

Celtis tetrandra Roxb., Fl. Ind. 2: 63. 1832; Hook. f., FBI 5: 482. 1888; Fischer in Gamble, FPM 1348. 1928; Fyson, FSIHS 538. 1932; Matthew, FPH 1164. 1999. *C. serotina* Planch., Ann. Sci. Nat. Bot. ser. 3. 10: 301. 1848; Wight, Ic. t. 1570. 1850. **Karukkuyyan, Sarala Kuyyan (EBIS).**

Medium sized trees; branchlets slender, pubescent. Leaves to 11 x 5 cm, obliquely ovate, base unequal, apex acuminate, sharply serrate, punctate above, pubescent along the nerves below. Flowers fascicled or in short cymules; male sepals 1.5 mm long, ovoid-obtuse, ciliate; stamens 4; ovary obovoid. Drupes 7 x 6 mm, ovoid, glabrous, black when ripe.

Fl. & Fr.: February-April

Distr.: Indo-Malesia. Occasional; in low and medium altitude sholas, usually in disturbed regions. MS, K-5, *KKK 31055.*

TREMA Loureiro

Fl. Cochinch. 539, 562. 1790.

Trema orientalis (L.) Blume, Mus. Bot. Lugduno-Batavum 2: 61. 1856; Hook. f., FBI 5: 484. 1888; Fischer in Gamble, FPM 1350. 1928; Fyson, FSIHS 539. t. 472. 1932; Matthew, FPH 1166. 1999. *Celtis orientalis* L., Sp. Pl. 1044. 1753; Wight, Ic. tt. 602 & 603. 1842. **Oma Maram (EBIS).**

Medium sized, dioecious trees; branchlets adpressed pubescent. Leaves to 10 x 5 cm, ovate-lanceolate, base obliquely cordate, apex acuminate, 3-5 ribbed from base, scabrous above, adpressed-hirsute below. Cymes in axillary clusters. Flowers 5 merous, tepals equal, 2 mm long, curved; ovary ovate, 1-celled. Drupe, 3 mm across, globose; seeds ovoid, 3 mm long.

Fl. & Fr.: June-December

Distr.: India, eastwards to Malesia and Australia and to Africa. Occasional; in low altitude shola borders or other disturbed sites. MS, K-4, *KKK 16472.*

93. CANNABACEAE

CANNABIS Linnaeus

Sp. Pl. 1027. 1753

Cannabis sativa L., Sp. Pl. 1027; 1753; Hook. f., FBI 5: 487. 1888; Fischer in Gamble, FPM 1350. 1928; Matthew, FPH 1167. 1999. **Kanchavu (EBIS) Plate 5.2.2.**

Erect herbs. Leaves decussate below, alternate above, palmately 3-9-foliolate; leaflets to 12 x 1.5 cm, lanceolate, serrate, hispid above, glandular below. Flowers unisexual, in short axillary cymes of panicles. Male flowers 5 mm across; tepals 5, free; stamens 5. Female flowers enclosed in spathaceous bracts; perianth absent; ovary globose, 1-celled. Achenes 4 x 3 mm, compressed; seed 1 mm, shiny, brown.

Fl. & Fr.: Throughout the year

Distr.: Probably native of Central Asia; widespread. Rare; a cultivated plant often found growing along roadsides and scrublands at low and medium altitudes. MS, Perumala, *KKK 18114*.

94. MORACEAE

1. Small herbs; latex watery; flowers on obconical receptacles, not enclosed in syconia ..... **Dorstenia**
1. Large lianas; latex milky; flowers enclosed in syconia ..... **Ficus**

DORSTENIA Linnaeus

Sp. Pl. 121. 1753

Dorstenia indica Wall. *ex* Wight, Ic. t. 1964. 1853; Hook. f., FBI 5: 494. 1888; Fischer in Gamble, FPM 1370. 1928; Fyson, FSIHS 543. t. 474. 1932; Matthew, FPH 1171. 1999.

Leaves to 9 x 2.5 cm, obovate or oblanceolate, base attenuate or cuneate, apex acute, membranous, distantly toothed. Flowers unisexual. Receptacle axillary, solitary, 5-angled, to 1.5 cm across, marginal lobes 10, to 0.5 cm long. Male flowers found outside and female towards the centre; perianth connate and adnate with receptacle; stamens 3; ovary globose. Achenes ovoid, sunken in the receptacle.

Fl. & Fr.: August-December

Distr.: South India and Sri Lanka. Occasional; on shady and moist forest floors near stream banks. MS, K-4.5, *KKK 18147*; Idlimottai, MS, *KKK 18158*.

FICUS Linnaeus

Sp. Pl. 1059. 1753

Ficus laevis Blume, Bijdr. 437. 1825, var. **macrocarpa** (Miq.) Corner, Gard. Bull. Singapore 18: 7. 1960; Matthew, Ill. FPH t. 671. 1996 & FPH 1181. 1999. *Pogonotrophe macrocarpa* Miq., London J. Bot. 7: 74. 1848; Wight, Ic. t. 1965. 1853. *Ficus macrocarpa* (Miq.) Wight *ex* King, Ann. Roy. Bot. Gard. (Calcutta) 1: 166, t. 208. 1888 & in Hook. f., FBI 5: 534. 1888, non Blume, 1825: Fischer in Gamble, FPM 1365. 1928; Fyson, FSIHS 541. t. 473. 1932. *F. amplocarpa* Govind. & Masil., Proc. Indian Acad. Sci. (Pl. Sci.) 91: 117. 1982. **Peyathi. Plate 4.13.2.**

Stems terete, rooting. Leaves to 15 x 10 cm, ovate, base subcordate, apex abruptly acuminate, 3-nerved, hispid below. Figs on short shoots on old stem, to 6 cm, subglobose, yellowish-green mottled with pink, pubescent. Male figs larger than females; tepals 6; stamens 3; ovary oblique; seeds oblong, compressed.

Fl. & Fr.: November-February

Distr.: Endemic to Western Ghats. Common; growing on trees at low and medium altitudes. MS, K-5, *KKK 16080*.

95. SALICACEAE

SALIX Linnaeus

Sp. Pl. 1015. 1753

Salix tetrasperma Roxb., Pl. Corom. t. 97. 1798; Wight, Ic. t. 1954. 1853; Hook. f., FBI 5: 626. 1888; Fischer in Gamble, FPM 1390. 1928; Fyson, FSIHS 553. 1932; Matthew, FPH 1196. 1999. **Vanchi Maram (EBIS).**

Medium sized trees. Leaves to 11 x 4 cm, elliptic-lanceolate, base acute, apex acuminate, margin serrate, glaucous beneath. Flowers cream, unisexual, on long drooping, axillary, 6-10 cm long, catkins; perianth absent; stamens 6-9, subequal, free; ovary 4 mm long, stalked, 1-celled, tomentose. Capsule 5 mm across, 2-4 valved; seeds 1-4, oblong, crowned with long, cottony hairs.

Fl. & Fr.: January-May

Distr.: India, Sumatra and Java. Rare; along stream sides at low altitudes. MS, Thalachorkadavu, *KKK 16042.*

MONOCOTYLEDONS

96. ORCHIDACEAE

1. Epiphytic plants (rarely terrestrial as in *Chrysoglossum*) 2
1. Terrestrial plants 12
2. Leaves equitant, laterally compressed ..... **Oberonia**
2. Leaves not equitant, terete or reduced to scales 3
3. Leaves dorsiventral or terete 4
3. Leaves reduced to minute scales ..... **Taeniophyllum**
4. Normal dorsiventral leaves 5
4. Leaves terete ..... **Seidenfadeniella**
5. Fleshy or pseudobulbous stem; sympodial plants 6
5. Stems not fleshy or pseudobulbous; monopodial plants 10
6. Plants <5cm; leaves two or more 7
6. Plants >10 cm; leaves single ..... **Cirrhopetalum**
7. Pollinia 8 ..... **Eria**
7. Pollinia 2-4 8
8. Inflorescence terminal, many flowered ..... **Liparis**
8. Inflorescence axillary 9
9. Column with a raised hood behind the anther ..... **Coelogyne**
9. Column without a raised hood ..... **Dendrobium**
10. Lip with two short obtuse sacs besides each other ..... **Diplocentrum**
10. Lip with a single sac or spur, or no such sac or spur 11
11. Lip with a raised tongue at back of wall of spur, close to the column base ..... **Trichoglottis**
11. Lip with no such tongue at the back wall ..... **Aerides**
12. Flowers without spur or mentum 13
12. Flowers spurred or with a mentum 14

13. Lip superior ..... **Seidenfia**
13. Lip inferior, saccate at base ..... **Cheirostylis**
14. Spur single **15**
14. Spurs 2 from the back of the superior lip ..... **Satyrium**
15. Scape lateral **16**
15. Raceme of spike terminal **17**
16. Spur longer than the sepals, lip adnate to the top of column ..... **Calanthe**
16. Spur absent or shorter than the sepals, lip adnate to the base of the column ..... **Chrysoglossum**
17. Lip lobed **18**
17. Lip entire, obcordate ..... **Brachycorythis**
18. Root not tuberous ..... **Anoectochilus**
18. Roots with simple or lobed tubers **19**
19. Sepals subequal and more or less connivent ..... **Peristylus**
19. Sepals unequal, the lateral spreading or reflexed ..... **Habenaria**

AERIDES Loureiro

Fl. Cochinch. 2: 525. 1790

Aerides ringens (Lindl.) Fischer, Kew Bull. 1928: 284. 1928 & in Gamble, FPM 1442. 1928; Fyson, FSIHS 579. t. 505. 1932; Abraham & Vatsala, Intr. Orch. 446. 1981; Matthew, Ill. FPH t. 725. 1996 & FPH 1264. 1999. *Saccolabium ringens* Lindl. in Wall., Cat. 7313. 1832. *Aerides radicosa* A. Rich., Ann. Sci. Nat. Bot. (ser. 2) 15: 65. 1841; Hook. f., FBI 6: 46. 1890. *Saccolabium rubrum* auct. non Lindl.: Wight, Ic. t. 1673. 1851. *S. paniculatum* Wight, Ic. t. 1676. 1851. *Aerides linearis* Hook. f., FBI 6: 47. 1890. *A. radicosa* A. Rich. Ann. Sci. Nat. Bot. ser. 2. 15: 65. 1841; Hook. f., FBI 6: 46. 1890. **Plate 4.12.5.**

Epiphytic herbs; stem woody. Leaves to 15 x 0.5 cm, linear, keeled, obliquely bilobulate. Racemes to 20 cm long. Flowers white with pink, 2 x 1.5 cm; dorsal sepal 8 x 3 mm, oblong-ovate; laterals 5 x 3.5 mm, broadly ovate; petals 6 x 3 mm, oblong, obtuse; lip 6 x 2 mm, ovate, acute, side lobes oblong or orbicular, midlobe linear-oblong, acute; disc with fleshy callus; spur 6 x 2 mm, cylindrical.

Fl.: June-August

Distr.: South India and Sri Lanka. Fairly common; found along shola borders at high altitudes. MS, Idlimottai, *KKK 16022*; *KKK 17586*. ENP, Amarachola, *KKK 17645*.

ANOECTOCHILUS Blume

Bijdr. 8: 411, t. 15. 1825.

Anoectochilus elatus Lindl., Proc. Linn. Soc. Bot. 1: 178. 1857; Hook. f., FBI 6: 95. 1890 '*elatior*'; Fischer in Gamble, FPM 1453. 1928; Abraham & Vatsala., Intr. Orch. 196. f. 18. 1981; Matthew, FPH 1208. 1999.

Terrestrial succulent herbs. Leaves to 5 x 4 cm, ovate or elliptic, acute, reddish-brownish with white reticulations. Racemes to 25 cm long. Flowers white tinged pink, 2.5 x 1 cm; dorsal sepal 11 x 5 mm, ovate, acuminate; lateral sepals obovate-oblong, subacuminate; petals 10 x 4 mm, obliquely oblong, acuminate; lip 3-lobed, 20 x 20 mm, side lobes oblong, retuse, curved, mesochile with 5-7 pairs of long fimbriate epichile, bilobed; spur bilobulate, with spindle-shaped gland.

Fl.: November-December

Distr.: Endemic to Southern Western Ghats. Occasional; in damp, shady forest floors especially along stream sides. MS, K-4, *KKK 16118.*

BRACHYCORYTHIS Lindley

Gen. Sp. Orch. 363. 1838.

1. Leaves closely set; epichile of lip obovate or orbicular, with a central triangular apiculus..... **B. iantha**
1. Leaves well spaced; epichile broadly obcordate, sinus large, central apiculus very small... **B. splendida**

Brachycorythis iantha (Wight) Summerh., Kew Bull. 10: 238. 1955; Abraham & Vatsala, Intr. Orch. 254. t. 44. 1981; Matthew, Ill. FPH t. 685. 1996 & FPH 1209. 1999. *Platanthera iantha* Wight, Ic. t. 1692. 1851. *Habenaria iantha* (Wight) Benth. in Benth & Hook. f., Gen. Pl. 3: 626. 1883; Hook. f. FBI 6: 164. 1890, p.p. *Platanthera affinis* Wight, Ic. t. 1693. 1851. *Habenaria galeandra* Benth., Fl. Hongk. 263. 1861 & in Hook. f., FBI 6: 163. 1890. *H. obcordata* (D. Don) Fyson, FNPHT 1: 405. 1915, var. *galeandra* (Reich. f.) Fyson, *l. c. Phyllomphax obcordata* (D. Don) Schltr., Report 16: 119. 1906; Fischer in Gamble, FPM 1476. 1928; Fyson, FSIHS 594. t. 528. 1932, var. *iantha* Hook. f. *ex* Fyson, *l.c.*

Unbranched herbs. Leaves to 3 x 1 cm, elliptic-oblong, acute, 3-nerved, well spaced. Flowers pink, 1.5 x 1 cm; dorsal sepal 4.5 x 2 mm, ovate-lanceolate, acute, 3-veined; lateral sepals 7 x 2.5 mm, falcate, ovate-oblong, acute, 3-veined; petals 5 x 1.5 mm, lanceolate, obliquely acute at apex, 1-2 veined; lip 14 x 12 mm, obcordate with a large sinus, sac ovate, obtuse, 2 x 2 mm, biparted.

Fl.: June-August

Distr.: India and China. Rare; in low altitude scrubland regions. MS, K-3.5, *KKK 16412.*

Brachycorythis splendida Summerh., Kew Bull. 2: 240. 1955; Abraham & Vatsala, Intr. Orch. 256, t. 45. 1981; Matthew, FPH 1210. 1999. *Habenaria iantha* Hook. f., FBI 6: 164. 1890 p.p. descr. tantum, partim, exclu. synon. *Phyllomphax obcordata* (D. Don) Schltr. var. *iantha* (Hook. f.) Fischer in Gamble, FPM 1476. 1928. **Plate 4.13.3.**

Herbs. Leaves to 3.5 x 2 cm, ovate-lanceolate, acute. Racemes terminal to 10 cm long. Flowers rosy-white with pink base, to 3 x 2 cm; dorsal sepal and petals connated to form a hood; dorsal sepal 8 x 4.5 mm, ovate, acute, 3-veined; lateral sepals 10 x 4.5 mm, obliquely ovate-lanceolate, acute, 4-veined; petals 8 x 2.5 mm, falcate-linear, acuminate, 3-veined; lip 23 x 16 mm, obcordate, apiculus triangular.

Fl.: July-September

Distr.: Endemic to Southern Western Ghats. Occasional; in medium altitude scrublands. MS, K-5, *KKK 16066.* ENP, Rajamalai, *KKK 31024.*

CALANTHE R. Brown

Bot Reg. 7: sub t. 573. 1821, *nom. cons.*

1. Flowers pink; dorsal sepal oblong, apiculate, 7-veined; lateral lobes of lip obliquely ovate ...**C. sylvatica**
1. Flowers rose or white; dorsal sepal ovate, obtuse, 3-5-veined; lateral lobe of lip oblong.....**C. triplicata**

Calanthe sylvatica (Thouars) Lindl., Gen. SP. Orchid Pl. 250. 1833; Matthew, Ill. FPH t. 701. 1996 & FPH 1229. 1999. *Centrosis sylvatica* Thouars, Orch. Iles. Austr. Afr. t. 35, 36. 1822. *C. masuca* (D. Don) Lindl., Gen. Sp. Orch. 249. 1833; Hook. f., FBI 5: 850. 1890; Fischer in Gamble, FPM 1432. 1928; Abraham & Vatsala., Intr. Orch. 265, t. 50. 1981. *Bletia masuca* D. Don, Prodr. Fl. Nepal 30. 1825. *Calanthe emarginata* (Blume) Lindl., Gen. Sp. Orchid Pl. 249. 1833; Wight, Ic. t. 1918. 1845.

Terrestrial herbs. Leaves to 45 x 12 cm, broadly elliptic-oblong, base attenuate into 10-15 cm long petiole. Racemes terminal, to 80 cm long; dorsal sepal 21 x 8 mm; lateral sepals 23 x 9 mm, oblong-lanceolate, acuminate, 7-veined; petals 18 x 9 mm, elliptic-lanceolate, obtuse, 5-veined; lip 15 x 10 mm, 3-lobed, side lobes small, 3 x 1 mm, obtuse, midlobe obcordate; spur 31 x 2 mm, cylindrical, acute.

Fl.: October-November

Distr.: India to Malesia. Common undergrowth in low and medium altitude sholas. MS, K-4, *KKK 16407.*

Calanthe triplicata (Willem.) Ames, Philip. J. Sci. 2: 326. 1907; Abraham & Vatsala, Intr. Orch. 263, t. 48. 1981; Matthew, Ill. FPH t. 702. 1996 & FPH 1228. 1999. *Orchis triplicata* Willem., Ann. Bot. (Usteri) 6: 52. 1796. *Calanthe veratrifolia* (Willd.) Ker Gawl., Bot. Reg. 9: t. 720. 1823; Hook. f., FBI 5: 851. 1890; Fischer in Gamble, FPM 1432. 1928; Fyson, FSIHS 574. t. 498. 1932. *C. perrottetii* A. Rich., Ann. Sci. Nat., Bot. (ser. 2) 15: 68. 1841; Wight, Ic. t. 1664-65. 1851.

Terrestrial herbs. Leaves to 35 x 10 cm, broadly elliptic-oblong, acute, glabrous. Racemes terminal, 80-90 cm long; dorsal sepal 11 x 7 mm, ovate, obtuse, 3-5 veined; lateral sepals elliptic, apiculate; petals to 11 x 5 mm, obovate; lip 10 x 10 mm, 3-lobed, side lobes 5 x 2 mm, oblong, obtuse; midlobe, 2-lobuled, obovate-oblong, truncate at apex; spur 20 mm long, disc with fleshy calli at mouth.

Fl.: May-June

Distr.: India to Philippine Islands. Common undergrowth in medium altitude sholas. MS, K-5, *KKK 31007.*

CHEIROSTYLIS Blume

Bijdr. 413, t. 16. 1825.

Cheirostylis flabellata Wight, Ic. t. 1727. 1851; Hook. f., FBI 6: 105. 1890 p.p.; Fischer in Gamble, FPM 1454. 1928; Fyson, FSIHS 584. t. 512. 1932; Abraham & Vatsala, Intr. Orch. 194. 1981; Matthew, Ill. FPH t. 680. 1996 & FPH 1205. 1999.

Delicate terrestrial herbs, 20 cm tall; stem reddish. Leaves few, 2.5 cm long, ovate, acute, sessile, brownish red. Racemes terminal, 10-20 cm long, glandular pubescent. Flowers white, glandular pubescent, 1.2 cm long; sepals oblong; petals linear oblong; lip bilobed, lobules obovate, dentate.

Fl.: July-August

Distr.: India, Sri Lanka and Burma. Rare; found in damp, shady regions at low altitudes. MS, Puthur, *KKK 16073*; K-4, *KKK 17618.*

CHRYSOGLOSSUM Blume

Bijdr. 6: t. 4. f. 7; 7: 337. 1825.

Chrysoglossum maculatum (Thwaites) Hook. f., FBI 5: 784 & 6: 190, 1890; Fischer in Gamble, FPM 1421. 1928; Matthew, FPH 1249. 1999. *Ania maculata* Thwaites, Enum. Pl. Zeyl. 301. 1861.

Rhizomes stout. Leaves to 30 x 10 cm, elliptic-acuminate, base tapering to the petiole ending in a pseudobulb to 7 cm long. Scape and raceme to 45 cm. Flowers to 2.5 cm long; sepals and petals oblong, subequal; lower petals greenish yellow; standard white; lip erect, broadly 3-lobed with purple spots; spur knob like.

Fl.: July-September

Distr.: Peninsular India and Sri Lanka. Occasional; found in medium altitude sholas. ENP, Way to Idlimottai, *KKK 16595*; PUS, *KKK 17602.*

CIRRHOPETALUM Lindley

Bot. Reg. 10: sub. t. 852, 1824 nomen, Gen. & Sp. Orch. Pl. 1830: 29 *nom. cons.*

Cirrhopetalum gamblei Hook. f., FBI 5: 778. 1890; Fischer in Gamble, FPM 1420. 1928; Garay *et al.* 618. 1994; Matthew, FPH 1249. 1999. *C. thomsonii* Hook.f. l.c.; Fyson, FSIHS 567. 1932. *C. macraei* auct. non Lindl., 1820: Wight, Ic. t. 1652. 1851. *Bulbophyllum gamblei* (Hook. f.) J. J. Sm., Bull. Jard. Bot. Buitz. (ser. 2) 8: 24. 1912, non Hook. f., 1890. *B. fischeri* Seidenf., Dansk Bot. Ark. 29: 202. 1973; Abraham & Vatsala, Intr. Orch. 341. 1981. **Plate 4.12.6.**

Pseudobulb to 1 cm wide, ovoid, ridged. Leaves solitary, to 5.5 x 1.5 cm, elliptic-oblong, base subacute, apex emarginate. Flowers 4-8, yellow, in 5-8 cm long slender peduncle; dorsal sepal to 7.5 x 4 mm, ovate or elliptic, acute, hooded; lateral sepals to 20 x 4 mm, linear-lanceolate, subacuminate; petals to 4.5 x 3 mm, elliptic-oblong or orbicular, obtuse, 3-veined; lip 4 x 1-2 mm, ovate, obtuse, curved.

Fl.: April-May

Distr.: South India and Sri Lanka. Very rare; found on trees along shola borders or stream sides at low altitudes. MS, Chengalar, *KKK 17602 & KKK 31014*; K-4, *KKK 18088.*

COELOGYNE Lindley

Collect. sub t. 33. 1822.

Coelogyne mossiae Rolfe, Kew Bull. 1894: 156. 1894; Fischer in Gamble, FPM 1430. 1928; Fyson, FSIHS 573. t.497.1932; Matthew, Ill. FPH t. 705.1996 & FPH 1232.1999.

Pseudobulb ovoid, ridged, 4 x 1 cm, tapering towards apex, with 2 leaves, each to 17 x 1.5 cm, linear, acute. Racemes 10-13 cm long, 4-6-flowered. Flowers white; dorsal sepal 13 x 4 mm, oblong-lanceolate, acute, 5-veined; lateral sepals 11.5 x 4 mm, oblong-lanceolate, acute, 5-veined; petals 11 x 2.5 mm, linear, acute, 3-veined; lip 12 x 7-8 mm, 3-lobed, middle ovate.

Fl.: April-May

Distr.: Endemic to Southern Western Ghats. Rare; found on ecotone trees at high altitudes only. ENP, Hut, *KKK 17510*; Umaya mala, *KKK 17537.*

DENDROBIUM Swartz

Nova Acta Regiae Soc. Sci. Upsal. 6: 82. 1799, *nom. cons.*

1. Leaves linear-lanceolate ..... **D. anamalayanum**
1. Leaves elliptic-lanceolate ..... **D. nanum**

Dendrobium anamalayanum Chandr., Chandrasek. & Nair, J. Bombay Nat. Hist. Soc. 78: 575. 1981. **Plate 4.13.4.**

Pseudobulb ovoid, to 1.5 x 0.7 cm. Leaves 2-3 x 0.5 cm, linear-lanceolate, acute. Flowers 4-6, rosy-white, on slender racemes borne on the top of bulbs; dorsal sepal 11 x 4.5 mm, lanceolate; lateral sepals 10 x 5 mm, falcately ovate, apiculate; petals to 11 x 4 mm, oblanceolate, slightly falcate, apiculate, 5-veined; lip 9 x 9 mm, trilobed, side lobes ovate-acute; midlobe ovate, acute; margins thick, fleshy, crenate, disc with 3-tipped calli.

Fl.: April-May

Distr.: Endemic to Southern Western Ghats. Rare; found growing on ecotone trees at high altitudes. MS, Idlimottai, *KKK 16024* & *KKK 18159*. ENP, Rajamala, *KKK 31027.*

Dendrobium nanum Hook. f., FBI 5: 717. 1888; Fischer in Gamble, FPM 1415. 1928; Fyson, FSIHS 566. t. 490. 1932.

Pseudobulb ovoid, to 2 x 1.5 cm. Leaves to 6 x 2 cm, elliptic-lanceolate, subacute. Flowers 8-10, white, in racemes borne on the top of bulbs; lip long clawed; limb suborbicular, serrulate; side lobes small; mid lobe rounded; disk with a broad, depressed, fleshy, truncate ridge.

Fl.: July-September

Distr.: Endemic to South India. Very rare; found growing on ecotone trees at high altitudes. MS, Idlimottai, *KKK 16638.*

DIPLOCENTRUM Lindley

Bot. Reg. 18: sub t. 1522. 1832.

Diplocentrum recurvum Lindl., Bot. Reg. 18: sub t. 1522. 1832. & Gen. Sp. Orch. 218. 1833; Hook. f., FBI 6: 78. 1890; Fischer in Gamble, FPM 1449. 1928; Fyson, FSIHS 582. t. 510. 1932; Abraham & Vatsala, Intr. Orch. 469. 1981. *Diplocentrum longifolium* Wight, Ic. t. 1681. 1852. **Plate 4.12.7.**

Stem 6-8 cm long. Leaves linear, to 20 x 0.4 cm, keeled, or subterete, obtuse, mucronate. Racemes branched. Flowers pinkish-white; dorsal sepal 3 x 1 mm, oblanceolate, bimucronate; lateral sepals 4 x 2 mm, falcately oblong, obtuse; petals 3 x 1.5 mm, oblong-lanceolate, subacute, 3-veined; lip 6.9 x 3 mm, oblong-lanceolate, obtuse, with 2 collateral spurs; disc with a fleshy ridge, forking at apex.

Fl.: May-June

Distr.: South India and Sri Lanka. Rare; found on trunks of ecotone trees at low altitudes. MS, Perumala, *KKK 16032*; K-3, *KKK 17504.*

ERIA Lindley

Bot. Reg. 11: t. 904. 1825, *nom. cons.*

1. Stem reduced to small discoid, button like pseudobulb 2
1. Stem elongate, plurinodal pseudobulb ..... **E. pauciflora**
2. Inflorescence 2-flowered; flowers creamy-white; leaves linear-oblanceolate ..... **E. nana**
2. Inflorescence 4-12-flowered; flowers greenish-yellow; leaves linear-lanceolate ..... **E. dalzellii**

Eria dalzellii Lindl., J. Linn. Soc. 3: 47. 1859; Hook. f., FBI 5: 789. 1890; Wight, Ic. t. 1642. 1851; Fischer in Gamble, FPM 1425. 1928; Abraham & Vatsala, Intr. Orch. 375. 1981. *Dendrobium filiforme* Wight, Ic. t. 1642. 1851, p.p.

Pseudobulbs 1.5 cm across. Leaves 3 or 4, to 7 x 1 cm, obtuse, mucronate. Racemes to 10 cm long; sepals subsimilar, lanceolate, acuminate, margins with stalked glands, 3-veined; petals slightly, narrower than sepals; lip 3 x 1 mm, falcate panduriform, minutely papillate; disc with 2 thick yellowish orange ridges.

Fl.: September-October

Distr.: Endemic to South India . Rare; found in medium altitude sholas. MS, Chengalar, *KKK 18136.* ENP, Nilgiri Teri, *KKK 17651.*

Eria nana A. Rich., Ann. Sci. Nat. (ser. 2) 11: 19. 1841; Hook. f., FBI 5: 789. 1890; Fischer in Gamble, FPM 1425. 1928; Fyson, FSIHS 569. t. 492. 1932; Abraham & Vatsala, Intr. Orch. 337. 1981; Matthew, Ill. FPH t. 712. 1996 & FPH 1246. 1999. *Dendrobium filiforme* Wight, Ic. t. 1642. 1851, p.p.

Pseudobulb 0.5 cm across, yellowish-green. Leaves 2-3, 6 x 0.4 cm, cuspidate, sheathing at base, scabrous. Racemes to 2 cm. Flowers 8 mm; dorsal sepal 7.5 x 1 mm, lanceolate, long-acuminate; lateral sepals 3 x 1-2 mm, ovate-lanceolate, acuminate; petals 7 x 3 mm, lanceolate, acuminate, 3-veined; lip 4 x 1 mm, subsessile, ligulate; disc with 2 fleshy calli at base.

Fl.: October-November

Distr.: Endemic to Southern Western Ghats. Rare; found at high altitudes. ENP, Hut 10 km, *KKK 18043.*

Eria pauciflora Wight, Ic. t. 1636. 1851; Hook. f., FBI 5: 779. 1890; Fischer in Gamble, FPM 1425. 1928; Abraham & Vatsala, Intr. Orch. 377. 1981.

Stem clavate, 8-10 cm tall. Leaves 2, 4-6 x 1 cm, oblong-lanceolate, acute. Racemes terminal, to 2 cm long. Flowers 2, white; dorsal sepal 7.5 x 3 mm, obovate-oblong, acute; lateral sepals 10 x 5.5-7 mm, obliquely ovate, acute; petals 8.5 x 2 mm, oblong-lanceolate, subacute-obtuse, 3-veined; lip 6.5 x 3.6 mm, quadrate, apex emarginate; disc with fleshy bilobed calli; midlobe 3 ridged.

Fl.: August-September

Distr.: Endemic to Southern Western Ghats. Rare; at medium altitudes only. MS, K-5, *KKK 16700.*

HABENARIA Willdenow

Sp. Pl. 4(1): 5, 44. 1805.

1. Petals 2-lobulate or 2-partite ..... **H. pallideviridis**
1. Petals entire 2
2. Floral bracts not longer than pedicel plus ovary 3
2. Bracts large, leafy, almost concealing the flowers ..... **H. perrottetiana**
3. Side lobes of lip broad, midlobe narrow 4
3. Side lobes of lip narrow, midlobe broad 5
4. Lip not, or hardly longer than lateral sepals ..... **H. longicornu**
4. Lip much longer than lateral sepals ..... **H. longicorniculata**
5. Floral bracts not cucullate ..... **H. elliptica**
5. Floral bracts cucullate, flower second on rachis ..... **H. heyneana**

Habenaria elliptica Wight, Ic. 5: 13, t. 1706. 1851; Hook. f., FBI 6: 147. 1890; Fischer in Gamble, FPM 1471. 1928; Fyson, FSIHS 589. t. 520. 1932; Abraham & Vatsala, Intr. Orch. 233. 1981; Matthew, Ill. FPH t. 692. 1996 & FPH 1221. 1999.

Herbs, 40-70 cm tall. Leaves to 15 x 3.5 cm, elliptic or oblong-lanceolate, acuminate. Flowers 5 x 1 cm, in lax raceme; dorsal sepals green, 15 x 10 mm, elliptic, acute; laterals sepals green, 24 x 7 mm, elliptic, acuminate; petals white, 26 x 7 mm, bipartite, lobes linear; upper lobe bearded; lip greenish-white, 3 cm long, 3-lobed; lobes filiform; spur 2.3 cm long.

Fl.: October-December.

Distr.: Endemic to Southern Western Ghats. Fairly common; found in grassland ecotones at medium altitudes. MS, K-4, *KKK 16773*. ENP, Near Amarachola, *KKK 18002*.

Habenaria heyneana Lindl., Gen. Sp. Orch. 320. 1835; Wight, Ic. t. 923. 1844; Hook. f., FBI 6: 148. 1890; Fischer in Gamble, FPM 1471. 1928; Fyson, FSIHS 590. t. 521. 1932; Abraham & Vatsala, Intr. Orch. 231. 1981; Matthew, FPH 1222. 1999. *H. subpubens* A. Rich., Ann. Sci. Nat. Sci. Nat., Bot. (ser. 2) 15: 75. t. 4c. 1841; Hook. f., FBI 6: 148. 1890.

Stem 10-40 cm high. Leaves to 6 x 9 cm, oblong-lanceolate, acute. Flowers white; dorsal sepal 9 x 4 mm, elliptic-oblong, acute; lateral sepals 10 x 3.5 mm, elliptic-oblong, apiculate; petals 8.5 x 4.5 mm, obliquely ovate-lanceolate, obtuse; lip 10 x 6 mm, 3-lobed; lateral lobes 7 x 1.5 mm, obliquely oblong-lanceolate, obtuse; midlobe 7.5 x 2.5 mm, oblong-lanceolate, obtuse; spur 13 x 1 mm, cylindric, subacute.

Fl.: August-November

Distr.: Endemic to South India. Occasional; in grassland ecotones at medium altitudes. ENP, Amarachola, *KKK 18054*.

Habenaria longicorniculata Grah., Cat. Pl. Bombay Pl. 202. 1839; Abraham & Vatsala, Intr. Orch. 238, f. 35. 1981; Matthew, Ill. FPH t. 693. 1996 & FPH 1219. 1999. *H. longicalcarata* A. Rich., Ann. Sci. Nat., Bot. (ser. 2) 15: 71, t. 3B. 1841; Wight, Ic. t. 925. 1845; Hook. f., FBI 6: 141. 1890; Fischer in Gamble, FPM 1470. 1928; Fyson, FSIHS 588. t. 519. 1932.

Stem 20-60 cm high. Leaves clustered at base, to 15 x 2 cm, oblong-lanceolate, acute. Scape to 40 cm. Flowers white, 2.5 cm wide; sepals 1 x 0.6 cm, obliquely ovate; petals 1 x 0.3 cm, spathulate, obtuse; lip 3-partite, side lobes 1 x 0.6 cm, oblong, subcuneate, apex oblique, subentire; midlobe linear-oblong, narrower; spur to 12 cm long, linear, subclavate.

Fl.: July-August

Distr.: Endemic to Peninsular India. Occasional; in grassland ecotones at medium altitudes. ENP, Amarachola, *KKK 18001.*

Habenaria longicornu Lindl., Gen. Sp. Orch. 322. 1835; Hook. f., FBI 6. 139. 1890; Fischer in Gamble, FPM 1470. 1928; Fyson, FSIHS 588. t. 518. 1932; Abraham & Vatsala, Intr. Orch. 229. f. 30. 1981; Matthew, FPH 1221. 1999. *H. montana* A. Rich., Ann. Sci. Nat., Bot. (ser. 2) 15: 73, t. 4A. 1841; Wight, Ic. t. 1714. 1851, p.p.

Stem 10-40 cm high. Leaves clustered towards the middle of the stem, to 12 x 2.5 cm, linear-oblong, lanceolate, acuminate. Scape to 25 cm tall. Flowers to 8, 2.5 cm across; sepals ovate, acute; petals linear-oblong, narrower; lip 3-partite; side lobes 1.2 x 0.5 cm, cuneate, apex obliquely truncate, fimbriate; midlobe linear, shorter; spur to 12 cm long, apex clavate.

Fl.: September-October

Distr.: Endemic to Southern Western Ghats. Occasional; found in scrublands at low altitudes. MS, Pallang Mala, *KKK 16686.*

Habenaria pallideviridis Seidenf., Kew Bull. 48: 764. 1993; Matthew, Ill. FPH t. 694. 1996 & FPH 1217. 1999.

Leaves to 7 x 2.5 cm, elliptic-lanceolate, acute, 2-3 towards apex of stem. Spikes to 40 cm long. Flowers white; dorsal sepal 12 x 4.5 mm, elliptic-lanceolate, apiculate; lateral sepals 12 x 4.5 mm, elliptic-lanceolate, acute, 3-veined; petals 11 x 3 mm, oblong-lanceolate, acute; lip 11 x 2 mm, oblong-lanceolate, without spur.

Fl.: October-December

Distr.: Endemic to Southern Western Ghats. Very rare; in grassland ecotones at higher altitudes. ENP, Vattachirambu Shola, *KKK 18081.*

Habenaria perrottetiana A. Rich., Ann. Sci. Nat., Bot. (ser. 2) 15: 74, t. 4B. 1841; Wight, Ic. t. 919. 1845; Hook. f., FBI 6: 164. 1890; Fischer in Gamble, FPM 1471. 1928; Fyson, FSIHS 591. t. 523. 1932; Abraham & Vatsala, Intr. Orch. 236. 1981; Matthew, Ill. FPH t. 695. 1996 & FPH 1223. 1999.

Stem 20-50 cm high. Leaves to 7 x 3 cm, elliptic-oblong, acute. Flowers yellowish, few, in about 15 cm long spike; bracts almost concealing the flowers; dorsal sepal 15 x 9 mm, ovate-oblong, obtuse, 5-veined; lateral sepals 15 x 9 mm, elliptic, obtuse, 7-veined; petals 15 x 4 mm, obliquely oblong, acute, 4-veined; spur 15 mm long, clavate.

Fl.: September-December

Distr.: Endemic to Southern Western Ghats. Rare; in grassland ecotones at medium altitudes. MS, K-4, *KKK 16774.*

LIPARIS L. C. Richard

Mem. Mus. Hist. Nat. 4: 43, 52. 1818, *nom. cons.*

1. Plants 10-15 cm high; flowers white; lip broad, dull purple, flat or with deflexed sides .....**L. wightiana**
1. Plants 15-25 cm high; flowers purple; lip recurved, margins yellowish, laterals spreading ....**L. walkerae**

Liparis walkerae Grah. in Lindl., Edinb. New Philos. J. 20: 194. 1836; Hook. f., FBI 5: 698. 1890; Fischer in Gamble, FPM 1410. 1928; Fyson, FSIHS 565. 1932; Matthew, FPH 1237. 1999.

Leaves to 12 x 5 cm, ovate, subacuminate. Racemes to 15 cm long; dorsal sepal oblong, acute, 3-veined; lateral sepals subfalcate, oblong, obtuse, 5-veined; petals linear, retuse, 1-veined; lip 6.5 x 5 mm, ovate, orbicular, fleshy, margins crenate, disc with 2 fleshy calli.

Fl.: August-September

Distr.: South India and Sri Lanka. Rare; along stream sides at medium altitudes. MS, K-5, *KKK 31118.*

Liparis wightiana Thw., Enum. Pl. Zeyl. 295. 1861; Hook. f., FBI 5: 695. 1890; Fischer in Gamble, FPM 1410. 1928; Abraham & Vatsala, Intr. Orch. 405. 1981; Matthew, FPH 1237. 1999. *L. atropurpurea* Wight, Ic. t. 904. 1844, sensu Lindl.; Fyson, FSIHS 565. 1932. *L. beddomei* Ridley, J. Linn. Soc., Bot. 22: 268. 1886; Hook. f., FBI 5: 695. 1890; Fischer in Gamble, FPM 1410. 1928.

Leaves to 5.5 x 2 cm, ovate, acuminate. Racemes 4-8 cm long; dorsal sepal lanceolate, obtuse, 3-veined; lateral sepals subfalcately lanceolate, acute, 3-veined; petals linear, obtuse, 1-veined; lip 7 x 6 mm, oblong-orbicular, auricled at base, disc with 2 tubercled calli, margins hairy.

Fl.: August-September

Distr.: South India and Sri Lanka. Rare; found along stream sides at medium altitudes. MS, Thalachorkadavu, *KKK 16764*; K-7, *KKK 31076.*

OBERONIA Lindley

Gen. Sp. Orchid. Pl. 15. 1830, *nom. cons.*

1. Leaves usually < 15 cm long **2**
1. Leaves usually >20 cm long **5**
2. Leaves lanceolate, falcate; flowers yellow ..... **O. sp. 1**
2. Leaves oblong-ensiform; flowers orange-yellow **3**
3. Lateral sepals obliquely ovate; petals oblong or ovate **4**
3. Lateral sepals ovate-oblong; petals linear ..... **O. wightiana**
4. Dorsal sepals ovate, acute; scape < 20 cm long; flowers 2.5 mm long ..... **O. thwaitesii**
4. Dorsal sepals oblong-ovate; scape > 25 cm long; flowers 4.5 mm long ..... **O. verticillata**
5. Flowers 4 mm long, greenish-yellow; lateral lobes auriculiform; disc ovate ..... **O. chandrasekharanii**
5. Flowers 2.5 mm long, yellow; lateral lobes oblong-obovate; disc crescent shaped ..... **O. sebastiana**

Oberonia chandrasekharanii Nair *et al.*, Blumea 28: 361. 1983; Ansari & Balakr., Orch. Monogr. 4: 12, f. 5. 1990. *O. ranganniana* Murthy *et al.*, Curr. Sci. 56: 621. 1987.

Leaves articulated, to 25 x 15 cm, ensiform, acute. Scape flattened. Spike to 25 cm long, pendulous. Flowers 4 x 1 mm, in verticils; bracts 2 x 1.3 mm, ovate, acute, denticulate, gland-dotted; dorsal sepals ovate-obtuse; lateral sepals ovate, acute; petals linear, truncate and denticulate at apex; lip 1.5 x 2 mm, semi-orbicular in outline, 3-lobed, papillose, gland dotted; lateral lobes folded upwards, rounded the column by the proximal end; midlobe 2-lobuled with a broad sinus; lobules orbicular; disc ovate, concave, sac like.

Fl.: December-September

Distr.: Endemic to Southern Western Ghats (Kerala and Karnataka). Occasional; in high altitude sholas. MS, Methappu, *KKK 17697.*

Oberonia sebastiana Shetty & Vivek., BBSI 17: 157. 1975; Ansari & Balakr., Orch. Monogr. 4: 1, f. 4. 1990.

Leaves to 20 x 1.5 cm, ensiform, acute. Scape flattened. Spike to 30 cm long. Flowers 2.5 x 1 mm, yellow, subverticillate; dorsal sepal oblong, obtuse; lateral sepals ovate, subacute; petals oblong, obtuse; lip semi-orbicular, 3-lobed; lateral lobes wing-like; midlobe, 2-lobuled; lobules obovate, cuneate, diverging; disc saccate.

Fl.: October-December

Distr.: Endemic to Southern Western Ghats. Occasional; in high altitude sholas. ENP, Vattachirambu shola, *KKK 18083*; Umaya mala, *KKK 17544.*

Oberonia thwaitesii Hook. f., FBI 5: 678. 1888; Manilal & S. Kumar, Curr. Sci. 33: 1106. 1984; Ansari & Balakr., Orch. Monogr. 4: 27, f. 23. 1990.

Leaves to 10 x 1 cm, acute; scape terete. Spike to 25 cm long. Flowers 2.5 x 1.5 mm, in verticils; lateral sepals obliquely ovate; petals ovate, subacute; lip 3-lobed; lateral lobes rounded, auricular; midlobe 2-lobuled; lobules oblong, toothed; disc indistinct.

Fl.: May-June

Distr.: South India and Sri Lanka. Occasional; in low altitude sholas. MS, K-4, *KKK 16651.*

Oberonia verticillata Wight, Ic. t. 1626. 1851; Hook. f., FBI 5: 677. 1888; Fischer in Gamble, FPM 1405. 1928; Fyson, FSIHS 561. 1932; Abraham & Vatsala, Intr. Orch. 419. 1981; Ansari & Balakr., Orch. Monogr. 4: 28, f. 24. 1990; Matthew, Ill FPH t. 710. 1996 & FPH 1243. 1999.

Leaves to 12 x 0.8 cm, acute. Scape terete. Spike to 27 cm long. Flowers 4.5 x 2 mm, in verticils; lateral sepals obliquely ovate, acute; petals oblong or ovate, obtuse; lip 3-lobed; lateral lobes rounded, auricled; midlobe 2-lobuled; lobules orbicular or obovate, serrate, overlapping, sinus narrow; disc indistinct.

Fl.: September-January

Distr.: South India and Sri Lanka. Common; at lower altitudes. MS, K-3, *KKK 16107.*

Oberonia wightiana Lindl., Bot. Reg. 25. Misc. 9. 1839; Wight, Ic. t. 1627. 1851; Hook. f., FBI 5: 683. 1888; Fischer in Gamble, FPM 1407. 1928; Fyson, FSIHS 562. t. 487. 1932; Ansari & Balakr., Orch. Monogr. 4: 24, f. 19. 1990; Matthew, Ill. FPH t.

711. 1996 & FPH 1242. 1999. *O. stachyoides* A. Rich., Ann. Sci. Nat., Bot. ser. 2, 15: 15. t. 1A. 1841. *O. arnottiana* Wight, Ic. t. 1628. 1851; Ansari & Balakr., Orch. Monogr. 4: 23. t. 18. 1990. *O. wightiana* Lindl. var. *arnottiana* (Wight) Ansari *et al.*, JETB 3: 118. 1982. *O. wightiana* Lindl. var. *nilgirensis* Ansari *et al.*, JETB 3: 118. 1982.

Leaves to 15 x 1 cm, oblong-ensiform, acute. Scape terete. Spike to 25 cm long. Flowers 3.5 x 1.5 mm, orange yellow, scattered on the rachis; dorsal sepal oblong, obtuse, entire; lateral sepals ovate-oblong, subacute; petals linear, obtuse, entire; lip 2 mm across, 3-lobed; lateral lobes oblong, ligulate, wing like on spreading; midlobe 2-lobuled; lobules ligulate, toothed at apex, diverging; disc ovate, indistinct.

Fl.: August-November

Distr.: South India and Sri Lanka. Occasional in medium altitude sholas. MS, Methappu, *KKK 17698*; K-5, *KKK 31079.*

Oberonia sp. 1

Leaves to 6 x 1 cm, lanceolate, falcate, acute, narrowed to base. Scape terete. Spike to 15 cm long. Flowers yellow, 2 mm across, in verticils; sepals similar ovate, acute; petals linear, obtuse; lip 3-lobed, 2 x 1.5 mm; lateral lobes oblong, obtuse; midlobe 2-lobuled with a conical protuberance in between; lobules oblong, subacute; disc ovate, indistinct.

Fl.: September-November

Distr.: Occasional; found at high to very high altitudes. MS, K-5, *KKK 31078*; ENP, Anamudi top, *KKK 18540.*

Note: This specimen with very small leaves and spike needs more critical examination.

PERISTYLUS Blume

Bijdr. 404, t. 30. 1825, *nom. cons.*

1. Leaves clustered near the middle of the stem; petals oblanceolate-oblong; spur ellipsoid ..... **P. exilis**
1. Leaves scattered throughout the stem; petals elliptic-lanceolate; spur clavate..... **P. richardianus**

Peristylus exilis Wight, Ic. t. 1698. 1851; Matthew, FPH 1212. 1999. *Habenaria aristata* (Lindl.) Hook. f., in Trimen, Syst. cat. fl. pl. Ceylon 91. 1885 & FBI 6: 158. 1890. *Peristylus aristatus* auct. non Lindl. 1835; Abraham & Vatsala, Intr. Orch. 246. 1981. p.p.; Fischer in Gamble, FPM 1474. 1928; Fyson, FSIHS 593. t. 526. 1932.

Terrestrial herbs. Leaves 4-7 x 2 cm, elliptic-lanceolate, subacuminate. Spike lax, to 18 cm. Flowers white; dorsal sepal 5 x 1.8 mm, elliptic-oblong, obtuse; lateral sepals 4.1 x 1.8 mm, obliquely ovate-oblong, obtuse; petals 5.5 x 2.5 mm, obtuse; lip 5 x 2 mm, 3-lobed; lobes very unequal; lateral lobes to 8 x 0.5 mm, linear, acute, midlobe 2.5 x 0.9 mm, oblong, obtuse; spur 3.2 x 1.5 mm, acute, stalk cylindric.

Fl.: August-September

Distr.: India, Burma, Indochina and Sri Lanka. Rare; in grassland ecotones at medium altitudes. ENP, Mampallam Chola, *KKK 16070.*

Peristylus richardianus Wight, Ic. t. 1697. 1851; Fischer in Gamble, FPM 1474. 1928; Fyson, FSIHS 592. t. 524. 1932; Abraham & Vatsala, Intr. Orch. 246. 1981; Matthew, Ill. FPH t. 686. 1996 & FPH 1211. 1999. *P. robustior* Wight, Ic. t. 1699. 1851. *Habenaria bicornuata* Hook. f., FBI 6: 156. 1890.

Terrestrial herbs. Leaves 5 x 1.5 cm, lanceolate, acuminate. Spike dense, to 15 cm. Flowers creamy-white; dorsal sepal oblong, obtuse, keeled; lateral sepals oblong, obtuse, keeled; petals obtuse, 1-veined with 2 lateral veins from the middle; lip 6 x 18 mm, 3-lobed; lobes unequal; midlobe 3 x 1 mm, oblong, obtuse; lateral lobes 8 x 0.5 mm, linear, upcurved; spur acute at apex.

Fl.: September-November

Distr.: Nepal, Meghalaya, Nilgiris & Palnis. Rare; in grassland ecotones at high altitudes. ENP, Hut 10 km, *KKK 18052.*

SATYRIUM Swartz

Kongl. Vetensk. Acad. Nya Handl. 21: 214. 1800, *nom. cons.*

Satyrium nepalense D. Don, Prodr. Fl. Nepal. 26: 1825; Wight, Ic. t. 929. 1844; Hook. f., FBI 6: 168. 1890; Fischer in Gamble, FPM 1476. 1928; Matthew, Ill. FPH t. t. 699. 1996 & FPH 1224. 1999. *Satyrium wightianum* Lindl., Gen. Sp. Orch. 340. 1838; Wight, Ic. t. 1718. 1851. *S. neilgherrense* Wight *ex* Fyson, FSIHS 595. t. 529. 1932.

Terrestrial herbs, to 30 cm tall. Leaves 2 or 3, to 14 x 6 cm, ovate or elliptic-lanceolate, apex acute. Racemes to 35 cm long, dense, terminal. Flowers pink; dorsal sepal oblong-lanceolate; lateral sepals elliptic, obtuse, 5-veined; petals oblong, obtuse, 3-veined; lip, 21 x 6 mm, superior, concave, keeled, enclosing the column with two parallel spurs; column erect; pollinia 2, with recurved caudicle.

Fl.: August-September

Distr.: India, Sri Lanka, Burma and China. Common; in grassland ecotones at high altitudes. MS, Idlimottai, *KKK 16637.*

SEIDENFADENIELLA Sathish

Cat. India Orch. 47. 1994.

Seidenfadeniella filiformis (Reichb. f.) Chr. & Ormerod. in Matthew, FPH 1258. 1999. *Saccolabium filiforme* Reichb. f., Walp. Ann. 6: 887. 1864. *Saccolabium chrysanthum* Alston in Trimen, Handb. Fl. Ceylon 6: 277. 1931. *Sarcanthus filiformis* Wight, Ic. t. 1684. 1851, non Lindl. 1842. *Schoenorchis filiformis* (Wight) Schltr., Feddes Repert. 1: 986. 1913. *nom. illeg.*; Abraham & Vatsala, Intr. Orch. 475. 1981. *Saccolabium filiforme* (Wight) Lindl., J. Linn. Soc. 3: 36. 1859; Hook. f., FBI 6: 56. 1890; Fischer in Gamble, FPM 1446. 1928; Fyson, FSIHS 581. t. 507. 1932. *Schoenorchis juncifolia* Thw., Enum. Pl. Zeyl. 304. 1864, non Blume. *Seidenfadeniella chrysantha* (Alston) Sathish, Cat. India Orch. 47. 1994.

Pendulous epiphytes, to 30 cm long, stem woody, terete, green. Leaves 10-11, terete, linear. Racemes axillary. Flowers orange-yellow; dorsal sepal oblong, acute, serrulate; lateral sepals falcately oblanceolate; petals orbicular or broadly elliptic-oblong, rounded, 3-veined; lip 3-lobed, lateral lobes orbicular; midlobe ovate, acute, papillate; spur inflated, laterally compressed, base rounded.

Fl.: May-June

Distr.: Southern Western Ghats and Sri Lanka. Rare; growing on the trunks of ecotone trees at medium altitudes. MS, K-5, *KKK 16427.*

SEIDENFIA Szlach.

Syst. Orch., Fragm. Florist. Geobot. Suppl. 3: 67. 1995.

Seidenfia rheedii (Sw.) Szlach., Syst. Orch. (Fragm. Florist. Geobot.) Suppl. 3: 122. 1995; Matthew, FPH 1239. 1999. *Malaxis rheedii* Sw., Kongl. Vetensk. Acad. Nya Handl. 21: 235. 1800 (excl. syn. *Epidendrum resupinatum*); Matthew, Ill. FPH t. 707. 1996. *Microstylis versicolor* Lindl., Gen. Sp. Orchid Pl. 21. 1830; Fischer in Gamble, FPM 1408. 1928; Fyson, FSIHS 563. 1932. *M. rheedii* (Sw.) Lindl., Gen. Sp. Orchid. Pl. 21. 1830, p.p.; Wight, Ic. t. 902. 1845; Hook. f., FBI 5: 690. 1890. *Malaxis versicolor* (Lindl.) Abeyw., Ceylon J. Sci., Biol. Sci. 2(2): 147. 1959

Terrestrial herbs. Leaves 2-3, sessile, to 6 x 4 cm, elliptic, apex acuminate. Racemes terminal, resupinate. Flowers to 3.5 mm across, greenish yellow; dorsal sepal 3.5 x 1.2 mm, linear-oblong, lateral sepals 2.5 x 1.5 mm, obliquely-oblong, deflexed; petals 3 x 1 mm, lanceolate; lip sub-quadrate, pectinate, toothed; column 1 mm high, 2 horned. Capsule 0.7 x 0.4 cm, oblong-obovate.

Fl. & Fr.: September-March

Distr.: India and Sri Lanka. Rare; in medium altitude sholas. MS, K-6, *KKK* 31077. PUS, *KKK 18584.*

TAENIOPHYLLUM Blume

Bijdr. 6: t. 3, f. 70. 1825.

Taeniophyllum alwisii Lindl., J. Linn. Soc. Bot. 3: 42. 1859; Hook. f., FBI 6:76. 1890; Ansari *et al.*, Indian J. For. 17: 260. 1994; Matthew, FPH 1254. 1999. **Plate 4.12.8.**

Small leafless epiphytes. Roots green, to 5 x 0.25 cm, trigonous or subterete. Spikes 5-10 mm long, 1-3 flowered. Flowers sub-sessile, 5-6 mm long, creamy white; sepals and petals united into a 1 mm long tube; dorsal sepals oblong-lanceolate, obtuse; lateral sepals oblong-lanceolate, acute; free parts of petals ovate, acute; lip 2-2.5 x 0.7 mm, ovate, obtuse with a recurved, delicate mucro at apex; spur 1 x 0.6 mm, oblong, obtuse; column 0.8 x 0.5 mm, stigmatic arms oblong, obtuse; ovary 2 mm long, 9-ridged. Capsule 10 x 2 mm, oblong, curved, 9-ridged.

Fl. & Fr.: September - March

Distr.: Tamil Nadu, Kerala and Sri Lanka. Very rare; located only once growing on a *Syzygium densiflorum* tree. MS, K-7, *KKK 18506.*

Note: This species was considered as a Sri Lankan endemic (Jayaweera, 1981) until it was reported by Seidenfaden (1983) from the Servarayans (Yercad) plateau, Salem of Tamil Nadu. It was also reported from the Shevaroy and Kolli hills of Tamil Nadu (Ansari *et al.*, 1994). Since then, it was not reported from any other Indian states. So this collection forms a new record for the Kerala State and extends the distribution range of this rare and little known species (Rajesh and Kumar, 2004).

TRICHOGLOTTIS Blume

Bijdr. 6: t. 3. 1825.

Trichoglottis tenera (Lindl.) Schltr., Bull. Herb. Boiss. (Ser. 2) 6: 471. 1906; Matthew, FPH 1259. 1999. *Oeceoclades tenera* Lindl., Gen. Sp. Orch. 236. 1833;

Wight, Ic. t. 1683. 1851. *Cleisostoma tenerum* (Lindl.) Hook. f., FBI 6: 73. 1890; Fischer in Gamble, FPM 1448. 1928; Fyson, FSIHS 582. t. 509. 1932.

Epiphytes; stem terete, woody. Leaves to 3 x 1.5 cm, elliptic-oblong, obtuse. Racemes stout, to 20 cm long. Flowers yellow; dorsal sepal elliptic, obtuse; lateral sepals oblanceolate, falcate, obtuse; petals smaller than sepals, oblong, obtuse, 5-veined; lip adnate to the base of column, 3-lobed; lateral lobes oblong, lanceolate, obtuse; midlobe ovate, obtuse, 3-lobuled; spur 3 x 1 mm, cylindrical.

Fl.: April-May

Distr.: South India ad Sri Lanka. Fairly common; on trees along stream sides at medium altitudes. MS, K, *KKK 31119.*

97. ZINGIBERACEAE

1. Inflorescence to 40 cm long, basal, separate from stem; labellum white with pink stripes ..... **Alpinia**
1. Inflorescence to 20 cm long, terminal; labellum yellow ..... **Hedychium**

ALPINIA Roxburgh

Asiat. Res. 11: 350. 1810, *nom. cons.*

Alpinia abundiflora Burtt & Smith, Notes Roy. Bor. Gard. Edinburgh 34: 179. t. 5. 1975. *Elettaria floribunda* Thwaites, Enum. P. Zeyl. 319. 1861, non *Alpinia floribunda* Schum., 1904. *Amomum floribundum* (Thwaites) Trimen, Cat. 92. 1885; Baker in Hook. f., FBI 6: 233. 1892. *A. involucratum* auct. non Benth. *ex* Trimen, 1885: Fischer in Gamble, FPM 1487. 1928. **Kattu Elam. Plate 4.13.5.**

Tall fleshy herbs to 4 m high. Leaves to 85 x 15 cm, oblong-lanceolate, base attenuate, apex acuminate, subcoriaceous, glabrous. Spike 9 x 7 cm, truncate; sterile outer bracts deep red; outer fertile bracts subtending a single flower; inner ones narrower, subtending short stalked concinna of up to 7 flowers; calyx 15 x 2 cm long, tubular; corolla tube 3 cm long, lobes 9 x 8 mm, broadly ovate, laterals narrower; labellum small, obovate, unequally 3 lobed; ovary to 4 mm long, triangular. Capsule 18 x 11 mm, elliptic, compressed, thin walled, smooth.

Fl. & Fr.: February-October.

Distr.: Sri Lanka and South India. Very rare; only once found growing along a streamside in a disturbed shola patch at an altitude of 1650 m. MS, Kovil Route, *KKK 18135.*

Notes: This species is so far not reported from Kerala state (Sabu, 1991) and thus forms a new record to Kerala.

HEDYCHIUM Koenig

in Retzius, Observ. Bot. 3: 61. 1783.

Hedychium flavescens Carey *ex* Rosc., Monandr. t. 50. 1825; Wight, Ic. t. 2008. 1853; Fischer in Gamble, FPM 1485. 1928; Matthew, Suppl. Ill. FPH t. 1154. 1998 & FPH 1276. 1999. *H. coronarium* Koenig var. *flavescens* (Rosc.) Baker in Hook. f., FBI 6: 226. 1892. *H. subdictum* Turril, Kew Bull. 370. 1914. *H. coronarium* Koenig var.

subdictum (Turril) Naik in Naik & Panigrahi, BBSI 3: 71. 1961. **Navakkutti, Kooku Vala. Plate 4.13.6.**

Tall herbs, to 3 m high. Leaves to 50 x 8 cm, oblong-lanceolate, acuminate, base tapering, glabrous above, densely pubescent below. Bracts broadly ovate, margin membranous, ciliate, subtending a cincinna of 3-4 flowers; calyx to 4.5 cm long, sparsely pubescent, tip slightly 3 toothed, unilaterally split about half; corolla tube to 6 cm, slender, lobes linear, unequal; labellum 4.5 x 3.5 cm, broadly obcordate, bilobed, clawed at the base; ovary 5 x 3 mm long, densely pubescent.

Fl.: Throughout the year

Distr.: North-East Asia and Sri Lanka. Common; along stream sides and shola borders at low altitudes. MS, K-3, *KKK 16467.*

Notes: The species closely resembles *H. coronarium* but differs in ciliate bracts; calyx longer than the bracts; staminodes and stamen longer than lip.

98. HAEMODORACEAE

1. Leaves linear-oblong, flat, ribbed; scape to 35 cm long; staminal filaments free ..... **Ophiopogon**
1. Leaves elliptic, plicate; scape < 15 cm long; staminal filaments united into a ring ..... **Peliosanthes**

OPHIOPOGON Ker-Gawler

Bot. Mag. t. 1063. 1807.

Ophiopogon intermedius D. Don, Prodr. 48. 1825; Hook. f., FBI 6: 209. 1892; Fischer in Gamble, FPM 1499. 1928; Fyson, FSIHS 600. t. 534. 1932; Matthew, FPH 1293. 1999. *O. indicus* Wight, Ic. t. 2050. 1853.

Densely tufted, scapigerous, perennial herbs; rootstock rhizomatous. Leaves clustered, to 40 x 0.7 cm, narrowed to the base into a petiole. Flowers 4-10; tepals 6, white with pink shades, 6 x 4 mm, oblong, obtuse; stamens 6; ovary 3-celled. Berry 7 mm across, globose, glabrous, blue; seeds 1-3, globose or trigonous.

Fl. & Fr.: August-March

Distr.: India. Commonly found in medium altitude sholas. MS, K-5, *KKK 16451.*

PELIOSANTHES Andrews

Bot. Repos. tt. 605, 634. 1808.

Peliosanthes courtallensis Wight, Ic. t. 2051. 1853; Hook. f., FBI 6: 266. 1892; Fischer in Gamble, FPM 1498. 1928; Matthew, Ill. FPH t. 732. 1996 & FPH 1293. 1999. *P. teta* Andr., Bot. Repos. 10: t. 605. 1810, subsp. *humilis* (Andr.) Jessop., Blumea 23: 155. 1976 & in Steenis, Fl. Males. I. 9: 299. 1979. *P. humilis* Andr., Bot. Rep. 634. 1811. *P. neilgherrensis* Wight, Ic. t. 2052. 1853; Hook. f., FBI 6: 266. 1892; Fischer in Gamble, FPM 1498. 1928.

Scapigerous perennial herbs; stem solitary or loosely tufted, erect or oblique, covered with roots. Leaves few, clustered, to 32 x 10 cm, elliptic, acute at either ends, plicate. Racemes to 20 cm long. Flowers purple, many, 6-8 mm across; tepals 6, oblong, connate at base; stamens 6; ovary 3-celled. Berry 8 x 8 mm, top-shaped, glabrous, bluish black; seeds 1-3, globose.

Fl. & Fr.: August-February

Distr.: Indo-Malesia. Common; in medium altitude sholas. MS, K-6, *KKK 31130.*

99. IRIDACEAE

ARISTEA W. Aiton

Hortus Kew 1: 67; 3: 506. 1789

Aristea ecklonii Baker, J. Linn. Soc. Bot. 16: 112. 1877; Matthew, Suppl. Ill. FPH t. 1185. 1998 & FPH 1332. 1999. *A. dichotoma* Ecklon in Sched. *ex* Klatt, Linnaea 34: 555. 1865-66, non Ker. *A. paniculata* Pax, Bot. Jahrb. 15: 151. 1892.

Herbs; rootstock woody. Leaves basal, to 50 x 1 cm, linear, arching, base reddish, apex acute. Flowers in clusters of 2-4 arranged in panicles; perianth 2 cm wide, blue; tube short, lobes 3+3, emarginated; outer 10 x 5 mm, oblong; inner 15 x 9 mm, ovate; stamens 3; ovary oblong. Capsule 2.5 cm, woody, sharply angled; seeds plenty.

Fl. & Fr.: January-March

Distr.: Tropical America and South Africa. Common along shola borders, grasslands and roadsides at high altitudes. ENP, Umaya Mala, *KKK 17508.*

100. AMARYLLIDACEAE

CRINUM Linnaeus

Sp. Pl. 291. 1753

Crinum latifolium L., Sp. Pl. 291. 1753; Wight, Ic. tt. 2019 & 2020. 1853; Hook. f., FBI 6: 283. 1892; Fischer in Gamble, FPM 1504. 1928; Matthew, FPH 1321. 1999. **Plate 4.13.7.**

Perennial herbs; rootstock bulbous, to 6 cm wide. Leaves to 35 x 4 cm, widely channelled, oblong, curved, acute, fleshy. Umbels stout, to 60 cm tall, thick. Flowers large, sessile, 12-16 together; spathe membranous; perianth tube 10 cm long, narrow, lobes 6, 8 x 3 cm, oblong, acute, pinkish white, spreading or deflexed; stamens 6; ovary 3-celled. Capsule oblong; seeds many.

Fl. & Fr.: June-August

Distr.: Tropical Asia and Africa. Rare; in exposed grassy regions and along roadsides at higher altitudes. PAS, Vandaravu, *KKK 18200.*

101. HYPOXIDACEAE

1. Leaves elliptic-lanceolate, plicate; flowers polygamous; capsule indehiscent.....**Curculigo**
1. Leaves linear, not plicate; flowers bisexual; capsule circumscissile near the apex.....**Molineria**

CURCULIGO Gaertner

Fruct. 1: 63, t. 16, f. 11. 1788.

Curculigo orchioides Gaertn., Fruct. 1: 63, t. 16, f. 11. 1788; Hook. f., FBI 6: 279. 1892; Fischer in Gamble, FPM 1502. 1928; Fyson, FSIHS 602. t. 536. 1932; Matthew, Suppl. Ill. FPH. t. 1166. 1998 & FPH 1304. 1999. *C. malabarica* Wight, Ic. t. 2043a. 1853. **Nilaippana (EBIS).**

Perennial herbs; rhizome to 15 cm long, oblong, vertical. Leaves radical, subsessile, to 15 x 1.5 cm, base sheathing, pilose. Racemes short, axillary. Flowers yellow; scape hidden among leaves underground; perianth 1.5 cm across, lobes 3+3, 6 mm, oblong, tube 3 cm long, narrow, sparsely pilose; stamens 6; ovary villous. Capsule to 2.5 cm long, ovoid; seeds 8, globose.

Fl. & Fr.: August-January

Distr.: Indo-Malesia. Common; in grasslands at high altitudes. MS, Conical Patch, *KKK* 16446; Idlimottai, *KKK 17598.*

MOLINERIA Colla

Mem. Reale Accad. Sci. Torino 31 (Hortus Ripul. App. 2): 331. 1826.

Molineria trichocarpa (Wight) Balakr., J. Bomb. Nat. Hist. Soc. 63: 330. 1966; Matthew, Suppl. Ill. FPH. t. 1166. 1998 & FPH 1304. 1999. *Hypoxis trichocarpa* Wight, Ic. t. 2045. 1853. *H. latifolia* Wight, Ic. t. 2044. 1853. *H. leptostachya* Wight, Ic. t. 2045. 1853. *H. pauciflora* Wight, Ic. t. 2046. 1853. *Molineria finlaysoniana* Baker, J. Linn. Soc. Bot. 17: 121. 1878; Gamble, FPM 1502. 1928. *Curculigo finlaysoniana* (Baker) Wall. *ex.* Hook. f., FBI 6: 279. 1892.

Densely tufted perennial herbs; stem short, tuberous, covered with leaf sheaths forming a bulb. Leaves radical, sessile, to 20 x 0.3 cm, acuminate, hairy, strongly nerved. Flowers solitary or paired on 10 cm long axillary peduncle; perianth yellow, lobes 3+3, 10 x 2.5 mm, lanceolate, free, hairy outside; stamens 6; ovary 3-celled, densely hispid. Capsule 8 x 2.5 mm; seeds 9-12, globose, brown.

Fl. & Fr.: Throughout the year

Distr.: Peninsular India and Sri Lanka. Occasional; in low altitude sholas. MS, Perumala, *KKK 18122.*

102. LILIACEAE

1. Climbing or subscandent shrubs ..... **Protasparagus**
1. Erect herbs **2**
2. Flowers more than 15 cm long ..... **Lilium**
2. Flowers less than 3 cm long **3**
3. Flowers in long racemes ..... **Chlorophytum**
3. Flowers solitary or in short cymes ..... **Disporum**

CHLOROPHYTUM Ker-Gawler

Bot. Mag. t. 1071. 1807.

Chlorophytum attenuatum (Wight) Baker, J. Linn. Soc. Bot. 15: 332. 1876; Hook. f., FBI 6: 335. 1892; Fischer in Gamble, FPM 1526. 1928; Fyson, FSIHS 609. 1932; Matthew, FPH 1312. 1999. *Phalangium attenuatum* Wight, Ic. t. 2037. 1853. **Plate 4.13.8.**

Tufted perennials. Leaves many, to 50 x 1 cm, linear-lanceolate, acuminate, glabrous, with a white patch along the midrib. Raceme terminal, to 30 cm long, slender, unbranched. Flowers densely packed; perianth lobes white, to 8 x 3 mm,

oblong, obtuse, spreading. Capsule to 7 x 7 mm, obovoid, obtusely 3-winged, glabrous: seeds many, orbicular, flat, black.

Fl. & Fr.: July-September

Distr.: Endemic to Western Ghats. Rare; in scrublands and shola borders high altitudes. MS, Gudalar road, *KKK 18597.*

DISPORUM Salisbury

Trans. Hort. Soc. 1: 332. 1812.

Disporum leschenaultianum D. Don, Proc. Linn. Soc. London 1: 45. 1839; Wight, Ic. t. 2048. 1853; Hook. f., FBI 6: 360. 1892; Fischer in Gamble, FPM 1522. 1928; Fyson, FSIHS 611. t. 546.1932; Matthew, Ill. FPH t. 731.1996 & FPH 1292.1999. *D. ceylanicum* Wight, Ic. t. 2049. 1853. *D. mysorense* Wight, Ic. t. 2049. 1853. **Plate 4.13.9.**

Erect dichotomously branched herbs. Leaves to 8 x 4 cm, ovate-lanceolate, base rounded or cordate, 3-5 ribbed, sessile. Umbels terminal, also axillary. Flowers white, 3-6 together; perianth lobes 3+3, free, 10 x 5 mm, obovate, acute; stamens 6, free; ovary 3-celled, ovoid. Berry, 7 x 7 mm, depressed-globose, 1-seeded.

Fl. & Fr.: Throughout the year

Distr.: Western Ghats and Sri Lanka. Occasional; along shola borders and grasslands at medium and high altitudes. MS, K-6, *KKK 16419.* ENP, Umaya mala, *KKK 17518.* PUS, *KKK 18583.*

LILIUM Linnaeus

Sp. Pl. 302. 1753.

Lilium neilgherrense Wight, Ic. tt. 2031 & 2032. 1853; Hook.f., FBI 6:350.1892; Fischer in Gamble, FPM 1523. 1928; Fyson, FSIHS 611. t. 545. 1932; Matthew, Ill. FPH t. 737. 1996 & FPH 1331. 1999. *L. wallichianum* Schult. & Schult. f. in L., Syst. Veg. 7(2): 1689. 1830, var. *neilgherrense* (Wight) Hara in Ohashi, Fl. East. Himal. 3: 132. 1975. **Thatha Poovu, Thazhamboo.**

Erect unbranched herbs; stem leafy, to 1.5 m high. Leaves to 10 x 2 cm, lanceolate, base attenuate, apex acute, glabrous. Umbels terminal. Flowers white, 1-3 together; perianth 20 cm long, campanulate; lobes 3+3, ovate, acute, base tubular; stamens 6; ovary oblong. Capsule 4 x 0.5 cm, oblong, 3-valved; seeds many, compressed.

Fl. & Fr.: August-December

Distr.: Endemic to Southern Western Ghats. Rare; in grasslands or scrublands at low and medium altitudes. MS, K-5, *KKK 16546.*

PROTASPARAGUS Obermeyer

in S. Afr. J. Bot., 2(3): 243. 1983, *nom. nov.*

1. Flowers solitary, clustered or umbelled, not racemed ..... **P. fysonii**
1. Flowers racemed ..... **P. racemosus**

Protasparagus fysonii (Macbr.) Kamble, J. Econ. Taxon. Bot. 15(3): 709. 1991. *Asparagus fysonii* Macbr., Contr. Gray. Herb., n. s. 56: 17. 1918; Fischer in Gamble,

FPM 1517. 1928; Matthew, Ill. FPH t. 733. 1996 & FPH 1295. 1999. *A. asiaticus* Wight, Ic. t. 2053. 1853, non L. 1753. *A. subulatus* Steud. *ex* Baker, J. Linn. Soc. Bot. 14: 614. 1875; Hook. f., FBI 6: 315. 1892; Fyson, FSIHS 608. t. 543. 1932.

Spines to 1 cm, axillary. Cladodes 2-7 together, to 0.8 cm, 3-angled, compressed, curved; branches angled. Flower clusters 2-4 cm long; tepals obovate, white; lobes 3+3; stamens 6. Berry 7 mm across, globose, smooth.

Fl. & Fr.: July-September

Distr.: Endemic to Southern Western Ghats. Occasional; along shola borders and roadsides at lower altitudes. MS, K-4, *KKK 31081.*

Protasparagus racemosus (Willd.) Oberm., S. Afr. J. Bot. 2: 244. 1983. *Asparagus racemosus* Willd., Sp. Pl. 2: 152. 1799; Wight, Ic. t. 2056. 1853; Hook. f., FBI 6: 316. 1892; Fischer in Gamble, FPM 1517. 1928; Matthew, FPH 1296. 1999. **Pilichaviri, Thaali Periyan.**

Roots tuberous; cladodes triquetrous, 3-6 together, stout, acuminate, spreading, 1 cm long; branchlets angled; spines strong, recurved. Racemes fascicled, branched, 2-4 cm; bracts small, ovate; tepals obovate, white. Berry 6 mm across, globose, smooth.

Fl. & Fr.: July-September

Distr.: Paleotropics. Occasional along shola borders and roadsides at lower altitudes. K-3, *KKK 16541.*

103. SMILACACEAE

SMILAX Linnaeus

Sp. Pl. 1028. 1753

1. Umbels sessile; leaves widely cordate at base ..... **S. aspera**
1. Umbels not sessile; leaves acute or round at base, not cordate ..... **S. wightii**

Smilax aspera L., Sp. Pl. 1028. 1753; Hook. f., FBI 6: 306. 1892; Fischer in Gamble, FPM 1518. 1928; Fyson, FSIHS 606. t. 538. 1932; Matthew, Suppl. Ill. FPH t. 1162. 1998 & FPH 1290. 1999. *S. maculata* Roxb., Fl. Ind. 3: 796. 1832; Wight, Ic. t. 2059. 1853. **Pomburi Kodi.**

Stout tendril climbers, stem ridged, prickles few, scattered. Leaves to 10 x 7 cm, ovate-deltoid, apex acuminate, coriaceous, 9-ribbed, glabrous, midrib and petiole shortly prickled. Flowers unisexual; perianth 3+3, free, to 4.5 x 2 mm; stamens 3+3; ovary oblong, 3 celled. Berry 1 cm across, globose.

Fl.: June-September

Distr.: India, Sri Lanka, South Europe and North Africa. Rare; in shola borders at high altitudes. MS, Idlimottai, *KKK 16416.*

Smilax wightii A. DC., Monogr. Phan. 1: 174. 1878; Hook. f., FBI 6: 310. 1892; Fischer in Gamble, FPM 1519. 1928; Fyson, FSIHS 607. t. 541. 1932. *S. zeylanica* Wight, Ic. tt. 2057-8, 1853. **Choora Mullu.**

Stout tendril climbers; branches terete, armed with prickles. Leaves to 15 x 13 cm, broadly ovate-obtuse, apex cuspidate, 5-7 ribbed. Peduncle to 10 cm long; umbels alternate, 2-3. Flowers many, unisexual; perianth 3+3, to 5 x 2 mm; stamens 3+3; ovary trigonous. Berry 7 x 7 mm, globose.

Fl. & Fr.: November-May

Distr.: Endemic to Southern Western Ghats. Occasional in shola borders at lower altitudes. MS, K-3, *KKK 16470.*

104. XYRIDACEAE

XYRIS Linnaeus

Sp. Pl. 42. 1753

Xyris capensis Thunb., var. **schoenoides** (Mart.) Nilsson, Ueber die Afrik. Arten Gattung. Xyris 3: 154. 1891; Matthew, FPH 1338. 1999. *Xyris schoenoides* Mart. in Wall., Pl. Asiat. Rar. 3: 30. 1832; Hook. f., FBI 6: 365. 1892; Fischer in Gamble FPM 1532. 1928; Fyson, FSIHS 613. t. 549. 1932.

Erect, scapigerous herb. Leaves basal, to 15 x 0.3 mm, ensiform, apex curved. Scape to 50 cm, ribbed, winged. Heads terminal, to 1 cm wide, obovoid. Flowers yellow, sepals 3, to 6 x 3 mm, ovate; petals 3, limb 6 x 5 mm, obovate, fimbriate; stamens 3, staminodes 3; ovary 1 celled. Capsule 4 mm, oblong; seeds ellipsoid.

Fl. & Fr.: Throughout the year.

Distr.: Indo-Malesia. Common; in grassland bogs or stream sides at high altitudes. MS, Idlimottai, *KKK 17592.*

105. COMMELINACEAE

1. Fertile stamens 3; staminodes 1-3 2
1. Fertile stamens 6; staminodes 0 ..... **Cyanotis**
2. Cymes 1-2, arising from a spathaceous bract ..... **Commelina**
2. Cymes panicled, not arising from a spathaceous bract ..... **Murdannia**

COMMELINA Linnaeus

Sp. Pl. 40. 1753.

1. Two cells of ovary 2-ovuled; third cell 1-ovuled or obsolete ..... **C. clavata**
1. All the 3 cells of ovary 1-ovuled ..... **C. paleata**

Commelina clavata Clarke, Comm. Cyrt. Bengal t. 5. 1874; Hook. f., FBI 6: 371. 1890; Fischer in Gamble, FPM 1539. 1928; Fyson, FSIHS 615. t. 551. 1932; Matthew, Ill. FPH t. 741. 1996 & FPH 1340. 1999. **Kalani.**

Erect or procumbent herbs; stem fleshy. Leaves to 5 x 1 cm, elliptic-lanceolate, base tapering, apex acuminate. Spathe to 2.5 cm, ovate-lanceolate, base cordate, apex attenuate. Flowers blue; sepals 3, to 6 mm, obovate to lanceolate; petals 3, median one 3 mm, diminutive, laterals 7 mm, ovate; claw 6 mm; stamens 3, staminodes 3. Capsule constricted in the middle; seeds oblong, reticulate.

Fl. & Fr.: July-December

Distr.: India, Sri Lanka and Java. Common along roadsides and stream sides at low altitudes. MS, K-3, *KKK 16092.*

Commelina paleata Hassk. in Miq., Pl. Jungh. 139. 1852; Hook. f., FBI 6: 372. 1890; Fischer in Gamble, FPM 1540. 1928; Matthew, Ill. FPH t. 744. 1996 & FPH 1343. 1999.

Erect or procumbent herbs; stem fleshy; persistent dry leaves present at base. Leaves 7 x 1 cm, lanceolate, base cuneate, apex acuminate. Spathe 3.5 x 2 cm, ovate-acuminate. Flowers blue or purplish; sepals 3, middle lobe lanceolate, laterals obovate; petals 3, to 5 mm, odd one lanceolate, laterals rounded; claw 3 mm; stamens 3, staminodes 3. Capsule 6 x 4 mm, oblong, apex pointed; seeds 3 mm.

Fl. & Fr.: July-December

Distr.: Peninsular India and Indonesia. Common along roadsides at low altitudes. MS, K-4, *KKK 16768.*

CYANOTIS D. Don

Prodr. Fl. Nepal. 45. 1825, *nom. cons.*

1. Branchlets cottony **2**
1. Branchlets otherwise **3**
2. Shoots purplish, to 50 cm, cottony; leaves to 20 cm long; cymes dense ..... **C. arachnoidea**
2. Shoots not purple, < 30 cm, flocossely silky; leaves < 6 cm long; cymes lax ..... **C. fasciculata**
3. Bracts leafy, twice as long as cymes ..... **C. cristata**
3. Bracts not leafy, not exceeding cymes **4**
4. Leaves cauline, silky villous below, drying black above; seeds rugose ..... **C. villosa**
4. Leaves cauline and radical, glabrous or pilose below, drying grey above; seeds pitted ..... **C. pilosa**

Cyanotis arachnoidea Clarke in DC., Monogr. Phan. 3: 250. 1881; Hook. f., FBI 6: 386. 1892; Fischer in Gamble, FPM 1550. 1931; Fyson, FSIHS 618. t. 556. 1932; Matthew, Ill. FPH t. 745. 1996 & FPH 1344. 1999. *C. pilosa* Wight, Ic. t. 2083. 1853, non Roem. & Schult.

Suberect herbs, densely white-cottony hairy. Leaves to 20 x 1.5 cm, ovate to linear-lanceolate. Cymes terminal; bracts ovate, acute; bracteoles curved, falcate, 10-25 pairs, to 6 x 1.5 mm. Flowers bluish-violet; sepals 6 x 1.5 mm, base united, densely hairy; corolla tube 7 mm long, lobes triangular, acute; ovary densely hairy at apex. Capsule 2.5 mm long, oblong, hairy; seeds transversally rugose, black.

Fl. & Fr.: July-December

Distr.: Peninsular India and Sri Lanka. Common; in exposed rocky regions at low altitudes. MS, K-3, *KKK 31015.*

Cyanotis cristata (L.) D. Don, Prodr. Fl. Nepal 46. 1825; Wight, Ic. t. 2085. 1853; Hook. f., FBI 6: 385. 1892; Fischer in Gamble, FPM 1549. 1931; Matthew, Ill. FPH t. 746. 1996 & FPH 1345. 1999. *Commelina cristata* L., Sp. Pl. 42. 1753.

Erect or decumbent herbs, pubescent. Leaves to 5 x 2 cm, ovate, base cordate, apex obtuse, margin ciliate, often reddish. Cymes 15-30 flowered, recurved; bracts ovate, acute; bracteoles falcate, margins ciliate. Flowers bluish-purple, sessile; sepals 4 mm, oblanceolate, keeled; corolla tube 11 mm, lobes obtuse. Capsule 3.5 mm long, glabrous with few apical hairs; seeds to 1.5 mm, striate, brownish black.

Fl. & Fr.: September-December

Distr.: Paleotropics. Common; in exposed regions at low altitudes. MS, Conical Patch, *KKK 16453.*

Cyanotis fasciculata (Heyne *ex* Roth) Schult. f., Syst. Veg. 7: 1152. 1830; Wight, Ic. t. 2086. 1853; Hook. f., FBI 6: 387. 1892; Fischer in Gamble, FPM 1550. 1931; Fyson, FSIHS 619. 1932; Matthew, Ill. FPH t. 747. 1996 & FPH 1346. 1999. *Tradescantia fasciculata* Heyne *ex* Roth., Nov. Pl. Sp. 189. 1821. *Cyanotis rosea* Wight, Ic. t. 2086. 1853. *C. decumbens* Wight, Ic. t. 2088. 1853, p.p.

Procumbent herbs, stems tufted, cottony. Leaves to 3 x 0.8 cm, lanceolate, falcate, folded, base rounded, long-hairy; sheath saccate. Cymes axillary, solitary; bracts lanceolate, acuminate; bracteoles 2-4 pairs, falcate, acute. Flowers few, blue or purplish, sessile; sepals 5 x 2 mm, base united, not keeled, hairy; corolla tube 6 mm long, campanulate, lobes obtuse. Capsule 2.5 mm long, pilose at apex.

Fl. & Fr.: August-October

Distr.: Peninsular India and Sri Lanka. Occasional; on rocky regions in grasslands or scrublands at low altitudes. MS, K-5, *KKK 16574.*

Cyanotis pilosa Schult. f., Syst. Veg. 7: 1152. 1830; Hook. f., FBI 6: 387. 1892; Fischer in Gamble, FPM 1549. 1931; Fyson, FSIHS 617. t. 555. 1932; Matthew, Ill. FPH t. 748. 1996 & FPH 1346. 1999. *C. wightii* Clarke in Hook. f., FBI 6: 386. 1892. *C. longifolia* Wight, Ic. t. 2084. 1853. **Kalani (EBIS).**

Procumbent herbs. Leaves to 10 x 2.5 cm, narrowly lanceolate or elliptic, base cuneate-subcordate, apex acuminate, glabrous above. Cymes subcorymbose. Flowers blue; bracts lanceolate; bracteoles to 7 pairs, lanceolate; calyx 7 mm, lobes pilose; corolla 12 mm, lobes ovate. Capsule to 5 mm; seeds pyramidal.

Fl. & Fr.: Throughout the year

Distr.: Peninsular India and Sri Lanka. Fairly common; along roadsides at medium altitudes. MS, K-5, *KKK 16152.*

Cyanotis villosa (Spreng.) Schult. f., in L. Syst. Veg. 7: 1155. 1830; Hook. f., FBI 6: 387. 1892; Fischer in Gamble, FPM 1540. 1931; Fyson, FSIHS 618. 1932; Matthew, Ill. FPH t. 750. 1996 & FPH 1347. 1999. *Tradescantia villosa* Spreng., Syst. Veg. 2: 116. 1825. *Cyanotis lanceolata* Wight, Ic. t. 2085. 1853.

Erect or procumbent herbs; stem terete, villous. Leaves to 8 x 2 cm, ovate, sessile, base cordate. Cymes terminal and upper axillary, sessile; bracts ovate-lanceolate, villous; bracteoles ovate, curved, margins ciliate. Flowers few; sepals 6-7 mm long, free, lanceolate, keel ciliate; corolla tube to 7 mm, lobes 4 mm, obtuse, blue with red glands. Capsule 2-3 mm long, hairy at apex; seeds paired.

Fl. & Fr.: September-January

Distr.: Peninsular India and Sri Lanka. Common; along roadsides at medium altitudes. MS, K-5.5, *KKK 17685.*

MURDANNIA Royle

Ill. Bot. Himalayan Mts. t. 95. 1839, *nom. cons.*

1. Leaves linear-lanceolate, > 8 mm wide; staminal filaments bearded ..... **M. dimorpha**
1. Leaves linear, < 3 mm wide; staminal filaments naked ..... **M. juncoides**

Murdannia dimorpha (Dalz.) Brueck. in Engl. & Prantl, Pflanzenf. (ed. 2) 15a: 173. 1930; Karthik. *et al.,* Fl. Ind. Enum. 28. 1989; Matthew, Ill. FPH t. 751. 1996 & FPH 1348. 1999. *Aneilema dimorphum* Dalz. in Hook.'s J. Bot. Kew Gard. Misc. 3: 138. 1851; Hook. f., FBI 6: 377. 1892; Fischer in Gamble, FPM 1545. 1931; Fyson, FSIHS 616. t. 553. 1932. *A. paniculata* Wight, Ic. t. 2075. 1853.

Erect annuals, to 30 cm tall, pubescent. Leaves to 8 x 0.7 cm, linear-lanceolate, base cordate, apex acute, glandular below, thinly pubescent above; sheath open, minutely hairy, pink. Cymes panicled, terminal. Flowers pale blue, 8-9 mm across; sepals 3 mm long, ovate, acute; petals 4 x 3 mm, obovate, glabrous; stamens 3. Capsule 6 x 3 mm, oblong, glabrous; seeds cubical, pitted.

Fl. & Fr.: July-October

Distr.: Peninsular India and Sri Lanka. Common; in grassland marshes and along stream sides at high altitudes. ENP, Amarachola, *KKK 18056.*

Murdannia juncoides (Wight) Rau & Kammathy in Bull. Bot. Surv. Ind. 6: 3. 1964. *Dichaespermum juncoides* Wight, Ic. t. 2078. 1853. *Aneilema paniculatum* Wall *ex* Clarke in DC., Monogr. Phan. 3: 218. 1881; Hook. f., FBI 6: 381. 1892; Fischer in Gamble, FPM 1546. 1931.

Erect, tufted, slender annuals. Leaves to 6 x 0.2 cm, linear, apex acuminate. Panicles terminal. Flowers blue, 4-5 mm across; sepals 2 mm, ovate; petals 2 mm, oblong; ovary globose. Capsule to 3 mm, 3 valved; seeds smooth.

Fl. & Fr.: September-December

Distr.: Endemic to Peninsular India. Common along stream sides growing on rocks. ENP, Nilagiri Teri, *KKK 18012.*

106. JUNCACEAE

JUNCUS Linnaeus

Sp. Pl. 325. 1753.

1. Leaves grass-like, flat, non-septate or absent; tepals clearly unequal 2
1. Leaves culm-like, terete, septate within; tepals equal 4
2. Cymes terminal; leaves prominent ..... **J. bufonius**
2. Cymes (pseudo)lateral; leaves reduced to sheaths 3
3. Basal sheaths dark brown; culms distinctly ribbed; tepals brownish; stamens 6 ..... **J. inflexus**
3. Basal sheaths dull-brown; culms not ribbed; tepals greenish to yellowish; stamens 3 ..... **J. effusus**

4. Stems to 1 m tall ..... **J. leschenaultii**
4. Stems < 20 cm tall ..... **J. sp. 1**

Juncus bufonius L., Sp. Pl. 466. 1753; Hook. f., FBI 6: 392. 1892, p.p.; Fischer in Gamble, FPM 1553. 1931; Fyson, FSIHS 621. t. 559. 1932; Matthew, Ill. FPH t. 755. 1996 & FPH 1352. 1999.

Tufted herbs; stems to 40 cm tall, terete, ridged, glabrous, greenish-brown. Leaves to 11 x 0.1 cm, linear, channeled above. Panicles 2-3 cm across, lateral, sessile, 3-6 cm below the apex of the stem. Flowers mostly paired, globose, shortly pedicelled; tepals 3+3, 2 mm long, oblong-lanceolate, yellow; stamens 6. Capsule 2.5 x 1.5 mm, ovoid, obtuse; seeds curved-ellipsoid, brown.

Fl. & Fr.: July-October

Distr.: Northern temperate regions. Common; along roadsides at medium and high altitudes; K-6.5, *KKK 16556.*

Juncus effusus L., Sp. Pl. 326. 1753; Hook. f., FBI 6: 392. 1892, p.p.; Matthew, Ill. FPH t. 756. 1996 & FPH 1353. 1999.

Tufted herbs; stems to 50 cm tall, terete, ridged, glabrous, bluish-green. Sheaths to 8 cm long, rounded, with a cauducous awn. Cymes solitary, to 3 x 2 cm. Flowers many, straw coloured; tepals 2 x 0.5 mm, narrowly ovate-elliptic, acute; stamens 3; ovary obovoid. Capsule to 0.3 x 0.2 cm, obovoid, trigonous; seeds oblong, brownish.

Fl. & Fr.: May-September

Distr.: India, Sri Lanka Europe, North Asia, Africa, America and Australia. Common; along roadsides at medium and high altitudes; K-7, *KKK 16724.*

Juncus inflexus L., Sp. Pl. 326. 1753; Matthew, Ill. FPH t. 757. 1996 & FPH 1353. 1999. *J. glaucus* Ehrh. *ex* Sibth., Fl. Oxon. 113. 1794; Hook. f., FBI 6: 393. 1892; Fischer in Gamble, FPM 1553. 1931; Fyson, FSIHS 620. t. 557. 1932.

Tufted herbs; stems to 70 cm tall, terete, ridged, green, glabrous. Sheaths to 10 cm, acute, stem clasping, with an apical 5 mm long awn. Cymes sessile to 3.5 cm across. Flowers many, to 3 mm long; tepals to 3 mm, narrowly ovate-lanceolate; stamens 6; ovary ovoid. Capsule 2.5 x 1.5 mm, ovoid, trigonous; seeds 1 x 0.5 mm, oblong, brownish.

Fl. & Fr.: July-February

Distr.: India, Sri Lanka, Europe, North Asia and North Africa. Common; in marshy areas of grasslands at high altitudes. Idlimottai, *KKK 16626.*

Juncus leschenaultii Gay in Laharpe, Essai Monogr. Jonc. 137. 1827 ; Matthew, Ill. FPH t. 758. 1996 & FPH 1354. 1999. *J. prismatocarpus* R. Br., Prodr. 259. 1810, var. *leschenaultii* (Gay) Buchenau in Engl., Bot. Jahrb. Syst. 6: 205. 1885 & Pflanzenr. 25: 180. 1906. *J. prismatocarpus* auct. non R. Br. 1810: Hook. f., FBI 6: 395. 1892. p.p.; Fischer in Gamble, FPM 1553. 1931; Fyson, FSIHS 620. t. 558. 1932.

Tufted herbs; stems to 1 m tall, terete, ridged, green, glabrous. Leaves to 25 cm, linear, hollow with occasional transverse septa; sheaths to 7 cm with 2 apical auricles.

Corymbs to 20 cm, terminal; heads, subsessile, 4-12 flowered. Flowers sessile; tepals reddish-brown, to 4.5 mm, oblong-lanceolate, acute; stamens 3; ovary ovoid. Capsule to 4.5 mm, oblong, trigonous, brownish; seeds yellowish.

Fl. & Fr.: May- September

Distr.: Indo-Malesia to New Zealand. Common in grass land bogs at low and medium altitudes. MS, Idlimottai Route, *KKK 16588*; Methappu, *KKK 16004*.

Juncus sp. 1

Tufted herbs; stems to 20 cm tall, terete, ridged, green, glabrous. Leaves to 10 cm, linear, hollow with occasional transverse septa; sheaths to 4 cm with 2 apical auricles. Corymbs terminal, to 10 cm long; heads subsessile, 6-10 flowered. Flowers sessile; tepals to 4.5 mm, linear, acute; stamens 3; ovary ovoid. Capsule to 4 mm, oblong, trigonous, brownish; seeds ellipsoid, yellowish.

Fl. & Fr.: May- September

Distr.: Common in grass land bogs at high altitudes. MS, Methappu, *KKK 16004*.

Note: The specimen resembles *J. prismatocarpus* R. Br. of Fyson in description and figure, but differs from *J. leschenaultii* of Matthew by its extremely smaller size (< 20 cm). According to Matthew, the true *J. prismatocarpus* R. Br. is a non-Asian plant. So the identity of this specimen has to be ascertained.

107. ARECACEAE (Palmae)

CALAMUS Linnaeus
Sp. Pl. 325. 1753.

Calamus gamblei Becc. *ex* Becc. & Hook. f. in Hook. f., FBI 6: 493. 1893; Fischer in Gamble, FPM 1568. 1931. **Chooral (EBIS).**

Clustering moderate sized cane; stems to 15 m; sheaths green, armed with bulbous based spines, knee present. Leaves to 1 m long, leaflets to 40 x 2 cm, lanceolate. Inflorescence flagellate, arising well above the mouth of the sheath. Partial inflorescence 5-6, to 90 cm long. Fruit 1.5 cm across, turbinate globose, slightly tapers at base; scales deeply channelled, pale yellow, shining.

Fl. & Fr.: December-April

Distr.: Endemic to Western Ghats. Occasional; found along stream sides at low and medium altitudes. MS, K-5, *KKK 17620*.

108. ARACEAE (Aroideae)

ARISAEMA Martius
Flora 14: 459. 1831

1. Leaves pedate compound, not digitate ..... **A. tortuosum**
1. Leaves palmate compound 2
2. Leaflets usually 5-7 3
2. Leaflets 7-17 4

3. All leaflets sessile including central leaflet ..... **A. murrayi**
3. Leaflets petiolulate, central one distinctly so ..... **A. barnesii**
4. Limb of spathe erect or suberect **5**
4. Limb of spathe recurved or hooded **6**
5. Appendix clavate, tip obtuse ..... **A. leschenaultii**
5. Appendix tapering, tip acute or globulate ..... **A. attenuatum**
6. Spathe cylindrical with a hooded limb ..... **A. psittacus**
6. Spathe broad with a recurved limb ..... **A. tuberculatum**

Arisaema attenuatum Barnes & Fischer, Bull. Misc. Inform. 1936: 275. 1936; Chatterjee, Bull. Bot. Soc. Bengal 8: 121. 1959. **Pambu Cholam.**

Tuberous herbs, dioecious; corms to 3 cm across, oblate. Leaf solitary, petiole slender, to 75 cm long, mottled; leaflets 6-12, to 20 x 5 cm, elliptic-lanceolate to oblanceolate, base tapering, apex acuminate. Tube of spathe cylindric, to 9 x 1.5 cm; limb elongate-lanceolate, to 6 cm long, long acuminate. Spadix to 9 cm, tip acute and curved at right angles and shortly exserted. Male inflorescence 3 cm long, flowers crowded near base; female inflorescence 1.5 cm long, ovaries subglobose.

Fl. & Fr.: February-March

Distr.: Endemic to Southern Western Ghats. Occasional; found in shola borders or scrublands. MS, Chengalar, *KKK 31016*. ENP, MPCA, *KKK 17526*.

Arisaema barnesii Fischer in Kew Bull. 1933: 342. 1933 & in Gamble, FPM 1891. 1936 ; Chatterjee, Bull. Bot. Soc. Bengal 8: 121. 1959.

Tuberous herbs, dioecious; corms to 2.5 cm across, subglobose; petiole to 50 cm, smooth; leaves radiate, membranous leaflets 5-7, 15 x 3 cm, elliptic-lanceolate, acuminate, base caudate. Tube of spathe cylindric, to 7.5 x 1.5 cm, limb horizontal, shorter than the tube, tapering into a filiform tail. Spadix 5-6 cm long, clavate at apex. Female infloresence to 7 cm long; ovaries subglobose.

Fl. & Fr.: March-August

Distr.: Endemic to Southern Western Ghats. Rare; found along shola borders at low altitudes. MS, Thalachorkadavu, *KKK 18157*.

Arisaema leschenaultii Blume, Rumph. 1: 93. 1836; Hook. f., FBI 6: 504. 1893; Fischer in Gamble, FPM 1585. 1931; Fyson FSIHS 623. t. 562. 1932; Chatterjee, Bull. Bot. Soc. Bengal 8: 127. 1959; Matthew, FPH 1369. 1999. *A. papillosum* Steud. *ex* Schott, Prodr. Syst. Aroid. 46. 1860. *A. huegelii* Schott, Prodr. Syst. Aroid. 44. 1860. *A. pulchrum* N. E. Br., J. Linn. Soc. Bot. 18: 252, t. 6. 1880; Hook. f., FBI 6: 505. 1893; Fischer in Gamble, FPM 1585. 1931. **Pambu Cholam. Plate 4.14.1.**

Tuberous herbs, dioecious; corm to 3.5 cm across, globose; petiole 25-60 cm long, smooth. Leaves radiate, leaflets 5-10, to 15 x 5 cm, elliptic-lanceolate, base caudate, apex acuminate. Spathe to 18 x 4 cm, broadly lanceolate; limb as long as the tube, broadly ovate, greenish with 5-6 purple streaks. Spadix to 10 cm long, clavate at apex. Male florets dark, sparse; female florets with sessile obovoid ovaries; appendix to 5 cm long. Fruit to 8 mm across, obovoid.

Fl. & Fr.: March-August

Distr.: Endemic to Southern Western Ghats. Common along roadsides and exposed regions at all altitudes. MS, Thalachorkadavu, *KKK 18156*; Idlimottai, *KKK 18182.*

Arisaema murrayi (Graham) Hook. in Bot. Mag. 74: t. 4388. 1848; Hook. f., FBI 6: 507. 1893; Fischer in Gamble, FPM 1585. 1931; Chatterjee, Bull. Bot. Soc. Bengal 8: 129. 1959. *Arum murrayi* Graham, Cat. Pl. Bombay 229. 1839. **Pambu Cholam.**

Tuberous herbs, usually monoecious; corm to 4 cm across, subglobose. Leaf digitate compound, lobes 5-8, to 17 x 6 cm, elliptic or ovate-lanceolate, base cuneate, apex acuminate; petiole sheathing, to 40 cm long. Spathe striate, to 10 cm long, base to 3 x 1.5 cm, tubular; limb 10 x 5 cm, green with white streaks, reddish along margins. Spadix 6 cm long; male florets above. Berry to 6 x 5 mm, obovoid.

Fl. & Fr.: May-October

Distr.: Endemic to Western Ghats. Rare; along shola borders at lower elevations. MS, Chengalar, *KKK 16702.*

Arisaema psittacus Barnes in Hook., Icon. Pl. ser. 5, 5: t. 3405. 1940; Chatterjee, Bull. Bot. Soc. Bengal 8: 131. 1959; Nair *et al.*, Rheedea 7(2): 101-106. 1997. **Pambu Cholam. Plate 4.14.2.**

Tuberous herbs, dioecious; corm to 3.5 cm across, subglobose; petiole to 65 cm long, green with purplish mottlings. Leaves digitate compound, leaflets 8-10, to 20 x 5 cm, elliptic-lanceolate, base cuneate, apex caudate-acuminate, dark green above, light and glossy below. Spathe to 18 x 4 cm, tip caudate acuminate, recurved, tube striped with green and white; limb hemispherical to 15 x 4 cm. Spadix 8 cm long; appendix to 5 cm. Male flowers purplish; female flowers deep green; ovaries ovoid.

Fl. & Fr.: May-September.

Distr.: Endemic to Southern Western Ghats. Very rare and threatened species found at medium altitudes. MS, Idlimottai, *KKK 18180.* PAS, Vandaravu, *KKK 18192.*

Note: According to Nair *et al.* (1997) the species was so far collected only from Mannavan Shola (type locality) and Chundavurrai, Idukki District, Kerala. Now the specimens could be collected from Pambadam Shola also.

Arisaema tortuosum (Wall.) Schott in Melet. Bot. 1: 17. 1832; Hook. f., FBI 6: 502. 1893; Fischer in Gamble, FPM 1584. 1931; Fyson FSIHS 622. t. 561. 1932; Chatterjee, Bull. Bot. Soc. Bengal 8: 136. 1959; Matthew, FPH 1370. 1999. *Arum tortuosum* Wall., Pl. Asiat. Rar. 2: 10, t. 114. 1830. *Arisaema tortuosum* var. *curvatum* (Roxb.) Engl., Pflanzenr. 4: 23. F: 191. 1920. *Arum curvatum* Roxb., Fl. Ind. 3: 506. 1832. *Arisaema curvatum* (Roxb.) Kunth, Enum. Pl. Zeyl. 3: 20. 1841. *A. tortuosum* (Wall.) Schott var. *neglectum* (Schott) Fischer in Gamble, FPM 1585. 1931. *A. neglectum* Schott in Bonplandia 7: 26. 1859; Hook. f., FBI 6: 504. 1893. **Plate 4.14.3.**

Tuberous herbs, monoecious or dioecious; corm to 3 cm wide, depressed globose. Leaves paired, pedatisect; leaflets 8-12, to 12 x 4 cm, oblanceolate, base acute, apex abruptly acuminate, sparsely hispid below; petiole to 35 cm long, 2-together. Spathe to 12 cm long, lanceolate, green; limb ovate, acuminate, with white and purple

streaks; tube 4-6 cm long. Spadix 12-20 cm long; appendix sigmoidally curved, appendage narrow. Male florets long stipitate; ovaries obovoid.

Fl. & Fr.: August-December

Distr.: Himalayas, South India and Sri Lanka. Rare; in grassland ecotones at high altitudes. ENP, Rajamala, *KKK 31087.*

Arisaema tuberculatum Fischer, Kew Bull. 1935: errata slip opposite p. 66, nom nov. 1935 & in Gamble, FPM 1890. 1936. *A. convolutum* Fischer, Kew Bull. 1934: 167. 1934, non Nakai, 1929.

Tuberous herbs, dioecious; corm to 6 cm wide, subdiscoid. Leaves digitate; leaflets 9-12, to 12 x 6 cm, narrowly oblanceolate, apex caudate acuminate; petiole to 55 cm. Spathe to 12 cm, narrowly funnel shaped; limb ovate, acuminate; tube 6 cm long; appendage to 14 cm, filiform. Spadix straight, to 6 cm long; appendix cylindric, terminated in a knob. Male florets scattered; ovaries crowded, subglobose.

Fl. & Fr.: May-September.

Distr.: Endemic to Southern Western Ghats. Rare; in grassland ecotones at high altitudes. ENP, Rajamala, *KKK 31022.*

109. ERIOCAULACEAE

ERIOCAULON Linnaeus

Sp. Pl. 87. 1753.

1. Heads > 1.5 cm wide; involucral bracts pubescent; male petals triangular-ligulate..... **E. brownianum**
1. Heads < 1 cm wide; involucral bracts glabrous; male petals not triangular-ligulate 2
2. One petal much enlarged in male florets and extruded beyond the floral bracts..... 3
2. All petals equal in male florets ..... **E. collinum**
3. Mouth of sheath clearly oblique; heads subglobose, straw coloured; receptacle pilose ..... **E. odoratum**
3. Mouth of sheath truncate; heads globose, black; receptacle glabrous..... **E. melaleucum**

Eriocaulon brownianum Mart. *ex* Wall., Pl. Asiat. Rar. 3: 25, t. 248. 1832; Hook. f., FBI 6: 576. 1893; Ansari & Balakr., Eriocaul. India. 27. 1994. *E. nilagirense* Steud., Syn. Pl. Glumac. 2: 271. 1855. *E. brownianum* var. *nilagirense* (Steud.) Fyson, J. Indian Bot. Soc. 2: 262. 1921 & FSIHS 627. t. 565. 1932; Fischer in Gamble, FPM 1619. 1931. **Valiya Button Poovu (EBIS) Plate 5.6.1.**

Perennial herbs, larger in size. Leaves to 60 x 2 cm, linear-lanceolate, flat or folded, base pubescent, widely sheathing. Peduncle to 1 m high; heads to 2 cm across, depressed globose, white; involucral bracts black, obovate; floral bracts spathulate-cuneate, acute, white-papillose hairy. Male sepals 3, obovate; petals 3, triangular-ligulate, glandular; stamens 3+3. Female sepals 3, free, boat-shaped, hairy; petals oblong, pilose, black glandular; seeds subglobose.

Fl. & Fr.: July-December

Distr.: India, Myanmar and Sri Lanka. Occasional; found in grassland bogs at high altitudes. MS, Idlimottai, *KKK 16624; KKK 16625.*

Eriocaulon collinum Hook. f., FBI 6: 584. 1893; Fyson, FSIHS 628. t. 566. 1932; Ansari & Balakr., Eriocaul. India. 43. 1994; Matthew, Suppl. Ill. FPH t. 1197. 1998 & FPH 1385. 1999. *E. christopheri* Fyson, Kew Bull. 1914: 330. 1914 & J. Indian Bot. Soc. 2: 206. 1921. *E. oliveri* Fyson, Kew Bull. 1914: 331. 1914 & J. Indian Bot. Soc. 2: 206. 1921. **Button Poovu (EBIS) Plate 5.6.2.**

Perennial herbs, smaller in size. Leaves to 6 x 0.4 cm, linear-lanceolate, apex acuminate, glabrous. Peduncle to 30 cm, glabrous; heads to 0.8 cm wide, subglobose, dark grey; involucral bracts black, obovate-orbicular; floral bracts cuneate, white-papillose hairy. Male sepals 3, obovate, blackish; petals 3, unequal, with an apical black gland; stamens 3+3. Female sepals 3, free, bat shaped, white papillose towards apex; petals 3, spathulate, pilose; seeds ellipsoid.

Fl. & Fr.: July-December

Distr.: Peninsular India. Common; in grassland bogs at high altitudes. MS, Idlimottai, *KKK 16621.*

Eriocaulon melaleucum Mart. in Wall., Pl. Asiat. Rar. 3: 29. 1832; Hook. f., FBI 6: 574. 1893; Fischer in Gamble, FPM 1619. 1928 ; Matthew, FPH 1396. 1999. *E. geoffreyi* Fyson, Kew Bull. 1914 : 330. 1914 & FSIHS 629. t. 567. 1932. *E. leucomelas* Steud., Nom. Bot. (ed. 2) 1: 585. 1840; Ansari & Balakr., Eriocaul. India. 174. 1994. **Button Poovu (EBIS).**

Perennial herbs, smaller in size. Leaves to 4 x 0.3 cm, linear-lanceolate, apex acuminate, recurved. Peduncle to 15 cm, glabrous; heads to 0.8 cm wide, subglobose, white; involucral bracts black; floral bracts obovate-cuspidate, black. Male sepals 3, black; petals subequal with large black glands, tube slender; female sepals boat shaped; petals oblanceolate with long white hairs.

Fl. & Fr.: July-December.

Distr.: Endemic to Southern Western Ghats. Occasional; in grassland bogs at high altitudes. MS, Idlimottai, *KKK 16623.*

Eriocaulon odoratum Dalz. in Hook.'s J. Bot. Kew Gard. Misc. 3: 280. 1851; Hook. f., FBI 5: 574. 1893; Fischer in Gamble, FPM 1618. 1931; Fyson, FSIHS 629. 1932; Ansari & Balakr., Eriocaul. India 43. 1994; Matthew, Suppl. Ill. FPH t. 1199. 1998 & FPH 1387. 1999. **Button Poovu (EBIS).**

Perennial herbs, smaller in size. Leaves to 10 x 0.3 cm, lanceolate, apex acute, glabrous. Peduncles to 45 cm long, glabrous; heads depressed globose; involucral bracts obovate, obtuse, hyaline; floral bracts deltoid, acuminate to a sharp point, sparsely or densely hairy. Male sepals united into a 3-lobed sheath, black, hairy; petals 3, unequal, white. Female sepals 3, ovate, concave, hairy along the keel; petals oblanceolate, hairy, white; seed oblong, appendages many.

Fl. & Fr.: July-December.

Distr.: Endemic to Southern Western Ghats. Common; in marshy places in grasslands at higher elevations. MS, Idlimottai, *KKK 16622.*

110. CYPERACEAE

1. Florets unisexual ..... **Carex**
1. Florets bisexual 2
2. Hypogynous bristles present; leaves reduced to sheaths 3
2. Hypogynous bristles absent; leaves developed with blades 4
3. Style base dilated and constricted above the ovary ..... **Eleocharis**
3. Style base not dilated and not constricted above the ovary ..... **Schoenoplectus**
4. Style-base dilated and constricted above the nut; glumes spiral (rarely distichous) ..... **Fimbristylis**
4. Style-base continuous with the nut; glumes distichous 5
5. Rachilla persistent 6
5. Rachilla deciduous 7
6. Nut trigonous; stigmas 3 ..... **Cyperus**
6. Nut biconvex; stigmas 2 ..... **Pycreus**
7. Keels of nut bearing glumes usually winged or serrulate; stigmas 2 ..... **Kyllinga**
7. Keels of nut bearing glumes not winged or serrulate; stigmas 3 ..... **Mariscus**

CAREX Linnaeus

Gen. Pl. ed. 1, 280. 1737

1. Terminal spikelets wholly male ..... **C. phacota**
1. Terminal spikelets wholly bisexual 2
2. Stigmas 2 3
2. Stigmas 3 5
3. Spikelets ovoid to subglobose ..... **C. nubigena**
3. Spikelets elongate, cylindric 4
4. Utricle elliptic, base narrowed, dark brown, hispid ..... **C. brunnea**
4. Utricle elliptic-lanceolate, base stipitate, pale brown, glabrous ..... **C. longicruris**
5. Male portion of spikelet equal to female ..... **C. myosurus**
5. Male portion of spikelets shorter than female 6
6. Spikelets at least 20 mm long ..... **C. baccans**
6. Spikelets always <15 mm long 7
7. Partial panicle ovoid or oblong; mouth of utricle distinctly bifid 8
7. Partial panicle pyramical; mouth of utricle entire, rounded or very shortly bifid ..... **C. filicina**
8. Rachis appressed-pubescent; partial panicles contracted; utricle obscurely ribbed 9
8. Rachis densely patent-hairy; partial panicles expanded; utricle strongly ribbed ..... **C. raphidocarpa**
9. Spikelets 0.6 to 1 cm long; utricles narrower ..... **C. lindleyana** var. **lindleyana**
9. Spikelets 1.25 to 1.75 cm long; utricles distant ..... **C. lindleyana** var. **major**

Carex baccans Nees *ex* Wight, Contrib. Bot. India 122. 1834; Clarke in Hook. f., FBI 6: 722. 1894; Fischer in Gamble, FPM 1687. 1931; Fyson, FSIHS 650. 1932; Matthew, Ill. FPH t. 760. 1996 & FPH 1397. 1999. **Cheru Korappullu.**

Perennials; culms to 100 cm high, triquetrous, stout. Leaves to 80 x 1 cm, long-attenuate, 3-costate. Panicles pyramidal. Spikelets to 5 x 0.8 cm, cylindrical; male portion 1 cm long; staminate glumes to 4.5 mm long; stamens 3; pistillate glumes 3.5

x 1.5 mm, deep red; utricle 3-4 mm long, beak 2-cleft. Nut 3 x 1.5 mm, ellipsoid, dark brown.

Fl. & Fr.: July-December

Distr.: Indo-Malesia and China. Common along shola borders and roadsides at medium and high altitudes. MS, K-5, *KKK 16165.*

Carex brunnea Thunb., Fl. Jap. 38. 1784; Clarke in Hook. f., FBI 6: 705. 1894; Fischer in Gamble, FPM 1686. 1931; Fyson, FSIHS 648. 1932; Matthew, Ill. FPH t. 761. 1996 & FPH 1398. 1999.

Perennials; culms tufted, to 90 cm high, triquetrous. Leaves to 75 x 0.5 cm, linear-elongate, 3-costate. Panicles pyramidal. Spikelets to 5 x 0.4 cm, narrowly cylindrical; female portion 3 cm long; staminate glumes to 4 mm long, ovate; stamens 3; pistillate glumes 3.5 x 1.5 mm, deep red; utricle 3-5 mm long, ovoid, beak 2-cleft, dark brown. Nut 25 x 1.5 mm, ovoid-oblong, straw coloured.

Fl. & Fr.: July-December

Distr.: Indo-Malesia and Australia. Common along roadsides at medium altitudes. MS, K-5, *KKK 16706.*

Carex filicina Nees in Wight, Contrib. 123. 1834; Clarke in Hook. f., FBI 6: 717. 1894; Fischer in Gamble, FPM 1686. 1931; Fyson, FSIHS 648. t. 581. 1932; Matthew, FPH 1399. 1999.

Perennials; culms to 120 cm tall, slender. Leaves to 60 x 0.8 cm, linear, scabrous; sheaths reddish. Panicles decompound, to 40 cm; partial panicles to 10 x 3 cm, pyramidal. Spikelets 1.5 cm long, linear-oblong; male portion 3-4 mm long, narrower; staminate glumes 3 x 1.5 mm, ovate-oblong; pistillate glumes 2 mm long, reddish brown; utricle 3.5 mm long, scabrid, beak deeply bifid. Nut 2 mm, ellipsoid, trigonous, straw coloured.

Fl. & Fr.: July-December

Distr.: South and South East Asia. Common along roadsides at lower and medium altitudes. MS, K-4.5, *KKK 16792.*

Carex lindleyana Nees in Wight, Contrib. 121. 1834, var. **lindleyana** Clarke in Hook. f., FBI 6: 721. 1894; Fischer in Gamble, FPM 1686. 1931. *C. thyrsiflora* Boott, Ill. Carex 1: 12, t. 34. 1858. *C. cruciata* sensu Thw., Enum. Pl. Zeyl. 355. 1864. **Korappullu. Plate 4.14.6.**

Perennials; culms to 100 cm tall, slender. Leaves to 70 x 1.5 cm, long-attenuate, minutely puberulous; sheaths purplish-brown. Panicles decompound, to 30 cm; partial panicles to 6 x 3 cm, ovoid. Spikelets to 1.5 x 0.4 cm, linear-oblong; staminate glumes 4 x 1.5 mm, lanceolate; pistillate glumes 2 mm long, reddish brown; utricles ellipsoid below, scabrid, beak deeply bifid. Nut 3.5 mm, oblong-elliptic, trigonous, brownish-yellow.

Fl. & Fr.: July- December

Distr.: South India and Sri Lanka. Common; in grasslands at high altitudes. MS, Idlimottai, *KKK 16441.*

Carex lindleyana Nees in Wight, Contrib. 121. 1834, var. **major** (Steud.) Fischer in Gamble, FPM 3: 1687. 1931; Matthew, Suppl. Ill. FPH t. 1205. 1998 & FPH 1402. 1999. *C. mercarensis* Hochst. *ex* Steud., Syn. Pl. Glumac. 2: 194. 1855, var. *major* Steud., Syn. Syn. Pl. Glumac. 2: 194. 1855; Clarke in Hook. f., FBI 6: 719. 1894.

Perennials; culms to 110 cm tall. Leaves to 80 x 1.5 cm, long-attenuate, minutely puberulous. Panicles to 30 cm; partial panicles to 6 x 3 cm, ovoid, condensed. Spikelets to 1.75 x 0.3 cm, linear-oblong; staminate glumes 4 x 1.5 mm, lanceolate; pistillate glumes 2 mm long, reddish brown; utricles distant, scabrous hairy, beak deeply bifid. Nut 3.5 mm, oblong-elliptic, trigonous, brownish-yellow.

Fl. & Fr.: July- December

Distr.: South India and Sri Lanka. Common; along roadsides at high altitudes. MS, K-7, *KKK 16554.*

Carex longicruris Nees in Wight, Contrib. 124. 1834; Clarke in Hook. f., FBI 6: 705. 1894; Fischer in Gamble, FPM 1686. 1931.

Tufted annuals; culms to 45 cm tall, obtusely triangular. Leaves mostly basal, to 35 x 0.5 cm, linear-lanceolate; sheath keeled. Panicle unbranched with two distant solitary spikelets; lower female, upper male, each 2.5 cm long. Staminate glumes 2.5 x 1.5 mm, oblong; stamens 3; pistillate glumes 5-10, to 3 x 2 mm, broadly ovate, keeled; utricles 4 x 1.5 mm, ellipsoid, shortly beaked, 2-fid at apex.

Fl. & Fr.: July- December

Distr.: India, China and Sri Lanka. Common; along roadsides at medium altitudes. MS, Coupe road, *KKK 16596*; K-5, *KKK 16706.*

Carex myosurus Nees in Wight, Contrib. 122. 1834; Clarke in Hook. f., FBI 6: 723. 1894; Fischer in Gamble, FPM 1687. 1931; Fyson, FSIHS 649. t. 582. 1932; Matthew, FPH 1403. 1999.

Perennials; culms to 90 cm tall. Leaves to 75 x 0.8 cm, linear-lanceolate, scabrid; sheath 15 cm long, brown. Panicle to 25 cm, scabrid. Spikelets solitary or paired at nodes, 5-7 cm long; male portion above, to 2.5 cm long. Staminate glumes 5 x 1.5 mm, oblong, aristate; stamens 3; pistillate glumes 3.5 x 2 mm, 1-nerved, aristate; utricle 3.5 x 1 mm. Nut 3 mm long, oblong-ellipsoid, dark brown.

Fl. & Fr.: July- December

Distr.: Indo-Malesia and China. Rare; found along shola borders and scrublands at low altitudes. MS, Conical patch, *KKK 16729.*

Carex nubigena D.Don, Trans. Linn. Soc. London 14: 326. 1824; Clarke in Hook. f., FBI 6: 702. 1894; Fischer in Gamble, FPM 1685. 1931; Fyson, FSIHS 647. t. 579. 1932; Matthew, Ill. FPH t. 766. 1996 & FPH 1404. 1999. *C. nubigena* D. Don var. *fallax* Clarke, J. Linn. Soc. Bot. 36: 301. 1904.

Perennials; culms to 65cm tall. Leaves to 60 x 0.4 cm, narrowly linear, scabrid; sheaths brown. Spikes to 3 cm, pyramidal to oblong, scabrid. Spikelets 5-12, ovoid to subglobose, sessile; male portion above. Staminate glumes 3.5 x 1.5 mm, ovate, acute, shortly awned; stamens 3; pistillate glumes 3-nerved; utricle 4 x 1 mm, ovoid, plano-convex, beak bifid. Nut 1.5 mm, suborbicular, pale brown.

Fl. & Fr.: July- December

Distr.: Afghanistan, India, Sri Lanka, China, Sumatra and Java. Common in grasslands at high altitudes. MS, Idlimottai, *KKK 16634*.

Carex phacota Spreng., Syst. Veg. 3: 826. 1826; Clarke in Hook. f., FBI 6: 708. 1894; Fischer in Gamble, FPM 1686. 1931; Fyson, FSIHS 648. t. 580. 1932; Matthew, FPH 1405. 1999.

Perennials; culms to 100 cm tall. Leaves to 80 x 0.5 cm, linear, attenuate; sheaths brownish. Spikes to 16 cm; spikelets 4-7, to 5 x 0.5 cm, linear-cylindric; terminal one male. Staminate glumes 3 x 1.5 mm, oblong, emarginate; stamens 3; pistillate glumes 2 x 1 mm, obovate, truncate at apex, aristate; utricle 3 x 1.5 mm, ovoid-elongate, puberulus, deep brown. Nut to 2 mm, pyriform, brownish.

Fl. & Fr.: October-February

Distr.: Indo-Malesia and Sri Lanka. Common in grassland bogs at high altitudes. MS, Idlimottai, *KKK 16030*; *KKK 16631*; *KKK 18176*.

Carex raphidocarpa Nees in Wight, Contr. Bot. India 122. 1834; Clarke in Hook. f., FBI 6: 719. 1894; Fischer in Gamble, FPM 1687. 1931; Matthew, FPH 1405. 1999.

Perennials; culms to 130 cm. Leaves to 75 x 1.3 cm, long attenuate, glabrous; sheaths brownish. Panicles pyramidal; spikelets to 2.5 x 0.5 cm, oblong, at right angles to rachis; male portion to 0.8 cm; staminate glumes to 4 x 1 mm; stamens 3; pistillate glumes 3 mm long; utricle ovate, ribbed, spreading. Nut 2 mm long, pyriform.

Fl. & Fr.: August-December

Distr.: Endemic to Southern Western Ghats. Occasional; along roadsides at medium altitudes. MS, K-5, *KKK 31082*.

CYPERUS Linnaeus

Sp. Pl. ed. 1, 1: 44. 1753.

Cyperus compressus L., Sp. Pl. 46. 1753; Clarke in Hook. f., FBI 6: 605. 1893; Fischer in Gamble, FPM 1640. 1931; Matthew, FPH 1409. 1999.

Annuals; culms to 40 cm tall, obtusely trigonous, slender. Leaves to 20 x 0.4 cm, linear, glabrous; sheaths reddish-brown. Spikes 5-10 cm across, broadly ovoid; spikelets 6-12, to 3 x 0.4 cm, oblong, 30-40 flowered, much compressed; rachis narrowly winged; glumes 4 x 2.5 mm, ovate, mucronate, keeled; stamens 3. Nut 1.5 x 1 mm, broadly ovoid, trigonous, dark brown, smooth.

Fl. & Fr.: Throughout the year

Distr.: Pantropical. Common; at low altitudes. MS, Thalachorkadavu, *KKK 16748*.

ELEOCHARIS R. Brown

Prodr. Fl. Nov. Holl. 224. 1810.

Eleocharis congesta D. Don, Prodr. Fl. Nepal. 41. 1825; Clarke in Hook. f., FBI 6: 630. 1893; Fischer in Gamble, FPM 1648. 1931; Clarke in Hook. f., FBI 6: 630. 1894; Fischer in Gamble, FPM 1648. 1931; Fyson, FSIHS 637. t. 574. 1932; Matthew, FPH 1417. 1999.

Tufted annuals; culms to 25 cm tall, slender, ribbed, smooth; sheaths tubular, mouth oblique with small appendage, red glandular. Spikelets to 6 x 3 mm, ovoid, 20-40-flowered; glumes 2 x 1 mm, acute, 1-nerved, upper margin reddish-pink, rest hyaline; bristles 6, 2 mm long, golden yellow; stamens 3. Nut 1.5 mm long, obovoid, 3-angled, yellowish green.

Fl. & Fr.: July-March

Distr.: Indo-Malesia. Common; in marshy areas at lower altitudes. MS, Conical patch. *KKK 16569.*

FIMBRISTYLIS Vahl

Enum. Pl. 2: 285. 1806, *nom. cons.*

1. Glumes distichous; stigmas 3 ..... **F. kingii**
1. Glumes spirally imbricated; stigmas 3 or 2 2
2. Stigmas 2; nut biconvexed; ligule present ..... **F. dichotoma** var. **villosa**
2. Stigmas 3; nut trigonous; ligule absent ..... **F. uliginosa**

Fimbristylis dichotoma (L.) Vahl., Enum. Pl. 2: 287. 1806, var. **villosa** Fischer in Gamble, FPM 1658. 1931.

Annual herbs; culms to 15 cm tall, densely tufted, angular, glabrous. Leaves basal, to 7 x 0.1 cm, flat, acuminate, scabrid. Inflorescence simple; spikelets solitary, to 5 mm, ovoid, many flowered; glumes to 3 mm, ovate, mucronate, reddish brown; stamens 3; style base villous hairy. Nut 1.2 mm, obovoid, biconvex, straw coloured.

Fl. & Fr.: July-December

Distr.: Tropical Asia and Australia. Common in grasslands at high altitudes. MS, Idlimottai, *KKK 16630.*

Fimbristylis kingii Gamble *ex* Boeck., Beitr. Cyper. 2: 40. 1890; Clarke in Hook. f., FBI 6: 633. 1894; Fischer in Gamble, FPM 1658. 1931; Fyson, FSIHS 638. t. 575. 1932; Matthew, FPH 1421. 1999.

Annual herbs; culms to 20 cm tall, densely tufted, glabrous. Leaves to 18 x 0.1 cm, flat, acute, hairy; sheaths membranous. Inflorescence simple; spikelets solitary, to 5 mm, ovoid, many flowered; glumes to 2 mm, ovate, mucronate, membranous, reddish brown; stamens 3. Nut 1 mm, obovoid, trigonous, straw coloured.

Fl. & Fr.: July-December

Distr.: Endemic to Southern Western Ghats. Common in grasslands at high altitudes. MS, Idlimottai, *KKK 16629.*

Fimbristylis uliginosa Hochst. *ex* Steud., Syn. Pl. Glumeac. 109. 1855; Clarke in Hook. f., FBI 6: 648. 1894; Fischer in Gamble, FPM 1660. 1931; Fyson, FSIHS 640. t. 576. 1932; Matthew, FPH 1423. 1999.

Perennial herbs; culms tufted, to 25 cm tall. Leaves clustered, basal, to 15 x 0.2 cm, narrowed from a broad base, scabrid. Inflorescence compound; spikelets 1-4, to 8 x 3 mm, ellipsoid-oblong, sessile; glumes spiral, 4 x 3 mm, ovate, mucronate, reddish-brown; stamens 3. Nut 1.5 x 1 mm, obovoid, trigonous, dark brown.

Fl. & Fr.: July-December

Distr.: Endemic to South India. Common in grasslands at high altitudes. MS, Idlimottai, *KKK 16628.*

KYLLINGA Rottboel

Descr. & Ic. Rar. Nov. Pl. 12. 1773, *nom. cons.*

Kyllinga nemoralis (J. R. Forst. & G. Forst.) Dandy *ex* Hutch. & Dalz., Fl. W. Trop. Africa 2: 486,487. 1936; Matthew, FPM 1426. 1999. *Thryocephalon nemoralis* J. R. Forst. & G. Forst., Char. Gen. Pl. 130. 1776. *Kyllinga monocephala* Rottb., Descr. Ic. 13. 1773; Clarke in Hook. f., FBI 6: 588. 1893; Fischer in Gamble, FPM 1624. 1931. *Cyperus kyllinga* Endl., Cat. Hort. Acad. Vindb. 1: 1842.

Perennial herbs; rhizomes long creeping; culms to 40 cm tall. Leaves 30 x 0.3 cm, flat, scabrid; sheaths reddish-brown. Spike solitary, to 1 cm, globose or ovoid; spikelets rarely 1-3, lateral, ovate-elliptic, 1-2 flowered; glumes 4, to 3 mm, narrowly linear; keel acute; stamens 3. Nut to 1.5 mm long, oblong to obovoid, biconvex, brownish.

Fl. & Fr.: July-October

Distr.: Pantropical. Common along roadsides at medium altitudes. MS, K-5, *KKK 16550.*

MARISCUS Vahl

Enum. Pl. 2: 372. 1806, *typ. cons.*

Mariscus paniceus (Rottb.) Vahl, Enum. Pl. 2: 373. 1806; Clarke in Hook. f., FBI 6: 620. 1893; Fischer in Gamble, FPM 1644. 1931; Matthew, FPH 1433. 1999. *Kyllinga panicea* Rottb., Descr. Ic. 15. 1773. *Cyperus paniceus* (Rottb.) Boeck., Linnaea 36: 381. 1870.

Perennial herbs; rhizomes creeping; culms to 40 cm tall, 3-angled, smooth. Leaves to 30 x 0.4 cm, long-acute, glabrous; sheaths pale brownish. Umbel simple; spikes 3-6, each 1.5 x 0.8 cm. Spikelets 4 x 0.6 mm, linear-lanceolate, terete; glumes 4, lower two glumes smaller; third glume 3 x 1.5 mm, ovate-lanceolate, fourth glume scaly; stamens 3. Nut 2.5 mm long, oblong, yellowish brown.

Fl. & Fr.: August-January

Distr.: Indo-Malesia. Common along roadsides at low altitudes. MS, K-3, *KKK 16782.*

PYCREUS P. Beauvois

Fl. d'Oware & Benin 2: 48, t. 86. 1807.

Pycreus flavidus (Retz.) Koyama, J. Jap. Bot. 51: 31. 1976; Matthew, FPH 1434. 1999. *Cyperus flavidus* Retz., Obs. Bot. 5: 13. 1788. *Pycreus flavidus* (Retz.) Koyama var. *nilagiricus* (Steud.) Karth., Fl. Ind. Enum. (Monocot.) 65. 1989. *Cyperus nilagiricus* Hochst. *ex* Steud., Syn. Pl. Glumac. 2 : 2. 1855. *Pycreus globosus* (All.) Reichb. f., Fl. Germ. Excurs. 140. 1830; Fischer in Gamble, FPM 1627. 1931; Fyson, FSIHS 634. tt. 570, 571. 1932. *Cyperus globosus* All., Fl. Pedem. Auct. 49: 1789. *Pycreus capillaris* (Koenig *ex* Roxb.) Nees *ex* Clarke in Hook. f., FBI 6: 591. 1893. *Cyperus capillaris* Koenig *ex* Roxb., Fl. Ind. 1: 194. 1832.

Annual herbs; culms tufted, to 45 cm, smooth. Leaves 40 x 0.2 cm, flat or channeled, acuminate; sheaths reddish-brown. Inflorescence to 7 cm, simple or subcompound. Spikes to 2.5 cm, ovoid or subglobose; spikelets 4-12, linear-oblong, compressed; glumes to 2.5 mm, ovate-oblong, chartaceous; keel greenish; stamens 2. Nut to 1 mm, ellipsoid or obovoid, biconvex, dark brown.

Fl. & Fr.: July-December

Distr.: South Europe, Africa and Central and South Asia. Common along roadsides at low altitudes. MS, K-4, *KKK 16537.*

SCHOENOPLECTUS (Reichenbach) Palla

Sitzber. Zool. Bot. Ges. Wein 38: 49. 1888, *nom. cons.*

Schoenoplectus mucronatus (L.) Palla, Bot. Jahrb. Syst. 10: 299. 1889; Matthew, FPH 1438. 1999. *Scirpus mucronatus* L., Sp. Pl. 50. 1753; Clarke in Hook. f., FBI 6: 657. 1893; Fischer in Gamble, FPM 1666. 1931; Fyson, FSIHS 642. t. 577. 1932. *S. triangulatus* Roxb., Fl. Ind. 1: 219. 1820.

Perennial herbs; culms densely tufted, to 90 cm tall, subterete, spongy below; sheaths 3-4, upper one cylindrical, pale greenish, lower brownish. Spikelets to 1 x 0.6 cm, ovoid-oblong, 10-25, in a pseudolateral head below the stem tip; glumes 4 x 3 mm, obovate, shortly mucronate, pale brown; stamens 2-3. Nut 2 x 1.7 mm, obovoid, biconvex, base cuneate, apiculate, dark brown.

Fl. & Fr.: Throughout the year

Distr.: Eurasia, from Central and South Europe east to Japan. Common in water logged areas of grasslands at low altitudes. MS, Chengalar Dam, *KKK 16703.*

111. POACEAE

1. Culms woody, arborescent; leaf blade articulating with leaf-sheath 2
1. Culms not woody; herbs; leaf blade not articulating with leaf-sheath 3
2. Culm sheaths persistent; inflorescence simple; stamens 3, filaments free ..... **Arundinaria**
2. Culm sheaths deciduous; inflorescence compound; stamens 6, filaments united.. **Pseudoxytenanthera**
3. Spikelets 1-many flowered 4
3. Spikelets strictly 2-flowered 13
4. Spikelets containing 1 bisexual floret 5
4. Spikelets containing 2 or more bisexual florets ..... **Isachne**
5. Ligule membranous; lowest floret of a spikelet male or barren 6
5. Ligule split into fine cilia; lowest floret of a spikelet bisexual 8
6. Spikelets with only 1 barren floret below bisexual one ..... **Poa**
6. Spikelets with two male or barren florets below bisexual one 7
7. Spikelets 1-flowered ..... **Agrostis**
7. Spikelets 2-several flowered 8
8. Glumes or at least the upper one enclosing the florets ..... **Anthoxanthum**
8. Glumes not enclosing the florets ..... **Helictotrichon**
9. Spikelets disarticulating above glumes, laterally compressed 10
9. Spikelets falling entire, subterete 12

10. Lemma concealing palea ..... **Zenkeria**
10. Lemma not concealing palea **11**
11. Lemmas entire, awnless ..... **Eragrostis**
11. Lemmas 2-dentate, awned ..... **Tripogon**
12. Spikelets 2-flowered; upper lemma scaberulous **13**
12. Spikelets 1-flowered; upper lemma glabrous ..... **Garnotia**
13. Panicles much contracted, spiciform; base of leaves amplexicaule ..... **Jansenella**
13. Panicles lax or slightly contracted; base of leaves not cordate or amplexicaule ..... **Arundinella**
14. Upper lemma usually not awned; spikelets solitary, rarely paired **15**
14. Upper lemma often geniculately awned; spikelets paired, one sessile and the other pedicelled **18**
15. Spikelets not subtended by bristles, nor raceme-rachis prolonged into a subulate point **16**
15. Spikelets subtended by one or more bristles or raceme-rachis prolonged into a subulate point... **Setaria**
16. Lemma of upper floret with decurrent wings or scars at base ..... **Panicum**
16. Lemma of upper floret without basal wings or scars **17**
17. Inflorescence an open panicle; spikelets thickly covered with long silky hairs ..... **Rhynchelytrum**
17. Inflorescence of racemes arranged on a central axis; spikelets not as above ..... **Oplismenus**
18. Pedicelled spikelets similar to sessile ones in shape, both fertile **19**
18. Pedicelled spikelets differing from sessile, in shape and sex **20**
19. Culms erect; spikelets villous; lower glume not grooved ..... **Eulalia**
19. Culms rambling; spikelets glabrous; lower glume with a median groove ..... **Microstegium**
20. Lower glume flattened abaxially and keeled **21**
20. Lower glume rounded abaxially, not keeled **23**
21. Lower glume depressed or grooved between keels, not winged at apex ..... **Cymbopogon**
21. Lower glume not as above, winged at apex **22**
22. Racemes 1-noded, enclosed by a spathe ..... **Apluda**
22. Racemes many nodded, not enclosed by spathes ..... **Ischaemum**
23. Pedicelled spikelets without callus; awn of upper lemma glabrous **24**
23. Pedicelled spikelets with prominent callus; awn of upper lemma pubescent ..... **Themeda**
24. Spikelets dorsally compressed, paired or solitary ..... **Sorghum**
24. Spikelets laterally compressed, in three's ..... **Chrysopogon**

ANTHOXANTHUM Linnaeus

Sp. Pl. 28. 1753.

Anthoxanthum borii S. K. Jain & D. C. Pal, J. Bombay Nat. Hist. Soc. 72: 92. 1975; Matthew, Ill. FPH t. 781. 1996 & 1465. 1999. *A. hookeri* auct. non (Griseb.) Rendle: Fischer in Gamble, FPM 1846. 1934. *A.* sp. Bor, Grass. India 431-432. 1960.

Perennials; culms tufted, branched, to 1 m tall. Leaves to 30 x 0.8 cm, sparsely hairy. Panicles to 15 cm, contracted. Spikelets to 7 mm, oblong-lanceolate; lower glume to 5 mm, ovate-lanceolate, upper 7 mm, ovate-acuminate, 3-veined, keeled; sterile lemma 6 mm, brown-ciliate, awned; awn to 6 mm; fertile lemma 3 mm, shortly aristate; palea 2 mm. Grain elliptic-ovoid, laterally compressed.

Fl. & Fr.: September-February

Distr.: Endemic to Western Ghats. Common in grasslands at high altitudes. ENP, Way to hut, *KKK 17571.*

APLUDA Linnaeus

Sp. Pl. 82. 1753

Apluda mutica L., Sp. Pl. 82. 1753; Fischer in Gamble, FPM 1750. 1934; Bor, Grass. Burma, Ceylon, India & Pakistan 93.1960; Sreekumar & Nair, Fl. Kerala Grass. 32. 1991; Matthew, FPH 1585. 1999. *A. varia* Hack. in DC., Monogr. Phan. 6:197. 1889; Hook. f., FBI 7: 150. 1896.

Perennials; culms to 1.5 m tall. Leaves to 30 x 1 cm, linear-lanceolate. Panicle to 30 cm, lax. Spikelets 3 in a cluster; one sessile and two pedicelled; sessile spikelets 7 x 3 mm, oblong; glumes subequal, 5 x 1 mm, elliptic-ovate; lower lemma 5 x 1 mm, oblong, 3-nerved, paleate; upper lemma 4 x 1.5 mm, 2-cleft and awned; awn 10-15 mm long; palea oblong, 2-keeled, hyaline; stamens 3; ovary oblong. Grain to 2 mm, ellipsoid.

Fl. & Fr.: August-December

Distr.: India, South East Asia and Australia. Common in grasslands and other open areas at lower altitudes. MS, Kulachivayal, *KKK 16666.*

ARUNDINARIA Michx.

Fl. Bor. Amer. 1: 73. 1803

Notes: Munro (1868) described two species of *Arundinaria* from South India (*A. densifolia* and *A. walkeriana)* following the generic concept of Michaux (1803). Later two more species were described (*A. wightiana & A. floribunda*). All are high altitude plants usually found in grasslands or sholas above 1500 m altitude. Gamble (1896) and later workers followed Munro's concept. While revising *Arundinaria* of South East Asia and Africa, Chao and Renvoize (1989) transferred all the South Indian species to the genus *Sinarundinaria,* which was described by Nakai (1935) based on the vegetative structures. Later Seethalakshmi and Kumar (1998) also followed this generic concept. However, the genus *Sinarundinaria* became invalid when the type species flowered and it turned out to be *Fargesia.* Majumdar (1989) on the other hand transferred all the South Indian *Arundinaria* species to the genus *Yushania,* following Keng's (1957) generic concept. However, this concept is not widely accepted. Therefore, we are retaining *Arundinaria* and placed the three species under it.

1. Ovary with 3 plumose stigmatic lobes ..... **A. walkeriana**
1. Ovary with 2 plumose stigmatic lobes **2**
2. Spikelets with one fertile floret; palea with a sulcus ..... **A. densifolia**
2. Spikelets with more than one fertile floret; palea without sulcus ..... **A. floribunda**

Arundinaria densifolia Munro, Trans. Linn. Soc. London 26: 32. 1868; Gamble, Ann. Roy. Bot. Gard. Calcutta 7: 8, t. 7. 1896 & in Hook. f., FBI 7: 379. 1897; Fischer in Gamble, FPM 1857. 1934. *Chimonobambusa densifolia* (Munro) Nakai, J. Arnold Arbor. 6: 151. 1925. *Sinarundinaria densifolia* (Munro) Chao & Renv., Kew Bull. 44: 354. 1989; Seethalakshmi & M. Kumar, Bamb. India Comp. 264. 1998. *Yushania densifolia* (Munro) Majumdar in Karthikeyan *et al.*, Fl. Ind. Enum. Monocotyl. 282. 1989. **Plate 4.14.5. & 8.**

Shrubby bamboo; culms to 1 m tall and 1 cm dia., densely clumped; lateral branches 2-3; culm sheath striate, hirsute with small pointed auricles. Leaves 5-10 on each lateral branch, to 7 x 0.8 cm, lanceolate, entire, base rounded, apex sharply acuminate, glabrous. Racemes dense, in leafy branchlets. Spikelets 1 cm long, 10-15 together; glumes purplish; lower glume ovate, attenuate into a small awn; upper glume triangular, 7-nerved; lemma 8-10 mm long, ovate-lanceolate.

Fl. & Fr.: November-May.

Distr.: Endemic to Southern Western Ghats. Rare; found along stream sides and rock cliffs at high altitudes only. ENP, Bhiman Odai, *KKK 18041*; Anaimudi, *KKK 31020*; *SS & MR 20605*.

Notes: Only the vegetative specimens of this species could be collected earlier from Eravikulam National Park, and were misidentified as *Sinarundinaria microphylla* (which is actually a Bhutan endemic) following the vegetative identification keys of Munro and Gamble (Kumar & Kumar, 1999). Later flowering specimens were reported from the same location (Kumar *et al*, 2000), and were treated under *S. microphylla* itself. But recent rivisionary studies on the bamboos of India (at Kerala Forest Research Institute) have led to the final conclusion that the specimens belongs to *S. densifolia,* which is a rare Southern Western Ghats endemic species and also the shortest bamboo so far reported from India (Remesh, *pers. comm.*). However, it is ironical to note that the same workers have treated the specimens under *S. microphylla* as evidenced from the latest publications (Kumar, 2002). Since the genus *Sinarundinaria* itself has become invalid and so far there are no other reliable publications on this issue, here the specimen was treated as *Arundinaria densifolia* to avoid further complication.

Arundinaria floribunda Thw., Enum. Pl. Zeyl. 475. 1864; Munro in Trans. Linn. Soc. London 26: 20. 1868; Gamble, Ann. Roy. Bot. Gard. Calcutta 7: 5, t. 3. 1896 & in Hook. f., FBI 7: 377. 1897. *Sinarundinaria floribunda* (Thwaites) Chao & Renv., Kew Bull. 44: 356. 1989; Seethalakshmi & M. Kumar, Bamb. India Comp. 270. 1998. **Eeta. Plate 4.14.7.**

Shrubby bamboo; culms to 2 m tall and 1.2 cm dia.; node swollen; culm sheath striate, sparsely hirsute, deciduous when old. Leaves to 11 x 1.6 cm, lanceolate, base attenuate, apex acuminate, glabrous, margins scabrous. Panicles large; spikelets 5-8 flowered, purple, hirsute; sterile glumes 2, outer to 0.3 cm long, ovate, glabrous; inner to 0.5 cm long, ovate-lanceolate, glabrous; lemma 0.5-0.6 cm long, lanceolate, mucronate, scabrous; palea glabrous, 2 keeled and with 2 broad wings, sulcate between keels; ovary glabrous, globose. Grains linear-oblong.

Fl. & Fr.: June-October

Distr.: Sri Lanka and Western Ghats. Common at stream sides and ecotones at lower and medium altitudes. MS, K-3, *KKK 16401*.

Arundinaria walkeriana Munro, Trans. Linn. Soc. London 26: 21. 1868; Gamble, Ann. Roy. Bot. Gard. Calcutta 7: 3. 1896 & in Hook. f., FBI 7: 377, t.1. 1897; Fischer in Gamble, FPM 1857. 1934. *Sinarundinaria walkeriana* (Munro) Chao & Renv., Kew

Bull. 44. 354. 1989; Seethalakshmi & M. Kumar, Bamb. India Comp. 287. 1998; Matthew, FPH 1448. 1999. *Yushania walkeriana* (Munro) Majumdar in Karthikeyan *et al.*, Fl. Ind. Enum. Monocotyl. 282. 1989. **Eeta.**

Shrubby bamboo; culms hollow, to 8 m tall and 3.5 cm across; lateral branches densely clustered; culm sheath linear-lanceolate, ribbed, ciliate. Leaves 10-20 on lateral branches, to 20 x 3.5 cm, ovate-oblong, apex pointed, margins scabrous. Panicles large, spreading, to 30 cm long, glabrous. Spikelets to 20 mm long, purplish, solitary; glumes 2, unequal, lower shorter, 5.5 mm long, ovate-lanceolate, upper 6.5 mm long. Flowers 4 or 5; lowest flower bisexual and large; upper ones aborted; lower lemma 7 mm long, ovate, apiculate; palea shorter.

Fl. & Fr.: March-June

Distr.: Southern Western Ghats and Sri Lanka. Rare; along stream sides at high altitudes. ENP, Anaimudi slope, *KKK 31083.*

ARUNDINELLA Raddi

Agrost. Brass. 36, t. 1, f. 3. 1823.

Arundinella vaginata Bor, J. Bot. Ind. Bot. Soc. 27: 66. 1948; Matthew, Suppl. Ill. FPH t. 1216. 1998 & FPH 1560. 1999. *A. villosa* sensu Fischer in Gamble, FPM 1801. 1934. *A. villosa* Arn. *ex* Steud. var. *heynei* Hook. f., FBI 7: 73. 1896; Fischer in Gamble, FPM 1801. 1934; Sreekumar & Nair, Fl. Kerala Grass. 335. 1991. **Chonappullu.**

Perennials; culms tufted, to 70 cm, densely villous below panicles. Leaves to 40 x 0.8 cm, linear, recurved, pubescent. Panicles to 25 cm, axis villous. Spikelets to 7 mm, paired; lower glumes to 6 mm, elliptic, aristate, 3-5 nerved; upper glume to 7 mm, elliptic, acute, 5 veined; lower lemma to 6 mm, elliptic; palea to 4 mm, lanceolate; upper lemma 4 mm, elliptic-oblong, 2 lobed, awn to 5 mm, twisted.

Fl. & Fr.: July-December

Distr.: Endemic to South India. Common in grasslands at high altitudes. MS, Idlimottai, *KKK 16635.*

CHRYSOPOGON Trinius

Fund. Agrost. 187. 1820, *nom.cons.*

Chrysopogon nodulibarbis (Steud.) Henrard, Blumea 4: 543. 1941; Clayton in Dassan., Rev. Handb. Fl. Ceylon 8: 120. 1994. *Andropogon nodulibarbis* Steud., Syn. Pl. Glum. 1: 396. 1854. *Andropogon zeylanicus* Nees ex Steud., Syn. Pl. Glum. 1: 397. 1854; Hook. f., FBI 7: 192. 1896. *Chrysopogon zeylanicus* (Nees ex Steud.) Thw., Enum. Pl. Zeyl. 366. 1864; Fyson, FSIHS 667. t. 595. 1932; Fischer in Gamble, FPM 1739. 1934; Sreekumar & Nair, Fl. Kerala Grass. 65. 1991; Matthew, Ill. FPH t. 799. 1996 & FPH 1579. 1999.

Perennials; culms densely tufted, to 1 m tall. Leaves to 45 x 1 cm, tubercled, hairy, margins scabrid. Panicles to 15 cm, lax, branches spreading, purple and green coloured; rachis slender. Sessile spikelets to 1 cm, narrowly oblong, bearded on margins; lower glume 6 mm, linear; upper glume linear, 2 toothed at apex; awn to 6

mm, scabrid; lower lemma oblong, ciliate; upper lemma narrowly linear, apex 2 toothed; awn to 3 cm; palea absent.

Fl. & Fr.: July-December

Distr.: South India and Sri Lanka. Common along roadsides at low altitudes. MS, K-3, *KKK 16490*; Conical patch, *KKK 16568*; Idlimottai route, *KKK 16587*.

CYMBOPOGON Sprengel

Pl. Pugill. 2: 14. 1815.

1. Pedicel of lowest pedicelled spikelets not swollen; panicle flexuous ..... **C. flexuosus**
1. Pedicel of lowest pedicelled spikelets swollen; panicle effuse ..... **C. travancoricus**

Cymbopogon flexuosus (Nees *ex* Steud.) Wats., Atk. Gaz. N. W. Prov. Ind. 392. 1882; Fischer in Gamble, FPM 1756. 1934; Sreekumar & Nair, Fl. Kerala Grass. 71. 1991; Matthew, Ill. FPH t. 803. 1996 & FPH 1592. 1999. *Andropogon flexuosus* Nees *ex* Steud., Syn. Pl. Glum. 1: 388. 1854. *A. nardus* L. var. *flexuosus* (Nees *ex* Steud.) Hack. in DC., Monogr. Phan. 6: 603. 1889; Hook. f., FBI 7: 207. 1896. **Inchipullu, Teruvapullu, Vevvapullu (EBIS).**

Perennials; culms to 2 m tall, robust; nodes glabrous. Leaves to 65 x 1.5 cm, linear-lanceolate, scabrid, glaucous. Panicles to 60 cm long, lax, reddish with drooping racemes. Sessile spikelets 4 x 1 mm, lanceolate; lower glume 4 x 1 mm, oblong; upper glume ovate-oblong, apex winged, margins infolded; lower lemma hyaline, 3 mm long; upper lemma with filiform lobes; awn 10 mm. Pedicelled spikelets 4 mm long, lanceolate.

Fl. & Fr.: July-November.

Distr.: India and South East Asia. Common in open grasslands and roadsides at lower altitudes. MS, K-3, *KKK 16491*.

Cymbopogon travancorensis Bor, J. Bombay Nat. Hist. Soc. 52: 174. 1954; Sreekumar & Nair, Fl. Kerala Grass. 74. 1991; Matthew, Ill. FPH t. 806. 1996 & FPH 1594. 1999. **Kattuvevvapullu.**

Perennials; culms to 2 m tall, robust, loosely tufted. Leaves to 70 x 2 cm, linear, margins scabrid. Panicle to 60 cm long, lax, leaves intermixed with partial panicles. Sessile spikelets to 4 mm long, oblong; lower glume 3.5 x 1.2 mm, oblong, 4-nerved, 2-keeled, margins incurved; upper glume boat shaped, 1-nerved; lower lemma hyaline, 3 mm long, oblong; upper lemma 3 x 0.5 mm; awn to 9 mm. Pedicelled spikelets 3 mm long, elliptic; pedicels hairy along the margins.

Fl. & Fr.: October-January.

Distr.: Endemic to Southern Western Ghats (Kerala). Occasional; in low altitude grasslands. MS, Kulachivayal, *KKK 16676*.

ERAGROSTIS N. M. Wolf

Gen. Pl. 23. 1776.

1. Ligule a row of hairs ..... **E. tef**
1. Ligule a rim only or a membrane **2**

2. Spikelets grey or black... 3
2. Spikelets purplish black... **E. unioloides**
3. Pedicels with glandular bands; spikelets serrate by gapping of lemmas... **E. tenuifolia**
3. Pedicels without glandular bands; spikelets not serrate... **E. nigra**

Eragrostis nigra Nees *ex* Steud., Syn. Pl. Glum. 1: 267. 1854; Hook. f., FBI 7: 324. 1896; Fischer in Gamble, FPM 1827. 1934; Sreekumar & Nair, Fl. Kerala Grass. 384. 1991; Fyson, FSIHS 678. t. 606. 1932; Matthew, FPH 1491. 1999.

Tufted perennials; culms to 50 cm tall. Leaves to 20 x 0.5 cm, linear; sheath slightly keeled, ciliate towards the mouth. Panicles to 30 cm long, ovate, lax. Spikelets to 8 flowered, pedicelled, to 5 x 3 mm, oblong, black; glumes similar, 2.2 x 0.5 mm, 1-nerved, keeled; lemma 2.2 x 1 mm, ovate, acute, 3-nerved; palea 2 x 1 mm, oblong, curved, keels smooth. Grain to 8 mm, oblong.

Fl. & Fr.: July-December

Distr.: India, China and Sri Lanka. Common found at low altitude grasslands. MS, K-4, *KKK 16521.*

Eragrostis tef (Zucc.) Trotter, Bull. Soc. Bot. Ital. 62. 1918; Sreekumar & Nair, Fl. Kerala Grass. 388. 1991. *Poa tef* Zucc., Diss. Ist. Pianta Panizz. Abiss. 1774.

Annuals; culms to 40 cm tall, sub-erect, loosely tufted. Leaves to 20 x 0.5 cm, linear, base rounded, glabrous. Panicles to 8 cm long, effuse; branches filiform, axils of branches with long hairs. Spikelets 2 x 1 mm, solitary, pedicelled, black; glumes similar, 1 x 0.5 mm, ovate, acute, keeled; florets 3-5; lemmas 1.2 x 0.5 mm, ovate; palea 0.7 mm long, ciliate along the keels.

Fl. & Fr.: August-December

Distr.: Native of Ethiopia, now spread to Tropical countries. Rare; along roadsides at high altitudes. MS, K-7, *KKK 16557.*

Eragrostis tenuifolia (A. Rich.) Hochst. *ex* Steud., Syn. Pl. Glum. 1: 268. 1854; Hook. f., FBI 7: 322. 1896; Fischer in Gamble, FPM 1827. 1934; Fyson, FSIHS 677. t. 605. 1932; Sreekumar & Nair, Fl. Kerala Grass. 391. 1991; Matthew, FPH 1492. 1999. *Poa tenuifolia* A. Rich., Tent. Fl. Abyss. 2: 425. 1851.

Annuals or perennials; culms tufted, to 60 cm tall, erect. Leaves to 25 x 0.8 cm, linear; base rounded. Panicles to 20 cm long, effuse, glabrous. Spikelets to 12 mm long, linear-oblong, serrate; glumes similar, ovate-lanceolate, 1-nerved; florets 10-18, all bisexual; lemmas 2 x 1.5 mm, broadly ovate, mucronate, greyish black; palea curved, truncate at apex, persistent. Grain to 1.5 mm, oblong.

Fl. & Fr.: July-November

Distr.: South India and Tropical Africa. Common along roadsides and stream sides at low altitudes. MS, K-4, *KKK 16521.*

Eragrostis unioloides (Retz.) Nees *ex* Steud., Syn. Pl. Glum. 1: 264. 1854; Fischer in Gamble, FPM 1826. 1934; Sreekumar & Nair, Fl. Kerala Grass. 392. 1991; Matthew,

FPH 1494.1999. *Poa unioloides* Retz., Obs. Bot. 5: 19. 1789. *Eragrostis amabilis* auct. non Wight & Arn. *ex* Nees, 1838: Hook. f., FBI 7: 317. 1896. **Karayampullu.**

Annuals or perennials; culms to 40 cm tall, tufted. Leaves to 15 x 0.5 cm, linear. Panicles to 25 cm long, very lax, effuse, glabrous. Spikelets to 17 x 4 mm, ovate to oblong; glumes subequal, to 2 x 0.5 mm, ovate-lanceolate; florets 20-40, similar; lemmas 2 x 1.5 mm, ovate, acute; palea 2 mm, curved, keel scabrid; stamens 3. Grain to 8 mm, elliptic-oblong.

Fl. & Fr.: June-November

Distr.: South East Asia, India and Africa. Common in marshy grasslands at low altitudes. MS, K-3, *KKK 16405.*

EULALIA Kunth

Revis. Gram. 1: 160. 1829.

Eulalia phaeothrix (Hack.) O. Ktze., Rev. Gen. Pl. 2: 775. 1891; Fischer in Gamble, FPM 1715. 1934; Sreekumar and Nair, Fl. Kerala Grass. 103. 1991; Matthew, Ill. FPH t. 829. 1996 & FPH 1564. 1999. *Pollinia phaeothrix* Hack. in DC., Monogr. Phan. 6: 168. 1819; Hook. f., FBI 7: 112. 1896; Fyson, FSIHS 663. t. 592. 1932. **Plate 4.14.4.**

Perennials; culms to 1.5 m tall, base brownish red tomentose, nodes hairy. Leaves to 40 x 0.8 cm, linear-lanceolate, densely hairy above. Racemes 2-6, to 15 cm long, golden-brown hairy, sessile. Spikelets paired; sessile spikelets to 5 mm, elliptic-oblong, densely villous; lower glume 4.5 mm, oblong, margins involute; upper glume ovate-oblong; lower lemma 4.5 mm, oblong; upper lemma linear, awned, awn to 15 mm long. Pedicelled spikelets to 4.5 mm long, awned or not.

Fl. & Fr.: August-February

Distr.: South India and Sri Lanka. Common in grasslands at medium and high altitudes. MS, K-3, *KKK 16767*; Idlimottai, *KKK 16627.*

GARNOTIA Brongniart

in Duperrey, Voy. Coq. Bot. Phan. 2: 132, t. 21. 1832.

Garnotia tenella (Arn. *ex* Miq.) Janowski, Fedde. Repert Sp. Nov. 17: 86. 1921; Sreekumar & Nair, Fl. Kerala Grass. 413. 1991; Matthew, FPH 1562.1999. *Berghausia tenella* Arn. *ex* Miq. in Verh. Kon. Ned. Inst. III, 4: 34. 1851. *Garnotia stricta* auct. non Brongn., 1832: Hook. f., FBI 7: 243. 1896; Fischer in Gamble, FPM 1812. 1934.

Annuals or perennials; culms 10-50 cm high, tufted, reddish brown, nodes bearded. Leaves to 18 x 0.6 cm, lanceolate, margins scabrid; sheath rounded. Panicles to 30 cm long, effuse, branches angled. Spikelets 3.5 x 1 mm, lanceolate, glabrous; glumes subequal, 3-3.5 x 1 mm, aristate, 3-nerved; lemma 2.5 x 1 mm, lanceolate, 3-nerved; palea 2 x 0.5 mm, hyaline; stamens 3.

Fl. & Fr.: November-February

Distr.: South East Asia. Common along shola borders at low and medium altitudes. MS, Puthur, *KKK 16074.*

HELICTOTRICHON Besser *ex* J. A. Schultes *et* J. H. Schultes

Mant. 3: 526 ("326"). 1827.

Helictotrichon virescens (Nees *ex* Steud.) Henr., Blumea 3: 425. 1940; Matthew, Suppl. Ill. FPH t. 1221. 1998 & FPH 1464. 1999. *Trisetum virescens* Nees *ex* Steud., Syn. Pl. Glumac. 1: 226. 1854. *Helictotrichon asperum* (Munro *ex* Thwaites) Bor, Indian For. Rec. 1: Bot. 68. 1938. *Avena aspera* Munro *ex* Thwaites, Enum. Pl Zeyl. 372. 1864. *Avenastrum asperum* (Thwaites) Fischer in Gamble, FPM 1802. 1934.

Perennials; culms tufted, erect, to 1 m. Leaves to 25 x 1 cm, linear, glabrous. Panicles to 40 cm, oblong, nodding. Spikelets to 12 mm, ovate-oblong; lower glume to 7 mm, lanceolate, 1-3 veined, keel scabrid below; upper glume to 9 mm, ovate-lanceolate, 5 veined; lower lemma to 10 mm, ovate-lanceolate, scaberulous; awn to 20 mm; palea to 8 mm, 2-keeled, ciliate.

Fl. & Fr.: August-December

Distr.: India and Sri Lanka. Common at low altitudes. MS, Dam side, *KKK 16523*; Chengalar, *KKK 16527*.

ISACHNE R. Brown

Prodr. 196. 1810.

1. Florets equal in size and texture; perennials..... **I. walkeri**
1. Florets unequal, the lower one twice as long as upper; annuals..... **I. bourneorum**

Isachne bourneorum Fischer, Kew Bull. 1932: 324. 1932 & in Gamble, FPM 1796. 1934; Sreekumar & Nair, Fl. Kerala Grass. 4172. 1991; Matthew, Ill. FPH t. 838. 1996 & FPH 1553. 1999.

Culms to 70 cm tall, geniculate or trailing; nodes bearded. Leaves to 5 x 1 cm, lanceolate, base rounded, margins thickened, serrulate and glabrous. Panicle to 15 cm long, branches angled, serrulate. Spikelets 4 mm long, lanceolate; glumes unequal, 4 x 1 mm, ovate, acuminate, sparsely bulbous based hairy; lower floret empty; upper bisexual; lower lemma 3 x 1.5 mm, ovate, hyaline, epaleate; upper lemma 1 mm across, ovate-orbicular, pubescent; palea 1 x 1 mm; stamens 3.

Fl. & Fr.: July-September

Distr.: Endemic to Southern Western Ghats. Common along roadsides at low altitudes. MS, K-4, *KKK 16517*.

Isachne walkeri (Arn. *ex* Steud.) Wight & Arn. *ex* Thw., Enum. Pl. Zeyl. 361. 1864; Hook. f., FBI 7: 26. 1896; Fischer in Gamble, FPM 1797. 1934; Sreekumar & Nair, Fl. Kerala Grass. 426. 1991. *Panicum walkeri* Arn. *ex* Steud., Syn. Pl. Glum. 1: 97. 1854.

Culms trailing or erect, to 1.2 m tall, robust; nodes glabrous, rooting from lower ones. Leaves to 25 x 2.5 cm, lanceolate, subcoriaceous, glabrous; margins cartilaginous. Panicle very lax; branches with glandular bands. Spikelets 3-4 mm long, pedicelled, ovate, acute; glumes equal, 3 x 1 mm, ovate, obtuse, glabrous; lemmas 3 x 1.5 mm, ovate, coriaceous; palea 3 x 1 mm; stamens 3; ovary elliptic.

Fl. & Fr.: September-February

Distr.: South India and Sri Lanka. Common at low and medium altitudes. MS, Chengalar, *KKK 16540*; K-7, *KKK 18138*.

ISCHAEMUM Linnaeus

Sp. Pl. 1049. 1753.

Ischaemum indicum (Houtt.) Merr., J. Arnold Arbor. 19: 320. 1938. var. **indicum** subvar. **villosum** (Nees) Bor, Grass. Burma, Ceylon, India & Pakistan 180. 1960; Sreekumar & Nair, Fl. Kerala Grass. 138. 1991; Matthew, FPH 1586. 1999. *Spodiopogon villosum* Nees in Hook. et Arn., Bot. Beech. Voy. 242. 1838. *Ischaemum ciliare* Retz. var. *villosum* (Nees) Hack. in DC., Monogr. Phan. 6: 227. 1889; Hook. f., FBI 7: 134. 1896.

Perennials; culms to 70 cm high; nodes bearded. Leaves 15 x 1 cm, lanceolate, acuminate, thickly pubescent. Racemes purple, to 8 cm long; sessile. Spikelets 4-5 mm long; lower glume 2-winged at apex, glabrous; upper glume narrowly winged along the keel; lower lemma oblong, 1-nerved; upper lemma hyaline; awn 5-9 mm long. Pedicelled spikelets 4 x 2 mm, ovate-lanceolate, similar to lower spikelets.

Fl. & Fr.: July-December.

Distr.: Peninsular India and Sri Lanka. Common along shola borders and roadsides at high altitudes. MS, Idlimottai, *KKK 16585*; *KKK 16633*.

JANSENELLA N. L. Bor

Kew Bull. 10: 96. 1955.

Jansenella griffithiana (C. Muell.) Bor, Kew Bull. 1955: 98. 1955; Sreekumar & Nair, Fl. Kerala Grass. 348. 1991. *Danthonia griffithiana* C. Muell., Bot. Zeitung 2. 14: 347. 1856. *Arundinella avenacea* Munro *ex* Thw., Enum. Pl. Zeyl. 362. 1864; Hook. f., FBI 7: 69. 1896; Fischer in Gamble, FPM 1801. 1934.

Tufted annuals; culms to 30 cm tall, rooting from the lower nodes. Leaves to 7 x 0.7 cm, lanceolate. Heads 2-3 cm long, oblong, congested. Spikelets dense, 5-7 mm long; lower glume 4 x 1 mm, lanceolate, keeled, 3-nerved; upper glume 6.5 x 1 mm, acuminate; florets 2, lower empty, upper bisexual; lower lemma elliptic, cuspidate, 3-nerved; palea oblong, obtuse; upper lemma 3.5 mm long, oblong, densely ciliate; awn 9 mm long; palea oblanceolate, 2-keeled; stamens 3. Grain oblong.

Fl. & Fr.: September-December.

Distr.: India and Sri Lanka. Occasional; found in grassland ecotones and streamsides at high altitudes. ENP, Mampallam Chola, *KKK 18069*.

MICROSTEGIUM Nees

in Lindley, Nat. Syst. ed. 2, 447. 1836.

1. Racemes 3-6, spreading at right angles on rachis; stamens 2 ..... **M. nudum**
1. Racemes 2-10, not spreading at right angles on rachis; stamens 3 ..... **M. ciliatum**

Microstegium ciliatum (Trin.) A. Camus, Ann. Soc. Linn. Lyon 68: 201. 1921; Fischer in Gamble, FPM 1716. 1934; Sreekumar & Nair, Fl. Kerala Grass. 172. 1991; Matthew, Ill. FPH t. 847. 1996 & 1567. 1999. *Pollinia ciliata* Trin., Mem. Acad. Sci. St.-Petersb. ser. 6, 2: 306. 1834; Hook. f., FBI 7: 116. 1896.

Annuals; culms 80 cm tall; nodes glabrous. Leaves 10 x 1.2 cm, lanceolate, aristate, glabrous. Racemes slender, 6-7 cm long. Spikelets similar, to 5 x 1 mm, paired, one pedicelled and one sessile; lower glume 4 x 1 mm, elliptic, shortly 2-cleft at apex, glabrous; upper glume 4 x 1 mm, boat-shaped, acuminate, 4-nerved; lower floret absent; upper bisexual; upper lemma suborbicular; awn 5-6 mm long; palea 0.5 mm long, hyaline; ovary elliptic, glabrous.

Fl. & Fr.: June-December

Distr.: India and Burma. Common along roadsides at low altitudes. MS, K-3, *KKK 16403.*

Microstegium nudum (Trin.) A. Camus, Ann. Soc. Linn. Lyon 68: 201. 1921; Fischer in Gamble, FPM 1716. 1934; Sreekumar & Nair, Fl. Kerala Grass. 174. 1991; Matthew, FPH 1567. 1999. *Pollinia nuda* Trin., Bull. Acad. Sci. Petersb. ser. 6, 2: 307. 1832; Hook. f., FBI 7: 117. 1896.

Annuals; culms to 70 cm; nodes glabrous. Leaves to 9 x 0.8 cm, sparsely hairy. Racemes to 6 cm, linear. Spikelets to 4 mm, linear-lanceolate; lower glume to 4 mm, linear-lanceolate, 2-keeled; upper glume to 4 mm, deltoid-lanceolate, 1-keeled; lower lemma to 3 mm, lanceolate, epaleate; upper lemma to 2 mm, linear, 1-vieed; awn to 12 mm; palea chartaceous.

Fl. & Fr.: June-December

Distr.: India, China, Japan and South Africa. Common along roadsides at lower altitudes. MS, K-4, *KKK 16516.*

OPLISMENUS P. Beauvois

Fl. Oware 2: 14, t. 68, f. 1. 1809, *nom. cons.*

1. Perennials; culms to 100 cm tall; panicles to 30 cm; awns needle like ..... **O. compositus**
1. Annuals; culms < 50 cm tall; panicles < 10 cm; awns capillary ..... **O. burmannii**

Oplismenus burmannii (Retz.) P. Beauv., Ess. Agrost. 54. 168. 1812; Hook. f., FBI 7: 68. 1896; Fischer in Gamble, FPM 1778. 1934; Sreekumar & Nair, Fl. Kerala Grass. 256. 1991; Matthew, FPH 1522. 1999. *Panicum burmannii* Retz., Obs. Bot. 3: 10. 1783.

Culms rooting from lower nodes. Leaves to 5 x 1 cm, elliptic. Racemes to 2 cm long, distant or close. Spikelets to 3 mm long; glumes subequal, keeled upwards; lemmas dissimilar

awns capillary, minutely scaberulous, to 1 cm long. Grain oblong.

Fl. & Fr.: July-December

Distr.: Pantropical. Common along roadsides at lower altitudes. MS, K-4, *KKK 16515.*

Oplismenus compositus (L.) P. Beauv., Ess. Agrost. 54. 168. 1812; Hook. f., FBI 7: 66. 1896; Fyson, FSIHS 659. 1932; Fischer in Gamble, FPM 1778. 1934; Sreekumar & Nair, Fl. Kerala Grass. 257. 1991; Matthew, FPH 1522. 1999. *Panicum compositum* L., Sp. Pl. 57. 1753.

Culms erect or trailing, rooting from lower nodes. Leaves to 16 x 2.5 cm, elliptic, base cuneate, covered with bulbous based hairs. Racemes 5-10, to 6 cm long; rachis

triquetrous. Spikelets 4 mm long; lower glume 2 x 1 mm, awned; awn 4 mm long; upper glume 3 x 1.5 mm, 7-nerved, awnless; lower lemma 3 x 2.5 mm, awnless; palea oblong; upper lemma 3 x 0.5 mm, lanceolate, 3-nerved; palea 3 x 0.5 mm, hyaline. Grain to 1 mm, ellipsoid.

Fl. & Fr.: September-February

Distr.: Pantropical. Common along roadsides at medium altitudes. MS, K-5.5, *KKK 16163.*

PANICUM Linnaeus

Sp. Pl. 55. 1753.

Panicum gardneri Thw., Enum. Pl. Zeyl. 359. 1864; Fischer in Gamble, FPM 1783. 1934; Sreekumar & Nair, Fl. Kerala Grass. 264. 1991; Matthew, Ill. FPH t. 852. 1996 & FPH 1524. 1999. *Isachne gardneri* (Thw.) Benth. in Benth & Hook. f., Gen. Pl. 3: 100. 1883; Hook. f., FBI 7: 26. 1896. **Kolapullu.**

Perennials; culms to 1 m tall, rooting from lower nodes. Leaves to 15 x 2.5 cm, lanceolate, base rounded, glabrous. Panicles to 16 cm, obovate-oblong, lax, glabrous. Spikelets to 5.5 mm long, pubescent; lower glume 2.5 x 1 mm, ovate-lanceolate, 1-nerved; upper glume 4 x 1.5 mm, ovate, 7-nerved; lower floret empty; lower lemma 3.5 x 1.5 mm, 7-9 nerved; palea oblong; upper lemma 2.5 x 1.5 mm, ovate, concave; palea 2.5 x 1 mm, ovate, margins recurved.

Fl. & Fr.: September-February

Distr.: South India and Sri Lanka. Common along roadsides at medium altitudes. MS, K-5.5, *KKK 16166.*

POA Linnaeus

Sp. Pl. 67. 1753.

Poa annua L., Sp. Pl. 68. 1753; Hook. f., FBI 7: 345. 1896; Fyson, FSIHS 679. t. 609. 1932; Fischer in Gamble, FPM 1850. 1934; Sreekumar & Nair, Fl. Kerala Grass. 406. 1991; Matthew, FPH 1459.1999.

Annuals; culms to 20 cm tall, tufted; nodes pilose. Leaves to 8 x 0.3 cm, base rounded. Panicles terminal, to 6 x 2 cm, ovate, contracted; branches filiform, glabrous. Spikelets similar, 5-6 mm long, ovoid, glabrous; lower glume 2 x 0.5 mm, ovate-lanceolate, 1-nerved; upper glume 2.5 x 1 mm, elliptic, 3-nerved; florets 2-5, similar; upper florets exerted; lemmas 3 x 1 mm, ovate-lanceolate, 5-nerved; palea 3 x 0.75 mm, lanceolate, 2-nerved; stamens 3; ovary oblong. Grain 1.5 mm, terete.

Fl. & Fr.: September-February

Distr.: Cosmopolitan. Occasional; in high altitude scrublands and ecotones. MS, K-7, *KKK 16799*; Idlimottai, *KKK 16018.*

PSEUDOXYTENANTHERA Soderstrom & Ellis

Smithsonian Contr. Botany 72: 52. 1988.

Pseudoxytenanthera monadelpha (Thw.) Soderstrom & Ellis, Smiths. Contrib. Bot. 72: 52. 1988; Matthew, FPH 1452. 1999. *Dendrocalamus monadelphus* Thw., Enum.

Pl. Zeyl. 376. 1864. *Oxytenanthera thwaitesii* Munro, Trans. Linn. Soc. London 26: 129. 1868; Gamble in Hook. f., FBI 7: 402. 1896. *O. monadelpha* (Thw.) Alston in Trim., Suppl. Handb. Fl. Ceylon 6: 342. 1931; Fischer in Gamble, FPM 1861. 1934. **Kaattu Mula.**

Straggling bamboo; culms to 15 x 3 m, scandent, smooth; sheaths to 15 x 7 cm, brown hairy below; blade to 10 x 1.5 cm, ovate, glabrous, base rounded with thick ring of callus and strong bristles. Leaves to 40 x 5 cm, petiolate; sheath glabrous. Spikelets to 1.2 cm long, lanceolate, compressed; glumes 2; lower larger, acute, glabrous; florets 3; lower lemmas sterile, lanceolate, epaleate; upper most one fertile, lanceolate, glabrous; palea oblong, 2-keeled; keels glabrous.

Fl. & Fr.: February-May

Distr.: South India and Sri Lanka. Occasional; along stream sides at lower altitudes. MS, Thalachorkadavu, *KKK 18155.*

RHYNCHELYTRUM Nees

in Lindley, Intr. Nat. Syst. Bot. ed. 2. 446. 1836.

Rhynchelytrum repens (Willd.) C.E. Hubb., Kew Bull. 1934: 110. 1934; Sreekumar & Nair, Fl. Kerala Grass. 297. 1991. *Saccharum repens* Willd., Sp. Pl. ed. 4, 1: 322. 1798. *Tricholaena wightii* Nees & Arn. *ex* Steud., Syn. Pl. Glum. 1: 93. 1854, *pro syn.*; Hook. f., FBI 7: 65. 1896. *Rhynchelytrum villosum* Chisu, Annuar R. Inst. Bot. Roma 8: 310. 1908; Fischer in Gamble, FPM 1791. 1934.

Annuals; culms to 50 cm tall; nodes hairy. Leaves to 20 x 0.5 mm, lanceolate, acuminate; sheath rounded. Panicles to 10 cm long. Spikelets 5-6 mm long, similar, pedicelled, densely silky hairy; lower glume 1 x 0.5 mm, oblong, obtuse; upper glume 5 x 2 mm, aristate; florets 2, lower male, upper bisexual; lower lemma keeled; palea 3 x 1 mm, lanceolate; upper lemma 2 x 1 mm, 3-nerved, hyaline; palea 2-keeled, chartaceous; stamens 3; ovary elliptic.

Fl. & Fr.: January-April

Distr.: Africa and drier parts of India. Common along ecotones at lower altitudes. MS, K-3, *KKK 17626.*

SETARIA P. Beauvois

Essai Agrost. 51, 178, t. 13, f. 3. 1812. *nom. cons.*

1. Panicles spiciform, cylindrical; bristles in clusters ..... **S. pumila**
1. Panicles open, not cylindrical; contracted or effuse; bristles not in clusters ..... **S. paniculifera**

Setaria paniculifera (Steud.) Fourn. *ex* Hemsl., Biol. Centr. Amer. Bot. 3. 505. 1855; Sreekumar & Nair, Fl. Kerala Grass. 308. 1991; Matthew, Ill. FPH t. 864. 1996 & FPH 1536. 1999. *Panicum paniculiferum* Steud., Syn. Pl. Glum. 1: 54. 1854. **Nayurippullu.**

Perennials; culms few together, to 2 m tall, robust; nodes sparsely bearded. Leaves to 40 x 2.5 cm, linear-elliptic, plicately folded; sheath strongly keeled. Panicles to 25 cm, linear-oblong, lax. Spikelets 3 x 1 mm, ellipsoid; lower glume 1.5 mm, broadly ovate, obtuse; upper glume 2 x 1.5 mm, ovate, obtuse, 5-nerved; lower floret barren;

lower lemma 2 mm, ovate, 5-nerved, acute; palea lanceolate; upper lemma 3 x 1 mm, ovate-orbicular; palea to 2.5 mm, subcoriaceous.

Fl. & Fr.: February-May

Distr.: Native of Tropical America; introduced as a fodder. Occasional; along ecotones and roadsides at low altitudes. MS, School curve, *KKK 18145*; Chengalar, *KKK 16707.*

Setaria pumila (Poir.) Roem. & Schult., Syst. Veg. 2: 891. 1817; Sreekumar & Nair, Fl. Kerala Grass. 309. 1991; Matthew, FPH 1537. 1999. *Panicum pumilum* Poir. in Lam., Encycl. Meth. Bot. (Suppl.) 4: 273. 1816. *P. pallida-fuscum* Schum., Beskr. Guin. Pl. 58. 1827. *Setaria glauca* sensu Hook. f., FBI 7: 78. 1896. non P. Beauv., 1812; Fyson, FSIHS 661. t. 590. 1932. *S. pallida-fusca* (Schum.) Stapf & Hubb., Kew Bull. 1930: 259. 1930; Fischer in Gamble, FPM 1789. 1934. **Kambilipullu.**

Tufted annuals; culms to 1 m tall, decumbent or erect; nodes glabrescent. Leaves to 25 x 0.6 cm, linear, scabrid; sheath keeled. Panicle to 15 cm; bristles 5-10 mm long. Spikelets 2.5 mm long, ovoid, acute; lower glume 1 mm long, ovate, 3-nerved; upper glume 1.5 mm long, ovate, 5-nerved; lower floret barren; lower lemma 2.5 mm long, broadly ovate, 3-nerved; upper lemma 2 mm, cymbiform, rugose.

Fl. & Fr.: August-December

Distr.: Tropics of the Old World and introduced to North America. Common along stream sides at lower altitudes. MS, K-3, *KKK 16657.*

SORGHUM Moench

Methodus 207. 1794, *nom. cons.*

1. Culm nodes glabrous or pubescent; panicle branches subdivided ..... **S. bicolor**
1. Culm nodes densely villous; panicle branches simple ..... **S. nitidum**

Sorghum bicolor (L.) Moench., Meth. Bot. 207. 1794; Fischer in Gamble, FPM 1736. 1934; Matthew, Ill. FPH t. 868. 1996 & FPH 1582. 1999. *Holcus bicolor* L., Mant. Pl. 2: 301. 1771. *Sorghum vulgare* Pers., Syn. Pl. 1: 101. 1805. *S. margaritiferum* Stapf in Prain, Fl. Trop. Afr. 9: 125. 1917. **Cholam.**

Perennials; culms solitary or loosely tufted, to 2 m tall; nodes pubescent. Leaves to 50 x 5 cm, lanceolate, base rounded, margins scabrid. Panicle to 20 cm, dense. Sessile spikelet to 6 x 4 mm, elliptic or obovate ; glumes subequal, yellowish-brown ; lower lemma sterile, epaleate; upper lemma to 3 mm, broadly ovate, 2-lobed at apex, awn to 1 cm or mucronate; palea absent. Pedicelled spikelet to 4 mm, lanceolate. Grain broadly obovoid or spherical.

Fl. & Fr.: September-December

Distr.: Native of Tropical Africa; introduced elsewhere. Common; in low altitude grasslands. MS, Kulachivayal, *KKK 16685.*

Sorghum nitidum (Vahl) Pers., Syn. Pl. 1: 101. 1805; Fischer in Gamble, FPM 1735. 1934; Matthew, Ill. FPH t. 870. 1996 & FPH 1584. 1999. *Holcus nitidus* Vahl, Symb. Bot. 2: 102. 1791. *Andropogon serratus* Thunb., Fl. Jap. 41. 1784; Hook. f., FBI 7: 185. 1896. *Sorghum serratum* (Thunb.) O. Ktze., Rev. Gen. Pl. 2: 792. 1891.

Perennials; culms to 2 m tall; nodes bearded. Leaves to 40 x 1 cm, linear-lanceolate, base narrowed, scabrid; sheath keeled. Panicle to 25 cm, pyramidal; branches whorled. Spikelets in pairs, dimorphic. Sessile spikelets 4 x 2 mm, oblong; lower glume 4 x 2 mm, oblong, dark brown; upper glume 4 x 1.5 mm, ovate, acute; lower floret empty; upper bisexual; lower lemma 3.5 mm, broadly ovate, hyaline; palea absent; lower glume coriaceous; upper chartaceous; lower floret male.

Fl. & Fr.: September-December

Distr.: India, Sri Lanka, Myanmar, extending through Indo-China to Australia. Common in low altitude grasslands. MS, Kulachivayal, *KKK* 16684.

THEMEDA Forsskal

Fl. Aegypt.- Arab. 178. 1775.

Themeda triandra Forssk., Fl. Aeg.-Arab. 178. 1775; Fischer in Gamble, FPM 1746. 1934; Sreekumar & Nair, Fl. Kerala Grass. 202. 1991; Matthew, FPH 1600. 1999. *Anthistiria imberbis* Retz., Obs. Bot. 3: 11. 1783; Hook. f., FBI 7: 211. 1896. **Chekkanampullu.**

Densely tufted perennials; culms to 2 m tall, white or yellowish white. Leaves to 40 x 1.2 cm, base rounded. Panicle to 45 cm long; racemes dense. Involucral spikelets to 9 x 2 mm, lanceolate; lower glume elliptic; upper glume oblong. Bisexual spikelets to 10 mm, solitary, callus brown hairy; lower glume to 9 mm, oblong, brown, apically hairy; upper glume 6 mm long, pubescent; lower lemma 3 mm long, lanceolate, brown; upper lemma linear, stipitate, awn to 8 cm long.

Fl. & Fr.: September-December

Distr.: Old World Tropics. Common in low altitude grasslands. MS, Kulachivayal, *KKK 16675.*

TRIPOGON Roemer & Schultes

Syst. Veg. 2: 34, 600. 1817.

Tripogon bromoides Roem. & Schult., Syst. Veg. 2: 600. 1817; Fischer in Gamble, FPM 1834. 1934; Fyson, FSIHS 675. 1932; Sreekumar & Nair, Fl. Kerala Grass. 399. 1991; Matthew, FPH 1498. 1999.

Densely tufted perennials; culms to 40 cm tall; nodes glabrous. Leaves usually basal, to 30 x 0.3 cm, linear, base rounded, sparsely hairy above; mouth of sheath with long hairs. Raceme to 30 cm long; spikelets 0.5-1 cm long, oblong, glabrous, sessile; lower glume 3 x 0.5 mm, keeled; upper glume 6 x 1 mm, notched below the apex, 3-nerved. Flowers 10-16; lemma to 4 x 2 mm, 4-lobed at apex, 3-awned; one median and two laterals; median one twice the length of laterals; palea 3 x 1 mm, elliptic, scabrid along the keels. Grain to 2 mm, linear-elliptic.

Fl. & Fr.: August-December

Distr.: Western Ghats and Sri Lanka. Common in high altitude grasslands. MS, Idlimottai, *KKK 16632.*

ZENKERIA Trinius

Linnaea 11: 150. 1837.

Zenkeria elegans Trin., Linnaea 11: 150. t. 3. 1837; Fyson, FSIHS 673. t. 601. 1932; Fischer in Gamble, FPM 1805. 1934; Sreekumar & Nair, Fl. Kerala Grass. 363. 1991; Matthew, FPH 1476.1999.

Densely tufted perennials; culms to 1 m tall; nodes glabrous. Leaves to 60 x 0.8 cm, linear-lanceolate, flat, glabrous; margins serrulate, glabrous; sheath keeled, glabrous. Panicles purplish, to 30 cm long, pyramidal, lax; branches filiform, glabrous. Spikelets to 6 x 3 mm, pedicelled, glabrous; glumes equal, 3 x 1 mm, lanceolate, 1-nerved; lemma 5 x 1 mm, lanceolate, acuminate, sparsely hairy; palea 3 x 1 mm, 2-nerved, sparsely hairy; stamens 3. Grain to 3.5 mm, narrowly oblong.

Fl. & Fr.: August-December

Distr.: Endemic to Southern Western Ghats. Common in low altitude grassland regions. MS, Conical patch, *KKK 16564*; Chengalar, *KKK 16539*.

II. PTERIDOPHYTES

ENUMERATION OF THE TAXA

About 93 taxa of pteridophytes coming under 48 genera and 25 families were collected. A complete list of the species collected is given as Appendix 1. The species are arranged according to the alphabetical sequence of the family.

4.4. FLORISTIC ANALYSIS AND DISCUSSION

4.4.1. Basic statistics

During this study, 669 taxa (661 species and 8 infraspecific taxa) of flowering plants belonging to 369 genera under 110 families were collected and described (Appendix 2). Dicotyledons were represented by 536 taxa (529 species and 7 infraspecific taxa) belonging to 295 genera under 94 families. Monocotyledons were represented by 133 taxa (132 species and 1 variety) in 74 genera under 16 families. Among the total of 669 taxa, there were 14 subspecies and 41 varieties. In the case of pteridophytes, there were 93 taxa (92 species) belonging tc 48 genera under 25 families. In total there were 3 varieties also (Table 4.1.)

Table 4.1. Preliminary information regarding the floristic analysis

No	PLANT GROUPS	FAMILY	GENERA	TAXA	SPECIES	SUB-SPECIES	VARIETY
A	**ANGIOSPERMS**	**110**	**369**	**669**	**661**	**14**	**41**
1.	Dicots	94	295	536	529	14	37
2.	Monocots	16	74	133	132	0	4
B	**PTERIDOPHYTES**	**25**	**48**	**93**	**92**	**0**	**3**
TOTAL		**135**	**417**	**762**	**753**	**14**	**44**

Among the dicots, *Asteraceae* with 50 taxa belonging to 29 genera is the largest family. It is followed by *Fabaceae* (42/22), *Rubiaceae* (36/17), *Acanthaceae* (26/7), *Lamiaceae* (24/10) etc. Among the monocots, *Orchidaceae* with 37 taxa under 20 families is the largest family. It is followed by *Poaceae* (35/26), *Cyperaceae* (19/8), *Commelinaceae* (9/3), *Araceae* (7/1), *Juncaceae* (5/1) etc. When the South Indian flora is considered, *Fabaceae* holds the prime position in dominance followed by *Poaceae* and *Rubiaceae* (Gamble, 1915). But in this study, these families hold the second, fifth and fourth positions respectively, while *Asteraceae*, which holds the seventh position in South Indian, flora stands first here.

When the tree species alone are considered, *Lauraceae* with 23 taxa under 9 genera is the largest. It is followed by *Rubiaceae* (15/7), *Euphorbiaceae* (10/7),

Symplocaceae (10/1), *Myrtaceae* (9/4), *Myrsinaceae* (7/4), etc. (Table 4.2.). The relative dominance of these families, which constitute the tree flora, is the case prevailing in all shola regions. But the undergrowth flora shows a different picture as indicated by the earlier figures. In this study only the shola vegetation was given much importance. The dominance figures would have changed if the grassland vegetation was also given equal importance.

Table 4.2. Floristic richness of the different taxonomic hierarchies*

No.	FAMILY	GENERA	TAXA
	Dicotyledons		
1.	Asteraceae	**29**	**50**
2.	Fabaceae	22	42
3.	Rubiaceae	17	36
4.	Acanthaceae	7	26
5.	Lamiaceae	10	24
6.	Balsaminaceae	1	23
	Monocotyledons		
1.	Orchidaceae	**20**	**37**
2.	Poaceae	26	35
3.	Cyperaceae	8	19
4.	Commelinaceae	3	9
5.	Araceae	1	7
6.	Juncaceae	1	5
	Tree species only		
1.	Lauraceae	**9**	**23**
2.	Rubiaceae	7	15
3.	Euphorbiaceae	7	10
4.	Symplocaceae	1	10
5.	Myrtaceae	4	9
6.	Myrsinaceae	4	7
	Pteridophytes		
1.	Aspleniaceae	**1**	**12**
2.	Polypodiaceae	5	8
3.	Dryopteridaceae	3	9
4.	Lycopodiaceae	3	8
5.	Thelypteridaceae	5	7
6.	Athyriaceae	4	6

(*only the first six families are included)

Among the pteridophytes, *Aspleniaceae* with 12 taxa under 1 genus was the largest. It is followed by *Polypodiaceae* (8/5), *Dryopteridaceae* (9/3), *Lycopodiaceae* (8/3), *Thelypteridaceae* (7/5), *Athyriaceae* (6/4) etc.

4.4.2. Habit and Habitat

Regarding the habit of the plants, out of the 536 dicot taxa, 219 (41%) belonged to herbs, 179 (33%) were shrubs and 138 (26%) were trees (Table 4.3.). Out of the 219 herbs, 20 were climbers and 14 were parasitic. Climbers include species of *Tylophora, Diplocyclos, Solena, Trichosanthes, Zehneria, Cajanus, Canavalia, Desmodium, Dumasia, Rhynchosia, Shuteria, Vigna, Clematis,* etc. Parasitic herbs include various species of *Balanophora, Utricularia, Christisonia, Striga asiatica,* etc. The lianas reported (7 nos.) include *Cayratia pedata, Cissampelopsis corymbosa, C. walkeri, Connarus wightii, Derris brevipes, Ficus amplocarpa* and *Parthenocissus semicordata.* Out of the 179 shrubs, 10 were parasitic. Parasitic shrubs mainly belong to *Loranthaceae* and *Viscaceae* (*Helicanthes, Helixanthera, Macrosolen, Taxillus, Korthalsella, Viscum,* etc). Among the 133 monocot taxa, 126 (95%) belonged to herbs and only 7 are shrubs. Shrubs include reed bamboo species such as *Arundinaria densifolia, A. floribunda* and *A. walkeriana* other than *Pseudoxytenanthera monadelpha, Protasparagus fysonii, P. racemosa,* etc. A complete list of plants showing the adaptations and habitat specificity is given as Appendix 3.

Table 4.3. Table showing the Habit & Habitat wise distribution of shola plants

I. DICOTS (Total 536 taxa)				
No.	**Habit**	**Code**	**No of taxa**	**Total**
1.	Herbs	H	181	
2.	Climbing Herbs	HCl	20	
3.	Parasitic Climbing Herbs	HClP	1	**219**
4.	Epiphytic Herbs	HE	3	
5.	Parasitic Herbs	HP	14	
6.	Lianas	L	7	
7.	Shrubs	S	92	
8.	Climbing Shrubs	SCl	20	
9.	Epiphytic Shrubs	SE	2	**179**
10.	Parasitic Shrubs	SP	10	
11.	Subshrubs	SS	40	
12.	Straggling Shrubs	SSt	8	
13.	Trees	T	138	**138**

Table 4.3. (contd.)

II. MONOCOTS (Total 133 taxa)				
No.	**Habit**	**Code**	**No of taxa**	**Total**
1.	Herbs	H	104	
2.	Climbing Herbs	HCl	2	**126**
3.	Epiphytic Herbs	HE	20	
4.	Shrubs	S	4	
5.	Climbing Shrubs	SCl	1	**7**
6.	Straggling Shrubs	SSt	2	
III. PTERIDOPHYTES (Total 93 taxa)				
No.	**Habit**	**Code**	**No of taxa**	**Total**
1.	Epiphytic Herbs	HE	21	
2.	Epiphytic or Lithophytic Herbs	HE/L	13	
3.	Terrestrial Herbs	HT	49	**93**
4.	Terrestrial or Lithophytic Herbs	HT/L	8	
5.	Trees	T	2	

Among the 93 pteridophytes, terrestrial taxa are more (51) than the epiphytes, and lithophytes. Eight taxa are either terrestrial or lithophytic. Similarly plants, which grow both as epiphytic and lithophytic, constituted 13 taxa. The genus *Asplenium* is distributed in all the above-mentioned groups. Family members of *Grammitidaceae, Lomariopsidaceae, Loxogrammaceae, Hymenophyllaceae, Vittariaceae,* etc. are epiphytic. Similarly, *Athyriaceae, Dryopteridaceae, Pteridaceae* and *Thelypteridaceae* members are terrestrial. The tree fern species include *Alsophila nilgirensis* and *Sphaeropteris crinita,* which were formerly included under the genus *Cyathea.* The pteridophytes constitute a major part of the shola vegetation.

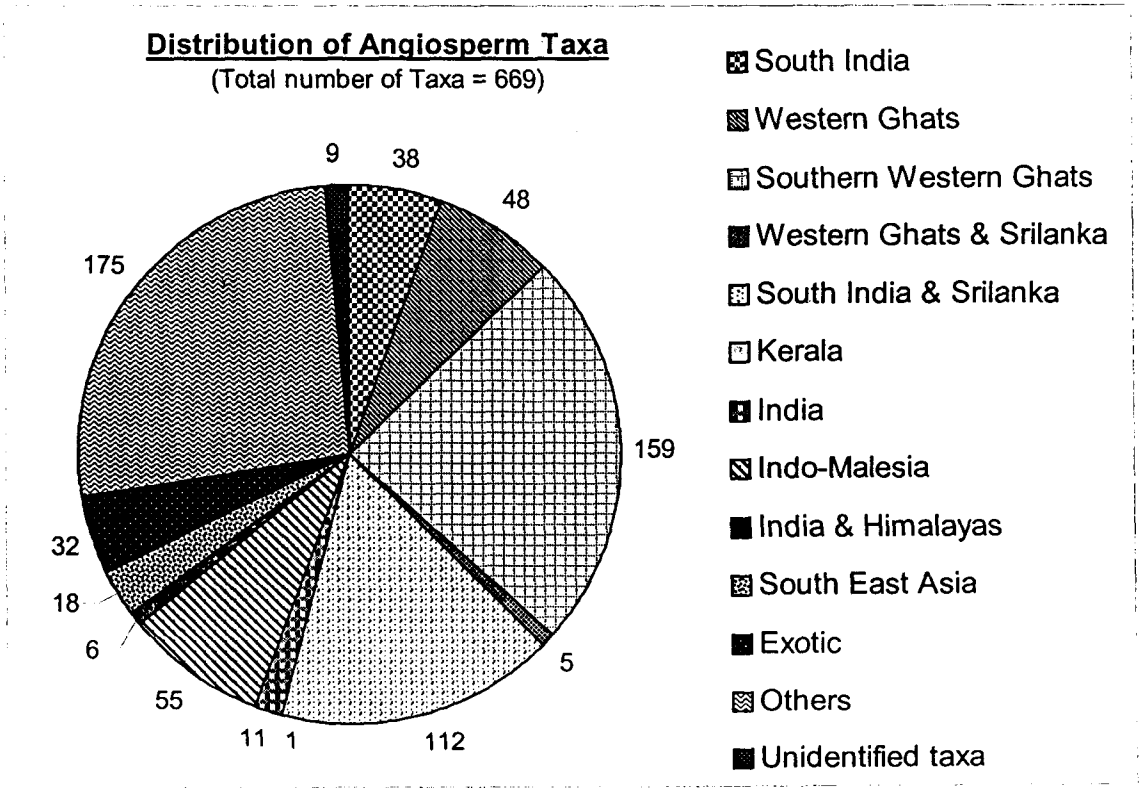
4.4.3. Distribution of the species

It is understood from the figures that more than 30 percent of the plants are restricted to Western Ghats (Table 4.4). About 16 percent of plants are common to South India and Srilanka. Indo-Malesian species constitute about 8 percentage. About 3 percentage of plants are of Southeast Asian distribution. Out of the total number of 669 angiosperm taxa, 32 (4.8%) are exotics.

Table 4.4. Pattern and percentage of geographical distribution of Angiosperm taxa

No	DISTRIBUTION	DICOTS	MONOCOTS	TOTAL	PERCENTAGE
1.	South India	31	7	**38**	5.68
2.	Western Ghats	43	5	**48**	7.18
3.	Southern Western Ghats	131	28	**159**	23.77
4.	Western Ghats & Srilanka	5	0	**5**	0.75
5.	South India & Srilanka	78	34	**112**	16.74
6.	Kerala	1	0	**1**	0.15
7.	India	10	1	**11**	1.64
8.	Indo-Malesia	48	7	**55**	8.22
9.	India & Himalayas	5	1	**6**	0.90
10.	South East Asia	15	3	**18**	2.69
11.	Exotic	32	0	**32**	4.78
12.	Others	129	46	**175**	26.16
13.	Unidentified taxa	8	1	**9**	1.35
	TOTAL	**536**	**133**	**669**	**100**

Fig. 4.1. Pie Diagram showing the geographical distribution of the Angiosperm Taxa



Some of these are introduced ornamentals escaped from the gardens or mere weeds (*Acanthospermum hispidum, Ageratina adenophora, Ageratum houstonianum, Calceolaria gracilis, Desmodium uncinatum, Erigeron karvinskianus, Galinsoga parviflora. Gamochaeata coarctata, Lantana camara, Oenothera laciniata, Parthenium hysterophorus, Chenopodium ambrosioides* etc). The introduction of exotic fodder grasses by the Livestock development board has resulted in the influx of the seeds of several other herbaceous plants also, which have now naturalised in the wild. Some introduced and widely cultivated trees have also entered into sholas (*Acacia dealbata, A. mearnsii, A. dealbata, Eucalyptus globulus, E. grandis, Grevillea robusta* etc). Several introduced vegetables such as *Cyphomandra betacea, Lycopersicon lycopersicum, Passiflora edulis, P. ligularis, P. mollissima,* etc. are also now seen growing in low altitude shola regions. The role of birds, animals and man in the dispersal of the seeds of these species is noteworthy.

4.4.4. Endemism

Identification of endemic species of a region or a country is considered a priority exercise in any programme of conservation of biodiversity. Since endemic species usually have specific ecological niches (mountain peaks, islands) and edaphic gradients, the habitats of endemic species are far more vulnerable than other species. It is generally considered that endemic floristic elements of a country or geographical region throw light on the biogeography of the area, adaptive evolution of the flora and centres of speciation. Endemic species once lost, it is a loss of biodiversity forever (Nayar, 1997).

In India, there are about 5725 endemic taxa of angiosperms, which represent 33.5 % of Indian flora (17,000 species). They are located in mainly the 'hotspots' (Nayar, 1996). 'Anamala-High Ranges' where most part of this study is concentrated is one among these hotspots. Ahmedullah & Nayar (1987) have reported that there are 1,923 taxa of flowering plants endemic to Peninsular India. Out of the estimated 3,800 species of flowering plants in Kerala, 1272 (22.6 % of Indian endemics) are endemic to the Southern Western Ghats (Nayar, 1996). These endemic flora belong to a paleotropic one, a part of the peninsular Indian endemic flora of Gondwanaland origin.

Kerala is the natural habitat of about 120 taxa of *paleoendemic* angiosperms belonging to 75 genera and 40 families. This number excludes *neoendemic* species and also those endemic taxa of Western Ghats/Peninsular India, which also occur in Kerala. Together with the Western Ghats/ Peninsular Indian endemics and Kerala endemics, endemism of the flora of our state is very high.

The importance of shola forests in this regard which are considered, as the megacentres of endemism becomes evident (Basha & Nair, 1991; Nair & Basha, 1995). This is evidenced from the present study also. Out of the total 669 angiosperm taxa, 246 (36.8 %) are endemics. This ratio is very huge, when compared with the scenario of the country (only 33.5 %). Out of this 206 taxa (30.7 %) belong to dicots, while monocots constitute only 40 taxa (5.97 %). Among the pteridophytes, out of the 93 taxa, only 6 taxa (6.5 %) are found to be endemic. This indicates that pteridophytes comparatively have a wide range of (often cosmopolitan) distribution (Table 4.5.).

Table 4.5. Categorisation of the taxa into various distributional/conservational statuses

No	Plant groups	Total Taxa	Endemics	Rare	Endangered /Threatened	Ethno-botanically important	Possibly extinct
A	**Angiosperms**	**669**	**246**	**111**	**20**	**182**	**7**
1.	Dicots	536	206	78	15	167	5
2.	Monocots	133	40	33	5	15	2
B	**Pteridophytes**	**93**	**6**	**34**	**8**	**6**	**0**
Total		**762**	**252**	**145**	**28**	**188**	**7**

A list of the Peninsular Indian endemic genera (6 nos.) reported from the shola forests is given as Table 4.6. This includes *Campbellia, Diplocentrum, Helicanthes, Nilgirianthus, Phlebophyllum* and *Vanasushava*. Among these, *Nilgirianthus* and *Phlebophyllum* are now treated under *Strobilanthes*. Genera such as *Arisaema, Hedyotis, Impatiens, Strobilanthes, Ophiorrhiza* and *Vernonia* are represented by more than 3 endemic species in Kerala, many of which are reported from the shola forests only. The representation of the families under various endemic regions is provided in Table 4.7. Among the dicots, majority of the South Indian endemics (6 taxa) belong the family *Lamiaceae,* while *Asteraceae* (7 taxa) and *Rubiaceae* (21 taxa) have the highest

number taxa as Western Ghat and Southern Western Ghat endemics. Out of the total number of 23 *Impatiens* reported, 18 (73 %) are endemics (14 species are Southern Western Ghat endemics and 4 are Western Ghat endemics). Similarly, out of the total number of 19 *Strobilanthes* reported, 16 (84 %) are endemics (15 are Southern Western Ghat endemics and 1 is Western Ghat endemic).

Table 4.6. List of the Endemic genera* and the species reported from the sholas

No	Name of the genera	Family	Name of the species	Name as in this work
1.	*Campbellia* Wight	Orobanchaceae	*C. cytinoides* Wight	*Christisonia neilgherrica* Gardner
2.	*Diplocentrum* Lindl.	Orchidaceae	*D. recurvum* Lindl.	(no change)
3.	*Helicanthes* Danser	Loranthaceae	*H. elastica* (Desr.) Danser	(no change)
4.	*Nilgirianthus* Bremek. #	Acanthaceae	*N. foliosus* (Wight) Bremek.	*Strobilanthes foliosus* T. Anders.
		Acanthaceae	*N. neilgherrensis* (Bedd.) Bremek.	*Strobilanthes neilgherrensis* Bedd.
		Acanthaceae	*N. papillosus* (T. Anders.) Bremek.	*Strobilanthes papillosus* T. Anders.
		Acanthaceae	*N. perrottetianus* (Nees) Bremek.	*Strobilanthes perrottetianus* Nees
		Acanthaceae	*N. urceolaris* (Gamble) Bremek.	*Strobilanthes urceolaris* Gamble
		Acanthaceae	*N. wightianus* (Nees) Bremek.	*Strobilanthes wightianus* Nees
5.	*Phlebophyllum* Nees #	Acanthaceae	*P. kunthianum* Nees	*Strobilanthes kunthianus* (Nees) T. Anders. *ex* Benth.
6.	*Vanasushava* Mukh. & Constance	Apiaceae	*V. pedata* (Wight) Mukh. & Constance	(no change)

(* Ref.: Ahmedullah & Nayar, 1997; # now treated under *Strobilanthes*)

Table 4.7. Distribution of the Endemic taxa within various regions and families*

Sl. No	PLANTS	ENDEMICS					
		South India	No	Western Ghats	No	S. Western Ghats	No
1.	Dicots	Lamiaceae	6	Asteraceae	7	Rubiaceae	21
		Asteraceae	5	Balsaminaceae	4	Acanthaceae	18
		Fabaceae	3	Acanthaceae	3	Lauraceae	14
		Lauraceae	2	Ranunculaceae	3	Balsaminaceae	14
2.	Monocots	Orchidaceae	4	Araceae	1	Orchidaceae	12
		Cyperaceae	1	Arecaceae	1	Poaceae	4
		Poaceae	1	Commelinaceae	1	Araceae	5
		..		Liliaceae	1	Cyperaceae	2
		..		Poaceae	1	Eriocaulaceae	2
		..		..		Liliaceae	2
3.	Pteridophytes	Lomariopsidaceae	2	..		Gleicheniaceae	1
		Thelypteridaceae	2	..		..	
		Cyatheaceae	1	..		..	

- * Only those families ranking first are listed out;
- 'No' indicate the number of taxa within different families.

Among the *Rubiaceae,* all the species of *Hedyotis* (4), *Lasianthus* (5) and *Psychotria* (3) are S. W. Ghat endemics. Same is the case with all the species of *Actinodaphne* (3) and *Cinnamomum* (6) of *Lauraceae.*

In the case of monocots, out of the 37 *Orchidaceae* members, 13 (35 %) are S. W. Ghats endemics and 5 are South Indian endemics. Among the 7 *Arisaema* (*Araceae*) collected, 5 are S. W. Ghats endemics and one is W. Ghats endemic.

Among the pteridophytes, *Elaphoglossum, Psuedocyclosorus, Sphaeropteris* (earlier name *Cyathea*) and *Gleichenia* coming under *Lomariopsidaceae, Thelypteridaceae, Cyatheaceae* and *Gleicheniaceae* are the four genera, which have representation of endemic taxa (Table 4.7).

4.4.5. Plants under different threat categories

Joseph (1977), Henry *et al* (1979), Jain & Sastry (1984), Ahmedullah & Nayar (1987) and Nayar & Sastry (1987, 1988, 1990) have well documented the rare and threatened plants of South India. Nayar (1997) listed out 1272 endemic taxa in Kerala and 460 of them are placed under threat categories. Since sholas are centers of endemism, with more than one third (39.3 %) of the taxa being endemic as evidenced from the present study, chances of local extinction of species is far great. The habitat destruction and other anthropological activities have speeded up this process. So the figures of rare and threatened plants as documented in the above works are always not dependable, since majority of these works are based on secondary data or those based on the earlier herbarium collections. Thorough field investigation studies are necessary to validate many of this information.

It is a fact that a lot of other species, which are not reported in the works cited earlier, are found locally in very rare and threatened conditions. Since sholas are facing several threats, documentation of such information deserves attention in the conservation point of view. Because many of such locally endangered taxa may face extinction, if proper conservational measures are not taken up. Complete lists of plants which are documented in the above-mentioned works are given as Appendix 4.

4.4.6. Rediscovery of plants categorized as '*Possibly extinct*'

During the study seven species of angiosperms (all dicots), earlier documented as '*Possibly extinct*' could be rediscovered (Table 4.8.). *Actinodaphne bourneae* could not be collected during this century and was considered extinct (Nayar, 1997). This species could be collected from the Anamudi slope of Eravikulam National Park.

Table 4.8. 'Possibly extinct'* plants rediscovered during the study

No.	Name of the species	Habit	Family	References
1.	*Actinodaphne bourneae* Gamble	Tree	Lauraceae	Nayar, 1997
2.	*Arisaema attenuatum* Barnes & C.E.C. Fisch.	Herb	Araceae	Shetty & Vivekananthan, 1991; Nair & Basha, 1995
3.	*Arisaema psittacus* Barnes	Herb	Araceae	Shetty & Vivekananthan, 1991; Nair & Basha, 1995
4.	*Impatiens anaimudica* C.E.C. Fisch.	Herb	Balsaminaceae	Nayar & Sastry, 1988
5.	*Impatiens platyadena* C.E.C. Fisch.	Herb	Balsaminaceae	Ahmedullah & Nayar, 1987; Hajra *et al.*, 1997
6.	*Pimpinella pulneyensis* Gamble	Herb	Apiaceae	Nayar, 1997; Matthew, 1999
7.	*Symplocos monantha* Wight	Tree	Symplocaceae	Nayar, 1997

Arisaema attenuatum and *A. psittacus* were treated as *'possibly extinct'* by Shetty & Vivekananthan (1991). *A. attenuatum* could be collected from the Chengalar dam region at Mannavan Shola and also from the Umayamala valleys (MPCA plots) at Eravikulam. This species is occasionally found in the shola borders or scrublands. *A. psittacus* is a threatened, narrow endemic species which could not be relocated after the type collection by Barnes in 1937 from Chunduvurrai & Mannavan Shola. It was so considered extinct in its natural habitat. However the species was recently rediscovered from the same localities by Nair *et al.* (1997). I could collect the species from both these locations and also from another locality named Pambadam Shola, which is situated nearby.

Impatiens anaimudica was considered as *'possibly extinct'* by Nayar & Sastry (1988), since it was not collected after the type collection by Barnes (1933) from Anamudi. I could collected this species during October 1996 from the Umayamala ranges of Eravikulam. Biju (2001) also relocated this species from Anamudi. *Impatiens platyadena* was considered as *'possibly extinct'* by

Ahmedullah & Nayar (1987) and Hajra *et al* (1997). It was Barnes who made the type collection from the Nyamakkad gap of Idukki District during 1933 and after that it could not be collected. The species was collected from the Nilagiri teri region of Eravikulam. *Pimpinella pulneyensis* was so far reported from it's type locality (Palni hills) only and was considered *'possibly extinct'* (Nayar, 1997; Matthew, 1999). Present collection from Idlimottai region of Mannavan Shola thus forms both a rediscovery and extension of distribution of the species to Kerala. *Symplocos monantha* was also considered extinct by Nayar (1997) since it could not be relocated after the type collection, which was made from the Shevagherry Hills of Tamil Nadu by Robert Wight, until it was reported from Periyar Tiger Reserve recently (Sasidharan, 1998). Present collection from the Idlimottai regions of Mannavan Shola extends the distribution of the species.

4.4.7. New records

About 70 plants are reported for the first time from Kerala as a result of this study. This include 55 angiosperms and 15 pteridophytes. These figures form about 8.2 % of the total angiosperms collected (669 taxa) and 16 % of the total pteridophytes collected (93 taxa), which is a substantially high figure. Among these, three are rediscoveries of plants considered as *'possibly extinct'* (*Actinodaphne bourneae, Pimpinella pulneyensis* and *Symplocos monantha*), while one is a new record to the country (*Oenothera laciniata* – Onagraceae). Among these new records, 14 species are ethnobotanically important also. A detailed list of the plants are given as Appendix 5.

4.4.8. Diversity of Pteridophytes

The total number of 93 pteridophytes collected from the shola regions of Kerala forms 28.1 % of the total pteridophyte flora of the state (331 species: Easa, 2003). The significance of this figure becomes clear when we compare the area of shola forests with that of Kerala as a whole. We have earlier seen that Shola forests occupy only about 70 sq. km area, while Kerala as a whole occupy 38,863 sq. km of land, with about 9400 sq. km area under forests (Nair, 1997). It is quite interesting to see that shola forests which form only less than one percentage (0.7 %) of the total forested land of Kerala (0.2 % of the whole area of the State), is supporting 28.1 % of the pteridophytes of the

state. The present figure also forms 54 % of the total collections made from the Malabar region by Nayar & Geevarghese (1993).

Very rare and interesting tree ferns, which are considered as *'fossil plants'*, are found to grow only in the shola forests, where they are facing several threats of destruction (see Table 5.2 and Plate 5.5.4). The need for conserving the shola forests, which acts as a refugium of pteridophyte diversity, becomes evident here.

Table 4.9. A comparison of species diversity of Pteridophytes

No.	Area	No. of species	References
1.	**S. W. Ghats**	**251**	Manickam & Irudayaraj (1992)
2.	**Kerala State**	**246**	Nair *et al.* (1988-1994)
3.	Southern India	240	Beddome (1863-64)
4.	Karnataka State	174	Rajagopal & Bhat (1998)
5.	Malabar	170	Nayar & Geevarghese (1993)
6.	Periyar Tiger Reserve	167	Rajesh (2001)
7.	Palni hills	135	Manickam (1986)
8.	Wayanad District	119	Leena & Madhusoodanan (1998)
9.	**Shola forests of Kerala**	**92***	**Present study**

(*Total no. of taxa = 93)

4.4.9. Doubtful/New taxa

Some 15 specimens remain unidentified even after thorough examinations (Table 4.10). This include 10 angiosperms (8 dicots and 2 monocots) and 5 pteridophytes. These collections on further critical examinations may prove to be new taxa. Difficulty in identifying some of these collections is the non-availability of all the necessary plant parts (flowers, fruits and seeds) required for identification.

Table 4.10. Taxa whose identity remains doubtful

No	Name	Family	Collection numbers & Locations
ANGIOSPERMS			
1.	*Strobilanthes* sp. 1	Acanthaceae	ENP, Amarachola, *KKK* 18526; ENP, Umayamala, *KKK 18553.*
2.	*Balanophora* sp. 1	Balanophoraceae	MS, K-6, *KKK 17619.*
3.	*Balanophora* sp. 2	Balanophoraceae	MS, Perumala, *KKK 31058.*
4.	*Impatiens* sp. 1	Balsaminaceae	MS, K-4, *KKK 16659.*
5.	*Crotalaria* sp. 1	Fabaceae	MS, Idlimottai, *KKK 16618.*

No	Name	Family	Collection numbers & Locations
6.	*Crotalaria* sp. 2	Fabaceae	MS, Methappu, *KKK 16431.*
7.	*Eugenia* sp. 1	Myrtaceae	ENP, Umayamala, *KKK 17520*
8.	*Ophiorrhiza* sp. 1	Rubiaceae	MS, K- 5, *KKK 16426*
9.	*Oberonia* sp. 1	Orchidaceae	MS, K-5, *KKK 31078*; ENP, Anamudi top, *KKK 18540.*
10.	*Juncus* sp. 1	Juncaceae	MS, Methappu, *KKK 16004.*
PTERIDOPHYTES			
1.	*Asplenium* sp. 1	Aspleniaceae	PUS, *KKK 18578*
2.	*Polystichum* sp. 1	Dryopteridaceae	ENP, Anamudi, *KKK 18538*
3.	*Polystichum* sp. 2	Dryopteridaceae	MS, IM, *KKK 17600*; MS, IM, *KKK 18174*
4.	*Grammitis* sp. 1	Grammitidaceae	MS, Chengalar, *KKK 18130*
5.	Unidentified sp. 1	Thelypteridaceae	MS, K-6, *KKK 17694*

Since sholas harbour most remote and hostile mountainous tracts having diverse microclimates, thorough investigations will certainly yield several other taxa new to the world.

4.5. CONCLUSIONS

The taxonomical studies mainly aimed to make a detailed floristic account of the shola forests of Kerala, based on studies at the most important shola regions of Kerala. The study also aimed to answer two hypotheses (i) whether the shola forest is a refugium for a number of endemic, rare, endangered and threatened plants that their preservation is very important and (ii) whether the shola forest is a highly rich resource, both biologically and economically.

From the study it is becoming clear that sholas are one of the most diverse ecosystems in the Western Ghats, which is considered as one of the 'hottest' of the hotspots of biodiversity. The total of 669 angiosperm taxa collected from a small area certainly indicates the high diversity prevailing in these regions. The 93 taxa of pteridophytes which contribute about 28.1 % of the total flora of the state, collected from such a small area also signifies the high pteridophyte diversity of the region. From the study it is becoming clear that out of the total of 669 angiosperm taxa collected, 246 (36.8%) belong to endemics. These figures substantiates the general view that sholas as megacentres of endemism. Perhaps the unique altitudinal and climatic factors, which favour diverse microclimatic situations, might be leading to the high endemic concentration and diversity in these regions.

A number of plants belonging to various threat categories could be located by this study. About seven plants, which were considered as 'possibly extinct', could also be rediscovered. Some 70 plants including 15 pteridophytes were also reported for the first time from Kerala. All this points out the need for conservation of sholas, which face several threats of destruction. More than a dozen of unidentified taxa indicate that, thorough explorations in the area may lead to the discovery of more new taxa, since many of the regions remain still unexplored due to inaccessibility and hostile environments.

Therefore in short, the sholas, which are floristically unique in all respects, have to be protected and explored thoroughly to elucidate the floral diversity and status of the endemics, before they get extinct due to degradation, depletion or conversion of natural vegetation.



1. *Berberis tinctoria*



2. *Hydnocarpus alpina*



3. *Pittosporum neelgherrense*



4. *Polygala arillata* var. *chartacea*



5. *Gordonia obtusa*



6. *Ternstroemia gymnanthera*



7. *Grewia umbellifera*



8. *Elaeocarpus munronii*

Plate 4.1



1. *Impatiens chinensis*



2. *Impatiens cordata*



3. *Impatiens cuspidata*



4. *Impatiens hensloviana*



5. *Impatiens parasitica*



6. *Impatiens phoenicea*



7. *Impatiens tangachee*



8. *Impatiens wightiana*

Plate 4.2

16

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1. *Aglaia apiocarpa*



2. *Gomphandra coriacea*



3. *Bhesa indica*



4. *Parthenocissus semicordata*



5. *Meliosma pinnata* ssp. *barbulata*



6. *Meliosma simplicifolia* ssp. *simplicifolia*



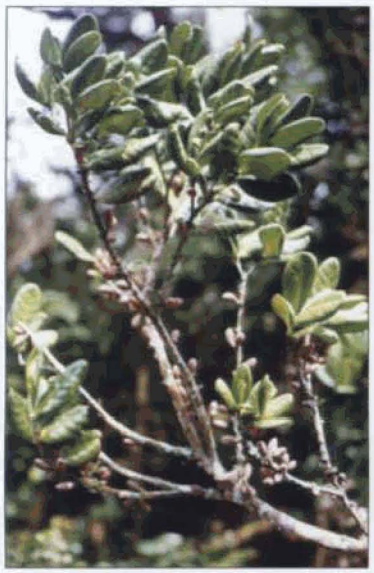
7. *Archidendron clypearia*



8. *Photinia integrifolia*

Plate 4.3

296C



1. *Microtropis ramiflora*



2. *Desmodium repandum*



3. *Rubus fairholmianus*



4. *Prunus ceylanica*



5. *Rosa leshenaultiana*



6. *Rubus niveus*



7. *Kalanchoe grandiflora*

Plate 4.4

296 D



1. *Syzygium caryophyllatum*



2. *Syzygium cumini*



3. *Syzygium densiflorum*



4. *Osbeckia reticulata*



5. *Viburnum coriaceum*



6. *Viburnum punctatum*



7. *Ixora notoniana*



8. *Lasianthus acuminatus*

Plate 4.5



1. *Heracleum sprengelianum*



2. *Pimpinella leschenaultii*



3. *Mussaenda hirsutissima*



4. *Ophiorrhiza brunonis*



5. *Saprosma foetens*



6. *Ageratum houstonianum*



7. *Cissampelopsis corymbosa*



8. *Gamochaeta coarctata*

Plate 4.6

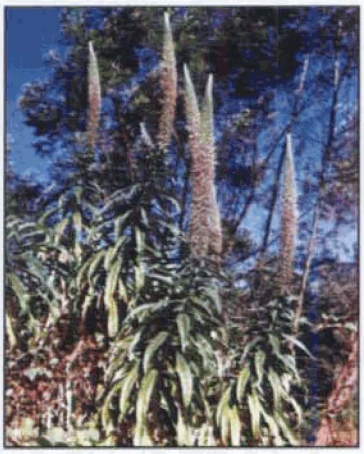
296 F



1. *Senecio scandens*



2. *Vernonia peninsularis*



3. *Lobelia leschenaultiana*



4. *Vaccinium leschenaultii*



5. *Myrsine wightiana*



6. *Isonandra lanceolata*



7. *Isonandra perrottetiana*



8. *Ligustrum perrottetii*



9. *Rauvolfia densiflora*

Plate 4.7

296 G



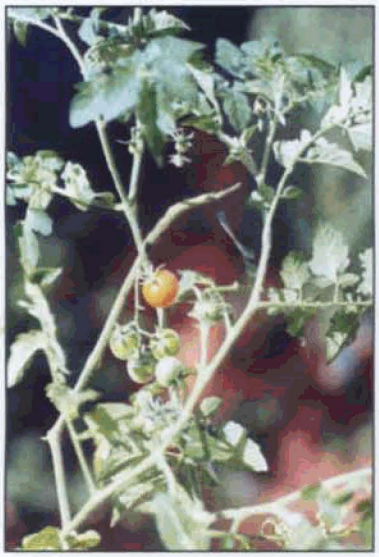
1. *Wattakaka volubilis*



2. *Fagraea ceylanica*



3. *Cynoglossum zeylanicum*



4. *Lycopersicon lycopersicum*



5. *Physalis peruviana*



6. *Solanum virginianum*



7. *Solanum anguivi* var. *anguivi*



8. *Calceolaria gracilis*

Plate 4.8

22

296 H



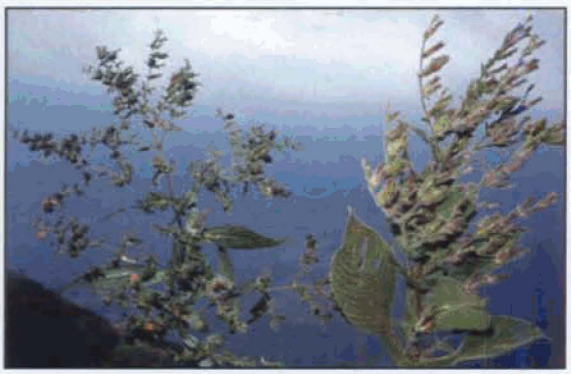
1. *Pedicularis zeylanica & P. perrottetii*



2. *Christisonia neilgherrica*



3. *Christisonia tubulosa*



4. *Strobilanthes gracilis* & *S.* sp. 1.



5. *Strobilanthes kunthianus*



6. *Strobilanthes luridus*



7. *Strobilanthes micranthus*



8. *Strobilanthes violaceus*

Plate 4.9



1. *Leucas suffruticosa*



2. *Prunella vulgaris*



3. *Persicaria chinensis*



4. *Persicaria glabra*



5. *Piper argyrophyllum*



6. *Piper mullesua*



7. *Piper schmidtii*



8. *Litsea wightiana* var. *tomentosa*

Plate 4.10

296J



1. *Beilschmiedia wightii*



2. *Cinnamomum wightii*



3. *Litsea oleoides*



4. *Persea macrantha*



5. *Phoebe wightii*



6. *Korthalsella japonica* on *Symplocos* sp.



7. *Viscum ramosissimum*



8. *Balanophora dioica* (♂ and ♀ plants)

Plate 4.11



1. *Balanophora fungosa* ssp. *indica* (♂)



2. *Daphniphyllum neilgherrense*



3. *Glochidion ellipticum*



4. *Mallotus tetracoccus*



5. *Aerides ringens*



6. *Cirrhopetalum gamblei*



7. *Diplocentrum recurvum*



8. *Taeniophyllum alwisii*

Plate 4.12

296 K



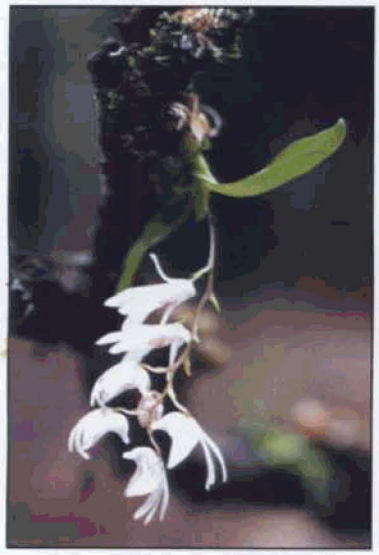
1. *Girardinia diversifolia*



2. *Ficus laevis* var. *macrocarpa*



3. *Brachycorythis splendida*



4. *Dendrobium anamalayanum*



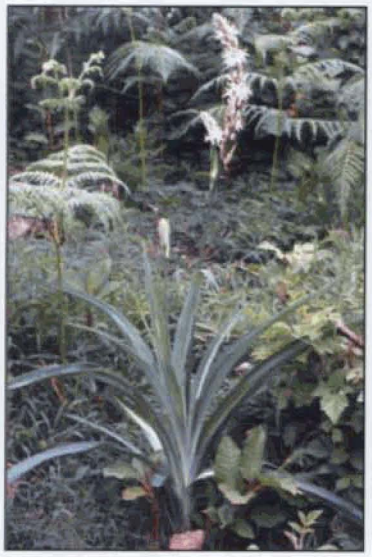
5. *Alpinia abundiflora*



6. *Hedychium flavescens*



7. *Crinum latifolium*



8. *Chlorophytum attenuatum*



9. *Disporum leschenaultianum*

Plate 4.13

27

296 L



1. *Arisaema leschenaultii*



2. *Arisaema psittacus*



3. *Arisaema tortuosum*



4. *Eulalia phaeothrix* - Habitat



5. *Arundinaria densifolia* - Habitat



6. *Carex lindleyana*



7. *Arundinaria floribunda*



8. *Arundinaria densifolia*

Plate 4.14

28

296M



1. *Alsophila nilgiriensis*



2. *Sphaeropteris crinita*



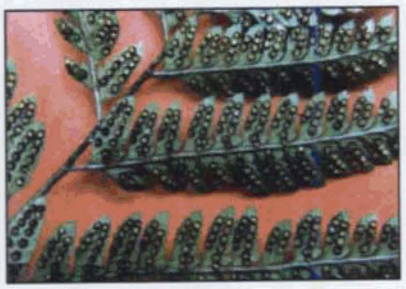
3. *Antrophyuum plantagineum*



4. *Asplenium decrescens*



5. *Asplenium formosum*



6. *Arachniodes aristata*



7. *Cheilanthes farinosa*



8. *Crepidomanes schmidianum*



9. *Ctenopteris perplexa*



10. *Dicranopteris linearis*



11. *Diplazium esculentum*



12. *Elaphoglossum stelligerum*



13. *Grammitis attenuata*



14. *Huperzia ceylanica*



15. *Huperzia hilliana*

Plate 4.15

29

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1. *Lepochilus decurrens*



2. *Odontosoria chinensis*



3. *Parahemionitis cordata*



4. *Pleopeltis macrocarpa*



5. *Pteris confusa*



6. *Selaginella involvens*



7. *Asplenium auritum*



8. *Botrychium daucifolium*



9. *Huperzia hamiltonii*



10. *Lindsea odorata*



11. *Lycopodiella cernua*



12. *Lycopodium wightianum*



13. *Microlepia speluncae*



14. *Vittaria elongata*

Plate 4.16



TAXONOMICAL STUDIES

"It is ironical to note that the satellite missions are for searching the possible occurrence of extra terrestrial life, when most species of the earth are becoming extinct even before they are properly identified and named"

S. L. Pimm & P. Raven (2000)
(Ecologists)

4. TAXONOMICAL STUDIES

4.1. INTRODUCTION

4.1.1. Taxonomy and its significance in the present age

Probably the first scientific study of plants was an attempt to classify them. Classification, here means identification, naming and grouping of organisms into a formal system based on similarities such as, internal and external anatomy, physiological functions, genetic makeup, or evolutionary history. With an estimated 10 million to 13 million species on earth, the diversity of life is immense. Determining an underlying order in the complex web of life is a difficult undertaking that encompasses advanced scientific methods as well as fundamental philosophical issues about how to view the living world and that is here the role of a taxonomist arises.

Plant taxonomy, one of the basic scientific disciplines was set aside during the middle of the present century, due to the diversion of interests into more advanced vistas of science. With the result, when we went in search for the possible occurrence of extra terrestrial life through various satellite missions, several species on our earth were becoming extinct even before they have been properly identified and named (Pimm and Raven, 2000; Mc Cann, 2000).

It is rather satisfactory to see that due to the world appeal for the conservation of Tropical Forests Biodiversity, Plant taxonomy is now showing signs of resurrection. We know tropical forests are facing great threats from various anthropogenic activities. It is these forests, which harbour more than 70% of living organisms of the whole world. Out of these more than 50,000 plant species are confined as exclusive endemics in 25 areas throughout the tropical forests (Myers *et al.*, 2000). It is shocking to know that these twenty-five '*Hotspots*' which holds 44 percent of vascular plant species and 35 percent of all species in four vertebrate groups, represent only around 1.4 % of the total land area of the world and are under severe threat of habitat destruction. Chatterjee (1995) has estimated that around 7500 species of organisms are becoming extinct every year, including many unknown species and according to IUCN, around 10% of the world floras are facing the danger of extinction.

This is a highly alarming rate and so the important role of taxonomists and conservationists become evident here.

4.1.2. Status of the taxonomy of Shola forests

For most vegetation types in India, pioneering botanical studies emerged out of the amature botanical interests of the foresters. However, the shola forests were largely neglected because: (i) they were considered as of no timber value, (ii). the extent of the shola forests is small and so the study on it too, and (iii). the sholas mostly occupy less accessible and hostile climatic regions. Therefore, it would not be surprising at all to see that the studies on shola forests is few, compared to other vegetal types.

4.2. METHODOLOGY

From 1994 onwards, regular field trips were organized to Mannavan Shola, Idlimottai Sholas, Pullaradi Shola, Pambadam Shola and Eravikulam National Park for collecting plant specimens. A few trips were carried out to Silent Valley (Palakkad) and Vellarimala (Kozhikode) regions. Repeated collections were made for certain tree specimens to get both the flowering and fruiting specimens or the male and female flowers of the plant. Usually 4 specimens of each species were collected from all available habitats to study the range of variation.

Field characters like the height, pattern of branching, colour and nature of bark (inside and outside), presence and colour of latex and other exudates, presence of buttress, odour and colour of vegetative and floral parts wherever applicable, associated species, local names and the uses, etc. were carefully recorded in the field book. Separate collections were made for dioecious plants and when parasites were collected the details of the host plants were also recorded. Special attention was given when the collection of delicate materials like, *Impatiens* spp., were made. Collections were brought to the field stations and herbaria prepared as per standard procedure (Fosberg and Sachet, 1965; Bridson and Forman, 1991). Flowers and fruits of almost all specimens or even the whole plants (if small) were preserved either in Formalin Aceto Alcohol (FAA) or Kew mixture (9 parts of 70 % Ethyl alcohol, ½ part of 40% Formaldehyde and ½ part of Conc. Acetic acid) for further microscopical

studies. Large fruits were dried and poisoned separately to keep the shape unchanged. All the herbarium specimens are deposited in Kerala Forest Research Institute Herbarium (KFRI), Peechi.

The specimens were critically studied and identifications were made initially with the help of the *Flora of the Presidency of Madras* (Gamble, 1915-1936), *Flora of British India* (Hooker, 1872-1897), Fyson's *Flora of the Nilgiri and Pulney Hill-tops* (1915-1921), *Flora of South Indian Hill Stations* (1932), *Flora of Palni Hills* (Matthew, 1999). Illustrations of the species available in Wight's *Icones Plantarum Indiae Orientalis* (1838-1853), both the works of Fyson (1915-21; 1932) and those in *Illustrations of Palni Hills* (Matthew, 1996) and the *Supplementary Illustrations of Palni Hills* (Matthew, 1998) were referred for identification. Available monographs and revisions were also consulted. Several literature on phytogeographical studies and the internet cites of IPNI (www.ipni.org) were also referred to get the world distribution of each species. Specimens were also taken to the Madras Herbarium (MH) at Coimbatore and the Calicut University Herbarium (CALI) for verification and confirmation. Those, which needed further confirmation, were referred to experts in the concerned groups in India and abroad. Apart from those collected during the study period, specimens collected earlier from the study area by others and available at MH, CALI and KFRI were also referred to for the present study.

Since pteridophytes form a major part of the flora of shola forests, systematic collection of the pteridophytes was also done. Most of the plants were collected in full including the rhizomes by uprooting them. For larger plants and tree ferns only the parts necessary for identification such as, fronds including stipes, sporophylls with sporangia, rhizome scales, etc. were collected. Data on the habit, habitat and other ecological details were noted down to facilitate identification. Identification of the specimens was done mainly using pertinent literature such as Beddome (1863-1864, 1865-70, 1876, 1883 and 1892), Manickam (1986, 1989, 1995), Manickam and Ninan (1984), Manickam and Irudayaraj (1992), Nayar and Geevarghese (1993), various monographs, M. Phil. and Ph. D. dissertations and hundreds of other publications on pteridophytes. Doubtful specimens were sent to experts and got confirmed. Details of the species collected, such as the scientific name, local name (if available), family, locality, altitude and collection numbers,

distributional and conservational status, etc. are given as a table (Appendix 1). Ethnobotanically important species and endemics are denoted with an 'asterisk' (*) mark.

Format of the Flora

In this work the Angiosperm families are arranged according to the classification of Bentham and Hooker (1862-1883) with necessary modifications according to Hutchinson (1926, 1934, 1959 and 1973) and in accordance with the ICBN, 2000. Keys for identification of genera under each family and that for the species under each genus are given in respective places. The genera under each family are arranged in alphabetical sequence. Full name of the authors and citation of the original publication of the generic name are also given. Dichotomous bracketed type keys for identification of species and infraspecific taxa, if any, are also provided.

The species under genera are also arranged in alphabetic order. The correct name of the species is given in bold letters followed by the author citation and full reference of the original publication. Basionyms, important synonyms and citation of the names included in the important national and regional floras are also given. The floras cited are: *Flora of British India* (Hooker, 1872-1897), *Flora of the Presidency of Madras* (Gamble, 1915-1936), *Flora of South Indian Hill Stations* (Fyson, 1932), *Flora of Palni Hills* (Matthew, 1999) and the *Flora of India* series published by the Botanical Survey of India till date (Vols. 1, 2, 3, 4, 5, 12 and 13). Synonyms relevant to the above mentioned floras only are given in italics. All the relevant monographs and revision works are also cited. The local names used by the Muthuva tribesmen are given in bold italics and those of the natives are given as bold non-italics at the end of the nomenclature citations. Ethnobotanically important species are denoted as (EBIS) given after the local name. The number of the illustrations or plates, if any, is given next. This is followed by a brief description of the species highlighting the most striking features. The characters already given in the identification keys are not given under the species description which is in following sequence: 'Habit; branchlets; leaves; inflorescence; flowers; calyx; corolla; stamens; ovary; fruit and seed'. The flowering (*Fl.*) and fruiting (*Fr.*) periods are given after the species description. The geographical distribution,

the status of the species in relation to the conservation point of view, the abundance in the study area indicating the type of vegetation and name of the locality followed by the name of the collector(s) and collection number(s) are given in a single separate paragraph. Taxonomic and/or nomenclatural notes and conservation or distribution aspects, new records if any, are also given at the end of the above details of each species. Enumeration of the pteridophytes is restricted to a table given as Appendix 1, with pertinent information regarding various species.

Abbreviations used in the flora part of the thesis

BBSI	-	Bulletin of the Botanical Society of India
CALI	-	Calicut University Herbarium
FBI	-	Flora of British India
FNPHT	-	Flora of Nilgiri and Palni Hill Tops
FPH	-	Flora of Palni Hills
FPM	-	Flora of the Presidency of Madras
FSIHS	-	Flora of South Indian Hill Stations
JETB	-	Journal of Economic and Taxonomic Botany
JBNHS	-	Journal of Bombay Natural History Society
KFRI	-	Kerala Forest Research Institute Herbarium
ca.	-	about
diam.	-	diameter
Distr.	-	distribution
Fl.	-	flowering
Fr.	-	fruiting
KKK	-	K. Kishore Kumar
MS	-	Mannavan Shola
ENP	-	Eravikulam National Park
PUS	-	Pullaradi Shola
PAS	-	Pambadam Shola
VMS	-	Vellari Mala Sholas
K-3, K-5.5, etc.	-	Kanthallur-3 km, Kanthallur-5.5 km, etc.
T. K.	-	Thalachor Kadavu

4.3. TAXONOMIC TREATMENT

I. ANGIOSPERMS

DICOTYLEDONS

1. RANUNCULACEAE

1. Climbing shrubs; leaves opposite ..... **Clematis**
1. Erect or trailing herbs; leaves radical or alternate **2**
2. Petals and sepals present ..... **Ranunculus**
2. Petals absent; sepals often petalloid **3**
3. Flowers 2.5-3 cm across, bracts involucrate ..... **Anemone**
3. Flowers 0.7 cm across, not involucrate ..... **Thalictrum**

ANEMONE Linnaeus

Sp. Pl. 538. 1753.

Anemone rivularis Buch.- Ham. *ex* DC., Syst. 1: 211. 1817; Hook. f., FBI 1: 9. 1872; Dunn in Gamble, FPM 4. 1915; Fyson, FSIHS 5. t. 2. 1932; Rau in Sharma *et al.*, Fl. Ind. 1: 35. 1993; Matthew, Ill. FPH t. 1. 1996 & FPH 2. 1999. *A. wightiana* Wall. *ex* Wight & Arn., Prodr. 3. 1834; Ic. t. 936. 1845.

Tufted herbs. Leaves radical, to 10-12 cm wide; leaflets 3-5. Flowers solitary, 2.5-3 cm across; sepals petalloid, usually 5 or more, to 12 x 7 mm, obovate, golden yellow; stamens many; pistils many, styles hooked. Achenes ovoid, evenly pitted, compressed.

Fl. & Fr.: June-July.

Distr.: India, Sri Lanka, Myanmar and China. Rare along shola ecotones and scrublands at higher altitudes. MS, Gudalar road, *KKK 18565.*

Note: The present collection is a new record to Kerala. From South India, so far reported from Tamil Nadu only (Sharma *et al.*, 1993).

CLEMATIS Linnaeus

Sp. Pl. 543. 1753.

1. Leaves 1 foliolate ..... **C. smilacifolia**
1. Leaves 3-7 foliolate **2**
2. Leaves 3 foliolate ..... **C. munroiana**
2. Leaves 7 foliolate ..... **C. wightiana**

Clematis munroiana Wight, Ill. Indian Bot. 1: 5, t. 1. 1831; Dunn in Gamble, FPM 3. 1915; Fyson, FSIHS 3. 1932; Rau in Sharma *et al.*, Fl. Ind. 1: 71. 1993; Matthew, Ill. FPH t. 2. 1996 & FPH 4. 1999. *Clematis. smilacifolia* Hook. f. & Thoms. in Hook. f., FBI 1: 3. 1872, p.p, non Wall., 1820.

Stems glabrous. Leaflets to 10 x 4 cm, ovate or ovate-lanceolate. Inflorescence 1-6 flowered. Flowers nodding, 4 cm across, sepals spreading, 25 x 6 mm, velvety

tomentose and purple coloured with whitish margins on outside. Achenes ovate, compressed, hairy with *ca.* 6 cm long feathery tails.

Fl. & Fr.: September–January

Distr.: Endemic to Southern Western Ghats. Rare, found in interior forest regions at medium altitudes. MS, K-6, *KKK 18507*; K-6, *KKK 18118.*

Clematis smilacifolia Wall., Asiat. Res. 13: 402. 1820; Hook. f. & Thoms. in Hook. f., FBI 1: 3. 1872; Dunn in Gamble, FPM 3.1915; Rau in Sharma *et al.*, Fl. Ind. 1: 75. 1993. *C. loureiriana* Merr., Trans. Amer. Phil. Soc. 24: 154. 1935. p.p., non DC.

Stems glabrous. Leaves to 10 x 5 cm, ovate-acuminate, base cordate, chartaceous, purplish beneath; petiole twining. Cymes 3-few flowered, trichotomous. Flowers 3.5 cm across, creamy-white; sepals ovate. Achenes to 11 x 5 mm, with *ca.* 7 cm long feathery tails.

Fl. & Fr.: September-December

Distr.: India. Rare, found in shola interiors at medium altitudes. MS, K-5, *KKK 18098.*

Note: The present collection is a new record to Kerala.

Clematis wightiana Wall. *ex* Wight & Arn., Prodr. 2. 1834; Wight Ic. t. 935. 1845; Hook. f. & Thoms., FBI 1: 5. 1834; Dunn in Gamble, FPM 3. 1915; Fyson, FSIHS 3, t. 1. 1932; Rau in Sharma *et al.*, Fl. Ind. 1: 80. 1993.

Stems pubescent. Leaves to 20 x 16 cm; leaflets to 7 x 5 cm, ovate or ovate-lanceolate. Inflorescence few flowered. Flowers nodding, sepals spreading, velvety tomentose, glabrous inside; staminal filaments linear, to 10 mm long. Fruit not seen.

Fl.: December-January

Distr.: Endemic to Western Ghats. Very rare, found along shola borders at lower altitudes. MS, K-3, *KKK 18126.*

RANUNCULUS Linnaeus

Sp. Pl. 548. 1753.

1. Erect perennial herbs; leaves deeply divided; achenes compressed ..... **R. wallichianus**
1. Trailing perennial herbs; leaves entire; achenes not compressed ..... **R. reniformis**

Ranunculus reniformis Wall. *ex* Wight & Arn., Prodr. 3. 1834; Wight, Ic. t. 75. 1838; Hook. f. & Thoms. in Hook. f., FBI 1: 16. 1872; Dunn in Gamble, FPM 5. 1915; Fyson, FSIHS 7. t. 4. 1932; Rau in Sharma *et al.*, Fl. Ind. 1: 126. 1993; Matthew, Ill. FPH t. 5. 1996 & FPH 9. 1999. *R. peninsularis* Sald., Fl. Karnataka 1: 91. 1984.

Radical leaves to 5 x 7 cm, ovate, base truncate or cordate, coarsely crenate; cauline leaves ovate-elliptic or elliptic-lanceolate. Flowers 2 cm across; sepals to 7 x 5 mm, ovate, emarginate; petals 8-9, lobes 9 x 6 mm, obovate. Achenes in globose head.

Fl. & Fr.: June-August

Distr.: Endemic to Western Ghats. Rare, found along shola ecotones and grasslands at higher altitudes. MS, Idlimottai, *KKK 16437*; *KKK 16604*; *KKK 18186.* PAS, Vandaravu, *KKK 18595.*

Note: The specimen (*KKK 18595*), with larger leaves (6 x 12 cm; petioles 20 cm) is likely to be a polyploid form.

Ranunculus wallichianus Wight & Arn., Prodr. 4. 1834; Wight, Ic. t. 937. 1845; Hook. f. & Thoms. in Hook. f., FBI 1: 20. 1872; Dunn in Gamble, FPM 5. 1915; Fyson, FSIHS 8. t. 6. 1932; Rau in Sharma *et al.*, Fl. Ind. 1: 131. 1993; Matthew, Ill. FPH t. 6. 1996 & FPH 9. 1999.

Radical leaves 3-partite, dissected, 5-8 cm across, margins crenate or deeply incised; cauline leaves stalked, 3-lobed; flowering scapes 7-9 cm. Flowers 1 cm across; sepals 5 x 3 mm, elliptic, reflexed. Petals 7 x 4 mm, elliptic. Achenes rounded, tubercled with an incurved beak.

Fl. & Fr.: June-August

Distr.: Endemic to Western Ghats. Common, along shola borders and roadsides at medium altitudes. MS, K-3.5, *KKK 16502*; K-5, *KKK 16411.*

THALICTRUM Linnaeus

Sp. Pl. 545. 1753.

Thalictrum javanicum Blume, Bijdr. 2. 1825; Hook. f. & Thoms. in Hook. f., FBI 1: 13. 1872; Dunn in Gamble, FPM 4. 1915; Fyson, FSIHS 6. t. 3. 1932; Rau in Sharma *et al.*, Fl. Ind. 1: 136. 1993; Matthew, Ill. FPH t. 7. 1996 & FPH 10. 1999. *T. glyphocarpum* Wight & Arn., Prodr. 2. 1834; Wight, Ic. t. 48. 1838.

Perennial herbs, to 50 cm higher. Leaves ternately decompound, leaflets 5-9, 1.5 x 2 cm, obovate, base rounded, margins crenate. Flowers 7 mm across, in terminal panicled cymes; sepals 4, ovate, obtuse, white; stamens many. Achenes few, 3-6 mm long, 9-ribbed, sessile, ellipsoid, with hooked style.

Fl. & Fr.: August-October

Distr.: Peninsular India, Sri Lanka, Himalaya, Tibet, China and Java. Rare; found along shola margins at higher altitudes. MS, Idlimottai, *KKK 18170.*

Note: The present collection is a new record to Kerala.

2. MAGNOLIACEAE

MICHELIA Linnaeus

Sp. Pl. 536. 1753.

Michelia nilagirica Zenk., Pl. Ind. 21. t.20. 1835; Wight, Ic. t. 938. 1845; Hook. f. & Thoms. in FBI 1: 44. 1872; Dunn in Gamble FPM 9. 1915; Fyson, FSIHS 10. t. 8. 1932; Raju in Sharma *et al.*, Fl. Ind. 1: 179. 1993; Matthew, Ill. FPH t. 11. 1996 & FPH 15. 1999; *M. pulneyensis* Wight, Ill. t. 14. 1840; *M. ovalifolia* Wight, Ill. t. 13. 1840. **Chembakam.**

Small trees. Leaves to 11 x 5 cm, elliptic, coriaceous; stipules spathaceous. Flowers yellowish-white; sepals and petals alike, 10-12, to 5 x 1.5 cm, oblanceolate; stamens crowded at the base of gynophore; gynoecium stipitate, 2 x 1 cm. Fruit a 4-6 cm long dense spike of coriaceous carpels.

Fl. & Fr.: October-February

Distr.: Endemic to Western Ghats. Rare; found along stream sides at higher altitudes only. ENP, Umayamala, *KKK 17529*; V-point, *KKK 18009.*

Note: New record to Kerala. From South India, so far reported from Karnataka and Tamil Nadu only (Sharma *et al.*, 1993).

3. MENISPERMACEAE

1. Erect shrubs; leaves cuneate at base, not peltate ..... **Cocculus**
1. Slender climbers; leaves truncate at base, peltate ..... **Stephania**

COCCULUS A. P. de Candolle

Syst. Nat. 1: 515. 1817.

Cocculus laurifolius DC., Syst. Nat. 1: 530. 1817; Hook. f. & Thoms. in Hook. f., FBI 1: 101. 1872; Gamble, FPM 29. 1915; Pramanik & Gangop. in Sharma *et al.*, Fl. Ind. 1: 319. 1993. **Marpingi, *Aadukolli* (EBIS).**

Leaves to 11 x 5 cm, elliptic, stiffly chartaceous, 3-ribbed. Flowers yellow, in axillary branched cymes; sepals 4, 1.2 x 1 mm, ovate; petals 4, 2 x 1.5 mm, broadly ovate, emarginate at apex; stamens 6 in male flowers, free; staminodes present; carpels 3, free. Drupes 5 mm across, globose, glabrous.

Fl. & Fr.: December-June

Distr.: Indo-Malesia and East Asia. Common in disturbed and exposed regions at lower altitudes. MS, Thalachorkadavu, *KKK 16036.*

Note: New record to Kerala. From South India, so far reported from Karnataka and Tamil Nadu only (Sharma *et al.*, 1993).

STEPHANIA Loureiro

Fl. Cochinch. 608. 1790.

Stephania japonica (Thunb.) Miers, Ann. Mag. Nat. Hist. ser.3, 13: 14. 1866; Dunn in Gamble, FPM 29. 1915; Fyson, FSIHS 13. t. 9. 1932; Pramanik & Gangop. in Sharma *et al.*, Fl. Ind. 1: 335. 1993; Matthew, FPH 27. 1999. *Menispermum japonicum* Thunb., Fl. Japan 193. 1784. *Cissampelos hernandifolia* Willd., Sp. Pl. 4: 861. 1806. *Stephania hernandifolia* (Willd.) Walp., Rep. Bot. Syst. 1: 96. 1842; *sensu* Hook. f. & Thoms. in Hook. f., FBI 1: 103. 1872, *p.p.*, non Walp., 1842. *Cyclea hernandifolia* (Willd.) Wight & Arn., Prodr. 14. 1834; Wight, Ic. t. 939. 1845. **Pasi chedi.**

Leaves to 9 x 7 cm, ovate to ovate-triangular, chartaceous. Cymes umbellate; male flowers greenish yellow; sepals 6-8 in 2 whorls; petals 3-5, free; stamens 6-8, synandrous; female flowers yellow, carpels solitary. Drupes orange, subglobose, transversely ridged and grooved. Seeds reniform.

Fl. & Fr.: July-October

Distr.: Indo-Malesia and East Asia. Common along shola borders at lower altitudes. MS, Thalachorkadavu, *KKK* 16752; K-3, *KKK 16652*; K-4, *KKK 16503.*

4. BERBERIDACEAE

1. Leaves simple, entire ..... **Berberis**
1. Leaves pinnate, spinous serrate ..... **Mahonia**

BERBERIS Linnaeus

Sp. Pl. 330. 1753.

Berberis tinctoria Lesch., Mem. Mus. Paris 9: 306. 1822; Dunn in Gamble, FPM 32. 1915; Fyson, FSIHS 15. t. 10. 1932; Rao & Naithani in Sharma *et al.*, Fl. Ind. 1: 386.

1993; Rao *et al.* 8(1): 11. 1998; Matthew, Ill. FPH t. 14. 1996 & FPH 29. 1999. **Kozhikkal Mullu. Plate. 4.1.1.**

Bushy shrubs, 2 m tall; stem spiny; spines 3-fid, 1-1.5 cm long. Leaves to 5.5. x 2 cm, obovate, base cuneate, apex obtuse, mucronate. Racemes 8-12 flowered; sepals 3 whorled; petals yellow, 6 x 4 mm, obovate, clawed with glands at the base; stamens 6. Berries 10 x 5 mm, elliptic-oblong, pinkish blue.

Fl. & Fr.: February-June

Distr.: India, Afghanistan and Bhutan. Rare along shola borders at lower altitudes. MS, Perumala, *KKK 18142*; Perumala, *KKK 18511*; Puthur, *KKK 16198.*

Note: New record to Kerala. From South India, so far reported from the Nilgiris of Tamil Nadu only (Sharma *et al.*, 1993; Rau *et al.*, 1998).

MAHONIA Nuttall

Gen. 1: 211. 1918. *nom. cons.*

Mahonia leschenaultii (Wall. *ex* Wight & Arn.) Takeda *ex* Gamble, Dunn in Gamble, FPM 32. 1915; Fyson, FSIHS 16. t. 11. 1932; Guha in Sharma *et al.*, Fl. Ind. 1: 410. 1993; Matthew, Suppl. Ill. FPH t. 955. 1998 & FPH 30. 1999. *Berberis leschenaultii* Wall. *ex* Wight & Arn., Prodr. Fl. Ind. Orient. 1: 16. 1834; Wight, Ic. t. 940. 1845. *B. nepalensis* Spreng. in L., Syst. Veg. (ed.16) 2: 120. 1825, var. *leschenaultii* (Wall. *ex* Wight & Arn.) Hook. f. & Thoms. in Hook. f., FBI 1: 109. 1872. **Manjanathi (EBIS).**

Shrubs to small trees. Leaves crowded at apex, 30-40 cm long; leaflets to 9 x 5 cm, obliquely ovate, base rounded, apex acuminate, margins spinous serrate, recurved. Flowers yellow, in a bunch of racemes; sepals 2-whorled; petals 6, 6 x 3 mm, elliptic, emarginate; stamens 6; stigma peltate. Berries 7 mm across, globose, purple.

Fl. & Fr.: February-March

Distr.: Endemic to Southern Western Ghats. Common along shola borders at higher altitudes. MS, Methappu, *KKK 16005.* ENP, Amarachola, *KKK 17511.*

Note: New record to Kerala. From South India, so far reported from the Nilgiris of Tamil Nadu only (Sharma *et al.*, 1993).

5. BRASSICACEAE

1. Pods linear and dehiscent ..... **Cardamine**
1. Pods globular and indehiscent ..... **Coronopus**

CARDAMINE Linnaeus

Sp. Pl. 654. 1753.

1. Perennial herbs; branches decumbent; leaves trifoliolate ..... **C. africana**
1. Annual herbs; branches procumbent; leaves 5 to more foliolate ..... **C. hirsuta**

Cardamine africana L., Sp. Pl. 655. 1753; Hook. f. & T. Anders. in Hook. f., FBI 1: 137. 1872; Dunn in Gamble, FPM 38. 1915; Fyson, FSIHS 21. t. 12. 1932; Henry & Janarthanam in Sharma & Balakr., Fl. Ind. 2: 109. 1993; Matthew, Ill. FPH t. 20. 1996 & FPH 39. 1999. *C. borbonica* Pers., Syn. 2: 195. 1806; Wight, Ic. t. 941. 1845.

Plants to 30 cm higher. Leaflets to 5 x 2.5 cm, lyrate; petiole 5-10 cm long. Flowers 8 mm across; sepals linear; petals 5 x 1 mm, clawed; stamens 6, tetradynamous. Siliqua 4 x 0.2 cm; seeds 2 x 1 mm, elliptic, brownish black.

Fl. & Fr.: Throughout the year

Distr.: Asia, Malesia, Africa, Americ*a*. Common in exposed regions at medium altitudes. MS, K-5, *KKK 16164*; K-4, *KKK 16508*.

Note: New record to Kerala. From South India, so far reported from Karnataka and Tamil Nadu only (Sharma & Balakrishnan, 1993).

Cardamine hirsuta L., Sp. Pl. 655. 1753; Hook. f. & T. Anders. in Hook. f., FBI 1: 138. 1872; Dunn in Gamble, FPM 38. 1915; Fyson, FSIHS 22. t. 13. 1932; Henry & Janarthanam in Sharma & Balakr., Fl. Ind. 2: 112. 1993; Matthew, Ill. FPH t. 10. 1996 & FPH 40. 1999.

Plants to 25 cm higher. Leaves to 4 cm long; leaflets orbicular, deeply crenate, lyrate. Flowers 5 mm across; sepals 4, 3 x 1 mm, oblong; petals 4, as long as the sepals; stamens 4. Siliqua 2 x 0.15 cm, flat; seeds 7-8, 1.5 x 1 mm, oblong, smooth, brown.

Fl. & Fr.: December-January

Distr.: Cosmopolitan. Occasional in forest ecotones or in other exposed regions at medium altitudes. ENP, Nilagiri Teri, *KKK 18063*.

Note: New record to Kerala. From South India, so far reported from Tamil Nadu only (Sharma & Balakrishnan, 1993).

CORONOPUS Zinn

Cat. Pl. Gott. 325. 1757.

Coronopus didymus (L.) Smith, Fl. Britain 2: 691. 1800; Fyson, FSIHS 24. 1932; Henry & Janarthanam in Sharma & Balakr., Fl. Ind. 2: 192. 1993; Matthew, FPH 41. 1999. *Lepidium didymum* L., Mant. Pl. 92. 1767 (Syst. Nat. 2: 433. 1759). *Senebiera didyma* (L.) Pers. Syn. 2: 185. 1800; Dunn in Gamble, FPM 39. 1915.

Procumbent herbs to 35 cm long. Leaves 2-6 cm long, deeply lobed; lobes 1 mm broad, oblong. Flowers white in terminal or axillary racemes; sepals 4, orbicular; petals absent; stamens 2; ovary 2-celled. Capsules 1.2 x 2 mm; seeds oblong, pitted and mucilaginous when wet.

Fl. & Fr.: September-December

Distr.: Probably native of South America, but wide spread; a cosmopolitan weed of cultivation. Occasionally found in exposed areas at lower altitudes. MS, Pallang mala, *KKK 16695*.

Note: The present collection is a new record to Kerala.

6. VIOLACEAE

VIOLA Linnaeus

Sp. Pl. 833. 1753.

1. Erect herbs; leaves triangular-lanceolate, not deeply cordate.....**V. betonicifolia**
1. Prostrate herbs; leaves ovate, deeply cordate, sinuate; caulescent herbs.....**V. pilosa**

Viola betonicifolia Smith in Rees, Cyclop. 37 (1): n. 7. 1817, subsp. **nepalensis** (Ging.) Becker in Engl., Bot. Jahrb. 54: Beibl. 120, 166. 1917; Banerjee & Pramanik in Sharma & Balakr., Fl. Ind. 2: 355. 1993. *V. patrinii* var. *nepalensis* Ging. in DC. Prodr. 1: 293. 1824. *V. patrinii* auct. non Ging. 1824; Hook. f. & Thoms. in Hook. f., FBI 1: 183. 1872; Dunn in Gamble, FPM 48. 1915; Fyson, FSIHS 26. t. 16. 1932. *V. walkeri* Wight, Ill. 1: 42. t. 18. 1838.

Leaves to 5 x 1.5 cm, base decurrent to the petiole, tip acute, shallowly serrate, pubescent. Flowers white with violet streaks; sepals 4 mm long, lanceolate; petals spreading, lower petal pouched at base; anthers connate; ovary 2.5 mm. Capsule straight; seeds globose.

Fl. & Fr.: May- June

Distr.: India, Sri Lanka, Bangladesh, China, Japan to Australia. Occasionally found along shola borders and grasslands at higher altitudes. MS, Idlimottai, *KKK 18178.*

Viola pilosa Blume, Cat. Gew. Buitenz. 57. 1823; Banerjee & Pramanik in Sharma & Balakr., Fl. Ind. 2: 371. 1993; Matthew, Ill. FPH t. 30. 1996 & FPH 56. 1999. *V. serpens* Wall. *ex* Ging. in DC., Prodr. 1: 296. 1824; Hook. f. & Thoms. in Hook. f., FBI 1: 184. 1872; Dunn in Gamble, FPM 48. 1915; Fyson, FSIHS 27. t. 17. 1932. *V. wightiana* Wall. *ex* Wight, Ic. t. 943. 1845.

Leaves to 6 x 5 cm, pubescent; petiole 3-18 cm. Flowers lilac with violet streaks; sepals 6 x 2 mm, ovate-lanceolate; petals oblong-obovate, lower petal 13 x 3 mm; ovary 1 celled. Capsule 5 x 4 mm, globose; seeds ovoid, black.

Fl. & Fr.: January-May

Distr.: Indo-Malesia and China. Common along shola borders, roadsides and ecotones at medium and higher altitudes. MS, K-3, *KKK 16120*; K-9, *KKK 17502*; Idlimottai, *KKK 18184.*

7. FLACOURTIACEAE

1. Trees armed with spines ..... **Scolopia**
1. Unarmed trees **2**
2. Flowers unisexual; petals present, fruit a globose berry ..... **Hydnocarpus**
2. Flowers bisexual; petals absent; fruit an ellipsoid or oblong capsule ..... **Casearia**

CASEARIA N. J. Jacquin

Enum. Pl. Carib. 4: 21. 1760.

1. Leaves obovate, coriaceous; stamens 10; capsule ellipsoid ..... **C. thwaitesii**
1. Leaves elliptic-oblong, sub-coriaceous; stamens 5; capsule oblong ..... **C. zeylanica**

Casearia thwaitesii Briq., Ann. Cons. Jard. Bot. Geneve 62. 1898; Mitra in Sharma & Balakr., Fl. Ind. 2: 397. 1993; Matthew, Ill. FPH t. 33. 1996 & FPH 61. 1999. *C. coriacea* sensu Thw., Enum. Pl. Zeyl. 20. 1858, non Vent. 1803; Clarke in Hook. f., FBI 2: 592. 1879; Dunn in Gamble, FPM 521. 1915; Fyson, FSIHS 238. 1932.

Small trees. Leaves 8 x 5 cm, base cuneate, apex rounded or emarginate. Flowers greenish yellow, 6-9 per cluster; sepals orbicular, recurved; anthers triangular; staminodes oblong, apex hairy; ovary 1.5 mm long. Capsule 1.3 x 0.8 cm, 2 valved, bright yellow, smooth when dry.

Distr.: Peninsular India and Sri Lanka. Common at higher altitudes. ENP, Umayamala, *KKK 17538*. PUS, *KKK 18567*.

Note: New record to Kerala. From Peninsular India, so far reported from Nilgiris & Palni hills of Tamil Nadu only (Mukherjee, 1972; Sharma & Balakrishnan, 1993).

Casearia zeylanica (Gaertn.) Thw., Enum. Pl. Zeyl. 19. 1858; Mitra in Sharma & Balakr., Fl. Ind. 2: 399. 1993; Matthew, Ill. FPH t. 34. 1996 & FPH 61. 1999. *Vareca zeylanica* Gaertn., Fruct. 290, t. 60. 1788. *Casearia esculenta* Roxb., Fl. Ind. 2: 422. 1832; Clarke in Hook. f., FBI 2: 592. 1879 p.p.; Dunn in Gamble, FPM 521. 1919.

Small trees. Leaves 9 x 4 cm, base cuneate, apex acute, acuminate or rounded. Flowers greenish white to yellowish; sepals 3 mm across, ovate; staminodes unequal, oblong. Capsule 1.8 x 0.8 cm, orange coloured, ribbed when dry.

Fl. & Fr.: June-August

Distr.: India, Nepal, Burma and Sri Lanka. Common at medium altitudes. PUS, *KKK 18580*.

HYDNOCARPUS Gaertner

Fruct. 1: 288, t. 60, f. 3. 1788

Hydnocarpus alpina Wight, Ic. t. 942. 1845; Hook. f. & Thoms. in Hook. f., FBI 1: 197. 1872; Dunn in Gamble, FPM 52. 1915; Fyson, FSIHS 29. t. 19. 1932; Mitra in Sharma & Balakr., Fl. Ind. 2: 418. 1993. **Vila Maram, Marotti, *Vilan* (EBIS). Plate 4.1.2.**

Large trees with zigzag branches. Leaves to 18 x 5 cm, ovate-lanceolate or elliptic-lanceolate, base obtuse, apex acuminate, young leaves brilliant red. Flowers in short axillary spikes; sepals ovate; petals 5, white, 18 x 3 mm, linear, margins folded, fimbriate; stamens 5; ovary globose. Berry 6 cm across, rind hard, coriaceous.

Fl. & Fr.: January-May

Distr.: Endemic to Peninsular India and Sri Lanka. Common; usually found below 1900 m only. MS, Puthur, *KKK 16078*.

SCOLOPIA Schreber

Gen. 1: 335. 1789.

Scolopia crenata (Wight) Clos, Ann. Sci. Nat. Bot. 4, 8: 250. 1857; Hook. f. & Thoms. in Hook. f., FBI 1: 191. 1872; Dunn in Gamble, FPM 52. 1915; Fyson, FSIHS 28. t. 18. 1932; Mitra in Sharma & Balakr., Fl. Ind. 2: 430. 1993; Matthew, FPH 64. 1999. *Phoberos crenatus* Wight in Wight & Arn., Prodr. 29. 1834. **Mullu Kara, Karim Kara (EBIS). Plate 5.3.7.**

Leaves alternate, to 15 x 6 cm, elliptic, base cuneate, apex acuminate, margins crenate, subcoriaceous, glossy. Panicles terminal, to 8 cm, dense; flowers bisexual, 1.5

cm across; sepals 5, oblong, ciliate; petals 5, white, ovate, ciliate; stamens many; ovary globose. Berry 1.5 cm across, globose.

Fl. & Fr.: March-July

Distr.: Endemic to Southern Western Ghats. Common at lower and medium altitudes only. MS, K-4, *KKK 31053.*

8. PITTOSPORACEAE

PITTOSPORUM Banks *ex* Solander

in Gaertner, Fruct. 1: 286, t. 59. 1788.

1. Racemes umbellate, glabrous, < 8 flowered; capsule ovoid ..... **P. neilgherrense**
1. Racemes corymbose, tomentose, > 20 flowered; capsule globose ..... **P. tetraspermum**

Pittosporum neilgherrense Wight & Arn., Prodr. 154. 1834; Hook. f. & Thoms. in Hook. f., FBI 1: 198. 1872, "*nilghirensis*"; Dunn in Gamble, FPM 55. 1915; Fyson, FSIHS 31. 1932; Nayar & Giri, Fl. Ind. Fasc. 6: 9. 1980 & in Sharma & Balakr., Fl. Ind. 2: 446. 1993; Matthew, Ill. FPH t. 37. 1996 & FPH 66. 1999. **Plate. 4.1.3.**

Small trees with umbelled branches. Leaves to 10 x 3.5 cm, elliptic-lanceolate, base attenuate, apex acuminate. Flowers greenish-yellow; sepals 2.5 x 2 mm, ovate-acute; petals 11 x 3 mm, oblong-lanceolate; ovary whitish brown tomentose. Capsule 9 x 8 mm, 2 valved; seeds subtrigonous.

Fl. & Fr.: March-August

Distr.: Endemic to shola forests of Southern Western Ghats. Occasional along shola margins at higher altitudes. MS, Methappu, *KKK 16009*; Idlimottai, *KKK 16601.*

Pittosporum tetraspermum Wight & Arn., Prodr. 154. 1834; Wight, Ic. t. 971. 1845; Hook. f. & Thoms. in Hook. f., FBI 1: 198. 1872; Dunn in Gamble, FPM 55. 1915; Fyson, FSIHS 31. t. 20. 1932; Nayar & Giri, Fl. Ind. Fasc. 6: 11. 1980 & in Sharma & Balakr., Fl. Ind. 2: 447. 1993; Matthew, Ill. FPH t. 38. 1996 & FPH 67. 1999.

Small trees. Leaves subverticillate, elliptic or oblanceolate, coriaceous. Flowers pale yellow; sepals small, pubescent; petals 10 x 2.5 mm, linear-oblong; stamens 5 mm long. Capsule 2 valved, 9 mm across, orange coloured; seeds subtrigonous, red.

Fl. & Fr.: April-October

Distr.: Endemic to shola forests of Southern Western Ghats and Sri Lanka. Rare along shola margins at higher altitudes. ENP, Bhiman Odai Shola, *KKK 18034.*

9. POLYGALACEAE

POLYGALA Linnaeus

Sp. Pl. 701. 1753.

1. Large erect shrubs; flowers yellow, in extra-axillary racemes ..... **P. arillata**
1. Perennial herbs; flowers pink, in axillary racemes **2**
2. Caruncle 3 fid to the base; seeds elliptic ..... **P. persicariaefolia**
2. Caruncle cup shaped; seeds oblong ..... **P. sibirica**

Polygala arillata Buch.-Ham. *ex* D. Don, Prodr. Fl. Nep. 199. 1825,. var. **chartacea** (Mukherjee) Giri in Bull. Bot. Surv. India 26: 5. 1984 (1985); Banerjee in Sharma & Balakr., Fl. Ind. 2: 457. 1993. *P. arillata* forma *chartacea* Mukherjee in Bull. Bot. Soc. Bengal 12: 32. 1958. **Plate. 4.1.4.**

Leaves to 15 x 6 cm, oblanceolate, base cuneate, apex cuspidate, chartaceous. Flowers drooping; outer sepals 5 x 3 mm, ovate-obtuse, inner sepals yellow, 15 x 6 mm, oblong, emarginate; petals 14 mm long, wings decurrent at base, lower one crested at tip. Capsule 15 x 8 mm, compressed; seeds 7 x 6 mm, black, rounded.

Fl. & Fr.: June-August

Distr.: Endemic to Kerala and Tamil Nadu parts of Western Ghats. Common along shola margins at lower and medium altitudes. MS, K-4, *KKK 16408.*

Polygala persicariifolia DC., Prodr. 1: 326. 1824; Bennet in Hook. f., FBI 1: 202. 1872 "*persicariaefolia*"; Dunn in Gamble, FPM 58. 1915; Banerjee in Sharma & Balakr., Fl. Ind. 2: 480. 1993; Matthew, FPH 72. 1999.

Leaves to 2 x 0.4 cm, elliptic-oblong, base attenuate, apex subacute, slightly hairy. Racemes to 4 cm long; outer sepals 4 x 1 mm, lanceolate, inner sepals 6 x 3 mm, elliptic, acute; wing petals 4 mm long, obovate; dorsal petals 7 mm long, crest fimbriate, not stalked. Capsule 4 x 4 mm; seeds 3 x 1.5 mm, brownish black, hairy.

Fl. & Fr.: March-April

Distr.: Indo-Malesia, North Australia and Tropical East Afric*a.* Occasional along shola margins at higher altitudes. MS, Idlimottai, *KKK 17597.*

Polygala sibirica L., Sp. Pl. 702. 1753; Bennet in Hook. f., FBI 1: 205. 1872; Dunn in Gamble, FPM 58. 1915; Fyson, FSIHS 35. t. 23. 1932; Banerjee in Sharma & Balakr., Fl. Ind. 2: 481. 1993; Matthew, Ill. FPH t. 42. 1996 & FPH 73. 1999. *P. sibirica* L. var. *heyneana* (Wall. *ex* Wight & Arn.) Bennet in Hook. f., FBI 1: 205. 1872. *P. heyneana* Wall. *ex* Wight & Arn., Prodr. 38. 1834.

Leaves 2 x 0.5 cm, elliptic-oblong, base acute, apex acuminate. Racemes to 2 cm long; outer sepals 3 x 1.5 mm, lanceolate, inner sepals, 6 x 3 mm, ovate, acute; wing petals 8 mm long, obovate, dorsal petals 6 mm long, crest fimbriate. Capsule 2 x 2 mm; seeds hairy.

Fl. & Fr.: March-August

Distr.: Indo-Malesia extending to Europe. Occasional along shola borders and grasslands at higher altitudes. MS, Idlimottai, *KKK 16017* & *KKK 16643.*

10. CARYOPHYLLACEAE

1. Erect herbs; leaves whorled ..... **Spergula**
1. Prostrate herbs; leaves opposite 2
2. Leaves ovate-lanceolate ..... **Cerastium**
2. Leaves orbicular ..... **Drymaria**

CERASTIUM Linnaeus

Sp. Pl. 437. 1753

Cerastium indicum Wight & Arn., Prodr. 43. 1834; Edgew. & Hook. f. in Hook. f., FBI 1: 227. 1874; Dunn in Gamble, FPM 61. 1915; Fyson, FSIHS 39. t. 25. 1932; Majumdar in Sharma & Balakr., Fl. Ind. 2: 524. 1993; Matthew, Ill. FPH t. 44. 1996 & FPH 76. 1999.

Leaves 2.5-1.5 cm, sessile, tomentose. Flowers white, in terminal dichotomous cymes; sepals 5, 6 x 1.5 mm, lanceolate, margins scarious; petals 5, 8 x 4 mm, elliptic, deeply bifid; stamens 10, filaments 4 mm long; styles 3, filiform; ovary 3 valved, 1 mm long.

Fl. & Fr.: August-September

Distr.: South India and Sri Lanka. Occasional in grasslands and ecotones at higher altitudes. MS, Idlimottai, *KKK 16613.*

Note: The present collection is a new record to Kerala.

DRYMARIA Willdenow *ex* J. A. Schultes

in J.J. Roemer *et* J. A. Schultes, Syst. Veg. 5: 31, 406. 1819-1820.

Drymaria cordata (L.) Willd. ex Roem. & Schult. subsp. **diandra** (Blume) Duke, Ann. Miss. Bot. Gard. 48: 253. 1961; Matthew, FPH 78. 1999. *D. diandra* Blume, Bijdr. 62. 1825; Majumdar in Sharma & Balakr., Fl. Ind. 2: 533. 1993. *D. cordata* sensu Edgew. & Hook. f. in Hook. f., FBI 1: 244.1874 p.p.; Dunn in Gamble, FPM 63. 1915. *Cerastium cordifolium* Roxb., Fl. Ind. 2: 458. 1832.

Leaves to 1.8 x 1.5 cm, base cordate or subtruncate, chartaceous, puberulus. Cymes branched, axillary or terminal; peduncle to 15 cm; sepals 5, 3.5 x 1.5 mm, lanceolate; petals 5, 3 x 1 mm, bifid at apex; stamens 3-5; ovary globose, 1 mm across. Capsule 2.5 mm, ovoid; seeds 0.5 mm across, orbicular, muricate, brown.

Fl. & Fr.: Throughout the year

Distr.: Paleotropics. Common along roadsides at medium altitudes. ENP, Vaguvarai, *KKK 31092.*

SPERGULA Linnaeus

Sp. Pl. 440. 1753.

Spergula arvensis L., Sp. Pl. 440. 1753; Edgew. & Hook. f. in Hook. f., FBI 1: 243. 1874; Dunn in Gamble, FPM 63. 1915; Fyson, FSIHS 43. t. 27. 1932; Majumdar in Sharma & Balakr., Fl. Ind. 2: 578. 1993; Matthew, Ill. FPH t. 51. 1996 & FPH 82. 1999.

Leaves narrow, linear, 20-30 x 0.5 mm, whorled at nodes. Inflorescence in regular trichotomous cymes; sepals 5, 3 x 2 mm, ovate, acute; petals 5, 2 x 1.5 mm, elliptic-acute, white; stamens 5; ovary 1 mm long, ovate; styles 5, recurved. Capsule subglobose, 5 x 3 mm; seeds 1 mm across, black, orbicular, discoid, papillose.

Fl. & Fr.: October-December

Distr.: Cosmopolitan. Occasionally found in the grassland marshes at lower altitudes. MS, Puthur, *KKK 16722.*

11. PORTULACACEAE

PORTULACA Linnaeus
Sp. Pl. 445. 1753.

Portulaca oleracea L., Sp. Pl. 445. 1753; Dyer in Hook. f., FBI 1: 246. 1874; Dunn in Gamble, FPM 66. 1915; Rao in Sharma & Sanj., Fl. Ind. 3: 4. 1993; Matthew, FPH 86. 1999.

Erect or prostrate herbs. Leaves alternate, sub-opposite or pseudo-whorled, to 3 x 1.5 cm, obovate, base cuneate, apex truncate. Flowers 3-4 together; sepals 2, 5 mm across; petals 6 x 6 mm, yellow; stamens 12; ovary 1 celled. Capsule 5 mm across, ovoid; seeds 0.8 mm across, reniform, tubercled, black.

Fl. & Fr.: August-November

Distr.: Pantropical. Common in lower altitude grasslands, way sides and disturbed shola regions. MS, Pallang mala, *KKK 16696.*

12. HYPERICACEAE

HYPERICUM Linnaeus
Sp. Pl. 783. 1753.

1. Slender herbs; flowers < 1 cm across, tetramerous ; stamens monadelphous ..... **H. japonicum**
1. Stout shrubs; flowers to 5 cm across, pentamerous; stamens arranged in 5 bundles ..... **H. mysorense**

Hypericum japonicum Thumb. *ex* Murr. in L., Syst. Veg. 702. 1784; Dyer in Hook. f., FBI 1: 256. 1874; Dunn in Gamble, FPM 70. 1915; Fyson, FSIHS 48. t. 32. 1932; Biswas in Sharma & Sanj., Fl. Ind. 3: 69. 1993; Matthew, FPH 92. 1999.

Leaves sessile, to 5 x 2 mm, ovate-lanceolate, base cordate, apex obtuse. Sepals 4 x 1.5 mm, oblong, mucronate; petals yellow, shorter than sepals, elliptic; ovary 2-3 mm long, ovoid, unilocular. Capsule 4 mm long, 3-valved, ovoid, red.

Fl. & Fr.: November-December

Distr.: Indo-Malesia to Australia and New Zealand and East Asia. Common along shola margins and roadsides at higher altitudes. ENP, Amarachola, *KKK 18076.*

Hypericum mysurense Heyne *ex* Wight & Arn., Prodr. 99. 1834; Dyer in Hook. f., FBI 1: 253. 1874; Dunn in Gamble, FPM 70. 1915; Fyson, FSIHS 46. t. 29. 1932; Biswas in Sharma & Sanj., Fl. Ind. 3: 69. 1993; Matthew, Ill. FPH t. 55. 1996 & FPH 92. 1999. *Norysca mysurensis* (Heyne *ex* Wight & Arn.) Wight, Ic. t. 56. 1838. **Avaram Kola (EBIS) Plate 5.2.7.**

Leaves to 3.5 x 0.6 cm, lanceolate, closely packed. Flowers 2-3 together; sepals 10 x 3 mm, lanceolate; petals yellow, 2 x 1 cm, obtuse; ovary 6 x 3 mm, 5-celled.. Capsule 1.5 cm long, ellipsoid.

Fl. & Fr.: January-March

Distr.: Tropical Asia and Africa. Common along shola borders and scrublands from lower to higher altitudes. MS, Puthur, *KKK 16053.* VMS, Masthakappara, *KKK 31133.*

13. CLUSIACEAE (Guttiferae)

GARCINIA Linnaeus

Sp. Pl. 443. 1753.

Garcinia gummi-gutta (L.) Robs., Brittonia 20: 103. 1968. var. **papilla** (Wight) Singh in Sharma & Sanj., Fl. Ind. 3: 111. 1993. *G. papilla* Wight Ic. t. 96. 1839. *Cambogia gummi-gutta* L., Gen. Pl. (ed. 5) 522. 1754. *Garcinia cambogia* (Gaertn.) Desv. in Lam., Encycl. 3: 701. 1792, var. *papilla* (Wight) T. Anders. in Hook. f. FBI 1: 261. 1874. *Mangostana cambogia* Gaertn., Fruct. 2: 106. 1790. *Garcinia cambogia* var. *conicarpa* (Wight) T. Anders. in Hook. f., FBI 1: 262. 1874. *Garcinia conicarpa* Wight, Ic. t. 121. 1839. **Kodampuli (EBIS).**

Medium sized trees with yellow latex. Leaves 9 x 4.5 cm, elliptic, base cuneate, apex acute. Flowers orange red; male flowers in short axillary fascicles; bisexual flowers 1-3; sepals 4, obovate, coriaceous, margins scarious; petals 4, obovate, concave, longer than sepals; stamens about 25, united; ovary subglobose, 6-8 locular. Berry 4 x 3 cm, ovate-oblong, grooved, tip umbonate; seeds sub-triangular.

Fl. & Fr.: May-February

Distr.: Endemic to Southern Western Ghats. Occasional along shola borders and stream sides at medium altitudes. ENP, Mampallam chola, *KKK 17552.*

Note: The present collection is a new record to Kerala.

14. THEACEAE (Ternstroemiaceae)

1. Large trees; leaves entire; flowers yellow ..... **Ternstroemia**
1. Shrubs to small trees; leaves serrate or crenate; flowers white **2**
2. Flowers < 0.5 cm across, in axillary fascicles; fruit a berry; seeds 1 mm long, angular ..... **Eurya**
2. Flowers to 3.5 cm across, solitary; fruit a capsule; seeds 5 mm long, ellipsoid ..... **Gordonia**

EURYA Thunberg

Nova Gen. Pl. 67. 1783.

1. Anthers longer than filaments; style less than 1 mm long ..... **E. japonica**
1. Anthers shorter than filaments; style 1.5-2.5 mm long ..... **E. nitida**

Eurya japonica Thunb., Fl. Jap. 191. t. 25. 1784; Dyer in Hook. f., FBI 1: 284. 1874; Dunn in Gamble, FPM 79. 1915; Fyson, FSIHS 53. t. 35. 1932; Chauhan & Paul in Sharma & Sanj., Fl. Ind. 3: 184. 1993. **Koora Mar (EBIS).**

Leaves to 6 x 2.5 cm, elliptic or oblanceolate, base acute to cuneate, apex obtuse to sub-acute, undulate to bluntly serrate, coriaceous. Sepals 2 mm long, broadly ovate to orbicular; petals 2-2.5 mm long, orbicular; stamens unequal; ovary 3-4 mm long. Berries subglobose, brown, warty.

Fl. & Fr.: December-February

Distr.: South India and Japan. Common along shola margins and grassland ecotones at all altitudes. MS, K-3, *KKK 16128.* ENP, Amarachola, *KKK 17546*; Anamudi, *KKK 18536.*

Note: New record to Kerala. So far reported from Karnataka and Tamil Nadu only (Sharma & Sanjappa, 1993).

Eurya nitida Korth. in Temminck, Verh. Nat. Gesch. Bot. 3: 115, t. 17. 1840; Chauhan & Paul in Sharma & Sanj., Fl. Ind. 3: 184. 1993; Fyson, FSIHS 53. t. 35. 1932; Matthew, Suppl. Ill. FPH t. 961. 1998 & FPH 98. 1999. *Eurya japonica* Thunb. var. *thunbergii* Thw., Enum. Pl. Zeyl. 41. 1858; Dyer in Hook. f., FBI 1: 284. 1874. *Eurya japonica* Thunb. var. *nitida* (Korth.) Dyer in Hook. f., FBI 1: 284. 1874. **Koora Mar (EBIS) Plate 5.3.5.**

Leaves to 6 x 2 cm, narrowly elliptic-lanceolate, base cuneate, apex acute or acuminate, upper 2/3rd portion closely sharply serrate, thinly coriaceous. Sepals 1.5 mm across, orbicular; petals 2.5 x 1.5 mm, oblong to orbicular; stamens connate at base; ovary 3.5 mm across. Berries ovoid, brown.

Fl. & Fr.: June-August

Distr.: Indo-Malesia and China. Common along shola margins and grasslands ecotones at all altitudes. MS, Methappu, *KKK 16413*. VMS, *KKK 31134*.

GORDONIA Ellis

Phil. Trans. 60: 520. 1771, *nom. cons.*

Gordonia obtusa Wall. *ex* Wight & Arn., Prodr. 87. 1834; Dyer in Hook. f., FBI 1: 291. 1874; Dunn in Gamble, FPM 79. 1915; Fyson, FSIHS 54. t. 36. 1932; Chauhan & Paul in Sharma & Sanj., Fl. Ind. 3: 162. 1993; Matthew, Ill. FPH t. 60. 1996 & FPH 99. 1999. ***Chembarasan.* Plate 4.1.5.**

Leaves alternate, to 13 x 4 cm, elliptic-lanceolate, base cuneate, apex acuminate, margins serrate to crenate. Sepals 7 x 6 mm, orbicular; petals 2 x 1.2 cm, obovate; stamens numerous, yellow, connate at base; ovary 3-5 mm long, ovoid, pubescent; stigma 4 or 5 lobed. Capsules oblong with a short acumen, 5 angled; seeds winged.

Fl. & Fr.: March-May

Distr.: Endemic to Western Ghats. Occasional, found along streamside at lower altitudes. MS, Chengalar, *KKK 17666*; Thalachorkadavu, *KKK 18152*.

TERNSTROEMIA Mutis *ex* Linnaeus f.

Suppl. 39, 264. 1782, *nom. cons.*

Ternstroemia gymnanthera (Wight & Arn.) Beddome, Fl. Sylv. 91, t. 91. 1871; Chauhan & Paul in Sharma & Sanj., Fl. Ind. 3: 190. 1993. *Cleyera gymnanthera* Wight & Arn., Prodr. 87. 1834; Wight, Ic. t. 47. 1838. *C. japonica* Thunb., Fl. Jap. 224. 1784. *Ternstroemia japonica* auct. Non. Thunb. 1794; Dyer in Hook. f., FBI 1: 280. 1874; Dunn in Gamble, FPM 78. 1915; Fyson, FSIHS 52. t. 34. 1932. *T. wightii* Choisy, Mem. Ternstroem. Camell. 19. 1855. *T. japonica* Thunb. var. *wightii* (Choisy) Dyer in FBI 1: 281. 1874. **Plate 4.1.6.**

Leaves to 8 x 3 cm, obovate, base cuneate, apex acute, coriaceous, midrib reddish below. Flowers solitary; sepals 5, 6 x 5 mm, ovate-obtuse, persistent; petals 5, 1.5 cm long, obovate; stamens numerous, free, adnate to the base of petals; ovary 2 celled, ovoid. Berry 18 x 14 mm, ovoid, red; seeds 4, 12 x 7 mm, elliptic, convex.

Fl. & Fr.: August-December

Distr.: South East Asia and China. Common along shola margins at all altitudes. MS, Chengalar, *KKK 16570*; K-3.5, *KKK 16781*.

15. MALVACEAE

1. Perennial herbs; leaves ovate or rhomboid; flowers yellow ..... **Sida**
1. Subshrubs; leaves ovate or shallowly 3-5 lobed; flowers white or pink **2**
2. Flowers large, white with deep purple centre ..... **Abelmoschus**
2. Flowers small, pink with purple centre ..... **Urena**

ABELMOSCHUS Medikus

Malvenfam. 45. 1787.

Abelmoschus angulosus Wall. *ex* Wight & Arn., Prodr. 53. 1834; Wight, Ic. t. 951. 1845; Paul & Nayar, Fl. Ind. Fasc. 19: 68. 1988; Paul in Sharma & Sanj., Fl. Ind. 3: 301. 1993; Sivar. & Pradeep, Malv. South. Pen. India 52. 1996; Matthew, Ill. FPH t. 62. 1996 & FPH 105. 1999. *Hibiscus angulosus* (Wight & Arn.) Steud., Nomencl. Bot. (ed. 2) 1: 758. 1840; Masters in Hook. f., FBI 1: 341. 1874; Dunn in Gamble, FPM 97. 1915; Fyson, FSIHS 60. t. 40. 1932. **Kattu Sembarathi.**

Leaves 12 cm across, lobes triangular ovate, apex acute, crenate, stiff hairy. Flowers in the upper axils; epicalyx 4-5 parted; sepals 3 x 1 cm, ovate-lanceolate, hairy; petals 5 x 2 cm, obovate, glabrous; ovary 6 x 4 mm, conical. Capsule 3 x 1.5 cm, ovate-oblong, densely hispid; seeds 2.5 x 2 mm, ovate, discoid, black.

Fl. & Fr.: December-February

Distr.: South and South East Asia. Common along roadsides at lower and medium altitudes. MS, K-6, *KKK 16184*; K-3.5, *KKK 16780.*

SIDA Linnaeus

Sp. Pl. 683. 1753.

Sida rhombifolia L., Sp. Pl. 684. 1753; Masters in Hook. f., FBI 1: 323. 1874, in part; Gamble, FPM 90. 1915; Fyson, FSIHS 59. 1932; Paul & Nayar, Fl. Ind. Fasc. 19: 212. 1988; Paul in Sharma & Sanj., Fl. Ind. 3: 290. 1993; Sivar. & Pradeep, Malv. South. Pen. India 245. 1996; Matthew, FPH 121. 1999. *Sida rhombifolia* subsp. *rhombifolia* Borss., Blumea 14: 193. 1966. *Sida rhombifolia* subsp. *rhombifolia* var. *rhombifolia* Paul & Nayar, Fasc. Fl. Ind. 19: 214. 1988. *Sida alba* Cav., Diss. I. 22. t. f. 3. 8. 1785, non L., 1763.

Leaves alternate, 5 x 3 cm, ovate to rhomboid, base obtusely acute, apex acute to acuminate, crenate in upper half. Calyx campanulate, lobes 7 x 3 mm, triangular; corolla 1.8 cm across, petals oblique, base cuneate, apex emarginate; staminal tube divided; ovary conical. Mericarps 6, with 2 short awns, each 1-2 mm long; seeds 2 mm across, flattened, glabrous, reniform, black.

Fl. & Fr.: December-February

Distr.: Pantropical. Common along roadsides at lower altitudes. MS, Puthur, *KKK 16189.*

URENA Linnaeus

Sp. Pl. 692. 1753.

Urena lobata L., Sp. Pl. 692. 1753; Mast. in Hook. f., FBI 1: 329. 1874; Dunn in Gamble, FPM 92. 1915; Fyson, FSIHS 59. t. 39. 1932; Paul & Nayar, Fl. Ind. Fasc. 19: 228. 1988; Paul in Sharma & Sanj., Fl. Ind. 3: 380. 1993; Sivar. & Pradeep, Malv. South. Pen. India 181. 1996; Matthew, FPH 123. 1999. *Urena lobata* L. subsp. *lobata* Borss., Blumea 14: 140. 1966, var. *lobata*; Paul in Sharma & Sanj., Fl. Ind. 3: 336. 1993. **Cheeli, Kuruva Chedi.**

Leaves 2-6 x 1-6 cm, base rounded, apex acute, margins serrate, densely stellate hairy. Epicalyx 5, 6 x 1 mm, linear-lanceolate; calyx tubular, lobes 5 x 1.5 mm, lanceolate; corolla 2.5 cm across; petals 13 x 0.5 cm, obovate, apex rounded. Schizocarps 6 mm across, globose; mericarp 4-5 mm; seeds 3 mm, reniform, glabrous.
Fl. & Fr.: December-February
Distr.: Pantropical. Common along shola borders and roadsides at lower altitudes. MS, Puthur, *KKK 16190.*

16. TILIACEAE

1. Climbing shrubs; flowers white, in axillary or terminal umbellate cymes ..... **Grewia**
1. Erect herbs; flowers yellow, in axillary or leaf opposed cymes ..... **Triumfetta**

GREWIA Linnaeus

Sp. Pl. 964. 1753.

Grewia umbellifera Bedd., For. Man. Bot. 37. 1871; Mast. in Hook. f., FBI 1: 393. 1874; Dunn in Gamble, FPM 117. 1915; Daniel & Chandr. in Sharma & Sanj., Fl. Ind. 3: 513. 1993. **Kokki Valli. Plate 4.1.7.**

Leaves to 8 x 3 cm, elliptic or elliptic-ovate, base rounded, apex acute or acuminate, glandular-serrate, glabrescent, 3-nerved. Sepals 1.2 cm long, narrowly lanceolate, acute, pubescent; petals 7-10 mm long, ovate-oblong, sub-acute; androphore cylindric, 8 x 2 mm, pubescent; stamens many; ovary subglobose. Drupe 1.8 cm across, distinctly 4-lobed, fleshy, purple; seeds 7 mm across, discoid.
Fl. & Fr.: August-February
Distr.: Endemic to Western Ghats. Common along scrublands and ecotones usually at lower altitudes. MS, K-4, *KKK 16542*; K-3, *KKK 17506.*

TRIUMFETTA Linnaeus

Sp. Pl. 444. 1753.

Triumfetta pilosa Roth, Nov. Pl. Sp. 223. 1821; Mast. in Hook. f., FBI 1: 394. 1874; Dunn in Gamble, FPM 120. 1915; Fyson, FSIHS 62. 1932; Daniel & Chandr. in Sharma & Sanj., Fl. Ind. 3: 519. 1993; Matthew, FPH 143. 1999. **Erumachappu (EBIS).**

Leaves to 13 x 6 cm, ovate-oblong to elliptic-lanceolate, base rounded, apex acute, margins serrate, stellate hairy. Sepals 1 cm long, lorate; petals 8 x 2 mm,

oblanceolate, obtuse, apex dentate; stamens 10, bright yellow; ovary globose, 4 loculed, hairy. Capsules 1 cm across, subglobose, densely glochidiate-bristled; seeds 2.5 x 2 mm, ovate, plano-convex, glabrous, black.

Fl. & Fr.: October-February.

Distr.: Tropical Africa, Central and East Asia. Common along shola borders and roadsides at lower altitudes. MS, Puthur, *KKK 16191*; K-3, *KKK 16662*.

17. ELAEOCARPACEAE

ELAEOCARPUS Linnaeus

Sp. Pl. 515. 1753.

1. Leaves obovate; drupes ovoid, laterally compressed ..... **E. tuberculatus**
1. Leaves not obovate; drupes elliptic or elliptic-oblong 2
2. Anthers not awned; ripe drupe > 3 x 1.5 cm ..... **E. glandulosus**
2. Anthers awned; ripe drupe < 2 x 1 cm 3
3. Leaves small, ovate-lanceolate, crenate-serrate, glandular; crowded at apex ..... **E. munronii**
3. Leaves large, oblong or elliptic, recurved, shallowly serrate; not crowded ..... **E. recurvatus**

Elaeocarpus glandulosus Wall. *ex* Merr., J. Arn. Arbor. 32: 194. 1951; Murti, J. Econ. Tax. Bot. 17(2): 288. 1993 & in Sharma & Sanj., Fl. Ind. 3: 539. 1993. Matthew, Ill. FPH t. 79. 1996 & FPH 146. 1999. *E. oblongus* sensu Wight, Ic. t. 46. 1838, non Gaertn., 1788 & Smith, 1809; Mast. in Hook. f., FBI 1: 403. 1874; Dunn in Gamble, FPM 124. 1915; Fyson, FSIHS 65. t. 41. 1932. **Kotlam Pazham (EBIS). Plate 5.2.6.**

Large trees. Leaves to 9 x 6 cm, broadly ovate or elliptic, base rounded, apex acute or acuminate, crenate-serrate, coriaceous. Racemes puberulus. Sepals 4 x 1.5 mm long, lanceolate, minutely pubescent outside, glandular inside; petals 7 x 4 mm long, cuneate at base; anthers puberulus; ovary densely hairy. Drupes 3.3 x 1.6 cm, fleshy, rugose; pyrenes oblong, 2 locular, 2 seeded.

Fl. & Fr.: December-March

Distr.: South Asia. Common; along shola borders at medium altitudes. MS, Perumala, *KKK 18144*.

Elaeocarpus munronii (Wight) Mast. in Hook. f., FBI 1: 407. 1874; Dunn in Gamble, FPM 124. 1915; Fyson, FSIHS 66. t. 43. 1932; "*munroii*"; Murti, J. Econ. Tax. Bot. 17(2): 290. 1993 & in Sharma & Sanj., Fl. Ind. 3: 546. 1993; Matthew, Ill. FPH t. 80. 1996 & FPH 147. 1999. *Monocera munroii* Wight, Ill. Ind. Bot. 1: 83. 1840 & Ic. t. 952. 1845. **Shiru Kodala. Plate 4.1.8.**

Medium sized trees. Leaves to 8 x 3 cm, base rounded, apex acuminate, sub-coriaceous. Sepals 8 x 1.5 mm long, linear-lanceolate, glabrous; petals 7 x 3 mm, elliptic-oblong, white with reddish lines at base, apex broad, laciniate; stamens 25-30, awns curved; ovary 2 mm long, conical, silky pubescent, 2 celled. Drupe 2 x 0.8 cm, glabrous, glaucous, unilocular, 1 seeded.

Fl. & Fr.: August-December

Distr.: Endemic to Western Ghats. Rare; along shola borders at medium altitudes. MS, K-5, *KKK 16713*; Coupe Road, *KKK 16584*.

Elaeocarpus recurvatus Corner in Gard. Bull. Str. Settl. 10. 319. 1939; Murti in Sharma & Sanj., Fl. Ind. 3: 549. 1993; Matthew, Ill. FPH t. 81. 1996 & FPH 148. 1999. *E. ferrugineus* (Wight) Bedd. Fl. Sylv. t. 112. 1871; non (Jack) Steudel 1840; Masters in Hook. f., FBI 1: 406. 1874; Dunn in Gamble, FPM 124. 1915; Fyson, FSIHS 65. t. 42. 1932; *Monocera ferruginea* Wight, Ic. t. 205. 1839; non Jack 1830. **Rudraksham (EBIS). Plate 5.4.5.**

Medium sized trees, young parts rusty grey tomentose. Leaves to 12 x 8 cm, base narrowed, apex acute or acuminate, coriaceous, wooly tomentose below. Racemes 6-9 cm. Sepals 10 x 2 mm, lanceolate, densely tomentose outside; petals 9 x 3 cm, oblong-cuneate, broader at apex, long hairy; anthers oblong; ovary 3 x 2 mm, ovoid-oblong, densely hairy. Drupes 1.8 x 0.9 cm, fleshy, green.

Fl. & Fr.: February-March

Distr.: Endemic to Southern Western Ghats. Rare; along shola borders at higher altitudes. MS, Idlimottai, *KKK 16027*; K-3, *KKK 16124*.

Note: Young leaves and those found at lower branches or plants found at lower altitude regions do not show prominent tomentum or recurved nature (Plate 6.5.2).

Elaeocarpus tuberculatus Roxb., Fl. Ind. 2: 594. 1832; Mast. in Hook. f., FBI 1: 404. 1874; Dunn in Gamble, FPM 124. 1915; Murti, J. Econ. Tax. Bot. 17(2): 292. 1993 & in Sharma & Sanj., Fl. Ind. 3: 559. 1993; Matthew, Ill. FPH t. 82. 1996 & FPH 148. 1999. *Monocera tuberculata* (Roxb.) Wight & Arn., Prodr. 83. 1834; Wight, Ic. t. 62. 1838. ***Koduvasi Maram*, Shembara Maram (EBIS). Plate 6.3.1.**

Large trees, prominently buttressed. Leaves to 18 x 5 cm, base narrowed, rounded or truncate, apex retuse or acute, obscurely crenate-dentate or sub-entire, coriaceous, rufous hairy beneath. Racemes ferruginous tomentose. Sepals 15 x 3 mm, linear-lanceolate; petals 20 x 5 mm, oblong; anthers oblong, thinly tomentose; ovary 4 x 3 mm, ovoid-oblong, silky tomentose. Drupes 3.5 x 2.5 cm, smooth.

Fl. & Fr.: March-August

Distr.: India and Malesia. Rare; along shola borders at lower altitudes. MS, Puthur, *KKK 16565*.

18. GERANIACEAE

GERANIUM Linn.

Sp. Pl. 676. 1753

Geranium nepalense Sweet, Gerania. 1: t. 12. 1820; Edgew. & Hook. f. in Hook. f., FBI 1: 430. 1874; Dunn in Gamble, FPM, 131. 1915; Fyson, FSIHS 70, t. 45. 1932; Malhothra in Hajra *et al.*, Fl. Ind. 4: 75. 1997; Matthew, Ill. FPH t. 85. 1996 & FPH 155. 1999.

Diffuse perennial herbs. Leaves opposite, to 5 cm across, orbicular, palmately 5 lobed, lobes sub equal, irregularly incised pubescent. Flowers solitary or in pairs, axillary; sepals 7 x 2.5 mm, lanceolate, mucronate; petals pink with deep purple veins, to 10 x 5 mm, obovate, base cuneate, apex emarginate; stamens 10; ovary oblong, 5 loculed; stigma 5 lobed. Schizocarp beaked; mericarps subglobular.

Fl. & Fr.: August-September

Distr.: South East Asia. Occasional; in grasslands and along roadsides at higher altitudes. MS, Idlimottai, *KKK 16614.*

19. OXALIDACEAE

1. Leaves pinnate; capsule valves detaching from axis ..... **Biophytum**
1. Leaves digitate; capsule valves cohering with axis ..... **Oxalis**

BIOPHYTUM A. P. de Candolle

Prodr. 1: 689. 1824.

1. Perennial herbs; stems branched; sepals linear; seeds ellipsoid ..... **B. intermedium** var. **pulneyensis**
1. Annual herbs; stems simple; sepals ovate-lanceolate; seeds ovoid .. **B. sensitivum** var. **candolleanum**

Biophytum intermedium Wight, Ill. Indian Bot. 1: 162. 1840; Edgew. & Hook. f. in Hook. f., FBI 1: 438. 1874, incl. var. **pulneyensis**; Dunn in Gamble, FPM 133. 1915; Fyson, FSIHS 76. t. 53. 1932; Manna in Hajra *et al.* , Fl. Ind. 4: 232. 1997; Matthew, FPH 161. 1999.

Leaves 3-4 cm; leaflets 14-16 pairs, apical ones 8 x 3 mm, oblong, falcate, base truncate, apex obliquely-apiculate, glabrous. Flowers yellow, 1 cm across; sepals 5 x 0.5 mm, linear, villous; petals 7 x 4 mm, obovate. Seeds ellipsoid, tubercled, ridged.

Fl. & Fr.: January-June

Distr.: India and Sri Lanka. Occasional; along stream sides at lower altitudes. MS, Thalachorkadavu, *KKK* 16756; Chengalar, *KKK 18127.*

Biophytum sensitivum (L.) DC., Prodr. 1: 690. 1824, var. **candolleanum** (Wight) Edgew. & Hook. f., FBI 1: 437. 1874; Manna in Hajra *et al.* , Fl. Ind. 4: 238. 1997. *B. candolleanum* Wight, Ill. Indian Bot. 1: 161. t. 62. 1840; Dunn in Gamble, FPM 133. 1915; Fyson, FSIHS 77. 1932.

Leaves sensitive, 4-5 cm long; leaflets 12-25 pairs, apical ones 7 x 4 mm, oblong, apex obliquely apiculate, strigose hairy. Flowers yellow; sepals 5 x 1.5 mm, acute, ridged; petals 6 x 2 mm, lanceolate; ovary 0.5 mm long. Seeds ovoid, tubercled.

Fl. & Fr.: February-September

Distr.: Peninsular India and Sri Lanka. Common; along shola borders at lower altitudes. MS, Perumala, *KKK 16060.*

OXALIS Linnaeus

Sp. Pl. 433.1753.

1. Caulescent, creeping herbs; leaflets broadly elliptic-obcordate; umbels 2 flowered ..... **O. corniculata**
1. Acaulescent herbs; leaflets fishtail shaped, broadly deltoid; umbels 10 or 11 flowered ..... **O. latifolia**

Oxalis corniculata L., Sp. Pl. 435. 1753; Wight, Ic. t. 18. 1838; Edgew. & Hook. f. in Hook. f., FBI 1: 436. 1874; Dunn in Gamble, FPM 132. 1915; Fyson, FSIHS 73. t. 47. 1932; Manna in Hajra *et al.*, Fl. Ind. 4: 242. 1997; Matthew, FPH. 163. 1999. *O.*

corniculata L. var. *hispida* Blatt., J. Bombay Nat. Hist. Soc. 34: 898. 1931. **Pulichan, Kottampulichan (EBIS).**

Leaves 2-4 cm across; leaflets to 2.5 x 2 cm, paler and pubescent beneath. Sepals 8 x 2 mm, pubescent, with narrow paler margins; petals 1 cm long, oblong, yellow; stamens united; ovary 3 x 1 mm, puberulus. Capsule to 15 x 2.5 mm; seeds 6-7, 1.5 x 7 mm, flattened-ovoid.

Fl. & Fr.: July-August.

Distr.: Cosmopolitan. Occasionally found along shola borders and roadsides at lower altitudes. MS, Chengalar, *KKK 16576.*

Oxalis latifolia Kunth, Nov. Gen. Sp. 5. 237. t. 467. 1821; Fyson, FSIHS 75, t. 51. 1932. *O. intermedia* A. Rich., Ess. Fl. Cuba 315. 1845, non Steud. 1841. *O. dehradunensis* Raiz., Suppl. Fl. Upp. Gang. Plain 37-38. 1976; Manna in Hajra *et al.*, Fl. Ind. 4: 246. 1997; Matthew, Ill. FPH. t. 92 1996 & FPH 164. 1999. **Pulichan.**

Roots filiform; bulbs 10 x 8 mm, ovoid, with numerous basal erect stolons. Leaves long petiolate; leaflets 4 x 1.5 cm, subbilobed with divergent lobes, base cuneate, apex acute. Sepals 5 x 1.5 mm, lanceolate, glabrous; corolla 1.5 cm long, infundibuliform, petals oblanceolate; ovary 5 lobed, to 2.5 mm long, glabrous. Fruits not seen

Fl.: August-September

Distr.: Native of Mexico and West Indies; introduced and naturalised in other areas. Occasional; along roadsides in lower altitudes. MS, Chengalar, *KKK 31093.*

Note: The present collection is a new record to Kerala.

20. BALSAMINACEAE

IMPATIENS Linnaeus

Sp. Pl. 937. 1753.

1. Epiphytic plants ..... **I. parasitica**
1. Terrestrial plants 2
2. Scapigerous herbs; leaves all radical ..... **I. modesta**
2. Herbs or shrubs; leaves cauline 3
3. Flowers solitary 4
3. Flowers in umbels or racemes 11
4. Leaves all opposite 5
4. Leaves opposite, alternate or whorled 7
5. Spur of lip slender, usually longer than wings 6
5. Spur of lip very short ..... **I. herbicola**
6. Stem stiff, simple ..... **I. chinensis**
6. Stem slender, flaccid ..... **I. tenella**
7. Leaves opposite, alternate and whorled on same plant 8
7. Leaves all alternate 9
8. Basal lobes of wings smaller than the distal; spur of the lip 15 mm ..... **I. latifolia**
8. Basal lobes of wings equalling or larger than distal; spur of lip 20 mm ..... **I. cuspidata**
9. Leaves, standard petal and lip glabrous ..... **I. balsamina**
9. Leaves, standard petal and lip tomentose 10

10. Flowers small; wings short ..... **I. munronii**
10. Flowers very large; wings large ..... **I. hensloviana**
11. Flowers in umbels 12
11. Flowers in racemes 19
12. Shrubs or large branching herbs 13
12. Annual herbs 14
13. Leaves alternate ..... **I. campanulata**
13. Leaves opposite and whorled ..... **I. verticillata**
14. Leaves all opposite 15
14. Leaves all alternate 16
15. Peduncle many flowered; leaves petioled ..... **I. goughii**
15. Peduncle 1 flowered; leaves subsessile ..... **I. parvifolia**
16. Leaves scattered on stems and branches 17
16. Leaves rosulate at the stem tip ..... **I. anaimudica**
17. Spur of lip present 18
17. Spur of lip absent ..... **I. elegans**
18. Spur of lip long, slender ..... **I. cordata**
18. Spur of lip short, tip incurved ..... **I. sp.1**
19. Leaves long petioled, ovate 20
19. Leaves sub-sessile, lanceolate ..... **I. tangachee**
20. Lip tubiform or deeply cylindric-saccate 21
20. Lip cymbiform or funnel shaped 22
21. Spur trumpet shaped, incurved with swollen tip ..... **I. phoenicea**
21. Spur tubular, blunt, upcurved with apex appressed to front of sac ..... **I. coelotropis**
22. Lip cymbiform or shortly funnel shaped; spur short, straight of upcurved ..... **I. wightiana**
22. Lip deeply funnel shaped; spur tubular, blunt, curved upwards in a semicircle ..... **I. platyadena**

Impatiens anaimudica Fischer, Kew Bull. 1935: 92-93 & in Gamble, FPM 1871. 1936; Vivek. *et al.* in Hajra *et al.*, Fl. Ind. 4: 117-118. 1997; Biju, Rheedea 11(2): 109-113. 2001.

Herbs, to 20 cm tall; stems terete, reddish green. Leaves rosulate at tip, to 3 x 2 cm, ovate-acuminate, margins with serrations ending in cilia, slightly pilose on veins. Umbels 3-4 flowered. Flowers scarlet red; lip cymbiform, small; spur reduced to a small rounded projection at base; lateral sepals ovate-acuminate; standard orbicular; not spurred; wings with 2 subequal lobes, obtuse; stamens 5; ovary ovate-elliptic. Capsule to 1 cm long, obliquely elliptic, aristate.

Fl. & Fr.: October-December

Distr.: Endemic to Southern Western Ghats. Very rare and endangered; along roadsides and grassland ecotones at high altitudes. ENP, Umayamala, *KKK 18015.*

Note: This species which was considered as *'possibly extinct'* (Nayar & Sastry, 1988) since it was not collected after the type collection by Barnes (1933) from Anamudi, was recently relocated by Biju (2001) from the same locality.

Impatiens balsamina L., Sp. Pl. 938. 1753; Hook. f., FBI 1: 453. 1874; Gamble, FPM 142. 1915; Fyson, FSIHS 91. 1932; Vivek. *et al.* in Hajra *et al.*, Fl. Ind. 4: 123. 1997; Matthew, FPH. t. 96. 1996 & FPH 170. 1999. **Thottachinungi (EBIS).**

Annual herbs, highly branched. Leaves to 11 x 1 cm, lanceolate, acute on both sides, margins deeply serrate. Flowers rosy pink, axillary, pedicellate; lip saccate, cuspidate, densely hairy, spur to 3 cm, hairy; lateral sepals 2 x 0.5 mm, linear; standard petals 10 x 8 mm, orbicular, cuspidate; wings 17 x 10 mm, 2 lobed, terminal lobe notched at apex, basal smaller. Capsule tomentose.

Fl. & Fr.: September-December

Distr.: Indo-Malesia; introduced into many countries. Occasional; along roadsides at lower altitudes. MS, K-3, *KKK 16653.*

Impatiens campanulata Wight, Madras J. Lit. Sci. ser. 1. 5: 11. t. 7. 1837; Hook. f., FBI 463. 1874; Gamble, FPM 143. 1915; Fyson, FSIHS 94. t. 74. 1932; Vivek. *et al.* in Hajra *et al.*, Fl. Ind. 4: 130. 1997; Matthew, Ill. FPH. t. 97. & FPH 171. 1999. **Thottachinungi.**

Tall herbs. Leaves to 14 x 6 cm, elliptic, apex acuminate, margins serrate. Racemes sub-umbellate, 2-3 flowered. Flowers white and yellow with purple spots; lip cymbiform, 1.5 cm long; spur 5 mm, stout; lateral sepals 1 x 0.5 cm, ovate; standard 13 mm long, orbicular, keeled at back; wings 2.5 cm long, bilobed; ovary elliptic, pointed at both ends, glabrous. Fruit not seen.

Fl.: July-August

Distr.: Endemic to Southern Western Ghats. Occasional; along roadsides at medium altitudes. MS, Gudalar road, *KKK 18596.*

Note: The present collection is a new record to Kerala.

Impatiens chinensis L., Sp. Pl. 937. 1753; Hook. f., FBI 1: 444. 1874; Gamble, FPM 139. 1915; Fyson, FSIHS 86, t. 63. 1932; Vivek. *et al.* in Hajra *et al.*, Fl. Ind. 4: 131. 1997; Matthew, Ill. FPH. t. 98. 1996 & FPH 171. 1999. *I. fasciculata* Lam., Dict. 1: 359. 1873; Wight, Ic. t. 748. 1844. **Plate 4.2.1.**

Unbranched herbs, stems to 40 cm tall, reddish. Leaves to 10 x 1 cm, linear-oblong, base cordate, distantly crenate, glabrous. Flowers binate, axillary, pedicelled; lip 8 mm long, acuminate and curved back at apex; spur 15 mm long, slender; standard 4 x 6 mm, orbicular, emarginate; terminal lobe of wing ovate, pink; dorsal auricle slender. Capsule 10 mm long, elliptic, glabrous.

Fl. & Fr.: August-January

Distr.: India and China. Common along stream sides at medium altitudes. MS, K-5, *KKK 31085.*

Impatiens coelotropis Fischer, Kew Bull. 1934: 390-391. 1934; Gamble, FPM 1871. 1936; Vivek. *et al.* in Hajra *et al.*, Fl. Ind. 4: 134. 1997.

Erect undershrubs. Leaves 10 x 2.5 cm, ovate to narrowly lanceolate, base cuneate, apex acute, margins distantly serrate. Racemes 3-4 flowered. Flowers 2.5 cm long; lateral sepals ovate-lanceolate; lip deeply cylindric-saccate; spur to 10 mm long,

tubular, blunt, upcurved, glossy green with scarlet mouth; standard 15 mm long suborbicular, scarlet; wings sessile, oblong falcate, scarlet. Capsule 15 mm long, ellipsoid-fusiform, glossy.

Fl. & Fr.: August-December

Distr.: Endemic to Southern Western Ghats. Rare; on rocks along stream sides in grasslands. ENP, Rajamala, *KKK 31094.*

Impatiens cordata Wight, Madras J. Lit. Sci. ser.1. 5: 10. 1837; Hook. f., FBI 1: 462. 1874; Gamble, FPM 144. 1915; Vivek. *et al.* in Hajra *et al.,* Fl. Ind. 4: 135. 1997. **Thottachinungi (EBIS) Plate 4.2.2.**

Procumbent herbs. Leaves to 8 x 5 cm, ovate, base cordate, shallowly serrate, chartaceous. Racemes subumbellate, axillary. Flowers rose with purple centre; lip 8 x 8 mm, concave, obtuse, mucronate; spur 35 mm long, pointed; lateral sepals ovate, mucronate; standard 11 x 8 mm, emarginate; wings 2 x 1 cm. Capsule 15 x 5 mm, elliptic, cuspidate, glabrous; seeds 3 x 2 mm, obovate, pilous.

Fl. & Fr.: July-December

Distr.: Endemic to Southern Western Ghats. Common in exposed regions, along water sources and roadsides at lower altitudes. MS, K-4, *KKK 16510* & *KKK 16511*; K-5, *KKK 17688.*

Impatiens cuspidata Wight & Arn., Comp. Bot. Mag. 1: 321. 1835; Wight, Ic. t. 741. 1844; Gamble, FPM 142. 1915; Fyson, FSIHS 91. 1932; Vivek. *et al.* in Hajra *et al.,* Fl. Ind. 4: 137. 1997. *I. latifolia* sensu Hook. f., FBI 1: 450. 1874, p.p. non L., 1753. **Thottachinungi. Plate 4.2.3.**

Shrubs to 1.2 m tall. Leaves opposite or alternate, crowded at tip, to 13 x 4.5 cm, elliptic, base acute, apex acuminate, sparsely pilose above. Flowers pale rose, 2.5 cm across, axillary; lip 10 x 6 mm, funnel shaped; spur to 20 x 1 mm, stout; lateral sepals linear; standard 15 x 13 mm, orbicular, bilobed above, strongly cuspidate; ovary ellipsoid. Capsule 2.5 x 1 cm, elliptic; seeds 4 x 3 mm, ovate.

Fl. & Fr.: October-December

Distr.: Endemic to Southern Western Ghats. Occasional; along shola borders at higher altitudes. ENP, Umayamala, *KKK 18061.*

Impatiens elegans Bedd., Madras J. Lit. Sci. ser. 2. 78: 67. 1859; Hook. f., FBI 1: 465. 1875; Vivek. *et al.* in Hajra *et al.,* Fl. Ind. 4: 144. 1997. **Thottachinungi.**

Herbs, to 30 cm tall. Leaves to 5.5 x 3.5 cm, ovate, apex acuminate, serrate, membranous. Racemes sub-umbellate. Flowers pale rosy white with a purple eye; lip cymbiform; spur absent; dorsal sepals ovate; standard orbicular-ovate, apiculate with a green dorsal ridge; terminal wing lobe obliquely-ovate, sessile; laterals small, rounded. Capsule to 12 mm long, ellipsoid, beaked; seeds hairy, subglobose.

Fl. & Fr.: October-December

Distr.: Endemic to Southern Western Ghats. Rare; along stream sides at lower and medium altitudes. ENP, Nilgiri Teri, *KKK 18059.*

Note: This species is closely allied to *I. cordata,* except in the absence of spur.

Impatiens goughii Wight, Ill. 1: 160. 1840; Wight, Ic. t. 1603. 1850; Hook. f., FBI 1: 452. 1874; Gamble, FPM 144. 1915; Fyson, FSIHS 95. t. 75. 1932; Vivek. *et al.* in Hajra *et al.*, Fl. Ind. 4: 152. 1997; Matthew, Ill. FPH t. 99. 1996 & FPH 172. 1999.

Herbs to 20 cm tall. Leaves to 2.5 x 1.25 cm, elliptic, acute at both ends, serrate. Flowers small, pink; lip 3 x 5 mm, boat shaped, acute, cuspidate; spur 2 mm long, cylindric, curved; lateral sepals acute; standard 2 x 2 mm, orbicular; wings 3 lobed, lobes shallow; dorsal auricle produced into a spur; ovary elliptic, acuminate. Capsule to 5 x 2.5 mm, oblique-ellipsoid, acuminate, glabrous.

Fl. & Fr.: September-December

Distr.: Endemic to Western Ghats. Common along exposed regions and roadsides at medium altitudes. MS, Coupe road, *KKK 16592*; K-4, *KKK 16659.*

Note: Since this plant is usually found on wet rocks, extremely stunted mature plants < 5 cm height are also often found.

Impatiens hensloviana Arn., Comp. Bot. Mag. 1: 322. 1836; Hook. f., FBI 1: 458. 1874; Gamble, FPM 143. 1915; Fyson, FSIHS 93. t. 71. 1932; Vivek. *et al.* in Hajra *et al.*, Fl. Ind. 4: 155. 1997; Matthew, Ill. FPH t. 100. 1996 & FPH 173. 1999. *I. albida* Wight, Madras J. Lit. Sci. ser. 1. 5: 7. t.1. 1837 & Ic. t. 743. 1844. **Plate 4.2.4.**

Bushy undershrubs with scars of fallen leaves. Leaves crowded at tip, to 12 x 5 cm, elliptic, base acute, apex acuminate, tomentose. Flowers white with rosy tinge in centre, to 4 cm across, solitary; lip 1.8 x 0.8 cm, funnel shaped; spur 40 mm long, hairy; lateral sepals 10 x 6 mm, ovate-cuspidate; standard broadly ovate; wings bilobed; ovary elliptic-acuminate. Capsule 3 cm long, slender, pubescent.

Fl. & Fr.: August-February

Distr.: South India and Sri Lanka. Commonly found as dense patches along shola borders and stream sides at lower and medium altitudes. Chengalar, *KKK* 16532; Thalachorkadavu, *KKK 18123*; ENP, Mampallam Chola, *KKK 18062.*

Impatiens herbicola Hook. f., Kew Bull. 1911: 354. 1911; Gamble, FPM 141. 1915; Vivek. *et al.* in Hajra *et al.*, Fl. Ind. 4: 156. 1997.

Branched herbs to 25 cm tall, stems pink. Leaves to 3 x 1 cm, lanceolate, base cordate, apex acute, serrate, pubescent. Flowers rose, in axillary fascicles; lip 10 x 5 cm, saccate, cuspidate; spur 1 mm long, curved; lateral sepals lanceolate; standard to 6 mm across, orbicular; wings 12 x 8 mm, unequally 2 lobed; ovary 2 x 1.5 mm. Capsule to 10 x 3 mm, elliptic, acute; seeds 1 x 0.5 mm, ellipsoid.

Fl. & Fr.: July-September

Distr.: Endemic to Southern Western Ghats. Common in grassland bogs at higher altitudes. MS, Idlimottai, *KKK 16641.*

Impatiens latifolia L. Sp. Pl. 937. 1753; Hook. f., FBI 1: 450. 1874 & o.c. 47. 1906, excl. syn. *I. cuspidata* Wight & Arn.; Gamble, FPM 141. 1915; Fyson, FSIHS 91. t. 69. 1932; Vivek. *et al.* in Hajra *et al.*, Fl. Ind. 4: 169. 1997; Matthew, Ill. FPH. t. 101. & FPH 173. 1999.

Erect shrubs. Leaves alternate, subopposite or whorled, crowded at apex, to 8 x 2.5 cm, ovate-lanceolate, apex caudate-acuminate, crenate-serrate, membranous. Flowers solitary, binate or in fascicles, white or purple; lateral sepals ovate; lip cymbiform;

spur 15 mm long, slightly incurved; standard larger than wings. Capsule 2 cm long, ellipsoid; seeds obovoid.

Fl. & Fr.: July-September

Distr.: Endemic to Southern Western Ghats. Occasional; found in moist, rocky regions at low altitudes. ENP, Rajamala, *KKK 31142.*

Impatiens modesta Wight, Madras J. Lit. Sci. ser. 1. 5: 13. 1837 & Ic. t. 968. 1844; Hook f., FBI 1: 442. 1874; Gamble, FPM 138. 1915; Fyson, FSIHS 83. t. 57. 1932; Vivek. *et al.* in Hajra *et al.*, Fl. Ind. 4: 182. 1997.

Stemless herbs. Leaves to 4 x 5 cm, broadly ovate, base cordate, apex acute, serrate, pubescent below. Scapes to 20 cm long. Flowers 8-9 mm across, confined to the tip of the scape; lip 4 x 2.5 mm, ovate, obtuse; spur 4 mm long, straight, cylindrical; sepals 2 x 1 mm, ovate; standard 3.5 x 4 mm, broadly ovate, obtuse, glabrous, entire; wing lobes subequal, oblong, obtuse. Capsule not seen.

Fl.: June

Distr.: Endemic to Southern Western Ghats. Occasional; as lithophyte or epiphytes in shady regions at medium altitudes. ENP, Rajamala, *KKK 31091.*

Impatiens munronii Wight, Ill. Ind. Bot. 1: 160. 1840 & Ic. t. 1049. 1846; Hook. f., FBI 1: 456. 1874; Fyson, FSIHS 92. 1932; Vivek. *et al.* in Hajra *et al.*, Fl. Ind. 4: 183. 1997.

Under shrubs. Leaves alternate, to 7 x 3 cm, elliptic, apex acuminate, shallowly serrate, scaly tomentose. Flowers white, with rosy tinge in centre, axillary, solitary; lip cymbiform; spur 1 cm long, incurved, yellow, tomentose; lateral sepals ovate, cuspidate, small; standard cucullate, small, hairy; wings small, bilobed, lobes ovate-oblong; ovary elliptic. Fruits not seen.

Fl.: December

Distr.: Endemic to Southern Western Ghats. Fairly common along shola borders at medium altitudes. MS, K-7, *KKK 18140.*

Note: New record to Kerala. So far reported from Tamil Nadu only (Hajra *et al.*, 1997).

Impatiens parasitica Bedd., Madras J. Lit. Sci. ser. 2. 20: 66. t. 7. f. 2. 1859 & Ic. t. 140. 1868-1874; Gamble, FPM 139. 1915; Vivek. *et al.* in Hajra *et al.*, Fl. Ind. 4: 191. 1997. *I. jerdoniae* Wight var. *parasitica* (Bedd.) Hook. f., FBI 1: 460. 1874. **Plate 4.2.5.**

Epiphytic perennial herbs, to 30 cm higher. Leaves alternate, fascicled at the ends of branches, 4 x 3 cm, ovate, apex acuminate, margins shallowly crenate. Umbels few flowered, terminal. Flowers yellowish green; lip scarlet, 2 x 0.5 cm, trumpet shaped; lateral sepals 10 x 3 mm, elliptic-acuminate; standard 8 x 14 mm, hood shaped; wings 10 x 8, bilobed, conical; ovary elliptic. Capsule to 15 x 4 mm, ellipsoid.

Fl. & Fr.: October-December

Distr.: Endemic to Southern Western Ghats. Rare; found on tree trunks along stream sides at higher altitudes. ENP, Amarachola, *KKK 18004.*

Impatiens parvifolia Bedd., Madras J. Lit. Sci. ser. 2. 20: 66. t. 7. f. 1. 1859 & Ic. t. 29, t. 142. 1868-74; Hook. f., FBI 1: 453. 1874; Gamble, FPM 144. 1915; Vivek. *et al.*

in Hajra *et al.*, Fl. Ind. 4: 191. 1997. *I. omissa* Hook. f., Rec. Bot. Surv. India 4: 48. 1906; Fyson, FSIHS 95. 1932.

Herbs to 20 cm tall. Leaves to 1.5 x 1 cm, elliptic, apex acute, serrate. Flowers pale pink with crimson blotches; peduncles 1 flowered; lip to 4 x 6 mm, boat shaped, acute, cuspidate; spur 4 x 1 mm, cylindric, curved; lateral sepals 2 x 1 mm, acute; standard 3 x 4 mm, orbicular; wings 8 x 4 mm, unequally 3 lobed; dorsal auricle produced into the spur; ovary 2 x 1 mm, elliptic-acuminate. Capsule ellipsoid.

Fl. & Fr.: September-December

Distr.: Endemic to Southern Western Ghats. Occasionally found on wet rocks along stream sides. ENP, Amarachola, *KKK 18014.*

Note: The present collection is a new record to Kerala.

Impatiens phoenicea Bedd., Madras J. Lit. Sci. ser. 2. 19: 175. 1858 & Ic. t. 30. t. 148. 1868-74; Hook. f., FBI 1: 466. 1875; Fyson, FSIHS 96. t. 76. 1932; Vivek. *et al.* in Hajra *et al.*, Fl. Ind. 4: 193. 1997; Matthew, FPH t. 103. 1996 & FPH 175. 1999 **Thottachinungi. Plate 4.2.6.**

Erect suffruticose herb, to 45 cm. Leaves alternate, to 10 x 3 cm, elliptic, acute at both ends, serrate. Flowers scarlet red with yellow in center; lip tubiform, acuminate; spur 1.5 cm long, trumpet shaped, fully curved with swollen tip; lateral sepals 6 x 4 mm, ovate, acuminate; wings 2 lobed, unequal, terminal lobe oblong, lateral one cordate; standard cup shaped; ovary elliptic. Capsule elliptic, cuspidate.

Fl. & Fr.: May-August

Distr.: Endemic to Southern Western Ghats. Occasional in shola interiors along stream sides at medium and higher altitudes. MS, Idlimottai, *KKK 18160*; K-4, *KKK 16409*; Chengalar, *KKK 16535.*

Impatiens platyadena Fischer, Kew Bull. 1934: 393. 1934; Gamble, FPM 1871. 1936; Vivek. *et al.* in Hajra *et al.*, Fl. Ind. 4: 193. 1997.

Undershrubs. Leaves alternate, to 15 x 5 cm, elliptic-lanceolate, apex acuminate, crenate-serrate, petiole with 6-8 flattened green tipped white glands on margins. Racemes with drooping peduncles, to 4 cm long. Flowers 1.5 cm long; lateral sepals suborbicular, cream coloured; lip funnel shaped; spur tubular; standard 7 mm long, ovate; wings 15 mm long, distal lobes scarlet. Capsule 6 mm long, ovoid, acute.

Fl. & Fr.: July-October

Distr.: Endemic to Idukki District of Kerala State. Very rare and endangered; found along stream sides at medium altitudes. ENP, Nilagiri Teri, *KKK 31089.*

Notes: This species was considered *'possibly extinct'* by Ahmedullah & Nayar (1987) and Hajra *et al.* (1997). The present collection forms a rediscovery after the type collection by Barnes from the Nyamakkad gap of Idukki District during 1933. The species can be easily identified by the green tipped white glands on the petiole.

Impatiens tangachee Bedd., Madras J. Lit. Sci. ser. 2. 20: 66. 1859 & Ic. t. 30. t. 147. 1868-74; Hook. f., FBI 1: 467. 1875; Fyson, FSIHS 97. 1932; Vivek. *et al.* in Hajra *et al.*, Fl. Ind. 4: 215. 1997; Matthew, FPH 175. 1999. **Aattalanji. Plate 4.2.7.**

Procumbent herbs. Leaves alternate, crowded at apex, to 12 x 2 cm, oblanceolate, apex acuminate, shallowly serrate. Flowers bright rose; lip 8 mm long, shallowly cymbiform, apex mucronate, abruptly constricted to a 20 mm long, filiform spur; lateral sepals 5 x 2.5 mm, ovate, oblique, acuminate; standard petal cucullate; wings 2 lobed, terminal oblong-ovate, lateral ovate; ovary elliptic. Capsule elliptic-acuminate, glabrous.

Fl. & Fr.: December-February

Distr.: Endemic to Southern Western Ghats. Common; found as dense patches on rocks along stream sides at lower altitudes. MS, Thalachorkadavu, *KKK 16113.*

Impatiens tenella Heyne *ex* Hook. f., FBI 1: 47. 1874, incl. var. *brachycarpa* Hook. f.; Gamble, FPM 140. 1915; Fyson, FSIHS 87, t. 64. 1932; Vivek. *et al.* in Hajra *et al.*, Fl. Ind. 4: 215. 1997. *I. rosmarinifolia* Retz., Obs. Bot. 5: 29. 1789; Wight, Ic. t. 750. 1844. *I. debilis* Turcz., Bull. Soc. Imp. Natur. Moscow. 32 (1): 271. 1859; Hook. f. FBI 1: 483. 1875.

Erect slender herbs. Leaves subsessile, opposite, to 5 cm long, oblong or lanceolate, serrate. Flowers pink, solitary or fascicled; lateral sepals linear; standard short; wings sessile, distal lobes clawed; dorsal auricle small, decurved; spur shorter. Capsule 1 cm long, clavate, pointed at tip.

Fl. & Fr.: August-January

Distr.: Endemic to Southern Western Ghats. Rare; along roadsides at medium altitudes. ENP, Rajamala, *KKK 31092.*

Impatiens verticillata Wight, Madras J. Lit. Sci. ser. 1, 5: 15. 1837; Hook. f., FBI 1: 452. 1874; Gamble, FPM 144. 1915; Vivek. *et al.* in Hajra *et al.*, Fl. Ind. 4: 225. 1997.

Perennial herbs, to 30 cm tall; stem reddish. Leaves opposite and whorled, to 5 x 1 cm, elliptic-lanceolate, base attenuate, apex acuminate, shallowly serrate. Racemes sub-umbellate, 3-6 flowered. Flowers rosy pink; lip shallowly cymbiform, 1 cm long, abruptly constricted to 35 mm long, filiform spur; lateral sepals ovate-lanceolate; standard petal shallowly cucullate; wings 2 lobed; terminal lobe of wing oblong, ovate, lateral ones elliptic obovate; ovary glabrous. Fruits not seen.

Fl.: October-December

Distr.: Endemic to Southern Western Ghats. Occasionally found on wet rocks along streamside at higher altitudes. ENP, Bhiman Odai, *KKK 18027.*

Impatiens wightiana Bedd., Madras J. Lit. Sci. ser. 2. 20: 67. 1859 & Ic. t. 146. 1868-1874; Hook. f., FBI 1: 467. 1875; Gamble, FPM 145. 1915; Vivek. *et al.* in Hajra *et al.*, Fl. Ind. 4: 229. 1997. **Plate 4.2.8.**

Erect suffruticose herb, 20-90 cm; stem woody. Leaves to 8 x 3 cm, elliptic-acuminate, base acute; margins serrate. Racemes axillary. Flowers white, mottled with pink; lip 8 mm long, cymbiform, acuminate; spur trumphet shaped, incurved, tip bulbous; lateral sepals 6 x 3 mm, obliquely ovate, acuminate; wings 2 lobed, unequal; standard orbicular, dorsal auricle produced into spur; ovary elliptic-acuminate. Capsule 1 x 0.5 cm, elliptic-acuminate; seeds 2 x 2 mm, ovate.

Fl. & Fr.: June-October

Distr.: Endemic to Southern Western Ghats. Rare; in exposed regions and road sides at higher altitudes. MS, Gudalar road, *KKK 18598*. ENP, Mampallam, *KKK 18064*.

Impatiens sp. 1

Small herbs; stems pink, to 30 cm. Leaves opposite or alternate, to 4 x 2.5 cm, ovate-elliptic, serrate, nerves 3 pairs, base glabrous, except on nerves; petioles 1-3 cm. Flowers small, pink; peduncles 8-9 cm, glabrous; lip 3 x 2 cm, boat shaped, acute, cuspidate; lateral sepals 2 x 1 mm, acute; standard orbicular, wings 6 x 2 mm, 2 lobed; lobes equal, dorsal auricle slender, produced into 3 mm long, cylindric spur; ovary 1 mm long, elliptic. Capsule elliptic, acuminate.

Fl. & Fr.: September-December

Distr.: Occasional; along shola borders and roadsides at medium altitudes. MS, K-4, *KKK 16659*.

Note: Allied to *I. uncinata* Wight, but differ in the shape of spur.

21. RUTACEAE

1. Medium sized trees; leaves simple ..... **Acronychia**
1. Erect shrubs, stragglers or woody climbers; leaves simple or compound **2**
2. Erect shrubs, thorny or unarmed **3**
2. Stragglers or woody climbers, armed with recurved prickles **4**
3. Thorny shrubs ; leaves simple ..... **Atalantia**
3. Unarmed shrubs; leaves pinnately 3-5 foliolate ..... **Murraya**
4. Leaves trifoliolate only; fruit a drupe ..... **Toddalia**
4. Leaves usually 5-7 foliolate (rarely 3); fruit a capsule ..... **Zanthoxylum**

ACRONYCHIA J. R. Forster & G. Forster

Charact. Gen. 53, t. 27. 1776, *nom. cons.*

Acronychia pedunculata (L.) Miq., Fl. Ind. Bot. Suppl. 532. 1861; Nair & Nayar in Hajra *et al.*, Fl. Ind. 4: 392. 1997; Matthew, Ill. FPH t. 106. 1996 & FPH 179. 1999. *Jambolifera pedunculata* L., Sp. Pl. 349. 1753. *Acronychia laurifolia* Blume, Cat. Gen. Buitens. 63. 1823; Hook. f., FBI 1: 498. 1875; Gamble, FPM 152. 1915; Fyson, FSIHS 103. t. 79. 1932. *A. barberi* Gamble, Kew Bull. 1915: 345. 1915 & Gamble, FPM 152. 1915. **Veruku Theeni, Kari Maram, *Chakki Maram, Mavurinji* (EBIS).**

Leaves opposite, to 10 x 4 cm, elliptic, base cuneate, apex obtusely acute. Panicles axillary, cymose. Flowers cream yellow; sepals 4, 1 mm long, ovate, obtuse; petals 4, 6 x 2 mm, linear-oblong, apex obtuse; stamens 8, didynamous; ovary 3-4 mm long, 4 lobed, tomentose. Drupe 1-1.2 cm across, subglobose; seeds 2-4, ovoid.

Fl. & Fr.: February-August.

Distr.: Indo-Malesia. Common; at lower and medium altitudes. MS, K-4, *KKK 16167*; Chengalar, *KKK 16522*.

ATALANTIA Correa

Ann. Mus. Natl. Hist. Nat. 6: 383. 1805, *nom. cons.*

Atalantia wightii Tanaka, Bull. Soc. Bot. France 75: 714. 1928; Nair & Nayar in Hajra *et al.*, Fl. Ind. 4: 274. 1997; Matthew, Ill. FPH t. 107. 1996 & FPH 181. 1999. *A. ceylanica* sensu Hook. f., FBI 1: 512. 1875, non (Arn.) Oliver, 1861; Gamble, FPM 160. 1915. **Kattu Elumachan, Kara (EBIS).**

Leaves to 3 x 4 cm, elliptic or elliptic-lanceolate, base obtuse or rounded, apex acute, emarginate. Racemes axillary, 1.5 cm long. Flowers creamy white, aromatic; calyx deeply 4 lobed, lobes 1.5 mm long, ovate, acute, margins ciliate; petals 4, 7 x 4 mm, elliptic-ovate; stamens 8, free; ovary 2 x 1.5 mm, ovoid. Berries 1 mm across, ellipsoid, glandular, yellowish when ripe; seeds 2-4 oblong ellipsoid.

Fl. & Fr.: April-September.

Distr.: Endemic to Western Ghats. Rare; along shola borders at lower altitudes. MS, Chengalar, *KKK 16525.*

MURRAYA J. G. Koenig *ex* Linnaeus

Mant. 2: 554, 563. 1771 *nom. cons.*

Murraya paniculata (L.) Jack., Malay. Misc. 1(5): 31. 1820; Nair & Nayar in Hajra *et al.*, Fl. Ind. 4: 352. 1997; Matthew, FPH 187. 1999. *Chalcas paniculata* L., Mant. Alt. Pl. 1: 68. 1767 *"Murraea". Murraya exotica* L., Mant. Pl. 2: 563. 1771; Hook. f., FBI 1: 502. 1875; Gamble, FPM 155. 1915; Fyson, FSIHS 102. 1932. **Paanamar, Kattu Mulla, *Palakanni, Vellakkal Thirukan* (EBIS).**

Leaves alternate; leaflets 3-9 x 1-3 cm, terminal ones bigger, elliptic-acuminate or obovate, base acute to cuneate. Panicle axillary, few flowered. Flowers white, 3.5 mm across; calyx lobes 5, 1 mm long, deltoid, acute at apex; petals 5, to 20 x 7 mm, elliptic-oblong; stamens 10, 2 seriate; disk annular; ovary elliptic, 2 x 1.5 mm. Berry 20 x 8 mm, ellipsoid, end tapering, reddish when ripe; seeds 1 or 2, ellipsoid.

Fl. & Fr.: March-December.

Distr.: Indo-Malesia and Australia. Occasional; in disturbed sholas at lower altitudes. MS, Thalachorkadavu, *KKK 16731*; K-3, *KKK 18151*; Chengalar, *KKK 17673.*

TODDALIA A. L. Jussieu

Gen. 371. 1789, *nom. cons.*

Toddalia asiatica (L.) Lam., Tabl. Encycl. 2: 116. 1797; Gamble, FPM 150. 1915; Fyson, FSIHS 100. t. 78. 1932; Nair & Nayar in Hajra *et al.*, Fl. Ind. 4: 403. 1997. *Paullinia asiatica* L., Sp. Pl. 365. 1753, *typ. cons. Toddalia aculeata* (Smith) Pers., Syn. Pl. 1: 249. 1805, *nom. superfl.*; Hook. f., FBI 1: 497. 1875. *Scopalia aculeata* Smith, Pl. Ic. Hact. ed. 1, 2: t. 34. 1790. *nom.superfl. Toddalia floribunda* Wall. Pl. As. Rar. 3: 17, t. 232. 1832. *T. asiatica* (L.) Lam. var. *floribunda* (Wall.) Kurz in J. Asiat. Soc. Bengal pt. 2, Nat. Hist. 44. 130. 1875; Gamble FPM 151. 1915; Matthew, FPH 189. 1999. *T. asiatica* (L.) Lam. var. *gracilis* Gamble, l.c. *T. asiatica* (L.) Lam. var. *obtusifolia* Gamble, *l.c.*, 151. 1915. **Kantha Mullu, Kantham Kolunthu, Kurangu Mullu (EBIS).**

Leaflets to 9 x 4.5 cm, variable, elliptic-obovate, apex obtuse or obtusely acute, entire or crenulate. Panicles axillary or terminal. Flowers creamy white; sepals 4 or 5, lobes triangular in male flowers, broadly deltoid in females; petals 4 or 5, oblong; stamens 5; ovary subglobose, gland dotted. Drupes 10 x 12 mm across, depressed-globose, orange when ripe; seeds, 6 x 4 mm, reniform, brownish-black, shiny.

Fl. & Fr.: February-June

Distr.: Indo-Malesia and Africa. Fairly common; found along shola edges at lower and medium altitudes. MS, Thalachorkadacu, *KKK 16044*. ENP, Mampallam Chola, *KKK 17555*. PAS, Vandaravu, *KKK 18194*.

Note: Matthew (1999) has segregated two varieties for this species. But here they are treated as single, following Nair & Nayar (1997).

ZANTHOXYLUM Linnaeus

Sp. Pl. 270. 1753.

Zanthoxylum tetraspermum Wight & Arn., Prodr. 1: 148. 1834; Hook. f., FBI 1: 494. 1875; Gamble, FPM 150. 1915; Fyson, FSIHS 99. 1932 *'Xanthoxylum'*; Babu, Bull. Bot. Surv. India 16(1-4): 63. 1974; Nair & Nayar in Hajra *et al.*, Fl. Ind. 4: 389. 1997. *Fagara tetrasperma* (Wight & Arn.) Engl. in Engl. & Prantl, Nat. Pflanzenfam. 3(4): 118. 1897. **Kokki Mullu (EBIS).**

Leaves alternate; petiole and rachis prickly; leaflets 5-9 x 2-5 cm, ovate to elliptic-oblong, base rounded, apex retuse, sinuate-crenate. Panicles 6-10 cm long. Flowers unisexual, 4-merous; sepals 1 mm long, ovate-deltoid, acute; petals 3 x 2 mm, ovate-elliptic, obtuse; ovary ovoid. Capsule to 8 mm across; seeds 4 mm across, suborbicular, discoid, black.

Fl. & Fr.: June-August

Distr.: South India and Sri Lanka. Rare; along stream sides at lower and medium altitudes. MS, K-4, *KKK 16545*.

22. MELIACEAE

1. Shrubs to small trees; fruit a berry or drupe **2**
1. Medium to large trees; fruit a capsule **3**
2. Small trees; young parts covered with brown fimbriate scales ..... **Aglaia**
2. Shrubs; young parts silky pubescent ..... **Cipadessa**
3. Large trees; seeds more than 10, winged ..... **Chukrasia**
3. Medium sized trees; seeds to 10, wingless ..... **Trichilia**

AGLAIA Loureiro

Fl. Cochinch.173. 1790, *nom. cons.*

Aglaia apiocarpa (Thw.) Hiern in Hook. f., FBI 1: 555. 1875; Pannell, Kew Bull. (Add. ser. XVI) 173. 1992; Jain & Bennet in Hajra *et al.*, Fl. Ind. 4: 456. 1997. *Milnea apiocarpa* Thw., Enum. Pl. Zeyl. 60. 1858. **Plate 4.3.1.**

Leaves 3-5 foliolate; leaflets opposite, to 12 x 4 cm, elliptic or oblanceolate, base cuneate, apex acuminate. Panicles 6-8 cm long, axillary, densely rusty-lepidote;

Flowers unisexual; calyx 1 mm long, 5 lobed, lobes obtuse; petals 2 x 1.5 mm, oblong, thick; anthers 5; ovary globose. Berry 2 x 1.5 cm subglobose, densely scaly.

Fl. & Fr.: March-August

Distr.: South India and Sri Lanka. Rare; in the shola borders at medium altitudes. MS, K-6, *KKK 17614*.

Note: New record to Kerala. So far reported from Tamil Nadu only (Hajra *et al.*, 1997).

CHUKRASIA A. Jussieu

Mem. Mus. Hist. Nat. 19. 251. 1830.

Chukrasia tabularis A. Juss., Mem. Mus. Hist. Nat. 19: 251, t. 22. 1830; Hiern in Hook. f., FBI 1: 568. 1875; Gamble, FPM 186. 1915; Jain & Bennet in Hajra *et al.*, Fl. Ind. 4: 481. 1997; Matthew, FPH 201. 1999. **Chandana Vembu, Vella Nangu (EBIS).**

Leaves to 30 cm long; leaflets to 5 pairs, subopposite, to 13 x 6 cm, ovate, base sharply unequal, apex acute. Panicles terminal. Flowers yellowish-white; calyx 6 mm across, campanulate; petals 5-6, 10 mm long, oblong; staminal tube cylindrical, anthers 10; ovary densely hairy. Capsule, 5 x 4 cm, 4-5-valved, glabrous.

Fl. & Fr.: January-February

Distr.: Indo-Malesia. Rare; in low altitude sholas. MS, Thalachorkadavu, *KKK 31095*.

CIPADESSA Blume

Bijdr. 162. 1825.

Cipadessa baccifera (Roth) Miq., Ann. Mus. Bot. Lugd.-Bat. 4: 6. 1868; Gamble, FPM 176. 1915; Fyson, FSIHS 103. 1932; Jain & Bennet in Hajra *et al.*, Fl. Ind. 4: 482. 1997; Matthew, FPH 201. 1999. *Melia baccifera* Roth, Nov. Pl. Sp. 215. 1821. *Cipadessa fruticosa* Blume, Bijdr. 162. 1825; Hiern in Hook. f., FBI 1: 545. 1875. **Potti (EBIS).**

Leaflets 7-13, opposite, to 8 x 4 cm, elliptic, base acute to cuneate, apex acuminate, entire or coarsely serrate. Panicles 10-12 cm long. Flowers white; calyx lobes 5, 1 mm long, obtuse; petals 3 x 1 mm, oblong; stamens 10; ovary truncate. Drupes 5 mm across, globose, reddish; seeds 3 x 1.5 mm, reniform.

Fl. & Fr.: Throughout the year

Distr.: Indo-Malesia. Common along shola borders at lower and medium altitudes. MS, Gudalar, *KKK 16086*; K-3, *KKK 16473*.

TRICHILIA P. Browne

Civ. Nat. Hist. Jamaica 278. 1756, *typ. cons.*

Trichilia connaroides (Wight & Arn.) Bentv., Acta Bot. Neerl. 11: 13. 1962; Jain & Bennet in Hajra *et al.*, Fl. Ind. 4: 515. 1997; Matthew, FPH 203. 1999. *Zanthoxylum connaroides* Wight & Arn., Prodr. 148. 1834, "*Zanthoxylon*". *Walsura trijuga* (Sims) Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 44: 148. 1875. *Heynea trijuga* sensu Roxb. *ex* Sims, Bot. Mag. 41: t. 1738. 1815; Hiern in Hook. f., FBI 1: 565. 1872; Gamble, FPM 183. 1915; Fyson, FSIHS 104. t. 80. 1932. **Karimaram, Pili Maram, Dedumbu, *Kozhipenali* (EBIS).**

Leaves crowded at tip, 20-30 cm long; leaflets 7-9, to 10 x 4 cm, ovate or ovate-oblong, base oblique, apex acuminate. Panicle corymbose, to 25 cm long. Flowers pale cream; calyx 5 lobed, pubescent; petals 5, 3 x 1 mm, oblong; anthers 10; ovary globose. Capsule 1.3 cm across, globose, red; seeds globose.

Fl. & Fr.: April-October.

Distr.: Indo-Malesia. Occasionally found along shola borders at lower altitudes. MS, Puthur, *KKK 16716*; Thalachorkadavu, *KKK 17670.*

23. ICACINACEAE

1. Petals connate into a tube; flowers in axillary cymes ..... **Gomphandra**
1. Petals free; flowers in terminal panicles **4**
2. Petals densely hairy within; filaments adnate to corolla ..... **Nothapodytes**
2. Petals glabrous; filaments free ..... **Apodytes**

APODYTES E. Meyer *ex* Arnott

Hooker's J. Bot. 3: 155. 1840.

Apodytes dimidiata E. Meyer *ex* Arn., Hook. J. Bot. 3: 155. 1840; Matthew, Suppl. Ill. FPH t. 967. 1998 & FPH 207. 1999; Mathur in Singh *et al.,* Fl. Ind. 5: 18. 2000. *Apodytes beddomei* Mast. in Hook. f., FBI 1: 588. 1875; Gamble, FPM 195. 1915. *A. benthamiana* Wight, Ic. t. 1153. 1846; Mast. in Hook. f. FBI 1: 588. 1875.

Trees, to 20 m higher. Leaves to 10 x 4 cm, oblong. Panicles 3-5 cm across; calyx cupular, 5-toothed; petals 5 x 1.5 mm, oblong, acute; stamens 5, filaments broadened at base; ovary oblique, gibbous at base, 1-celled; stigma oblique. Drupe ellipsoid, 1-seeded.

Fl. & Fr.: March-May

Distr.: Africa, eastward to Asia and Australia. Rare; in lower and medium altitude sholas. ENP, Umayamala, *KKK 17539.*

GOMPHANDRA Wallich *ex* Lindley

Nat. Syst. ed. 2, 439. 1876.

Gomphandra coriacea Wight, Ill. 1: 103. 1840; Bedd., Ic. t. 61. 1868-1874; Gamble, FPM 195. 1915; Fyson, FSIHS 107. t. 82. 1932; Matthew, Ill. FPH t. 114. 1996 & FPH 209. 1999; Mathur in Singh *et al.,* Fl. Ind. 5: 22. 2000. *G. polymorpha* Wight, Ill. 1: 103. 1840, p.p. & Ic. tt. 953, 954. 1843; Mast. in Hook. f., FBI 1: 586. 1875. **Chotta, Shotta, *Chakki Maram* (EBIS) Plate 4.3.2.**

Trees to10 m tall; branchlets brown. Leaves to 12 x 5 cm, elliptic, base acute to rounded, apex abruptly acuminate. Cymes peduncled. Flowers 5-9 together; calyx cup truncate; corolla 4 mm long; lobes acute; pistillode in male flowers pubescent. Drupe 15 x 8 mm, oblong, terete.

Fl. & Fr.: August-November

Distr.: Endemic to Western Ghats. Common; in lower and medium altitude sholas. MS, K-4, *KKK 16776*; K-5, *KKK 16501.* VMS, *KKK 31080.*

NOTHAPODYTES Blume

Mus. Bot. Lugd.-Bat. 1: 248. 1850.

Nothapodytes nimmoniana (Grah.) Mabber. in Manilal, Bot. Hist. Hort. Malab. 88. 1980; Matthew, Ill. FPH t. 115. 1996 & FPH 209. 1999; Mathur in Singh *et al.*, Fl. Ind. 5: 31. 2000. *Premna nimmoniana* Grah., Cat. Pl. Bombay 155. 1839. *Stemonurus foetidus* Wight, Ic. t. 955. 1845. *Mappia foetida* (Wight) Miers, Ann. Mag. Nat. Hist. (Ser. 2) 9: 395. 1852; Mast. in Hook. f., FBI 1: 589. 1875; Gamble, FPM 196. 1915; Fyson, FSIHS 106. t. 81. 1932. *Nothapodytes foetida* (Wight) Sleumer, Notizbl. Bot. Gart. Berlin-Dahlem 15: 247. 1940 & Blumea 17: 232. 1969. **Pulippacha.**

Small trees. Leaves to 17 x 9 cm, broadly ovate or elliptic, apex acuminate, base unequal. Flowers creamy yellow, foul smelling; calyx cupular, 1 mm long, 5-lobed; petals connate, apex inflexed; stamens 5, filaments as long as petals; staminodes 5, hairy; ovary 1-celled, hairy. Drupe 8 x 4 mm, oblong, reddish-brown, glabrous.

Fl. & Fr.: November-March

Distr.: Indo-Malesia and China. Occasionally found in the ecotones of lower and medium altitude sholas. MS, Idlimottai, *KKK 17595.* ENP, Mampallam Chola, *KKK 17554*; Amara Chola, *KKK 18071.* PUS, *KKK 18572.*

Note: Mathur (2000) has treated *Mappia oblonga, M. wightiana, M. tomentosa* and *M. ovata* as synonymous to this species.

24. AQUIFOLIACEAE

ILEX Linnaeus

Sp. Pl. 125. 1753

1. Leaf margins denticulate ..... **I. denticulata**
1. Leaf margins entire **2**
2. Large trees; flowers 6 merous ..... **I. malabarica**
2. Small or medium sized trees; flowers 5 merous **3**
3. Leaves mucronate or emarginate at apex; umbellules sessile ..... **I. walkeri**
3. Leaves acuminate at apex; umbellules subsessile ..... **I. wightiana**

Ilex denticulata Wall. *ex* Wight, Ill. Ind. Bot. t. 149. 1850; Hook. f., FBI 1: 600. 1875; Gamble, FPM 200. 1915; Fyson, FSIHS 108. t. 83. 1932; Matthew, FPH 211. 1999; Basu in Singh *et al.*, Fl. Ind. 5: 53. 2000. **Noola.**

Medium sized trees. Leaves 3.5-7 x 2-4 cm, elliptic, apex acuminate, denticulate-serrate. Flowers dioecious, tetramerous, 8-10 together; sepals ovate; petals 4 x 2 mm, ovate, obtuse; filaments 2 mm long; ovary 4 celled, free. Drupe 8 mm across, glabrous, red when ripe.

Fl. & Fr.: March-May

Distr.: Peninsular India, Sri Lanka and China. Common; along shola borders at higher altitudes. MS, Idlimottai, *KKK 16029*; *KKK 17601*; *KKK 18165* & *KKK 18175.*

Ilex malabarica Bedd., Fl. Sylv. t. 143. 1871; Hook. f., FBI 1: 600. 1875; Gamble, FPM 200. 1915; Basu in Singh *et al.*, Fl. Ind. 5: 63. 2000. **Aattu Njaval.**

Large trees. Leaves 3-10 x 1-2.5 cm, lanceolate, acute at both ends. Flowers in shortly peduncled cymes or umbels; sepals 1.5 x 1.5 mm, ovate, acute, ciliate; petals 3 x 2 mm, oblong, obtuse; anthers 1.5 x 1 mm, sagittate at base; ovary 4 celled; stigma stipitate, 3-4 furcated. Drupe globose.

Fl. & Fr.: March-May.

Distr.: Endemic to Western Ghats. Common; along streamside at lower altitudes. MS, Thalachorkadavu, *KKK 16033* & *KKK 18150.*

Note: The present collection is a new record to Kerala.

Ilex walkeri Wight & Gard. *ex* Thw., Enum Pl. Zeyl. 184. 1860; Hook. f., FBI 1: 600. 1875, p.p. Basu in Singh *et al.*, Fl. Ind. 5: 72. 2000. *I. thwaitesii* Loes. *ex* Gamble, Gamble, FPM 200. 1915. **Noola (EBIS). Plate 6.5.3.**

Medium sized trees. Leaves 3-6 x 1.5-3 cm, elliptic-obovate, apex mucronate or emarginate, pale beneath. Flowers in sessile umbellules; pedicel 1 cm; corolla rotate; ovary 5 celled. Drupe 5 mm across, red when ripe.

Fl. & Fr.: March-May.

Distr.: India and Sri Lanka. Common along shola borders and streamside at higher altitudes. MS, Methappu, *KKK 16013*; Idlimottai, *KKK 17632.* ENP, Estate border, *KKK 17655.*

Ilex wightiana Wall. *ex* Wight, Ic. t. 1216. 1848, var. **peninsularis** Hook. f., FBI 1: 603. 1875; Matthew, Ill. FPH t. 118. 1996 & FPH 211. 1999; Basu in Singh *et al.*, Fl. Ind. 5: 73. 2000. **Aattu Njaval, *Parasal* (EBIS).**

Small trees. Leaves 3-6 x 1.5-3 cm, elliptic, base narrowed, apex acuminate, midrib slightly impressed, highly coriaceous. Flowers 5 mm across, in sub-sessile umbellules; sepals ovate, acute, ciliate; petals 2 x 1 mm, oblong; ovary 4 celled. Drupe red.

Fl. & Fr.: March-May.

Distr.: Peninsular India and Sri Lanka. Common along shola borders and streamside at all altitudes. MS, K-4, *KKK 16486.* ENP, Mampallam Chola, *KKK 17556*; Anamudi, *KKK 18537.*

25. CELASTRACEAE

1. Large trees; leaves alternate ..... **Bhesa**
1. Small trees; leaves usually opposite **2**
2. Flowers in axillary clusters ..... **Microtropis**
2. Flowers in cymose panicles ..... **Euonymus**

BHESA Hamilton *ex* Arnott

Edinburgh New Philos. J. 16: 315. 1834.

Bhesa indica (Bedd.) Ding Hou, Blumea Suppl. 4: 152. 1958; Ramamurthy in Singh *et al.*, Fl. Ind. 5: 77. 2000. *Trochisandra indica* Bedd., Fl. Sylv. t. 120. 1872. *Kurrimia bipartita* Lawson in Hook. f., FBI 1: 622. 1875. *K. indica* (Bedd.) Gamble, FPM 207. 1918. *K. paniculata* sensu Lawson in Hook. f., FBI 1: 622. 1875 p.p. **Penali (EBIS) Plate 4.3.3.**

Leaves to 16 x 8 cm, elliptic obtuse, coriaceous, nerves parallel. Panicle rosy red, axillary, on terminal branches; calyx 5 lobed, free; petals 3 x 1 mm, oblong, deflexed; stamens 5, filaments united at base; ovary 2 celled. Capsule brown, leathery, 2 valved; one seed in each lobe; one lobe frequently abortive.

Fl. & Fr.: March-April.

Distr.: Indo-Malesia. Common in lower and medium altitude sholas. MS, K-4.5, *KKK 18149.*

EUONYMUS Linnaeus

Sp. Pl. 197. 1753, *orth. cons.*

Euonymus crenulatus Wall. *ex* Wight & Arn., Prodr. 161. 1834; Wight, Ic. t. 973. 1845; Lawson in Hook. f., FBI 1: 608. 1875; Gamble, FPM 203. 1918; Fyson, FSIHS 110. t. 85. 1932; Matthew, Ill. FPH t. 123. 1996 & FPH 219; Ramamurthy in Singh *et al.*, Fl. Ind. 5: 97. 2000.

Leaves often 3 at a node, to 8 x 4.5 cm, elliptic, rarely ovate, acute at both ends, coriaceous. Flowers 3-7 in a panicle; peduncles often in pairs in the upper leaf axils; sepals rounded; petals 5 x 5 mm, obovate, purplish brown; stamens 5; ovary sunk in the fleshy disc; stigma 5 lobed. Capsule 5 celled, valves slightly obcordate.

Fl. & Fr.: February-October.

Distr.: Endemic to Southern Western Ghats. Occasional; along shola borders at higher altitudes. ENP, Umayamala, *KKK 18008*; Anamudi slope, *KKK 18545.*

MICROTROPIS Wallich *ex* Meisner

Gen. 1: 68. 1837, *nom cons.*

Microtropis ramiflora Wight, Ic. t. 977. 1845; Lawson in Hook. f., FBI 1: 613. 1875; Gamble, FPM 207. 1918; Fyson, FSIHS 112. t. 86. 1932; Matthew, Ill. FPH t. 127. 1996 & FPH 221. 1999; Ramamurthy in Singh *et al.*, Fl. Ind. 5: 131. 2000. **Plate 4.4.1.**

Leaves 8 x 5 mm, broadly elliptic or obovate, rounded at both ends, coriaceous, margins revolute. Flowers cream, 5 mm across; sepals 5, 4 x 3 mm, obovate, margins scarious; petals 3.5 x 2.5 mm, obovate; stamens 5; ovary free, ovoid. Capsule 20 x 8 cm, oblong, beaked, 2 valved, brown; seeds 15 x 5 mm, oblong.

Fl. & Fr.: February-October.

Distr.: Peninsular India and Sri Lanka. Common; found along shola borders at higher altitudes. MS, Idlimottai, *KKK 17588.* ENP, Umaya mala, *KKK 17534*; Bhiman odai, *KKK 18037.* VMS, *KKK 31135.*

26. RHAMNACEAE

1. Leaves alternate; 3-5 ribbed from base ..... **Ziziphus**
1. Leaves alternate or subopposite; penninerved **2**
2. Unarmed shrubs; flowers in axillary fascicles ..... **Rhamnus**
2. Straggling shrubs with large recurved thorns; flowers in spicate panicles ..... **Sageretia**

RHAMNUS Linnaeus

Sp. Pl. 193. 1753

Rhamnus wightii Wight & Arn., Prodr. 1: 164. 1834; Wight, Ic. t. 159. 1839; Lawson in Hook. f. FBI 1: 639. 1875; Gamble, FPM 222. 1915; Fyson, FSIHS 120. t. 92. 1932; Matthew, Ill. FPH t. 131. 1996 & FPH 228. 1999; Bhandari & Bhansali in Singh *et al.*, Fl. Ind. 5: 197. 2000. **Kokkuvalli.**

Leaves to 10 x 4 cm, elliptic or elliptic-oblong, base acute or rounded, apex acuminate, serrate. Flowers 3-5 mm across; sepals 5, 3 mm across, triangular; petals 5, flat; stamens 5; ovary globose, 3 celled. Drupe 6-7 mm across, globose, beaked, purple; pyrenes 2-4; seeds 5 x 3 mm, obovoid, brown.

Fl. & Fr.: August-December.

Distr.: Peninsular India, Sri Lanka and Nepal. Rare; found along shola margins at higher altitudes. MS, Methappu, *KKK 17699.*

Note: The present collection is a new record to Kerala.

SAGERETIA A. T. Brongniart

Ann. Sci. Nat. 10: 359. 1827.

Sageretia hamosa (Wall.) Brongn., Mem. Fam. Rham. 53. 1826 & in Ann. Sci. Nat. Bot. Ser. 1, 10: 360. 1827; Lawson in Hook. f., FBI 1: 641. 1875; Gamble, FPM 223. 1918; Nayar, Thoth. & Sanj., Fl. Ind. Fasc. 20: 63. 1990; Matthew, Ill. FPH t. 132. 1996 & FPH 228. 1999; Bhandari & Bhansali in Singh *et al.*, Fl. Ind. 5: 200. 2000. **Kokki Mullu.**

Leaves to 12 x 6 cm, elliptic-oblong, base rounded, apex bluntly acuminate, serrulate. Panicle to 10 x 6 cm, pubescent. Flowers 2.5 mm across, greenish-white, sessile; sepals 5, 2 x 1 mm, ovate, connate at base; petals 5, 1 x 0.5 mm, ovate, concave and clawed, stamens 5, free; ovary 3-celled. Drupe 6 mm across, globose.

Fl. & Fr.: August-January.

Distr.: India, Sri Lanka, Nepal and Taiwan. Occasional; in disturbed low altitude shola regions. MS, Thalachorkadavu, *KKK 31096.*

ZIZIPHUS P. Miller

Gard. Dict. Abr. ed. 4. 1754.

Zizyphus rugosa Lam., Encycl. 3: 319. 1789; Lawson in Hook. f., FBI 1: 636. 1875; Gamble, FPM 221. 1918; Fyson, FSIHS 117. t. 90. 1932; Nayar, Thoth. & Sanj., Fl. Ind. Fasc. 20: 108. 1990; Matthew, FPH 232. 1999; Bhandari & Bhansali in Singh *et al.*, Fl. Ind. 5: 240. 2000. **Kotta Mullu (EBIS).**

Leaves to 10 x 6 cm, elliptic, closely serrate, densely brownish tomentose below. Inflorescence a cymose panicle. Flowers 5 mm across, greenish yellow; sepals 5, 2.5 x 1.5 mm, triangular, tomentose; petals absent; anthers 2 mm long; ovary 1 mm long, ovoid, tomentose. Drupe 7 mm across, ovoid, glabrous.

Fl. & Fr.: March-May

Distr.: South Asia. Occasional; along shola borders at lower altitudes. MS, Thalachorkadavu, *KKK 17663.*

27. VITACEAE

1. Flowers pentamerous ..... **Parthenocissus**
1. Flowers tetramerous **2**
2. Stem tuberculate; flowers polygamous; seeds deeply furrowed ..... **Tetrastigma**
2. Stem not tuberculate; flowers bisexual; seeds deeply pitted ..... **Cayratia**

CAYRATIA A. L. Jussieu

Dict. Sci. Nat.10: 103. 1818, *nom. cons.*

Cayratia pedata (Lam.) Juss. *ex* Gagnep. in Lecomte, Notul. Syst. (Paris) 1: 346. 1911; Gamble, FPM 236. 1915; Fyson, FSIHS 125. t. 97. 1932; Matthew, FPH 237. 1999; Shetty & Singh in Singh *et al.*, Fl. Ind. 5: 271. 2000. *Cissus pedata* Lam., Encycl. 1: 31. 1783. *Vitis pedata* (Lam.) Wall. *ex* Wight, Cat. 26. 1833 & Wight & Arn., Prodr. 128. 1834; Lawson in Hook. f., FBI 1: 661. 1875.

Large vines; tendrils leaf opposed. Leaves pedately 5-7 foliolate; leaflets to 18 x 8 cm, elliptic-lanceolate, base oblique rounded, apex acuminate, margin crenate. Corymbs axillary; calyx cupular, obscurely 4 lobed; petals hood shaped; ovary 2 celled. Berry globose, 2 seeded, beaked; seeds 6 x 6 mm, rugose.

Fl. & Fr.: December-February.

Distr.: Indo-Malesia. Common along steam sides and shola borders at lower altitudes. MS, Chengalar, *KKK 18094.*

PARTHENOCISSUS Planchon

in Alph. de Candolle *et* A. C. de Candolle, Monogr. Phan. 5: 447. 1887, *nom. cons.*

Parthenocissus semicordata (Wall.) Planch. in DC. Monogr. Phan. 5: 451. 1887; Shetty & Singh in Singh *et al.*, Fl. Ind. 5: 302. 2000. *Vitis semicordata* Wall. in Roxb., Fl. Ind. 2: 481. 1824. *Ampelopsis himalayana* Royle, Ill. Himal. Bot. 149. 1835. *V. himalayana* (Royle) Brandis var. *semicordata* (Wall.) Lawson in Hook. f., FBI 1: 656. 1875. *Parthenocissus himalayana* (Royle) Planch. in DC. Monogr. Phan. 5: 450. 1887. *P. neilgherriensis* (Wight) Planch. in DC., Monogr. Phan. 5: 2. 1887; Gamble, FPM 231. 1918; Fyson, FSIHS 123. t. 96. 1932; Matthew, Ill. FPH t. 137. 1996 & FPH 240.1999. *Vitis neilgherriensis* Wight, Ic. t. 965. 1845. *V. anamalayana* Bedd. in Trans. Linn. Soc. London 25: 213. 1865-1866; Lawson in Hook. f., FBI 1: 656. 1875. **Plate 4.3.4.**

Lianas; bark thick furrowed; tendrils branched, with sticky tips. Leaves trifoliolate, subcoriaceous, middle leaflet obovate, lateral leaflets to 15 x 10 cm, obliquely ovate-acuminate, cuspidate-serrate. Cymes dichotomous, to 15 cm, ending in umbellules. Flowers bisexual, 4 mm wide; calyx tube cupular; petals to 3 x 1 mm, oblong, yellowish, fleshy, apically bifid; ovary ovoid, 2 celled. Berry 1-2 seeded.

Fl. & Fr.: August-September.

Distr.: India. Common in lower altitude shola regions. MS, K-4, *KKK 16534.*

TETRASTIGMA (Miquel) Planchon

in Alph. de Candolle *et* A. C. de Candolle, Monogr. Phan. 5: 320, 423. 1887

Tetrastigma nilagiricum (Miq.) B. V. Shetty, Kew Bull. 44: 477. 1989; Matthew, Ill. FPH t. 138. 1996 & FPH 241. 1999; Shetty & Singh in Singh *et al.*, Fl. Ind. 5: 315.

2000. *Cissus nilagirica* Miq., Linnaea 26: 221. 1854. *Vitis muricata* sensu Wight & Arn., Prodr. 128. 1834, non Wall., 1832; Wight, Ic, t. 740. 1844. *V. lanceolaria* sensu Lawson in Hook. f., FBI 1: 660. 1875 *p.p.*, non Wall., 1932. *Tetrastigma muricatum* sensu Gamble, FPM 229. 1918; Fyson, FSIHS 123. t. 95. 1932. **Pashala Kodi (EBIS).**

Lianas. Leaves trifoliolate, rarely 4, subcoriaceous; leaflets to 5 x 3 cm, obovate, base rounded, apex acute, margin distantly serrate. Cymes dichotomously corymbose; calyx cupular, 1 mm wide; petals 2 x 1 mm, lanceolate; disk persistent; ovary 2 celled. Berry to 1 cm across, globose, 2-4 seeded; seeds 7 mm across, pyriform.

Fl. & Fr.: July-August.

Distr.: South India and Sri Lanka. Common in the ecotones of lower altitude sholas. MS, Thalachorkadavu, *KKK 16037*; Conical patch, *KKK 16478.*

Note: The present collection is a new record to Kerala.

28. STAPHYLEACEAE

TURPINIA Ventenat

Mem. Cl. Sci. Math. Inst. Natl. France 1807(1): 3. 1807, *nom. cons.*

Turpinia cochinchinensis (Lour.) Merr., J. Arnold Arbor. 19: 43. 1938; Pant in Singh *et al.*, Fl. Ind. 5: 415. 2000. *Triceros cochinchinensis* Lour., Fl. Cochinch. 184. 1790. *Turpinia nepalensis* Wall. *ex* Wight & Arn., Prodr. 156. 1834; Wight, Ic. t. 972. 1845; Gamble, FPM 241. 1918; Fyson, FSIHS 126. t. 98. 1932; Matthew, Ill. FPH t. 144. 1996 & FPH 258. 1999. *T. pomifera* sensu Hiern in Hook. f., FBI 1: 698. 1895 p.p., non (Roxb.) DC., 1825. **Kanali (EBIS).**

Medium trees. Leaves to 20 cm; leaflets 3-5, to 10 x 5 cm, elliptic, apex acuminate, crenate-serrate. Panicles to 10 cm long. Flowers to 5 mm across, shortly pedicelled; sepals 1.5 mm long, ovate, obtuse; petals 3 mm long, ovate, acute. Berry globose, glabrous, with a knot at apex

Fl. & Fr.: February-April

Distr.: India, China and Sri Lanka. Common; along shola borders at all altitudes. MS, K-4, *KKK 16126*; K-5.5, *KKK 16156*; Conical patch, *KKK 16477*; Methappu, *KKK 16798.*

29. SAPINDACEAE

1. Shrubs to small trees; leaves simple ..... **Dodonaea**
1. Stragglers; leaves 3-foliolate ..... **Allophylus**

ALLOPHYLUS Linnaeus

Sp. Pl. 348. 1753

Allophylus concanicus Radlk., Sitzungsber. Math.-Phys. Cl. Koenigl. Bayer. Akad. Wiss. Muenchen 20: 230. 1890, var. **lanceolatus** Gamble, FPM 246. 1918; Mukh., Indian For. 496. 1972 & J. Econ. Tax. Bot. 1: 79. 1980; Matthew, Ill. FPH t. 140. 1996 & FPH 246. 1999.

Leaflets to 13 x 6 cm, lanceolate or oblanceolate, apex acuminate, serrate towards the apex; midrib pubescent; domatia hairy. Raceme branched, hispid. Flowers solitary or paired, 2 mm across; sepals orbicular, ciliate; petals 5 mm across, densely white hairy within; filaments hairy, reddish; disk lobes 4, globular. Fruits not seen.

Fl.: October-December

Distr.: Endemic to Southern Western Ghats. Occasionally found in lower altitude shola forest regions. MS, K-5, *KKK 31097.*

Note: New record to Kerala. Only the variety *concanicus* was reported from Kerala before, while *lanceolatus*, was considered endemic to Tamil Nadu (Pant, 2000).

DODONAEA P. Miller

Gard. Dict. Abr. ed. 4. 28. 1754.

Dodonaea angustifolia L. f., Suppl. Pl. 218. 1782. *D. viscosa* Jacq. var. *angustifolia* (L. f.) Benth., Fl. Austral 1: 476. 1863; Matthew, FPH 249. 1999. *D. viscosa* (L.) Jacq., Enum. Pl. Carib. 19. 1760 *p.p.*; Hiern in Hook. f., FBI 1: 697. 1875; Gamble, FPM 253. 1918; Fyson, FSIHS 128. t. 100. 1932; Mukherjee, J. Econ. Tax. Bot. 1: 80. 1980; Leenh., Blumea 28(2): 285. 1983. *Ptelea viscosa* L., Sp. Pl. 118. 1753. **Vrali (EBIS) Plate 5.3.1.**

Branchlets gland dotted, sap sticky. Leaves to 8 x 1.5 cm, elliptic-lanceolate, base attenuate, apex acute. Racemes 3-7 cm. Flowers polygamous; sepals 4, 3 x 2 mm, ovate, ciliate; petals absent; stamens 8, 2 x1 mm; pistillode minute; ovary globose, 2-4 celled. Capsule 1.5 x 2 cm, 3-4 winged; seeds 4 x 3 mm, discoid.

Fl. & Fr.: July-August

Distr.: Pantropical. Common along shola borders and grassland ecotones at lower altitudes. MS, K-6, *KKK 16474.*

30. SABIACEAE

MELIOSMA Blume

Cat. Buitensorg 10. 1823.

1. Leaves simple; panicles terminal and axillary 2
1. Leaves imparipinnate; panicles terminal ..... **M. pinnata** subsp. **barbulata**
2. Leaves, petioles and peduncles tomentose ..... **M. simplicifolia** subsp. **pungens**
2. Leaves, petioles and peduncles glabrous ..... **M. simplicifolia** subsp. **simplicifolia**

Meliosma pinnata (Roxb.) Maxim. Bull. Acad. Sci. St. Pet. Ser. 3. 12; 64 in Obs. 1867. subsp. **barbulata** (Cufod.) Beus. in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 3: 384. 1981; Nayar *et al.*, Fl. Ind. Fasc. 20: 120. 1990; Majumdar in Singh *et al.*, Fl. Ind. 5: 423. 2000. *Meliosma rhoifolia* Maxim., subsp. *barbulata* Cufod., Oest. Bot. Zeit. 88. 254. 1939. *Millingtonia pinnata* Roxb., Fl. Ind. 1: 103. 1820. *Millingtonia arnottiana* Wight, Ill. t. 53. 1840. *Meliosma arnottiana* (Wight) Walp., Repert. 1: 423. 1842; Hook. f., FBI 2: 6. 1876; Gamble, FPM 256. 1918; Fyson, FSIHS. 131. t. 102. 1932. **Thakiri (EBIS) Plate 4.3.5.**

Medium sized trees; branchlets thickly tomentose. Leaves 10-16 foliolate; leaflets opposite, to 13 x 3.5 cm, elliptic, apex acuminate, densely hairy. Panicles 30 cm across, densely tomentose. Flowers 4 mm across, sessile; sepals ovate, hairy; petals orbicular, pale yellow; ovary densely hairy. Drupe 7 mm across, globose.

Fl. & Fr.: May-August

Distr.: South East Asia. Common; in low altitude disturbed sholas. MS, K-3, *KKK 31003.*

Meliosma simplicifolia (Roxb.) Walp. Rep. 1: 103. 1842 subsp. **pungens** (Wall. *ex* Wight & Arn.) Beus., Blumea 19: 466. 1971; Matthew, FPH 260. 1999; Majumdar in Singh *et al.,* Fl. Ind. 5: 427. 2000. *Millingtonia pungens* Wall. *ex* Wight & Arn., Edinb. New Phil. J. 15: 178. 1833; Wight, Ic. t. 964/3. 1845. *Meliosma pungens* (Wall. *ex* Wight & Arn.) Walp. Rep. 1: 423. 1842; Hook. f., FBI 2: 4. 1876. *M. wightii* Planch. *ex* Brandis, For. Fl. 116. 1874; Hook. f., FBI 2: 4. 1876; Gamble, FPM 256. 1918; Fyson, FSIHS 130. t. 101. 1932.

Medium sized trees. Leaves to 16 x 6 cm, elliptic-lanceolate, apex acuminate. Flowers cream coloured; sepals 1 mm across, ovate, ciliate; petals 0.5 mm across, orbicular; stamens 2 fertile; ovary 0.5 mm, globose; style short. Fruit not seen.

Fl.: April.

Distr.: Indo-Malesia and China. Occasional found along shola borders at higher altitudes. ENP, Anamalai route, *KKK 17637.*

Meliosma simplicifolia (Roxb.) Walp. Rep. 1: 103. 1842, subsp. **simplicifolia**: Hook. f., FBI 2: 5. 1876; Gamble, FPM 256. 1918; Nayar, Thoth. & Sanj., Fl. Ind. Fasc. 20: 122. 1990; Majumdar in Singh *et al.,* Fl. Ind. 5: 427. 2000. *Millingtonia simplicifolia* Roxb., Pl. Corom. 3: 50. t. 254. 1820, *p.p.* **Kolakkatta, *Chengoini* (EBIS) Plate 4.3.6.**

Medium sized trees. Leaves to 20 x 8 cm, oblanceolate, apex acute, scabrid. Panicles to 20 x 12 cm, puberulous. Flowers white, 2 mm across; sepals ovate, ciliate; petals 1 mm across, orbicular; anthers globose; 3 sessile deformed; disk annular; ovary sessile, conical, 2 celled. Drupe 5 mm across, sub globose.

Fl. & Fr.: February-August.

Distr.: Indo-Malesia and China. Common along shola borders at lower altitudes. MS, Puthur, *KKK 16140*; Thalachorkadavu, *KKK 16567.*

31. ANACARDIACEAE

NOTHOPEGIA Blume

Mus. Bot. 1: 203. 1850, *nom. cons.*

1. Leaves lanceolate, acuminate; nerves 20 pairs; petiole slender ..... **N. beddomei**
1. Leaves obovate, bluntly apiculate; nerves to 15 pairs; petiole stout ..... **N. monadelpha**

Nothopegia beddomei Gamble, FPM 265. 1918 & in Kew Bull. 1918. 227. 1918; Chandra & Mukherjee in Singh *et al.,* Fl. Ind. 5: 473. 2000. *N. colebrookeana* (Wight) Blume, Mus. Bot. Lugd. Bot. 1: 203. 1850; Hook. f., FBI 2: 40. 1876, *p.p. Pegia colebrookeana* Wight, Ic. t. 230. 1839. p.p. **Era (EBIS).**

Small trees. Leaves to 12 x 4 cm; petiole 1 cm long. Racemes to 5 cm long, often paniculate; calyx 4 lobed; petals 4, 1 x 0.5 mm, oblong, glabrous; stamens 4, glabrous. Drupes 10 mm across, ovoid, deep purple.

Fl. & Fr.: March-July

Distr.: Southern Western Ghats of India & Sri Lanka. Occasional; in lower altitude shola regions. MS, K-3, *KKK 31099.*

Nothopegia monadelpha (Roxb.) Forman, Kew Bull. 53. 754. 1998; Chandra & Mukherjee in Singh *et al.,* Fl. Ind. 5: 474. 2000. *Blackburnia monadelpha* Roxb. Fl. Ind. 1: 435. 1820. *N. colebrookeana* (Wight) Blume, Mus. Bot. Lugd. Bot. 1: 203. 1850; Hook. f., FBI 2: 40. 1876, *p.p.*; Gamble, FPM 265. 1918; Matthew, Ill. FPH t. 145. 1996 & FPH 265. 1999. *Pegia colebrookeana* Wight, Ic. t. 230. 1839. *p.p.* **Era (EBIS).**

Small trees; branchlets dark, lenticellate. Leaves to 20 x 6 cm, base acute, pale white beneath, coriaceous; petiole 1 cm long. Racemes axillary, 3-4 cm long. Flowers cream; calyx 4 lobed, densely pubescent; petals 4, 1 x 0.5 mm, oblong, reflexed; stamens 4, glabrous; disc 0.5 mm across. Drupes 10 mm across, ovoid.

Fl. & Fr.: December-January

Distr.: Western Ghats of India & Sri Lanka. Occasional; in lower altitude shola regions. MS, K-4, *KKK 31098.*

32. CONNARACEAE

CONNARUS Linnaeus

Sp. Pl. 675. 1753

Connarus wightii Hook. f., FBI 2: 51. 1876; Gamble, FPM 27. 1918; Mondal in Singh *et al.*, Fl. Ind. 5: 532. 2000. *C. ritchei* Hook. f., FBI 2: 51. 1876; Gamble, FPM 273. 1918. **Karinkodi (EBIS).**

Large climbing shrubs. Leaves 3 foliolate; leaflets 15 x 5 cm, elliptic-oblong, base rounded, apex abruptly acuminate. Panicles pyramidal, axillary on old branches, ferrugineous hairy. Flowers subsessile, few-together; sepals 4 x 1 mm, elliptic, hispid; petals 4 x 1.5 mm, oblanceolate, puberulus outside; stamens united at base, filaments unequal; ovary densely hairy. Fruits not seen.

Fl.: December-January

Distr.: Endemic to Western Ghats. Occasional; in lower and medium altitude sholas. MS, K-5, *KKK 31100.*

33. FABACEAE

Key to the subfamilies

1. Flowers irregular 2
1. Flowers regular ..... **Mimosoideae**
2. Petals papilionaceous; stamens united ..... **Faboideae**
2. Petals not papilionaceous; stamens free ..... **Caesalpinioideae**

Subfamily: **FABOIDEAE**

1. Anthers dimorphic ..... **Crotalaria**
1. Anthers uniform 2
2. Stamens 9+1; vexillary stamen always free 3
2. Stamens monadelphous or isodiadelphous (9, 10 or 5 + 5) 15
3. Plants covered with laterally adnated hairs ..... **Indigofera**
3. Plants not covered with laterally adnated hairs 4
4. Leaves more than 3-foliolate (rarely 3); lianas ..... **Derris**
4. Leaves 1-3-foliolate; not lianas 5
5. Pods turgid. ..... **Flemingia**
5. Pods not turgid 6
6. Pods twisted so as the joints face each other ..... **Uraria**
6. Pods not as above 7
7. Leaves 1-foliolate ..... **Desmodium**
7. Leaves 3-foliolate 8
8. Leaves digitately 3-foliolate; trailing herbs 9
8. Leaves pinnately 3-foliolate; climbers or erect shrubs 10
9. Flowers solitary or 2-3 together on axillary peduncles; corolla blue ..... **Parochetus**
9. Flowers in terminal, capitate, compact racemes; corolla pinkish ..... **Leptodesmia**
10. Keel petal twisted; stigma oblique ..... **Vigna**
10. Keel petal not twisted; stigma terminal 11
11. Calyx truncate; lobes obscure ..... **Dumasia**
11. Calyx not as above 12
12. Pods 1 or 2-seeded ..... **Rhynchosia**
12. Pods few, many-seeded 13
13. Climbing shrubs; pods falcate ..... **Lablab**
13. Twining herbs; pods straight 14
14. Pods membranous, not depressed between seeds ..... **Shuteria**
14. Pods coriaceous, depressed between seeds ..... **Cajanus**
15. Standard smaller than wings; stem armed ..... **Erythrina**
15. Standard equal to or larger than wings; stems unarmed 16
16. Stamens isodiadelphous ..... **Smithia**
16. Stamens monadelphous 17
17. Flowers white, densely packed; pods deflexed, depressed between seeds ..... **Neonotonia**
17. Flowers pink; loosely packed; pods erect continuous ..... **Canavalia**

CAJANUS A. P. de Candolle

Cat. Hort. Monspel. 85. 1813. *nom. cons.*

Cajanus rugosus (Wight & Arn.) Measen, Agri. Univ. Wageningen Pap. 85-4: 179. 1985; Sanj., Leg. India 102. 1991; Matthew, FPH 288. 1999. *Atylosia rugosa* Wight & Arn., Prodr. 257. 1834; Baker in Hook. f., FBI 2: 215. 1876; Gamble, FPM 369. 1918; Fyson, FSIHS 171. t. 132. 1932.

Leaves trifoliolate; leaflets to 4 x 3 cm, obovate, base acute, apex obtuse, glaucous, densely tomentose below; velvety pubescent above. Racemes lax, to 16 cm long.

Flowers 3-5; calyx to 7 mm long, lobes ovate, acute, densely hairy outside; standard retuse, auricled, yellow with red lines; wings obovate; keel 9 mm long, gibbous to one side. Capsule 1.8 x 0.6cm, flat, 2-3 seeded.

Fl. & Fr.: November-January

Distr.: South India and Sri Lanka. Occasional; along roadsides and ecotones. MS, Puthur, *KKK 16061.*

CANAVALIA A. P. de Candolle

Prodr. 2: 403. 1825, *nom. cons.*

Canavalia cathartica Thouars, J. Bot. Agric. 1: 81. 1813; Sanj., Leg. India 107. 1991; Matthew, FPH 289. 1999. *Dolichos virosus* Roxb., Hort. Beng. 55. 1814 & Fl. Ind. 3: 301. 1832 *p.p. Canavalia turgida* Grah. *ex* A. Gray, Bot. U.S. Expl. Exped. 1: 440. 1854. *Canavalia virosa* (Roxb.) Wight & Arn. Prodr. 253. 1834. *p.p.*; Gamble, FPM 359. 1918; Fyson, FSIHS 167. t. 130. 1932. *Canavalia stocksii* Dalz. & Gibs., Bombay Fl. 69. 1861. *Canavalia ensiformis* (L.) DC. var. *turgida* (Grah. *ex* A. Gray) Baker in Hook. f., FBI 2: 196. 1876.

Climbing shrubs; stem glabrescent. Leaves 3-foliolate; leaflets to 12 x 6 cm, ovate, apex acuminate, base rounded, sparsely hairy below. Racemes to 30 cm long, 10-15 flowered. Flowers 4 cm long; calyx 12 mm long, 2-lipped; standard orbicular, pink, auricled at base; wings oblong, obtuse; keel 18 x 7 mm, upcurved; stamens 10. Pods 12 x 2 cm, compressed; seeds 5, ellipsoid, biconvex.

Fl. & Fr.: December-January

Distr.: South East Asia, Africa, Australia & Pacific Islands. Common along ecotones at lower altitudes. MS, Kulachivayal, *KKK 16678.*

CROTALARIA Linnaeus

Sp. Pl. 714. 1753

1. Leaves digitately 3 or more foliolate ..... **C. pallida**
1. Leaves simple 2
2. Stipules decurrent as a persistent wing to the branches 3
2. Stipules absent or small, not decurrent 5
3. Erect shrubs; leaves more than 7 cm long ..... **C. wightiana**
3. Erect or prostrate herbs or undershrubs; leaves to 5 cm long 4
4. Small procumbent herbs, minutely hairy ..... **C. ovalifolia**
4. Bushy undershrubs, densely pubescent ..... **C. scabrella**
5. Racemes lateral, few or even 1 flowered ..... **C. fysonii**
5. Racemes terminal, rarely leaf opposed, many flowered 6
6. Diffuse annual herbs; calyx prominent, inner side brownish black ..... **C. calycina**
6. Erect undershrubs or shrubs; calyx not as above 7
7. Undershrubs; leaves to 3 cm broad 8
7. Stout shrubs; leaves more than 7 cm broad 9
8. Leaves >10 cm long, oblanceolate; flowers infinite ..... **C. spectabilis**
8. Leaves to 6 cm long, elliptic; flowers 4-5 ..... **C. sp. 1**

9. Leaves elliptic-obovate; racemes to 15 flowered ..... **C. beddomei**
9. Leaves ovate; racemes to 10 flowered ..... **C. sp. 2**

Crotalaria beddomeana Thoth. & Ansari, Bull. Bot. Surv. India 20: 180. 1979; Sanj., Leg. India 117. 1991; Matthew, Ill. FPH t. 154. 1996 & FPH 297. 1999. *C. lanata* Bedd., Madras J. Lit. Sci. 3: 178. 1858. *non* Thunb. 1796; Baker in Hook. f., FBI 2: 77. 1876; Gamble, FPM 297. 1918.

Shrubs; branches villous. Leaves to 12 x 8 cm, elliptic-obovate, base rounded, apex obtuse, villous below. Racemes lax, terminal. Flowers distant, 2.5 cm long; calyx to 2 cm long, lobes acuminate; standard 25 x 35 mm, yellow, glabrous outside; wings 30 x 12 mm. Pods to 6 x 2 cm, broadly oblong-clavate, glabrous.

Fl. & Fr.: August-October

Distr.: Peninsular India, Sri Lanka, Africa, New Guinea & Australia. Common along roadsides at higher altitudes. MS, Idlimottai, *KKK 16607.*

Crotalaria calycina Schrank, Pl. Rar. Hort. Monac. t. 12. 1817; Baker in Hook. f., FBI 2: 72. 1876; Gamble, FPM 295. 1918; Fyson, FSIHS 146. t. 110. 1932; Sanj., Leg. India 118. 1991; Matthew, Ill. FPH tt. 155-158. 1996 & FPH 298. 1999.

Annual herbs; stems adpressed hairy. Leaves to 4 x 0.5 cm, oblong, densely hairy below. Racemes terminal, 3-6 flowered. Flowers distant; calyx 1.5 cm long, lobes linear, densely hairy without, inner side brownish black; standard 15 mm long, yellow, hairy on back. Pods to 2 cm long, oblong, glabrous; seeds many.

Fl. & Fr.: August-December

Distr.: Paleotropics. Common; in grasslands. MS, Thalachorkadavu, *KKK 16747*; K-6, *KKK 31070.*

Note: This is a highly polymorphic species. Gamble and Matthew (1999) have attempted to group the species into 4 ecotypes, according to their size and altitude at which they are found. But here it is not attempted, since a clear-cut demarcation according to size is not possible always.

Crotalaria fysonii Dunn, Kew Bull. 1914: 26. 1914; Gamble, FPM 292. 1918; Fyson, FSIHS 144. t. 108. 1932. var. **glabra** Gamble, FPM 292. 1918; Sanj., Leg. India 120. 1991; Ansari, J. Econ. Tax. Bot. 16(1): 162. 1992; Matthew, FPH 301. 1999.

Trailing, perennial subshrubs. Leaves to 2.5 x 1.5 cm, ovate, base rounded, apex obtuse, adpressed pubescent below. Racemes terminal and leaf opposed. Flowers to 1 cm long; calyx 8 mm long, lobes acuminate, hispid; standard 8 x 6 mm, obovate, glabrous; wings to 9 x 4 mm; keel 11 mm long, glabrous; ovary dark brown-villous. Pods 2 x 0.7 cm, oblong, densely fulvous hairy.

Fl. & Fr.: August-November

Distr.: Southern Western Ghats. Rare; along ecotones and in grasslands. MS, Idlimottai route, *KKK 16589.*

Note: This species was considered as endemic to Palni hills of Tamil Nadu (Sanjappa, 1991). Thus the present collection forms a new record to the state of Kerala and also extends the distribution of the species.

Crotalaria ovalifolia Wall. *ex* Fyson, Kew Bull. 1914: 184. 1914; Gamble, FPM 291. 1918; Fyson, FSIHS 142. t. 106. 1932; Sanj., Leg. India. 126. 1991. *C. scabrella* Wight & Arn. Prodr. 181. 1834; Matthew, FPH 305. 1999. *C. rubiginosa* Baker in Hook. f., FBI 2: 69. 1876 p.p. *non* Willd. 1802.

Procumbent herbs. Leaves simple, subsessile, to 3 x 1.5 cm, elliptic, apex rounded, mucronate, densely pubescent below. Racemes axillary, to 3 cm, 3 flowered. Flowers yellow, to 2 x 1.5 cm; calyx 12 mm long, lobes lanceolate; standard 22 x 18 mm, orbicular; wings 12 x 5 mm, obovate; keels 15 x 6 mm long. Pods to 25 x 8 mm long, oblong; seeds many, 5 mm wide, reniform.

Fl. & Fr.: September-January

Distr.: Peninsular India. Common along shola borders and roadsides at lower altitudes. MS, Puthur, *KKK 16057.*

Notes: Matthew (1993 & 1999) has reduced this species to *C. scabrella*, justifying this as an ecotype found at lower altitude. However here it is treated as separate species. This species was considered endemic to Karnataka & Tamil Nadu parts of Western Ghats only (Sanjappa, 1991). Hence the present collection forms a new record to Kerala.

Crotalaria pallida Dryand. in Ait., Hort. Kew. ed. 1. 3: 20. 1789; Sanj., Leg. India. 126. 1991; Matthew, Ill. FPH t. 165. 1996 & FPH 304. 1999. *C. mucronata* Desv., J. Bot. 3: 76. 1814. *C. striata* DC., Prodr. 2: 131. 1825; Baker in Hook. f., FBI 2: 84. 1876; Gamble, FPM 301. 1918; Fyson, FSIHS 153. 1932.

Shrubs. Leaves 3-foliolate; leaflets to 9 x 3.5 cm, elliptic, acute at both ends, apex mucronate, thinly hairy below. Raceme terminal, to 26 cm long. Flowers yellow striped with red, to 15 mm long; pedicels to 3 mm long; calyx 8 mm long; lobes acuminate; standard to 12 x 6 mm, orbicular; wings 9 mm long, falcate; keel 15 mm long. Pods to 4 x 1 cm long, cylindrical; thinly hairy; seeds 20-30.

Fl. & Fr.: September-January

Distr.: Pantropical. Common in disturbed forest areas at lower altitudes. MS, Kulachivayal, *KKK 16672.*

Crotalaria scabrella Wight & Arn., Prodr. 181. 1834; Gamble, FPM 291. 1918; Fyson, FSIHS 141. t. 105. 1932; Sanj., Leg. India. 128. 1991; Ansari, J. Econ. Tax. Bot. 15(2): 455. 1991; Matthew, Ill. FPH t. 167. 1996 & FPH 305. 1999. *C. rubiginosa* Willd. var. *scabrella* (Wight & Arn.) Baker in Hook. f., FBI 2: 70. 1876.

Undershrubs. Leaves 4 x 2 cm, elliptic to obovate, apex obtuse, mucronate. Flowers yellow, 1-3 together in axillary racemes; calyx 12 mm long, lobes acuminate, standard 20 mm across, orbicular; wings 12 mm long, oblong; keel 15 mm long, apex twisted. Pods 3.5 x 1.2 cm, oblong; seeds 3.5 x 2.5 mm, reniform, black.

Fl. & Fr.: September-December

Distr.: South India and Sri Lanka. Occasional; in grasslands at medium altitudes. MS, Kalipettu Mala, *KKK 16746.*

Notes: Matthew (1993 & 1999) has attempted for extensive reduction merging *C. conferta* Fyson, *C. ovalifolia* Wall. *ex* Fyson, *C. bourneae* Fyson, *C. rubiginosa* Willd.,etc., into *C. scabrella*. But here the treatment of Sanjappa (1991) is followed. From South India the species is so far reported from Karnataka and Tamil Nadu only (Sanjappa, 1991). Hence the collection is a new distributional record to Kerala.

Crotalaria spectabilis Roth., Nov. Pl. Sp. 341. 1821; Sanj., Leg. India. 130. 1991; Matthew, FPH 306. 1999. *C. sericea* Retz., Obs. Bot. 5: 26. 1789 *non* Burm. f. 768; Baker in FBI 2: 75. 1876. *C. leschenaultii* DC., Prodr. 2: 125. 1825; Baker in Hook. f., FBI 2: 76. 1876; Gamble, FPM 293. 1918; Fyson, FSIHS 147. t. 111. 1932.

Under shrubs. Leaves sessile, to 10 x 2 cm, oblanceolate, base cuneate, apex rounded, hairy below. Racemes terminal, to 36 cm long. Flowers to 20 mm long; calyx 12 mm long, lobes acuminate; standard to 18 x 12 mm, orbicular, yellow; wings 17 x 10 mm long, falcate; keel 15 mm long. Pods to 5 x 2 cm long.

Fl. & Fr.: August-December

Distr.: Pantropical. Common along roadsides at lower altitudes. MS, Thalachorkadavu; *KKK 16710*; K-3, *KKK 16143*.

Crotalaria wightiana Grah. *ex* Wight & Arn., Prodr. 181. 1834; Gamble, FPM 291. 1918; Fyson, FSIHS 141. 1932; Sanj., Leg. India. 131. 1991; Matthew, Ill. FPH t. 172. 1996 & FPH 309. 1999. *C. rubiginosa* Willd. var. *wightiana* (Grah. *ex* Wight & Arn.) Baker in Hook. f., FBI 2: 70. 1876.

Shrubs. Leaves to 7 x 4 cm, obovate, base acute, apex obtuse to retuse; densely fulvous hairy. Raceme axillary. Flowers 3-5, yellow, to 25 mm long; calyx 17 x 5 mm, lobes lanceolate, unequal; standard 17 mm across, orbicular, thinly pubescent along back; keel pubescent along the margins. Pods 4.5 x 1.3 cm, oblong.

Fl. & Fr.: November-January

Distr.: South India and Sri Lanka. Occasional; along shola borders and scrublands at low altitudes. MS, Puthur, *KKK 16063*.

Note: From South India the species is so far reported from Tamil Nadu only (Sanjappa, 1991). Hence the collection is a new distributional record to Kerala.

Crotalaria sp. 1

Undershrubs, to 90 cm higher; stem terete, sparsely hairy. Leaves simple, to 6 x 3 cm, acute at both ends, tip mucronate, glabrous; stipules auricled; petiole 3-4 mm. Racemes terminal; bracts lanceolate. Flowers 20 mm long; calyx to 8 mm, lobes lanceolate, hairy; standard yellow with brown nerves, to 18 mm across, orbicular, thinly pubescent at back; wings 15 x 5 mm, falcate; keel to 18 mm. Fruit not seen.

Fl.: August

Distr.: Rare; along shola borders and grasslands at higher altitudes. MS, Idlimottai, *KKK 16618*.

Note: The species is allied to *C. spectabilis*, but differs in smaller elliptic leaves and less number of flowers.

Crotalaria sp. 2

Shrubs, to 1.5 m higher; stem terete, ribbed, glabrescent. Leaves simple, to 10 x 8 cm, base truncate, apex obtuse or rounded; fulvous hairy below; stipules 8 mm, auricled; petiole 8 mm. Racemes terminal or subterminal; bracts ovate. Flowers 25 mm long; calyx to 12 mm, lobes lanceolate, hairy; standard 20 mm across, orbicular; wings 15 x 5 mm, slightly falcate; keel 2.5 mm long. Fruit not seen.

Fl.: July-August

Distr.: Rare; along roadsides at higher altitudes. MS, Methappu, *KKK 16431.*

Note: The species is allied to *C. beddomeana*, but differs in ovate leaves with truncate base and less number of flowers.

CYTISUS Linnaeus

Sp. Pl. 739. 1753

Cytisus scoparius (L.) Link., Enum. Pl. Hort. Berol. 2: 241. 1823; Fyson, FSIHS 138. t. 104. 1932; Sanj., Leg. India. 133. 1991; Matthew, Ill. FPH t. 173. 1996 & FPH 310. 1999. *Spartium scoparius* L., Sp. Pl. 709. 1753.

Bushy shrubs; stem 5 ribbed. Leaves 3-foliolate at base, simple above; leaflets to 10 x 3 mm, elliptic-oblong. Raceme 3-5-flowered, axillary. Flowers yellow, solitary, to 30 mm long; calyx 6 mm, lobes 2 toothed; standard 20 mm across, orbicular; wings and keels 20 x 10 mm; stamens 10, dimorphic; ovary 1 cm, pubescent. Pods 3.5 x 1 cm, oblong, black, hairy along sutures.

Fl. & Fr.: October-March

Distr.: Native of Western Europe; naturalized in the hill stations of India. Occasional; along roadsides at higher altitudes. MS, Methappu, *KKK 18105.*

DERRIS Loureiro

Fl. Cochinch. 2: 432. 1790, *nom. cons.*

Derris brevipes (Benth.) Baker in Hook. f., FBI 2: 244. 1878; Gamble, FPM 388. 1918; Sanj., Leg. India. 144. 1991; Matthew, Ill. FPH t. 175. 1996 & FPH 314. 1999. *D. heyneana* Benth. var. *brevipes* Benth., J. Linn. Soc. 4 (Suppl.): 110. 1860. **Karinkodi (EBIS).**

Leaves to 20 x 13 cm; leaflets to 6 x 3.5 cm, elliptic, base acute, apex abruptly acuminate, coriaceous. Panicles axillary, brown rusty tomentose. Flowers white tinged pink, to 14 x 6 mm; calyx cupular, 4 mm long, hispid, black; standard 11 x 7 mm, obovate, emarginate; wings 9 x 3 mm, oblong; keels oblong to obovate; stamens monadelphous; ovary densely hairy. Pods 5 x 2.5 cm, ovate, obtuse at either ends, densely dark brown-hispid; seeds 2.

Fl. & Fr.: March-August

Distr.: Endemic to Peninsular India. Common at medium and higher altitudes. MS, Methappu, *KKK 18105.*

DESMODIUM Desvaux

J. Bot. Agric. 1: 122. 1813, *nom. cons.*

1. Erect undershrubs ..... **D. repandum**
1. Prostrate herbs or undershrubs **2**
2. Racemes axillary; flowers 3-5 ..... **D. triflorum**
2. Racemes terminal; flowers many, usually more than 5 ..... **3**
3. Herbs; silvery marking along midrib of leaves above; flowers pink; pods to 35 mm long ..... **D. uncinatum**
3. Undershrubs; leaves without any marks; flowers pale blue; pods to 12 mm long ..... **D. microphyllum**

Desmodium microphyllum (Thunb.) DC., Prodr. 2: 337. 1825; Sanj., Leg. India. 157. 1991; Matthew, Ill. FPH t. 179. 1996 & FPH 319. 1999. *Hedysarum microphyllum* Thunb., Fl. Jap. 284. 1784. *Desmodium parvifolium* DC., Prodr. 2: 334. 1825; Baker in Hook. f., FBI 2: 174. 1876; Gamble, FPM 348. 1918; Fyson, FSIHS 162. t. 125. 1932.

Leaves trifoliolate, elliptic; leaflets to 10 x 6 mm, obovate, apex mucronate. Racemes on the lateral branches, to 5 cm long, filiform, to 10-flowered. Standard 4 x 4 mm, orbicular; wings 3 mm, rounded at apex; keel spurred at base, glabrous; stamens monadelphous. Pods to 12 x 3 mm, 3 jointed, crenate along both sutures, hispid; seeds broad elliptic.

Fl. & Fr.: August-December

Distr.: India, China to Malesia. Common along shola borders at lower altitudes. MS, Conical patch, *KKK 16737.*

Desmodium repandum (Vahl) DC., Prodr. 2: 334. 1825; Sanj., Leg. India 161. 1991; Matthew, FPH 321. 1999. *Hedysarum repandum* Vahl, Symb. Bot. 2: 82. 1791. *Desmodium scalpe* DC., Prodr. 2: 334. 1825; Baker in Hook. f., FBI 2: 165. 1876; Gamble, FPM 345. 1918; Fyson, FSIHS 162. t. 124. 1932. **Kattu Avam Poovu. Plate 4.4.2.**

Leaves trifoliolate; leaflets to 4 x 3 cm, middle one rhomboid, lateral ones ovate, base rounded, apex acute, glabrous above, adpressed pubescent below. Racemes terminal, lax; calyx 4-lobed, campanulate; standard 10 mm across, reddish, orbicular. Pod to 1.5 x 0.6 cm, 2-3 jointed, falcate, covered with hooked hairs.

Fl. & Fr.: November-February

Distr.: Africa, eastward to Asia and Australia. Common along roadsides at medium altitudes. MS, K-5, *KKK 16154.*

Desmodium triflorum (L.) DC., Prodr. 2: 334. 1825; Wight, Ic. t. 292. 1839; Baker in Hook. f., FBI 2: 173. 1876; Gamble, FPM 347. 1918; Sanj., Leg. India 163. 1991; Matthew, FPH 321. 1999. *Hedysarum triflorum* L., Sp. Pl. 249. 1753.

Leaves trifoliate; leaflets to 15 x 10 mm, elliptic, mucronate, pubescent below. Racemes axillary. Flowers 3-5, 3 mm across; calyx 3 mm long, 5-lobed; standard 3 mm across, orbicular, pink; wings obovate; keel glabrous. Pod to 10 mm long, straight; joints 4-6, squarish, hooked-pubescent.

Fl. & Fr.: August-February

Distr.: India, Malesia to Australia, Africa and America. Common in scrublands at lower altitudes. MS, Conical patch, *KKK 16458.*

Desmodium uncinatum (Jacq.) DC., Prodr. 2: 331. 1825; Thulin, Opera Botanica 68: 114. 1983; Sasidh., Rheedea 6(2): 71. 1996. *Hedysarum uncinatum* Jacq., Hort. Schoenb. 3: 27. 1798. **Moschio, Pottu Kola, Kolagu Kola (EBIS).**

Stem covered with sticky, hooked hairs. Leaves trifoliate; leaflets to 6 x 2 cm, ovate, base acute, apex cuspidate, pubescent. Racemes terminal, to 50 cm long, lax; calyx 3 mm long, ovate, hairy; standard 10 mm long, glabrous. Pods 20-35 x 4 mm, deeply indented along the ventral suture; joints 3-10, hooked-hairy, pendulous.

Fl. & Fr.: November-January

Distr.: Tropical Africa and Asia. Common in waste lands and along roadsides at lower altitudes. MS, Perumala, *KKK 16597.*

Note: This plant, perhaps an accidental introduction along with the fodder grasses introduced by the Regional Live Stock Dept., Munnar, has now colonized in the higher ranges. However, this plant also finds its use as a green manure in plantations.

DUMASIA A. P. de Candolle

Ann. Sci. Nat. (Paris) 4: 96. 1825.

Dumasia villosa DC., Ann. Sci. Nat. (Paris) ser. 1. 4: 96. 1825 & Prodr. 2: 241. 1825; Baker in Hook. f., FBI 2: 183. 1876; Gamble, FPM 351. 1918; Fyson, FSIHS 165. t. 128. 1932; Sanj., Leg. India 167. 1991; Matthew, FPH 322. 1999. *D. congesta* Grah. *ex* Wight & Arn., Prodr. 206. 1834; Wight, Ic. t. 445. 1841.

Twining herbs. Leaves 3-foliolate; leaflets unequal, to 3.5 x 2.5 cm, rhomboid, acute or obtuse, adpressed-hairy. Racemes axillary, to 3 cm long. Flowers 2-6, golden yellow; calyx 7 mm long, tubular, black; standard to 20 mm long, obovate, clawed; wings obovate, long-clawed; keel brown at apex; stamens 9+1; ovary villous. Pods 4 x 0.6 cm, linear-oblong, stalked; seeds 3-5, 3 x 2 mm, subglobose, black.

Fl. & Fr.: December-January

Distr.: South East Asia to Tropical Africa and Malesia. Occasional; along shola borders at higher altitudes. MS, Idlimottai, *KKK 16602.*

FLEMINGIA Roxburgh *ex* W. Aiton *et* E. T. Aiton

Hortus Kew. ed. 2, 4: 349. 1812, *nom. cons.*

1. Leaves 3-foliolate, obliquely elliptic; racemes 5-7 cm long; standard obovate ..... **F. grahamiana**
1. Leaves simple, ovate-lanceolate; racemes to 22 cm long; standard orbicular ..... **F. strobilifera**

Flemingia grahamiana Wight & Arn., Prodr. 242. 1834; Baker in Hook. f., FBI 2: 228. 1876; Gamble, FPM 378. 1918; Fyson, FSIHS 173. t. 133. 1932; Sanj., Leg. India 175. 1991; Matthew, Ill. FPH t. 183. 1996 & FPH 327. 1999.

Shrubs. Leaflets 13 x 6 cm, apex obtusely acute, grey-tomentose beneath. Racemes densely yellowish brown hairy. Flowers dense; calyx 8 mm long, densely red-glandular, lobes lanceolate; standard 9 x 6 mm, acute, pinkish; wings 8 x 1.5 mm, linear-oblong; ovary densely hairy. Pod to 12 x 7 mm, oblong.

Fl. & Fr.: December-March

Distr.: Africa extending to South India. Common; along shola borders at lower altitudes. MS, Thalachorkadavu, *KKK 16041.*

Flemingia strobilifera (L.) R. Br. *ex* Ait., Hort. Kew. ed. 2, 4: 350. 1812; Wight, Ic. t. 267. 1840; Baker in Hook. f., FBI 2: 227. 1876; Gamble, FPM 377. 1918; Sanj., Leg. India 178. 1991. *Hedysarum strobiliferum* L., Sp. Pl. 746. 1753. *Flemingia bracteata* (Roxb.) Wight, Ic. t. 268. 1840. var. *bracteata* Baker in Hook. f., FBI 2: 227. 1876.

Shrubs. Leaves 7 x 4 cm, apex acute to acuminate, glabrate. Racemes distichous, axis zig-zag; floral leaves 25 x 14 mm, orbicular, cuspidate. Flowers 3-6-together in short cymes; calyx 5 mm long, hairy, one lobe larger; standard 5 x 6 mm, pinkish; wings 4.5 x 1 mm, white; keel 6.5 x 2 mm, clawed. Pod 8 x 5 mm, oblique.

Fl. & Fr.: September-January.

Distr.: Tropical Asia introduced in Micronesia, Polynesia, Mauritius and West Indies. Common in grasslands and shola borders at lower altitudes. MS, Kulachivayal, *KKK 16677.*

INDIGOFERA Linnaeus

Sp. Pl. 751. 1753

1. Shrubs; leaflets 10-12 pairs; flowers pink; pods glabrous ..... **I. cassioides**
1. Subshrubs; leaflets to 8 pairs; flowers brick red; pods hairy ..... **I. spicata**

Indigofera cassioides Rottl. *ex.* DC., Prodr. 2: 225. 1825; Sanj., Leg. India 186. 1991 & in Fl. Ind. Fasc. 21: 29. 1995; Matthew, FPH 334. 1999. *I. pulchella* Roxb., Fl. Ind. 3: 382. 1832; Wight, Ic. t. 367. 1874; Baker in Hook. f., FBI 2: 101. 1876; Gamble, FPM 313. 1918; Fyson, FSIHS 156. t. 119. 1932.

Leaves to 10 cm long; leaflets to 2 x 1 cm, obovate, emarginate, cuspidate. Racemes 8-13 cm long, axillary, many-flowered; bracts lanceolate, subulate above. Flowers to 13 mm across; calyx 3.5 mm long, lobes acuminate, hairy; standard 10 x 7 mm, obovate, glabrous; wings 10 mm long, oblanceolate; keel ciliate at apex. Pods 30 x 5 mm, oblong, compressed, cuspidate, many-seeded.

Fl. & Fr.: November-February .

Distr.: South and South East Asia. Common; along shola borders and other disturbed regions at lower altitudes. MS, Puthur, *KKK 16062.*

Indigofera spicata Forssk., Fl. Aegypt.-Arab. 138. 1775; Sanj., Leg. India 195. 1991 & Fl. Ind. Fasc. 21: 123. 1995; Matthew, Ill. FPH t. 188. 1996 & FPH 336. 1999. *I. endecaphylla* Jacq., Ic. Pl. Rar. 3(3): t. 570. 1789, "*hendecaphylla*"; Baker in Hook. f., FBI 2: 98. 1876; Gamble, FPM 311. 1918; Fyson, FSIHS 156. 1932.

Leaves to 5 cm long; leaflets 18 x 6 mm, oblanceolate, obtuse, shortly mucronate, sessile. Racemes to 13 cm long, slender. Flowers 6 mm across; calyx lobes subulate; standard hispid outside. Pods 30 x 2 mm, compressed, marginate, rugose, seeds 5-10.

Fl. & Fr.: August-December

Distr.: South Africa to Malaya. Rare; in disturbed areas and grasslands at lower altitudes. MS, Pallang Mala, *KKK 16694*; Thalachorkadavu, *KKK 16708.*

LABLAB Adanson

Fam. Pl. 2: 325. 1763

Lablab purpureus (L.) Sweet, Hort. Brit. ed. 1: 481. 1827; Sanj., Leg. India 199. 1991; Matthew, FPH 331. 1999. *Dolichos purpureus* L., SP. Pl. ed. 2: 1021. 1763. *D. lablab* L., Sp. Pl. 725. 1753; Baker in Hook. f., FBI 2: 209. 1876; Gamble, FPM 367. 1918. **Kattavara (EBIS).**

Climbing shrub. Leaves alternate, 3 foliolate, to 18 x 16 cm; terminal leaflet to 10 x 7 cm, ovate-deltoid; laterals to 8 x 5 cm, ovate, base obtuse, apex acuminate. Racemes to 30 cm. Flowers 2 cm across, purplish; calyx tube campanulate; standard to 1.5 x 2.5 cm, orbicular; wings 1.2 x 0.8 cm, obovate; keels 2 x 0.5 cm, oblong; ovary pubescent. Pod to 5x 2 cm, oblong-falcate, compressed; seeds ovoid.

Fl. & Fr.: December-March

Distr.: Paleotropical. Occasional; along shola borders and scrublands at lower altitudes. MS, Puthur, *KKK 16194.*

Note: This widely cultivated species has now run wild in the high ranges.

LEPTODESMIA (Bentham) Bentham & Hooker. f.

Gen. Pl. 1: 522. 1865.

Leptodesmia congesta (Wight) Benth. *ex* Baker in Hook. f., FBI 2: 152. 1876; Gamble, FPM 332. 1918; Fyson, FSIHS 160. 1932; Sanj., Leg. India 202. 1991; Matthew, Ill. FPH t. 191. 1996 & FPH 339. 1999. *Nicolsonia congesta* Wight, Ic. t. 1056. 1846.

Diffuse herb; branchlets wiry, pubescent. Leaves 1-3 foliolate; middle leaflet to 15 x 8 mm, oblong, obtuse at both ends; laterals 6 x 4 mm, obovate, sessile. Racemes terminal, capitate, to 1.5 cm across; calyx tube short, lobes 5; corolla pinkish; standard 2 mm wide, orbicular; wings 1 mm, oblong; keels 1 mm; ovary sessile, globose. Pod 3 x 2.5 mm, oblong, flattened.

Fl. & Fr.: October-March

Distr.: Endemic to Southern Western Ghats. Occasional; in disturbed regions and roadsides at lower and medium altitudes. MS, Puthur, *KKK 16077.*

Note: This species was considered endemic to Nilgiri and Palni hills of Tamil Nadu (Sanjappa, 1991). Hence this collection is a new distributional record to Kerala.

NEONOTONIA Lackey

Phytologia 37: 210. 1977.

Neonotonia wightii (Wight & Arn.) Lackey, Phytologia 37: 209. 1977; Sanj., Leg. India 219. 1991; Matthew, FPH 345. 1999. *Notonia wightii* Wight & Arn., Prodr. 208. 1834. *Glycine javanica* L., Sp. Pl. 754. 1753: Baker in Hook. f., FBI 2: 183. 1876; Gamble, FPM 351. 1918.

Stout climbers. Leaves 3-foliolate, to 14 x 12 cm; midleaflet 7 x 5, rhomboid, laterals 6 x 4 cm, ovate. Racemes to 13 cm long, velvety pubescent. Flowers 8 mm long, white; calyx 5 mm long, tube campanulate, lobes lanceolate; standard 5 mm wide, obovate; wings oblong; keels falcate; ovary densely hairy. Pods 4 x 0.6 cm, oblong, deflexed, densely hairy, depressed between seeds; seeds 5 x 4 mm, oblong.

Fl. & Fr.: October-January

Distr.: India, Tropical Africa and Indonesia. Common in lower altitude sholas, mostly in disturbed regions. MS, Thalachorkadavu, *KKK 16734.*

PAROCHETUS Buchanan-Hamilton *ex* D. Don

Prodr. Fl. Nep. 240. 1825.

Parochetus communis Buch.-Ham. *ex* Don, Prodr. Fl. Nep. 240. 1825; Baker in Hook. f., FBI 2: 86. 1876; Gamble, FPM 303. 1918; Fyson, FSIHS 154. t. 117. 1932: Sanj., Leg. India 227. 1991; Matthew, Ill. FPH t. 197. 1996 & FPH 346. 1999. *P. major* D. Don, Prod. Fl. Nepal 241. 1825; Wight, Ic. t. 483. 1840-43.

Leaflets to 13 x 15 mm, obcordate, base cuneate-obcordate, apex emarginate, margin obscurely lobed, pubescent below. Flowers blue; calyx 6 mm long, campanulate, 5-lobed; upper two lobes connate; standard 13 x 13 mm, obovate; wings 10 x 3 mm long, obovate, long-spurred at base; keel not spurred; stamens 9+1; ovary oblong, glabrous. Pods 2 x 0.5 cm, oblong; seeds many, globose.

Fl. & Fr.: October-February

Distr.: South-East Asia and Africa. Occasional along roadsides, shola borders and grasslands at medium and higher altitudes. MS, K-5, *KKK 16151.*

RHYNCHOSIA Loureiro

Fl. Cochinch. 425, 460. 1790, *nom. cons.*

Rhynchosia rothii Benth. *ex* Aitch. Cat. Pl. Punj. Sindh 50. 1869; Sanj., Leg. India 240. 1991; Matthew, FPH 355. 1999. *R. sericea* Span., Linnaea 15: 195. 1841, *non* Guil. *ex* Hook. & Arn. 1833; Baker in Hook. f., FBI 2: 225. 1876; Gamble, FPM 375. 1918.

Climbing shrubs; stem pink, soft silky pubescent. Leaflets 6.5 x 4 cm, rhomboid to ovate, base rounded, apex acute. Racemes, 5 cm long; calyx 3 mm long, lobes ovate, acute; petals pink turning blue; standard 6 mm across, orbicular, glabrous; wings 5 mm long, oblong; keels curved. Pods 7 x 5 mm, ovoid, tawny villous.

Fl. & Fr.: October-January

Distr.: Indo-Malesia. Common in grasslands at lower altitudes. MS, Pallang Mala, *KKK 16692.*

SHUTERIA R. Wight & Arnott

Prodr. Fl. Pen. Ind. Or. 1: 207. 1834, *nom. cons.*

1. Stems villous; racemes to 20 cm long; flowers purple ..... **S. involucrata**
1. Stems glabrescent; racemes to 6 cm long; flowers yellow ..... **S. vestita**

Shuteria vestita Wight & Arn., Prodr. 207. 1834; Wight, Ic. t. 165. 1839; Baker in Hook. f., FBI 2: 181. 1876; Gamble, FPM 350. 1918; Fyson, FSIHS 165. t. 127. 1932; Sanj., Leg. India 245. 1991. *Glycine vestita* Grah. in Wall., Cat. 5512. 1831-32 *nom. nud.* var. *vestita* forma *vestita*. *Shuteria glabrata* Wight & Arn., Prodr. 207. 1834. *S. vestita* (Wall.) Wight & Arn. var. *glabrata* (Wight & Arn.) Baker in Hook. f., FBI 2: 182. 1876. *S. involucrata* (Wall.) Wight & Arn., Prodr. 207. 1834. var. *glabrata* (Wight & Arn.) Ohashi, J. Jap. Bot. 50: 305. 1975.

Leaves 3-foliolate, leaflets to 5 x 3.5 cm, middle one rhomboid, lateral ones ovate, obtuse, base rounded, chartaceous, villous. Racemes to 6 cm long. Flowers dense;

calyx 4 mm long, lobes acuminate; standard 7 x 5 mm, orbicular, wings 8 mm long, spurred at base; keel 8 x 3 mm, oblong; ovary densely hairy. Pods 4 x 0.5 cm, linear-oblong, flat, densely hispid; seeds many, cubical.

Fl. & Fr.: November-March

Distr.: South and South-East Asia. Common; along roadsides at lower altitudes. MS, Thalachorkadavu, *KKK 16762.*

Shuteria involucrata (Wall.) Wight & Arn. Prodr. 207. 1834; Sanj., Leg. India 245. 1991; Matthew, FPH 358. 1999. *Glycine involucrata* Wall., Pl. Asiat. Rar. 3: 22, t. 241. 1832. *Shuteria vestita* Wight & Arn., Prodr. 207. 1834. var. *involucrata* (Wall.) Baker in Hook. f., FBI 2: 182. 1876.

Leaves 3-foliolate, leaflets to 4.5 x 3 cm, middle one rhomboid, lateral ones ovate, base rounded, apex obtuse, villous. Racemes to 20 cm long. Flowers lax; calyx 4 mm long, lobes ovate; standard to 8 x 5 mm, orbicular, wings 8 mm long, oblique-oblong, spurred; keel 8 x 3 mm, oblong, apex obtuse; ovary densely hairy. Pods 4.5 x 0.5 cm, linear-oblong, flat, densely hispid; seeds many, cubical.

Fl. & Fr.: November-March

Distr.: South and South-East Asia. Common along roadsides and ecotones at medium altitudes. MS, K-5, *KKK 31071.*

SMITHIA W. Aiton

Hortus Kew. 3: 496. 1789, *nom. cons.*

Smithia gracilis Benth., Linnaea 24; 642. 1851; Baker in Hook. f., FBI 2: 150. 1876; Gamble, FPM 330. 1918; Fyson, FSIHS 159. 1932; Sanj., Leg. India 247. 1991; Matthew, Suppl. Ill. FPH t. 976. 1998 & FPH 360. 1999.

Slender, branched, diffuse herbs. Leaflets 3 pairs, to 11 x 5 mm, obovate-oblong, ciliate along margins and midribs. Racemes to 1.5 cm long. Flowers pedicelled; calyx 5 mm long, 2-lipped, hairy, upper lip truncate; standard to 6 x 5 mm, obovate, emarginate, mucronate, yellow with red lines; wings 5 x 1.5 mm, yellow; keel spurred. Pods jointed; joints 2 x 2 mm, orbicular, biconvex, dark brown.

Fl. & Fr.: July-November

Distr.: Endemic to Peninsular India. Common along roadsides and disturbed forest floors. MS, Coupe road, *KKK 16591.*

TEPHROSIA Persoon

Syn. Pl. 2: 328. 1807, *nom. cons.*

Tephrosia tinctoria Pers., Syn. 2: 329. 1807; Wight, Ic. t. 388. 1840; Baker in Hook. f., FBI 2: 111. 1876; Gamble, FPM 319. 1918; Fyson, FSIHS 158. 1932; Sanj., Leg. India 259. 1991; Matthew, FPH 364. 1999. *T. pulcherrima* (Baker) Gamble, FPM 319. 1918. *T. tinctoria* Pers. var. *pulcherrima* Baker in Hook. f., FBI 2: 112. 1876.

Erect shrubs; golden brown pubescent. Leaves 3-7 foliolate; middle leaflet to 4.5 x 2.5 cm, oblong, obtuse; laterals to 2.5 x 1 cm, base acute, densely white-tomentose below. Racemes axillary. Flowers red; calyx 6 mm long, lobes lanceolate; standard

narrowed to the base; wings to 17 x 5 mm; keel obovate; Pods to 5 x 0.5 cm, oblong, flat, curved at tip, minutely hirsute, 8-10 seeded.

Fl. & Fr.: October-March

Distr.: India and Sri Lanka. Common along shola margins at lower altitudes. MS, Perumala, *KKK 17631*.

URARIA Desvaux

J. Bot. 1: 122, 1813.

Uraria rufescens (DC.) Schindl., Fedde, Rep. 21: 14. 1925; Sanj., Leg. India 268. 1991; Matthew, Ill. FPH t. 214. 1996 & FPH 369. 1999. *Desmodium rufescens* DC., Ann. Sci. Nat. 4: 101. 1825; Baker in Hook. f., FBI 2: 171. 1876; Gamble, FPM 346. 1918; Fyson, FSIHS 161. t. 123. 1932.

Erect subshrubs, stem reddish brown. Leaves 3-foliolate; leaflets to 4 x 2 cm, obovate, mucronate, base acute. Raceme to 12 cm long, terminal, densely flowered at top. Flowers light pink; calyx 5 mm long, hairy; standard 7 mm across, clawed; keel small. Pod 2 x 0.6 cm, oblong, divided, scabrous, straight.

Fl. & Fr.: January-May

Distr.: South to South East Asia. Common along roadsides at lower altitudes. MS, K-3, *KKK 16102*.

VIGNA Savi

Pisa Nuov. Giorn. Lett. 8: 113. 1824, *nom. cons.*

1. Scandent herbs; leaflets > 5 cm long ..... **V. bourneae**
1. Slender climbers; leaflets < 5 cm long **2**
2. Stipules basifixed; flowers violet-purple ..... **V. grahamiana**
2. Stipules peltately fixed; flowers yellow ..... **V. sublobata**

Vigna bourneae Gamble, FPM 365. 1918 & Kew Bull. 1919: 229. 1919; Sanj., Leg. India 272. 1991; Matthew, Suppl. Ill. FPH t. 978. 1998 & FPH 373. 1999.

Leaves to 18 x 13 cm; leaflets to 8.5 x 5 cm, ovate, base obtuse, apex acuminate; middle one deltoid. Racemes axillary; peduncle to 15 cm, stout; calyx 5 mm long, campanulate; corolla to 1.5 cm, yellow; standard 1.5 x 2 cm, auriculate; wings broad, 1.2 x 1 cm, obtuse; keels 1.5 x 0.5 cm; ovary villous. Pod to 7 x 0.7 cm, densely fulvous, glabrescent.

Fl. & Fr.: October-March

Distr.: Endemic to Southern Western Ghats. Occasional; along shola borders at lower altitudes. MS, Thalachorkadavu, *KKK 16035*; Chengalar, *KKK 18124*.

Note: This species was considered endemic to Tamil Nadu (Sanjappa, 1991). Present collection forms a new distributional record for Kerala.

Vigna grahamiana (Wight & Arn.) Verdc., Kew Bull. 24: 562. 1970; Sanj., Leg. India 273. 1991; Matthew, FPH 374. 1999. *Phaseolus grahamianus* Wight & Arn., Prodr. 244. 1834; Baker in Hook. f., FBI 2: 201. 1876; Gamble, FPM 362. 1918.

Leaflets to 4.5 x 3 cm, middle one deltoid, laterals smaller, ovate, apex acute, sparsely hispid. Flowers 3-5, small, in umbellate racemes; peduncle to 3 cm; calyx lobes 5 mm, acute, ciliate; corolla to 15 mm long; standard 14 x 8 mm; wings 12 x 5 mm. Pods 6 x 0.5 cm, flat, densely brown-strigose.

Fl. & Fr.: November-January

Distr.: Southern Western Ghats & Sri Lanka. Common; in disturbed forest areas at lower altitudes. MS, Puthur, *KKK 16721*.

Note: From Southern Western Ghats, this species is so far reported to Tamil Nadu only (Sanjappa, 1991). Present collection forms a new distributional record for Kerala.

Vigna sublobata (Roxb.) Babu & Sharma, Bull. Bot. Surv. India 27: 21. 1987; Sanj., Leg. India 276. 1991. *Phaseolus sublobatus* Roxb., Fl. Ind. 3: 288. 1832; Gamble, FPM 363. 1918; Fyson, FSIHS 168. 1932. *P. trinervius* Heyne *ex* Wight & Arn., Prodr. 245. 1834; Baker in Hook. f., FBI 2: 203. 1876. *Vigna brachycarpa* Kurz., J. Asiat. Soc. Beng. 43. 185. 1874; Baker in Hook. f., FBI 2: 206. 1876. *Phaseolus mungo* L. var. *radiatus* (L.) Baker in Hook. f., FBI 2: 203. 1876 p.p. *Vigna radiata* (L.) Wilczek., Fl. Congo Belge. 6: 386. 1954, var. *sublobata* (Roxb.) Verdc., Kew Bull. 24: 559. 1970; Matthew, Ill. FPH t. 220. 1996 & FPH 375. 1999.

Leaflets to 4.5 x 3 cm, middle one rhomboid, laterals smaller, obliquely ovate, acuminate at apex, sparsely hispid. Flowers densely packed, subsessile; calyx lobes 7 x 3 mm, ovate, acute, ciliate. Pods 3-5 x 0.5 cm, densely brown-strigose; seeds 3 x 2.5 mm, rectangular, longitudinally rugose.

Fl. & Fr.: November-March

Distr.: Indo-Malesia. Common; along roadsides and shola borders at lower and medium altitudes. MS, Gudalar, *KKK 16085*.

Subfamily: **CAESALPINIOIDEAE**

CASSIA Linnaeus

Sp. Pl. 376. 1753.

1. Erect shrubs to small trees; leaves > 25 cm; leaflets 3 pairs ..... **C. floribunda**
1. Suberect undershrubs; leaves < 5 cm; leaflets 16-22 pairs ..... **C. mimosoides**

Cassia floribunda Cav., Descr. 132. 1802; Sanj., Leg. India 15. 1991; Matthew, FPH 395. 1999. *C. laevigata* Willd., Enum. Hort. Berol. 441. 1809; Gamble, FPM 402. 1919; Fyson, FSIHS 181. t. 140. 1932. **Kattu Konna (EBIS).**

Leaves to 30 cm long; leaflets to 7 x 3.5 cm, ovate-acuminate, glabrous. Corymbs to 8 mm long; sepals 10 x 4 mm, elliptic; petals yellow, to 20 x 15 mm, obovate, obtuse; stamens unequal; anthers dimorphic. Pods to 9 x 1 cm oblong, cylindric, glabrous, brown; seeds many, biconvex, brown.

Fl. & Fr.: September-January

Distr.: Introduced from Tropical America and now running wild. Rare; in lower altitude sholas especially in disturbed regions. MS, Puthur, *KKK 16718*.

Cassia mimosoides L., Sp. Pl. 379. 1753; Baker in Hook. f., FBI 2: 266. 1878. var. **leschenaultiana** (DC.) Ohashi, J. Jap. Bot. 50: 308. 1975; Sanj., Leg. India 17. 1991. *C. leschenaultiana* DC., Mem. Soc. Phys. Geneve 2: 123. 1824; Gamble, FPM 403. 1919. *C. wallichiana* DC., Mem. Soc. Phys. Geneve 2: 122. 1824. *C. mimosoides* L. var. *wallichiana* (DC.) Baker in Hook. f., FBI 2: 266. 1878.

Leaves 4 x 0.5 cm long; leaflets to 5 x 1 cm, oblong, glabrous. Racemes to 30 cm long. Flowers solitary, axillary, to 8 x 1 mm, linear, glabrous; petals to 9 x 3 mm, obovate, yellow with brown striations. Pods 4 x 0.5 cm, oblong, flat, scabrous.

Fl. & Fr.: September-December

Distr.: South to South East Asia. Occasional; along roadsides and ecotones at lower altitudes. MS, K-4, *KKK 31068.*

Subfamily: **MIMOSOIDEAE**

1. Pods twisted ..... **Archidendron**
1. Pods straight ..... **Acacia**

ACACIA P. Miller

Gard. Dict. Abr. ed. 4. 28. 1754.

1. Leaves bipinnate **2**
1. Leaves reduced to phyllodes in older trees ..... **A. melanoxylon**
2. Foliage silvery; 1 gland on rachis between each pair of opposite pinnules ..... **A. dealbata**
2. Foliage dark green; 2 glands on rachis between each pair of opposite pinnules ..... **A. mearnsii**

Acacia dealbata Link., Enum. Pl. Hort. Berol 445. 1822; Gamble, FPM 429. 1919; Fyson, FSIHS 186. t. 144. 1932; Sanj., Leg. India 47. 1991; Matthew, Ill. FPH t. 230. 1996 & FPH 403. 1999. **Silver Wattle, Karuva (EBIS).**

Trees. Leaves to 10 x 4 cm long; pinnae 18-20 pairs, each to 5 x 1 cm; a gland present on rachis between each pair of opposite pinnae; pinnules opposite, to 40 pairs. Panicles to 25 cm long. Flowers yellow, to 8 mm wide in globose heads; calyx 5 lobed, lobes yellow; ovary oblong. Pod to 8 x 1 cm, flattened, straight or curved.

Fl. & Fr.: August-December

Distr.: Native of Australia, introduced to India. Common in shola borders and scrublands; often entering disturbed sholas. MS, K-5, *KKK 16552.*

Note: This species is extensively cultivated in the high altitude grasslands.

Acacia mearnsii de Wilde., Pl. Bequeart. 3: 61. 1925 *"mearnsi"*; Matthew, Rec. Bot. Surv. India 20(1): 80. 1969; Sanj., Leg. India 50. 1991; Matthew, Ill. FPH t. 236. 1996 & FPH 407. 1999. *A. decurrens* (Wendl.) Willd. var. *mollis* Lindl., Bot. Reg. 5. t. 371. 1819. **Black Wattle, Karuva (EBIS).**

Trees. Leaves to 13 x 10 cm; pinnae 14-18 pairs, each 5 x 0.5 cm, 2 glands present on the rachis between opposite pinnae; pinnules to 40-50 pairs, each 5 mm long, linear. Panicles to 10 cm long, with 10 mm wide heads. Flowers cream; calyx 5 lobed, lobes yellowish; ovary pubescent. Pod to 6 x 0.8 cm, linear, constricted in between.

Fl. & Fr.: August-March

Distr.: Native of Australia, introduced to India. Common in shola borders and scrublands. MS, K-5, *KKK 16552.*

Note: This species is extensively cultivated in the high altitude grasslands.

Acacia melanoxylon R. Br., Ait. f. Hort. Kew. ed. 2. 5: 462. 1813; Baker in Hook. f., FBI 2: 292. 1878; Gamble, FPM 429. 1919; Fyson, FSIHS 186. t. 143. 1932; Sanj., Leg. India 50. 1991; Matthew, Ill. FPH t. 237. 1996 & FPH 408. 1999. **(EBIS).**

Trees; branchlets angular; bark furrowed. Phyllodes to 8 x 1.2 cm, coriaceous. Racemes axillary, shorter than phyllodes; heads to 6 mm wide, globose; calyx 5 lobed; corolla cream, 5 lobed, obovate; ovary greenish. Pod to 12-16 x 0.8 cm, narrow-oblong, coiled and twisted; seed 10-12 per pod, black.

Fl. & Fr.: March-May

Distr.: Native of Australia, introduced to India. Common in the shola margins at higher altitudes. MS, Methappu, *KKK 16003.*

Note: This species is cultivated in the high altitude grasslands.

ARCHIDENDRON F. H. Jacob von Mueller

Fragm. 5: 59. 1865.

Archidendron clypearia (Jack) Nielsen, Adansonia 19: 15. 1979; Sanj., Leg. India 6`0. 1991; Gang. & Chakrab., J. Econ. Tax. Bot. 17(3): 686. 1993. *Inga clypearia* Jack, Malayan Misc. 2: 78. 1822. *Pithecellobium subcoriaceum* Thw., Enum. Pl. Zeyl. 100. 1859; Baker in Hook. f., FBI 2: 305. 1878; Gamble, FPM 434. 1919. **Pulivaka (EBIS). Plate 4.3.7.**

Small trees. Leaves bipinnate, dark green and glossy above, pale below; leaflets 8 x 3 mm, trapezoid-oblong, base oblique, apex acute. Flowers white, to 10 mm wide globose heads on axillary peduncles; calyx 3 mm long, campanulate; corolla yellowish-white, 8 mm long, tubular, lobes 5. Pods twisted, to 10 x 1.5 cm, hispid; dorsal suture coriaceous; seeds many, 5 mm across, compressed.

Fl. & Fr.: September-March

Distr.: India, Sri Lanka and South East Asia. Common along stream sides at lower and medium altitudes. MS, Chengalar, *KKK 16529.* ENP, Rajamala, *KKK 17693.*

34. ROSACEAE

1. Climbing shrubs with prickles; ovaries many, free 2
1. Trees or shrubs; ovaries 1-3, united 3
2. Ovary superior; fruit a drupe ..... **Rubus**
2. Ovary inferior; fruit an achene ..... **Rosa**
3. Flowers solitary, in racemes, or in axillary fascicles; calyx tube free from the ovary ..... **Prunus**
3. Flowers in terminal corymbose panicles; calyx tube adnate to the ovary ..... **Photinia**

PHOTINIA Lindley

Trans. Linn. Soc. 13: 103, t. 10. 1821.

Photinia integrifolia Lindl., Trans. Linn. Soc. London 13: 103. 1821, var. **sublanceolata** Miq., Fl. Ind. Bat. 1: 387. 1857; Matthew, Ill. FPH t. 252. 1996 & FPH

431. 1999. *P. notoniana* Wight & Arn., Prodr. Fl. Ind. Orient. 1: 302. 1834; Hook. f., FBI 2: 380. 1878; Gamble, FPM 445. 1919; Fyson, FSIHS 201. t. 154. 1932. **Choluvan (EBIS) Plate 4.3.8.**

Small trees. Leaves to 14 x 7 cm, ovate or elliptic, base obtuse, apex acute or acuminate, coriaceous. Panicles compound, to 6-12 cm long. Flowers 0.5 cm across; calyx tube campanulate, lobes 5, triangular; petals 5, white, 2 x 1.5 mm, obovate; stamens 15-20; filaments sub equal; ovary inferior, ovoid, villous at apex. Drupe 6 mm across, globose, red; seeds 4, to 4 x 2 mm, elliptic, black.

Fl. & Fr.: July-October.

Distr.: India and Sri Lanka. Common; along ecotones at medium and higher altitudes. MS, Puthur, *KKK 16075*; K-3, *KKK 16485*; K-4, *KKK 16547*; Conical patch, *KKK 16561*. ENP, Near Hut, *KKK 18022*. VMS, Vattappara, *KKK 31136*.

PRUNUS Linnaeus

Sp. Pl. 473. 1753

1. Large trees; flowers in axillary racemes; petals white; drupe transversely oblong ..... **P. ceylanica**
1. Small trees; flowers solitary or in fascicles; petals rose; drupe ovoid ..... **P. persica**

Prunus ceylanica (Wight) Miq., Fl. Ind. Bot. 1: 366. 1855; Matthew, FPH 437. 1999. *Polydontia zeylanica* Wight, Ill. Indian Bot. 1: 203. 1840, "*Polyodontia*". *Pygeum zeylanicum* Gaertn., Fruct. 218. t. 46. 1788. *Pygeum acuminatum* Colebr., Trans. Linn. Soc. London 12: 300. t. 18. 1818; Wight, Ic. t. 993. 1845; Hook. in Hook. f., FBI 2: 318. 1878; Gamble, FPM 439. 1919, non *Prunus acuminata* (Wall.) Dietr. 1803. *Pygeum wightianum* Blume *ex* Muell. in Walp., Ann. 4: 642. 1857; Hook. f., FBI 2: 319. 1878; Gamble, FPM 439. 1919. *P. gardneri* Hook. f., FBI 2: 321. 1878; Gamble, FPM 439. 1919; Fyson, FSIHS 190. t. 146. 1932. *P. sisparense* Gamble, Kew Bull. 238. 1918 & FPM 438. 1919. **Poochapiddukku, Vedipottan (EBIS). Plate 4.4.4.**

Leaves to 16 x 7 cm, elliptic or ovate lanceolate, base obtuse or obliquely rounded, apex acuminate, coriaceous, glabrescent. Flowers 6 mm across; calyx tube 3 mm long, pubescent, lobes 2 mm, lanceolate; petals ovate, pubescent; stamens many; ovary 1 celled, ovoid. Drupe 2.3 x 1.5 cm, 2 lobed; seeds globose.

Fl. & Fr.: August-September.

Distr.: Indo-Malesia. Occasional; along stream sides at lower and medium altitudes. MS, K-4, *KKK 16544*. ENP, Mampallam chola, *KKK 17549*.

Prunus persica (L.) Batsch, Beytr. Entw. Pragm. Gesch. Natur. 30. 1801; Hook. in Hook. f., FBI 2: 313. 1878; Gamble, FPM 439. 1919; Fyson, FSIHS 189. 1932; Matthew, Ill. FPH t. 258. 1996 & FPH 438. 1999. *Amygdalus persica* L., Sp. Pl. 472. 1753. **Pears** (*English*), **Pikkees** (*Tamil*) **(EBIS).**

Leaves to 12.5 x 2.5 cm, oblong-lanceolate, base acute, apex acuminate, margin serrate, chartaceous; petiole with 2 glands near leaf base. Flowers 30 mm across; calyx lobes 5 x 3 mm, spathulate, villous; petals 1.5 x 1 cm, obovate, margins undulate; stamens in 2 whorls; ovary ovoid, hirsute. Drupe 5 x 4 cm, hairy.

Fl. & Fr.: February-March.

Distr.: China, widely cultivated in Asia and Europe. Occasional; along roadsides at lower altitudes. MS, Puthur, *KKK 16188.*

Note: New record to the flora of Kerala. This exotic and cultivated plant, an escape from the orchards, has now established in lower altitude and disturbed shola pockets.

ROSA Linn.

Sp. Pl. 491. 1753

Rosa leschenaultiana Red. & Thory *ex* Wight & Arn., Prodr. Fl. Ind. Orient. 301. 1834; Wight, Ic. t. 38. 1838; Hook. f., FBI 2: 368. 1878; Gamble, FPM 444. 1919; Fyson, FSIHS 200. t. 152. 1932; Matthew, Ill. FPH t. 262. 1996 & FPH 440. 1999. **Kattu Roja (EBIS). Plate 4.4.5.**

Leaves alternate, imparipinnate, to 15 x 12 cm; leaflets 3-4 pairs, to 6 x 2.5 cm, oblong-ovate to elliptic-ovate, sub sessile. Flowers in terminal or axillary corymbs; calyx 5, 4 mm wide, flask-shaped, glandular, lobes 2 x 0.6 cm, oblong-lanceolate, margins reflexed, often serrate; corolla white, petals 5, 3 x 2 cm, obcordate; stamens infinite, filaments 1 cm; pistils infinite, superior, hairy; ovary 1 celled. Achenes ovoid.

Fl. & Fr.: June-July

Distr.: Endemic to Southern Western Ghats. Rare; found along shola borders at higher altitudes. MS, Gudalar road, *KKK 18510.*

RUBUS Linnaeus

Sp. Pl. 492. 1753

1. Leaves simple, shallowly 5 lobed, coriaceous; flowers in panicles; drupes red ..... **R. fairholmianus**
1. Leaves pinnately compound, chartaceous; flowers in corymbs; drupes not red **2**
2. Leaves 3-foliolate; leaflets elliptic or rounded; petals white; drupes orange red ..... **R. ellipticus**
2. Leaves 7-foliolate; leaflets ovate; petals pink; drupes pink ..... **R. niveus**

Rubus ellipticus Smith in Rees, Cyclop. 30: n.16. 1815; Hook. f., FBI 2: 336. 1878; Gamble, FPM 441. 1919; Fyson, FSIHS 193. 1932; Matthew, Ill. FPH t. 263. 1996 & FPH 443. 1999. *R. gowreephul* Roxb., Fl. Ind. 2: 517. 1832. *R. wallichianus* Wight & Arn., Prodr. 298. 1834; Wight, Ic. t. 230. 1839. **Vella Cheechi (EBIS).**

Shrubs; prickles sharply recurved. Leaves to 12 x 8 cm; terminal leaflets 6 x 6 cm, lateral ones 4.5 x 3.5 cm, wooly tomentose below, margins irregularly serrate. Flowers white; sepals 5 x 3 mm, ovate, base united, tomentose; petals to 5 x 3 mm, obovate; ovary globular, glabrous. Drupes 1.5 mm across, glabrous.

Fl. & Fr.: February-March.

Distr.: India, Sri Lanka and Myanmar. Common; along shola borders and ecotones at all altitudes. MS, K-3.5, *KKK 16131.*

Rubus fairholmianus Gard., Calcutta J. Nat. Hist. 8: 6. 1847; Gamble, FPM 441. 1919; Fyson, FSIHS 193. 1932; Matthew, Ill. FPH t. 264. 1996 & FPH 444. 1999. *R. moluccanus* sensu Hook. f., FBI 2: 330. 1878, p.p., non L. 1753. **Eruma Cheechi, Vettila Mullu (EBIS). Plate 4.4.3.**

Straggling shrubs; prickles few, small, slightly recurved. Leaves to 11 x 8 cm, ovate, base subcordate, apex obtuse, margins fine serrate, rugose above, white tomentose below. Flowers white; sepals to 8 x 4 mm, lanceolate, margins laciniate; petals to 6 x 5 mm, obovate; ovary glabrous. Drupes 1.5 x 1 cm, globose.

Fl. & Fr.: February-April.

Distr.: Indo-Malesia. Common along shola borders and roadsides at all altitudes. MS, K-3, *KKK 16135.*

Rubus niveus Thunb., Diss. Rub. 9. t. 1. f. 3. 1813; Gamble, FPM 442. 1919; Fyson, FSIHS 194. 1932; Matthew, FPH 444. 1999. *R. lasiocarpus* Smith in Rees, Cyclop. 30: n. 6. 1815; Wight, Ic. t. 232. 1839; Hook. f., FBI 2: 339. 1878. *R. niveus* Thunb. var. *subglaber* (Thw.) Gamble, FPM 442. 1919. **Karim Cheechi (EBIS). Plate 4.4.6.**

Rambling shrubs; prickles plenty, recurved. Leaves to 20 x 10 cm; leaflets 5 x 4 cm, base rounded or oblique, apex acute, sharply and irregularly toothed along margins; prickles on the midrib, petioles and rachis. Flowers 3-4; sepals to 1.5 x 0.4 cm, lanceolate, tip cuspidate, prickly outside, white inside; petals 6 x 5 mm, obovate; ovary villous. Drupes 1.5 cm across, ovate.

Fl. & Fr.: February-April.

Distr.: Indo-Malesia and China; Common along shola borders and ecotones at all altitudes. MS, K-6, *KKK 16187.*

35. SAXIFRAGACEAE

PARNASSIA Linnaeus

Sp. Pl. 273. 1753

Parnassia mysorensis Heyne *ex* Wight & Arn., Prodr. 35. 1834; Clarke in Hook. f., FBI 2: 402. 1878; Gamble, FPM 448. 1919; Fyson, FSIHS 206. t. 157. 1932; Matthew, Ill. FPH t. 267. 1996 & FPH 448. 1999.

Perennial, scapigerous herbs. Leaves entire, radical, to 1.5 x 2.5 cm, orbicular, cordate; sepals 5, lobes 5 x 2 mm, oblong; petals 5, white, 6 x 3 mm, obovate, 3 nerved, slightly fimbriate on the margins; stamens 5; staminodes 5, clavate, entire; ovary superior, 1 celled, 2.5 x 2 mm, ovoid. Fruit a capsule.

Fl. & Fr.: October-December.

Distr.: Peninsular India and Eastern Himalayas. Occasional; in grasslands at higher altitudes. ENP, Mesthirikettu, *KKK 18031.*

36. CRASSULACEAE

KALANCHOE Adanson

Fam. 2: 248. 1763.

Kalanchoe grandiflora Wall. *ex* Wight & Arn., Prodr. 359. 1834; Clarke in Hook. f., FBI 2: 415. 1878; Gamble, FPM 451. 1919; Fyson, FSIHS 208. t. 158. 1932; Matthew, Ill. FPH t. 275. 1996 & FPH 456. 1999. **Plate 4.4.7.**

Erect, fleshy herbs. Leaves opposite, sessile, thick, to 7 x 3.5 cm, obovate, obtuse, crenate. Flowers yellow, in erect, terminal, paniculate cymes; sepals free, to 6 x 3 mm, ovate, acuminate, red-streaked; petals 4, connate into a tube, lobes 6 x 4 mm, obovate, cuspidate; stamens 8, biseriate; carpels 4, free, with 4 hypogynous scales; ovules many, parietal. Fruit of 4 free follicles; seeds many, oblong, ribbed.

Fl. & Fr.: December-May

Distr.: Endemic to Southern Western Ghats. Occasional; in grasslands near streamlets. ENP, Anamudi slope, *KKK 18541.*

Note: The present collection is a new record to Kerala.

37. DROSERACEAE

DROSERA Linnaeus

Sp. Pl. 218. 1753

Drosera peltata Sm. in Willd., Sp. Pl. 1: 1546. 1797; Clarke in Hook. f., FBI 2: 424. 1878; Gamble, FPM 452. 1919; Fyson, FSIHS 211. t. 160. 1932; Matthew, FPH 458. 1999. **Koshukotti Pullu, Azhukanni. (EBIS) Plate 5.3.2.**

Erect, slender insectivorous herb, 20-35 cm tall, with a bulbous root stock. Leaves radical or cauline; basal ones rosulate, cauline leaves semi-lunate, with viscid stipulate glands above, those on the margin longer and spreading. Racemes terminal, 4-6 flowered. Flowers white, 1 cm across; sepals 5, 3 x 2 mm, ovate-elliptic, margins ciliate; petals 5, 6 x 3 mm, spathulate-obovate; stamens 5, sub equal; ovary 2 mm across, globose. Capsule 3 valved, membranous; seeds many, ovoid, black.

Fl. & Fr.: July-December.

Distr.: Indo-Malesia to Australia and East Asia. Common in grasslands and ecotones at medium and higher altitudes. MS, Coupe road, *KKK 16586.*

38. HALORAGACEAE

LAUREMBERGIA P. J. Bergius

Descript. Pl. Cap. 350. 1767

Laurembergia coccinea (Blume) Kan. in Mart., Fl. Bras. 13 (2): 377, t. 68. 1882; Matthew, FPH 461. 1999. *Epilithes coccinea* Blume, Bijdr. 734. 1826. *Serpicula brevipes* Wight & Arn., Prodr. 338. 1834; Gamble, FPM 453. 1919; Fyson, FSIHS 212. t. 161. 1932; *S. hirsuta* Wight & Arn., Prodr. 338. 1834; Wight, Ic. t. 1001. 1845; Gamble, FPM 453. 1919.

Small decumbent herbs. Leaves to 1 x 0.5 cm, oblanceolate, dentate, hairy. Flowers unisexual, axillary, tetramerous. Female flowers sessile, 3-5-together; sepals 0.5 mm long, hispid; petals pinkish-red, 2.5 x 0.5 mm, oblong-oblanceolate; ovary 1-celled. Male flowers pedicelled; petals 3 mm long, yellow; stamens 8, yellow. Capsule 1 mm long, subglobose, hispid.

Fl. & Fr.: Throughout the year

Distr.: Peninsular India and Sri Lanka. Common; found in marshy grasslands and ecotones at higher altitudes. MS, Idlimottai, *KKK 16639.*

39. MYRTACEAE

1. Shrubs to small trees; flowers large 2
1. Large trees; flowers small 3
2. Leaves 3 ribbed, tomentose; inflorescence a terminal or axillary cyme ..... **Rhodomyrtus**
2. Leaves not ribbed, glabrous; inflorescence an axillary fascicle ..... **Eugenia**
3. Leaves opposite only; fruit a berry ..... **Syzygium**
3. Leaves opposite in younger parts, alternate in older; fruit a hardened capsule ..... **Eucalyptus**

EUCALYPTUS L'Heritier de Brutelle

Sertum Angl. 18. 1789.

1. Umbels solitary; juvenile leaves sessile, opposite, glaucous ..... **E. globulus**
1. Umbels 4-6-flowered; juvenile leaves petiolate, alternate, not glaucous ..... **E. grandis**

Eucalyptus globulus Labill., Rel. Voy. Rech. Perouse 1: 153, t. 13. 1799; Gamble, FPM 486. 1919; Fyson, FSIHS 217. t. 164. 1932; Matthew, Ill. FPH t. 292. 1996 & FPH 479. 1999. **Eucali (EBIS).**

Large tree. Younger leaves to 9 x 3.5 cm, ovate to ovate-lanceolate, glaucous; mature leaves petiolate, alternate, 20 x 3 cm, lanceolate. Umbels axillary; buds 20 x 15 mm, turbinate, angled. Flowers white, operculum hemispherical, warty. Capsule 2 x 2.5 cm, obconical, ribbed, warty; seeds flattened-ellipsoid, brownish-black.

Fl. & Fr.: July-December

Distr.: Native of Tasmania; widely cultivated in Sri Lanka and India. Common; cultivated in grasslands and ecotones at higher altitudes. MS, Methappu, *KKK 18091.*

Note: This tree is cultivated widely in the grasslands of higher altitudes from where it has entered into the shola fringes and even inside disturbed sholas.

Eucalyptus grandis Hill *ex* Maid. Forest Fl. N. S. Wales 1: 79. 1903 & Crit. Rev. Eucalyptus 4: 338. 1920; Matthew, Ill. FPH t. 293. 1996 & FPH 479. 1999. **Grandis (EBIS).**

Large tree. Young leaves to 12 x 4 cm, lanceolate; mature leaves 20 x 2.5 cm, lanceolate. Umbels 4-6 flowered, axillary; buds 9 x 5 mm, ovoid, operculum conical. Flowers yellowish white; stamens 6 mm long. Capsule 8 x 6 mm, obconical, valves 4-5; seeds pyramidal, brown.

Fl. & Fr.: July-December

Distr.: Native of Australia. Common; cultivated in grasslands and ecotones at lower altitudes. MS, Puthur, *KKK 16197*; Thalachorkadavu, *KKK 16463.*

Note: Widely cultivated in plantations; often found inside sholas at lower altitudes.

EUGENIA Linnaeus

Sp. Pl. 470. 1753

1. Leaves 4-5 cm long, narrowly elliptic; calyx tube globose ..... **E. bracteata**
1. Leaves 8-9 cm long, broadly elliptic, obovate or orbicular; calyx tube campanulate 2
2. Leaves elliptic to obovate; flowers to 2.5 cm across, usually in pairs ..... **E. calcadensis**
2. Leaves elliptic to orbicular; flowers to 1.8 cm across, usually in fascicles ..... **E. sp. 1.**

Eugenia bracteata (Willd.) Roxb. *ex* DC., Prodr. 3: 264. 1828; Duthie in Hook. f., FBI 2: 502. 1879; Gamble, FPM 484. 1919. *Myrtus bracteata* Willd., Sp. Pl. 2: 969. 1799. *Eugenia willdenowii* Wight, Ic. t. 545. 1842 & Ill. 2: 13. 1850, non DC. 1828. *Syzygium bracteatum* (Willd.) Raizada, Indian For. 74: 336. 1948, non Korth. 1847. *Eugenia rothii* Panigrahi, J. Econ. Tax. Bot. 5: 994. 1984. *Myrtus latifolia* Heyne in Roth, Nov. Pl. Sp. 332. 1821.

Large shrubs to small trees. Leaves to 5 x 2.5 cm, base acute, apex acute to acuminate. Flowers white, 1.5 cm wide, in axillary, 2-3 flowered fascicles; calyx lobes to 5 x 4 mm, ovate, obtuse, brown tomentose; petals 9 x 6 mm, obovate, glandular; stamens plenty; disc 5 mm, not enlarged; ovary 2-celled. Fruit not seen.

Fl.: January-February

Distr.: Peninsular India and Sri Lanka. Occasional; in fairly exposed shola regions. ENP, Mampallam Chola, *KKK 17560.*

Eugenia calcadensis Bedd., Ic. t. 273. 1868-1872; Duthie in Hook. f., FBI 2: 502. 1879; Gamble, FPM 484. 1919.

Small trees. Leaves to 8 x 3 cm, base acute, apex acute to shortly acuminate. Flowers white, to 2.5 cm across; calyx tube 4 mm long, lobes 4 x 5 mm, orbicular, tomentose outside; petals 10 x 8 mm, orbicular, slightly scarious and recurved at margins. Fruits not seen.

Fl.: February-March

Distr.: Endemic to Southern Western Ghats. Occasional; in fairly exposed shola regions at higher altitudes. Anamudi slope, ENP, *KKK 18551.*

Eugenia sp. 1.

Small trees. Leaves to 9 x 5 cm, base acute, apex abruptly acuminate, glabrous, veins distant, prominent beneath, reticulated in between; petiole 0.5 cm. Flowers creamy white, to 1.8 cm across, rarely in pairs or solitary; calyx tube 5 x 6 mm, lobes 4 x 5 mm, orbicular, tomentose outside; petals 6 x 5 mm, orbicular, margisns scarious; staminal disc broad; filaments to 7 mm; style 7 mm. Fruits not seen.

Fl.: February-March

Distr.: Rare; found along streamside at higher altitudes. ENP, Umayamala, *KKK 17520.*

Note: This species is very much allied to *E. calcadensis* in general appearance, but differs in the fascicled inflorescence, smaller flowers borne on longer pedicels and elliptic to orbicular leaves.

RHODOMYRTUS (DC.) Reichenbach

Nom. 117. 1841.

Rhodomyrtus tomentosa (Ait.) Hassk., Flora 25(2): 35. 1842; Duthie in Hook. f., FBI 2: 469. 1878; Gamble, FPM 471. 1919; Fyson, FSIHS 218. t. 166. 1932; Matthew, Ill. FPH t. 316. 1996 & FPH 492. 1999. *Myrtus tomentosa* Ait., Hort. Kew (ed. 1) 2: 159. 1789; Wight, Ic. t. 522. 1842. **Kirattan (EBIS). Plate 5.6.5.**

Leaves opposite, decussate, to 5 x 3 m, elliptic, base acute, apex acute to obtuse, coriaceous, grey-tomentose below, softly puberulus above. Cymes 2-3 flowered. Flowers 2 cm across; calyx cupular, lobes 5, 6 x 4 mm, obtuse, tomentose; petals 5, pink, to 10 x 5 mm, obovate, tomentose, apex rounded; stamens rose coloured; ovary inferior, to 6 x 5 mm, subglobose, tomentose. Berry 1 cm across, subglobose.

Fl. & Fr.: June-July

Distr.: Indo-Malesia and China. Occasional; along shola borders at higher altitudes. MS, Methappu, *KKK 16415.*

SYZYGIUM R. Brown *ex* Gaertner

Fruct. 1: 166. 1788, *typ. cons.*

1. Cymes terminal or axillary, < 6 cm long; leaves small or medium sized 2
1. Cymes lateral, > 10 cm long; leaves large ..... **S. cumini**
2. Petals free, deciduous; branchlets tetragonous ..... **S. densiflorum**
2. Petals calyptrate; branchlets terete 3
3. Leaves membranous, elliptic-ovate; nerves close and regular ..... **S. gardneri**
3. Leaves coriaceous, obovate; nerves distant, reticulate in between ..... **S. caryophyllatum**

Syzygium caryophyllatum (L.) Alston in Trimen, Handb. Fl. Ceylon 6: (Suppl.) 116. 1931; Matthew, Ill. FPH t. 318. 1996 & FPH 495. 1999. *Myrtus caryophyllata* L., Sp. Pl. 472. 1753. *Syzygium caryophyllaeum* (L.) Gamble, FPM 480. 1919, non Gaertn. 1788. *Eugenia caryophyllaea* (L.) Wight, Ic. t. 540. 1842; Duthie in Hook. f., FBI 2: 490. 1878. **Potti Njaval (EBIS). Plate 4.5.1.**

Leaves to 9 x 4 cm, obovate, base attenuate, apex obtusely acute to acuminate, coriaceous. Cymes corymbose. Flowers 4 mm wide; calyx tube to 4 x 3 mm, ovoid, lobes ovate; petals cream, suborbicular. Berry to 1 cm across, globose, red.

Fl. & Fr.: April-August

Distr.: Western Ghats and Sri Lanka. Common; found at lower and medium altitudes. MS, Coupe road, *KKK 16580*; Chengalar, *KKK 17671.*

Syzygium cumini (L.) Skeels, U. S. D. A. Bur. Pl. Industr. Bull. 248: 2. 1912; Matthew, FPH 495. 1999. *Myrtus cumini* L., Sp. Pl. 471. 1753. *Eugenia jambolana* Lam., Encycl. 3: 198. 1789; Wight, Ic. t. 535. 1842; Duthie in Hook. f., FBI 2: 499. 1879. *Syzygium jambolanum* (Lam.) DC., Prodr. 3: 259. 1828; Gamble, FPM 481. 1919; Fyson, FSIHS 222. t. 170. 1932. **Valiya Njaval (EBIS) Plate 4.5.2.**

Leaves to 13 x 5.5 cm, elliptic, base acute, apex acuminate, coriaceous, minutely punctate. Cymes on the axils of leaf scars, to 16 cm long; calyx tube turbinate, obscurely 4-lobed; petals white, deciduous. Berry to 2 x 1.5 cm, oblong, purple.

Fl. & Fr.: March-August

Distr.: Indo-Malesia. Common; at lower altitudes and in disturbed regions only. MS, Kolathuvada, *KKK 16050*; Thalachorkadavu, *KKK 16452*; K-3.5, *KKK 16571.*

Syzygium densiflorum Wall. *ex* Wight & Arn., Prodr. 329. 1834; Matthew, Ill. FPH t. 319. 1996 & FPH 496. 1999. *Syzygium arnottianum* Walp. Rep. 2: 180. 1843; Gamble,

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FPM 478. 1919; Fyson, FSIHS 219. t. 167. 1932. *Eugenia arnottiana* (Walp.) Wight, Ic. t. 999. 1845; Duthie in Hook. f., FBI 2: 483. 1878. **Pilla Njaval (EBIS). Plate 4.5.3.**

Leaves to 6 x 2.5 cm, elliptic, base acute, apex caudate-acuminate, subcoriaceous. Cymes corymbose, to 6 cm long. Flowers to 6 mm wide; calyx tube 4 x 4 mm, turbinate, lobes ovate; petals free, cream, 3 x 2.5 mm, obovate; stamens to 6 mm long; ovary oblong. Berry oblong, red.

Fl. & Fr.: February-May

Distr.: Endemic to Southern Western Ghats. Common; usually found at higher altitudes only. ENP, Amarachola, *KKK 17507* & *KKK 18531*. VMS, *KKK 31137*.

Syzygium gardneri Thw., Enum. Pl. Zeyl. 117. 1859; Gamble, FPM 479. 1919. *Eugenia gardneri* (Thw.) Bedd., For. Man. Bot. FBI 108. 1874; Duthie in Hook. f., FBI 2: 489. 1878. *E. cymosa* Lam. var. *rostrata* Duthie in Hook. f., FBI 2: 482. 1878. **Venkal Njaval (EBIS).**

Leaves to 8 x 4 cm, elliptic-ovate, base rounded to acute, apex caudate-acuminate, membranous. Cymes to 8 cm long. Flowers globose; calyx tube 2 x 3 mm, obconical, lobes obtuse; petals calyptrate. Berry oblong, purple.

Fl. & Fr.: December-February

Distr.: Western Ghats & Sri Lanka. Rare; in medium and higher sholas. MS, Idlimottai, *KKK 31102*.

40. MELASTOMATACEAE

1. Epiphytic, subscandent shrubs ..... **Medinilla**
1. Terrestrial herbs, shrubs or trees **2**
2. Herbs or shrubs; leaves 3-5 ribbed from base **3**
2. Small trees; leaves penninerved ..... **Memecylon**
3. Succulent herbs; flowers trimerous ..... **Sonerila**
3. Herbs or shrubs, not succulent; flowers tetra or pentamerous ..... **Osbeckia**

MEDINILLA Gaudinchaud *ex* A. P. de Candolle

in Freyc., Voy. Uranie Bot. 484. 1830.

Medinilla malabarica Bedd., Ic. t. 157. 1868-1874; Clarke in Hook. f., FBI 2: 548. 1879; Gamble, FPM 496. 1919; Fyson, FSIHS 229. 1932.

Petiole, leaf base, peduncle and flowers crimson red. Leaves to 7 x 3 cm, elliptic-lanceolate, base rounded, apex acute, thinly fleshy. Fascicles axillary, 1-3 flowered; calyx 4, tube 7 x 5 mm long, truncate; petals 4, to 12 x 10 mm, ovate, obtuse; stamens 8; ovary enclosed in the calyx tube. Berry, crowned by the calyx limb.

Fl. & Fr.: November-December

Distr.: Endemic to Southern Western Ghats. Rare; along stream sides or shola borders at higher altitudes. ENP, Bhiman Odai, *KKK 18040*.

MEMECYLON Linnaeus

Sp. Pl. 349. 1753.

Memecylon flavescens Gamble, Kew Bull. 1919: 226. 1919 & FPM 503. 1919; Fyson, FSIHS 232. 1932.

Leaves opposite, alternate at base, to 5 x 3 cm, elliptic-obovate, obtuse, coriaceous, yellowish green when dry. Flowers borne on axillary tubercles, 2.5 mm across; calyx tube campanulate, lobes 4, triangular; petals 4, ovate, acute, pale pink; stamens 8, filaments 2.5 mm long. Fruit not seen.

Fl.: February-March

Distr.: Endemic to Southern Western Ghats. Very rare and endangered; found along shola borders at medium altitudes. ENP, Mampallam Chola, *KKK 17561.*

OSBECKIA Linnaeus

Sp. Pl. 345. 1753

1. Herbs; flowers 4-merous; stamens 8 ..... **O. parvifolia**
1. Shrubs; flowers 5-merous; stamens 10 2
2. Subshrubs to bushy shrubs; branchlets and leaves short, stiff hairy 3
2. Large shrubs; branchlets and leaves ferruginous hairy ..... **O. reticulata**
3. Shrubs > 2m; leaves 5 ribbed; petal margins serrate 4
3. Subshrubs; leaves 3 ribbed; petal margins entire ..... **O. leschenaultiana**
4. Calyx tube with simple bristles only ..... **O. aspera** var. **aspera**
4. Calyx tube with conspicuous tufts of bristles with elongate stalks ..... **O. aspera** var. **wightiana**

Osbeckia aspera (L.) Blume, Bijdr. Natuurk. Wetensch. 6: 220. 1831; Wight, Ic. t. 377. 1840; Clarke in Hook. f. FBI 2: 519. 1879; Gamble, FPM 492. 1919. var. **aspera** Hansen, Ginkgoana 4: 82. 1977; Matthew, Ill. FPH t. 323. 1996 & FPH 503. 1999. *Melastoma asperum* L., Sp. Pl. 389. 1753. *Osbeckia kleinii* Wight & Arn., Prodr. 323. 1834; Gamble, FPM 492. 1919. *O. aspera* var. *kleinii* (Wight & Arn.) Clarke in Hook. f. FBI 2: 519. 1879. *O. courtallensis* Gamble, Kew Bull. 1918: 242. 1918; Gamble, FPM 492. 1919. *O. lawsonii* Gamble, Kew Bull. 1918: 242. 1918 & FPM 492. 1919.

Leaves to 3 x 2 cm, elliptic-oblong, base obtuse to rounded, apex acute. Cymes to 4 cm, 4-5 flowered. Flowers 2 x 3 cm; calyx tube 1 x 0.8 cm, lobes 4 x 2.5 cm; petals 17 x 12 mm, obovate, rose; stamens and filaments yellow. Capsule 10 mm across.

Fl. & Fr.: March-June

Distr.: South India and Sri Lanka. Common; in shola ecotones and scrub-lands at higher altitudes. MS, Idlimottai, *KKK 16432.*

Osbeckia aspera (L.) Blume, Bijdr. Natuurk. Wetensch. 6: 220. 1831, var. **wightiana** (Benth. *ex* Wight & Arn.) Trimen, Handb. Fl. Ceylon 2: 196. 1894; Matthew, Ill. FPH t. 324. 1996 & FPH 503. 1999. *O. wightiana* Benth. *ex* Wight & Arn., Prodr. 1: 323. 1834; Wight, Ic. t. 998. 1845; Clarke in Hook. f. FBI 2: 519. 1879; Gamble, FPM 493. 1919; Fyson, FSIHS 226. t. 173. 1932.

Leaves subsessile, to 3 x 1.5 cm, ovate-oblong, base rounded, apex acute, whitish or pale below. Flowers 1-3 together; calyx tube 8 mm long, subglobose, lobes acute, hairy at apex; petals purple, 2 cm long, obovate; style curved at tip. Capsule 11 mm across.

Fl. & Fr.: March-May

Distr.: Endemic to South India. Common; along shola borders and scrublands at lower altitudes. MS, K-6, *KKK 31018.*

Osbeckia leschenaultiana DC., Prodr. 3: 142. 1828; Clarke in Hook. f., FBI 2: 520. 1879; Gamble, FPM 493. 1919; Fyson, FSIHS 227. t. 174. 1932; Matthew, Ill. FPH t. 327. 1996 & FPH 505. 1999. *O. gardneriana* Wight, Ic. t. 997. 1843-45.

Leaves sessile, to 2.5 x 1.5 cm, ovate-oblong, base rounded, apex acute. Flowers in dense trichotomous heads; calyx tube 8 mm long, subglobose, lobes acute, hairy, bristles stalked, brown; petals purple, to 1.5 cm long, obovate; stamens yellow. Capsule to 10 x 13 mm, subglobose, hairy.

Fl. & Fr.: March-April

Distr.: Endemic to Southern Western Ghats. Common along shola edges and scrub lands at higher altitudes. MS, Methappu, *KKK 16002.*

Osbeckia parvifolia Arn. in Hook., Comp. Bot. Mag. 2: 308. 1837; Clarke in Hook. f., FBI 2: 515. 1879. *O. cupularis* D. Don *ex* Wight & Arn., Prodr. 1: 323. 1834 p.p.; Gamble, FPM 494. 1919; Fyson, FSIHS 224. t. 171. 1932; Matthew, FPH 504. 1999. *O. rosea* Fyson, J. Ind. Bot. Soc. 11: 49. 1932; Gamble, FPM 1873. 1936.

Stem yellow. Leaves to 4 x 2 cm, elliptic or elliptic-ovate, acute, hairy on both sides. Flowers in close branches; calyx tube deep red, to 5 x 4 mm, lobes acute; petals to 7 x 6 mm, obovate, white blotched with pink on outside, margins hairy; style stout. Capsule to 6 x 5 mm, campanulate.

Fl. & Fr.: August-September

Distr.: South India and Sri Lanka. Occasional; in grasslands at higher altitudes. MS, Idlimottai, *KKK 16636.*

Note: The present collection is a new record to Kerala.

Osbeckia reticulata Bedd., Trans. Linn. Soc. London 25: 216. 1865; Clarke in Hook. f., FBI 2: 520. 1879; Gamble, FPM 493. 1919; Fyson, FSIHS 227. t. 175. 1932; Matthew, Ill. FPH t. 328. 1996 & FPH 506. 1999. **Plate 4.5.4.**

Leaves to 4.5 x 2.5 cm, ovate or ovate-lanceolate, base obtuse, apex acute, reticulate. Flowers in terminal umbellate clusters of 3 or 4; calyx tube to 11 mm across, hemispherical, lobes oblong, obtuse, ciliate and tipped by a large stellate hair, bristles stalked; petals deep purple, 2 x 1.5 cm, obovate; anthers with two small semi-circular flap like appendages at base. Capsule 17 x 12 mm, urceolate.

Fl. & Fr.: July-August

Distr.: Endemic to Southern Western Ghats. Common along shola borders and scrub lands at higher altitudes. MS, Methappu, *KKK 16417.*

Note: The present collection is a new record to Kerala.

SONERILA Roxburgh

Fl. Ind. 1: 180. 1820, *nom. cons.*

Sonerila grandiflora R. Br. *ex* Wight & Arn., Prodr. 322. 1834; Wight, Ic. t. 995. 1845; Clarke in Hook. f., FBI 2: 535. 1879; Gamble, FPM 499. 1919; Fyson, FSIHS 230. t. 177. 1932.

Stem reddish. Leaves opposite, to 5.5 x 3.5 cm, elliptic-ovate, rounded or shortly auricled at base, acute at apex, 3-nerved, sharply serrate. Flowers pink, in terminal

scorpioid cymes; calyx tube funnel shaped, glabrous, teeth 4 mm long, acute; petals 13 x 10 mm, obovate, acute; ovary inferior. Capsule 10 x 10 mm, funnel shaped; seeds 1 mm across, plenty, brown.

Fl. & Fr.: March-April

Distr.: Endemic to Southern Western Ghats. Rare; found along stream sides at medium altitudes. MS, K-6, *KKK 17603.*

41. LYTHRACEAE

ROTALA Linnaeus

Mant. 143, 175. 1771.

Rotala indica (Willd.) Koehne, Bot. Jahrb. 1: 172. 1880; Gamble, FPM 508. 1919; Joseph & Sivar., Proc. India Acad. Sci. (Pl. Sci.) 99: 184. 1989; Matthew, FPH 513. 1999. *Peplis indica* Willd., Sp. Pl. 2: 244. 1799. *Ammannia peploides* Spreng., Syst. 1: 444. 1825; Clarke in Hook. f., FBI 2: 566. 1879.

Erect or procumbent herbs; stems winged. Leaves to 10 x 7 mm, obovate-oblong, apex obtusely acute. Racemes lax; calyx 3 mm long, campanulate, lobes ovate, acuminate; petals 0.5 mm, elliptic, acute; stamens borne at the middle of calyx tube.

Fl. & Fr.: November-January

Distr.: India, Malaya to Philippines. Common; in grasslands bogs and other moist places at lower altitudes. MS, Kulachivayal, *KKK 16673.*

42. ONAGRACEAE

1. Very small annual herbs; flowers white; sepals and petals 2; fruit a berry ..... **Circaea**
1. Bushy herbs; flowers yellow; sepals and petals 4; fruit a capsule ..... **Oenothera**

CIRCAEA Linnaeus

Sp. Pl. 9. 1753

Circaea alpinia L., Sp. Pl. 9. 1753, subsp. **imaicola** (Asch. & Magn.) Kitam., Fl. Afghanistan 279. 1960; Matthew, Ill. FPH t. 332. 1996 & FPH 515. 1999. *C. alpina* L. var. *imaicola* Asch. & Magn., Bot. Zitung (Berlin) 28: 750. 1870. *C. alpina* L. var. *himalaica* Clarke in Hook. f., Hook. f., FBI 2: 589. 1879. *C. alpina* sensu Wight, Ill. Indian Bot. 2: t. 101. 1850, non L. 1753; Gamble, FPM 518. 1919; Fyson, FSIHS 237. t. 184. 1932.

Leaves alternate, to 2 x 2 cm, ovate, base truncate or broadly cuneate, apex acuminate, sinuate-serrate. Racemes axillary or terminal. Flowers 3 mm across; calyx tube ovoid, lobes 1 mm across; petals 1.5 x 1 mm, obcordate; stamens 2; ovary inferior. Berry 2.5 x 2 mm, pyriform, hispid; seeds ellipsoid.

Fl. & Fr.: July-September.

Distr.: Temperate north hemisphere. Rare; in interior sholas at higher altitudes. MS, Idlimottai, *KKK 16612.*

Note: New record to the flora of Kerala.

OENOTHERA Linnaeus

Sp. Pl. 346. 1753.

Oenothera laciniata Hill, Syst. Veg. 12 (App.): 64, pl. 10. 1767; Dietrich & Wagner, Syst. Bot. Monogr. (Onagraceae) 24: 41-43. 1988. *Raimannia laciniata* (Hill) Rose *ex* Britton & A. Br, Ill. Fl. N. U. S., ed. 2, 2: 59. 1913. *Oenothera sinuata* L., Mant. 2: 228. 1771. *Onagra sinuata* (L.) Moench., Methodus 676. 1794. *Oenothera repanda* Medikus, Act. Acad. Theod. Palat. 3: 198, t. 8. 1775. *O. minima* Pursh, Fl. Amer. Sept. 1: 262, t. 15. 1814. *O. sinuata* var. *minima* (Pursh) Nuttall, Gen. N. Amer. Pl. 1: 245. 1818.

Plants 30-60 cm tall; stem terete, pilose. Leaves alternate, sessile, 3-5 x 0.7-1.5 cm, elliptic-lanceolate, pinnately dissected in the lower half, upper half undulate or dentate, apex acute or obtuse, apiculate, pubescent. Flowers solitary, axillary; calyx tube 15 x 1.5 mm, lobes 10 x 2 mm, lanceolate, pilose; petals yellow, 8 x 4 mm, ovate-oblong; stamens 8, 4 x 1 mm long, versatile; filaments 6 mm; ovary 20 x 2 mm, 4 celled, cylindrical, scabrous-hispid; style 2 cm long; stigma 4 fid, spreading. Capsule 5 x 0.4 cm, 4 angled, cylindric, opening by 4 valves; seeds 2 x 1 mm, conical, angular, brownish-black, glabrous, plenty, in 4 rows.

Fl. & Fr.: March-April.

Distr.: Native of North America; introduced in many parts of the world such as Australia, Austria, Belgium, British Isles, France, Germany, Italy, Japan, Paraguay, South Africa, etc. (Dietrich & Wagner, 1988). Occasional; in scrublands adjoining sholas at lower altitudes. MS, Perumala, *KKK 17628*.

Notes: Matthew (1999) has reported five *Oenothera* species from South India so far, either growing in gardens or naturalised in the wild. They are *O. odorata* Jacq, *O. tetraptera* Cav., *O. rosea* Ait., *O. biennis* L. and *O. stricta* Ledeb. This species, perhaps an accidental introduction along with the fodder grasses introduced by the Regional Live Stock Dept., Munnar, has now established in lower altitude scrubland regions. The identity of this species was confirmed by Dr. Peter C. Hoch, Curator, Missouri Botanical Gardens, St. Louis, USA. Since this species is nowhere else reported from India so far, the present collection forms a new record to our country.

43. PASSIFLORACEAE

PASSIFLORA Linnaeus

Sp. Pl. 955. 1753

1. Leaves simple, entire **2**
1. Leaves palmately 3-lobed **3**
2. Leaves semi-orbicular, base rounded, apex broadly truncate ..... **P. leschenaultii**
2. Leaves ovate, base cordate, apex acuminate ..... **P. ligularis**
3. Hypanthium more than 5 cm long; petals rose ..... **P. mollissima**
3. Hypanthium to 1 cm long; petals white ..... **P. edulis**

Passiflora edulis Sims in Curtis, Bot. Mag. t. 1989. 1818; Gamble, FPM 524. 1919; Fyson, FSIHS 241. t. 187. 1932; Matthew, FPH 524. 1999. **Passion Fruit** (*English*), **Thattu Pootan, *Kodikkai, Poonakkai* (EBIS)**

Leaves to 14 x 12 cm, lobes to 9 x 5 cm, ovate, median one larger, base truncate to cordate, subcoriaceous, margins serrate. Flowers solitary, to 5 cm across; hypanthium lobes 3.5 x 1 cm; petals 5, 2 x 0.5 cm, oblong; corona in 4-5 whorls, filaments to 2.5 cm, violet at apex and white at base. Berry to 7 x 6 cm, ovoid, shell hard, pulp sweet, orange coloured; seeds 6 x 4 mm, black.

Fl. & Fr.: June-October

Distr.: Originally from America; introduced in India. Occasional; along shola borders at lower altitudes. MS, Chengalar, *KKK 16699.* PUS, *KKK 18574.*

Note: This exotic and cultivated species has now colonized in the wild. Birds, squirrels and monkeys are the active agents of seed dispersal.

Passiflora leschenaultii DC., Prodr. 3: 326. 1828; Wight, Ic. t. 39. 1838; Masters in Hook. f., FBI 2: 599. 1879; Gamble, FPM 524. 1919; Fyson, FSIHS 240. t. 185. 1932; Matthew, Ill. FPH t. 340. 1996 & FPH 525. 1999. **Murumurukkan Kodi (EBIS).**

Leaves to 9 x 7 cm, chartaceous, puberulus beneath. Flowers 4 cm across, axillary, in pairs; hypanthium 1 cm wide, lobes 2 x 0.6 cm, oblong, apex obtuse, petalloid; petals to 1.5 x 0.5 cm, oblong; coronal filaments to 1.5 cm; androgynophore 8 mm; ovary glabrous. Berry 4 x 3.5 cm, ovoid; seeds 5 x 3 mm.

Fl. & Fr.: February-June

Distr.: Endemic to Southern Western Ghats. Common; along shola borders at lower and medium altitudes. MS, K-3, *KKK 16132.* PAS, Vandaravu, *KKK 18592.*

Passiflora ligularis Juss., Ann. Mus. Natl. Hist. Nat. 6: 113. t. 40. 1865; Matthew, FPH 526. 1999. **Sweet Granadilla** (*English*) **(EBIS).**

Leaves to 16 x 12 cm, ovate, 6-7 nerved, glabrous; petiole with 4-6 thread like glands, each 6-7 mm long near the base of the lamina. Flowers solitary, 5 cm wide; hypanthium lobes 5, to 4 x 2 cm, ovate-acuminate; petals 5 x 1 cm long, oblong; coronal filaments to 4 cm long; Berry 9 x 6 cm, ovoid; seeds 8 x 4 mm.

Fl. & Fr.: June-December

Distr.: Native of Central America to Western South America; introduced to India. Rare; along shola borders at lower altitudes. MS, Perumala, *KKK 31035.*

Notes: New record to the flora of Kerala. This exotic and cultivated plant is now running wild in the higher ranges.

Passiflora mollissima (H. B. K.) L. H. Bailey, Rhodora 18: 156. 1916; Matthew, Ill. FPH t. 341. 1996 & FPH 526. 1999. *Tacsonia mollissima* H.B.K. Nov. Gen. Sp. 2: 144. 1817; Fyson, FSIHS 241. t. 188. 1932. **(EBIS).**

Leaves to 9 x 15 cm; lobes 8 x 4 cm, ovate-lanceolate, margins serrate. Flowers solitary, to 9 cm wide, pendulous; hypanthium to 6 x 1 cm, swollen below; sepals to 4.5 x 1.2 cm, oblong-acuminate, apex mucronate, pinkish; petals to 4.5 x 1.8 cm, oblong-lanceolate, rose; staminal filaments to 1.5 cm; ovary 10 x 3 cm, pubescent. Berry to 8 x 3 cm, oblong-ovoid, tomentose outside; seeds 6 x 5 mm.

Fl. & Fr.: June-September

Distr.: Native of South America; cultivated in Europe and other regions. Occasional; along shola borders at lower altitudes. MS, K-3.5, *KKK 31034*.

Note: New record to the flora of Kerala. This exotic and cultivated plant is now running wild in the higher ranges.

44. CUCURBITACEAE

1. Leaves palmately 5-7 lobed; petals fimbriate ..... **Trichosanthes**
1. Leaves palmately 3-5 lobed; petals not fimbriate **2**
2. Leaves entire or shallowly 3-lobed **3**
2. Leaves deeply palmately 5-lobed ..... **Diplocyclos**
3. Leaves amplexicaule; flowers dioecious only ..... **Solena**
3. Leaves not amplexicaule; flowers monoecious and dioecious ..... **Zehneria**

DIPLOCYCLOS Post & O. Kuntze

Lex. 178. 1903.

Diplocyclos palmatus (L.) Jeffrey, Kew Bull. 15: 352. 1962; Matthew, FPH 536. 1999. *Bryonia palmata* L., Sp. Pl. 1012. 1753. *B. laciniosa* L., Sp. Pl. 1013. 1753, p.p. excl. *typus*; Wight, Ic. t. 500. 1841; Clarke in Hook. f., FBI 2: 622. 1879. *Bryonopsis laciniosa* sensu Naucl., Ann. Sci. Nat. Bot. Ser. 4. 12: 141. 1859; Gamble, FPM 534. 1919. **Pambu kodi.**

Slender climbers; tendrils bifid. Leaves to 13 x 12 cm, serrate. Flowers monoecious, fascicled, 3-6 together; calyx tube 3 mm long, broadly campanulate, lobes 5; corolla campanulate, lobes 5, to 6 x 3 mm, obovate; ovary globose. Berry 2 cm across, globose, dark green with white longitudinal parallel bands; seeds 6 x 5 mm, pyriform, compressed, thinly rugose.

Fl. & Fr.: October-December

Distr.: Indo-Malesia, China and Africa. Occasional; along shola margins at lower altitudes. MS, Pallang mala, *KKK 16688*; Puthur, *KKK 16720*.

SOLENA Lourerio

Fl. Cochinch. 477, 514. 1790.

Solena amplexicaulis (Lam.) Gandhi in Sald. & Nicols., Fl. Hassan Distr. 179. 1976. *Bryonia amplexicaulis* Lam., Encycl. 1: 496. 1785. *Solena heterophylla* Lour., Fl. Cochinch. 514. 1790. *Zehneria umbellata* Thw., Enum. Pl. Zeyl. 125. 1859; Clarke in Hook. f., FBI 2: 625. 1879. *Melothria heterophylla* (Lour.) Cogn. in DC., Monogr. Phan. 3: 618. 1881; Gamble, FPM 539. 1919; Chakravarthy, Fl. Ind. Fasc. 11: 79. 1982.

Slender, scabrous climbers. Leaves to 15 x 7.5 cm, ovate, base hastate, coriaceous. Male flowers in axillary racemes; calyx tube 6 mm long, campanulate, lobes minute; petals 1.5 mm long, triangular; stamens 3, erect. Female flowers solitary, pedicellate. Berry to 2 x 2.5 cm, globose, smooth; seeds 8 x 8 mm, globose, rugose along the margins, dark brown.

Fl. & Fr.: December-May

Distr.: Indo-Malesia and Pakistan. Common; found along shola margins at lower altitudes. MS, K-3, *KKK 31132*.

TRICHOSANTHES Linnaeus

Sp. Pl. 1008. 1753

Trichosanthes lobata Roxb., Fl. Ind. 3: 703. 1832; Clarke in Hook. f., FBI 2: 610. 1879; Matthew, Suppl. Ill. FPH t. 991. 1998 & FPH 543. 1999. *T. perrottetiana* Cogn. in DC., Monogr. Phan. 3: 362. 1881; Gamble, FPM 529. 1919. *T. villosula* Cogn. in DC., Monogr. Phan. 3: 362. 1881; Gamble, FPM 529. 1919; Fyson, FSIHS 242. t. 189. 1932. **Kovan Kodi, Pepparal Kodi, Kattu Padavalam (EBIS).**

Villous climber. Leaves to 15 x 13 cm, lobes cuspidate, densely pubescent beneath, margins serrate. Flowers white, dioecious. Male racemes to 20 cm; flowers about 10-12; calyx tube 1.5 x 0.5 cm, lobes 0.5 cm, linear; petals 5, to 2.5 x 0.5 cm; stamens 3. Female flowers solitary, axillary; ovary ovoid. Berry 8 x 3 cm, glabrous, green with white lines; seeds 13 x 6 mm, oblong, rugose along margins.

Fl. & Fr.: October-December

Distr.: Endemic to Peninsular India. Occasional; along shola margins. MS, Pallang mala, *KKK 16697.*

ZEHNERIA Endlicher

Prodr. Fl. Norfolk. 1: 69. 1833.

1. Leaves ovate, deltoid; flowers monoecious; petals glabrous .....**Z. maysorensis** var. **umbellata**
1. Leaves triangular; flowers dioecious; petals villous within.....**Z. scabra**

Zehneria maysorensis (Wight & Arn.) Arn in Hook.'s, J. Bot. (Hook.) 3: 275. 1841, var. **umbellata** (Chakravarthy) Kumari in Nair & Henry, Fl. Tamil Nadu , 1: 175. 1983. *Melothria mucronata* var. *umbellata* Chakravarthy, Monog. Indian Cucurb. 150. 1959. *Bryonia maysorensis* Wight & Arn., Prodr. 345. 1834; Wight, Ic. t. 1609. 1850. *M. perpusilla* var. *subtruncata* Cogn. in DC., Monogr. Phan 3: 606. 1881; Gamble, FPM 538. 1919. *M. perpusilla* sensu Gamble, FPM 538. 1919, non (Blume) Cogn. 1881; Fyson, FSIHS 243. t. 190. 1932. **Musumusukkan Chedi.**

Scabrous climber. Leaves to 6 x 5 cm, base truncate or shallowly cordate, puberulus along the nerves at lower side, glandular toothed. Male flowers small, white; petals glabrous. Female flowers slightly yellowish; calyx cup 4 mm; petals 4 x 2 mm, ovate; ovary 3 mm across, globose. Berry 8 mm across.

Fl. & Fr.: January-March

Distr.: Endemic to Southern Western Ghats. Rare; along shola borders at medium and higher altitudes. MS, Methappu, *KKK 16011*; Gudalar, *KKK 16083.*

Note: This species was considered endemic to Tamil Nadu (Ahmedullah & Nayar, 1987). Present collection thus forms a new distributional record to Kerala.

Zehneria scabra (L. f.) Sond. in Harv. & Sond., Fl. Cap. 2: 486. 1862; Matthew, FPH 545. 1999. *Bryonia scabra* L. f., Suppl. Pl. 423. 1781. *Zehneria hookeriana* Arn. in Hook., J. Bot. 3: 275. 1841; Clarke in Hook. f., FBI 2: 624. 1879. *Melothria perpusilla* sensu Chakravarthy, Monogr. India Cucurb. 146. 1959 p.p. *M. mucronata* sensu Gamble, FPM 538. 1919, non (Blume) Cogn. 1881; Fyson, FSIHS 244. 1932.

Glabrous climber. Leaves to 11 x 9 cm, base cordate, glandular toothed. Umbels 3-5 flowered; flowers white, 7 mm across; calyx tube 2 mm long; petals obovate; stigma 3 lobed; ovary 2 mm across. Berry 10 mm across; seeds 3 x 3 mm, obovate.

Fl. & Fr.: July-November

Distr.: Tropical Africa, India and South East Asia. Common along shola borders at lower and medium altitudes. MS, K-6, *KKK 16180*; K-4, *KKK 16513*; K-7, *KKK 16711*.

45. BEGONIACEAE

BEGONIA Linnaeus

Sp. Pl. 1056. 1753

Begonia malabarica Lam., Encycl. 1: 393. 1785; Clarke in Hook. f., FBI 2: 655. 1879; Gamble, FPM 546. 1919; Fyson, FSIHS 245. 1932; Matthew, FPH 546. 1999. *Diploclinium lindleyanum* Wight, Ic. t. 1817. 1852. *Begonia fallax* A.DC. Prodr. 15(1): 329. 1864; Clarke in Hook. f., FBI 2: 643. 1879. *B. dipetala* Wight, Ic. t. 1813. 1852. ***Minukki* (EBIS).**

Branching shrubs. Leaves alternate, to 11 x 6 cm, obliquely ovate, toothed and serrate, hispid. Cymes axillary, dichotomously branched. Flowers pale rose, monoecious. Male flowers: sepals 13 mm across, orbicular; stamens 3 mm long. Female flowers: sepals 9 x 5 mm, reniform; ovary 8 x 4 mm, inferior. Capsule 2.5 x 2 cm, ovate-elliptic, winged; seeds brown, numerous.

Fl. & Fr.: April-June.

Distr.: Peninsular India and Sri Lanka. Occasional; in low altitude sholas near stream sides. MS, Thalachorkadavu, *KKK 17660*. PUS, *KKK 18573*.

46. APIACEAE

1. Umbels simple 2
1. Umbels compound 4
2. Leaves simple, orbicular-reniform; mericarps unarmed 3
2. Leaves tri-foliolate; mericarps prickled ..... **Sanicula**
3. Leaf margin dentate; base sheathing; stipules absent ..... **Centella**
3. Leaf margin lobed; base not sheathing; stipules present ..... **Hydrocotyle**
4. Leaf (basal) simple 5
4. Leaves compound or lobed 6
5. Petals yellow; leaves filiform ..... **Bupleurum**
5. Petals white; leaves (basal) ovate-cordate ..... **Pimpinella**
6. Erect herbs; leaves pinnate ..... **Heracleum**
6. Trailing herbs; leaves pedately 3-7 lobed ..... **Vanasushava**

BUPLEURUM Linnaeus

Sp. Pl. 236. 1753

1. Small grass like herbs; lower leaves crowded near base ..... **B. distichophyllum**
1. Tall, well branched herbs; lower leaves not crowded near base 2

2. Lower leaves to 30 x 1 cm, linear-oblong, apex acute ..... **B. mucronatum**
2. Lower leaves to 10 x 0.5 cm, linear, apex obtuse ..... **B. wightii**

Bupleurum distichophyllum Wight & Arn., Prodr. 370. 1834 & Wight, Ic. t. 1006. 1845; Clarke in Hook. f. FBI 2: 677. 1879; Gamble, FPM 558. 1919; Fyson, FSIHS 251. t. 199. 1932; Mukh. & Const., Umbell. India 59. 1993; Matthew, Ill. FPH t. 344. 1996 & FPH 557 1999.

Basal leaves to 20 x 3 mm, oblong-ovate, lower cauline leaves distichous, to 5 x 0.5 cm, linear-subulate, apex acuminate. Umbels terminal and in upper axils; umbellules 5 mm across, 15-20 flowered; petals obovate; stylopodium conical. Mericarps to 2 mm.
Fl. & Fr.: July-October
Distr.: Endemic to Southern Western Ghats. Common; in grassland ecotones at higher altitudes. MS, Idlimottai, *KKK 16620.*

Bupleurum mucronatum Wight & Arn., Prodr. 370. 1834; Gamble, FPM 558. 1919; Fyson, FSIHS 250. t. 198. 1932; Mukh. & Const., Umbell. India 57. 1993; Matthew, FPH 557. 1999. *B. ramosissimum* Wight & Arn., Prodr. 370. 1834. *B. falcatum* var. *ramosissimum* (Wight & Arn.) Dalz. & Gibs., Bombay Fl. 108. 1861. *B. mucronatum* var. *ramosissimum* (Wight & Arn.) Clarke in Hook. f., FBI 2: 676. 1879. *B. wightii* Mukh., Indian For. 95: 567. 1969, non Kozo-Polj. 1913

Leaves cauline, basal ones to 30 x 1 cm, linear-oblong. Umbellules 5 mm across, 5-10 flowered. Flowers yellow; involucral bracts 5, lanceolate; petals to 1 mm, apex emarginate; ovary conical, ribbed. Mericarps 3 x 2 mm, elliptic, sub-pentagonal.
Fl. & Fr.: February-March
Distr.: Peninsular India and Sri Lanka. Common along shola borders at higher altitudes. MS, Methappu, *KKK 18561.*

Bupleurum wightii Kozo-Polj., Epitome Bupleurorum Rossiae 166. 1913, non Mukh. 1969; Mukh. & Const., Umbell. India 64. 1993. *B. virgatum* Wight & Arn., Prodr. 370. 1834; Gamble, FPM 558. 1919; *B. mucronatum* Wight & Arn. var. *virgatum* (Wight & Arn.) Clarke in Hook.-f., FBI 2: 676. 1879; Fyson, FSIHS 251. 1932, non. *B. virgatum* Cav., 1827.

Basal leaves to 10 x 0.4 cm, linear. Umbels long peduncled with many rays. Involucral bracts 5, 10 x 1 mm, mucronate acuminate. Umbellules 7 mm across. petals to 1 mm; ovary conical, ribbed. Mericarps to 2 mm across, elliptic.
Fl. & Fr.: February-March
Distr.: Peninsular India and Sri Lanka. Occasional; found along shola fringes MS, K-3, *KKK 16562.*

CENTELLA Linnaeus

Sp. Pl. ed. 2, 1393. 1763.

Centella asiatica (L.) Urban in Mart., Fl. Bras. 11(1): 287. t. 78. f. 1. 1879; Gamble, FPM 556. 1919; Fyson, FSIHS 248. t. 195. 1932; Mukh. & Const., Umbell. India 15. 1993; Matthew, FPH 559. 1999. *Hydrocotyle asiatica* L., Sp. Pl. 234. 1753; Wight, Ic. t. 565. 1842; Clarke in Hook. f., FBI 2: 669. 1879. **Kuthirakkulambu Chedi, Vallara (EBIS).**

Prostrate herbs rooting at nodes. Leaves rosetted at base, to 4 x 3.5 cm, base cordate, apex rounded. Umbels 3 flowered. Flowers 2 mm wide; calyx tube 1 mm long, lobes 5, triangular; petals 5, 1 mm long, oblong, purplish; stamens 5; ovary 2 celled. Mericarps 2.5 x 1.5 mm, ovoid, laterally flattened, 7-9 ribbed.

Fl. & Fr.: January-February.

Distr.: Tropical Asia and Africa. Common along roadsides and stream sides at lower altitudes. MS, Chengalar, *KKK 18095.*

HERACLEUM Linnaeus

Sp. Pl. 249. 1753

1. Densely hirsute herb found in marshes; leaves ovate; mericarps ovoid-obovate..... **H. ceylanicum**
1. Slightly hirsute herb of open places; leaves oblong-obovate; mericarps elliptic..... **H. sprengelianum**

Heracleum ceylanicum Gardn. *ex.* Clarke in Hook. f. FBI 2: 716. 1879; Gamble, FPM 565. 1919; Fyson, FSIHS 256. t. 203. 1932, *"zeylanicum"*; Mukh. & Const., Umbell. India 243. 1993; Matthew, Ill. FPH t. 347. 1996 & FPH 562. 1999.

Leaves pinnate, to 25 x 15 cm; leaflets 5-6 pairs, to 10 x 6 cm, ovate-oblong. Umbels terminal or in upper axils, involucre absent; umbellules 10-15 flowered; calyx teeth small, aristate; petals 5, oblong-ovate, one larger, emarginate, 3-5 mm long. Mericarps to 10 x 3 mm long.

Fl. & Fr.: June-August.

Distr.: Peninsular India and Sri Lanka. Common in grassland bogs at higher altitudes. MS, Idlimottai, *KKK* 18185.

Note: From India, this species is so far reported from Palni hills of Tamil Nadu only (Mukh. & Const., 1993). Present collection is a new distributional record for Kerala.

Heracleum sprengelianum Wight & Arn., Prodr. 372. 1834; Clarke in Hook. f. FBI 2: 716. 1879; Gamble, FPM 565. 1919; Fyson, FSIHS 257. t. 204. 1932; Mukh. & Const., Umbell. India 241. 1993; Matthew, Ill. FPH t. 348. 1996 & FPH 564. 1999. *Pastinaca sprengeliana* (Wight & Arn.) Wight, Ic. t. 1008. 1845. **Plate 4.6.1.**

Leaves 3 pinnate, to 30 x 20 cm, ovate, hirsute; leaflets ovate, middle one often divided again; base rounded, apex acuminate, margin crenate-serrate; cauline leaves many. Umbels terminal or in upper axils; umbellules 16-18 flowered; calyx absent; petals small; ovary hairy; styles curved. Mericarps to 6 x 3 mm.

Fl. & Fr.: October-December.

Distr.: Endemic to Western Ghats. Common in grassland ecotones at higher altitudes. ENP, Mesthirikettu, *KKK 18003.*

HYDROCOTYLE Linnaeus

Sp. Pl. 234. 1753

Hydrocotyle javanica Thunb., Diss. Hydroc. n. 17. t. 2. 1798; Clarke in Hook. f. FBI 2: 667. 1879; Gamble, FPM 556. 1919; Fyson, FSIHS 247. t. 192. 1932; Mukh. & Const., Umbell. India 11. 1993; Matthew, Ill. FPH t. 350. 1996 & FPH 565. 1999. *H. polycephala* Wight & Arn., Prodr. 366. 1834; Wight, Ic. t. 1003. 1845. **Vaite Kala, Vella Vaite.**

Prostrate herbs, rooting at nodes. Leaves alternate, 7 x 5 cm, 8-9 palmately lobed, lobes triangular, softly pilose. Umbels small, pedicellate. Flowers 20-30 together, white, 1 mm across; calyx teeth absent; petals 5, to 0.6 mm long, ovate, acute, inflexed; stamens 5. Mericarps 1.5 x 2 mm, suborbicular.

Fl. & Fr.: Throughout the year

Distr.: Tropical Asia. Common undergrowth in lower and medium altitude sholas, particularly in disturbed regions. MS, Puthur, *KKK 16448.*

PIMPINELLA Linnaeus

Sp. Pl. 263. 1753

1. Leaves palmately 5 nerved 2
1. Leaves palmately 8 nerved ..... **P. pulneyensis**
2. Leaves broadly cordate, chartaceous, basal ones never tripartite ..... **P. leschenaultii**
2. Leaves orbicular-cordate, coriaceous, basal ones often tripartite ..... **P. candolleana**

Pimpinella candolleana Wight & Arn., Prodr. 369. 1834; Wight, Ic. t. 341. 1840; Clarke in Hook. f. FBI 2: 687. 1879; Gamble, FPM 560. 1919; Fyson, FSIHS 253. t. 200. 1932; Mukh. & Const., Umbell. India 148. 1993; Matthew, Ill. FPH t. 352. 1996 & FPH 567. 1999.

Tall, tawny pubescent herbs. Lower leaves 3 x 3 cm, sharply toothed, pubescent; passing in cauline ones to deeply pinnatifid and finally to a sheath with pinnatifid blade. Flowers small, 9-16 in an umbellule; calyx teeth minute; petals 5, 1 mm across, obovate, emarginate, hairy. Fruit 3 x 2 mm, ovate, densely villous, rugose.

Fl. & Fr.: November-January

Distr.: Endemic to Western Ghats. Common along grassland ecotones at lower altitudes. MS, K-4, *KKK 16775.*

Pimpinella leschenaultii DC. Prodr. 4: 122. 1830; Wight, Ic. t. 1005. 1845; Clarke in Hook. f. FBI 2: 687. 1879; Gamble, FPM 560. 1919; Fyson, FSIHS 254. 1932; Mukh. & Const., Umbell. India 141. 1993; Matthew, Ill. FPH t. 353. 1996 & FPH 567. 1999. **Plate 4.6.2.**

Scapigerous herbs; branchlets softly pubescent. Basal leaves simple, 4-5 cm wide, apex acute, margin dentate; cauline ones 3 foliolate; upper deeply pinnatifid or reduced to a sheath with pinnatifid blade. Flowers small; calyx teeth absent; petals 5, to 1 mm wide, obovate with a curved beak; ovary smooth, 1 mm long. Fruit not seen.

Fl.: July.

Distr.: Peninsular India and Sri Lanka. Common in grasslands at higher altitudes. MS, Idlimottai, *KKK 18187.*

Note: New record to the flora of Kerala.

Pimpinella pulneyensis Gamble, Kew Bull. 228. 1919 & FPM 560. 1919; Fyson, FSIHS 253. t. 201. 1932; Mukh. & Const., Umbell. India 141. 1993; Matthew, Ill. FPH t. 354. 1996 & FPH 568. 1999.

Tall herbs; branchlets hispid pubescent. Leaves simple at base, to 5 x 5.5 cm wide, broadly cordate, apex acute, margin denticulate, pubescent below; cauline leaves 3-foliolate, often dissected. Umbels 4 cm wide; rays 10-12; umbellules 10-12. Flowers 3 mm wide; sepals absent; petals 1.2 mm wide, emarginate; stylopodium subconical; ovary ovoid. Fruits not seen.

Fl.: August-September.

Distr.: Endemic to Southern Western Ghats. Occasional; along grassland ecotones at higher altitudes. MS, Idlimottai, *KKK* 16603.

Note: This species was so far reported from it's type locality (Palni hills) and was considered *'possibly extinct'* (Nayar, 1997; Matthew, 1999). Present collection thus forms both a rediscovery and extension of distribution of the species to Kerala.

SANICULA Linnaeus

Sp. Pl. 235. 1753

Sanicula elata Buch.-Ham. *ex* D. Don, Prodr. Fl. Nep. 183. 1825; Wight, Ic. t. 334. 1840; Mukh. & Const., Umbell. India 17. 1993; Matthew, Ill. FPH t. 356. 1996 & FPH 569. 1999. *S. hermaphrodita* Buch.-Ham. *ex* D. Don, Prodr. Fl. Nep. 183. 1825. *S. europaea* sensu Clarke in Hook. f., FBI 2: 670. 1879, non L. 1753; Gamble, FPM 557. 1919; Fyson, FSIHS 249. t. 196. 1932.

Perennial herbs; rootstock horizontal. Leaves to 10 x 6 cm, chartaceous; leaflets to 6 x 3.5 cm, ovate, base cuneate, apex acuminate, margins serrate. Umbels cymose, terminal, also in upper axils, to 25 cm. Flowers white, unisexual; sepals 5, 1 mm long, lanceolate, pointed; petals 5, to 1 mm long, obovate, apex emarginate; stamens 5. Mericarps to 3 x 2.5 mm, ovoid-oblong, covered with uncinate bristles.

Fl. & Fr.: January-March.

Distr.: Indo-Malesia and South Eastern Africa. Common along roadsides at lower and medium altitudes. MS, K-5, *KKK 16155*; K-4, *KKK 31037*.

VANASUSHAVA Mukherjee & Constance

Kew Bull. 29: 595. 1974

Vanasushava pedata (Wight) Mukh. & Const., Kew Bull. 29: 595. 1974 & Umbell. India 90. 1993; Matthew, Ill. FPH t. 357. 1996 & FPH 569. 1999. *Heracleum pedatum* Wight, Ic. t. 342. 1840; Clarke in Hook. f., FBI 2: 716. 1879; Gamble, FPM 565. 1919; Fyson, FSIHS 257. t. 205. 1932.

Leaves to 10 cm wide, orbicular to obovate, 3-7 foliolate; terminal leaflet lobed, base cuneate, apex acuminate, margins serrate. Umbels compound, terminal or in upper axils; umbellules 6-8 flowered. Flowers white, polygamous; sepals 5, 1 mm long, lanceolate; petals 5, subequal; stamens 5, free; ovary 1.5 mm, conical. Mericarps unequally winged.

Fl. & Fr.: July-October

Distr.: Endemic to Southern Western Ghats. Occasional; along roadsides at medium altitudes. MS, K-5, *KKK 31037*.

47. ARALIACEAE

1. Climbing shrubs to small trees; leaves bristly serrate; inflorescence a compound umbel..... **Pentapanax**
1. Small trees; leaves entire; inflorescence a panicle of umbel or raceme..... **2**
2. Leaves digitate; pedicels continuous ..... **Schefflera**
2. Leaves imparipinnate; pedicels jointed ..... **Polyscias**

PENTAPANAX B.C. Seeman

J. Bot. 2: 290, 294. 1864.

Pentapanax leschenaultii (DC.) Seem., J. Bot. 2: 296. 1864; Clarke in Hook. f., FBI 2: 724. 1879; Gamble, FPM 567. 1919; Fyson, FSIHS 259. 1932; Matthew, Ill. FPH t. 359. 1996 & FPH 572. 1999. *Panax leschenaultii* DC., Prodr. 4: 254. 1830. *Hedera trifoliata* Wight & Arn., Prodr. 377. 1834; Wight, Ic. t. 307. 1840.

Leaves simple pinnate or digitate; leaflets 3-5, to 15 x 10 cm, ovate-acuminate, glabrous, highly reticulate. Umbels 2-3 cm across. Flowers 3-4 mm across, plenty; calyx lobes 5, acute; petals 5, yellow; stamens 5; ovary inferior; styles connate. Drupe 4-5 celled, obscurely angled.

Fl. & Fr.: April-July

Distr.: Peninsular India, Himalayas to West China. Rare; along shola fringes at higher altitudes. MS, Idlimottai, *KKK 18162.*

Note: New record to the flora of Kerala.

POLYSCIAS J. R. Forster & G. Forster

Charact. Gen. 63, t. 32. 1776.

Polyscias acuminata (Wight) Seem., J. Bot. 3: 181. 1865; Clarke in Hook. f., FBI 2: 727. 1879; Gamble, FPM 568. 1919. *Hedera acuminata* Wight, Ic. t. 1062. 1846.

Leaves 30-35 cm long; leaflets 5-6 pairs, 5-9 x 3-4 cm, opposite, elliptic-oblong, base obtuse, apex cuspidate; petiole sheathing at base. Panicles umbelled, 30-40 cm long. Flowers 3-5 together, 3-4 mm across; petals 3 x 2 mm, ovate-acute; ovary 5 celled, inferior. Berry 5 angled, globose, purple coloured.

Fl. & Fr.: January-April.

Distr.: India and Sri Lanka. Occasional; along stream sides. MS, K-5, *KKK 17613.*

SCHEFFLERA J. R. Forster & G. Forster

Charact. Gen. 45. t. 23. 1776.

1. Flowers in umbelled panicles; leaflets not glaucous; nerves conspicuous..... **S. rostrata**
1. Flowers in racemose panicles; leaflets glaucous; nerves not conspicuous..... **S. racemosa**

Schefflera racemosa (Wight) Harms in Engl. & Prantl, Pflanzenf. 3: 38. 1894; Gamble, FPM 570. 1919; Fyson, FSIHS 260. t. 107. 1932; Matthew, FPH 573. 1999. *Hedera racemosa* Wight, Ic. t. 1015. 1845. *Heptapleurum racemosum* (Wight) Bedd., Fl. Sylv. t. 214. 1872; Clarke in Hook. f., FBI 2: 729. 1879. **Kappa Maram, Kottathunikkan.**

Leaves 30-35 cm across; leaflets 6-10, to 16 x 5 cm, oblong-lanceolate, apex acuminate. Panicles to 30 cm long, arising laterally from stout, old terminal branches. Flowers white, 8 mm across. Drupe 6 mm across; seeds ovoid.

Fl. & Fr.: February-June.

Distr.: Peninsular India and Sri Lanka. Common in exposed regions and shola fringes. MS, Puthur, *KKK 16076.*

Schefflera rostrata (Wight) Harms in Engl. & Prantl, Pflanzenf. 3: 38. 1894; Gamble, FPM 569. 1919; Fyson, FSIHS 262. 1932; Matthew, FPH 573. 1999. *Hedera rostrata* Wight, Ic. tt. 1013 & 1014. 1845, p.p. *Heptapleurum rostratum* (Wight) Bedd., For. Man. Bot. 122. 1874; Clarke in Hook. f., FBI 2: 729. 1879. ***Pullu Maram.***

Leaves to 30 cm across; leaflets 5-6, 6-14 x 3-5 cm, ovate-lanceolate, base acute, tip acuminate, nerves forming a loop at the margins. Panicles 12-14 cm long, young parts scurfy tomentose; umbels 1.5-2 cm across. Flowers white, 8-10, small; stamens exerted. Drupe 8 mm across, black; seeds compressed sideways.

Fl. & Fr.: February-March.

Distr.: Endemic to Southern Western Ghats. Very rare; along shola margins. ENP, Anamudi slope, *KKK 18544.*

Note: This species is so far reported from Nilgiris (Coimbatore) only (Ahmedullah & Nair, 1987). Present collection is a new distributional record for Kerala.

48. CORNACEAE

MASTIXIA Blume

Bijdr. 13: 654. 1825.

Mastixia arborea (Wight) Bedd., Fl. Sylv. t. 216. 1872; Clarke in Hook. f. FBI 2: 745. 1879; Gamble, FPM 573. 1919; Matthew, Blumea 23(1): 88. 1976 & Fl. Ind. Fasc. 19: 25. 1988. *Bursinopetalum arboreum* Wight, Ic. t. 956. 1845. **Eramba Maram, Kunthirikkam (EBIS). Plate 5.2.1.**

Large trees with resinous glands. Leaves alternate, to 14 x 5 cm, elliptic, suddenly narrowed in a twisted acumen; one row of glands present on either sides of mid rib. Panicle terminal, 7 cm across. Flowers greenish-white; calyx tube 3.5 mm across, campanulate, limb 5 lobed; petals 5, to 6 mm across, ovate, coriaceous, apex inflexed; stamens 5; disk 5 lobed; ovary 1 celled. Drupe 1 x 0.5 cm, ellipsoid.

Fl. & Fr.: March-July

Distr.: Endemic to Southern Western Ghats. Common in sholas at lower and medium altitudes. MS, K-4, *KKK 16581*; Chengalar, *KKK 31032.* ENP, Amarachola, *KKK 31065.*

49. CAPRIFOLIACEAE

VIBURNUM Linnaeus

Sp. Pl. 267. 1753

1. Small trees; flowers in terminal corymbose cymes 2
1. Shrubs to small trees; flowers in drooping panicles ..... **V. erubescens**

2. Corolla rotate; leaves elliptic ..... **V. punctatum**
2. Corolla tubular; leaves ovate-lanceolate ..... **V. coriaceum**

Viburnum coriaceum Blume, Bijdr. 656. 1826; Clarke in Hook. f., FBI 3: 5. 1880; Gamble, FPM 576. 1919; Fyson, FSIHS 263. t. 210. 1932. *V. hebanthum* sensu Wight, Ic. t. 1023. 1845. **Mottu Mookan (EBIS) Plate 4.5.5.**

Leaves to 15 x 6 cm, apex acuminate, glabrous, pale beneath. Inflorescence 8-10 cm across. Flowers white, 3 mm across, pedicelled; calyx tube 2 mm long, lobes obtuse; corolla tube 4 mm long, glabrous, lobes ovate-obtuse. Drupes 8 x 5 mm, elliptic, ribbed, beaked, reddish brown; seeds 6 x 4 mm, elliptic.

Fl. & Fr.: February-August

Distr.: India, Bhutan, Myanmar and Indonesia. Common along shola borders and other exposed regions. MS, Puthur, *KKK 16066*; K-4, *KKK 16150*; Methappu, *KKK 16439*; Thalachorkadavu, *KKK 16460.*

Viburnum erubescens Wall. *ex* DC., Prodr. 4: 329. 1830; Clarke in Hook. f., FBI 3: 7. 1880; Gamble, FPM 576. 1919; Fyson, FSIHS 265. t. 212. 1932; Matthew, Ill. FPH t. 365. 1996 & FPH 581. 1999. *V. wightianum* Wight & Arn., Prodr. 388. 1834; Wight, Ic. t. 1024. 1845.

Leaves to 8 x 4 cm, ovate, apex acuminate, serrate, thickly villous below. Inflorescence 3 cm across, pubescent; peduncle red. Flowers white, 6 mm across; calyx tube 3 mm, villous, lobes salvar shaped, obtuse; corolla tube 5 x 4 mm, glabrous, lobes salvar shaped, obtuse. Drupe ovoid-oblong.

Fl. & Fr..: February-June.

Distr.: India, Sri Lanka, China and Myanmar. Rare; along stream sides at lower altitudes. MS, K-6, *KKK 16181* & *KKK 17615*; Gudalar, *KKK 18509.*

Note: New record to the flora of Kerala.

Viburnum punctatum Buch.- Ham *ex* D. Don, Prodr. Fl. Nepal 142. 1825; Hook. f., FBI 3: 5. 1880; Matthew, FPH 581. 1999. *V. acuminatum* Wall. *ex* DC., Prodr. 4: 325. 1830; Gamble, FPM 575. 1919; Fyson, FSIHS 262. t. 209. 1932. *V. punctatum* Buch.-Ham *ex* D. Don var. *acuminatum* (Wall. *ex* DC.) Clarke in Hook. f., FBI 229. 1981. **Konakkara (EBIS). Plate 4.5.6.**

Young parts tomentose. Leaves to 11 x 4 cm, coriaceous, glabrous. Inflorescence 8-9 cm across. Flowers white, 5 mm across; calyx tube 1 mm long, lobes 5, obtuse; corolla lobes 2.5 mm long, ovate-obtuse; anthers yellow; ovary 1 celled. Drupes to 12 x 6 mm, elliptic, ribbed, beaked; seeds 7 x 4 mm, elliptic, compressed.

Fl. & Fr.: March-August.

Distr.: Indo-Malesia. Common along shola borders and other exposed regions at low altitudes. MS, Thalachorkadavu, *KKK 16040*; Puthur, *KKK 16442*; K-4, *KKK 16572.*

50. RUBIACEAE

1. Herbs 2
1. Trees, shrubs or lianas 8

2. Climbers; leaves whorled; pedicels jointed 3
2. Erect, diffuse or prostrate; leaves opposite; pedicels not jointed 4
3. Leaves sessile, 1 nerved; flowers 4-merous ..... **Galium**
3. Leaves petiolate, 5 or 7 nerved; flowers 5-merous ..... **Rubia**
4. Ovules 1 per cell 5
4. Ovules numerous 6
5. Flowers in terminal corymbs; corolla lobes incurved ..... **Knoxia**
5. Flowers in axillary fascicles or terminal heads; corolla lobes spreading ..... **Spermacoce**
6. Calyx teeth 4 7
6. Calyx teeth 5 ..... **Ophiorrhiza**
7. Leaf base truncate to rounded ..... **Neanotis**
7. Leaf base acute or decurrent ..... **Oldenlandia**
8. Leaves distichous; corolla lobes beaked ..... **Lasianthus**
8. Leaves decussate; corolla lobes not beaked 9
9. Corolla lobes twisted or imbricate in bud 10
9. Corolla lobes valvate in bud 12
10. Corolla 4-merous 11
10. Corolla 5-merous ..... **Wendlandia**
11. Styles as long as corolla tube; stigma 2-fid ..... **Ixora**
11. Styles much longer than corolla tube; stigma fusiform ..... **Pavetta**
12. One calyx lobe unequal, leafy, white; fruit a berry ..... **Mussaenda**
12. Calyx lobes equal; fruit a capsule or drupe 13
13. Ovules numerous; fruit a capsule ..... **Hedyotis**
13. Ovules 1 per cell; fruit a drupe 14
14. Inflorescence axillary 15
14. Inflorescence terminal 16
15. Branches with(out) spines; leaves chartaceous to subcoriaceous, not foetid ..... **Canthium**
15. Branches unarmed; leaves coriaceous, foetid ..... **Saprosma**
16. Corolla short and straight ..... **Psychotria**
16. Corolla long and curved ..... **Chassalia**

CANTHIUM Lamarck

Encycl. Meth. Bot. 1: 602. 1785.

1. Shrubs armed with recurved, supra-axillary thorns; domatia hairy 2
1. Unarmed shrubs; domatia glandular ..... **C. rheedii**
2. Flowers in sub-umbellate clusters; leaves obtusely acute ..... **C. neilgherrense** var. **chartaceum**
2. Flowers in axillary umbels; leaves caudate-acuminate ..... **C. dicoccum** var. **umbellatum**

Canthium dicoccum (Gaertn.) Teijsm. & Binn., Cat. Hort. Bog. 113. 1866. var. **umbellatum** (Wight) Sant. & Merch. in BBSI 3: 107. 1961. *C. umbellatum* Wight, Ic. t. 1034. 1845; Hook. f., FBI 3: 132. 1880. *Plectronia didyma* (Gaertn. f.) Kurz., var. *umbellatum* (Wight) Gamble, FPM 624. 1921; Fyson, FSIHS 282. 1932. *Psydrax umbellata* (Wight) Bridson, Kew Bull 48: 762. 1993; Matthew, FPH 628. 1999.

Leaves to 9 x 6 cm, elliptic to ovate, subcoriaceous. Flowers white, 3-12 together; calyx 3 mm long, obconical, lobes triangular, glabrous; corolla tube 6 mm long, campanulate, densely reflexed hairy below the stamens and erect hairy above the stamens in side; lobes 3 x 1.5 mm, oblong. Drupe 13 x 7 mm, obovoid.

Fl. & Fr.: February-April

Distr.: Endemic to Southern Western Ghats. Common at lower and medium altitudes. MS, K-5, *KKK 31066.*

Canthium neilgherrense Wight, Ic. t. 3(4): 4. t. 1064. 1846; Hook.f. FBI 3: 133. 1880, var. **chartaceum** (Gamble) Swamin. Boil. Mem., Angiosp. Taxon. Ser. 2 (1 & 2): 67. 1977; Matthew, Ill. FPH t. 367. 1996 & FPH 588. 1999. *Plectronia neilgherrensis* (Wight) Bedd., Forest Man. Bot. 134/6. 1873, var. *chartacea* Gamble, FPM 625. 1921; Fyson, FSIHS 283. t. 230. 1932. **Edali Maram.**

Leaves to 11 x 5 cm, elliptic-oblong, subcoriaceous. Flowers white, 4-6; calyx 2 mm long, cupular, lobes triangular, glabrous; corolla 8 mm across, tube 3 mm long, urceolate, villous, lobes 3 x 2 mm, ovate; ovary globose. Drupe 13 x 9 mm, obovate.

Fl. & Fr.: February-April

Distr.: Endemic to Southern Western Ghats. Occasional; found along shola borders. PAS, *KKK 18594.*

Canthium rheedii DC., Prodr. 4: 474. 1830; Hook. f., FBI 3: 134. 1880. *Plectronia rheedii* (DC.) Bedd., For. Man. Bot. 134/5. 1872; Gamble, FPM 625. 1921; Matthew, Ill. FPH t. 368. 1996 & FPH 589. 1999.

Leaves to 5 x 4 cm, broadly ovate, apex acute. Flowers greenish-white, 10 mm long, in axillary fascicles; calyx 2 mm, obconical, teeth minute; corolla tube 5 mm long, globose, lobes 7 x 3 mm, lanceolate, spreading; style bearded at middle. Drupe 15 x 12 mm, obovoid, compressed, black; seeds rugose, hard.

Fl. & Fr.: February-April

Distr.: Southern Western Ghats and Sri Lanka. Occasional; at medium altitudes. ENP, Mampallam Chola, *KKK 17557.*

CHASSALIA Commerson *ex* Poiret

in Dict. Sc. Nat. 8: 198. 1817.

Chassalia curviflora (Wall.) Thw., Enum. Pl. Zeyl. 150. 1864; Hook. f., FBI 3: 176. 1880, p.p.; Gamble, FPM 643. 1921. var. **ophioxyloides** (Wall.) Deb & Krishna, BBSI 24: 222. 1982 (1983). *Psychotria curviflora* Wall. in Roxb., Fl. Ind. 2: 167. 1824. *P. ophioxyloides* Wall. in Roxb., Fl. Ind. 2: 167. 1824; Sant. & Merch., BBSI 3(2): 108. 1961. *Psychotria ambigua* Wight & Arn., Prodr. 433. 1834. *Chassalia ophioxyloides* (Wall.) Craib, Gard. Bull. Straits Settlem. 6: 474. 1930.

Shrubs. Leaves variable, to 22 x 10 cm, oblanceolate, abruptly acuminate. Cymes 9 x 5 cm, terminal, panicled, glabrous. Flowers white, 8-10 mm long, subsessile; calyx 1.5 mm long, globose, lobes 5, ovate; corolla 8 mm long, curved, lobes ovate, obtuse; ovary 2-celled. Drupe 6 mm across, globose, glabrous, 2-seeded.

Fl. & Fr.: January-July

Distr.: Indo-Malesia. Common under growth in lower and medium altitude sholas. MS, Puthur, *KKK 16070*; Chengalar, *KKK 16115*; K-5, *KKK 16172*; Thalachorkadavu, *KKK 16741*. PUS, *KKK 18568*.

GALIUM Linnaeus

Sp. Pl. 105. 1753

Galium asperifolium Wall. in Roxb., Fl. Ind. 1: 381. 1820; Gamble, FPM 656. 1921; Fyson, FSIHS 295. t. 241. 1932; Matthew, FPH 594. 1999. *G. mollugo* Hook. f., FBI 3: 207. 1881, non L.

Diffuse herbs, stem 4-angled, scabrous. Leaves whorled, 6 per node, to 18 x 3 mm, oblanceolate, apex acute, lineolate-serrate, subsessile. Umbels axillary or terminal. Flowers 2-3, 5 mm long; calyx cupular, 2 mm long, lobes ovate, serrate; corolla white, 2 mm wide. Capsule 2 x 2 mm, globose, opening apically; seeds many.

Fl. & Fr.: Throughout the year

Distr.: India, Afghanistan and Thailand. Common; along shola ecotones and disturbed regions. MS, Conical patch, *KKK 16481*; K-7, *KKK 16560*.

HEDYOTIS Linnaeus

Sp. Pl. 101. 1753

1. Stipules rounded or elongate, not sheathing **2**
1. Stipules triangular dentate, lower ones sheathing ..... **H. anamalayana**
2. Stipules rounded, margins simply pectinate **3**
2. Stipules elongate, margins pinnatisect **4**
3. Subshrubs; leaves narrowly lanceolate, nerves thick; panicles large, many flowered ..... **H. articularis**
3. Stiff shrubs; leaves ovate, nerves obscure; cymes short, few flowered ..... **H. buxifolia**
4. Large shrubs; stipules pubescent; flowers pink; capsule ovoid, glabrous ..... **H. leschenaultiana**
4. Low shrubs; stipules glabrous; flowers pale lilac; capsule globose, pubescent ..... **H. swertioides**

Hedyotis anamalayana (Gamble) Rao & Hemadri, Ind. For. 99: 378. 1973; Henry *et al*, JBNHS 75(3): 689 1979. *Oldenlandia anamalayana* Gamble, Kew Bull. 1920: 67. 1920 & FPM 599. 1921. *Hedyotis lessertiana sensu* Bedd., Ic. t. 31. 1868-1874, non Arn. 1836.

Small, glabrous shrubs. Leaves to 10 x 3.5 cm, elliptic or ovate-lanceolate, base cuneate, apex acuminate, shining above. Panicles terminal, 8 x 3 cm. Flowers 7 mm long, tetramerous; calyx 2 mm, lobes ovate, obtuse; corolla white, lobes 5 mm, oblong, obtuse, tube densely villous within. Capsule 4 x 4 mm, ovoid; seeds black.

Fl. & Fr.: August-March

Distr.: Endemic to Southern Western Ghats. Common; along shola borders at low and medium altitudes. MS, Perumala, *KKK 16104*; K-4, *KKK 16402*; K-4.5, *KKK 16526*; K-7, *KKK 16558*.

Hedyotis articularis R. Br. *ex* Wight & Arn., Prodr. 407. 1834; Wight, Ic. t. 1028. 1845; Hook. f., FBI 3: 51. 1880; Matthew, FPH 597. 1999, subsp. **santapaui** (Shetty &

Vivek.) Deb. & Dutta, Taxon 32: 284. 1983. *Hedyotis santapaui* Shetty & Vivek. in BBSI 11: 447. ff. 1-11. 1969. *Oldenlandia articularis* (R. Br. *ex* Wight & Arn.) Gamble, FPM 597. 1921; Fyson, FSIHS 272. t. 218. 1932.

Stem articulated by persistent stipules. Leaves crowded at apex, to 18 x 8 mm, very coriaceous, nearly sessile, margins recurved. Cymes 1.5-3 cm across, hirsute. Flowers 9 mm long, sessile, 10-20 in a cyme; calyx 4 mm, campanulate, lobes 4, 1 mm, acute; corolla 5 mm across, tube slender, lobes oblong, lilac, margin recurved. Capsule 6 x 4 mm, obovate, pubescent; seeds obovoid, black.

Fl. & Fr.: August-March

Distr.: Endemic to Southern Western Ghats. Occasional; found along shola borders at lower altitudes. MS, Idlimottai, *KKK 16414*.

Hedyotis buxifolia Bedd., Ic. t. 1. 1868-1864; Hook. f., FBI 3: 52. 1880. *Oldenlandia buxifolia* (Bedd.) O. Ktze., Rev. Gen. Pl. 1: 292. 1891; Gamble, FPM 598. 1921; Nair *et al*, BBSI 22(1-4): 205. 1980.

Leaves to 13 x 6 mm, acute at both ends, coriaceous, scabrous above. Panicles 2.5 cm across. Flowers subsessile, 8 mm long; calyx 5 mm long, lobes 3 mm long, ovate; corolla tube 3 mm long, villous within, lobes oblong; anthers sessile, attached at the middle of the corolla tube. Capsule 4 mm long, obovoid.

Fl. & Fr.: August-December

Distr.: Endemic to Southern Western Ghats. Rare; found in grasslands near streams at higher altitudes. ENP, Bhiman Odai, *KKK 18086*.

Hedyotis leschenaultiana DC., Prodr. 4: 422. 1830; Matthew, Ill. FPH t. 375. 1996 & FPH 598. 1999. *H. stylosa* R. Br. *ex* Wight & Arn., Prodr. 407. 1834; Wight, Ic. t. 1027. 1845; Hook. f., FBI 3: 51. 1880. *Oldenlandia stylosa* (R. Br. *ex* Wight & Arn.) O. Ktze., Rev. Gen. Pl. 1: 292. 1891; Gamble, FPM 598. 1921; Fyson, FSIHS 272. t. 217. 1932.

Leaves ovate-lanceolate, base rounded, apex acuminate, glabrous. Cymes 12 x 5 cm, panicled; calyx limb 2 mm long, lobes obtuse, glabrous; corolla 8 mm long, tube slender, villous within, lobes 4 mm long, oblong, spreading; anthers sessile, adnated by the centre; stigma pink. Capsule 5 mm long.

Fl. & Fr.: February-May

Distr.: Endemic to Southern Western Ghats. Occasional; found along shola borders and road sides at higher altitudes. MS, Idlimottai, *KKK 16436*; Methappu, *KKK 31067*.

Hedyotis swertioides Hook. f., FBI 3: 42. 1880; Matthew, Ill. FPH t. 376. 1996 & FPH 599. 1999. *Oldenlandia swertioides* (Hook. f.) O. Ktze., Rev. Gen. Pl. 1: 292. 1891; Gamble, FPM 598. 1921; Fyson, FSIHS 273. t. 219. 1932. **Thavalakkal Chedi.**

Leaves to 6 x 2.5 cm, ovate-lanceolate, acute at both ends, glabrous. Cymes corymbose, to 12 cm across. Flowers to 10 mm long, sessile; calyx 4 mm long, lobes acute, densely puberulus; corolla tube 8 mm long, densely villous within, puberulus outside, lobes 2.5 x 1 mm, oblong, obtuse. Capsule 4 x 3 mm; seeds angled, light brown.

Fl. & Fr.: December-February

Distr.: Endemic to Southern Western Ghats. Common along shola borders and road sides at higher altitudes. MS, Puthur, *KKK 16193.* ENP, Way to hut, *KKK 18030*; Mesthirikkettu, *KKK 18042.*

IXORA Linnaeus

Sp. Pl. 110. 1753

Ixora notoniana Wall. *ex* G. Don, Gen. Syst. 3: 571. 1834; Hook. f., FBI 3: 51. 1880; Fyson, FSIHS 284. t. 231. 1932; Matthew, Ill. FPH t. 377. 1996 & FPH 600. 1999. *I. saulierei* Gamble, Kew Bull. 1920: 247. 1920 & FPM 630. 1921. **Plate 4.5.7.**

Small trees. Leaves to 17 x 7 cm, elliptic to oblanceolate, base attenuate, apex abruptly acuminate. Inflorescence lax, to 10 cm wide, ultimate corymbs 4 cm. Flowers pedicelled; calyx 2.5 mm long, lobes 1.5 mm long, acuminate; corolla tube 12 x 1 mm long, lobes 5 x 2 mm, ovate, acute. Drupe 10 mm wide, subglobose.

Fl. & Fr.: March-May

Distr.: Endemic to Southern Western Ghats. Occasional; in shola margins at higher altitudes. ENP, Anamudi route, *KKK 17638.*

KNOXIA Linnaeus

Sp. Pl. 104. 1753

Knoxia sumatrensis (Retz.) DC., Prodr. 4: 570. 1830; Matthew, FPH 602. 1999, var. **hookeriana** Bhattacharjee & Deb. in JETB. 6: 92. 1985. *Spermacoce sumatrensis* Retz., Obs. 4: 23. 1786. *Knoxia corymbosa* sensu Wight, Ill. Ind. t. 128. 1850, non Willd., 1798; Hook. f., FBI 3: 128. 1880; Gamble, FPM 622. 1921.

Straggling herbs, stem 4-angled, scabrous. Leaves to 5 x 2.5 mm, ovate to elliptic, acute at both ends, scabrous hispid. Corymbs terminal, 3-4 cm across, dense. Flowers 5 mm long; calyx tube 2 mm long, lobes 4, triangular, serrate; corolla white to purple, tube 5 mm, lobes 4, 3 mm. Capsule 4 x 4 mm, ellipsoid.

Fl. & Fr.: July-September

Distr.: South India and Sri Lanka. Common; at lower altitudes in disturbed regions. MS, Conical patch, *KKK 16454*; K-3, *KKK 16761.*

LASIANTHUS W. Jack

Trans. Linn. Soc. London 14: 125. 1823 *nom. cons.*

1. Cymes sessile; transverse nervules parallel **2**
1. Cymes with short, stout peduncles; transverse nervules reticulate ..... **L. venulosus**
2. Calyx limb and teeth glabrous ..... **L. blumeanus**
2. Calyx limb and teeth hairy **3**
3. Leaves elliptic or elliptic-obovate, abruptly acuminate; nerves 3-4 pairs ..... **L. acuminatus**
3. Leaves lanceolate or oblong-lanceolate, acuminate; nerves 6-9 pairs ..... **L. coffeoides**

Lasianthus acuminatus Wight, Calcutta J. Nat. Hist. 6:511.1846; Hook. f., FBI 3:185. 1880,p.p.; Gamble, FPM 647. 1921; Fyson, FSIHS 292. 1932; Matthew, Ill. FPH t. 379. 1996 & FPH 604. 1999. **Peenari, Theettanari, *Mootu Maram* (EBIS) Plate 4.5.8.**

Large shrubs. Leaves evil smelling, to 8 x 3.5 cm, base acute, glossy. Flowers 1-3 together; calyx tube 4 mm, lobes triangular, villous; corolla white, 8 mm long, tube slender, lobes ovate, obtuse, densely villous. Drupe 5 mm across, globose, glabrous.
Fl. & Fr.: August-March
Distr.: Endemic to Southern Western Ghats. Common undergrowth inside low and medium altitude sholas. MS, K-4, *KKK 16111.*

Lasianthus blumeanus Wight, Calcutta J. Nat. Hist. 6: 507. 1846; Hook. f., FBI 3: 184. 1880; Gamble, FPM 646. 1921.

Bushy shrubs. Leaves to 7 x 2.5 cm, elliptic, base acute, apex caudate- acuminate; nerves 5 pairs, prominent. Cymes 2-3 cm across. Flowers 8-10 mm long, sessile; calyx 4 mm long, lobes 4-5, lanceolate; corolla tube campanulate, glabrous; ovary 4-celled. Drupe 6 x 6 mm, obovoid, glabrous.
Fl. & Fr.: October-March
Distr.: Endemic to Southern Western Ghats. Occasional undergrowth inside medium altitude sholas. ENP, Mampallam Chola, *KKK 17547.*

Lasianthus coffeoides Fyson, Kew Bull. 1914: 1845. 1914; Gamble, FPM 647. 1921; Fyson, FSIHS 291. t. 237. 1932.

Erect, unbranched shrubs with long, slender, horizontal branches. Leaves 12 x 2.5 cm, base cuneate, apex acuminate, glabrous, glossy. Flowers 2-3 together, sessile; calyx 2 mm, teeth triangular, ciliate; corolla white, ciliate within, tube 5 mm, lobes 5, 2 mm long, acute; anthers shortly stalked.
Fl. & Fr.: June-December
Distr.: Endemic to Southern Western Ghats. Occasional; found in medium altitude sholas. PAS, Vandaravu, *KKK 18590.*

Lasianthus venulosus (Wight & Arn.) Wight, Ic. t. 1032. 1845; Hook. f., FBI 3: 190. 1880; Gamble, FPM 648. 1921; Fyson, FSIHS 290. t. 236. 1932; Matthew, Ill. FPH t. 381. 1996 & FPH 606. 1999.

Well branched shrubs. Leaves to 8 x 3 cm, elliptic-oblong, base acute, apex abruptly apiculate; nerves 6 pairs, oblique. Flowers 8 mm long, in axillary cymes; calyx tube 3 mm, lobes 4, lanceolate, hirsute; corolla yellowish white, 8 mm long, tube short, lobes hairy; stamens 4. Drupe 5 mm across, subglobose, dark blue.
Fl. & Fr.: : February-May
Distr.: Endemic to Southern Western Ghats. Occasional; in medium and higher altitude sholas. MS, K-4.5, *KKK 18110.* VMS, *KKK 31138.*

MUSSAENDA Linnaeus

Sp. Pl. 177. 1753

Mussaenda hirsutissima (Hook. f.) Hutch. *ex* Gamble, FPM 610. 1921; Fyson, FSIHS 279. t. 226. 1932; Matthew, FPH 610. 1999. *M. frondosa* L. var. *hirsutissima* Hook. f., FBI 3: 90. 1880. **Chandrakala Sooryakala (EBIS). Plate 4.6.3.**

Scandent shrubs. Leaves to 9 x 4 cm, broadly elliptic, acuminate at either ends, densely hispid. Cymes terminal, congested. Flowers densely arranged; calyx lobes 5, one lobe foliaceous, white, 7 x 3.5 cm, ovate, base cuneate, apex mucronate; corolla golden yellow, 2 cm wide, tube 3 cm long, narrow, densely hispid, lobes 10 x 8 mm, cuspidate; stamens 5. Berry globose, 1 cm across, sparsely hirsute, black.

Fl. & Fr.: December-February

Distr.: Endemic to Southern Western Ghats. Common along shola borders at lower and medium altitudes. MS, Puthur, *KKK 16069*; K-3.5, *KKK 16142*; K-5, *KKK 16476*.

NEANOTIS W. H. Lewis

Ann. Missouri Bot. Gard. 53: 34. 1966.

1. Corolla pink 2
1. Corolla white 3
2. Procumbent annual herbs; leaves acute at both ends ..... **N. indica** var. **affinis**
2. Straggling herbs; leaves rounded or obtuse at base ..... **N. indica** var. **indica**
3. Erect perennial subshrubs; leaves ovate-lanceolate, base obtuse; capsule elliptic ..... **N. hutchinsonii**
3. Prostrate annual herbs; leaves ovate, base truncate to attenuate; capsule subglobose . **N. monosperma**

Neanotis indica (DC.) W. H. Lewis, Ann. Missouri Bot. Gard. 53: 38. 1966, var. **affinis** (Wall. *ex* Wight & Arn.) W. H. Lewis, Ann. Missouri Bot. Gard. 53: 39. 1966; Matthew, Suppl. Ill. FPH t. 1004. 1998 & FPH 613. 1999. *Hedyotis affinis* Wall. *ex* Wight & Arn., Prodr. 411. 1834; Wight , Ic. t. 1030. 1845. *Anotis leschenaultiana* (Wall. *ex* Wight & Arn.) Hook. f. var. *affinis* (Wall. *ex* Wight & Arn.) Hook. f., FBI 3: 72. 1880; Gamble, FPM 604. 1921; Fyson, FSIHS 275. t. 221. 1932.

Procumbent annual herbs; shoots rooting at nodes. Leaves to 4 x 2 cm, ovate, acute at both ends, densely strigose. Corymbs 4 x 2.5 cm; calyx 3 mm long, lobes ovate, acute, glabrous; corolla tube 4 mm long, lobes 2 x 1 mm, ovate. Capsule 3 x 2.5 mm, subglobose.

Fl. & Fr.: August-December

Distr.: Indo-Malesia. Common; along shola borders at lower altitudes. MS, K-3, *KKK 16761*.

Neanotis indica (DC.) W. H. Lewis, Ann. Missouri Bot. Gard. 53: 38. 1966, var. **indica**. *Putoria indica* DC., Prodr. 4: 577. 1830. *Anotis leschenaultiana* (Wall. *ex* Wight & Arn.) Hook. f., FBI 3: 72. 1880; Gamble, FPM 604. 1921; Fyson, FSIHS 275. t. 221. 1932. *Hedyotis leschenaultiana* Wall. *ex* Wight & Arn., Prodr. 411. 1834.

Straggling herbs; branchlets ascending, villous. Leaves 3.5 x 2 cm, ovate, base rounded or obtuse, apex acute. Corymbs trichotomous, hirsute; calyx 3 mm, lobes ovate, acute; corolla 8 mm long, tube 4 mm long, lobes 3 x 1 mm, ovate. Capsule 3 x 2 mm, subglobose.

Fl. & Fr.: August-December

Distr.: Endemic to Western Ghats. Common; in grasslands and shola borders at higher altitudes. MS, Idlimottai, *KKK 16616*.

Neanotis hutchinsonii Deb. & R. Dutta, J. Bombay Nat. Hist. Soc. 87: 333. 1990; Matthew, Ill. FPH t. 387. 1996 & FPH 612. 1999. *Anotis longiflora* Hutch., Kew Bull. 1916: 35. 1916, *non* Benth. 1893; Gamble, FPM 604. 1921; Fyson, FSIHS 276. t. 222. 1932.

Erect perennial subshrub; stems scabrous. Leaves to 5 x 2.5 cm, apex acute, strigosely villous. Flowers many, in terminal corymbs; calyx lobes 4 mm, lanceolate, villous; corolla 9 mm long, tube 5 mm long, lobes 3 x 1 mm, ovate, ciliate. Capsule 4 x 3 mm.

Fl. & Fr.: October-December

Distr.: Endemic to Southern Western Ghats. Fairly common in shola borders at higher altitudes. ENP, Vattachirambu Chola, *KKK 18082*.

Neanotis monosperma (Wall. *ex* Wight & Arn.) W. H. Lewis, Ann. Missouri Bot. Gard. 53: 39. 1966; Matthew, Ill. FPH t. 388. 1996 & FPH 614. 1999. *Hedyotis monosperma* Wall. *ex* Wight & Arn., Prodr. 410. 1834. *Anotis monosperma* (Wall. *ex* Wight & Arn.) Hook. f., FBI 3: 75. 1880; Gamble, FPM 605. 1921.

Prostrate annual herbs; stems sparsely strigose. Leaves to 3.5 x 2 cm, apex acute, minutely villous. Cymes corymbose, lax, 3 x 1.5 cm; calyx lobes 4, lanceolate; corolla 3 mm wide, tube 2 mm long, lobes 2 x 1 mm, strigose. Capsule 2 mm wide.

Fl. & Fr.: July-December

Distr.: Endemic to Peninsular India. Common along shola borders at lower altitudes. MS, K-3, *KKK 16514*.

OLDENLANDIA Linnaeus

Sp. Pl. 119. 1753.

Oldenlandia corymbosa L., Sp. Pl. 119. 1753; Hook. f., FBI 3: 64. 1880; Gamble, FPM 600. 1921; Matthew, FPH 616. 1999. *Hedyotis corymbosa* (L.) Lam., Encycl. 1: 272. 1792; Sivar. & Biju, Taxon 39: 671. 1990.

Diffuse herbs, stem 4-angled, scabrous. Leaves to 10 x 1.5 mm, lanceolate, acute, lineolate-serrate, subsessile. Umbels axillary. Flowers 2-3, 5 mm long; calyx 3 mm long, cupular, lobes ovate, serrate; corolla white, 3 mm wide, tube 2 mm. Capsule 3 x 3 mm, globose; seeds many, angled.

Fl. & Fr.: Throughout the year

Distr.: Tropical Asia, Africa & America. Common; along shola margins at lower altitudes. MS, K-3.5, *KKK 16790*.

OPHIORRHIZA Linnaeus

Sp. Pl. 150. 1753

1. Leaves elliptic, base cuneate or attenuate ..... **O. brunonis**
1. Leaves elliptic-lanceolate, acuminate at both ends **2**
2. Nerves to 7 pairs; stipules lanceolate ..... **O. grandiflora**
2. Nerves to 10 pairs; stipules ovate ..... **O. roxburghiana**

Ophiorrhiza brunonis Wight & Arn., Prodr. 404. 1834: Hook. f., FBI 3: 79. 1880; Gamble, FPM 608. 1921; Fyson, FSIHS 278. t. 225. 1932. **Plate 4.6.4.**

Erect undershrubs. Leaves to 9 x 4 cm, base attenuate, apex acuminate, glabrous except the nerves. Cymes to 4 cm across, corymbose. Flowers densely arranged; calyx lobes 2 mm long, hairy; corolla tube 8 mm long, hispid, lobes ovate, obtuse. Capsule to 5 x 10 mm, obcordate, compressed.

Fl. & Fr.: August-December

Distr.: Endemic to Southern Western Ghats. Occasional; found near stream sides at medium altitudes. MS, K-4, *KKK* 18563. ENP, Mampallam Chola *KKK 18068.*

Ophiorrhiza grandiflora Wight, Ic. t. 1069. 1846; Hook. f., FBI 3: 80. 1880; Gamble, FPM 608. 1921.

Undershrubs; stems glabrous. Leaves to 10 x 4.5 cm, pale beneath. Cymes 3-6 cm broad, terminal, peduncled, sparsely villous. Flowers to 3.5 cm long; calyx 3 x 2 mm, ovoid, hispid, lobes 3-4 mm long, lanceolate; corolla tube 20 mm long, villous within, lobes 10 x 7 mm, ovate, acute. Capsule 4 x 8 mm, obcordate, compressed.

Fl. & Fr.: August-December

Distr.: Endemic to Southern Western Ghats. Occasional; at medium altitudes along stream sides. MS, Puthur, *KKK 16079.*

Ophiorrhiza roxburghiana Wight, Ic. t. 1068. 1846; Hook. f. FBI 3: 81. 1880; Gamble, FPM 608. 1921; Fyson, FSIHS 278. 1932; Matthew, Ill. FPH t. 392. 1996 & FPH 619. 1999.

Erect under shrubs, pubescent. Leaves to 10 x 5 cm, glabrous above, villous on nerves below. Cymes to 4 cm broad; calyx 3 mm long, lobes ovate; corolla 18 mm wide, tube 22 mm long, puberulous without, lobes 8 x 5 mm, ovate, acute. Capsule 4 x 10 mm, 2-winged.

Fl. & Fr.: August-February

Distr.: Endemic to Peninsular India. Occasional; found at medium altitudes. MS, K-5, *KKK 16095*; K-5.5, *KKK 16170.*

Note: This species was reported to be found restricted to Palni hills only (Ahmedullah & Nayar, 1987). Hence this forms a new record for Kerala.

PAVETTA Linnaeus

Sp. Pl. 110. 1753

Pavetta breviflora DC., Prodr. 4: 491. 1830; Hook. f., FBI 3: 151. 1880 p.p.; Gamble, FPM 633. 1921; Fyson, FSIHS 285. t. 232. 1932; Matthew, Ill. FPH t. 393. 1996 & FPH 621. 1999.

Large shrubs to small trees; branchlets glabrous. Leaves to 11 x 3 cm, elliptic, base attenuate, apex acuminate, drying black, gland dotted. Cymes compact, 6-10 cm across, hispidulous. Flowers dull white, pedicelled; calyx 2 mm long, obconical, lobes 4, ciliate; corolla tube 10 mm long, slender, glabrous outside, villous inside, lobes 4, 8 x 3 mm, oblong. Berry 10 mm across, globose.

Fl. & Fr.: February-May

Distr.: Endemic to Southern Western Ghats. Occasional; in higher altitude sholas. ENP, Amarachola, *KKK 17513*; Anamudi slope, *KKK 18550.*

PSYCHOTRIA Linnaeus

Syst. Nat. ed. 10, 929. 1364. 1759, *nom. cons.*

1. Inflorescence branches whorled; leaves to 8 cm long 2
1. Inflorescence branches decussate; leaves more than 12 cm long 3
2. Cymes dense; leaves obovate; nerves 7-8 pairs ..... **P. nilgiriensis** var. **nilgiriensis**
2. Cymes lax; leaves oblong to oblanceolate; nerves 10-13 pairs ..... **P. nilgiriensis** var. **astephana**
3. Leaves obovate; nerves 14-16 pairs; flowers pentamerous ..... **P. glandulosa**
3. leaves elliptic to oblanceolate; nerves 10-13 pairs; flowers tetramerous ..... **P. nudiflora**

Psychotria glandulosa (Dennst.) Suresh in Nicolson, D. H. *et al* Interpret. Hort. Malab. 229. 1988; Matthew, FPH 624. 1999. *Baldingera glandulosa* Dennst. Schlussel Hort. Malab. 9, 13, 31. 1818. *P. elongata* (Wight) Hook. f., FBI 3: 163. 1880; Gamble, FPM 641. 1921; Fyson, FSIHS 288. t. 234. 1932. *Grumilea elongata* Wight, Ic. t. 1036.1845.

Shrubs. Leaves to 15 x 8 cm, base cuneate, apex abruptly acute to acuminate. Cymes simple, to 8 cm, terminal. Flowers white, 5 mm long; calyx cupular, lobes 5, triangular, ciliate; corolla 5 mm across, tube 5 mm, villous at throat, lobes 5, 3 mm, oblong; stamens 5; style 5 mm; stigma bifid. Drupe 6 mm across, globose, black.

Fl. & Fr.: March-June

Distr.: Peninsular India and Sri Lanka. Fairly common at lower altitudes. MS, K-4, *KKK 16475*; Thalachorkadavu, *KKK 17665*.

Psychotria nilgiriensis Deb & M. G. Gangop., Taxon 31: 546. 1982, var. **astephana** (Hook. f.) Deb. & M. G. Gangop., Taxon 31: 546. 1982; Matthew, Ill. FPH t. 397. 1996 & FPH 625. 1999. **Pavadakkambu.**

Shrubs. Leaves to 8 x 2.5 cm, base cuneate, apex acute, dull green when dried. Cymes 3 cm across, terminal. Flowers 5 mm long; calyx cupular, lobes 4, obtuse, ciliate; corolla 7 mm across, tube shorter, lobes 4; stamens 4. Drupe 5 mm wide, ovoid.

Fl. & Fr.: August-December

Distr.: Endemic to Southern Western Ghats. Common undergrowth inside sholas at higher altitudes only. MS, Idlimottai, *KKK 16606*.

Psychotria nilgiriensis Deb & M.G. Gangop., Taxon 31: 546. 1982, var. **nilgiriensis**; Matthew, Ill. FPH t. 396. 1996 & FPH 625. 1999. *P. congesta* (Wight & Arn.) Hook. f., FBI 3: 162. 1880, non Spreng. *ex* DC., 1830; Gamble, FPM 640. 1921 p.p.; Fyson, FSIHS 287. t. 233. 1932. *Grumilea congesta* Wight & Arn., Prodr. 432. 1834; Wight, Ic. t. 1037. 1845. **Kottappoovu, Pavadakkambu (EBIS).**

Shrubs to small trees. Leaves to 8 x 3.5 cm, base cuneate, apex abruptly acute, green when dried. Cymes to 2.5 cm across, terminal. Flowers 5 mm long; calyx 2 mm long, cupular, lobes 5, obtuse, ciliate; corolla 5 mm across, tube 2 mm, lobes 5, 3 mm, ovate, puberulous within. Drupe 11 x 7 mm, ellipsoidal, glabrous.

Fl. & Fr.: December-March

Distr.: Endemic to Southern Western Ghats. Common undergrowth in medium altitude sholas. MS, Methappu, *KKK 16010*; K-5, *KKK 16153*.

Psychotria nudiflora Wight & Arn., Prodr. 434. 1834; Hook. f., FBI 3: 175. 1880; Gamble, FPM 641. 1921.

Shrubs. Leaves to 13 x 4 cm, apex acuminate, base narrowed, reddish brown when dried. Cymes 4 cm across, peduncled, rusty puberulus, branches whorled. Flowers sessile; calyx 1 mm long, membranous; corolla 5.5 mm long, lobes 4, short; style 2-fid at apex. Fruits not seen.

Fl.: December-January

Distr.: Endemic to Southern Western Ghats. Rare; at medium and higher altitudes. MS, Idlimottai, *KKK 18166.*

RUBIA Linnaeus

Sp. Pl. 109. 1753

Rubia cordifolia L., Syst. Nat. (ed. 12) 3: 229. 1768; Hook. f., FBI 3: 202. 1880; Gamble, FPM 655. 1921; Fyson, FSIHS 294. t. 239. 1932; Matthew, FPH 630. 1999.

Scabrous climber, stem 4-angled, articulate. Leaves whorled, 4 in each node, equal or unequal, to 5 x 3 cm, ovate, base cordate, apex acuminate, 5-ribbed from base. Flowers 3 mm across; in axillary dichotomous cymes; calyx tube turbinate, lobes 4, 1 mm long; corolla white, lobes ovate, valvate, spreading; styles 2, stigmas capitate. Drupe 8 mm across, globose, fleshy, deep blue.

Fl. & Fr.: December-March

Distr.: Asia, Africa and Europe. Rare; along shola ecotones at higher altitudes. ENP, Umayamala, *KKK 17535.*

SAPROSMA Blume

Bijdr. 956. 1826.

Saprosma foetens (Wight) K. Schum. in Engl. & Prantl, Pflanzenf. 4(4): 122. 1891. *Lasianthus foetens* Wight, Calcutta J. Nat. Hist. 6: 517. 1846. *Dysodidendron ceylanica* Gard., Calcutta J. Nat. Hist. 7: 2. 1847. *Serissa wightii* Bedd., Ic. t. 15. 1868-1874. *Saprosma ceylanicum* (Gard.) Bedd., For. Man. Bot. 134/5. 1872; Hook. f., FBI 3: 193. 1880; Gamble, FPM 649. 1921. **Theetanari (EBIS). Plate 4.6.5.**

Small trees; branchlets white. Leaves evil smelling, to 8 x 3.5 cm, elliptic, acute at both ends, black on drying. Flowers 1-3 together on short axillary cymes; calyx 4 mm long, campanulate, teeth 4, short; corolla tube 8 x 2.5 mm, lobes 4, 6 x 3 mm, triangular, spreading, dull white, purplish outside. Drupe 8 mm, deep blue.

Fl. & Fr.: August-December

Distr.: Endemic to Southern Western Ghats. Common undergrowth in low and medium altitude sholas. MS, Puthur, *KKK 16447.*

SPERMACOCE Linnaeus

Sp. Pl. 102. 1753

Spermacoce ocymoides Burm. f., Fl. Ind. 34. t. 13. f. 1.1768; Hook. f., FBI 3: 300. 1881; Fyson, FSIHS 293. t. 238. 1932; Matthew, FPH 632. 1999. *Borreria ocymoides* (Burm. f.) DC., Prodr. 4 : 544. 1830; Gamble, FPM 654. 1921.

Erect herbs, stems pink, quadrangular. Leaves subsessile, to 2 x 0.8 cm, elliptic to oblong, base acute, apex mucronate, glabrous. Flowers many, fascicled; calyx 3 mm, lobes acute, glabrous; corolla white. Capsule 3 x 2 mm, obcordate, glabrous; seeds black.

Fl. & Fr.: December-March

Distr.: Indo-Malesia and Tropical Africa. Common along shola borders. MS, K-3, *KKK 16772.*

WENDLANDIA Bartling *ex* A. P. de Candolle

Prodr. 4: 411. 1830, *typ. cons.*

Wendlandia thyrsoidea (Roemer & Schult.) Steud., Nomencl. ed. 2, 2: 786. 1841; Matthew, FPH 633. 1999. *Canthium thyrsoideum* Schult. in Roem. & Schult., Syst. 6: 207. 1820. *Wendlandia notoniana* Wall. *ex* Wight & Arn., Prodr. 403. 1834; Wight, Ic. t. 1033. 1845; Hook. f., FBI 3: 40. 1880; Gamble, FPM 588. 1921; Fyson, FSIHS 270. t. 215. 1932.

Large stiff shrubs. Leaves ternate, to 12 x 4 cm, oblanceolate, base cuneate, apex acute to acuminate. Panicles to 10 cm across, hispid. Flowers 6 mm long, many, sessile; calyx 2 mm, globose, hispid, lobes 5, ovate; corolla white to cream, 3.5 mm across, tube slender, villous within, lobes orbicular, spreading; stamens 5, exserted; style slender, stigma bifid. Capsule 1.5 x 1 mm, globose; seeds many, reticulate.

Fl. & Fr.: March-June

Distr.: Peninsular India and Sri Lanka. Rare; along shola borders at lower altitudes. MS, Puthur, *KKK 16058.*

51. VALERIANACEAE

VALERIANA Linnaeus

Sp. Pl. 31. 1753

1. Leaves radical; stem condensed ..... **V. hookeriana**
1. Leaves cauline; stem elongate **2**
2. Leaves simple or with 1-2 leaflets; flowers pink ..... **V. leschenaultii**
2. Leaves imparipinnate with 3-5 leaflets; flowers white ..... **V. arnottiana**

Valeriana arnottiana Wight, Ic. t. 1045-6. 1845; Gamble, FPM 657. 1921; Fyson, FSIHS 296. t. 242. 1932; Matthew, Ill. FPH t. 401. 1996 & FPH 635. 1999. *V. hardwickii* Wall. in Roxb, Fl. Ind. 1: 166.1820, var. *arnottiana* (Wight) Clarke in Hook. f., FBI 3: 213.1880.

Perennial herbs. Leaflets to 5 x 4 cm, ovate, base cuneate-truncate, apex acuminate, margin serrate-dentate, chartaceous, pubescent below; radical leaves absent on flowering. Cymes 3-4 cm across. Flowers 10-16 in a group; calyx limb small; corolla 4 mm across, lobes broadly ovate; ovary 2 x 1 mm. Fruit not seen.

Fl.: October-December.

Distr.: India, Bhutan, North Burma, East to West China, Java and Sumatra. Rare; along shola ecotones at higher altitudes. ENP, Way to Hut, *KKK* 18045.

Valeriana hookeriana Wight & Arn., Prodr. 444.1834; Clarke in Hook.f., FBI 3: 214.1881; Gamble, FPM 657. 1921; Fyson, FSIHS 296. t. 243. 1932; Matthew, Ill. FPH t. 402. 1996 & FPH 636. 1999. *V. microphylla* Bedd., Madras J. Lit. Sci. (ser. 3) 1: 50. 1869, non H. B. K. *V. beddomei* Clarke in Hook.f., FBI 3: 214. 1881; Gamble, FPM 657. 1921.

Perennial herbs. Leaves 10-15 cm long; leaflets many, linear, end ones 1-1.5 cm, ovate, softly puberulus, entire or a few dentate, apex acute. Cymes terminal, 4 x 2.5 cm; calyx limb small; corolla pale rose, to 4 mm wide; ovary ribbed. Fruit not seen.

Fl.: May-July.

Distr.: Endemic to Southern Western Ghats. Occasional; in grasslands at higher altitudes. MS, Idlimottai, *KKK 18177.*

Valeriana leschenaultii DC., Prodr. 4: 640. 1840; FBI 3: 214. 1881, incl. var. *brunoniana*; Wight, Ic. t. 1044. 1845; Clarke in Hook. f., FBI 3: 214. 1881; Gamble, FPM 657. 1921; Fyson, FSIHS 297. t. 244. 1932. *V. brunoniana* Wight & Arn. 443; Wight, Ic. t. 1043. 1845.

Perennial herbs. Leaves chartaceous; terminal leaflets to 6 x 4 cm, ovate, softy pubescent above, glabrous below, margins undulate-serrate. Cymes 2 cm wide; calyx small; corolla to 4 mm wide; ovary 1.5 mm long. Fruit not seen.

Fl.: June - July.

Distr.: Endemic to Southern Western Ghats. Occasional; along shola borders at medium altitudes. PAS, *KKK 18587.*

52. ASTERACEAE

1. Capitula discoid, disciform or radiate (ligules 3 toothed) with some bilabiate flowers; sap watery 2
1. Capitula ligulate; flowers all perfect (ligules 5 toothed); sap milky 27
2. Capitula mostly radiate or sometimes disciform, rarely discoid 3
2. Capitula discoid, with some corolla bilabiate 22
3. Leaves (at least basal) generally opposite 4
3. All leaves alternate 9
4. Achenes of ray florets alone fertile 5
4. Achenes of disc florets fertile 7
5. Achenes trigonous or laterally compressed 6
5. Achenes flat, dorsally compressed ..... **Moonia**
6. Leaves divided to the base, lobes pinnate; capitula not spiny ..... **Parthenium**
6. Leaves simple; capitula spiny ..... **Acanthospermum**
7. Disc achenes rounded or laterally compressed 8
7. Disc achenes dorsally compressed or angular and hardly compressed 9
8. Outer bracts of involucre clavate and glandular ..... **Sigesbeckia**
8. Outer bracts of involucre erect, not conspicuously glandular ..... **Acmella**
9. Pappus absent or consisting of 2-3 bristles ..... **Bidens**
9. Pappus consisting of 10 bristles ..... **Galinsoga**
10. Phyllaries mostly in several series, imbricate, (sub) equal, rarely 1 seriate 11
10. Phyllaries 1 (-2) seriate, equal 18

11. Anthers basally obtuse to strongly sagittate; style generally not truncate 12
11. Anthers basally strongly caudate; style subtruncate or apically rounded 16
12. Leaves not dissected; plants not scented 13
12. Leaves dissected; plants scented ..... **Artemisia**
13. Capitula disciform or with inconspicuous florets 14
13. Capitula distinctly radiate 15
14. Erect plants; leaves neither lobed nor pinnatifid, entire or serrate ..... **Conyza**
14. Decumbent or prostrate plants; leaves pinnatifid ..... **Dichrocephala**
15. Leaves ovate; pappus absent ..... **Myriactis**
15. Leaves dimorphic (obovate-attenuate to oblanceolate); pappus of fine hairs ..... **Erigeron**
16. Female florets infinite; bisexual florets a few (to 10) ..... **Gamochaeta**
16. Female florets generally fewer than bisexual ones 17
17. Phyllaries ovate-acute, spreading ..... **Anaphalis**
17. Phyllaries spathulate, obtuse, not spreading ..... **Helichrysum**
18. Capitula yellow 19
18. Capitula other than yellow 20
19. Capitula homogamous; ligules absent ..... **Cissampelopsis**
19. Capitula heterogamous; ligules present ..... **Senecio**
20. Leaves entire ..... **Kleinia**
20. Leaves variously serrate 21
21. Involucre with several smaller bracts at base 22
21. Involucre without smaller bracts at base ..... **Emilia**
22. Leaves mostly cauline; capitula brick red ..... **Crassocephalum**
22. Leaves mostly basal; capsule yellow/orange ..... **Gynura**
23. Leaves unarmed; anthers obtuse to sagittate at base 24
23. Leaves armed; anthers caudate at base ..... **Cirsium**
24. Style branches obtuse, clavate; anthers basally obtuse 25
24. Style branches attenuate; anthers basally sagittate 27
25. Panicles lax, cymose; achenes curved ..... **Adenostemma**
25. Panicles dense; achenes straight 26
26. Phyllaries multi-seriate; receptacle epaleaceous; achenes 5 angled ..... **Ageratina**
26. Phyllaries biseriate; receptacle paleaceous; achenes ribbed ..... **Ageratum**
27. Outer bracts leafy; pappus short ..... **Phyllocephalum**
27. Bracts similar; pappus long ..... **Vernonia**
28. Achenes beaked 29
28. Achenes not beaked ..... **Sonchus**
29. Achenes fusiform or oblong with short beak; corolla yellow ..... **Youngia**
29. Achenes flattened, beak ending in a circular disc; corolla pale yellow ..... **Cicerbita**

ACANTHOSPERMUM Schrank

Pl. Rar. Hort. Acad. Monac. 53. 1820.

Acanthospermum hispidum DC., Prodr. 5: 522. 1836; Gamble, FPM 704. 1921; Chowdhery in Hajra *et al*, Fl. Ind. 12: 361. 1995; Matthew, FPH 678. 1999. **Musu Musu.**

Erect, dichotomously branched, hispid herbs, 20-35 cm higher. Leaves 2-4 x 1-2 cm, ovate, acute. Heads 4-5 mm long, axillary, sessile; receptacle paleate. Outer flowers female, yellow, 3-lobed at apex; inner ones bisexual; corolla 2 mm long, tubular, 5-toothed at apex. Achenes 5 x 3 mm, obovate, with two diverging long spines at apex, densely covered with hooks; pappus absent.

Fl. & Fr.: October-January

Distr.: Native of South America, introduced to other tropical countries. Occasional; in disturbed low altitude shola regions. MS, K-3, *KKK 16654.*

ACMELLA L.C. Richard ex Persoon

Syn. Pl. 2: 472. 1807.

Acmella calva (DC.) R. K. Jansen, Syst. Acmella Syst. Bot. Monogr. 8: 41. 1988; Matthew, FPH 679. 1999. *Spilanthes calva* DC. in Wight, Contr. Bot. India 19. 1834 & Ic. t. 1109. 1846; Chowdhery in Hajra *et al,* Fl. Ind. 12: 409. 1995. *S. acmella* L., var. *calva* (DC.) Clarke Comp. Ind. 139. 1876. *S. acmella* sensu Hook. f., FBI 3: 307. 1881, non (L.) Murr. 1844; Fyson, FSIHS 338. t. 281. 1932. **Nai Koppu, Nai Manjal (EBIS). Plate 5.4.4.**

Procumbent scabrid herbs. Leaves to 4 x 2.5 cm, ovate, base truncate, apex acute, chartaceous. Heads 10 x 7 mm, solitary, conical. Flowers bisexual; corolla yellow, 2.5 mm long, tubular, campanulate above; lobes 0.5 mm long, ovate, acute, glabrous. Achenes 2 x 1 mm, obovate, biconvex, dark brown, glandular.

Fl. & Fr.: Throughout the year

Distr.: Indo-Malesia. Common along roadsides at lower altitudes. MS, K-3, *KKK 16133.*

ADENOSTEMMA J. R. Forster & G. Forster

Charact. Gen. 89, t. 45. 1776.

Adenostemma lavenia (L.) O. Ktze., Rev. Gen. Pl. 1: 304. 1891; Gamble, FPM 677. 1921; Fyson, FSIHS 315. t. 255. 1932; Uniyal in Hajra *et al,* Fl. Ind. 12: 346. 1995; Matthew, FPH 648. 1999. *Verbesina lavenia* L., Sp. Pl. 902. 1753. *Adenostemma viscosum* Forst., Char. Gen. 90, t. 45. 1776; Clarke, Comp. India 28.1876; Hook. f., FBI 3: 242. 1881. *A. latifolium* D. Don, Prodr. Fl. Nepal 181. 1825. *A. viscosum* Forst. var. *lavenia* (L.) Hook. f., FBI 3: 242. 1881, p.p.

Annual herbs; stems viscid. Leaves to 12 x 7 cm, broadly ovate, apex acute, base cuneate, crenate-serrate. Heads many, to 8 x 5 mm, hemi-spherical. Flowers white; corolla 2.5 mm long; tube puberulus; lobes hairy. Achenes 4 mm long, curved-obovoid, 3-angled, black; pappus of 3-4 glandular bristles.

Fl. & Fr.: October-January

Distr.: Paleotropics. Common along roadsides at lower and medium altitudes. MS, K-5, *KKK 16176*; K-3, *KKK 16500.*

AGERATINA Spach

Hist. Nat. Veg. Phan. 10. 286. 1841.

Ageratina adenophora (Spreng.) King & Robins., Phytologia 19: 211. 1970; Uniyal in Hajra *et al,* Fl. Ind. 12: 348. 1995; Matthew, FPH 648. 1999. *Eupatorium adenophorum* Spreng., Syst. Veg. (ed. 16) 3: 420. 1826. *E. glandulosum* sensu Kunth, Nov. Gen. Sp.

4: 122, t. 346. 1820, non Michaux, 1803; Fyson, FSIHS 316. 1932; Matthew, Rec. Bot. Surv. India 20: 135. 1969. **Thravada, Nilagiri (EBIS) Plate 5.4.3.**

Subshrubs, 1-1.5 m tall; glandular hairy; stems violet-blue. Leaves to 8 x 4 cm, ovate, acute, serrate. Heads 7 mm across, in terminal corymbose panicles. Outer florets bisexual, 4 mm long; corolla white, 5-lobed, hispid; inner florets female. Achenes 2 mm long, curved, ellipsoid, brown; pappus 5-10, 4 mm long, barbed.

Fl. & Fr.: December-May

Distr.: Originally from South America, now introduced in Peninsular India. Abundant; found along shola borders, scrublands and ecotones at all altitudes. MS, K-3, *KKK 16122*; Idlimottai, *KKK 16421*. VMS, *KKK 31139*.

AGERATUM Linnaeus

Sp. Pl. 839. 1753

Ageratum houstonianum Mill., Gard. Dict. (ed. 8) n. 2. 1768; Uniyal in Hajra *et al*, Fl. Ind. 12: 349. 1995; Matthew, Ill. FPH t. 411. 1996 & FPH 650. 1999. **Kaliyamman Pathiri Chedi, Michangala (EBIS) Plate 4.6.6.**

Herbs, viscid hairy. Leaves to 7 x 5 cm, ovate, base rounded, apex acute, margins crenate. Heads bluish-white, to 7 mm across, in terminal corymbose panicle. Flowers all bisexual; corolla 2.5 mm long, tubular, white, glabrous, 5-lobed at apex. Achenes 2 mm long, linear, 5-angled, hirsute; pappus 3-4 mm long, setaceous.

Fl. & Fr.: Throughout the year

Distr.: Native of Tropical America, now naturalized in Tropical Asia. Abundant in shola margins usually at lower altitudes. MS, K-3, *KKK 16751*.

ANAPHALIS A. P. de Candolle

Prodr. 6: 271. 1837

1. Subshrubs, more than 1 m tall; leaves 3 or 5 ribbed from base, > 1 cm wide ..... **A. travancorica**
1. Herbs, to 1 m tall; leaves 1 ribbed from base, < 6 mm wide 2
2. Leaves to 2 cm long, crowded; stem profusely branched 3
2. Leaves more than 2.5 cm long, not crowded; stem sparingly branched 4
3. Capitula white ..... **A. bournei**
3. Capitula yellow ..... **A. meeboldii**
4. Leaf margins folded back 5
4. Leaf margins not folded 7
5. Leaves soft cottony on both surfaces; heads large, in subumbellate terminal corymbs ..... **A. leptophylla**
5. Leaves not soft cottony on both surfaces; heads small and not as above 6
6. Heads in dense single or branched corymbs; flowers yellow ..... **A. marcescens**
6. Heads in few flowered compact clusters; flowers yellow turning white ..... **A. aristata**
7. Leaves linear-oblong; capitula pink tinged; achenes papillose ..... **A. subdecurrens**
7. Leaves oblong to oblanceolate; capitula white; achenes scaly ..... **A. lawii**

Anaphalis aristata DC., Prodr. 6:274.1838; Wight, Ic. t. 119.1846; Hook.f., FBI 3:285.1881; Gamble, FPM 696. 1921; Kumar & Pant in Hajra *et al*, Fl. Ind. 13: 55. 1995. Fyson, FSIHS 332. t. 273. 1932; Matthew, Ill. FPH t. 419. 1996 & FPH 661. 1999. **Panji Poovu (EBIS).**

Leaves 2-4 x 0.3 cm, linear- lanceolate, base broad amplexicaule or cordate, apex acuminate, scabrous above. Heads 3 mm wide, hemispherical. Bisexual flowers central, 10-15; corolla 2.5 mm long, broader above; female flowers <10; corolla 1.5 mm long, slender. Achenes cylindrical, brown, papillose; pappus 2 mm long.
Fl. & Fr.: July-December
Distr.: Endemic to Southern Western Ghats. Rare; in grasslands at lower altitudes. MS, Puthur, *KKK 16072*; Methappu, *KKK 31072*.

Anaphalis bournei Fyson, Kew Bull. 1914: 209. 1914; Gamble, FPM 697. 1921; Fyson, FSIHS 333. t. 275. 1932; Kumar & Pant in Hajra *et al,* Fl. Ind. 13: . 1995; Matthew, Ill. FPH t. 421. 1996 & FPH 663. 1999. **Panji Poovu (EBIS).**

Leaves 1-2 x 0.4 cm, linear to oblanceolate, acute. Heads 3 x 6 mm, sessile, collected in terminal congested cymes. Bisexual flowers 30-40, central; corolla broader; female flowers 10-20. Achenes ovoid brown, papillose; pappus 3 mm long.
Fl. & Fr.: July-November
Distr.: Endemic to Southern Western Ghats. Rare; in higher altitude grasslands. ENP, Way to hut, *KKK 18028*.

Anaphalis lawii (Hook. f.) Gamble, FPM 696. 1921; Fyson, FSIHS 330. t. 272. 1932; Kumar & Pant in Hajra *et al,* Fl. Ind. 13: 66. 1995; Matthew, FPH 663. 1999. *A. oblonga* DC. var. *lawii* Hook. f., FBI 3: 283. 1881. **Panji Poovu (EBIS).**

Leaves 4-5 x 0.7 cm, base amplexicaule, apex acute. Heads 4 mm across, in densely branched corymbose cymes. Bisexual flowers 5-7, central; corolla 2.5 mm long, white, 5-toothed at apex. Achenes minute, cylindrical, scaly, brown.
Fl. & Fr.: August-December
Distr.: Endemic to Peninsular India. Occasional; found in grasslands and shola borders at all altitudes. MS, Puthur, *KKK 16065*; Idlimottai, *KKK 16609*.

Anaphalis leptophylla (DC) DC., Prodr. 6: 273. 1838; Hook.f. FBI 3: 285. 1881; Gamble, FPM 696. 1921; Fyson, FSIHS 333. 1932; Kumar & Pant in Hajra *et al,* Fl. Ind. 13: 67. 1995; Matthew, FPH 663. 1999. *Helichrysum leptophyllum* DC. in Wight, Contr. Bot. India 20. 1834. **Panji Poovu (EBIS).**

Leaves 3-6 x 0.4 cm, linear-oblanceolate, apex acute. Heads to 8 mm wide. Bisexual flowers 40-60, central; corolla broader, tube 2.5 mm; female flowers 30-40; corolla glabrous. Achenes ovoid-oblong, brown, papillose; pappus 3 mm long, white.
Fl. & Fr.: July-November
Distr.: Endemic to Southern Western Ghats. Occasional; in higher altitude grassland regions. MS, Methappu, *KKK 31073*.

Anaphalis marcescens (Wight) Clarke, Comp. Ind. 110. 1876; Hook. f., FBI 3: 286. 1881; Gamble, FPM 696. 1921; Fyson, FSIHS 331. 1932; Kumar & Pant in Hajra *et al,* Fl. Ind. 13: 67. 1995. *Gnaphalium marcescens* Wight, Ic. t. 1115. 1856.

Leaves 3-4 x 0.4 cm, linear, apex acute, dark green and glabrous above. Heads 3 x 6 mm. Bisexual flowers 4-6, central; corolla broader; female flowers many. Achenes brown, papillose; pappus 2 mm long, white.
Fl. & Fr.: July-November

Distr.: South India and Sri Lanka. Occasional; in shola borders and waysides. MS, K-9, *KKK 16796.*

Anaphalis meeboldii W.W. Sm., Rec. Bot. Surv. India 4: 282. 1911; Gamble, FPM 696. 1921; Kumar & Pant in Hajra *et al,* Fl. Ind. 13: 69. 1995; Matthew, Ill. FPH t. 422. 1996 & FPH 664. 1999. **Panji Poovu (EBIS).**

Leaves 2 x 0.3 cm, lanceolate, apex acute. Heads 4-5 mm wide, sessile, collected in terminal congested corymbs. Bisexual flowers 16-20, central; female flowers 8-16; corolla yellow, slender, 4 lobed. Achenes brown, papillose; pappus 2 mm long.

Fl. & Fr.: July-November

Distr.: Endemic to Western Ghats. Rare; in higher altitude grassland regions. MS, Idlimottai, *KKK 16619.*

Anaphalis subdecurrens (DC.) Gamble, FPM 695. 1921; Kumar & Pant in Hajra *et al,* Fl. Ind. 13: 75. 1995; Matthew, Ill. FPH t. 423. 1996 & FPH 664. 1999. *Gnaphalium subdecurrens* DC. in Wight, Contrib. 21. 1834. *Anaphalis oblonga* DC., Prodr. 6: 274. 1837; Hook. f., FBI 3: 283. 1881. p. p. **Panji Poovu (EBIS).**

Leaves 3-4 x 0.6 cm. Heads 5-6 mm wide, sessile, collected in terminal branched corymbs. Bisexual flowers 4-6, central; female flowers many; corolla rose turning white, slender, glabrous. Achenes brown, papillose; pappus 2 mm long.

Fl. & Fr.: July-November

Distr.: South India and Sri Lanka. Common; found in low and medium altitude grasslands. MS, Puthur, *KKK 16068.*

Anaphalis travancorica W.W. Sm., Rec. Bot. Surv. India 4: 284. 1911; Gamble, FPM 695. 1921; Fyson, FSIHS 329. t. 271. 1932; Kumar & Pant in Hajra *et al,* Fl. Ind. 13: 76. 1995; Matthew, Ill. FPH t. 424. 1996 & FPH 665. 1999. **Panji Poovu (EBIS) Plate 5.4.1.**

Leaves 5-6 x 1 cm, elliptic to oblanceolate, apex acute, dense wooly. Heads 6 mm across, white with yellowish centre, collected in terminal corymbs. Bisexual flowers plenty, central; corolla broader; female flowers 30-40; corolla tube 3 mm, slender, glabrous. Achenes 1 mm, brown, papillose; pappus 3 mm long.

Fl. & Fr.: July-November

Distr.: Endemic to Southern Western Ghats. Occasional; in higher altitude grasslands. MS, Methappu, *KKK 17503.*

ARTEMISIA Linnaeus

Gen. Pl. ed. 5. 367. 1754.

Artemisia nilagirica (Clarke) Pamp. in Nuovo., Giorn. Bot. Ital. 33: 452. 1926; Sant., BBSI 3(1): 12. 1961; Naithani in Hajra *et al,* Fl. Ind. 12: 36. 1995; Matthew, Ill. FPH tt. 454-455. 1996 & FPH 699. 1999. *A. vulgaris* L. var. *nilagirica* Clarke, Comp. India 162. 1876. *A. indica* sensu Wight, Ic. t. 112. 1846. non Willd., 1803. *A. vulgaris* auct. non L., 1753: Hook. f., FBI 3: 325. 1881; Gamble, FPM 713. 1921; Fyson, FSIHS 342. 1932. **Velipathiri (EBIS).**

Perennial subshrubs. Leaves to 20 x 10 cm, oblong-lanceolate, dissected, lobes oblong, acute. Panicles leafy, terminal and in upper axils,. Heads 3-4 mm long, globose. Female flowers many; corolla white, narrow. Bisexual flowers 4-6; corolla broader, glabrous. Achenes 1.5 mm long, oblong, glabrous.

Fl. & Fr.: August-December

Distr.: Endemic to Peninsular India. Very common; along way sides at lower altitudes. MS, Puthur, *KKK 16196.*

BIDENS Linnaeus

Sp. Pl. 831. 1753

Bidens pilosa L., Sp. Pl. 832. 1753; Hook. f., FBI 3: 309. 1881; Gamble, FPM 709. 1921; Fyson, FSIHS 339. t. 282. 1932; Chowdhery in Hajra *et al,* Fl. Ind. 12: 372. 1995; Matthew, FPH 680. 1999. *B. chinensis* auct non Willd., Hook. f., FBI 3: 309. 1881.

Erect subshrubs; stem ribbed. Leaves pinnate or bipinnate, to 16 cm long; leaflets 6-8 x 3 cm, ovate, acuminate, serrate. Heads radiate, 1-1.5 cm across, oblong, in loose corymbose panicles or solitary. Outer flowers ligulate; limb 5 x 3 mm, oblong, 3-lobed, white; inner flowers bisexual; corolla tubular, 5-lobed, yellow, lobes obtuse. Achenes 16 mm long, linear, glabrous; pappus 3, retrorsely barbed, spinescent.

Fl. & Fr.: July-September

Distr.: Pantropical. Very common along roadsides at lower altitudes. MS, K-4, *KKK 16497*; Puthur, *KKK 16691.*

CICERBITA Wallroth

Sched. Crit. 433. 1822.

Cicerbita cyanea (D. Don) Beauv., Bull. Soc. Bot. Geneve, ser. 2, 2: 132. 1910; Mamgain & Rao in Hajra *et al.,* Fl. Ind. 12: 268. 1995. *Sonchus cyaneus* D. Don, Prodr. 164. 1825. *Lactuca hastata* DC., Prodr. 7: 139. 1838; Hook. f., FBI 3: 407. 1881; Gamble, FPM 731. 1921; Fyson, FSIHS 357. t. 302. 1932. *Mulgedium neilgheryense* Wight, Ic. t. 1144. 1846.

Tall hispid, perennial herbs. Leaves radical and alternate, polymorphous, usually pinnatifid with a large hastate terminal lobe; petiole winged and auricled at base. Heads 2 x 1 cm, subcampanulate, in terminal paniculate racemes. Flowers yellow; outer bracts 6 x 2 mm, oblong-ovate; inner linear-oblong, ligules bluish-purple. Achenes 10 mm, ovoid-oblong, dark brown, flattened, 3 ribbed; pappus black.

Fl. & Fr.: June-August

Distr.: India, Nepal, China and Tibet. Fairly common in high altitude grasslands or ecotones. ENP, Bhiman Odai, *KKK 18018.*

CIRSIUM P. Miller

Gard. Dict. Abr. Ed. 4. 28. 1754.

Cirsium wallichii DC., Prodr. 6: 643. 1838; Hajra in Hajra *et al.,* Fl. Ind. 12: 171. 1995, var. **wightii** (Hook. f.) Vivek., Biol. Mem., Angiosp. Taxon. ser. 2 (1 & 2): 77.

1977; Matthew, FPH 720. 1999 & Ill. FPH t. 472. 1996. *Cnicus wallichii* DC. var. *wightii* Hook. f., FBI 3: 364. 1881; Gamble, FPM 725. 1921. *C. wallichii* auct. non DC., Fyson, FSIHS 352. t. 297. 1932. *Cirsium argyracanthum* Wight, Ic. tt. 1137 & 1138. 1846; Hook. f., FBI 3: 364. 1881. **Chakku Mullu (EBIS).**

Erect thistle; branchlets ribbed. Leaves alternate, clasping, to 10 x 4 cm, lanceolate, deeply pinnatisect, segments irregularly toothed and spiny. Corymbs terminal or in upper axils. Heads 4-5 cm wide, ovoid, cream. Outer phyllaries spiny, inner ones incurved near apex. Florets to 2 cm long, lobes 5. Achenes ovoid, 4 angled, papillose; pappus to 10 mm long, feathery.

Fl. & Fr.: July-September

Distr.: Himalayas down to Western Ghats. Occasional; along roadsides, scrublands and ecotones at medium and higher altitudes. MS, Coupe road, *KKK 16579.*

CISSAMPELOPSIS (A. P. de Candolle) Miquel

Fl. Ind. Batav. 2: 102. 1856.

1. Leaves deltoid, base truncate, apex acute, densely tomentose, coriaceous.....**C. corymbosa**
1. Leaves ovate, base cordate, apex acuminate, glabrous, chartaceous.....**C. walkeri**

Cissampelopsis corymbosa (Wall. *ex* DC.) C. Jeffrey & Y. L. Chen, Kew Bull. 39(2): 341. 1984; Mathur in Hajra *et al*, Fl. Ind. 13: 199. 1995; Matthew, Ill. FPH t. 458. 1996 & FPH 707. 1999. *Senecio corymbosus* Wall. *ex* DC. in Wight, Contr. Bot. India 22. 1834; Wight, Ic. t. 1130. 1846; Hook. f., FBI 3: 351. 1881; Gamble, FPM 723. 1921; Fyson, FSIHS 350. 1932. **(EBIS) Plate 4.6.7.**

Large lianas. Leaves to 7 x 8 cm, deltoid, base truncate, apex acute, margin denticulate, cinnamomeous tomentose below (purple in younger leaves). Corymbs terminal or in upper axils. Heads 6 mm across, discoid, cream. Corolla 2.5 mm wide, lobes 5. Achenes 1.5 mm long, cylindrical, ribbed; pappus 8 mm long, white.

Fl. & Fr.: January-May

Distr.: Peninsular India and Sri Lanka. Common; along shola borders at all altitudes. MS, Idlimottai, *KKK 16008*; K-4, *KKK 16148.*

Cissampelopsis walkeri (Arn.) C. Jeffrey & Y. L. Chen, Kew Bull. 39(2): 341. 1984; Mathur in Hajra *et al*, Fl. Ind. 13: 200. 1995; Matthew, Ill. FPH t. 459. 1996 & FPH 707. 1999. *Senecio walkeri* Arn. Pug. P. Ind. Or. 349. 1836; Wight, Ic. t. 1131. 1846; Gamble, FPM 723. 1921; Fyson, FSIHS 350. 1932. **Vettuva Marunnu Chedi (EBIS).**

Slender climber. Leaves to 9 x 7.5 cm, ovate, base cordate, apex abruptly acuminate, cottony but glabrous when old. Heads with 9-12 florets. Corymbs to 10 cm wide, terminal or in upper axils. Heads 5 mm across, discoid, cream. Corolla 2 mm wide, tube 4 mm, lobes 5. Achenes 2.5 mm, cylindrical; pappus 8 mm long, white.

Fl. & Fr.: December-March

Distr.: Peninsular India and Sri Lanka. Common at medium altitudes. MS, Gudalar, *KKK 16087.*

CONYZA Lessing

Syn. Gen. Comp. 203. 1832, *typ. cons.*

Conyza stricta Willd., Sp. Pl. 3: 1922. 1803; Hook. f., FBI 3: 258. 1881; Gamble, FPM 683. 1921; Fyson, FSIHS 321. t. 263. 1932; Hajra in Hajra *et al,* Fl. Ind. 12: 108. 1995; Matthew, FPH 654. 1999.

Erect woody herbs; stem terete or ridged, pubescent. Leaves to 5 x 1 cm, oblanceolate to spathulate, obtuse, entire or serrate, pubescent. Heads 3 x 3 mm, in dense corymbose panicle. Corolla 2.5 mm long, bright yellow. Achenes 1 mm long, ribbed, hairy; pappus 3 mm long, yellow.

Fl. & Fr.: Throughout the year

Distr.: Africa, India and China. Common along road sides at lower altitudes. MS, Puthur, *KKK 16055.*

CRASSOCEPHALUM Moench

Meth. 516. 1794

Crassocephalum crepidioides (Benth) S. Moore, J. Bot. 50: 211. 1912; Matthew, Suppl. Ill. FPH t. 1009. 1998 & FPH 708. 1999. *Gynura crepidioides* Benth in Hook., Niger Fl. 438. 1849. *Erechtites valerianifolia* sensu Fischer in Gamble, FPM 1882. 1936, non (Wolf) DC. 1838.

Stout, erect herbs; branchlets striate. Leaves cauline, to 25 x 12 cm, oblong, base attenuate; segments 5-9, elliptic, deeply and irregularly dentate. Racemes terminal. Heads 5 mm wide, discoid, cylindrical, brick red. Florets 1 cm long; corolla tubular, lobes 5. Achenes cylindrical, brown; pappus 12 mm, white.

Fl. & Fr.: Throughout the year

Distr.: Pantropical weed of American origin; Distributed in India, Sri Lanka, China, Africa and Madagascar. Occasional; along waysides at lower altitudes. K, *KKK 16496.*

DICHROCEPHALA L' Heritier *ex* A. P. de Candolle

Arch. Bot. (Paris) 2: 517. 1833.

1. Leaves sessile, base auricled and stem clasping, margin coarsely serrate ..... **D. chrysanthemifolia**
1. Leaves petiolate, base neither auricled or stem clasping, margin crenate-serrate..... **D. integrifolia**

Dichrocephala chrysanthemifolia (Blume) DC., Prodr. 5: 372. 1836; Wight, Ic. t. 1095. 1851; Hook. f., FBI 3: 245. 1881; Gamble, FPM 679. 1921; Fyson, FSIHS 317. tt. 257 & 259. 1932; Hajra in Hajra *et al,* Fl. Ind. 12: 114. 1995; Matthew, Ill. FPH t. 415. 1996 & FPH 655. 1999. *Cotula chrysanthemifolia* Blume, Bijdr. 918. 1826.

Erect herbs, hispid. Leaves to 5 x 2 cm, lyrate-pinnatifid, obtuse. Heads 4 mm across, globose, in terminal panicles. Flowers cream; female flowers in several outer rows; corolla tubular, 2-4-toothed at apex, glabrous; bisexual flowers few, central; corolla 4-lobed, white. Achenes 1 mm long, obovate, compressed, 4-ribbed, glabrous; pappus with 2 deciduous bristles.

Fl. & Fr.: October-February

Distr.: Paleotropics. Occasional; in grasslands and waysides at higher altitudes. MS, Methappu, *KKK 16418.* ENP, Way to hut, *KKK 18035.*

Dichrocephala integrifolia (L. f.) O. Ktze., Rev. Gen. Pl. 333. 1891; Hajra in Hajra *et al,* Fl. Ind. 12: 114. 1995; Matthew, FPH 655. 1999. *Hippia integrifolia* L. f., Suppl. Pl. 1781. *Dichrocephala latifolia* DC. in Wight, Contrib. India Bot. 11. 1834 & Ic. t. 1096. 1851; Hook. f., FBI 3: 245. 1881; Gamble, FPM 679. 1921; Fyson, FSIHS 317. t. 259. 1932.

Diffuse herbs, hispid. Leaves to 6 x 4 cm, obovate, obtuse; terminal lobes larger. Heads 3 mm across, globose, in terminal panicles. Flowers yellow; female flowers in several outer rows; corolla narrowly tubular, curved; bisexual flowers few, central; corolla 4-lobed at apex, white. Achenes 1 mm long, obovate, compressed, 4-ribbed, glabrous; pappus with 2-3 deciduous bristles.

Fl. & Fr.: July-September

Distr.: Tropical Asia, China and Africa. Occasional; along waysides at lower altitudes. MS, K-4, *KKK 16504.*

EMILIA Cassini

Bull. Sci. Soc. Philom. Paris 68. 1817.

1. Leaves chiefly radical or for a short way up the stems ..... **E. scabra**
1. Leaves chiefly cauline; radical leaves few **2**
2. Stout herb, to 60 cm; flowers scarlet ..... **E. javanica**
2. Slender herb, to 30 cm; flowers purple ..... **E. zeylanica** var. **paludosa**

Emilia javanica (Burm. f.) C. B. Rob., Phillipp. J. Sci. 3: 217. 1908; Mathur in Hajra *et al,* Fl. Ind. 13: 210. 1995; Matthew, Ill. FPH t. 460. 1996 & FPH 709. 1999. *Hieracium javanicum* Burm. f., Fl. Indica 174, t. 57. f. 1. 1768. *Emilia flammea* Cass. in F. Cuvier, Dict. Sci. Nat. 14: 406. t. 5. 1819; Hook. f., FBI 3: 336. 1881; Gamble, FPM 716. 1921.

Stems hirsute. Leaves 4-5 x 1.5-2 cm, obovate, entire or lyrate, crenate, base auricled, crispately pubescent. Heads few, 1.5 cm wide, on 5-6 cm long solid peduncles. Flowers bisexual; corolla tubular, 1.5 mm, glandular, lobes acute. Achenes 3 mm long, 5 ribbed.

Fl. & Fr.: August-December

Distr.: Endemic to Western Ghats. Fairly common in grasslands at higher altitudes. ENP, Amarachola, *KKK 18049.*

Emilia scabra DC., Prodr. 6: 303. 1838; Wight, Ic. t. 1123. 1846; Gamble, FPM 716. 1921; Fyson, FSIHS 344. t. 287. 1932; Mathur in Hajra *et al,* Fl. Ind. 13: 211. 1995. *E. sonchifolia* (L.) DC. var. *scabra* (DC.) Hook. f., FBI 3: 336. 1881. **Poosha Thala (EBIS).**

Stems hirsute. Leaves to 4 x 1 cm, oblong, entire or lyrate, crenate, base auricled, crispately pubescent. Heads large, 1.2-1.5 cm long. Flowers bisexual; corolla 7 mm long, glandular, bright red, lobes acute. Achenes 3 mm long, ribbed, angles hispid.

Fl. & Fr.: Throughout the year

Distr.: Peninsular India. Common in sholas at lower altitudes. MS, K-3, *KKK 16770.*

Emilia zeylanica Clarke, Compos. Ind. 175. 1876; Hook. f. FBI 3: 336. 1881, var. **paludosa** Gamble, FPM 2: 716. 1921; Fyson, FSIHS 344. t. 288. 1932; Mathur in Hajra *et al*, Fl. Ind. 13: 215. 1995; Matthew, Ill. FPH t. 462. 1996 & FPH 711. 1999.

Stem glabrous. Leaves 4 x 0.5 cm, linear, entire, apex acute. Heads 1.5 cm wide, few, on 5 cm long peduncles. Flowers bisexual; corolla 6 mm long; lobes oblong, glandular. Achenes 2 mm long, tetrangular, hispid along the angles.

Fl. & Fr.: August-December

Distr.: Endemic to Western Ghats. Fairly common along marshy roadsides at higher altitudes. ENP, Bhiman Odai, *KKK 18084.*

ERIGERON Linnaeus

Sp. Pl. 863. 1753

Erigeron karvinskianus DC., Prodr. 5: 285. 1836; Hajra in Hajra *et al*, Fl. Ind. 12: 122. 1995; Matthew, FPH 656. 1999. *E. mucronatus* DC., Prodr. 5: 285. 1836; Gamble, FPM 682. 1921; Fyson, FSIHS 321. t. 262. 1932. **Pottu Poovu (EBIS) Plate 5.4.2.**

Spreading, perennial herbs. Leaves dimorphic, 2-3 x 1 cm, elliptic, acute at either ends, dentate, lower ones 3 lobed. Heads heterogamous, 1 cm wide, solitary, peduncled. Female flowers ligulate, peripheral; limb 4 mm long, narrow, entire, white turning purple. Bisexual flowers inner, tubular; corolla 3 mm long, 5-lobed, yellow. Achenes 1.2 mm, compressed, hairy at base; pappus barbed, white.

Fl. & Fr.: Throughout the year

Distr.: Native of Mexico, introduced to India, Malesia, S. Europe and Japan. Common along shola borders and roadsides at medium and higher altitudes. MS, K-3, *KKK 16117*; K-5.5, *KKK 16174.*

GALINSOGA Ruiz & Pavon

Prodr. 110. t. 24. 1794.

Galinsoga parviflora Cav., Ic. 3: 41, t. 281. 1796; Hook. f., FBI 3: 311. 1881; Gamble, FPM 711. 1921; Fyson, FSIHS 340. t. 284. 1932; Chowdhery in Hajra *et al*, Fl. Ind. 12: 388. 1995; Matthew, Ill. FPH t. 441. 1996 & FPH 685. 1999.

Annual herbs. Leaves opposite, 3-5 x 2 cm, ovate, apex acute, serrate, 3-ribbed from base. Heads 4 x 3 mm, on peduncled cymes; peduncles dichotomous, slender. Outer row of flowers ligulate, limb deeply 3-lobed, white. Inner flowers tubular, bisexual; corolla 1.5 mm long, 5-toothed. Achenes 2 mm long, obovoid, truncate, black, 3-4 angled, scabrid; pappus of 3-4 fimbriate hyaline scales.

Fl. & Fr.: September-December

Distr.: Native of South America. Common in sholas at lower altitudes. MS, K-3, *KKK 16786.*

GAMOCHAETA Weddel

Chlor. Andina 1: 151. 1856.

1. Leaf surfaces discolourous; panicles > 8 cm long, leafy ..... **G. coarctata**
1. Leaf surfaces concolorous; panicles < 5cm long, not leafy ..... **G. purpurea**

Gamochaeta coarctata (Willd.) M. Kerguelen, Lejeunia 120: 104. 1987; Matthew, Ill. FPH t. 429. 1996 & FPH 669. 1999. *Gnaphalium coarctatum* Willd., Sp. Pl. 3: 1886. 1800; Kumar & Pant in Hajra *et al,* Fl. Ind. 13: 85. 1995. **Plate 4.6.8.**

Stout, perennial herbs, 35-45 cm higher. Basal leaves larger, 9 x 2 cm, oblanceolate, obtuse, narrowed to the base, softly white wooly below; cauline leaves 4-5 x 0.8 cm, spathulate, obtuse. Heads heterogamous, 3 x 2 mm, in leafy clusters, sessile. Bisexual flowers 1 or 2, central; corolla 2 mm long, filiform, glabrous. Achenes 5 mm long, 3-angled, black, hirsute; pappus 2.5 mm long, setaceous.

Fl. & Fr.: Throughout the year

Distr.: Native of South America, now wide spread. Occasional; found along roadsides at lower to higher altitudes. MS, Idlimottai, *KKK 16012*; Chengalar, *KKK 18139.*

Gamochaeta purpurea (L.) Cabrera, Bol. Soc. Argent. Bot. 9: 377. 1961; Matthew, Ill. FPH t. 430. 1996 & FPH 670. 1999. *Gnaphalium purpureum* L. Sp. Pl. 854. 1753; Kumar & Pant in Hajra *et al,* Fl. Ind. 13: 92. 1995.

Erect herbs. Basal leaves larger, 3 x 1.5 cm, spathulate to oblanceolate, base truncate, apex obtuse, tomentose below, glabrescent above; cauline leaves 3 x 1.5 cm, lanceolate, obtuse. Heads 3 mm wide, in terminal panicles. Bisexual flowers 3-4, central; corolla 2 mm long, glabrous. Achenes 0.5 mm long, ellipsoid; pappus 2 mm long, setaceous.

Fl. & Fr.: Throughout the year

Distr.: North and South America, Europe; adventive in New Zealand, India & Pakistan. Occasional along road sides at lower altitudes. MS, K-3, *KKK 16785.*

GYNURA Cassini

Dict. Sci. Nat. 34: 391. 1825.

1. Plants glabrous; leaves oblanceolate; heads yellow ..... **G. nitida**
1. Plants hirsute or tomentose; leaves elliptic to obovate; heads orange ..... **G. travancorica**

Gynura nitida DC. in Wight, Contrib. 24. 1834; Wight, Ic. t. 1121. 1846; Hook. f., FBI 3: 333. 1881; Gamble, FPM 714. 1921; Fyson, FSIHS 343. t. 286. 1932; Mathur in Hajra *et al,* Fl. Ind. 13: 221. 1995; Matthew, FPH 712. 1999.

Stout herbs. Leaves to 15 x 4 cm, oblanceolate, entire, apex obtusely-acute, base narrowed and amplexicaule. Heads 16 x 12 mm, cylindrical, 10-20 together, in panicled cymes; peduncle 2-4 cm long. All flowers not fertile; corolla 10 mm long, lobes obtuse, glandular. Achenes 3.5 x 1 mm, ellipsoid, 11-ribbed, truncate, black; pappus 14 mm long, white.

Fl. & Fr.: August-January

Distr.: Endemic to Western Ghats. Common; along roadsides at medium altitudes. MS, K-5, *KKK 16543.*

Gynura travancorica Smith, Rec. Bot. Surv. India 6: 29. 1914; Gamble, FPM 714. 1921; Fyson, FSIHS 343. 1932; Mathur in Hajra *et al,* Fl. Ind. 13: 224. 1995; Matthew, FPH 713. 1999. **Moyalu Kola, Koppu Chedi (EBIS).**

Erect herbs. Leaves 10-13 x 3.5 cm, elliptic to obovate, acute at either ends, sharply and distantly serrate; upper ones amplexicaule. Heads homogamous, to 18 x 7 mm, in terminal panicled cymes; corolla 13 mm long, lobes acute, glandular. Achenes 4 mm, oblong, ribbed, pubescent, black; pappus 12 mm long, white.

Fl. & Fr.: August-December

Distr.: Endemic to Western Ghats. Common along roadsides at higher altitudes. MS. Idlimottai, *KKK 16015* & *KKK 16420*; K-9, *KKK 16795*. ENP, Mesthiri kettu, *KKK 18020*.

HELICHRYSUM P. Miller

Gard. Dict. Abr. ed. 4. 1754, orth. cons.

Helichrysum buddleioides DC. in Wight, Contrib. Bot. India 20. 1834; Wight, Ic. t. 1113. 1846; Hook. f., FBI 3: 290. 1881; Gamble, FPM 699. 1921; Fyson, FSIHS 335. t. 278. 1932; Pant in Hajra *et al,* Fl. Ind. 13: 98. 1995; Matthew, Ill. FPH t. 433. 1996 & FPH 673. 1999. *H. hookerianum* Wight & Arn. in DC. Prodr. 6: 201. 1838; Fyson, FSIHS 336. 1932. *H. buddleioides* DC. var. *hookerianum* (Wight & Arn.) Hook. f., FBI 3: 291. 1881. **Panji Poovu (EBIS). Plate 5.2.8.**

Stout herbs, densely cottony wooly. Leaves to 10 x 2 cm, elliptic-oblong, apex acute, base narrowed and amplexicaule, sparsely cottony above, 5-7-ribbed. Heads 4 x 4 mm, globose, heterogamous, densely packed. Bisexual flowers 10-15; corolla 2 mm long, tubular, glabrous, yellow. Female flowers many; corolla 3 mm long. Achenes oblong, 3-angled, scabrid; pappus white.

Fl. & Fr.: November-March

Distr.: Peninsular India and Sri Lanka. Common in the ecotones at higher altitudes. MS, Idlimottai, *KKK 16021*; K-3, *KKK 16127*; Idlimottai, *KKK 17599*. ENP, Mampallam Chola, *KKK 18067*.

KLEINIA P. Miller

Gard. Dict. Abr. ed. 4. 1754.

Kleinia grandiflora (DC.) N. Rani in Matthew, Fl. Tamilnadu Carnatic 2: t. 381. 1982, 3: 801. t. 56d. 1983; Mathur in Hajra *et al,* Fl. Ind. 13: 226. 1995; Matthew, Ill. FPH tt. 463-464. 1996 & FPH 713. 1999. *Notonia grandiflora* Wall. *ex* DC. in Guill., Arch. Bot. (Paris) 2: 518. 1833; Hook. f., FBI 3: 336. 1881; Gamble, FPM 717. 1921.

Subshrubs; branchlets angled above. Leaves alternate, to 14 x 8 cm, obovate to oblanceolate, base cuneate, apex obtuse, entire. Corymbs terminal. Heads homogamous, cylindric, 1.5 cm. Florets to 2.5 cm long; corolla cream or yellowish, tube to 18 mm. Achene linear or oblong, to 5.5 mm, ribbed; pappus 1.5 cm.

Fl. & Fr.: December-May

Distr.: South India, Nepal and Sri Lanka. Rare; along rocky stream sides. MS, Kalippettu Mala, *KKK 17622*.

MOONIA Arnott

Nova Acta Phys.-Med. Acad. Caes. Leop.-Carol. Nat. Cur. 18: 348. 1836

Moonia heterophylla Arn., Nova Acta Nat. Cur. 18: 349. 1836; Gamble, FPM 704. 1921; Fyson, FSIHS 337. t. 279. 1932; Chowdhery in Hajra *et al,* Fl. Ind. 12: 401.

1995; Matthew, Ill. FPH t. 443. 1996 & FPH 689. 1999. *Chrysogonum heterophyllum* (Arn.) Benth. *ex* Clarke, Compos. Ind. 132. 1876; Hook. f., FBI 3: 303. 1881. *Moonia arnottiana* Wight, Ic. t. 1105. 1846; Gamble, FPM 704. 1921; Fyson, FSIHS 337. 1932. *Chrysogonum arnottianum* (Wight) Benth. *ex* Clarke, Compos. Ind. 132. 1876; Hook. f., FBI 3: 303. 1881.

Erect subshrubs. Leaves opposite, to 8 x 7 cm; lowers 1-pinnately compound or divided; lobes elliptic, acuminate, serrate; hirsute below. Heads 10 x 8 mm, solitary, pedunculate, upper axillary. Outer flowers female, ligulate; limb deeply divided into 3 lobes, yellowish white; bisexual flowers central; corolla 4 lobed, tubular. Achenes 3.5 x 2 mm, biconvex, puberulus, black; pappus absent.

Fl. & Fr.: November-February

Distr.: South India and Sri Lanka. Fairly common along roadsides at higher altitudes. ENP, Way to hut, *KKK 18021.*

MYRIACTIS Lessing

Linnaea 6:127.1831

Myriactis wightii DC. in Wight, Contrib. 10. 1834; Ic. t. 1091. 1846; Hook. f., FBI 3: 247. 1881; Gamble, FPM 680. 1921; Fyson, FSIHS 319. t. 260. 1932; Hajra in Hajra *et al,* Fl. Ind. 12: 135. 1995; Matthew, Ill. FPH t. 417. 1996 & FPH 658. 1999.

Erect herbs. Leaves to 4 x 2 cm, obovate, obtuse, hispid, coarsely serrate, shortly petioled. Heads 4 mm long, cylindrical, solitary, on long peduncles. Female florets outside; tube 1 mm long, white; limbs 2.5 x 0.5 mm, oblong, recurved. Inner florets bisexual; corolla tube 2 mm long, yellow, lobes acute. Achenes 3 x 1 mm, ellipsoid, compressed, obtusely 3-angled, acute at both ends, smooth; pappus absent.

Fl. & Fr.: March-May

Distr.: South India and Sri Lanka. Common along road sides at medium altitudes. MS, K-5, *KKK 16162.*

Note : This species hitherto has not reported from Kerala. Hence the present collection forms a new distributional record for Kerala.

PARTHENIUM Linnaeus

Sp. Pl. 988. 1753.

Parthenium hysterophorus L., Sp. Pl. 988. 1753; Ellis & Swamin. in J. Bombay Nat. Hist. Soc. 66: 233. 1969; Chowdhery in Hajra *et al,* Fl. Ind. 12: 403. 1995; Matthew, FPH 690. 1999.

Erect herbs; branchlets puberulus. Leaves alternate, deeply pinnatisect, lobes to 10 x 1 cm, oblong-lanceolate, entire, base decurrent, apex acute. Heads terminal, in lax panicles. Outer florets 5, rayed, female; corolla ligulate, white, limb short, entire. Inner florets bisexual; corolla tubular, white. Achenes 2 x 1.5 mm, broadly ovoid, compressed, puberulus; pappus absent or with two short hooks.

Fl. & Fr.: August-February

Distr.: Native of America, now a Pantropical weed. Common along road sides at lower altitudes. MS, K-3, *KKK 16704.*

PHYLLOCEPHALUM Blume

Bijdr. 888. 1826

1. Perennial herbs of higher altitudes; leaves white wooly tomentose, margins crenulate ..... **P. indicum**
1. Annual herbs of low altitudes; leaves loosely white felted, margins serrate ..... **P. scabridum**

Phyllocephalum indicum (Less.) K. Kirkman, Rhodora 83: 12. 1981; Uniyal in Hajra *et al*, Fl. Ind. 13: 340. 1995; Matthew, Ill. FPH t. 404. 1996 & FPH 641. 1999. *Ampherephis indica* Less. Linnaea 6: 686. 1831. *Decaneurum reticulatum* DC. in Wight, Contr. Bot. India 3. 1834 & Ic. t. 1080. 1846. *Centratherum reticulatum* (DC.) Benth. in Benth. & Hook. f., Gen. Pl. 2: 225. 1873; Hook. f. FBI 3: 227. 1881; Gamble, FPM 666. 1921; Fyson, FSIHS 306. t. 246. 1932.

Leaves 9-12 x 3-4 cm, ovate, apex acuminate, nerves brown beneath. Heads 1.8 x 1 cm, peduncled. Flowers 10-12, tubular; corolla 8-10 mm long, lobes acute, glabrous. Achenes 2 mm long, 10-ribbed, glabrous, brown; pappus 2 mm long, many, setaceous.

Fl. & Fr.: August-December

Distr.: India and Sri Lanka. Occasional; along shola borders and waysides at higher altitudes. ENP, Amarachola, *KKK 18048*.

Phyllocephalum scabridum (DC.) K. Kirkman, Rhodora 83: 10. 1981; Uniyal in Hajra *et al*, Fl. Ind. 13: 344. 1995. *Decaneurum scabridum* DC. in Wight, Contrib. 7. 1834. *D. molle* DC., Prodr. 5 67. 1838. *D. courtallense* Wight, Ic. t. 1081. 1846. *Centratherum molle* (DC.) Benth. in Benth & Hook. f., Gen. Pl. 2: 225. 1873; Hook. f., FBI 3: 227. 1881; Gamble, FPM 666. 1921. *C. courtallense* (Wight) Benth *ex* Hook. f., FBI 3: 227. 1881. *Phyllocephalum courtallense* (Wight) Narayana, Curr. Sci. 51: 438. 1982.

Leaves 15 x 6.5 cm, elliptic, acuminate at both ends, thinly scabrid above, deeply serrate. Heads 1.3 x 1 cm, few. Flowers 12-15; corolla 8 mm long, tube broadening up; lobes oblong, glabrous. Achenes 1.5 mm long, 12-ribbed, glabrous; pappus few, 2.5 mm long.

Fl. & Fr.: August-December

Distr.: Endemic to Western Ghats. Common along roadsides at lower altitudes. MS, K-4, *KKK 16528*.

SENECIO Linnaeus

Sp. Pl. 866. 1753.

1. Erect herbs or subshrubs **2**
1. Climbing shrubs ..... **S. scandens**
2. Hispid herbs; leaves oblong to broad lanceolate; heads heterogamous ..... **S. lavandulaefolius**
2. Fleshy subshrubs; leaves elliptic; heads homogamous ..... **S. stylosus**

Senecio lavandulaefolius DC. in Wight, Contr. Bot. India 23. 1834; Wight, Ic. t. t. 1133. 1846; Hook. f. FBI 3: 343. 1881; Gamble, FPM 721. 1921; Fyson, FSIHS 347. t. 292. 1932; Matthew, Ill. FPH t. 465. 1996 & FPH 714. 1999. *Pseudojacoboea lavendulaefolius* (DC.) Mathur in Rao *et al*, Fl. Ind. Enum. Aster. 59. 1988 & in Hajra *et al*, Fl. India 13: 304. 1995.

Leaves alternate, to 3 x 1 cm, base cuneate, apex acute, margin strongly reflexed, fluffy below. Corymbs terminal, 5 cm wide. Heads 5 cm wide, campanulate. Outer ray florets 1.2 cm, ligule 3 fid. Inner disc florets 7 mm; corolla tube 4.5 mm, lobes 5. Achenes linear, 1.5 mm long.

Fl. & Fr.: December-April

Distr.: Endemic to Western Ghats. Rare; in grasslands at very higher altitudes. ENP, Anamudi top, *KKK 18533.*

Senecio scandens Buch.-Ham. *ex* D. Don, Prodr. Fl. Nep. 178. 1825; Hook. f., FBI 3: 352. 1881; Matthew, FPH 715. 1999. *S. wightianus* DC. in Wight, Contrib. 22. 1834; Wight, Ic. t. 1136. 1846; Gamble, FPM 724. 1921; Fyson, FSIHS 350. t. 296. 1932; Mathur in Hajra *et al,* Fl. Ind. 13: 280. 1995. **Pomburi Kodi (EBIS) Plate 4.7.1.**

Stems ridged, zig-zag, glabrous. Leaves to 10 x 4 cm, ovate, base hastate, apex acute, serrate, decurrent and auricled at the base of the petiole. Heads 7 x 5 mm, many, in axillary panicle with zig-zag branches. Female flowers peripheral; corolla 7 mm long, limb 3-lobed, yellow. Bisexual flowers central; corolla 4 mm long, tubular. Achenes ribbed, hairy between the ribs; pappus white, 3-4 mm long.

Fl. & Fr.: December-February

Distr.: Indo-China. Common in shola borders at lower and medium altitudes. MS, Puthur, *KKK 16094*; Kalipettu Mala, *KKK 16759.* PAS, Topstation, *KKK 18591.*

Senecio stylosus Balakr., J. Bombay Nat. Hist. Soc. 67: 62. 1970. *Gynura walkeri* Wight, Ic. t. 1122. 1846. *Notonia walkeri* (Wight) Clarke, Comp. India 176. 1876; Hook. f., FBI 3: 337. 1881; Gamble, FPM 717. 1921; Fyson, FSIHS 345. t. 289. 1932. *Kleinia walkeri* (Wight) Uniyal in Rao, Fl. Ind. Enum. Aster. 49. 1988; Mathur in Hajra *et al,* Fl. Ind. 13: 227. 1995.

Stem glabrous. Leaves to 13 x 4 cm, alternate, acuminate at either ends, crenate-serrate, glabrous. Heads 14 x 8 mm in terminal corymbose panicle; bracteolate. Flowers all bisexual, tubular; corolla 8 mm long, 5-lobed, white or pale yellow. Achenes 5 mm long, oblong, 10-ribbed; pappus many, cottony, white, setaceous.

Fl. & Fr.: December-March

Distr.: South India and Sri Lanka. Fairly common at medium and higher altitudes. ENP, MPCA plot, *KKK 17522.*

SIGESBECKIA Linnaeus

Sp. Pl. 900. 1753

Sigesbeckia orientalis L., Sp. Pl. 900. 1753; Hook. f., FBI 3: 304. 1881; Gamble, FPM 704. 1921; Fyson, FSIHS 338. t. 280. 1932; Chowdhery in Hajra *et al,* Fl. Ind. 12: 407. 1995; Matthew, FPH 690. 1999.

Erect subshrubs; stem scabrous and viscid. Leaves to 15 x 10 cm, ovate, base cuneate and decurrent, apex acute, pubescent, dentate. Heads 8 x 4 mm, solitary, terminal, on slender, densely hairy peduncles. Outer florets ligulate, female, corolla tubular; limb 2 mm long, 3-lobed, yellow. Inner disc florets 2 mm long. Achenes 4 mm long, curved, 4-angled, black; pappus absent.

Fl. & Fr.: October-January

Distr.: Throughout Tropical Countries. Occasionally along road sides and scrublands at lower altitudes. MS, K-3.5, *KKK 16783.*

SONCHUS Linnaeus

Sp. Pl. 793. 1753.

Sonchus oleraceus L., Sp. Pl. 794. 1753; Hook. f., FBI 3: 414. 1881; Gamble, FPM 732. 1921; Mamgain & Rao in Hajra *et al,* Fl. Ind. 12: 321. 1995; Matthew, Suppl. Ill. FPH t. 1014. 1998 & FPH 725. 1999. *S. ciliatus* Lam., Fl. Franc. 287. 1805; Wight, Ic. t. 1141. 1846. **Palkkola, Varapputhanal (EBIS).**

Annuals, to 90 cm higher; stems reddish, glandular hairy. Leaves to 15 x 6 cm, runcinate-pinnatifid, with a wide hastate terminal lobe, base auricled and amplexicaule; lobes spinulose-serrate. Heads 15 x 8 mm, in panicled cymes. Flowers all ligulate; corolla 12 mm long, limb yellow, 5-lobed; lobes obtuse. Achenes 3 x 1 mm, base narrowed, apex truncate, muriculate; pappus 10 mm long, white, cottony.

Fl. & Fr.: July-December

Distr.: Cosmopolitan. Occasional; along roadsides at lower altitudes. MS, K-3, *KKK 16655.*

VERNONIA Schreber

Gen. 2: 541. 1791, *nom. cons.*

1. Small trees ..... **V. arborea**
1. Shrubs, undershrubs or tall herbs **2**
2. Achenes 10 ribbed **3**
2. Achenes 3-5 angled ..... **V. bourneana**
3. Involucral bracts obtuse, mucronate ..... **V. fysonii**
3. Involucral bracts sharply acuminate, often aristate **4**
4. Flower heads small; leaves crenate-serrate ..... **V. saligna** var. **nilghirensis**
4. Flower heads large; leaves crenate ..... **V. peninsularis**

Vernonia arborea Buch.-Ham., Trans. Linn. Soc. London 14: 218. 1824, var. **arborea**; Hook. f., FBI 3: 329. 1881; Uniyal in Hajra *et al,* Fl. Ind. 13: 359. 1995; Matthew, FPH 644. 1999. *Monosis wightiana* DC. in Wight, Contrib. Ind. Bot. 1. 1834 & Ic. t. 1085. 1846. *Vernonia monosis* Benth. *ex* Clarke, Compos. India 24. 1876, non. Schultz.-Bip., 1847; Gamble, FPM 672. 1921; Fyson, FSIHS 308. t. 247. 1932. *V. arborea* Buch.-Ham. var. *wightiana* (DC.) Hook. f., FBI 3: 239. 1881. **Shengurinji.**

Branchlets densely brown silky hairy. Leaves 15-17 x 7-10 mm, obovate, apex abruptly acuminate, densely pubescent. Panicle 25 x 20 cm, terminal, densely pubescent. Heads many, 10 x 2 mm. Flower solitary; corolla 9 mm long, glabrous, purple; lobes acute. Achenes 4 mm long, 10-ribbed, hairy between the ribs; pappus similar, 9 mm long, bent at base, setaceous, white.

Fl. & Fr.: February-May

Distr.: Indo-Malesia. Common along roadsides and ecotones at higher altitudes. MS, Methappu, *KKK 16001*; Idlimottai, *KKK 16438.*

Vernonia bourneana W.W. Sm., Rec. Bot. Surv. India 6: 101. 1914; Gamble, FPM 675. 1921; Fyson, FSIHS 312. t. 253. 1932; Uniyal in Hajra *et al,* Fl. Ind. 13: 364. 1995; Matthew, Ill. FPH t. 406. 1996 & FPH 644. 1999.

Undershrubs to shrubs; branches grey wooly-tomentose. Leaves to 14 x 4 cm, lanceolate, apex acute, base cuneate, subentire, soft golden tomentose below, glabrous above. Cymes to 15 x 15 cm, terminal, corymbose. Heads 9 x 5 mm, peduncled. Flowers to 12, similar; corolla 5-6 mm long, lobes oblong, recurved. Achenes 2.5 mm long, 4-angled, glandular; pappus dull yellow.

Fl. & Fr.: March-May

Distr.: Endemic to Peninsular India. Occasional along stream sides at medium altitudes. MS, K-6, *KKK 17612.*

Vernonia fysonii Calder, Rec. Bot. Surv. India 6: 343. t. 10. 1919; Gamble, FPM 673. 1921; Fyson, FSIHS 311. t. 250. 1932; Uniyal in Hajra *et al,* Fl. Ind. 13: 371. 1995; Matthew, Ill. FPH t. 409. 1996 & FPH 646. 1999.

Undershrubs; stems densely cottony-hairy. Leaves to 8 x 3 mm, elliptic-lanceolate, base attenuate, apex acuminate, minutely serrate, densely hairy below, glabrous above. Cymes 5-8 cm across, corymbose. Heads 13 mm long, densely packed. Flowers 12-15; corolla 8 mm long, purple, lobes 5, oblong, recurved. Achenes 3 x 1 mm, smooth; pappus biseriate, similar, 8 mm long.

Fl. & Fr.: November-March

Distr.: Endemic to Southern Western Ghats. Common along roadsides at lower altitudes. MS, K-4, *KKK 16784.*

Note: This species was reported to be found restricted to Palni hills only (Ahmedullah & Nayar, 1987). Hence this forms a new record for Kerala.

Vernonia peninsularis (Clarke) Clarke *ex* Hook. f., FBI 3: 233. 1881; Gamble, FPM 674. 1921; Fyson, FSIHS 311. t. 251. 1932; Uniyal in Hajra *et al,* Fl. Ind. 13: 378. 1995; Matthew, Ill. FPH t. 410. 1996 & FPH 646. 1999. *V. bracteata* Wall. var. *peninsularis* Clarke, Compos. India 18. 1876. *Decaneurum silhetense* Wight, Ic. t. 1083. 1846, non DC. 1838. **Plate 4.7.2.**

Subshrubs; stems ribbed, pectinate-hairy. Leaves to 10 x 5 cm, elliptic, base acute, apex crenate, pectinate-hairy below. Heads 15 x 13 mm, globose, in terminal loose corymbose cymes, long-peduncled; corolla 10 mm long, pale pink. Achenes glabrous; outer pappus setaceous, 6-9 mm long, white.

Fl. & Fr.: December-March

Distr.: Endemic to Southern Western Ghats. Fairly common along shola borders at medium altitudes. MS, K-6, *KKK 16177.*

Vernonia saligna DC., Prodr. 5: 33. 1836 var. **nilghirensis** Hook. f., FBI 3: 235. 1881; Gamble, FPM 674. 1921; Uniyal in Hajra *et al,* Fl. Ind. 13: 383. 1995. *V. saligna* sensu Fyson, FSIHS 312. t. 252. 1932, non DC. 1836.

Undershrubs; stem terete, wooly-tomentose. Leaves to 12 x 3 cm, elliptic-lanceolate, acuminate at both ends, pubescent along the nerves beneath. Panicle

terminal, lax, to 25 cm across. Heads 5-6 x 7 mm. Flowers few, similar; corolla 5 mm long, glabrous. Achenes 1.5 mm long, glandular between ribs; pappus reddish-white, to 0.5 mm long, setaceous.

Fl. & Fr.: January-May

Distr.: Endemic to Southern Western Ghats. Occasional; along road sides at higher altitudes. MS, Methappu, *KKK 31074.*

YOUNGIA Cassini

Ann. Sci. Nat. (Paris) 23: 88. 1831.

Youngia japonica (L.) DC., Prodr. 7: 194. 1838; Mamgain & Rao in Hajra *et al,* Fl. Ind. 12: 329. 1995; Matthew, FPH 727. 1999. *Prenanthes japonica* L., Mant. Pl. 107. 193. 1767. *Youngia napifolia* DC., Prodr. 7: 193. 1838; Wight, Ic. t. 1846. *Lactuca napifolia* DC., in Wight, Contrib. 27. 1834. *Crepis japonica* (L.) Benth., Fl. Hong. 194. 1861; Hook. f., FBI 3: 395. 1881; Gamble, FPM 730. 1921.

Slender scapigerous herbs. Leaves mostly radical, to 15 x 3.5 cm long, oblanceolate, membranous, lyrate-pinnatifid, margin sinuate-dentate. Heads 6 x 3 mm, in terminal panicles. Flowers yellow, all ligulate; corolla 5 mm long, tube slender, limb 5-toothed. Achenes 2 x 1 mm, ribbed, beaked, scabrous, brown.

Fl. & Fr.: October-February

Distr.: South-East Asia. Common along road sides at lower altitudes. MS, K-4, *KKK 16505.*

53. CAMPANULACEAE

1. Corolla actinomorphic; anthers free 2
1. Corolla zygomorphic; anthers connate ..... **Lobelia**
2. Capsule dehiscence loculicidal; corolla rotate ..... **Wahlenbergia**
2. Capsule dehiscence by valves; corolla campanulate ..... **Campanula**

CAMPANULA Linnaeus

Sp. Pl. 163. 1753

Campanula alphonsii Wall. *ex* A. DC. in DC., Prodr. 7: 473. 1839; Clarke in Hook. f., FBI 3: 440. 1881; Gamble, FPM 740. 1921; Fyson, FSIHS 362. t. 307. 1932; Matthew, Ill. FPH t. 479. 1996 & FPH 730. 1999.

Diffusely branched villous herb. Leaves to 1.4 x 0.5 cm, obovate, acute at both ends, glaucous below, chartaceous, margin sub-crenate. Flowers blue, solitary, 10 mm wide, in upper axils; calyx lobes 5, 5 mm long, ovate; corolla campanulate, tube 6 mm, lobes 6 x 4 mm; stamens 5; ovary 3 celled. Capsule 5 mm long, obovoid.

Fl. & Fr.: November-December.

Distr.: Endemic to Western Ghats. Rare; in grasslands at higher altitudes. ENP, Bhiman Odai, *KKK 18085.*

Note: New record to the flora of Kerala.

LOBELIA Linnaeus

Sp. Pl. 929. 1753

1. Erect or prostrate herbs; branchlets trigonous, not hollow 2
1. Erect subshrubs; branchlets terete, hollow when mature 3
2. Prostrate herbs; all anthers penicillate at apex ..... **L. alsinoides**
2. Erect herbs; only 2 anthers penicillate at apex ..... **L. heyneana**
3. Shoots usually unbranched; leaves glaucous below; spikes dense; flowers purple ..... **L. leschenaultii**
3. Shoots branched; leaves not glaucous below; racemes lax; corolla white ..... **L. nicotianiifolia**

Lobelia alsinoides Lam., Encycl. 3: 588. 1792; Harid. & Mukh., Fasc. Fl. Ind. 19: 42. 1988; Matthew, FPH 732. 1999. *L. trigona* Roxb., Fl. Ind. 2: 111. 1824; Clarke in Hook. f., FBI 3: 423. 1881; Gamble, FPM 736. 1921; Fyson, FSIHS 359. t. 303. 1932.

Leaves to 1.5 x 1 cm, ovate, base cordate, apex obtusely-acute, serrate. Flowers solitary, in upper axils; calyx 5 x 1 mm, linear; corolla blue, 7 mm long, cauducous. Capsule 2 valved; seeds trigonous.

Fl. & Fr.: February-March

Distr.: Indo-Malesia. Common in grasslands at higher altitudes. ENP, Umayamala, *KKK 17572.*

Lobelia heyneana Roem. & Schult., Syst. Veg. 5: 50. 1819-1820; Harid. & Mukh., Fasc. Fl. Ind. 19: 51. 1988; Matthew, Ill. FPH t. 482. 1996 & FPH 732. 1999. *L. trialata* Buch.-Ham. *ex* D. Don, Prodr. Fl. Nepal. 157. 1825; Clarke in Hook. f., FBI 3: 425. 1881; Gamble, FPM 736. 1921.

Leaves to 1.8 x 1.4 cm, ovate, base rounded, apex obtusely acute, margin serrate. Flowers solitary in upper axils; calyx 5 x 1 mm, filiform; corolla blue, bilabiate, 7 mm long. Capsule not seen.

Fl.: February.

Distr.: Indo-Malesia, China and Africa. Common along stream sides and shola borders at lower altitudes. MS, Mattukkulam, *KKK 18131.*

Lobelia leschenaultiana (Presl.) Skottsb., Act. Hort. Bot. Gothob. 4: 4, f. 2-7. 1928; Harid. & Mukh., Fasc. Fl. Ind. 19: 52. 1988; Matthew, Ill. FPH t. 483. 1996 & FPH 733. 1999. *Rapuntium leschenaultianum* Presl., Prodr. Monogr. Lobel. 24. 1836. *Lobelia excelsa* Roxb., Fl. Ind. 2: 114. 1824, non Bonpl., 1813; Wight, Ic. tt. 1173 & 1174. 1848; Clarke in Hook. f., FBI 3: 427. 1881 p.p.; Gamble, FPM 737. 1921; Fyson, FSIHS 359. t. 304. 1932. *L. aromatica* Moon *ex* Wight, Ic. t. 1172. 1848. **Thonnali (EBIS) Plate 4.7.3.**

Leaves to 25 x 3 cm, elliptic-lanceolate, base attenuate, apex acuminate, serrate. Spikes terminal, to 60 cm long, 7 cm wide; calyx tube cupular, lobes 10 mm long, lanceolate; corolla tube to 20 mm, constricted below the lobes, lobes unequal, 10-15 mm. Capsule 1 cm long, cupular; seeds oblong.

Fl. & Fr.: February-March.

Distr.: India and Sri Lanka. Common along roadsides and shola margins. MS, Puthur, *KKK 16067.*

Lobelia nicotianiifolia Roth *ex* Schult. in Roem. & Schult., Syst. Veg. 5: 47. 1819; Clarke in Hook. f., FBI 3: 427. 1881; Gamble, FPM 736. 1921; Fyson, FSIHS 360. 1932; Harid. & Mukh., Fasc. Fl. Ind. 19: 53. 1988; Matthew, Ill. FPH t. 484. 1996 & FPH 733. 1999. *L. trichandra* Wight, Ic. t. 1171. 1848.

Leaves distant, 17 x 4 cm, elliptic, base attenuate, tip acuminate, chartaceous, margin inconspicuously serrate. Racemes terminal or in upper axils, to 50 cm; calyx tube 3 mm, lobes 12 x 2 mm, lanceolate; corolla tube 15 mm, constricted below lobes, upper lobe 15 mm, lower 5 mm. Capsule 0.8 x 0.6 cm, cupular; seeds broad-elliptic.

Fl. & Fr.: March-April.

Distr.: Indo-Malesia. Common along road sides a low altitudes. MS, Kolathuvada, *KKK 16052*; Thalachorkadavu, *KKK 16742.*

WAHLENBERGIA H. A. Schrader *ex* A. W. Roth

Novae Pl. Sp. 399. 1821 *(nom. cons.)*

1. Leaves elliptic-lanceolate; often > 0.5 cm wide; flowers lilac; capsule 5 nerved ..... **W. erecta**
1. Leaves lanceolate or oblanceolate; < 0.3 cm wide; flowers light blue; capsule 10 nerved..**W. marginata**

Wahlenbergia erecta (Roth *ex* Schult.) Moeliono & Tuyn in Steenis, Fl. Males. I. 6: 113.1960; Matthew, FPH 735. 1999. *Dentella erecta* Roth *ex* Schult. in Roem. & Schult., Syst. Veg. 5: 25.1819. *Cephalostigma schimperi* Hochst. *ex* A. Rich., Tent. Fl. Abyss. 2: 2.1851; Clarke in Hook.f., FBI 3: 428. 1881; Gamble, FPM 738. 1921. *Wahlenbergia perotifolia,* Wight & Arn., Prodr. 405. 1834, *nom. illeg.*; Wight, Ic. t. 842. 1844-45.

Prostrate, slightly pubescent herb. Leaves highly variable, 1-4 x 0.3-1 cm, sessile. Flowers solitary, pentamerous; calyx 5 x 1 mm, lanceolate; corolla campanulate, lobes obovate; ovary 3 celled. Capsule 4 mm wide, hairy.

Fl. & Fr.: October-December.

Distr.: Indo-Malesia and Tropical East Africa. Common in grasslands at higher altitudes. ENP, Hut 9 km, *KKK 18032*; Mampallam Chola, *KKK 18055.*

Wahlenbergia marginata (Thunb.) A. DC., Monog. Campan. 143. 1830; Matthew, Ill. FPH t. 485. 1996 & FPH 735. 1999. *Campanula marginata* Thunb., Fl. Jap. 89. 1784. *Wahlenbergia gracilis* (Forst. f.) Schrader *ex* A. DC., Monog. Campan. 142. 1830; Clarke in Hook.f., FBI 3: 429. 1881; Gamble, FPM 738. 1921; Fyson, FSIHS 361. t. 305. 1932. *Campanula gracilis* Forst. f., Insul. Austr. Prodr. 84. 1786. *Wahlenbergia agrestris* A. DC., Monog. Campan. 145. 1830; Wight, Ic. t. 1175. 1848.

Small herbs; rootstock perennial. Leaves to 6 x 0.8 cm, bigger at base, minutely toothed or entire, strongly one-nerved, strigose below. Flowers solitary or in binate cymes; calyx tube 4-5 mm long, ribbed, lobes erect, linear-lanceolate; corolla widely campanulate; petals 10 x 4 mm. Capsule obconical; seeds ellipsoid, dark brown.

Fl. & Fr.: August-November.

Distr.: Asia, Africa, Australia and New Zealand. Common along shola borders and road sides. MS, Coupe road, *KKK 16588*; Idlimottai, *KKK 16611.* ENP, Bhiman Odai, *KKK 18032*; Mampallam Chola, *KKK 18055.*

54. ERICACEAE

1. Bushy shrubs, aromatic; flowers white tinged with pink; leaves gland dotted ..... **Gaultheria**
1 Trees; non aromatic; flowers crimson red; leaves not gland dotted ..... **Rhododendron**

GAULTHERIA Linnaeus

Sp. Pl. 395. 1753.

Gaultheria fragrantissima Wall., Asiat. Res. 13:397.1820; Wight, Ic. t. 1196. 1848; Clarke in Hook.f., FBI 3: 457.1882; Gamble, FPM 743. 1921; Fyson, FSIHS 366. t. 311. 1932; Matthew, Ill. FPH t. 486. 1996 & FPH 738. 1999. *G. leschenaultii* DC., Prodr. 7: 593. 1839; Wight, Ic. t. 1195. 1848. **Kolgatte Chedi (EBIS) Plate 5.3.4.**

Leaves to 8 x 4 cm, elliptic, acute to obtuse at both ends, thick coriaceous, reddish gland dotted, aromatic, serrulate. Racemes to 8 cm long in upper axils. Calyx 5 lobed, lobes 4 mm, triangular, margins hairy; corolla 5 mm wide, urceolate, tube 5 mm long, lobes 5, round, reflexed; stamens 10; ovary 3 mm wide. Capsule 8 x 6 mm, cupular, blue with red stalk.

Fl. & Fr.: February-March.

Distr.: Indo-Malesia. Very common in scrublands, grassland ecotones and along road sides at all altitudes. MS, K-3, *KKK 16101.*

RHODODENDRON Linnaeus

Sp. Pl. 392. 1753.

Rhododendron arboreum Smith, Exot. Bot. 1: 9. t. 6. 1805, subsp. **nilagiricum** (Zenk.) Tagg., Stevenson, Sp. Rhodod. 15. 1930; Matthew, Ill. FPH t. 487. 1996 & FPH 740. 1999. *R. nilagiricum* Zenk., Amer. Sci. Nat. ser. 2, 6: 150. 1836; Gamble, FPM 743. 1921; Fyson, FSIHS 368. t. 312. 1932. *R. arboreum* Smith var. *nilagiricum* (Zenk.) Clarke in Hook. f., FBI 3: 466. 1881. **Alangi (EBIS) Plate 5.4.6.**

Leaves alternate, to 10 x 4 cm, oblong-elliptic, base obtuse, apex rounded, coriaceous, glabrous and rugose above, spongy below, margin reflexed. Racemes 6-12 flowered. Calyx to 2 mm, lobes 5, rounded; corolla tubular-campanulate, lobes 3.5 x 2 cm, orbicular; stamens 10; ovary conical, 0.5 cm, densely tomentose. Capsule 2 x 1 cm, oblong, valves separating from placentas; seeds small, plenty.

Fl.& Fr. : January-March.

Distr.: Endemic to Southern Western Ghats. Common along shola borders at all altitudes. MS, K-4, *KKK 16130.*

55. VACCINIACEAE

VACCINIUM Linnaeus

Sp. Pl. 349. 1753

1. Leaves ovate-elliptic, margins crenate; corolla glabrous outside ..... **V. leschenaultii**
1. Leaves lanceolate, margins serrate; corolla pubescent outside ..... **V. neilgherrense**

Vaccinium leschenaultii Wight, Ic. t. 1188. 1848; Clarke in Hook. f., FBI 3: 455. 1882; Gamble, FPM 742. 1921; Fyson, FSIHS 364. t. 309. 1932; Matthew, Ill. FPH t. 488. 1996 & FPH 742. 1999. **Kela Maram (EBIS) Plate 4.7.4.**

Small trees. Leaves to 6 x 3 cm, ovate-elliptic, base attenuate, apex acute to acuminate, margin crenate with minute spines, glabrous, coriaceous. Racemes dense, 8-20 flowered. Flowers 1 x 0.5 cm, white to pink, fleshy and glabrous; calyx 4 mm, lobes 5, margins ciliate; corolla to 9 x 6 mm, urceolate. Berry 8 mm wide, globular, tinged red.

Fl. & Fr.: February-March.

Distr.: Endemic to Southern Western Ghats. Common; found along shola margins at all altitudes. MS, Puthur, *KKK 16059*; K-4, *KKK 16125*. ENP, Umayamala, *KKK 17519*; Amara Chola, *KKK 18529*; Anaimudi slope, *KKK 18543*; Anamudi, *KKK 18547*. VMS, *KKK 18133*.

Notes: Several morphological variations are exhibited by this species with regard to general habit, size and shape of leaves and flowers etc. Many people have attempted to categorize the species into several varieties, but here it is not attempted.

Vaccinium neilgherrense Wight, in Calcutta J. Nat. Hist. 8: 173.1847 & Ic. t. 1189. 1848; Clarke in Hook. f., FBI 3: 454. 1882; Gamble, FPM 741. 1921; Fyson, FSIHS 365. t. 310. 1932; Matthew, Ill. FPH t. 488. 1996 & FPH 743. 1999. **Kela Maram (EBIS).**

Small trees. Leaves to 8 x 2 cm, ovate-lanceolate to lanceolate, base attenuate, distantly serrate, subcoriaceous. Racemes lax, to 6 cm long, 8-10 flowered; calyx 4 mm, lobes 5, margins glabrous, often with a few laciniate outgrowths; corolla rosy white, 8 x 4 mm, slightly pubescent outside; stamens 10 in a ring. Berry 6 mm wide, globose, red, glabrous.

Fl. & Fr.: February-March

Distr.: Endemic to Southern Western Ghats. Common along shola margins at lower altitudes. MS, Puthur, *KKK 16056*; K-4, *KKK 16145*.

56. PRIMULACEAE

LYSIMACHIA Linnaeus

Sp. Pl. 146. 1753.

Lysimachia procumbens Baudo, Ann. Sci. Nat. Bot. 2: 20. 1843; Matthew, Ill. FPH t. 490. 1996 & FPH 748. 1999. *L. deltoidea* Wight, Ill. Ind Bot. t. 144. 1841-1850; Hook. f., FBI 3: 505. 1882; Gamble, FPM 746. 1921; Fyson, FSIHS 370. t. 314. 1932.

Trailing, pubescent herb. Leaves decussate, to 2 x 1.5 cm, deltoid, base cordate, apex acute, apex apiculate, chartaceous, crispate-pubescent. Flowers 1 or 2, axillary; calyx to 8 mm wide, with orange brown dots, lobes 5, 7 x 2 mm, lanceolate; corolla yellow, rotate, tube 2 mm, lobes 6 x 3 mm, broad-obovate, orange dotted; stamens 5; ovary 1.5 mm, globose, 1 celled. Capsule 3 mm wide, seeds many, trigonous.

Fl. & Fr.: October-December.

Distr.: Peninsular India, Sri Lanka, Himalyas and Assam. Rare; in grasslands at higher altitudes. ENP, Amara Chola, *KKK 18007*.

57. MYRSINACEAE

1. Straggling shrubs ..... **Embelia**
1. Erect shrubs or trees **2**
2. Leaf margin serrate; fruit fleshy, many-seeded ..... **Maesa**
2. Leaf margin entire; fruit not fleshy, 1-seeded **3**
3. Leaves rhomboid; flowers in stalked umbels ..... **Ardisia**
3. Leaves obovate, elliptic or oblanceolate; flowers clustered around leafless branchlets ..... **Myrsine**

ARDISIA O. Swartz

Prodr. 3, 48. 1788, *nom. cons.*

Ardisia rhomboidea Wight, Ic. t. 1213. 1848; Clarke in Hook. f., FBI 3: 529. 1882; Gamble, FPM 755. 1921; Fyson, FSIHS 376. 1932; Matthew, Ill. FPH t. 491. 1996 & FPH 750. 1999.

Large shrub. Leaves to 6 x 2.5 cm, acuminate at both ends, chartaceous, margin very obscurely crenulate. Umbels to 3.5 cm wide, 2-7 flowered. Flowers nodding; calyx campanulate, lobes 5, 1.5 mm, lanceolate; corolla whitish pink, 1 cm wide, lobes 5 x 3 mm, broad-ovate, gland dotted; stamens 5; ovary globose. Berry 1 cm wide, subglobose; seed only one, 6 mm wide, subglobular.

Fl. & Fr.: February-March.

Distr.: Endemic to Southern Western Ghats. Common undergrowth inside sholas. MS, K-3, *KKK 16108*; Idlimottai, *KKK 17581*; Idlimottai, *KKK 18171*. ENP, V-point, *KKK 17527*; Anamudi, *KKK 18549*.

EMBELIA N. L. Burman

Fl. Ind. 62. 1768.

1. Leaves coriaceous; inflorescence racemose; flowers orange; drupe blood-red ..... **E. tsjeriam-cottam**
1. Leaves chartaceous; inflorescence panicle; flowers greenish white; drupe bluish-black ..... **E. ribes**

Embelia ribes Burm. f., Fl. Ind. 62, t.23. 1768; Clarke in Hook. f., FBI 3: 513. 1882; Gamble, FPM 752. 1921; Fyson, FSIHS 375. t. 317. 1932; Matthew, FPH 751. 1999.

Lianas; branchlets slender, white, without lenticels. Leaves to 7 x 3 cm, elliptic, acute at both ends. Panicles 15 cm wide, glabrous, branches long, slender. Flowers many; calyx lobes 5, 0.5 mm, triangular, tomentose; corolla 2 mm long, ovate, puberulous; stamens 5, exserted; ovary ribbed. Drupe 3 mm across, globose.

Fl. & Fr.: January-May

Distr.: Indo-Malesia and South China. Occasional; along shola borders at lower altitudes. MS, K-4, *KKK 31011*; Chengalar, *KKK 31062*.

Embelia tsjeriam-cottam (Roem. & Schult.) A. DC., Trans. Linn. Soc. London 17: 131. 1834; Wight, Ic. t. 1209. 1848; Gamble, FPM 753. 1921; Matthew, Ill. FPH t. 318. 1996 & FPH 751. 1999. *Ardisia tsjeriam-cottam* Roem. & Schult., Syst. Veg. 4: 518. 1819. *E. villosa* Wall. *ex* Roxb., Fl. Ind. 2: 289. 1824; Gamble, FPM 753. 1921. *E. robusta* sensu Clarke in Hook. f., FBI 3: 515. 1882, non Roxb. 1832. *Embelia basaal* (Roem. &

Schult.) A. DC., Trans. Linn. Soc. London 17: 131. 1834; Gamble, FPM 753. 1921; Fyson, FSIHS 376. t. 318. 1932. *Ardisia basaal* Roem. & Schult., Syst. Veg. 4: 517. 1819. *Embelia viridifolia* sensu (A. DC.) Hook. f., FBI 3: 516. 1882, non Scheff. 1867. *Chloripetalum aurantiacum* A. DC., Wight, Ic. t. 1210. 1848. *Samara rheedii* Wight, Ic. t. 1591. 1850.

Straggler. Leaves to 12 x 5.5 cm, broadly obovate to oblong. Racemes axillary, to 4 cm. Flowers usually 4-merous; calyx lobes 4(5), 1 mm, coriaceous; corolla 3.5 mm wide, lobes 3 mm; stamens 4(5), exserted. Drupe 8 mm wide, crowned with persistent style.

Fl. & Fr.: January-May

Distr.: Indo-Malesia. Occasional; along shola borders at lower altitudes. MS, Chengalar, *KKK 18101.*

Note: *E. tsjeriam-cottam* and *E. basaal* are treated here as synonyms following Nicolson (1988) and Matthew (1999)

MAESA Forsskal

Fl. Aegypt.-Arab. 66. 1775.

Maesa indica (Roxb.) A. DC., Trans. Linn. Soc. London 17: 134. 1834; Wight, Ic. t. 1206. 1848; Matthew, FPH 752. 1999. *Baeobotrys indica* Roxb., Fl. Ind. 2: 230. 1824. *Baeobotrys dubia* Wall. in Roxb., Fl. Ind. 2: 235. 1824. *Maesa dubia* (Wall.) DC., Trans. Linn. Soc. London 17: 134. 1834; Clarke in Hook. f., FBI 3: 510. 1882; Gamble, FPM 749. 1921. *M. perrottetiana* A. DC. in DC., Prodr. 8: 80. 1844; Gamble, FPM 749. 1921; Fyson, FSIHS 372. 1932. *M. indica* (Roxb.) A. DC. var. *perrottetiana* (A. DC.) Clarke in Hook. f., FBI 3: 509. 1882. **Kattu Malli, *Vallara.***

Shrub to small tree. Leaves to 12 x 6 cm, elliptic to ovate, base rounded to acute, apex acuminate, subcoriaceous, glabrous. Panicles to 8 cm long; calyx lobes 5, 1 mm, ovate, acute, persistent; corolla white, 3 mm wide; ovary glabrous, adnate to calyx. Drupe fleshy, 0.8 x 0.6 cm, globose, yellowish green; seeds angular.

Fl. & Fr.: February-July.

Distr.: Indo-Malesia and Pakistan. Common; found along shola borders at lower and medium altitudes. MS, K-4, *KKK 16149*; Puthur, *KKK 16444.*

MYRSINE Linnaeus

Sp. Pl. 196. 1753

1. Flowers sessile, leaves elliptic or obovate ..... **M. capitellata** var. **sessilis**
1. Flowers pedicelled; leaves obovate or oblanceolate **2**
2. Pedicels 1-2 mm; branchlets not short leaves oblanceolate, narrow ..... **M. wightiana**
2. Pedicels 4-5 mm; branchlets stout; leaves obovate, wide ..... **M. thwaitesii**

Myrsine capitellata Wall. in Roxb. Fl. Ind. 2 : 295. 1824; Matthew, FPH 753. 1999, var. **sessilis** Gamble, FPM 750. 1921; Clarke in Hook. f. FBI 3: 512, p.p., 1882. *Rapanea capitellata* (Wall.) Mez. in Engl. Pflanzenr. 9: 356. 1902, var. *sessilis* Gamble, FPM 750. 1921. **Cheera Maram (EBIS).**

Small trees; branchlets stout, rough. Leaves to 12 x 5 cm, elliptic or obovate, base acute, apex obtusely acute, coriaceous. Flowers sessile; calyx 3 mm wide, lobes acute; corolla greenish-brown, lobes 4 x 1.5 mm, gland dotted; stamens sessile; ovary ovoid. Berry 5 mm across, globose, purple; seeds 4 mm wide, globose.

Fl. & Fr.: February-March.

Distr.: Endemic to Southern Western Ghats. Common along shola borders at higher altitudes. ENP, Umayamala, *KKK 17540*; Umayamala, *KKK 17541.*

Note: New record to the flora of Kerala.

Myrsine wightiana Wall. *ex* DC. in Trans. Linn. Soc. London 17: 106. 1834; Matthew, Suppl. Ill. FPH t. 1021. 1998 & 753. 1999. *M. capitellata* Wall. var. *lanceolata* Clarke in Hook. f., FBI 3: 512. 1882. *M. capitellata* sensu Wight, Ic. t. 1211. 1848, non Wall. 1824. *Rapanea wightiana* (Wall. *ex* DC.) Mez in Engl. Pflanzenr. 9: 360. 1902; Gamble, FPM 751.1921; Fyson, FSIHS 374. t. 316. 1932. **Cheera Maram (EBIS) Plate 4.7.5.**

Small trees; branchlets not very stout. Leaves to 8 x 1.5 cm, oblanceolate, base attenuate, apex acute, coriaceous, veins obscure. Flowers 4 mm across, shortly stalked; calyx 3 mm wide, lobes 1 mm long, acute; corolla lobes 3 x 1 mm, gland dotted; stamens sessile; ovary ovoid. Berry 3 mm wide, subglobose.

Fl. & Fr.: February-March.

Distr.: South India and Sri Lanka. Common along shola margins at lower and medium altitudes. MS, K-4, *KKK 16129.*

Myrsine thwaitesii (Mez) B. M. Wadhwa in M.D. Dassanayake & W.D. Clayton, eds., Revised Handb. Fl. Ceylon, 13: 159. 1999. *Rapanea thwaitesii* Mez in Engl., Pflanzenr., Myrsin. IV 236(9): 357. 1902; Gamble, FPM 751. 1921; Fyson, FSIHS 373. 1932. **Cheera Maram (EBIS).**

Small trees; branchlets thick. Leaves to 8 x 3 cm, obovate on oblanceolate, base attenuate, apex acute, rounded or emarginate. Flowers 3 mm across; calyx 3 mm wide, lobes acute, tip ciliate; corolla lobes 3 x 1.5 mm, sparsely gland dotted; ovary 1 mm. Fruit not seen.

Fl. & Fr.: February-March.

Distr.: Endemic to Western Ghats. Common along shola borders at higher altitudes. MS, Idlimottai, *KKK 16014*; Idlimottai, *KKK 17583.*

58. SAPOTACEAE

1. Thorny trees; calyx lobes 1-seriate, imbricate; stamens 5 ..... **Xantolis**
1. Thornless trees; calyx lobes 2-seriate, outer series valvate; stamens 6 or more ..... **Isonandra**

ISONANDRA Wight

Ic. t. 359. 1840.

1. Leaves 8-18 cm long, margins not recurved, berry ellipsoid ..... **I. lanceolata**
1. Leaves 6-7 cm long, margins recurved; berry oblong ..... **I. perrottetiana**

Isonandra lanceolata Wight, Ic. t. 359. 1840; Clarke in Hook. f., FBI 3: 539. 1882; Gamble, FPM 761.1921. **Vella Pala (EBIS) Plate 4.7.6.**

Large shrubs to small trees. Leaves highly variable, 8-18 x 3-6 cm, elliptic to oblanceolate, base acute to cuneate, apex acuminate, glabrous and glossy. Flowers in axillary and extra axillary fascicles; calyx lobes 3 mm long, ovate, acute, brown tomentose; corolla yellow, 7 mm long, lobes acute; stamens 8; ovary 4 celled. Berry to 1.5 x 1 cm, ellipsoid, orange-yellow, smooth.

Fl. & Fr.: Throughout the year

Distr.: South India and Sri Lanka. Occasional in medium altitudes. MS, K-5, *KKK 31049.*

Isonandra perrottetiana A. DC. in DC., Prodr. 8: 188. 1844; Wight, Ic. t. 1219. 1848; Clarke in Hook. f., FBI 3: 539. 1882; Gamble, FPM 761. 1921; Fyson, FSIHS 379. 1932; Matthew, Ill. FPH t. 492. 1996 & FPH 756. 1999. *I. candolleana* Wight, Ic. t. 1220.1848; Fyson, FSIHS 379. t. 320. 1932. **Karimbala (EBIS) Plate 4.7.7.**

Medium sized trees. Leaves to 7 x 3 cm, elliptic or oblanceolate, base cuneate to attenuate, apex obtusely acute. Flowers subsessile; calyx campanulate, lobes 1 mm, triangular; corolla cream, tubular-campanulate, lobes 3.5 mm, spathulate; anthers obtuse, tip black-hairy; ovary globose. Berry 1.5 cm long, orange turning red.

Fl. & Fr.: January-March

Distr.: Endemic to Southern Western Ghats. Common; in lower and medium altitudes. MS, K-4, *KKK 17505*; K-5, *KKK 31021.*

XANTOLIS Rafinesque

Sylva Tell. 36. 1838.

Xantolis tomentosa (Roxb.) Raf. Sylva Tellur. 36. 1838, var. **elengioides** (A. DC.) Vajr., Biol. Mem. Angiosp. Taxon. ser. 2: 86. 1977; Matthew, Ill. FPH t. 493. 1996 & FPH 759. 1999. *Sideroxylon tomentosum* Roxb., Pl. Corom. t. 28. 1795 & Fl. Ind. 1: 602. 1832; Clarke, FBI 3: 538. 1882, var. *elengioides* (A. DC.) Gamble, FPM 759. 1921. Fyson FSIHS 377. t. 319. 1932. *Sapota elengioides* A. DC. in DC., Prodr. 8: 176. 1844; Wight, Ic. t. 1218. 1848. **Kara (EBIS).**

Medium sized trees; trunk irregularly fluted; thorns elongate. Leaves to 7 x 3 cm, elliptic, subcoriaceous, glabrous, base narrowly cuneate, apex acute. Fascicles subsessile, in upper axils of leaves. Flowers cream; calyx campanulate, lobes 5, to 6 x 3 mm, ovate, margins fimbriate; corolla campanulate, lobes 5, to 10 mm, lanceolate; stamens and staminodes 5 each; ovary globose. Berry 3.5 x 2 cm, ovoid; seeds black.

Fl. & Fr.: March-June

Distr.: Endemic to South India. Common; in lower and medium altitudes. MS, K-4, *KKK 31116.*

59. SYMPLOCACEAE

SYMPLOCOS N. J. Jacquin

Enum. Pl. Carib. 5: 24. 1760.

1. Filaments more or less pentadelphous; corolla tube divided nearly to the base **2**
1. Filaments adnate to the corolla tube; corolla tube elongate ..... **S. pendula**

2. Stamens about 12, in pairs or 3-4 together or solitary ..... **S. oligandra**
2. Stamens usually > 40, in several rows in a ring or in bundles at corolla base 3
3. Drupe ampulliform, globose ..... **S. cochinchinensis** subsp. **laurina**
3. Drupe ovoid-oblong, not ampulliform 4
4. Inflorescence 4-many flowered 5
4. Inflorescence to 4 flowered 8
5. Drupe glabrous 6
5. Drupe villous ..... **S. macrophylla** subsp. **macrophylla**
6. Leaves coriaceous 7
6. Leaves submembranous ..... **S. macrophylla** subsp. **rosea**
7. Whole plant glabrous ..... **S. obtusa**
7. Young branchlets, leaf midribs beneath and inflorescence fulvous-villous ..... **S. foliosa**
8. Leaves coriaceous, small 9
8. Leaves membranous, fairly large ..... **S. pulchra** var. **villosa**
9. Flower on slender recurved peduncle; leaves elliptic, serrulate ..... **S. anamallayana**
9. Flower sessile or shortly peduncled; leaves elliptic or lanceolate, minutely toothed ..... **S. monantha**

Symplocos anamallayana Bedd., Fl. Sylv. S. India, For. Man. 150. 1872 & Ic. t. 116. 1868-74; Clarke, FBI 3: 581. 1882; Gamble, FPM 784. 1923; Matthew, Suppl. Ill. FPH t. 1023. 1998 & FPH 764. 1999.

Shrubs. Leaves to 5 x 3 cm, broadly ovate to oblong, base acute to obtuse, apex acute, subcoriaceous, margin serrate, glabrous. Flowers white, solitary on recurved stalks; calyx lobes 5, puberulous; corolla lobes 4 x 2.5 mm, obovate, connate at base; stamens numerous; ovary 3 celled. Drupe 8 mm, oblong.

Fl. & Fr.: May-August

Distr.: Endemic to Southern Western Ghats. Rare and threatened species; found in shola borders at higher and very higher altitudes only. MS, Idlimottai, *KKK 16025*; Idlimottai, *KKK 18168.*

Symplocos cochinchinensis (Lour.) Moore J. Bot. 52. 148. 1914, subsp. **laurina** (Retz.) Nooteb., Leiden Bot. ser. 1: 156; Hore, Fl. India Fasc. 20: 146. 1990; Matthew, FPH 765. 1999. *Drupatris cochinchinensis* Lour., FL. Cochinch. 1: 314. 1790. *Myrtus laurinus* Retz., Obs. Bot. 4: 26. 1786. *Symplocos laurina* (Retz.) Wall. *ex* G. Don, Gen. Syst. 4: 3. 1837. *S. spicata* Roxb. var. *laurina* (Retz.) Clarke in Hook. f., FBI 3: 573. 1882; Gamble, FPM 782. 1923; Wight, Ic. t. 150. 1839. *S. spicata* Roxb. var. *malasica* Clarke in Hook. f., FBI 3: 573. 1882. *S. spicata* Roxb. var. *attenuata* (A.DC.) Clarke in Hook. f., FBI 3: 573. 1882. **Kaatukappi, Parala (EBIS) Plate 5.3.8.**

Small trees. Leaves to 13 x 6 cm, elliptic, acute at both ends, dentate-crenulate, coriaceous, glabrous. Spikes to 7 cm long, solitary or branched. Flowers white, sessile; sepals rounded, 1 mm across, hairy; corolla 7 mm across, glabrous, lobes orbicular; stamens numerous. Drupe 5 mm long, ampulliform, glabrous, blue.

Fl. & Fr.: December-January

Distr.: South East Asia and Australia. Common; along shola borders at medium and higher altitudes. MS, K-4, *KKK 16406*; K-5, *KKK 16098*; Thalachorkadavu, *KKK* 18154; Idlimottai, *KKK 18167.* ENP, Amarachola, *KKK 17516*; Pannithavarnai, *KKK 18556.*

Symplocos foliosa Wight, Ic. t. 1234. 1848; Clarke in Hook. f., FBI 3: 582. 1882; Gamble, FPM 783. 1923; Fyson, FSIHS 382. t. 322. 1932; Hore, Fl. India Fasc. 20: 150. 1990; Matthew, Ill. FPH t. 494. 1996 & FPH 765. 1999. *S. nervosa* Wight, Ic. t. 1235. 1848, non DC., 1844. **Parala (EBIS).**

Medium sized trees; branchlets fulvous tomentose, glabrous when mature. Leaves to 15 x 4 cm, oblong or elliptic, base acute, apex acuminate, crenate-serrate, coriaceous, tomentose below. Spikes unbranched, densely fulvous tomentose. Flowers 10 mm across, white; sepals glabrous, roundish; corolla lobes 6 x 3 mm, orbicular, ciliate; stamens numerous; ovary 3 celled. Drupe 10 x 5 mm, ovoid, dark blue when ripe.

Fl. & Fr.: November-January

Distr.: Endemic to Southern Western Ghats. Fairly common at high altitudes. MS, Idlimottai, *KKK 18163.* ENP, Hut 9 km, *KKK 18036.*

Symplocos macrophylla Wall. *ex* A. DC. in DC., Prodr. 8: 257. 1844, subsp. **macrophylla** Nooteb., Rev. Symplocac. Old World, 226. 1975, var. **macrophylla** Nooteb., Rev. Symplocac. Old World, 227. 1975; Clarke in Hook. f., FBI 3: 578. 1882. *S. gardneriana* Wight, Ic. t. 1213. 1848; Clarke in Hook. f., FBI 3: 582. 1882; Gamble, FPM 782. 1923.

Small trees; branchlets densely fulvous-tomentose. Leaves to 13 x 6 cm, elliptic, acute at base and apex, coriaceous, crenate, margins recurved, yellow when dry, densely hairy above and below. Spike 3-5 cm long, stout, tomentose. Flowers sessile; sepals ovate, acute, densely hairy. Drupe 12 x 7 mm, oblong, brown.

Fl. & Fr.: February-April

Distr.: Endemic to Southern Western Ghats. Occasional at high altitudes. MS, Idlimottai, *KKK 31088.*

Symplocos macrophylla Wall. *ex* A. DC. in DC., Prodr. 8: 257. 1844, subsp. **rosea** (Bedd.) Nooteb., Rev. Symplocac. Old World, 229. 1975; Hore, Fl. India Fasc. 20: 159. 1990. *S. rosea* Bedd., Trans. Linn. Soc. London 25: 219. 1866; Clarke in Hook. f., FBI 3: 583. 1882; Gamble, FPM 783. 1923. *S. barberi* Gamble, Kew Bull. 1921: 219. 1921 & FPM 783. 1923.

Shrubs; branchlets hispid. Leaves oblanceolate, bluntly acuminate, spinous serrate, coriaceous, glabrous, midrib hairy below. Spikes 4 cm long, unbranched, hispid. Flowers few, shortly pedicelled; sepals rounded, densely hairy; corolla 10 mm across, glabrous, lobes roundish; stamens 50, unequal; disk hairy. Drupe 15 x 4 mm, cylindrical, blue.

Fl. & Fr.: February-April

Distr.: Endemic to Southern Western Ghats. Common; in shola ecotones at high altitudes. MS, Idlimottai, *KKK 31110.* ENP, Mampallam Chola, *KKK 17548*: Pannithavarnai, *KKK 18555.*

Symplocos monantha Wight, Ic. t. 1236. 1848; Clarke in Hook. f., FBI 3: 581. 1882; Gamble, FPM 784. 1923; Hore, Fl. India Fasc. 20: 160. 1990.

Shrubs; branchlets tomentose. Leaves to 5 x 2 cm, ovate, apex acuminate, serrate, coriaceous; nerves obscure, glabrous. Flowers sessile or shortly pedicelled, axillary; sepals 1.5 mm long, triangular, acute, ciliate; corolla lobes 4 x 3 mm, united at base, obtuse, glabrous; stamens 30-40 in 5-6 bundles, attached at the base of the corolla; ovary hairy at apex. Drupe 12 x 5 mm, ovoid, truncate at apex, white.

Fl. & Fr.: November-January

Distr.: Endemic to Southern Western Ghats. Rare; in shola ecotones at higher altitudes. MS, Idlimottai, *KKK 31111.*

Note: This species was considered as *'possibly extinct'* (Nayar, 1997), until it was relocated from Periyar Tiger Reserve after 150 years since the type collection (Sasidharan, 1998). Present collection extends the distribution of the species to Mannavan Shola.

Symplocos obtusa Wall. *ex* G. Don, Gen. Hist. 4: 3. 1838; Wight, Ic. t. 1233. 1848; Clarke in Hook. f., FBI 3: 583. 1882; Gamble, FPM 783. 1923; Fyson, FSIHS 383. t. 323. 1932. *S. laeta* var. *pedicellata* Clarke in Hook. f., FBI 3: 583. 1882. *S. obtusa* Wall. *ex* G. Don, var. *pedicellata* (Clarke) Nooteb., Rev. Symplocac. Old World, 244. 1975.

Small trees. Leaves to 7 x 2.5 cm, elliptic, acuminate at either ends, closely serrate, dark grey when dry, glabrous. Racemes 2-3 cm long, unbranched, hispid. Flowers white, few, distant; pedicels slender; sepals 1.5 x 1 mm, obtuse, hairy. Drupe 12 x 5 mm, terete, yellowish-green, minutely hispid towards the apex.

Fl. & Fr.: April-May

Distr.: South India and Sri Lanka. Rare; at medium altitudes. MS, Gudalar road, *KKK 18599*; Idlimottai, *KKK 31117.* VMS, *KKK 31141.*

Symplocos oligandra Bedd., For. Man. Bot. 150. 1872 & Ic. t. 272. 1868-1874; Clarke in Hook. f., FBI 3: 574. 1882; Gamble, FPM 782. 1923.

Small trees. Leaves to 9 x 4 cm, elliptic, base cuneate, apex acute, subcoriaceous, serrate, greenish-black when dry. Racemes to 1 cm long, pubescent. Flowers small, 3-6; sepals 1.5 mm long; petals red, small, tube divided to the base; stamens 12. Fruit not seen.

Fl.: January-February

Distr.: Endemic to Southern Western Ghats. Rare; in medium altitude sholas. MS, K-5, *KKK 18096.*

Symplocos pendula Wight, Ic. t. 1237. 1848; Clarke in Hook. f., FBI 3: 587. 1882; Gamble, FPM 784. 1923; Fyson, FSIHS 384. t. 324. 1932; Matthew, FPH 766. 1999. *S. sessilis* Clarke, FBI 3: 587. 1882; Gamble, FPM 784. 1923.

Trees. Leaves to 8 x 4 cm, elliptic-obovate, base acute, apex obtuse or rounded, coriaceous, glabrous. Flower solitary, pendulous; calyx lobes 5, rounded, margin puberulous; corolla white tinged pink, 1 cm wide, tube to 6 mm, puberulous within; stamens numerous; ovary 2-celled. Drupe 1.2 cm, oblong, sessile.

Fl. & Fr.: August-December

Distr.: South East Asia, Malay Peninsula. Rare; at medium and higher altitudes. MS, Chengalar, *KKK 16531.* PAS, vandaravu, *KKK 18588.*

Symplocos pulchra Wight, Ic. t. 1230. 1848, var. **villosa** (Brand.) Nooteb., Rev. Symplocac. Old World. 266. 1975; Hore, Fl. India Fasc. 20: 165. 1990. *S. villosa* Brand. in Engl., Pflanzenr. Heft 6: 63. 1901; Gamble, FPM 784. 1921.

Shrubs; branchlets densely villous. Leaves elliptic-lanceolate, apex acuminate, base cuneate, densely adpressed-hairy below, distantly spineus-serrate; nerves 7 pairs, slender, looping below the margin, green when dry; petiole 6 mm long. Flowers shortly peduncled; sepals acute, hairy; corolla 7 mm across, white. Drupe 12 mm long, oblong, white-villous

Fl. & Fr.: March-April

Distr.: Endemic to Southern Western Ghats. Rare; along shola borders at higher altitudes. MS, Idlimottai, *KKK 31112.*

60. OLEACEAE

1. Climbing or erect subshrubs; fruit a didymous berry ..... **Jasminum**
1. Small shrubs or trees; fruit a drupe 2
2. Corolla split to the base in paired lobes; inflorescence dichasial, axillary ..... **Chionanthus**
2. Corolla with a clear tube; inflorescence in terminal panicles 3
3. Flowers polygamous; corolla tubular; drupe 1 cm or longer ..... **Olea**
3. Flowers all bisexual; corolla funnel shaped; drupe < 1 cm long ..... **Ligustrum**

CHIONANTHUS Linnaeus

Sp. Pl. 8. 1753.

1. Flowers in few branched cymose clusters; drupe small, < 2 cm long ..... **C. linocieroides**
1. Flowers in panicles; drupe large, 5 cm long ..... **C. ramiflorus** var. **peninsularis**

Chionanthus linocieroides (Wight) Bennet & Raizada, Indian J. For. 4: 68.1981; Srivastava & Kapoor, J. Econ. Tax. Bot. 15: 133. 1991. *Olea linocieroides* Wight, Ic. t. 1241. 1850. *Linociera wightii* Clarke in Hook. f., FBI 3: 608. 1882; Gamble, FPM 794. 1923.

Medium sized trees. Leaves to 9 x 4 cm, elliptic, base acute or rounded, apex acute to acuminate, coriaceous. Calyx lobes rounded, ciliate; corolla white, petals short, elliptic-oblong. Drupe 1.5 x 0.8 cm, smooth.

Fl. & Fr.: July-August.

Distr.: Endemic to Southern Western Ghats. Common in low and medium altitudes. MS, Coupe Road, *KKK* 16582. ENP, Mampallam Chola, *KKK 18062.*

Chionanthus ramiflorus Roxb., Fl. Ind. 1: 106. 1820, var. **peninsularis**, Ravikumar & Lakshmanan in Bull. Bot. Surv. India 31: 163. 1989; Matthew, Ill. FPH t. 497. 1996 & FPH 769. 1999. **Kattu Chakkalathi, *Vella Edali* (EBIS).**

Medium sized trees. Leaves to 12 x 4 cm, elliptic to oblanceolate, base narrowly attenuate, apex acute, sub-coriaceous. Panicles, to 10 cm; calyx lobes small, acute; corolla cream, 4 mm across, lobes 4 x 1.5 mm, elliptic-oblong, acute; ovary 1 mm. Drupe 5 x 2.5 cm, ellipsoid, smooth, often slightly curved.

Fl. & Fr.: March-May.

Distr.: Endemic to Southern Western Ghats. Common; in shola interiors at medium altitudes. MS, K-5, *KKK 17633.*

Note: New record to the flora of Kerala.

JASMINUM Linnaeus

Sp. Pl. 7. 1753.

1. Erect subshrubs; leaves paripinnate; flowers yellow; berry paired ..... **J. bignoniaceum**
1. Woody lianas; leaves 3-foliolate; flowers white tinged pink; berry single ..... **J. brevilobum**

Jasminum bignoniaceum Wall. *ex* DC., Prodr. 8: 313. 1844; Gamble, FPM 791. 1923; Fyson, FSIHS 387. t. 327. 1932; Matthew, Ill. FPH t. 498. 1996 & 771. 1999. *J. humile* auct. non L., Clarke in Hook. f. FBI 3: 602. 1882, p.p. *J. revolutum* auct non Sims., Wight, Ic. t. 1258. 1848.

Branchlets glabrous, angular. Leaves glabrous; leaflets 3-5 pairs, to 2 x 1 cm, elliptic, base attenuate, apex acute. Cymes leaf-opposed, sub umbellate, to 5 flowered. Flowers nodding; calyx tube 2 mm, lobes 1 mm, triangular; corolla lobes 1.5 x 1 mm, ovate, recurved. Berry 7 mm, sub globose.

Fl. & Fr.: April-May

Distr.: Native of Europe; now widely cultivated in Nilgiris. Common; found along shola borders and scrublands at higher altitudes. ENP, V-Point, *KKK 17656.* PAS, Vandaravu, *KKK 18195.*

Jasminum brevilobum. A.DC., in DC. Prodr. 8: 307. 1844; Clarke in Hook. f. FBI 3: 600. 1882; Gamble, FPM 791. 1923; Fyson, FSIHS 387. t. 326. 1932; Matthew, Ill. FPH t. 499. 1996 & 772. 1999. **Kattu Mulla (EBIS).**

Branchlets tawny pubescent, rusty. Odd leaflet to 5 x 4.5 cm, deltoid, base truncate, apex mucronate, lateral leaflets reduced, 1 cm across, orbicular, fulvous tomentose. Cymes corymboid. Flowers fragrant, sessile; calyx tube 3 mm, lobes 2 mm, ovate, pubescent; corolla 2 cm wide, tube 2.5 cm, lobes 1 cm, obovate, apiculate; ovary tomentose above. Berry globose.

Fl. & Fr.: June-August.

Distr.: Endemic to Peninsular India. Occasional; along shola borders at lower altitudes. MS, K-3, *KKK 16483.*

Note: New record to the flora of Kerala.

LIGUSTRUM Linnaeus

Sp. Pl. 7. 1753.

Note: Green (1990) merged all the South Indian species of *Ligustrum* into one species (*L. perrottetii* A. D.C). But here I treat my collections into two distinct species, owing to their significant differences.

1. Leaves chartaceous; flowers extremely small in lax cymose panicles ..... **L. robustum** var. **walkeri**
1. Leaves subcoriaceous; flowers comparatively large in dense cymose panicles ..... **L. perrottetii**

Ligustrum perrottetii DC., Prodr. 8: 294. 1844; Clarke in Hook. f., FBI 3: 615. 1882; Gamble, FPM 797. 1923; Fyson, FSIHS 390. t. 329. 1932; Matthew, FPH 776. 1999. *L. neilgherrense* Wight, Ic. t. 1243. 1848; Clarke in Hook. f., FBI 3: 615. 1882. **Pingan, Pingi (EBIS) Plate 4.7.8.**

Small trees. Leaves to 7x 3cm, elliptic, base cuneate, apex acute; petiole often red. Inflorescence to 9 cm, glabrous; calyx truncate, 3 mm across, tube 2 mm, lobes 3 x 2 mm, ovate-acute, reflexed; stamens 2; ovary 2 celled. Drupes 8 x 5 mm, ellipsoid, glabrous, pink coloured with persistent calyx.

Fl. & Fr.: October-November.

Distr.: Endemic to Western Ghats. Common along shola borders at all altitudes. MS, Mattukulam, Idlimottai, *KKK 16599*; Kulachivayal, *KKK 16665*. ENP, Amarachola, *KKK 17517*; Umayamala, *KKK 17533*.

Ligustrum robustum (Roxb.) Blume, Mus. Bot. Lugd.-Bat. 1: 313. 1849, subsp. **walkeri** (Decne.) Green, Kew Bull. 40: 130. 1985. *Phillyrea robusta* Roxb., Fl. Ind. 1: 101. 1820. *Ligustrum walkeri* Decne., Nov. Arch. Mus. Hist. Nat. 2: 27. 1879; Clarke in Hook. f., FBI 3: 614. 1882; Gamble, FPM 797. 1923.

Small trees. Leaves 9 x 3.5 cm, elliptic-lanceolate, base acute, apex acuminate. Inflorescence to 20 cm, puberulous; calyx tube 1.5 mm long, 5 toothed; corolla 5 mm wide, lobes longer than tube, ovate, reflexed; stamens 2; ovary 2 celled. Drupes 7 mm long, obovoid, glabrous.

Fl. & Fr.: June-December

Distr.: Peninsular India and Sri Lanka. Common along shola borders at lower altitudes. MS, K-4, *KKK 31038*.

OLEA Linnaeus

Sp. Pl. 8. 1753

Olea paniculata R.Br., Prodr. 523. 1810; Mathew, FPH 778. 1999. *O. glandulifera* Wall. *ex* G. Don, Gen. Syst. 4: 49. 1838; Clarke in Hook. f., FBI 3: 612. 1882; Gamble, FPM 796.1923; Fyson, FSIHS 389. t. 328. 1932. *O. bournei* Fyson, Kew Bull. 1914: 186. 1914.

Medium trees; branchlets glabrous. Leaves to 6.5 x 3 cm, obovate, base acute, apex acuminate, chartaceous, glabrous. Panicles cymose, terminal. Calyx gland dotted, lobes 4, triangular; corolla white, 4 mm across, tube 1 mm, lobes 2 mm long; stamens 2. Drupe 10 x 6 mm, pyriform, brownish-black when ripe.

Fl. & Fr.: April-June.

Distr.: Peninsular India, Himalaya and Nepal. Common; found in medium altitude sholas. MS, K-4, *KKK 31039*.

61. APOCYNACEAE

1. Fruit a follicle; leaves lanceolate, 4 per node, nerves numerous, close ..... **Alstonia**
1. Fruit a drupe; leaves obovate, 7-many at each node, nerves a few, distantly spaced ..... **Rauvolfia**

ALSTONIA R. Brown

Wern. Nat. Hist. Soc. 1: 75. 1811, *nom. cons.*

Alstonia venenata R. Br., Mem. Wern. Nat. Hist. Soc. 1: 77. 1811; Wight, Ic. t. 436. 1841; Hook. f., FBI 3: 642. 1882; Gamble, FPM 810. 1923; Matthew, Ill. FPH t. 505. 1996 & FPH 784. 1999. **Thippili (EBIS)**

Shrubs to small trees. Leaves to 8 x 3 cm, acuminate at both ends, slightly pale beneath, membranous. Flowers white, in corymbose cymes; calyx tube 1 mm, lobes lanceolate, ciliate; corolla lobes 13 mm long, oblong, twisted; stamens included, villous; ovary 2 mm, oblong. Follicle 8-16 cm long, 2-angled, acute; seeds smooth.

Fl. & Fr.: February-May

Distr.: Tropical Asia. Occasional; along shola fringes at lower altitudes. MS, K-4, *KKK 16088.*

RAUVOLFIA Linnaeus

Sp. Pl. 208. 1753.

Rauvolfia densiflora (Wall.) Benth. *ex* Hook. f., FBI 3: 633. 1882; Gamble, FPM 808. 1923; Fyson, FSIHS 393. t. 331. 1932; Matthew, Ill. FPH t. 508. 1996 & FPH 790. 1999. *Tabernaemontana densiflora* Wall. in Edward's Bot. Reg. 15: t. 1273. 1829. *Ophioxylon neilgherrense* Wight, Ic. t. 1292. 1848. *Rauvolfia verticillata* (Lour.) Baill, Bull. Soc. Linn. Paris 1: 768. 1888; Markgraf, Blumea 30: 160. 1984. *Dissolena verticillata* Lour., Fl. Cochinch. 137. 1790. **Plate 4.7.9.**

Shrubs. Leaves to 18 x 9 cm, base cuneate , apex abruptly acuminate, lateral nerves 12-14 pairs. Cymes corymbose, 3-6 cm long; calyx lobes 5, 6 mm long, lanceolate, acuminate; corolla white, salvar shaped, tube 7 mm; disk annular. Pyrenes 10 x 6 mm, ellipsoid, crustaceous, blue when ripe.

Fl. & Fr.: March-May

Distr.: India, Sri Lanka and South East Asia. Common; along shola borders at lower and medium altitudes. MS, K-3.5, *KKK 16471*; Idlimottai route, *KKK 16590.*

62. ASCLEPIADACEAE

1. Slender, twining herbs; leaves chartaceous; follicles narrowly lanceolate, not woody ..... **Tylophora**
1. Lianas; leaves cordiform, subcoriaceous; follicles ovate-oblong, woody ..... **Wattakaka**

TYLOPHORA R. Brown

Mem. Wern. Nat. Hist. Soc. 1: 28. 1811.

Tylophora mollissima Wight & Arn. in Wight, Contrib. Bot. India 49. 1834; Wight, Ic. t. 1275. 1848; Hook. f., FBI 4: 48. 1883; Gamble, FPM 843. 1923; Fyson, FSIHS 398. t. 336. 1932; Matthew, Ill. FPH t. 513. 1996 & 816. 1999.

Leaves to 6 x 3 cm, elliptic-oblong or ovate, base rounded, apex acute, apiculate or mucronate, chartaceous. Flowers pinkish, 5 mm across; sepals 1 x 0.5 mm, ovate, acute; corolla lobes 3 x 1.5 mm, ovate-oblong, obtuse; corona shallowly 5-lobed. Follicles to 6 cm long, narrowly lanceolate.

Fl. & Fr.: September-December

Distr.: Endemic to South India. Common in shola borders at lower altitudes. MS, Kulachivayal, *KKK 16661.*

WATTAKAKA Hasskarl

Flora 40: 99. 1857.

Wattakaka volubilis (L. f.) Stapf in Curtis, Bot. Mag. 148: sub. t. 8976. 1923; Matthew, FPH 819. 1999. *Asclepias volubilis* L. f., Suppl. 170. 1782. *Dregea volubilis* (L. f.) Benth. *ex* Hook. f., FBI 4: 46. 1883. *D. volubilis* var. *lacuna* (Ham.) Hook. f. FBI 4: 46. 1883. *Marsdenia volubilis* (L. f.) Cooke, Fl. Pres. Bombay 2: 166. 1904; Gamble, FPM 846. 1923; Fyson, FSIHS 399. t. 338. 1932. **Kakklan Kodi (EBIS) Plate 4.8.1.**

Leaves to 10 x 7 cm, ovate, base cordate, apex acuminate, glabrous. Umbels 5-6 cm long, axillary; calyx lobes unequal, 2 mm, lanceolate; corolla rotate, tube 3 mm, lobes 4 x 4 mm, orbicular; corona single, staminal with 2 globular masses above anthers; pollinia erect. Follicles 10 x 3 cm, ribbed, blunt at apex.

Fl. & Fr.: February-September.

Distr.: Indo-Malesia and China. Occasional; in exposed regions at lower altitudes. MS, K-3, *KKK 16663.*

63. LOGANIACEAE

1. Small trees, epiphytic when young; leaves obovate, coriaceous; flowers large, cream ..... **Fagraea**
1. Climbers; leaves elliptic to lanceolate, subcoriaceous; flowers small, yellow ..... **Gardneria**

FAGRAEA Thunberg

Vet. Acad. Handl. Stockh. 125. 1782.

Fagraea ceylanica Thunb., Vetensk. Acad. Handl. 3: 132. 1782; Clarke in Hook. f., FBI 4: 83. 1883 "*zeylanica*"; Gamble, FPM 865. 1923. *F. obovata* Wall. in Roxb., Fl. Ind. 2: 33. 1824; Clarke in Hook. f., FBI 4: 83. 1883; Gamble, FPM 865. 1923; Fyson, FSIHS 406. t. 345. 1932. **Maruthanka Maram. Plate 4.8.2.**

Branchlets with persistent leaf scars. Leaves alternate, to 20 x 8 cm, base cuneate, apex obtuse, fleshy, glabrous, glossy above. Flowers in stout, terminal cymes; calyx tube 1 cm, lobes 5, 7 mm long, ovate; corolla 6-7 cm across, tube 4 cm, funnel shaped, lobes 3 x 2.5 cm, obovate; stamens 5; ovary 2 celled. Berry 2 celled, 3.5 x 3 cm, ovoid, with a beak, glossy; seeds many.

Fl. & Fr.: October-March.

Distr.: Indo-Malesia. Common; along stream sides at lower altitudes. MS, K, *KKK 16051*; Chengalar, *KKK 16650.*

GARDNERIA Wallich *ex* Roxburgh

Fl. Ind. 1: 400. 1820.

Gardneria ovata Wall. in Roxb., Fl. Ind. 1: 400. 1820; Clarke in Hook. f., FBI 4: 93. 1883; Gamble, FPM 869. 1923; Fyson, FSIHS 405. t. 344. 1932; Matthew, Suppl. Ill. FPH t. 1033. 1998 & FPH 820. 1999.

Branchlets terete, glabrous. Leaves opposite, to 11 x 5 cm, base acute, apex acuminate. Cymes axillary, 3 flowered; to 2.5 cm long; calyx lobes 4, 2 mm, obtuse; corolla rotate, lobes 5 x 2 mm, lanceolate; stamens 4, nearly sessile, connivent to form a hard cone in the centre; ovary 2 celled. Berry deep red, 1 cm wide, globose, with a persistent mucro; seeds 2, cup shaped.

Fl. & Fr.: February-June.

Distr.: Indo-Malesia. Common; along shola margins at all altitudes. MS, K-5, *KKK 16169*; K-4, *KKK 16499*. ENP, Umayamala, *KKK 17531*; Idlimottai, *KKK 18189*.

64. GENTIANACEAE

1. Ovary 2 celled; stamens connivent around a filiform style ..... **Exacum**
1. Ovary 1 celled; stamens away from style **2**
2 Basal leaves rosetted; corolla lobes without nectaries ..... **Gentiana**
2. Basal leaves not rosetted; corolla lobes with 1 glandular nectary at base ..... **Swertia**

EXACUM Linnaeus

Sp. Pl. 112. 1753.

1. Tufted herbs; stems terete; leaves broadly elliptic, thick coriaceous ..... **E. anamallayanum**
1. Erect subshrubs; stems quadrangular; leaves ovate-lanceolate, chartaceous ..... **E. wightianum**

Exacum anamallayanum Bedd., Ic. t. 154. 1868-1874; Gamble, FPM 874. 1923; Klack., Opera Bot. 84: 69. 1985; Matthew, Ill. FPH t. 515. 1996 & FPH 827. 1999. *E. atropurpureum* Bedd. var. *anamallayanum* (Bedd.) Clarke in Hook. f., FBI 4: 97. 1883; Fyson, FSIHS 408. t. 347. 1932. *E. saulierei* Dunn, Kew Bull. 1914: 30. 1914.

Leaves sessile, to 5 x 3.5 cm, base stem-clasping, apex acute. Cymes to 3 cm, terminal, 1-3 flowered. Flowers bright blue; calyx lobes 8 x 4 mm, lanceolate, glabrous; corolla to 4 cm wide, tube 8 mm, lobes 3 x 1.3 cm, broad elliptic; anthers linear-oblong, yellow. Capsule 1 x 0.8 cm, broadly ovoid.

Fl. & Fr.: October-February.

Distr.: Endemic to Southern Western Ghats. Very rare; in grassland ecotones at higher altitudes. ENP, Anamudi slope, *KKK 18547*.

Exacum wightianum Arn., Ann. Sci. Nat. Bot. 11: 176. 1839; Wight, Ic. t. 840. 1844; Clarke in Hook. f., FBI 4: 97. 1883; Gamble, FPM 873. 1923; Fyson, FSIHS 407. t. 346. 1932; Matthew, Ill. FPH t. 517. 1996 & FPH 828. 1999. *E. atropurpureum* Bedd. var. *palghatense* Gamble, FPM 874. 1923. **Vella Thavalakkal Chedi (EBIS).**

Leaves to 8 x 3 cm, base abruptly cuneate, apex acuminate, glabrous, subsessile. Cymes to 4 cm; calyx lobes 12 x 4 mm, lanceolate, broadly winged, tip acuminate; corolla deep blue, 4 cm wide, tube 6 mm, lobes 2.5 x 1.2 cm, obovate, apiculate; anthers linear-oblong. Capsule 1.2 x 1 cm, broadly ovoid to sub orbicular.

Fl. & Fr.: October-February.

Distr.: Endemic to Southern Western Ghats. Common; along shola borders at lower and medium altitudes. MS, K-3, *KKK 16146*; K-5, *KKK 31040*. ENP, Amarachola, *KKK 18024*.

GENTIANA Linnaeus

Sp. Pl. 227. 1753

Gentiana pedicellata (D. Don) Griseb., Gen. Sp. Gent. 274. 1839, var. **wightii** Kusn. Trudy, Imp. S.-Peterburgsk. Bot. Sada 15: 401. 1895; Gamble, FPM 876. 1923; Fyson, FSIHS 409. t. 349. 1932; Matthew, Ill. FPH t. 518. 1996 & FPH 829. 1999. *Ericala pedicellata* D. Don, Edinburgh New Philos J. 8: 76. 1836.

Tufted herb; stem terete. Leaves opposite, base connate; basal rosetted leaves to 3 x 1 cm, broadly elliptic; stem leaves decussate, to 1.2 x 0.5 cm, ovate-elliptic, sessile. Cymes to 1.5 cm. Flowers 1-3; calyx lobes 5, 3 mm wide, linear, apiculate, keeled; corolla blue, 4 mm wide, tube 5 mm long, lobes 1 x 1.5 mm, oblanceolate, apiculate; stamens 5; ovary 1 celled. Capsule 4 x 2.5 mm, broad-oblong.

Fl. & Fr.: March-August.

Distr.: Indo-Malesia and China. Common; along shola margins and grasslands at higher altitudes. MS, Idlimottai, *KKK 16642* & *KKK 18173*; Methappu, *KKK 17594*.

SWERTIA Linnaeus

Sp. Pl. 226. 1753

1. Small, branched herb; leaves broadly elliptic to ovate-elliptic; corolla pale blue ..... **S. corymbosa**
1. Tall, erect herb; leaves elliptic-lanceolate; corolla white with deep blue streaks ..... **S. lawii**

Swertia corymbosa (Griseb.) Wight *ex* Clarke in Hook. f., FBI 4: 126. 1883; Gamble, FPM 881. 1923; Fyson, FSIHS 410. t. 350. 1932. *Ophelia corymbosa* Griseb., Gen. Sp. Gent. 317. 1839; Wight, Ic. t. 1329. 1848.

Leaves sessile, to 2.5 x 1.5 mm, base cuneate and stem-clasping, apex acute or apiculate, chartaceous, 3-5 ribbed. Corymbs to 4 cm long, of compact terminal cymules; calyx lobes 8 mm, lanceolate; corolla 10 x 4 mm, lobes elliptic; nectary basal, single, fimbriate at mouth; stamens 4. Capsule 2-valved; seeds many.

Fl. & Fr.: October-December.

Distr.: Endemic to Western Ghats. Common; in grasslands at higher altitudes. ENP, Amarachola, *KKK 18006*; Mesthirikkettu, *KKK 18023*.

Swertia lawii (Wight *ex* Clarke) Burkill in J. Asiat. Soc. Beng. n. s. 2: 379.1906; Gamble, FPM 881. 1923. *S. corymbosa* Wight var. *lawii* Wight *ex* Clarke in Hook. f., FBI 4: 126. 1883.

Leaves to 3.5 x 1 cm, elliptic-lanceolate, base stem clasping, apex acuminate. Flower cymules lax; calyx lobes to 8 mm long, lanceolate; corolla to 10 x 3 mm; nectary large, ciliate, covered with a fimbriate scale. Capsule to 10 x 3 mm, oblong.

Fl. & Fr.: December-February.

Distr.: Endemic to Peninsular India. Occasional; along road sides and shola margins at lower altitudes. MS, K-3, *KKK 16112*; K-4, *KKK 16769*.

65. BORAGINACEAE

CYNOGLOSSUM Linnaeus

Sp. Pl. 134. 1753

Cynoglossum zeylanicum (Vahl *ex* Hornem.) Thunb. *ex* Lehm, Neue Schriften Naturf. Gen. Halle 3(2): 20. 1817; Matthew, FPH 839. 1999. *Anchusa zeylanica* Vahl *ex* Hornem., Enum. Pl. Hort. Hafn. 3. 1807. *Cynoglossum denticulatum* A. DC. var. *zeylanicum* (Vahl *ex* Hornem.) Clarke in Hook.f., FBI 4: 157. 1883; FPM 900. 1923. *C. furcatum* Wall. *ex* Roxb., Fl. Ind. 2: 6. 1824; Wight, Ic. t. 1395. 1848; Clarke in Hook. f., FBI 4: 155. 1883; Gamble, FPM 900. 1923; Fyson, FSIHS 413. t. 352. 1932. **Plate 4.8.3.**

Annual herbs, softly adpressed grey-pubescent. Leaves alternate, to 6 x 2 cm, oblong-lanceolate, base cuneate, apex acute. Racemes 10-25 cm, tawny villous. Flowers deep blue, sessile; sepals 5, 2 mm long; corolla 2 x 1 mm, campanulate; stamens 5, included; ovary 4 celled. Fruit of 4 nutlets, 3-5 mm across, glochidiate.

Fl. & Fr.: Throughout the year.

Distr.: Indo-Malesia and China. Common along roadsides, ecotones and other regions, mainly at lower altitudes. MS, Idlimottai, *KKK 16099*; K-5, *KKK 16492*.

66. CONVOLVULACEAE

1. Climbing shrubs; leaves alternate; flowers purple in corymbose cymes; fruit a berry ..... **Argyreia**
1. Twining parasitic herbs; leafless; flowers cream in short racemes; fruit a capsule ..... **Cuscuta**

ARGYREIA Loureiro

Fl. Cochinch. 95, 134. 1790.

Argyreia hirsuta Wight & Arn., Nova Acta Phys.-Med. Acad. Caes. Leop.-Carol. Nat. Cur. 18: 356. 1836; Clarke in Hook. f., FBI 4: 189. 1883; Gamble, FPM 909. 1923; Fyson, FSIHS 415. t. 353. 1932; Matthew, Ill. FPH t. 526. 1996 & FPH 846. 1999. *Rivea hirsuta* (Wight & Arn.) Wight, Ic. t. 891. 1845.

Leaves 9 x 8 cm, ovate-cordate, apex abruptly acuminate, pubescent. Inflorescence to 10 cm long; sepals 10 x 6 mm, ovate, acute, slightly pubescent, persistent; corolla to 5.5 cm long, funnel shaped; stamens 5; ovary 4 celled. Berry, orange coloured, 13 x 10 mm, depressed-globose; seed one, 1 x 8 mm, brown.

Fl. & Fr.: September-February.

Distr.: South India and Sri Lanka. Common along shola borders at lower altitudes. MS, Puthur, *KKK 16093*.

CUSCUTA Linnaeus

Sp. Pl. 124. 1753.

Cuscuta reflexa Roxb., Pl. Corom. t. 104. 1798; Clarke in Hook. f., FBI 4: 225. 1883; Gamble, FPM 931. 1923; Matthew, Suppl. Ill. FPH t. 1039. 1998 & FPH 848. 1999.

Stems yellow to reddish, to 5 mm across. Flowers cream; calyx cupular, lobes 2 x 2 mm, orbicular, obtuse; corolla campanulate-tubular, 6-8 mm long, lobes triangular-

ovate, acute, entire, spreading; stamens 5; ovary 2 celled, ovoid. Capsule, 10 x 7 mm, globose-conical, tip beaked; seeds 4 x 4 mm, discoid, black.

Fl. & Fr.: August-April

Distr.: Indo-Malesia and China. Common along shola borders at lower altitudes. MS, Thalachorkadavu, *KKK 16034*; Chengalar, *KKK 16577*; Methappu, *KKK 17700*. ENP, Mampallam Chola, *KKK 17565*;

67. SOLANACEAE

1. Anther dehiscence porous 2
1. Anther dehiscence longitudinal 3
2. Anther tips sterile; berry ovoid ..... **Cyphomandra**
2. Anthers fertile throughout; berry globose ..... **Solanum**
3. Fruiting calyx inflated, larger than berry 4
3. Fruiting calyx not inflated, smaller than berry ..... **Lycopersicon**
4. Fruiting calyx cordate-ovate; corolla blue ..... **Nicandra**
4. Fruiting calyx angular; corolla yellow with 5 dark purple blotches at base ..... **Physalis**

CYPHOMANDRA C. F. P. Martius *ex* Sendtner

Flora 28: 162. 1845.

Cyphomandra betacea (Cav.) Sendtn., Flora 28: 172. t. 4. 1845; Fyson, FSIHS 422. 1932; Matthew, FPH 863. 1999. **Seemakkathiri, Mara Thakkali (EBIS)**

Shrubs to small trees; branchlets puberulous. Leaves to 30 x 26 cm, cordate-ovate, apex acuminate, subcoriaceous, very lightly pubescent. Cymes scorpioid, drooping, to 4 cm long; calyx tube 6 mm, lobes 5, orbicular; corolla pinkish-white, 2 cm across, lobes 1 x 0.5 cm, lanceolate; stamens 5, filaments pinkish; ovary conical, 2 celled. Berry 6.5 x 4 cm; seeds many.

Fl. & Fr.: June-October

Distr.: Native of Peru, Brazil; introduced. Occasional; a cultivated plant running wild in low altitude shola regions and other exposed lands. MS, Puthur, *KKK 16461*.

Note: New record to the flora of Kerala.

LYCOPERSICON P. Miller

Gard. Dict. Abr. ed. 4. 1754.

Lycopersicon lycopersicum (L.) Karsten, Deut. Fl., 996. 1881; Matthew, FPH 866. 1999. *Solanum lycopersicum* L., Sp. Pl. 185. 1753. *Lycopersicon esculentum* Mill., Gard. Dict. ed. 8, 1768; Clarke in Hook. f., FBI 4: 237. 1883; Gamble, FPM 941. 1923. **Chirangu Thakkali, Cheru Thakkali (EBIS) Plate 4.8.4.**

Sticky pubescent herb. Leaves 15-20 cm long, pinnatisect, lobes triangular-ovate. Flower yellow, solitary, axillary; calyx lobes 5, 5 mm, lanceolate; corolla 1.3 cm wide, lobes 0.8cm, ovate; stamens 5, connivent; ovary 2 celled. Berry to 2 cm wide, depressed-globose, 4-6 lobed, pulp juicy; seeds discoid, numerous.

Fl. & Fr.: Throughout the year

Distr.: East and South America, Mexico, widely cultivated. Occasional; found growing along roadsides, in scrublands and near tribal settlements at lower altitudes; often cultivated. MS, Perumala, *KKK 31020.*

Note: It is interesting to note that this wild variety has comparatively smaller berries and has several medicinal uses, especially in treating skin diseases.

NICANDRA Adanson

Fam. Pl. 2: 219. 1763, *nom. cons.*

Nicandra physalodes (L.) Gaertn., Fruct. 2: 237, t. 131, f. 2. 1791, "*physaloides*"; Clarke in Hook. f., FBI 4: 240. 1883; Gamble, FPM 941. 1923; Fyson, FSIHS 423. t. 362. 1932; Matthew, FPH 2: 867. 1999. **Oomathan.**

Herbs; branchlets grooved. Leaves to 18 x 10 cm, ovate, base attenuate, apex acute, sinuate-dentate. Flowers solitary, extra-axillary, nodding; calyx 5 angled, inflated, 5 lobed, lobes to 1.5 x 1 cm, cordate-ovate; corolla 3.5 cm wide, campanulate, 5 lobed; stamens 5; ovary 3 mm across, globose. Berry 2 cm across, globose, enveloped in inflated calyx; seeds plenty, compressed.

Fl. & Fr.: Throughout the year.

Distr.: Native of Andes; now widely naturalised in the tropics. Common in grassland ecotones at lower altitudes. MS, Kulachivayal, *KKK 16683.*

PHYSALIS Linnaeus

Sp. Pl. 183. 1753

Physalis peruviana L., Sp. Pl. ed. 2, 1670. 1762; Clarke in Hook. f., FBI 4: 238. 1883; Gamble, FPM 939. 1923; Fyson, FSIHS 423. t. 361. 1932; Matthew, Suppl. Ill. FPH t. 1048. 1998 & FPH 869. 1999. **Pottipalam, Perungunni, Malathakkali Keera (EBIS) Plate 4.8.5.**

Tall herbs, densely pubescent. Leaves alternate or sub-opposite, to 10 x 7 cm, ovate, base cordate, apex acute, margin entire. Flowers solitary, axillary; calyx campanulate, lobes 5, 5 x 3 mm, ovate-acute; corolla campanulate, 1.5 cm wide, softly pubescent, lobes 5; stamens 5; ovary globose. Berry 1.5 cm wide, globose, orange-yellowish, enveloped in sac like inflated calyx; seeds plenty, compressed.

Fl. & Fr.: July-November

Distr.: Tropical South America. Common; along roadsides at lower and medium altitudes. MS, K-5, *KKK 16410.*

SOLANUM Linnaeus

Sp. Pl. 184. 1753

1. Armed plants **2**
1. Unarmed plants ..... **S. nigrum**
2. Leaves sinuately or pinnatifidly lobed, with prickles **3**
2. Leaves entire, without prickles ..... **S. giganteum**
3. Leaves shallowly lobed with small prickles; flowers in racemes or spikes **4**
3. Leaves deeply lobed with large prickles; flowers in extra-axillary cymes ..... **S. virginianum**

4. Leaves shallowly sinuate, chartaceous; racemes lax, unbranched ..... **S. anguivi** var. **anguivi**
4. Leaves deeply sinuate, subcoriaceous; racemes spicate, branched ..... **S. anguivi** var. **multiflora**

Solanum nigrum L., Sp. Pl. 186. 1753; Clarke in Hook. f., FBI 4: 229. 1883; Gamble, FPM 936. 1923; Fyson, FSIHS 419. 1932; Matthew, FPH 874. 1999. *S. rubrum* Roxb., Wight, Ic. t. 344. 1840. **Eeradakukkeera (EBIS).**

Branchlets pink, glabrescent. Leaves simple, to 6 x 3 cm, ovate-elliptic, base rounded, apex acuminate, margin entire, greenish black. Umbels extra-axillary, 2-4 flowered. Flowers white, small; calyx lobes 1.5 mm, ovate; corolla 6 mm wide, lobes 4 mm long; ovary globose. Berry 8 mm, orange to blue when ripe.

Fl. & Fr.: June-September

Distr.: Cosmopolitan. Occasional; found along roadsides at medium and higher altitudes. MS, Methappu, *KKK 16424*; K-4, *KKK 16494.*

Solanum giganteum Jacq., Coll. Bot. 4: 125. 1791; Wight, Ic. t. 893. 1844-45; Clarke in Hook. f., FBI 4: 233. 1883; Gamble, FPM 937. 1923; Fyson, FSIHS 422. 1932; Matthew, Suppl. Ill. FPH t. 1049. 1998 & FPH 872. 1999.

Large shrub to small trees; densely white stellate tomentose; stem prickles conical. Leaves to 20 x 6 cm, elliptic-lanceolate, base acute, apex abruptly acuminate. Flowers in dense, stellately woolly, lateral or sub terminal corymbose cymes; calyx lobes 2.5 mm long, triangular; corolla bluish-violet, 8 mm long; ovary globose. Berry 1 cm across, globose, red when ripe; seeds many, flat.

Fl. & Fr.: April-June.

Distr.: South India and Sri Lanka. Occasional; along stream sides at lower altitudes. MS, Thalachorkadavu, *KKK 17662.*

Solanum anguivi Lam., Encycl. 2: 23. 1794, var. **anguivi**. *S. indicum* sensu Hook. f., FBI 4: 234. 1883; Gamble, 938. 1923. *S. violaceum* Ortega, Hort. Matr. Dec. 56. 1798, subsp. *violaceum* Matthew, Kew Bull. 46: 545. 1991, Ill. FPH t. 544. 1996 & FPH 876. 1999. **Kandanka Mullu. Plate 4.8.7.**

Armed shrub; prickles small, flattened, recurved. Leaves to 13 x 10 cm, base obliquely truncate, apex acute. Racemes extra-axillary, lax, to 12 flowered; calyx lobes 6 mm, triangular; corolla 1.2 cm wide. Tomentose; stamens 5. Berry 0.8 cm wide, orange when ripe; seeds minutely pitted.

Fl. & Fr.: September-February

Distr.: Indo-Malesia. Common; along shola margins at lower altitudes. MS, Perumala, *KKK 18560.*

Note: New record to the flora of Kerala.

Solanum anguivi Lam., Encycl. 2: 23. 1794, var. **multiflora** (Roth. *ex* Roem. & Schult.) Chitra in Henry *et al*, Fl. Tamilnadu 2: 115. 1987. *S. multiflorum* Roth. *ex* Roem. & Schult., Syst. Veg. 4: 669. 1819. *S. indicum* L. var. *multiflora* (Roth. *ex* Roem. & Schult.) Clarke, FBI 4: 235. 1883; Gamble, FPM 938. 1923: Fyson, FSIHS 421. t. 358. 1932. *S. ferox* L. var. *minus* Wight, Ic. t. 1400. 1848. *S. violaceum* Ortega, Hort.

Matr. Dec. 56. 1798, subsp. *multiflorum* (Clarke) Matthew, Kew Bull. 46: 545. 1991 & Ill. FPH t. 545. 1996 & FPH 877. 1999. **Kanda Mullu.**

Armed shrub; prickles large, flattened, recurved. Leaves to 15 x 12 cm, base obliquely truncate, apex acute. Racemes 12-16 flowered. Flowers purplish, sessile; calyx lobes 8 x 2 mm, lanceolate; corolla 1.8 cm wide. Berry 1.3 cm wide, red when rip; seeds pitted.

Fl. & Fr.: February-April.

Distr.: Endemic to Western Ghats. Common; found along shola margins at higher altitudes. MS, K-6, *KKK 16183.*

Solanum virginianum L., Sp. Pl. 187. 1753; Matthew, FPH 877. 1999. *S. surattense* Burm. f., Fl. Ind. 57. 1768. *S. xanthocarpum* Schrad. & Wendl., Sert. Hannov. 1: 8, t. 2. 1795; Clarke in Hook. f., FBI 4: 236. 1883; Gamble, FPM 938. 1923. *S. jacquinii* Willd., Sp. Pl. 1: 1041. 1798; Wight, Ic. t. 1401. 1848. **Kandam Kathiri (EBIS) Plate 4.8.6.**

Armed, perennial subshrubs; prickles on leaves to 2 cm, straight, yellow, those on stems small, recurved. Leaves to 12 x 9 cm, ovate, deeply sinuate, base obtuse, tip acute. Cymes 2-4 flowered, shortly stalked; calyx lobes ovate, abruptly acute; corolla blue-purple, 2 cm across, lobes lanceolate; stamens yellow. Berry to 4 cm across, yellow or white with green streaks; seeds 2.5 mm across.

Fl. & Fr.: Throughout the year.

Distr.: Peninsular India, Himalaya, South-east Asia, Malesia, Australia, Polynesia. Common, along roadsides and shola borders at lower and medium altitudes. MS, K-4, *KKK 18559.*

68. SCROPHULARIACEAE

1. Leaves all alternate ..... **Pedicularis**
1. Leaves, opposite, whorled or upper ones only alternate **2**
2. Leaves divided into linear lobes ..... **Sopubia**
2. Leaves entire or toothed **3**
3. Small herbs parasitic on grasses ..... **Striga**
3. Non parasitic herbs **4**
4. Corolla deep yellow, upper lip saccate, lower lip inflated, bag like; branchlets succulent ..... **Calceolaria**
4. Corolla blue or lilac; subrotate, neither saccate nor inflated; branchlets not succulent **5**
5. Erect, densely branched herbs; leaves linear-oblong; corolla blue with white tips ..... **Dopatrium**
5. Decumbent herbs, rooting at nodes; leaves elliptic-oblong; corolla blue to purple ..... **Lindernia**

CALCEOLARIA Linnaeus

Vet. Acad. Handl. Stockholm 31: 286. 1770 *nom. cons.*

Calceolaria gracilis Kunth. in H. B. K. Nov. Gen. Sp. 2: 339. 1818; Matthew, Suppl. Ill. FPH t. 1056. 1998 & FPH 883. 1999. *C. mexicana* Benth, Benth., Pl. Hartw. 47. 1840; Gamble, FPM 973. 1923; Fyson, FSIHS 426. t. 365. 1932. **Nettipottu Chedi. Plate 4.8.8.**

Annual herbs; branchlets reddish brown. Leaves decussate; basal pair simple, sinuate; upper ones to 8 x 6 cm, ovate-lanceolate, 5-7 times pinnatifid; leaflets to 3 x 1.5 cm, deeply serrate. Cymes in upper axils; calyx 4 lobed, glandular hairy, lobes 6 x 4 mm, ovate; upper lip of corolla ascending, lower lip 1.5 x 1 cm; stamens 2, situated in upper lip; ovary 2 celled. Capsule 9 x 6 mm, ovoid; seeds plenty.

Fl. & Fr.: June-September.

Distr.: Mexico to Bolivia; introduced. Common; along roadsides at higher altitudes. MS, K-6, *KKK 31044.*

Note: This exotic plant has now naturalised in the wild.

DOPATRIUM F. Hamilton *ex* Bentham

in Lindley, Edward's Bot. Reg. Ad. t. 1770(4). 1835.

Dopatrium nudicaule (Willd.) Benth., Scroph. Ind. 31. 1835; Hook. f., FBI 4: 274. 1884; Gamble, FPM 954. 1923; Matthew, FPH 888. 1999. *Gratiola nudicaulis* Willd., Ges. Naturf. Freunde Berlin Neue Schriften 4: 193. 1803. *G. cuneifolia* Roxb., Fl. Ind. 1: 142. 1832.

Herbs; stems quadrangular. Leaves decussate, 1 x 0.2 cm, apex acute, sessile. Racemes lax; calyx free, lobes 5, 3 x 1 mm, linear; corolla bilabiate, to 1.5 x 0.5 cm; stamens 2, syngenesious; ovary ovoid. Capsule 6 mm long, elliptic-oblong, with persistent style at apex.

Fl. & Fr.: October -December.

Distr.: South India, Sri Lanka and Philippines. Common; in grasslands at lower altitudes. MS, Kulachivayal, *KKK 16674.*

LINDERNIA Allioni

Melanges Philos. Math. Soc. Roy. Turin. (Misc. Taur.) 3(1): 178. 1766.

Lindernia ruellioides (Colsm.) Pennell, Brittonia 2: 182. 1936; Philcox, Kew Bull. 17: 484. 1964; Matthew, FPH 893. 1999. *Gratiola ruellioides* Colsm, Prodr. Desc. Grat. 12. 1793. *G. reptans* Roxb., Fl. Ind. 1: 140. 1820. *Bonnaya reptans* (Roxb.) Spreng., Syst. 1: 41. 1824; Hook. f., FBI 4: 284. 1884. *Ilysanthes reptans* (Roxb.) Urban, in Ber. Deutsch. Bot. Ges. 2: 436. 1884; Gamble, FPM 962. 1923.

Leaves to 2 x 0.6 cm, base attenuate, apex obtusely acute, margin serrate. Racemes terminal; calyx 5 lobed, lobes 5 x 1 mm; corolla to 8 mm long, bilabiate, with 2 anterior and 3 posterior petals; stamens 2, yellow; ovary elliptic. Capsule 1.7 cm long, linear, acuminate; seeds trigonous, 0.5 mm long, rugose, brown.

Fl. & Fr.: August-September.

Distr.: Tropical and Subtropical Asia. Common; near watercourses at medium altitudes. MS, Coupe road, *KKK 16593.*

PEDICULARIS Linnaeus

Sp. Pl. 607. 1753

1. Flowers solitary; corolla white, tube to 10 cm long; calyx > 2 cm ..... **P. perrottetii**
1. Flowers in compact racemes; corolla rose-pink, tube to 1.5 cm long; calyx < 1 cm ..... **P. zeylanica**

Pedicularis perrottetii. Benth. in DC., Prodr. 10: 565. 1846; Wight, Ic. t. 1418. 1849; Hook. f., FBI 4: 317. 1884; Gamble, FPM 973. 1924; Fyson, FSIHS 434. t. 375. 1932. **Plate 4.9.1b.**

Perennial herbs. Leaves 3 x 1 cm, oblanceolate, pinnatifid, cut more than half may to the midrib, lobes crenate, glandular hairy. Calyx tubular, 2 x 0.5 cm, teeth crested; corolla tube 10 x 0.4 cm, upper lip erect, hooded, 1.5 cm long, obtusely acute, lower lip 2.5 cm long; ovary elliptic. Capsule 2.5 cm long, falcate.

Fl. & Fr.: October-March

Distr.: Endemic to Southern Western Ghats. Fairly common in grassland ecotones at all altitudes. ENP, Mesthirikkettu, *KKK 18005.*

Pedicularis zeylanica Benth., Scroph. Ind. 54. 1835; Wight, Ic. t. 1419. 1849; Hook. f., FBI 4: 317. 1884; Gamble, FPM 972. 1924; Fyson, FSIHS 433. t. 374. 1932; Matthew, Suppl. Ill. FPH t. 1073. 1998 & FPH 896. 1999. **Plate 4.9.1a.**

Perennial herb; branchlets glabrous. Leaves whorled below, pinnatisect, to 6 x 1 cm, elliptic-oblong to oblanceolate, base attenuate, apex rounded, crenate, coriaceous. Calyx spathaceous, split down on one side, lobes 2+3, crested; corolla tube 1.5 cm, limb 1.5 cm, upper lip 1 cm long, erect, hooded, lower lip 3 lobed, spreading, lobes 1.2 cm long, ovate; ovary elliptic. Capsule 6 x 4 mm, ovate-falcate.

Fl. & Fr.: February-March.

Distr.: Peninsular India and Sri Lanka. Occasional; along shola grassland ecotones from low to higher altitudes. MS, Puthur, *KKK 16064.*

SOPUBIA F. Hamilton *ex* D. Don

Prodr. Pl. Nepal. 88. 1825.

1. Corolla tubular, purple, pink at base; calyx tube 5 ribbed; capsule oblong..... **S. delphiniifolia**
1. Corolla rotate, yellow with purple centre; calyx tube not ribbed; capsule subglobose..... **S. trifida**

Sopubia delphiniifolia (L.) G. Don, Gen., Syst. 4:560.1837, "*delphinifolia*"; Hook. f., FBI 4: 302. 1885; Gamble, FPM 970. 1924; Fyson, FSIHS 432. t. 372. 1932; Matthew, Suppl. Ill. FPH t. 1074. 1998 & FPH 898. 1999. *Gerardia delphiniifolia* L., Cent. Pl. 2:21.1756.

Branched herbs, stem quadrangular. Leaves to 4 cm long, pinnatifid below, 3-fid to linear above, progressively reduced upwards. Racemes lax; calyx tube 4 mm long, lobes 4 cm long, linear; corolla 1 cm wide, tube 1 cm, lobes 6 mm, broad ovate; staminal filaments twisted. Capsule 7 x 4 mm.

Fl. & Fr.: October-December

Distr.: India and Sri Lanka. Occasional; in low altitude grassland ecotones. MS, Kulachivayal, *KKK 16679.*

Sopubia trifida Buch.-Ham. *ex* D. Don, Prodr. 88. 1825; Hook. f., FBI 4: 302. 1884; Gamble, FPM 970. 1924; Fyson, FSIHS 433. t. 373. 1932; Matthew, FPH 898. 1999.

Coarse herbs. Leaves to 2 cm long, trifid below, linear above, hairy. Racemes terminal, to 13 cm long; calyx tube 3 mm, lobes 2.5 mm, triangular, ciliate; corolla 1 cm wide, tube 3 mm; anthers bearded at base. Capsule 5 mm wide; seeds brown.

Distr.: Indo-Malesia and China. Occasional; in grassland ecotones at higher altitudes. ENP, Amarachola, *KKK 18011.*

STRIGA Loureiro

Fl. Cochinch. 17, 22. 1790.

Striga asiatica (L.) O. Ktze., Rev. Gen. Pl. 2: 466. 1891; Matthew, FPH 900. 1999. *Buchnera asiatica* L., Sp. Pl. 1630. 1753. *Striga lutea* Lour., Fl. Cochinch. 1: 22. 1790; Hook. f., FBI 4: 299. 1884; Gamble, FPM 968. 1924; Fyson, FSIHS 431. t. 371. 1932.

Leaves 8 x 1 mm long, narrow-oblong, rough. Spikes terminal, to 8 cm long; calyx tube 4 mm long, 10 ribbed, lobes 5, 3.5 mm long; corolla 6 mm wide, bright yellow, bilabiate; upper lip with 2 lobes, lower lip 3 lobed; stamens 4, didynamous; ovary many ovuled. Capsule 4 x 3 mm, ovoid; seeds oblong, plenty.

Fl. & Fr.: October-December.

Distr.: South East Asia and Africa. Common in grasslands. K-4, *KKK 16179*; ENP, Mampallam Chola, *KKK 18057.*

69. OROBANCHACEAE

1. Calyx spathaceous, split in front nearly to the base ..... **Aeginetia**
1. Calyx tubular-campanulate ..... **Christisonia**

AEGINETIA Linnaeus

Sp. Pl. 632. 1753

Aeginetia pedunculata (Roxb.) Wall., Pl. Asiat. Rar. 2: t. 219. 1831; Wight, Ic. t. 1421. 1849; Hook. f., FBI 4: 320. 1884; Gamble, FPM 974. 1924. *Orobanche pedunculata* Roxb., Hort. Beng. 45. 1829.

Herbs, 10-15 cm tall, reddish, parasitic on grasses. Scapes scaly, short, stout, bracteate. Corymbs terminal; calyx orange, 3.5 x 1.5 cm; corolla 4 x 3 cm, tube yellow, mouth blue, lobes 5, broad, spreading; stamens 4, didynamous, to 2.5 cm; ovary 1 celled. Capsule partially 2 valved.

Fl. & Fr.: September-November.

Distr.: Indo-Malesia. Occasional; in low altitude grasslands. MS, Kulachivayal, *KKK 31045.*

CHRISTISONIA G. Gardner

Calcutta J. Nat. Hist. 8: 153. 1897.

1. Anthers 1 celled; flowers > 10, crowded apically; corolla hirsute; stigma clavate..... **C. neilgherrica**
1. Anthers 2 celled; flowers < 8, distant on the shoot; corolla glabrous; stigma peltate **2**
2. Stems elongate, 15-20 cm long; peduncles long; racemes lax ..... **C. tubulosa**
2. Stems short, < 12 cm long; peduncles short, stout, corymbosely arranged..... **C. bicolor**

Christisonia neilgherrica Gardner, Calcutta J. Nat. Hist. 8: 157. 1847; Hook. f. FBI 4: 322. 1884; Matthew, Suppl. Ill. FPH t. 1058.1998 & FPH 884.1999. *Campbellia cytinoides* Wight, Ic. t. 1425.1849; Gamble FPM 976. 1924; Fyson, FSIHS 435. t. 377.1932. **Plate 4.9.2.**

Stout, subsucculent herb with thick rootstock; shoots yellowish, scales imbricating. Calyx tube 2 cm, campanulate, lobes 4 mm; corolla funnel shaped, hirsute, tube 3 cm, cream, lobes subequal, crimson; stamens exserted, 2+2; ovary 1 celled. Capsule 1.5 x 1.3 cm, globose

Fl. & Fr.: June-November

Distr.: South India and Sri Lanka. Rare; on shola floors at higher altitudes. MS, K-7, *KKK 17695*; Methappu, *KKK 18566.*

Christisonia bicolor Gard., Calcutta J. nat. Hist. 8: 160. 1847; Hook. f., FBI 4: 322. 1884; Gamble, FPM 976. 1924; Fyson, FSIHS 435. 1932; Matthew, Suppl. Ill. FPH t. 1057. 1998 & FPH. 884. 1999. *C. aurantiaca* Wight, Ic. t. 1486. 1849.

Short, tuberous plants; scales imbricate. Flowers large, on short peduncles; calyx lobes acute; corolla 4 x 2 cm, tubular, tube dull yellowish with bluish limb, yellow within, upper lobes erect, lower horizontal shorter; anthers one fertile, other long spurred, 6 mm long. Capsule not seen.

Fl.: February

Distr.: South India and Sri Lanka. Rare; in medium altitude sholas. MS, K-5, *KKK 16173.*

Christisonia tubulosa (Wight) Benth. *ex* Hook. f., FBI 4: 321 1884; Gamble, FPM 975. 1924; Fyson, FSIHS 435. 1932; Matthew, Suppl. Ill. FPH t. 1060. 1998 & FPH 885. 1999. *Oligopholis tubulosa* Wight, Ic. t. 1422. 1849. **Plate 4.9.3.**

Slender herbs; stem branched, light brown; scales small, distant. Flowers in lax racemes; pedicels stout; bracts 1 x 0.4 cm, oblong; calyx 2.3 x 1.2 cm, tubular, lobes 5, sub equal, yellow; corolla yellowish white, glabrous, 5 x 3 cm at mouth, with a pink tinge at the borders; stamens 2+2, imperfect cell reduced to a spur. Capsule ovoid.

Fl. & Fr.: November-February.

Distr.: Endemic to Southern Western Ghats. Occasional; at medium altitude sholas. MS, K-4, *KKK 18116*; K-5, *KKK 31046.*

70. LENTIBULARIACEAE

UTRICULARIA Linnaeus

Sp. Pl. 18. 1753

1. Foliar organs orbicular; seeds with appendages ..... **U. striatula**
1. Foliar organs linear or spathulate; seeds without appendages **2**
2. Bracts medifixed; foliar organs spathulate ..... **U. roseopurpurea**
2. Bracts basifixed; foliar organs linear **3**
3. Corolla blue to violet; racemes to 30 cm; traps subglobose ..... **U. graminifolia**
3. Corolla white to violet; racemes to 8 cm; traps globose ..... **U. nayarii**

Utricularia graminifolia Vahl, Enum. Pl. 1: 195. 1804; Gamble, FPM 981. 1924; Fyson, FSIHS 437. t. 378a. 1932; Janarthanam & Henry, Fl. India ser. 4. 57. 1992; Matthew, Suppl. Ill. FPH t. 1081. 1998 & FPH 905. 1999. *U. pedicellata* Wight in

Hook.'s J. Bot. Kew Gard. Misc. 1: 373. 1849 & Ic. t. 1578, f. 2. 1850. *U. uliginoides* Wight in Hook.'s J. Bot. Kew Gard. Misc. 1: 372. 1849 & Ic. t. 1573. 1850. *U. conferta* Wight, Ic. t. 1575. 1850.

Terrestrial herbs. Foliar organs, linear, to 2.5 x 0.2 cm, base cuneate, apex acute, 3-nerved. Traps 2-3 mm across, subglobose, mouth basal, appendages 2, simple. Racemes to 30 cm long, 1-5 flowered. Calyx lobes 2, unequal, to 3.5 x 2 mm, ovate; corolla to 10 x 5 mm, upper lip 4 x 2.5 mm, linear-oblong, lower lip 6 x 5 mm, obovate; spur to 5 mm. Capsules 3 mm long, ovoid.

Fl. & Fr.: June-August

Distr.: South India, Sri Lanka, China, Burma & Thailand. Common along stream sides and in grassland marshes at higher altitudes. MS, Idlimottai, *KKK 18190.* ENP, Mesthirikettu, *KKK 18078*; Rajamala, *KKK 31028.*

Utricularia nayarii Janarthanam & Henry, Bull. Bot. Surv. India 28: 195. 1986 & Fl. India ser. 4, 77. 1992.

Small, terrestrial herbs. Foliar organs to 2.5 x 0.1 cm, linear, 3-nerved. Traps 1-1.5 mm across, globose, mouth basal; appendages 2, subulate. Racemes to 8 cm long, 1-5 flowered. Flowers to 8 mm long; calyx lobes to 3.5 mm long, unequal, ovate; upper lip of corolla 4 x 2 mm, oblong, lower lip 6 x 5 mm, obovate; spur 3 mm long, conical, acute; stamens 2. Capsule 3 x 2 mm, ovoid.

Fl. & Fr.: August-December

Distr.: Endemic to Southern Western Ghats. Rare; on wet rocks at higher altitudes. ENP, Mesthirikettu, *KKK 18046.*

Utricularia roseopurpurea Stapf. *ex* Gamble in Herb. Kew. 235. 1924 & FPM 983. 1924; Fyson, FSIHS 437. t. 378c. 1932. *Utricularia racemosa* sensu Wight, Ic. t. 1584. f. 1. 1850, non Wall. *ex* Walp. 1843. *U. rosea* Clarke in Hook. f., FBI 4: 333, non Edgew. 1847.

Terrestrial herbs. Foliar organs to 1 x 0.2 cm, spathulate, 1 nerved. Traps 1-2 mm across, globose, mouth terminal. Racemes to 10 cm tall, erect, 1-5 flowered. Flowers 8-10 mm long; calyx lobes 2-3 mm, hooded; corolla pink, upper lip 5 mm long, linear, lower lip 7 mm long, suborbicular, apex rounded; spur 3 mm long; stamens 2. Capsule 2-3 mm across, globose.

Fl. & Fr.: October-December

Distr.: Endemic to Peninsular India. Occasional; along stream sides at higher altitudes. ENP, Eravikulam lake, *KKK 18077.*

Utricularia striatula Sm. in Rees, Cyclop. 37. n. 17. 1819; Gamble, FPM 983. 1924; Fyson, FSIHS 438. t. 378d. 1932; Janarthanam & Henry, Fl. Ind. ser. 4. 106. 1992; Matthew, Suppl. Ill. FPH t. 1083. 1998 & FPH 906. 1999. *U. orbiculata* Wall. *ex* A. DC. in DC., Prodr. 8: 18. 1844; Clarke in Hook. f., FBI 4: 334. 1884. *U. glochidiata* Wight, Hook.'s J. Bot. Kew Gard. Misc. 1: 373. 1849 & Ic. t. 1581. 1850

Terrestrial herbs. Foliar organs to 4 x 3 mm, orbicular, rostrate at base; scape scattered, filiform. Traps to 1.5 mm across, globose, mouth lateral. Scape to 8 cm

long, 4-5-flowered. Flowers to 1 cm long; calyx unequal, papillose; corolla white to pink, upper lip 2 x 2 mm, semiorbicular, lower lip 5 mm, ovate, 3 lobed; spur 3 mm long, conical; stamens 2. Capsule 3 mm long, obliquely ovoid.

Fl. & Fr.: July-December

Distr.: Tropical Africa and South East Asia. Common in grassland bogs at higher altitudes. MS, Idlimottai, *KKK 18191.*

71. GESNERIACEAE

1. Epiphytic, branched undershrubs; leaves entire; flowers scarlet red ..... **Aeschynanthus**
1. Terrestrial, scapigerous herbs; leaves irregularly crenate-serrate; flowers lilac ..... **Henckelia**

AESCHYNANTHUS Jack

Trans. Linn. Soc. London 14: 42. t. 2. f. 3. 1823, nom. *cons.*

Aeschynanthus perrottetii A. DC. in DC., Prodr. 9: 261. 1845; Clarke in Hook. f., FBI 4: 339. 1884; Gamble, FPM 985. 1923; Fyson, FSIHS 440. t. 379. 1932; Matthew, Suppl. Ill. FPH t. 1084. 1998 & FPH 908. 1999. *A. ceylanica* sensu Wight, Ic. t. 1347. 1848, non Gard., 1846. *A. perrottetii* A. DC. var. *planiculmis* Clarke in Hook. f., FBI 4: 340. 1884, *'platyculmis'*. *A. planiculmis* (Clarke) Gamble, FPM 985. 1924.

Leaves entire, opposite, fleshy, to 10 x 1.5 cm, linear-lanceolate, base acute, apex acuminate. Flowers in fascicles, on terminal peduncles, rarely solitary; calyx 5 partite, lobes 8 x 1 mm, linear; corolla scarlet red, with purple spots, to 3.5 x 0.5 cm, tubular-ventricose, curved, widening above, lobes ovate, obtuse; stamens 4; ovary oblong, stipitate. Capsule to 18 cm long, narrow-linear.

Fl. & Fr.: August-November.

Distr.: Endemic to Western Ghats. Rare; along shola borders at medium altitudes. MS, K-5, *KKK 16644.*

HENCKELIA K. P. J. Sprengel

Anleit. (ed. 2) 2(1): 402. 1817.

Henckelia incana (Vahl) Spreng., Syst. Veg. 1: 38. 1824; Matthew, FPH 909. 1999. *Rottlera incana* Vahl, Enum. Pl. 1: 88. 1804. *Didymocarpus rottlerianus* Wall., Cat, no. 778. 1829, nom. illegit. *D. tomentosus* Wight, Ic. t. 1349. 1848; Clarke in Hook. f., FBI 4: 353. 1884; Gamble, FPM 989. 1924; Fyson, FSIHS 440. t. 380. 1932.

Leaves in a basal rosette, to 10 x 6 cm, obovate or spathulate, base attenuate, apex rounded, densely bullose above, fulvous tomentose below. Cymes sub-umbellate to 12 cm long, glandular hairy; calyx small, narrow, 5- fid; corolla 12 cm long, campanulate, lobes 5, rounded; stamens 4, 2 are staminodes; ovary 1 celled, densely glandular, hairy. Capsule to 2 x 0.2 cm, linear, densely glandular hairy.

Fl. & Fr.: June-September.

Distr.: Endemic to Peninsular India. Occasional; in exposed regions, mainly on rocky road cuttings. MS, Conical patch, *KKK 16455.*

72. ACANTHACEAE

1. Twiners, calyx filiform ..... **Thunbergia**
1. Herbs or shrubs, calyx 4 or 5 partite **2**
2. Corolla lobes nearly equal; stamens 2 or 4 ..... **3**
2. Corolla strongly two lipped; stamens 2 ..... **5**
3. Corolla lobes twisted to the left in bud ..... **Strobilanthes**
3. Corolla lobes imbricate in bud **4**
4. Calyx 4-partite ..... **Barleria**
4. Calyx 5-partite ..... **Asystasia**
5. Stamens exserted; spike normal **6**
5. Stamens included, spike one sided ..... **Rungia**
6. Small procumbent or branching herbs ..... **Justicia**
6. Large erect herbs ..... **Andrographis**

ANDROGRAPHIS Wallich *ex* C. G. D. Nees

in Wallich, Pl. Asiat. Rar. 3: 77, 116. 1832.

Andrographis neesiana Wight, Ic. t. 1561. 1850; Clarke in Hook. f., FBI 4: 504. 1884; Gamble, FPM 1049. 1924; Fyson, FSIHS 454. t. 395. 1932; Matthew, Suppl. Ill. FPH t. 1089. 1998 & FPH 928. 1999.

Branches tetragonous, strigose. Leaves 2-6 x 1-2 cm, elliptic, base acute, apex acute or acuminate, glabrous. Panicles terminal; calyx lobes 5 mm long, lanceolate, glandular hairy; corolla 1.5 cm, brownish-purple, lobes obtuse, hairy. Capsule 18 x 4 mm, linear-oblong, hairy; seeds 1.5 x 1 mm, elliptic.

Fl. & Fr.: December-February

Distr.: Endemic to Western Ghats. Common along shola borders and road sides at lower altitudes. MS, K-2.5, *KKK 16138*; K-3, *KKK 16777*.

ASYSTASIA Blume

Bijdr. 796. 1826.

Asystasia crispata Benth., Linnaea 24: 647.1852; Clarke in Hook. f., FBI 4: 494. 1884; Gamble, FPM 1063. 1924; Fyson, FSIHS 454. t. 394. 1932; Matthew, FPH 929. 1999. *A. coromandeliana* Wight, Ic. t. 1506, 1850. not of Nees.

Small shrubs. Leaves to 9 x 4, ovate, base obtuse, apex acuminate, crispate. Racemes, lax, terminal, 2 branched. Flowers lilac with violet spots; calyx deeply 5 partite; lobes 5 x 1 mm, lanceolate; corolla 3.5 x 2 cm, tube short, funnel shaped; stamens 4, didynamous; ovary 2 celled. Capsule elliptic, compressed.

Fl. & Fr.: October-December

Distr.: Endemic to Western Ghats. Common along shola borders at lower altitudes. MS, Pallang Mala, *KKK 16689*.

BARLERIA Linnaeus

Sp. Pl. 636. 1753

Barleria involucrata Nees in Wall., Pl. Asiat. Rar. 3: 92. 1832, var. **elata** (Dalz.) Clarke in Hook. f., FBI 4: 486. 1884; Gamble, FPM 1060. 1924; Fyson, FSIHS 453. t.

393. 1932; Matthew, FPH 932. 1999. *B. elata* Dalz. in Hook.'s J. Bot. Kew. Gard. Misc. 3: 227. 1851.

Shrubs. Leaves opposite, to 20 x 8 cm, elliptic, acuminate at both ends, glabrous above, pubescent on nerves below. Racemes in terminal axils. Calyx 4 lobed, in 2 opposite pairs; outer lobes 3 x 1 cm, ovate-lanceolate, inner lobes smaller, tawny pubescent; corolla blue, 7-8 cm long, tube 4-6 cm long, thinly hairy; stamens 2; ovary 2 celled. Capsule oblong; seeds 4, compressed, hairy.

Fl. & Fr.: December-March

Distr.: Endemic to Southern Western Ghats, Occasional; along stream sides at lower altitudes. MS, K-3.5, *KKK 16779*; Chengalar, *KKK 18111*.

JUSTICIA Linnaeus

Sp. Pl. 15. 1753

1. Diffuse branching herbs; calyx lobes scarious margined, ciliate ..... **J. japonica**
1. Procumbent herbs; calyx lobes pectinately ciliate ..... **J. latispica**

Justicia japonica Thunb., Fl. Jap. 20. 1784. *J. simplex* D. Don, Prodr. 118. 1825; Clarke in Hook. f., FBI 4: 539. 1884; Gamble, FPM 1080. 1924; Fyson, FSIHS 457. t. 398. 1932; Matthew, FPH 943. 1999. *Rostellularia japonica* (Thunb.) Ellis, Bull. Bot. Surv. India 22: 196. 1966.

Leaves to 3.5 x 1.2 cm, elliptic, base rounded, hirsute. Spikes 30 x 7 mm. Flowers 0.9 cm long; calyx lobes 4, scarious margined, corolla 0.8 x 0.3 cm, lilac with pink spots; style hairy. Capsule 3 x 1.5 mm, elliptic, tip mucronate.

Fl. & Fr.: December-February

Distr.: Indo-Malesia and East Africa. Common along shola borders and road sides at lower altitudes. MS, Puthur, *KKK 16195*.

Justicia latispica (Clarke) Gamble, FPM 1080. 1924; Fyson, FSIHS 456. 1932. *J. procumbens* L., var. *latispica* Clarke in Hook. f., FBI 4: 539. 1885. *Rostellularia procumbens* sensu Wight, Ic. t. 1539. 1850, non Nees, 1832. *R. latispica* (Clarke) Bremek., Verh. Kon. Ned. Akad. Wetensch., Natuurk., Tweede Sect. 45: 71. 1948.

Leaves to 3 x 1.5 cm, elliptic, apex obtusely acute. Spikes to 3 x 1 cm, cylindrical; bracts and bracteoles ciliate. Flowers 1.2 cm long; calyx lobes 4 x 0.5 mm, pectinately ciliate; corolla 1 x 0.5 cm, pale lilac; ovary hairy at apex; style hairy. Capsules papery.

Fl. & Fr.: October-February.

Distr.: Peninsular India and Sri Lanka. Common along shola ecotones and road sides at higher altitudes. ENP, Amarachola, *KKK 17509* & *KKK 18026*.

RUNGIA C. G. D. Nees

in Wallich, Pl. Asiat. Rar. 3: 77, 109. 1832.

Rungia laeta Clarke in Hook. f., FBI 4: 550. 1885; Gamble, FPM 1071. 1924; Fyson, FSIHS 458. t. 399. 1932; Matthew, Suppl. Ill. FPH t. 1094. 1998 & FPH 947. 1999.

Shrubs, often rooting at lower nodes; stems terete, zigzag. Leaves opposite, 11 x 4.5 cm, elliptic, acute or acuminate at both ends. Spikes axillary, 5 x 2 cm, peduncled; floral bracts pale green, 2 x 1 cm, elliptic, acute, tip mucronate, scarious margined; sepals 7 x 1 mm, aristate; corolla 2 cm long, white with brown or pink streaks; stamens 2; ovary 2 celled. Capsule 7 mm, oblong.

Fl. & Fr.: December-February

Distr.: Endemic to Southern Western Ghats. Common along exposed regions or along road sides at higher altitudes. MS, K-6.5, *KKK 16097*; K-9, *KKK 17501*; K-7, *KKK 18115*.

STROBILANTHES Blume

Bijdr. 781, 796. 1826.

Note: The broad generic concept of *Strobilanthes* is followed here.

1. Fertile stamens 2; filaments not basally united 2
1. Fertile stamens 4; filaments basally united 4
2. Racemes condensed with 2 or 4 foliaceous bracts; seeds glabrous when wetted ..... **S. foliosus**
2. Racemes elongate, foliaceous bracts 0; seeds hairy when wetted 3
3. Flowers in dense, broad spikes ..... **S. kunthianus**
3. Flowers in narrow spikes ..... **S. cuspidatus**
4. Inflorescence elongate, in terminal, lax, leafy, panicled spikes; no floral bracts 5
4. Inflorescence condensed, in heads or short cymose spikes; bracts usually rounded and concave 8
5. Leaves oblong-lanceolate, blade decurrent and ending in an auricle 6
5. Leaves ovate, acute, abruptly rounded at base and shortly decurrent on the petiole ..... **S. violaceus**
6. Whole plant densely glandular pubescent ..... **S. sp. 1**
6. Whole plants not pubescent 7
7. Spike stout; nodal bracts large; bracteoles spathulate ..... **S. homotropus**
7. Spikes slender; nodal bracts small; bracteoles linear ..... **S. gracilis**
8. Flowers in capitate heads or short spikes 9
8. Flowers in strobilate often cymose spikes or heads 18
9. Seeds glabrous 10
9. Seeds hairy ..... **S. tristis**
10. Flowers in heads 11
10. Flowers in spikes 16
11. Heads very hairy, short and dense, elongating in fruit; involucral bracts 2 or more, leaf-like 12
11. Heads softly rufous hairy, elongate, clavate; involucral bracts small ..... **S. perrottetianus**
12. Corolla tube shorter than the urceolate upper part; filaments and their sheaths glabrous 13
12. Corolla tube long and slender, as long as the much curved ventricose part; filaments white hairy 14
13. Filaments nearly equal; bracts lanceolate, acute; calyx lobes acuminate ..... **S. wightianus**
13. Filaments unequal; bracts obovate, obtuse, crenate; calyx lobes linear-obtuse ..... **S. urceolaris**
14. Heads small, densely white hairy 15
14. Heads large, densely bristly hirsute ..... **S. neilgherrensis**
15. Bracts suborbicular; leaf base acute, margins serrate ..... **S. pulneyensis**
15. Bracts lanceolate; leaf base shortly cuneate, margins callous-serrate ..... **S. papillosus**

16. Spikes erect, oblong; mouth of corolla ventricose 17
16. Spikes deflexed, oblong; mouth of corolla campanulate ..... **S. micranthus**
17. Leaves pilose; corolla pale yellow ..... **S. calycina**
17. Leaves glabrescent; corolla blue to violet ..... **S. zenkerianus**
18. Flowers on younger braches, axillary or lateral; flowers blue ..... **S. asperrimus**
18. Flowers from the old wood; flowers white ..... **S. luridus**

Strobilanthes asperrimus Nees in DC., Prodr. 11: 183. 1847; Clarke in Hook. f., FBI 4: 443. 1884; Gamble, FPM 1041. 1924.

Shrubs; branches hirsute. Leaves to 10 x 7 cm, broadly elliptic, base attenuate, apex bluntly acuminate, crenate, hairs bulbous based. Spikes 3-4 together, axillary, on trichotomous peduncles. Flowers blue; sepals 6 x 2.5 mm, oblong, emarginate, connate a little above the base; corolla 2.5 cm long, tube stout; staminal filaments and sheath hairy. Capsule 1 x 0.4 cm, glabrous; seeds winged.

Fl. & Fr.: September-January

Distr.: South India and Sri Lanka. Common; along forests margins. ENP, Amarachola, *KKK 17542.*

Note: New record to the flora of Kerala.

Strobilanthes calycina Nees in Hook., Companion Bot. Mag. 2: 321. 1836 & in DC., Prodr. 11: 186. 1847; Clarke in Hook.f., FBI 4: 450. 1885. *S. colorata* Nees in Hook., Companion Bot. Mag. 2: 312. 1836. **Muttakkannikurinji.**

Shrubs 2 m tall; stem densely pilose. Leaves 18 x 10 cm, broadly ovate-elliptic, base rounded, apex acuminate, crenate, pilose. Spikes to 8 x 4 cm, cylindrical; bracts to 2.5 x 1.5 cm, ovate; calyx 1.5 cm long, lobes oblong-elliptic; corolla 2 cm long, pale yellow, tube cylindrical, lobes 4 x 6 mm, ovate. Capsule 2 x 0.7 cm, elliptic-oblong, glabrous; seeds 7 x 6 mm, suborbicular.

Fl. & Fr.: November-February

Distr.: Southern India and Sri Lanka. ENP, Amarachola, *KKK 18527.*

Note: This species was so far considered endemic to Sri Lanka. Present collection is the first report from India.

Strobilanthes cuspidatus (Benth.) T. Anders., J. Linn. Soc. Bot. 9: 465. 1867; Clarke in Hook. f., FBI 4: 435. 1884; Gamble, FPM 1036. 1924; Fyson, FSIHS 446. t. 385. 1932; Matthew, Ill. FPH t. 562. 1996 & FPH 952. 1999, *"cuspidata". Endopogon cuspidatus* Benth., Linnaea 24: 646. 1851. *E. versicolor* Wight, Ic. t. 1497. 1849. *Phlebophyllum versicolor* (Wight) Bremek., Verh. Kon. Ned. Akad. Wetensch. 41: 170. 1944. **Kannarakurinji (EBIS).**

Large shrubs; stems terete; branchlets adpressed-white woolly. Leaves to 15 x 6 cm, ovate, base acute, apex acuminate. Spikes 3-5 cm long, interrupted, on trichotomously branched peduncle. Flowers few; calyx 7 mm long, lobes subulate, glandular-hairy; corolla 2.5 cm long, blue; staminal filaments glabrous. Capsule 1.6 cm long, stalked, glabrous; seeds orbicular, hairy.

Fl. & Fr.: November-February

Distr.: Endemic to Southern Western Ghats. Common along shola margins at medium altitudes. ENP, Amarachola, *KKK 18530.*
Note: New record to the flora of Kerala.

Strobilanthes foliosus (Wight) T. Anders., J. Linn. Soc. 9: 467. 1867; Clarke in Hook. f., FBI 4: 433. 1884; Gamble, FPM 1035. 1924; Fyson, FSIHS 445. t. 383. 1932; Matthew, Ill. FPH t. 563. 1996 & FPH 952. 1999, *"foliosa". Endopogon foliosus* Wight, Ic. t. 1501. 1849. *Nilgirianthus foliosus* (Wight) Bremek., Verh. Kon. Ned. Akad. Wetensch. 41: 173. 1944. **Kallukurinji, Vettilakurinji (EBIS).**

Shrubs; branchlets terete, glabrous, reddish. Leaves to 7 x 3 cm, elliptic, acute at either ends, coriaceous, whitish below, serrate. Spikes 3-4 cm long, lanceolate, axillary and terminal; floral bracts 2 x 0.6 cm, lanceolate. Flowers few; calyx 17 mm, lanceolate, glabrous; corolla 4.5 cm, blue, tube cylindrical at lower part. Capsule 1.8 cm long; seeds 8 x 7 mm, yellowish, glabrous.
Fl. & Fr.: December-May
Distr.: Endemic to Southern Western Ghats. Common along shola margins at low altitudes. MS, Chengalar, *KKK 18129.* VMS, Olichuchattam, *KKK 31142.*

Strobilanthes gracilis Bedd., Trans. Linn. Soc. London 25: 222. 1865 & Ic. t. 207. 1868-1874; Clarke in Hook. f., FBI 4: 474. 1884; Gamble, FPM 1043. 1924; Matthew, Suppl. Ill. FPH t. 1096. 1998 & FPH 953. 1999. *Mackenziea gracilis* (Bedd.) Bremek., Verh. Kon. Ned. Akad. Wetensch. 41: 182. 1944. **Thoka Kurinji. (EBIS) Plate 4.9.4a.**

Very large shrubs, 5-12 m tall; stems quadrangular. Leaves to 15 x 6 cm, elliptic, base decurrent and auricled, apex acuminate, serrate. Spikes panicled, terminal and upper axillary; sepals 1 x 0.2 cm, tube 0.15 cm long, lobes oblanceolate; corolla 3 cm long; tube narrow below, ventricose above, hairy; staminal filaments hairy. Capsule 1.4 x 0.7 cm, elliptic, compressed; seeds 3.5 x 3 mm, orbicular, flat.
Fl. & Fr.: April-June
Distr.: Endemic to Southern Western Ghats. Common undergrowth in medium and high altitude sholas. MS, K-5.5, *KKK 18107.* ENP, Amarachola, *KKK 18528.*

Strobilanthes homotropus Nees in DC., Prodr. 11: 187. 1847; Clarke in Hook. f., FBI 4: 474. 1884; Gamble, FPM 1043. 1924; Fyson, FSIHS 452. t. 392. 1932. *S. sexennis* sensu Bedd., Ic. t. 206. 1868-1874, non Nees, 1847. *Mackenziea homotropa* (Nees) Bremek., Verh. Kon. Ned. Akad. Wetensch. 41: 182. 1944. **Thoka Kurinji.**

Large shrubs or small trees; young branches glandular-hairy. Leaves to 20 x 8 cm, elliptic, base attenuate and auricled, apex acuminate. Spikes 1-3 flowered, in terminal panicles, tomentose; bracts leafy, bracteoles spathulate, glandular-hairy; sepals 1.3 x 0.2 cm, spathulate, hairy; corolla 2.8 cm long, pale blue; staminal filaments hairy. Capsule 1.5 x 0.7 cm, glabrous; seeds 5 x 4 mm, compressed.
Fl. & Fr.: April-June
Distr.: Endemic to Southern Western Ghats. Occasional in shola borders at high altitudes. PAS, Topstation, *KKK 18593.*

Strobilanthes kunthianus (Nees) T. Anders. *ex.* Benth., Fl. Hongk. 262. 1861; Clarke in Hook. f., FBI 4: 434. 1884; Gamble, FPM 1036. 1924; Fyson, FSIHS 445. t. 384. 1932; Matthew, Ill. FPH t. 564. 1996 & FPH 954. 1999. *Phlebophyllum kunthianum* Nees in Wall., Pl. Asiat. Rar. 3: 83. 1832; Wight, Ic. t. 448. 1841. **Neelakkurunji. Plate 4.9.5.**

Bushy shrubs; branches quadrangular, reddish. Leaves to 6 x 3 cm, elliptic, thick-coriaceous, dark green, and scabrid above, reticulate and white villous below, crenate-serrate. Spikes 2-5, 3-5 cm long, on axillary peduncles; floral bracts 1.2 x 0.4 cm, ovate-acuminate, tawny pubescent; calyx 1 cm long, lobes acuminate; corolla 2.5 cm long, pale blue, hairy. Capsule 1.5 x 0.4 cm; seeds 4.

Fl. & Fr.: September-January

Distr.: Endemic to Southern Western Ghats. Common in grasslands and shola ecotones at medium and high altitudes. MS, Thalachorkadavu, *KKK 16754*; K-5, *KKK 16551*

Strobilanthes luridus Wight, Ic. tt. 1515 & 1516. 1850; Clarke in Hook. f., FBI 4: 450. 1884; Gamble, FPM 1042. 1924; Fyson, FSIHS 451. t. 391. 1932; Matthew, Ill. FPH t. 565. 1996 & FPH 955. 1999. *Didyplosandra lurida* (Wight) Bremek., Verh. Kon. Ned. Akad. Wetensch. 41: 178. 1944. **Muttakannikurinji. Plate 4.9.6.**

Large straggling shrubs; branchlets grey-pubescent. Leaves to 25 x 15 cm, broadly elliptic, acute at both ends, hispid, serrulate. Spikes to 15 x 5 cm, cylindrical, axillary; floral bracts 2.5 x 3 cm, orbicular, reddish brown; calyx 2.5 cm long, lobes elliptic, margins ciliate; corolla 3.5 cm long, campanulate, purplish white, lobes orbicular. Capsule 2 x 0.6 cm, ellipsoid, glabrous; seeds orbicular.

Fl. & Fr.: November-January

Distr.: Endemic to Southern Western Ghats. Common along shola borders at medium altitudes. MS, Chengalar, *KKK 18104*; K-5, *KKK 18108.*

Strobilanthes micranthus Wight, Ic. t. 1519. 1850; Clarke in Hook. f., FBI 4: 444. 1884; Gamble, FPM 1040. 1924; Fyson, FSIHS 451. 1932; Matthew, Ill. FPH t. 566. 1996 & FPH 956. 1999, "*micrantha*". *Taeniandra micrantha* (Wight) Bremek., Verh. Kon. Ned. Akad. Wetensch. 41: 175. 1944. **Kallankurinji. Plate 4.9.7.**

Large shrubs; branchlets quadrangular. Leaves to 15 x 8 cm, elliptic, base attenuate, decurrent, apex acuminate, serrulate, glabrous. Spikes 5-10 cm, ovoid to oblong, solitary, axillary; bracts 27 x 12 mm, lanceolate, hirsute. Calyx 17 mm long, lobes acuminate; corolla 1.8 cm long, campanulate, lobes recurved, reddish brown outside, pale white inside. Capsule 1.4 x 0.5 cm, oblong; seeds 6 x 4 mm, oblong.

Fl. & Fr.: November-January

Distr.: Endemic to Southern Western Ghats. Common along shola borders at medium altitudes. MS, K-6, *KKK 18106.* PAS, Vandaravu, *KKK 18586.*

Strobilanthes neilgherrensis Bedd., Ic. t. 196. 1868-1874; Clarke in Hook. f, FBI 4: 438. 1884; Gamble, FPM 1038. 1924. *Nilgirianthus neilgherrensis* (Bedd.) Bremek., Verh. Acad. Wet. afd. Natuurk. Sect. 2, 41: 174. 1944.

Large shrubs; stems subtetragonous. Leaves to 13 x 8 cm, ovate, base rounded, apex acuminate, rugose with bulbous-based hairs, scabrous-hispid, subcoriaceous, crenate. Flowers white, in large, dense, bristly hirsute heads; calyx lobes lanceolate; corolla tube longer than the ventricose mouth; stamens 2+2. Fruits not seen.

Fl.: December

Distr.: Endemic to Southern Western Ghats. MS, K-5, *KKK 18112*

Strobilanthes papillosus T. Anders., J. Linn. Soc. Bot. 9: 468. 1867; Clarke in Hook.f., FBI 4: 445. 1884; Gamble, FPM 1039. 1924; Fyson, FSIHS 448. 1932

Large shrubs; whole plant bulbous-based hairy. Leaves to 6 x 4 cm, ovate, base cuneate, apex acute, serrate. Heads erect, close; involucral bracts with leafy tips. Flowers blue; corolla large, tube 1.5 cm, mouth 2 cm, lobes large. Capsule 1.2 x 0.6 cm, elliptic; seeds 6 x 4 mm, elliptic, glabrous.

Fl. & Fr.: January-March

Distr.: Endemic to Southern Western Ghats. Occasional; along shola borders at low altitudes. MS, Thalachorkadavu, *KKK 18153.*

Note: New record to the flora of Kerala.

Strobilanthes perrottetianus Nees in DC., Prodr. 11: 179. 1847; Clarke in Hook. f., FBI 4: 439. 1884; Gamble, FPM 1039. 1924; Fyson, FSIHS 448. t. 387. 1932. *Nilgirianthus perrottetianus* (Nees) Bremek., Verh. Acad. Wet. afd. Natuurk. Sect 2, 41: 174. 1944. **Chonakurinji.**

Large shrub; stem and leaves reddish-purple hairy. Leaves 9 x 6 cm, ovate, apex acute to acuminate, crenate. Heads clavate, deflexed. Flowers pale blue or lilac; calyx lobes linear; corolla 2.2 cm long, tube short, enclosed by ovate bracts, upper part infundibular; ovary glabrous. Capsule 2 seeded.

Fl. & Fr.: January-March

Distr.: Endemic to Southern Western Ghats. Common; in low and medium altitude sholas. MS, Thalachorkadavu, *KKK 18153.* ENP, Amarachola, *KKK 18532.*

Note: New record to the flora of Kerala.

Strobilanthes pulneyensis Clarke in Hook. f., FBI 4: 438. 1884; Gamble, FPM 1038. 1924; Fyson, FSIHS 447. t. 386. 1932; Matthew, Ill. FPH t. 567. 1996 & FPH 957. 1999. *S. punctatus* Bedd., Ic. t. 204. 1868-1874, non Nees, 1847. *Xenacanthus pulneyensis* (Clarke) Bremek., Verh. Kon. Ned. Akad. Wetensch. 41: 176. 1944. **Chonayamkallu Kurinji.**

Well branched shrubs; branchlets densely hispid. Leaves to 8 x 5 cm, elliptic, base cuneate, apex acute, margin serrate. Spikes flattened, 1-3 in axils; bracts 1-3 x 1.2 cm, ovate to orbicular, serrate, densely white hairy at base. Flowers blue to violet; sepals 1 cm long, lobes acute, hairy; corolla 1.5 x 0.5 cm long, tube narrow, 1 cm long, thinly hairy outside. Capsule 0.8 x 0.4 cm, oblong; seeds elliptic.

Fl. & Fr.: October-January

Distr.: Endemic to Southern Western Ghats. Common; along shola margins at medium altitudes. ENP, Amarachola, *KKK 18017.*

Strobilanthes tristis (Wight) T. Anders., J. Linn. Soc. Bot. 9: 470. 1867; Clarke in Hook. f., FBI 4: 441. 1884; Gamble, FPM 1040. 1924. *Goldfussia tristis* Wight, Ic. t. 1508. 1850.

Shrubs; branchlets glabrous. Leaves to 20 x 10 cm, acuminate at both ends, glabrous. Spikes to 4 cm long, lanceolate, 1-2-flowered, deflexed, in axillary clusters; bracts 2.5 x 0.5 cm, lanceolate, acuminate, margins ciliate; sepals 1.5 x 0.3 cm, acuminate, hairy; corolla 3 cm long, narrowed to the base, glabrous, bluish-white; staminal sheath glabrous. Capsule 1 x 0.3 cm; seeds orbicular.

Fl. & Fr.: November-January

Distr.: Endemic to Southern Western Ghats. Rare; in low altitude sholas. Mattupatty Shola, *KKK 31131.*

Strobilanthes urceolaris Gamble, Kew Bull. 1923: 374. 1923 & FPM 1038. 1924; Fyson, FSIHS 449. 1932; Matthew, FPH 957. 1999. *Nilgirianthus urceolaris* (Gamble) Bremek., Verh. Kon. Ned. Akad. Wetensch. 41: 173. 1944. **Panjikurinji.**

Shrubs; branchlets densely hirsute. Leaves to 9 x 5 cm, ovate, base rounded, apex acute, densely scabrous, crenate. Spikes to 2 cm long, ovoid, 5-8 together on short lateral branches; bracts 0.8 x 0.4 cm, obovate, densely hirsute. Flowers few; calyx lobes 0.9 cm long, linear, united above, densely hairy; corolla 1.7 cm long, glabrous, pale blue. Capsule 1 cm long, obovoid, glabrous; seeds 4 x 3 mm, oblong.

Fl. & Fr.: December-January

Distr.: Endemic to Southern Western Ghats. Common along shola margins at higher altitudes. ENP, Umayamala, *KKK 17542.*

Strobilanthes violaceus Bedd., Ic. t. 205. 1872; Clarke in Hook. f., FBI 4: 474. 1884; Gamble, FPM 1044. 1924; Fyson, FSIHS 452. 1932. *Mackenziea violacea* (Bedd.) Bremek., Verh. Nederl. Akad. Wetensch., Amst., Afd. Natuurk., sect. 2, 1: 182. 1944. **Plate 4.9.8.**

Large shrub. Leaves to 10 x 4 cm, elliptic-oblong, base narrowed and sheathing, apex acute, puberulous, chartaceous. Spikes glandular, terminal and axillary; bracts oblanceolate; sepals 6-8 x 1.5 mm, oblanceolate-oblong; corolla bluish-purple, to 3 x 2.5 cm, ventricose; stamens 4. Fruit not seen.

Fl.: December-February

Distr.: Endemic to Southern Western Ghats. Occasional; in shola borders at medium altitudes. ENP, Amarachola, *KKK 18552.*

Note: New record to the flora of Kerala.

Strobilanthes wightianus Nees in Wall., Pl. Asiat. Rar. 3: 86. 1832; Wight, Ic. t. 1514. 1850; Clarke in Hook. f., FBI 4: 438. 1884; Gamble, FPM 1037. 1924; Fyson, FSIHS 449. t. 388. 1932. *Nilgirianthus wightianus* (Nees) Bremek., Verh. Kon. Ned. Akad. Wetensch. 41: 174. 1944.

Shrubs; branches hirsute. Leaves 7 x 4 cm, ovate, acuminate, serrate, densely hirsute. Spikes 1.5 x 2.5 cm, obconical; involucral bracts 2-4, leafy, to 3 x 1.5 cm; floral bracts densely hairy at base. Flowers pale blue; calyx 10 mm long, hairy, united

below the middle; corolla 2 cm long, tube 5 mm long, villous inside. Capsule 1 x 0.3 cm, glabrous; seeds 3 x 3 mm, orbicular, oblique at base.

Fl. & Fr.: October-January

Distr.: Endemic to Western Ghats. Common along shola margins at low and medium altitudes. MS, K-4, *KKK 18113.*

Strobilanthes zenkerianus (Nees) T. Anders, J. Linn. Soc. Bot. 9: 467. 1867; Clarke in Hook. f., FBI 4: 439. 1884; Gamble, FPM 1039. 1924; Fyson, FSIHS 451. t. 390. 1932; Matthew, Ill. FPH t. 568. 1996 & FPH 958. 1999, "*zenkeriana*". *Goldfussia zenkeriana* Nees in DC. Prodr. 11: 172. 1847. *Endopogon strobilanthes* Wight, Ic. t. 1500. 1849. *Xenacanthus zenkerianus* (Nees) Bremek, Verh. Kon. Ned. Akad. Wetensch. 41: 176. 1944.

Gregarious shrub; branchlets angled. Leaves to 12 x 4cm, elliptic-ovate, base cuneate, apex acuminate, margin serrulate, subcoriaceous. Spikes erect, to 6 cm, oblong; bracts ovate, spathulate below. Flowers blue to violet; calyx 18 mm long, lobes 5, 1.6 cm , lanceolate; corolla 1.5 cm, tube 1.2 cm, lobes 4. Capsule 2 x 0.5 cm, ellipsoid; seeds 4.

Fl. & Fr.: October-January

Distr.: Endemic to Southern Western Ghats. Common undergrowth species found at higher altitudes. MS, Idlimottai, *KKK 31113.*

Strobilanthes sp. 1. Chonayamkallu Kurinji. Plate 4.9.4b.

Shrub to 3 m tall; whole plant glandular-pubescent. Leaves to 22 x9 cm, elliptic, base narrowed and sheathing, apex acuminate, serrate, deeply veined. Spikes dense panicled, terminal or axillary; bracts oblanceolate. Sepals 2 x 0.2 cm, subulate; petals 3.5 cm long, tube narrowing below, ventricose above. Capsule 2.5 x 1 cm, elliptic, glabrous; seeds 5x 4 mm, suborbicular, discoid.

Fl. & Fr.: December-February

Distr.: Rare; in shola borders at medium and higher altitudes. ENP, Amarachola, *KKK* 18526; Umayamala, *KKK 18553.*

THUNBERGIA Retzius

Physiogr. Salsk. Handl. 1(3): 163. 1780, *nom. cons.*

Thunbergia tomentosa Wall. *ex* Nees in Wall., Pl. Asiat. Rar. 3: 78. 1832; Clarke in Hook. f., FBI 4: 391. 1884; Gamble, FPM 1008. 1924; Fyson, FSIHS 443. t. 382. 1932; Matthew, Suppl. Ill. FPH t. 1098. 1998 & FPH 960. 1999.

Climbing herbs. Leaves 5 x 3 cm, ovate, cordate to hastate, lobes spreading at base, tomentose when young. Flowers axillary, large; bracts leafy; calyx teeth 8 mm long, filiform, villous; corolla white, to 5 cm across, ventricose, curved, limb oblique; stamens 4, didynamous; ovary 2 celled. Capsule 2.3 x 1 cm, globose below, beaked above; beak 1.5 cm long, sword shaped; seeds 5 x 3 mm, discoid.

Fl. & Fr.: January-March.

Distr.: Endemic to Southern Western Ghats. Common along shola borders and road sides at medium altitudes. MS, Gudalar, *KKK 16082.*

73. VERBENACEAE

1. Inflorescence a paniculate cyme; fruit a drupe ..... **Clerodendrum**
1. Inflorescence a spike; fruit a pyrene ..... **Lantana**

CLERODENDRUM Burman *ex* Linnaeus

Sp. Pl. 637. 1753

1. Subshrubs; leaves elliptic; calyx subtruncate; corolla blue ..... **C. serratum**
1. Shrubs to small trees; leaves ovate to orbicular; calyx deeply lobed; corolla cream ..... **C. viscosum**

Clerodendrum serratum (L.) Moon, Cat. Pl. Ceylon 46. 1824; Clarke in Hook. f., FBI 4: 592. 1885; Gamble, FPM 1100. 1924; Fyson, FSIHS 461. t. 401. 1932; Matthew, FPH 965. 1999. *Volkameria serrata* L., Mant. Pl. 1: 90. 1767.

Leaves verticillate, 3 at a node, to 18 x 9 cm, base decurrent, apex shortly acuminate, coarsely serrate, sub-coriaceous. Panicles to 15 cm; calyx 0.4 cm, cupular, sub truncate; corolla 2 cm wide, tube 1 cm, limb 2 lipped, lobes spathulate; stamens 4; ovary globose. Drupe 4 lobed, 1 cm wide.

Fl. & Fr.: August-December.

Distr.: India, Nepal, Myanmar and Sri Lanka. Common in shola borders and disturbed regions at lower altitudes. MS, Pallang Mala, *KKK 16687.*

Clerodendrum viscosum Vent., Jard. Mal. 1: t. 25. 1803; Matthew, Ill. FPH t. 569. 1996 & FPH 966. 1999. *C. infortunatum* Wight, Ic. t. 1471. 1849, "*infortunata*", non L.; Clarke in Hook. f., FBI 4: 594. 1885; Gamble, FPM 1100. 1924. **Kattu Padappa (EBIS).**

Leaves to 20 x 16 cm, base cordate, apex acuminate, margin denticulate, tawny villous. Cymes panicled, diffuse, terminal or in upper axils; calyx 1 cm long, lobes 5, lanceolate, acute; corolla 1 cm wide, funnel shaped, tube 1.5 cm, lobes oblanceolate; stamens 4; ovary 4 celled. Drupe 8 mm wide, globose.

Fl. & Fr.: February-March.

Distr.: Indo-Malesia. Common along road sides and shola borders at lower and medium altitudes. MS, Idlimottai, *KKK 16578.*

LANTANA Linnaeus

Sp. Pl. 626. 1753

1. Armed plants with recurved prickles; spikes condensed; leaves ovate, margin serrate ..... **L. camara**
1. Unarmed plants; spikes elongate; leaves elliptic-oblong, margin crenate ..... **L. indica**

Lantana camara L., Sp. Pl. 627. 1753; Clarke in Hook. f., FBI 4: 562. 1885; Matthew, FPH 969. 1999. *L. aculeata* L., Sp. Pl. 627. 1753; Gamble, FPM 1087. 1924; Fyson, FSIHS 459. 1932. **Unni Mullu, Sankutheva Mullu (EBIS).**

Leaves to 8 x 5 cm, ovate, base cordate-attenuate, apex acute, margin serrate, scabrid. Spikes to 4 cm wide, capitate ovoid, terminal or in upper axils,. Flowers 15-

20; calyx bilabiate, 3 mm; corolla white or rose, tube 1 cm, narrow, hairy, limb 1 cm wide, 5 lobed; ovary 0.75 mm. Berry 5 mm wide, globose, black when ripe.

Fl. & Fr.: Throughout the year

Distr.: Native of Tropical America, naturalized in the tropics and subtropics. Common along shola borders and roadsides at lower altitudes. MS, Perumala, *KKK 18501.*

Lantana indica Roxb., Fl. Ind. 3: 89. 1832; Clarke in Hook. f., FBI 4: 562. 1885; Gamble, FPM 1087. 1924; Matthew, Suppl. Ill. FPH t. 1101. 1998 & FPH 969. 1999. **Kuzhaloothi Palam (EBIS).**

Leaves to 7 x 3.5 cm, elliptic-oblong, base rounded, apex acute, margin crenate, sub-coriaceous, densely sericeus below. Spikes to 3 cm, cylindric; calyx 1.2 mm long; corolla pink, 4 mm wide, lobes 5, tube 5 mm long; stamens 4; ovary 2 celled. Berry 0.5 cm wide, globose, red when ripe.

Fl. & Fr.: August-September.

Distr.: India, Nepal and Thailand. Occasional; along shola borders and in scrublands. MS, Idlimottai, *KKK 16598.*

74. LAMIACEAE (Lamiaceae)

1. Calyx 8-10 toothed; upper lip of corolla hooded ..... **Leucas**
1. Calyx 5 toothed; upper lip of corolla straight or spreading **2**
2. Calyx lobes (sub) equal, not 2 lipped **3**
2. Calyx lobes unequal, clearly 2 lipped **4**
3. Corolla lobes 4; stamens (sub) equal ..... **Pogostemon**
3. Corolla lobes 5; stamens didynamous ..... **Anisomeles**
4. Upper lip of calyx 1 lobed, broader than lower lobes **5**
4. Upper lip of calyx 3 lobed with scutellum, nearly as broad as lower lobes ..... **Scutellaria**
5. Calyx oblique, lower lip truncate ..... **Anisochilus**
5. Calyx equally 2 lipped, lower lip 2-4 toothed **6**
6. Stamens ascending to the upper lip, projecting straight forward **7**
6. Stamens descending, lying upon or enclosed in the lower lip **9**
7. Calyx tube straight ..... **Prunella**
7. Calyx tube inwardly curved **8**
8. Calyx equally 5 toothed; erect herbs ..... **Micromeria**
8. Calyx distinctly 2 lipped; trailing herbs ..... **Clinopodium**
9. Calyx conspicuously 2-lipped ..... **Plectranthus**
9. Calyx with 5 subequal teeth ..... **Isodon**

ANISOCHILUS Wallich *ex* Bentham

in Lindley, Edward's Bot. Reg. 15: t. 1300. 1830.

Anisochilus argenteus Gamble, Kew Bull. 1924: 265. 1924 & FPM 1127. 1924; Matthew, Ill. FPH t. 571. 1996 & FPH 982. 1999. **Seethakkorali.**

Bushy shrubs; branchlets silvery, base terete, apex angular. Leaves sessile, whorled, to 3 x 0.7 cm, oblanceolate, base cuneate, apex acute, thick coriaceous, dense silvery tomentose. Spikes terminal, to 6.5 x 0.8 cm; calyx 2 lipped, upper lip 2 x

1 mm, rounded; corolla purplish, upper lip 0.6 x 0.2 mm, obovate, lower lip 1 x 0.5 mm, oblanceolate; stamens 4. Nutlets 1 x 0.5 mm, ovoid, compressed.

Fl. & Fr.: February-March

Distr.: Endemic to Southern Western Ghats . Rare; found along shola borders and scrublands at medium altitudes. MS, Mattukulam, K-3, *KKK 18134.*

Note: New record to the flora of Kerala.

ANISOMELES R. Brown

Prodr. 503. 1810

Anisomeles indica (L.) O. Ktze., Rev. Gen. Pl. 512. 1891; Gamble, FPM 1140. 1924; Fyson, FSIHS 478. 1932; Matthew, Suppl. Ill. FPH t. 1104. 1998 & FPH 985. 1999. *Nepeta indica* L., Sp. Pl. 571. 1753. *Anisomeles ovata* Aiton f. in Ait., Hort. Kew. 3: 364. 1811; Wight, Ic. t. t. 865. 1844-45; Clarke in Hook. f., FBI 4: 672. 1885, var. *mollissima* Benth. in DC. Prodr. 12: 456. 1848.

Subshrubs; branchlets 4 angled. Leaves decussate, to 7 x 5 cm, ovate, base abruptly acute, apex acute, crenate, pubescent. Spikes to 13 x 6 cm; calyx tubular-campanulate, hairy, tube 0.6 cm, lobes 3 x 1.5 mm, acuminate; corolla white, 1.3 x 0.4 cm, tube 0.8 cm, upper lip erect, lower lip 3 lobed, spreading; stamens 6-8 mm, brown; ovary 1.2 cm. Nutlets 4, lenticulate.

Fl. & Fr.: December-May.

Distr.: Indo-Malesia and China. Occasional; along shola borders and road sides at lower altitudes. MS, Chengalar, *KKK 18143.*

CLINOPODIUM Linnaeus

Sp. Pl. 587. 1753

Clinopodium umbrosoum (M. Bieb.) K. Koch, Linnaea 11: 673. 1848; Matthew, Suppl. Ill. FPH t. 1105. 1998 & FPH. 986. 1999. *Melissa umbrosa* M. Bieb., Fl. Taur.-caucas 2: 63. 1808; Wight, Ic. t. 1447. 1849. *Calamintha umbrosa* (M. Bieb). Reich., Fl. Germ. Excurs. 1: 329. 1821; Hook. f., FBI 4: 650. 1885; Gamble, FPM 1139. 1924; Fyson, FSIHS 475. t. 412. 1932.

Branchlets quadrangular, hairy. Leaves decussate, to 2.5 x 2 cm, ovate, base truncate, apex acute, serrate, puberulous. Inflorescence verticillate, to 2.5 cm wide; calyx tubular-campanulate, tube 5 x 2 mm, upper lip 3 lobed, lower 2 lobed, longer; corolla pink to purple, tube 0.5 cm, upper lip 2 lobed, lower 3 lobed, mid lobe larger; stamens 4, didynamous; ovary 5 celled. Nutlets 4, erect.

Fl. & Fr.: August-September.

Distr.: Indo-Malesia. Occasional; along waysides and grasslands at higher altitudes. MS, Idlimottai, *KKK 16617.*

Note: New record to the flora of Kerala.

ISODON (Schrader *ex* Bentham) Spach

Hist. Nat. Veg. Phn. 9: 162. 1840

Isodon nilgherricus (Benth.) H. Hara, J. Jap. Bot. 60: 236. 1985; Matthew, FPH 991. 1999. *Plectranthus nilgherricus* Benth. in DC., Prodr. 12: 57. 1848; Hook. f., FBI 4: 619. 1885; Gamble, FPM 1121. 1924; Fyson, FSIHS 466. 1932.

Tall herbs; whole plant tawny villous. Leaves to 4 x 2.5 cm, ovate, base broadly cuneate, apex acuminate, margin serrate. Panicles to 9 cm long. Flowers to 8 mm long; calyx teeth subequal, 2 mm long; petals white with red spots, 2 lipped, tube straight; stamens to 10 mm long; style to 1 cm. Nutlets ovoid.

Fl. & Fr.: December-January.

Distr.: Endemic to Southern Western Ghats. Common in lower altitude sholas. MS, K-4, *KKK 16771.*

LEUCAS R. Brown

Prodr. 504. 1810.

1. Leaves ovate 2
1. Leaves linear to lanceolate 3
2. Erect herbs; stem silvery, deflexed hairy; inflorescence an axillary verticillate ..... **L. chinensis**
2. Straggling herbs; stem tawny villous; inflorescence in terminal whorls ..... **L. lamifolia**
3. Calyx mouth oblique ..... **L. zeylanica**
3. Calyx mouths straight 4
4. Leaves entire 5
4. Leaves serrate or crenate 8
5. Leaves small, 2-3 cm long, narrow, coriaceous and with distinct revolute margins 6
5. Leaves large, 10-12 cm long, broad, chartaceous, margin very slightly revolute ..... **L. lancifolia**
6. Branches fulvous; leaves white tomentose below 7
6. Branches greenish grey; leaves grey villous beneath ..... **L. rosmarinifolia**
7. Stems and leaves scaly and hispid; bracts setaceous ..... **L. suffruticosa**
7. Stems and leaves closely adpressed villous; bracts subulate ..... **L. ternifolia**
8. Leaf margin crenate-serrate, distinctly tomentose; calyx mouth straight ..... **L. vestita**
8. Leaf margin distinctly obscurely serrate, slightly pubescent; calyx mouth oblique ..... **L. zeylanica**

Leucas chinensis (Retz.) R. Br., Prodr. 504. 1810; Hook. f., FBI 4: 681. 1885; Gamble, FPM 1151. 1924; Matthew, Ill. FPH t. 1109. 1998 & FPH 995. 1999. *Phlomis chinensis* Retz., Obs. Bot. 2: 19. 1781.

Stout herbs. Leaves to 4 x 3.5 cm, ovate, base truncate, apex acute, crenate-serrate, silvery green. Calyx 1.5 x 0.5 cm, funnel shaped, mouth straight, lobes 10, 2 x 1.5 mm, triangular, acute; corolla white, 12 x 3 mm, tube 1 cm, oblique, upper lip 8 mm, hairy, lower lip 6 mm, glabrous; stamens 4. Nutlets 4.

Fl. & Fr.: Throughout the year.

Distr.: Peninsular India and China. Common; along shola borders and waysides at lower altitudes. MS, Kulachivayal, *KKK 16680.*

Leucas lamifolia Desf., Mem. Mus. Nat. Hist. 11: t. 2. 1824; Hook. f., FBI 4: 686. 1885; Gamble, FPM 1153. 1924; Fyson, FSIHS 483. t. 421. 1932. **Perum Thumba (EBIS).**

Straggling herbs. Leaves to 6 x 3 cm, ovate, base rounded, apex acute, margin crenate, tawny villous above, whitish pubescent below. Inflorescence 2.5 cm across; calyx tubular, tube 7 x 3 mm, teeth slender, tubular, stellately spreading, throat

villous; corolla white, upper lip densely covered with white hairs, lower lip trilobed, middle lobe large, 7 x 4 mm; stamens 4. Nutlets 4.
Fl. & Fr.: February-March.
Distr.: Endemic to Western Ghats. Common; along shola borders at lower altitudes. MS, K-3, *KKK 16144.*
Note: New record to the flora of Kerala.

Leucas lancifolia Desf., Mem. Mus. Nat. Hist. 11: 5, t. 2. f. 2. 1824; Wight, Ic. t. 1452. 1849, *"lanceaefolia"*; Hook. f., FBI 4: 685. 1885; Gamble, FPM 1153. 1924; Fyson, FSIHS 482. t. 419. 1932; Matthew, Suppl. Ill. FPH t. 1111. 1998 & FPH 996. 1999.

Subshrubs; branchlets densely tomentose. Leaves to 12 x 3 cm, lanceolate, base acute to cuneate, apex apiculate, scaberulous above, glaucous below. Verticils in upper axils, to 2.5 cm wide; calyx 1.1 x 0.5 cm, ribs and teeth 10, mouth straight; corolla white, tube 1 cm, bilipped, lower lip 8 x 4 mm, glabrous; upper lip white hairy; stamens 4. Nutlets 4, to 3 x 1.5 mm, oblong, brown.
Fl. & Fr.: July-December.
Distr.: Endemic to Peninsular India. Common; along shola borders and grasslands at higher altitudes. MS, Methappu, *KKK 16422*; Idlimottai, *KKK* 16434; K-9, *KKK 16797.*

Leucas rosmarinifolia Benth. in Wall. Pl. Asiat. Rar. 1: 61. 1830; Wight, Ic. t. 1455. 1849; Hook. f., FBI 4: 685. 1885; Gamble, FPM 1152. 1924; Fyson, FSIHS 480. t. 416. 1932.

Small bushy shrub, grey-green in colour. Leaves to 18 x 4 mm, linear, tip obtuse, grey villous beneath, many, fascicled at nodes. Flower whorls usually 1 (2); calyx tube 6 x 4 mm, teeth triangular, shorter than the rim of hairs; corolla white, 9 x 4 mm, tube 5 x 1.5 mm upper lip white hairy, lower lip 4 x 3.5 mm.
Fl. & Fr.: June-August.
Distr.: Endemic to Southern Western Ghats. Occasional; along grassland ecotones. MS, K-4, *KKK 31042.*
Note: New record to the flora of Kerala.

Leucas suffruticosa Benth., Labiat. Gen. Sp. 611. 1834; Hook. f., FBI 4: 685. 1885; Gamble, FPM 1152. 1924; Fyson, FSIHS 480. t. 417. 1932. **Plate 4.10.1.**

Bushy undershrub, rootstock perennial. Leaves 2 x 0.5 cm, linear, base cuneate, apex acute to obtuse, subsessile, white tomentose beneath. Flower whorls 1-2 at the top of branches; calyx tube to 5 x 4 mm, obconical, teeth minute as long as the throat ring of hairs; corolla white, tube 6 x 1 mm, upper lip dense white tomentose, lower lip glabrous. Nutlets 2 x 1 mm, oblong.
Fl. & Fr.: August-September.
Distr.: Endemic to Peninsular India. Common; in grasslands at higher altitudes. MS, Idlimottai, *KKK 16610.*

Leucas ternifolia Desf., Mem. Mus. Hist. Nat. 11: 4. t. 1. f. 2. 685. 1824; Gamble, FPM 1152. 1924; Fyson, FSIHS 482. 1932; Matthew, Suppl. Ill. FPH t. 1112. 1998 & FPH 997. 1999. *L. helianthemifolia* Hook. f., FBI 4: 685. 1885, non Desf. 1824.

Subshrubs with woody rootstock; branchlets golden hairy. Leaves 3 per node, to 2.5 x 0.5 cm, oblong or oblanceolate, base cuneate, apex acute, margin recurved, densely white tomentose below, subsessile. Verticils 2-3, subterminal; calyx tube 5 x 4 mm, teeth 10, minute; corolla tube 7 x 1.5 mm, upper lip shorter, densely white hairy, lower lip 5 mm long. Nutlets 1 x 0.5 mm, oblong, black.

Fl. & Fr.: July-September

Distr.: Endemic to Peninsular India. Occasional; along shola borders and grasslands at higher altitudes. MS, Idlimottai, *KKK 16435.*

Leucas vestita Benth. in Wall., Pl. Asiat. Rar. 1: 61. 1830; Hook. f., FBI 4: 686. 1885; Gamble, FPM 1153. 1924; Fyson, FSIHS 482. t. 420. 1932; Matthew, Ill. FPH t. 575. 1996 & FPH 998. 1999. **Hanuman Pal.**

Stout herbs; densely tawny villous. Leaves golden brown, to 5 x 1.5 cm, lanceolate, base cuneate, apex acute, densely tomentose. Verticils terminal, to 2.5 cm wide; calyx tube 8 x 4 mm, teeth 10, 2.5 mm long; corolla white, tube 10 mm, curved, bilipped, upper and lower lips 4 x 4 mm, brown, hairy, lower lip 3 lobed.

Fl. & Fr.: February-March.

Distr.: Endemic to Southern Western Ghats. Common along shola borders and in grasslands. MS, K-4, *KKK 16100.*

Leucas zeylanica (L.) R. Br., Prodr. 504. 1810; Hook. f., FBI 4: 689. 1885; Gamble, FPM 1150. 1924; Fyson, FSIHS 484. 1932. *Phlomis zeylanica* L., Sp. Pl. 586. 1753.

Stout herbs; hispid. Leaves to 7 x 2 cm, linear-lanceolate, base cuneate, apex acute, slightly puberulous. Verticils in upper axils; calyx tube erect, 7 mm long, upper tooth long 3 mm, rest smaller; corolla white, upper lip 6 mm, pubescent, lower lip 10 x 5 mm, midlobe broad, tube 8 mm.

Fl. & Fr.: October-December.

Distr.: South and South East Asia. Occasional; in open places and ecotones at lower altitudes. MS, K-3, *KKK 16656.*

MICROMERIA Bentham

Edwards's Bot. Reg. 15: (4) Post. t. 1282. 1829.

Micromeria biflora (Buch.-Ham. *ex* D. Don.) Benth., Lab. Gen. Sp. 378. 1834; Wight, Ic. t. 1446. 1849; Hook. f., FBI 4: 650. 1885; Gamble, FPM 1138. 1924; Fyson, FSIHS 474. t. 411. 1932; Matthew, Suppl. Ill. FPH t. 1114. 1998 & FPH 999. 1999. *Thymus biflorus* Buch.-Ham. *ex* D. Don, Prodr. Fl. Nep. 112. 1825.

Tufted herbs; rootstock woody; branchlets wiry, pubescent. Leaves to 6 x 4 mm, ovate, base cordate to obtuse, apex acute, margins thickened, gland dotted below. Cymes in upper axils, 2-3 flowered; calyx tube narrow, 3 x 1.5 mm, teeth 5, 1.5 mm, hairy; corolla rose, tube 5 mm, limb 2 lipped, upper one 5 mm long, emarginate, lower one longer; ovary 4 celled. Nutlets 1 mm, oblong, brown.

Fl. & Fr.: December-February.

Distr.: West Asia, India and South Africa. Common; along shola borders at all altitudes. MS, Puthur, *KKK 16054*; Way to Hut, *KKK 18053.*

PLECTRANTHUS L' Heritier

Stirp. Novae 84. 1788. *nom. cons.*

1. Floral bracts closely imbricate; filaments connate into a staminal sheath; calyx villous within 2
1. Floral bracts laxly imbricate; filaments free; calyx tube glabrous within 3
2. Calyx throat with a ring of white hairs; leaves subcoriaceous, white, hairy, glaucous beneath ..... **P. barbatus**
2. Calyx throat glabrous within; leaves membranous, glabrous ..... **P. malabaricus**
3. Lower lip of calyx longer than the upper; nutlets brown ..... **P. mollis**
3. Calyx lobes equal; nutlets black, shining ..... **P. coleoides**

Plectranthus barbatus Andr., Bot. Repos. t. 594.1809; Matthew, FPH 1005.1999. *Coleus barbatus* (Andr.) Benth. in Wall., Pl. Asiat. Rar. 2: 15. 1830; Wight, Ic. t. 1432. 1849; Hook. f., FBI 4: 625. 1885; Gamble, FPM 1124. 1924; Fyson, FSIHS 468. t. 406. 1932.

Herbs; hirsute. Leaves to 5 x 3 cm, ovate, base obtuse to rounded, apex acute, margin crenate. Thyrses axillary or terminal, to 25 cm; upper lip of calyx 3 x 2 mm, ovate-acuminate, lower lip 4 lobed, teeth lanceolate, tube 2 mm, hairy; corolla blue, lower lip 1.5 x 0.6 cm, boat shaped, upper lip 0.8 cm, reflexed. Nutlets brown.

Fl. & Fr.: August-September.

Distr.: India, Sri Lanka and Tropical East Africa. Occasional; along shola borders and roadsides at lower altitudes. MS, K-3, *KKK 16553.*

Plectranthus coleoides Benth. in DC., Prodr. 12: 64. 1848; Hook. f., FBI 4: 622. 1885; Gamble, FPM 1122. 1924; Fyson, FSIHS 466. t. 404. 1932; Matthew, FPH 1006. 1999. *Coleus wightii* Benth., Labiat. Gen. Sp. 58. 1832; Wight, Ic. t. 1433. 1849, non *Plectranthus wightii* Benth. 1832; Wight, Ic. t. 1429. 1849. **Padappayila (EBIS).**

Succulent herbs; stem terete, purple. Leaves to 15 x 12 cm, orbicular-ovate, base cordate to rounded, apex acute, dentate, pubescent, whitish beneath. Panicles terminal, to 25 x 12 cm; calyx 8 mm long, upper lip entire, lower 4 lobed; corolla lilac, 1.2 cm long, lower lip elongate, acute, ciliate; stamens didynamous; ovary 4 partite.

Fl. & Fr.: July-August.

Distr.: Endemic to Peninsular India. Occasional; along stream sides and shola borders at lower altitudes. MS, Chengalar, *KKK 31043.*

Note: New record to the flora of Kerala.

Plectranthus malabaricus (Benth.) Willemse, Blumea 25: 509. 1979; Matthew, Ill. FPH t. 576.1996 & FPH 1007.1999. Coleus malabaricus Benth. in Wall., Pl. Asiat. Rar. 2: 16. 1830; Hook. f., FBI 4: 626. 1885; Gamble, FPM 1124. 1924; Fyson, FSIHS 468. 1932.

Succulent herbs; branchlets purplish. Leaves to 16 x 12 cm, ovate, base rounded to cuneate, apex acuminate, dentate, purplish below. Panicles terminal, in cymose whorls; calyx tube 4 mm, upper lip rounded and reflexed, lobes of lower lip acuminate; corolla blue, tube 7 mm, throat inflated, upper lip 7 x 5 mm, crenate, lower lip boat shaped, smaller. Seeds 2.5 x 2 mm, elliptic, discoid, black.

Fl. & Fr.: January-February.

Distr.: South India and Sri Lanka. Common along stream banks and roadsides at all altitudes. MS, K-2.5, *KKK 16090.*

Plectranthus mollis (Ait.) Spreng., Syst. Veg. 2: 690. 1825; Matthew, FPH 1007. 1999. *Ocimum molle* Ait., Hort. Kew 2: 322. 1789. *Plectranthus incanus* Link., Enum. Hort. Berol. 2: 120. 1822; Hook. f., FBI 4: 621. 1885; Gamble, FPM 1121. 1924.

Bushy herbs. Leaves, to 7 x 6 cm, ovate, base cordate, apex acuminate, margin crenate to double crenate, pubescent. Thyrsus terminal, branched, to 25 x 4 cm; calyx tube 6 mm, upper lip entire, 3 x 2 mm, ovate, lower lip 4 lobed, 3 x 1 mm; corolla blue, 8 mm long, lower lip large. Nutlets 2 x 1.5 mm, discoid, brown.

Fl. & Fr.: November-December.

Distr.: Sri Lanka, India and Himalaya. Common in lower altitude shola borders and roadsides. MS, Thalachorkadavu, *KKK 16749.*

POGOSTEMON Desfontaines

Mem. Mus. Hist. Nat. 2: 154. 1815.

1. Spikes or racemes of clusters terminal and axillary, forming a panicled inflorescence **2**
1. Spikes or racemes of clusters terminal or axillary, solitary, not panicled 3
2. Stems and leaves nearly glabrous ..... **P. pubescens**
2. Stems hoary-puberulous, leaves also on the under surface ..... **P. benghalensis**
3. Filaments of the stamens bearded ..... **P. wightii**
3. Filaments of the stamens not bearded but slightly villous at base ..... **P. atropurpureus**

Pogostemon atropurpureus Benth. in DC., Prodr. 12: 154. 1848; Hook. f., FBI 4: 636. 1885; Gamble, FPM 1134. 1924; Fyson, FSIHS 473. 1932. **Kuzhaloothi Pazham (EBIS).**

Erect shrubs; branches velvety tawny. Leaves to 5 x 3 cm, ovate, base cuneate, apex acuminate, crenate, dark green and puberulous above, densely pubescent below. Racemes spicate, to 15 cm; calyx 5 toothed, tube 3.5 mm, teeth 1.5 mm, densely pilose; corolla dark purple, upper lip 3 lobed; ovary 4 partite. Fruit not seen.

Fl.: February

Distr.: Endemic to Southern Western Ghats. Rare; along shola edges at higher altitudes. ENP, Anamudi, *KKK 18534.*

Pogostemon benghalensis (Burm. f.) O. Ktze., Rev. Gen. Pl. 2: 517. 1891; Matthew, FPH 1009. 1999. *Origanum benghalense* Burm. f., Fl. Ind. 128, t. 38, f. 3. 1768. *Pogostemon plectranthoides* Desf., Ann Mus. Hist. Nat. 2: 156. t. 6. 1808; Hook. f., FBI 4: 632. 1885; Gamble, FPM 1133. 1924.

Subshrubs; branchlets pubescent. Leaves to 8 x 4 cm, ovate to elliptic, base cuneate, apex acute, margin double serrate. Racemes spicate, branched, to 10 cm; calyx lobes subequal, tube 4 mm, lobes 1 mm, pubescent; corolla pinkish, 4 mm wide, lobes 4, 2 lipped; stamens purplish. Nutlets 0.7 mm across, discoid.

Fl. & Fr.: February-May

Distr.: Endemic to India. Common along shola edges at medium altitudes. ENP, Mampallam Chola, *KKK 17553.*

Pogostemon pubescens Benth. in DC., Prodr. 12: 142. 1848; Gamble, FPM 1133. 1924; Fyson, FSIHS 471. t. 408. 1932; Matthew, Suppl. Ill. FPH t. 1119. 1997 & FPH 1010. 1999. *Pogostemon parviflorus* Benth. in Wall., Pl. Asiat. Rar. 1: 31. 1830, p.p.; Hook. f., FBI 4: 632. 1885, p.p..

Subshrubs; branchlets pink, glabrescent. Leaves to 10 x 6 cm, ovate, base attenuate, apex acute, margin crenate-serrate. Panicles to 6 cm, terminal or in upper axils, dense; calyx 5 mm, tube 4 mm, teeth sub equal; corolla white, 4 mm wide, tube 3 mm, limb 2 lipped, upper one with rose spots, lower white; stamens 4. Nutlets 4, ovoid.

Fl. & Fr.: March-May

Distr.: India and Sri Lanka. Common; along shola margins and roadsides at lower altitudes. MS, K-3, *KKK 16091.*

Pogostemon wightii Benth. in Wall., Pl. Asiat. Rar. 1: 31. 1830; Hook. f., FBI 4: 635. 1885; Gamble, FPM 1134. 1924; Fyson, FSIHS 472. 1932; Matthew, Suppl. Ill. FPH t. 1120. 1997 & FPH 1011. 1999.

Diffuse herbs; stem reddish, pubescent. Leaves to 6 x 3.5 cm, ovate, base cuneate, apex acute, double crenate, hispid, membranous. Racemes spicate, interrupted towards base, to 10 x 1.5 cm; calyx tube 4 x 2 mm, lobes 1 mm long, ciliate; corolla white tinged pink, 4 mm wide, limb 2 lipped; staminal filaments pinkish hairy. Nutlets 0.5 mm, black, constricted at mouth.

Fl. & Fr. February-April

Distr.: Endemic to Southern Western Ghats. Common in sholas at medium altitudes. MS, K-4, *KKK 16159.*

PRUNELLA Linnaeus

Sp. Pl. 600. 1753

Prunella vulgaris L., Sp. Pl. 600. 1753; Wight, Ic. t. 1448. 1849, "*Brunella*"; Hook. f., FBI 4: 670. 1885; Gamble, FPM 1143. 1924; Fyson, FSIHS 477. t. 414. 1932; Matthew, Suppl. Ill. FPH t. 1121. 1997 & FPH 1011. 1999. **Plate 4.10.2.**

Perennial herbs; rhizome creeping; branchlets ascending, purplish, hispid. Leaves to 4 x 3 cm, base cuneate, apex obtuse, margin subentire, pilose. Spikes terminal, verticillate, to 4 x 2 cm; calyx tube straight, 5 x 3 mm long, 2 lipped, upper 3 mm broad, lower ones lanceolate; corolla violet, tube 6 mm, limb 2 lipped, lower lip 3 lobed, spreading, side lobes oblong; stamens 4. Nutlets 4, oblong.

Fl. & Fr.: June-August.

Distr.: America, Europe, North temperate zone of Indian subcontinent, Australia and Sri Lanka. Occasional; in grassy bogs at higher altitudes. MS, Idlimottai, *KKK 18188.*

SCUTELLARIA Linnaeus

Sp. Pl. 598. 1753

1. Slender herbs; leaves green on either side, drying green ..... **S. violacea**
1. Stout herbs; leaves purplish below, drying black ..... **S. wightiana**

Scutellaria violacea Heyne *ex* Benth. in Wall., Pl. Asiat. Rar. 1: 66. 1830; Hook. f., FBI 4: 668. 1885; Gamble, FPM 1142. 1924; Fyson, FSIHS 476. t. 413. 1932; Matthew, Ill. FPH t. 582. 1996 & FPH 1016. 1999. *S. violacea* var. *sikkimensis* Hook. f., FBI 4: 668. 1885.

Branchlets soft-pubescent. Leaves to 6 x 4 cm, ovate, base cordate, apex acute, membranous, margin crenate. Racemes lax, terminal, to 17 cm; calyx 2 lipped, 3 mm long; corolla bluish-violet, tube 8 mm, limb 2 lipped; stamens 4. Nutlets 4.

Fl. & Fr.: June-August

Distr.: South India and Sri Lanka. Common; along roadsides at lower altitudes. MS, K-3, *KKK 16404*; K-4.5, *KKK 16512.*

Scutellaria wightiana Benth. in Wall., Pl. Asiat. Rar. 1: 67. 1830; Gamble, FPM 1142. 1924; Matthew, Ill. FPH t. 582. 1996 & FPH 1016. 1999. *S. violacea* Heyne *ex* Benth. var. *hispidior* Benth. in DC., Prodr. 12: 418. 1848; Hook. f., FBI 4: 668. 1885.

Branchlets soft pubescent. Leaves ovate, to 5 x 3 cm, base cordate, apex acute, membranous, margin crenate. Racemes terminal, to 10 cm; calyx 2 lipped, 2 mm long; corolla purple to violet, tube 8 mm, limb 2 lipped; stamens 4. Nutlets 4.

Fl. & Fr.: June-August

Distr.: Endemic to Peninsular India. Occasional; along shola borders and roadsides at very high altitudes. ENP, Anamudi top, *KKK 31103.*

75. PLANTAGINACEAE

PLANTAGO Linnaeus

Sp. Pl. 112. 1753

Plantago erosa Wall. in Roxb., Fl. Ind. 1: 423. 1820; Matthew, FPH 1019. 1999. *P. major* sensu Hook. f., FBI 4: 705. 1885, p.p., non L. 1753. *P. asiatica* sensu Wight, Ill. Indian Bot. t. 177. 1841-1850, non L.; Gamble, FPM 1160. 1923; Fyson FSIHS 485. t. 425. 1932. **Nilachakka, Njaramboori (EBIS) Plate 5.3.6.**

Perennial, scapigerous herbs. Leaves in rosettes, to 13 x 4.5 cm, elliptic, base attenuate, apex acute, 5 nerved from base. Spikes to 10, unbranched, to 20 cm long. Flowers cream; calyx lobes 4, 2.5 mm, ovate, margin scarious; corolla salver shaped, tube 2 mm, lobes 1 mm long, lanceolate, recurved; stamens 4; ovary globose, 2 celled. Capsule 4 mm long, ellipsoid.

Fl. & Fr.: Throughout the year.

Distr.: Pantropical. Common; along road sides and shola ecotones at medium and higher altitudes. MS, Idlimottai, *KKK 16019*; K-4, *KKK 16506.*

76. AMARANTHACEAE

1. Leaves alternate 2
1. Leaves opposite ..... **Achyranthes**
2. Flowers bisexual 3
2. Flowers unisexual ..... **Amaranthus**

3. Seeds several ..... **Celosia**
3. Seeds solitary ..... **Allmania**

ACHYRANTHES Linnaeus

Sp. Pl. 204. 1753

1. Leaves ovate-lanceolate; bracteoles adnate at base; staminal tube truncate at apex ..... **A. bidentata**
1. Leaves elliptic to obovate; bracteoles entirely adnate; staminal tube semicircular at apex **2**
2. Bracts broadly ovate; mouth of staminal tube long ciliate; branches tomentose .... **A. aspera** var. **aspera**
2. Bracts lanceolate; mouth of staminal tube not ciliate; branches glabrous ..... **A. aspera** var. **pubescens**

Achyranthes aspera L., Sp. Pl. 204. 1753, var. **aspera**; Wight, Ic. t. 1777. 1852; Hook. f., FBI 4: 730. 1885; Gamble, FPM 1176. 1925; Fyson, FSIHS 487. 1932; Matthew, FPH 1025. 1999. **Nayaruvi Chedi.**

Stout, erect herbs. Leaves to 8 x 4 cm, elliptic, apex acuminate, sparingly tomentose above, dense below. Spikes to 40 cm, hispid; tepals pink, 5 x 2 mm, acute, glabrous. Achenes 2.5 x 1 mm, brown.

Fl. & Fr.: October-December

Distr.: South India and Sri Lanka. Occasional; in open regions at lower altitudes. MS, Kulachivayal, *KKK 16671.*

Achyranthes aspera L. var. **pubescens** (Miq.) Townsend, Kew Bull. 28: 145. 1973 & Kew Bull. 29: 473. 1974.

Erect herbs. Leaves 5 x 3 cm, obovate, apex acuminate, puberulous on both sides. Spike 7 cm long, hispid; wings of the bracteoles unequal, apically free; bracts lanceolate; tepals 5 mm long, acuminate; staminal tube cuneate. Achenes 2 mm long, cuspidate.

Fl. & Fr.: January-March.

Distr.: India. Common along shola borders at lower altitudes. MS, Perumala, *KKK 16103.*

Achyranthes bidentata Blume, Bijdr. 545. 1826; Wight, Ic. t. 1779. 1852; Hook. f., FBI 4: 730. 1885; Gamble, FPM 1176. 1925; Fyson, FSIHS 487. t. 426. 1932; Matthew, FPH 1025. 1999. **Nayaruvi Chedi.**

Scandent herbs. Leaves to 8 x 4 cm, ovate-elliptic, base cuneate, apex acute, thinly pubescent. Spikes 10-25 cm long, narrow. Flowers pink, 4 mm wide; tepals 7 x 1.5 mm, lanceolate, apex acute; stamens 5; ovary depressed-globose. Achenes 3 x 1.5 mm, cylindrical, reddish brown.

Fl. & Fr.: July-December.

Distr.: Asia and Africa. Occasional; found along shola borders and other open places at lower altitudes. MS, Kulachivayal, *KKK 16671.*

ALLMANIA R. Brown *ex* R. Wight

J. Bot. (Hooker) 1: 226. 1834

Allmania nodiflora (L.) R. Br. *ex* Wight in Hook. J. Bot. 1: 227. t. 128. 1834; Hook. f., FBI 4: 716. 1885; Gamble, FPM 1167. 1925; Matthew, FPH 1027. 1999. *Celosia nodiflora* L., Sp. Pl. 205. 1753. *Allmania albida* (Willd.) R. Br. *ex* Hook. f., FBI 4: 717. 1885. *Celosia albida* Willd., Sp. Pl. 1: 1197. 1798. *Chamissoa albida* (Willd.) Wight, Ic.

t. 1769. 1852. *Allmania longipedunculata* (Trimen) Gamble, FPM 1168. 1925. *A. nodiflora* (L.) R. Br. *ex* Wight var. *roxburghii* Hook. f., FBI 4: 717. 1885.

Straggling herbs, highly branched; root stock stout. Leaves to 6 x 1.5 cm, elliptic-oblong, apex acute, entire, chartaceous. Flowers in terminal or axillary globose cymes, 1.5 cm across; tepals 5, equal, 5 x 1 mm, obovate-oblong; stamens 5; ovary obovoid, 1 celled. Achenes 3 x 2 mm, ellipsoid, with a long beak, biconvex, black.

Fl. & Fr.: November-December.

Distr.: Tropical Asia. Occasional; in exposed regions along stream sides at lower altitudes. MS, Chengalar, *KKK 16664.*

AMARANTHUS Linnaeus

Sp. Pl. 989. 1753

Amaranthus viridis L., Sp. Pl. ed. 2. 1405. 1763; Hook. f., FBI 4: 720. 1885; Gamble, FPM 1171. 1925; Matthew, FPH 1030. 1999. *Euxolus caudatus* Moq. in DC., Prodr. 13(2): 274. 1849; Wight, Ic. t 1773. 1852. **Arakkeera (EBIS).**

Decumbent herbs; stem reddish. Leaves alternate, 2.5 x 2 cm, obovate, base cuneate, apex emarginate. Flowers purplish, monoecious, in axillary, globose or terminal spikes. Male flowers: tepals 3, 1 mm long, ovate-lanceolate; stamens 3. Female flowers: tepals 0.5 mm long, obovate; ovary ovoid, compressed, 1 celled. Utricle 2 x 1 mm, orbicular, compressed; seed 1 mm across, orbicular, dark brown.

Fl. & Fr.: Throughout the year

Distr.: Pantropical. Occasional; in disturbed forest areas at low altitudes. MS, Kulachivayal, *KKK 18582.*

CELOSIA Linnaeus

Sp. Pl. 205. 1753

Celosia pulchella Moq. in DC., Prodr. 13(2): 238. 1849; Wight, Ic. t. 1768. 1852; Hook. f., FBI 4: 715. 1885; Gamble, FPM 1166. 1925; Fyson FSIHS 486. 1932; Matthew, Suppl. Ill. FPH t. 1127. 1998 & FPH 1032. 1999.

Erect, glabrous herbs. Leaves alternate, to 5 x 2 cm, ovate, base cuneate, apex acute. Spikes terminal and axillary, 5-12 cm long, slender. Flowers pale rose, clustered; tepals 5, 2.5 x 1 mm, elliptic-ovate, hyaline; stamens 5; ovary globose. Utricles 4 x 3 mm, ovoid, seeds many, 1 mm across, black, muricate.

Fl. & Fr.: September-December.

Distr.: India and Sri Lanka. Rare; along shola borders at lower altitudes. MS, Kulachivayal, *KKK 16681.*

77. CHENOPODIACEAE

CHENOPODIUM Linnaeus

Sp. Pl. 218. 1753

Chenopodium ambrosioides L., Sp. Pl. 219. 1753; Wight, Ic. t. 1786. 1852; Hook. f., FBI 5: 4. 1886; Gamble, FPM 1181. 1925; Fyson, FSIHS 489. 1932; Matthew, FPH 1037. 1999. **Natta Chedi (EBIS).**

Erect, aromatic, gregarious herbs; stems pink, pubescent. Leaves alternate, lower ones large, to 9 x 3 cm, oblong-lanceolate, base attenuate, dentate. Flowers greenish, bisexual, in axillary, panicled spikes; perianth 5 lobed, 1 mm long, ovate-acute, concave, incurved; stamens 5, yellow; ovary 1 celled, globose. Utricle enclosed by the persistent perianth; seeds smooth.

Fl. & Fr.: Throughout the year

Distr.: Native of Tropical America; introduced in many tropical countries. Occasional; in marshy areas of grasslands and roadsides at lower altitudes. MS, Pallang Mala, *KKK 16693.*

78. PHYTOLACCACEAE

PHYTOLACCA Linnaeus

Sp. Pl. 441. 1753.

Phytolacca octandra L., Sp. Pl. ed. 2. 1: 631. 1762; Ghosh & Sikdar, J. Econ. Tax. Bot. 4(1): 159. 1983; Matthew, Ill. FPH t. 586. 1996 & FPH 1039. 1999.

Erect, fleshy herbs. Leaves alternate, to 10 x 3.5 cm, elliptic- lanceolate, base acute to attenuate, papillose, veins pink. Flowers 5-7 mm across, bisexual, in terminal spikes; perianth 5 lobed, 3 x 2 mm, ovate-acute; stamens 10; ovary 2 x 1 mm, 6-7 lobed, discoid. Capsule, 7 mm across, depressed, globose; seeds 6-8, 3 mm across, orbicular, discoid, black, shining.

Fl. & Fr.: August-December.

Distr.: Native of Paraguay, South America; introduced in many tropical countries. Common along roadsides, shola borders and watercourses at lower altitudes. MS, Chengalar, *KKK* 16573; Puthur, *KKK* 16725.

Note: New record to the flora of Kerala.

79. POLYGONACEAE

1. Flowers 3-5-merous; stigma capitellate ..... **Persicaria**
1. Flowers 6-merous; stigma fimbriate ..... **Rumex**

PERSICARIA (Linnaeus) P. Miller

Gard. Dict. Abr. ed. 4. 1754.

1. Inflorescence a simple or corymbose panicle **2**
1. Inflorescence a capitate spike ..... **P. nepalensis**
2. Trailing or scandent shrubs; flowers in corymbose heads; tepals white ..... **P. chinensis**
2. Stout, erect herbs; flowers in simple, subsessile racemes; tepals pink ..... **P. glabra**

Persicaria chinensis (L.) Gross, Bot. Jahrb. Syst. 49: 269, 277 & 315. 1913; Matthew, FPH 1045. 1999. *Polygonum chinense* L., Sp. Pl. 363. 1753; Wight, Ic. t. 1806. 1852; Hook. f., FBI 5: 44. 1886; Gamble, FPM 1190. 1925; Fyson, FSIHS 493. t. 429. 1932. **Mukkala, *Oduthan* (EBIS) Plate 4.10.3.**

Leaves to 12 x 6 cm, ovate, base rounded, apex acuminate. Flower heads in corymbose panicles, to 5 x 4 cm; perianth white, lobes 6, 4 x 2 mm, ovate; stamens 8; ovary 1 mm, obovate. Nutlets 5 mm long, compressed.

Fl. & Fr.: July-February

Distr.: India, China, Japan and Malesia. Common along shola borders and roadsides at lower altitudes. MS, Gudalar, *KKK 16089*; K-4, *KKK 16468*. VMS, *KKK 31143*.

Persicaria glabra (Willd.) M. Gomez, Ann. Inst. Segunda Ensef. Habana 2: 278. 1896; Matthew, FPH 1045. 1999. *Polygonum glabrum* Willd., Sp. Pl. 2: 447. 1799; Wight, Ic. t. 1797. 1852; Hook. f., FBI 5: 34. 1886; Gamble, FPM 1189. 1925; Fyson, FSIHS 491. 1932. **Cherumukkala. Plate 4.10.4.**

Leaves to 18 x 2 cm, narrow-lanceolate, glabrous. Inflorescence a terminal or axillary branched raceme; perianth lobes 5, 2.5 mm long, pink coloured; stamens 5. Nutlets 2 mm across, brown, shining.

Fl. & Fr.: November-December

Distr.: India, Africa, Eastward to Malesia. Common; found along stream sides and roadsides at lower altitudes. MS, Perumala, *KKK 31050*.

Persicaria nepalensis (Meisner) Gross, Bot. Jahrb. Syst. 49: 277. 1913; Matthew, FPH 1046. 1999. *Polygonum nepalense* Meisner, Mon. Polygon. 84. t. 7. f. 2. 1826; Wight, Ic. t. 1804. 1852. *P. alatum* Buch.-Ham. *ex* Spreng., Syst. Cur. Post. 4 (2): 154. 1827; Hook. f., FBI 5: 41. 1886. *P. punctatum* Buch.-Ham. *ex* D. Don, Prodr. Fl. Nep. 72. 1825; Gamble, FPM 1190. 1925. **Cherumukkala.**

Diffuse herbs, stem pink, rooting from lower nodes. Leaves to 3.5 x 2.5 cm, deltoid, base truncate to obtuse, abruptly narrowing to a sheathing petiole, apex acute, sparsely hairy. Spikes 1 cm across, in the axils of terminal leaves; tepals white to pink, 4 fid, 2 mm long, obtuse. Nutlets to 1.5 mm across, black, apiculate.

Fl. & Fr.: July-December

Distr.: Tropical Africa, India, east to Malesia. Common along roadsides at lower and medium altitudes. MS, K-4, *KKK 16520*. ENP, Nilgiri Teri, *KKK 18033*.

RUMEX Linnaeus

Sp. Pl. 333. 1753

Rumex nepalensis Spreng. in L., Syst. Veg. 2: 159. 1825; Wight, Ic. t. 1810. 1852; Hook. f., FBI 5: 60. 1886; Gamble, FPM 1192. 1925; Fyson FSIHS 496. t. 432. 1932; Matthew, FPH 1049. 1999. **Chethakkala (EBIS).**

Foul smelling herbs; stem grooved. Radical leaves to 20 x 8 m, oblong-lanceolate; upper leaves to 12 x 4 cm, elliptic-lanceolate, base truncate to obtuse, apex acute, margin serrulate to wavy. Racemes lax, terminal, to 65 cm. Flowers bisexual, whorled, leafy; tepals 6, biseriate, inner larger, 3 mm across, orbicular, fimbriate; stamens 6, free; ovary 3 celled. Capsule 2.5 x 1.5 mm, 3 winged, glabrous.

Fl. & Fr.: August-December

Distr.: Paleotropics. Common; along roadsides at lower altitudes. MS, Pallang Mala, *KKK 16698*.

80. PODOSTEMACEAE

1. Thallus fucoid or dimorphic; secondary shoots from the margin, with leaf bearing axes.....**Polypleurum**
1. Thallus crustaceous or ribbon like; secondary shoots found as rosettes of leaves..... **Zeylanidium**

POLYPLEURUM (Tulsane) Warming

Kongel. Danske Vidensk.-Selsk. Skr. Ser. 6, II: 64. 1901

Polypleurum stylosum (Wight) Hall, Kew Bull. 26: 131. 1971; Matthew & Satheesh, Aquatic Bot. 57: 287. 1997. *Dicraea stylosa* Wight, Ic. t. 1917, f. 2. 1852; Gamble, FPM 1196. 1925. *Podostemon stylosus* (Wight) Benth. *ex* Hook. f., FBI 5: 64. 1884.

Floral bracts 2 pairs, apex filamentous, to 7 mm long, base dilated; tepals 2, linear; stamens 2, monadelphous, as long as the ovary; ovary smooth; fruiting pedicel 5 mm long. Capsule 8 ribbed, isolobous, with persistent style base at apex; seeds very small, elliptic, numerous.

Fl. & Fr.: January-March

Distr.: India and Sri Lanka. Rare; on boulders and rocks in low altitude streams. MS, Thalachorkadavu, *KKK 18128*.

ZEYLANIDIUM (Tulasne) Engler

in Engler & Prantl, Nat. Pflanzenfam. ed. 2, 18a : 61. 1930.

1. Spathe splitting dorsally; stamens above 8 mm long; ovary elliptic..... **Z. johnsonii**
1. Spathe opening at apex; stamens up to 4 mm long; ovary globose.....**Z. olivaceum**

Zeylanidium johnsonii (Wight) Engl. & Prantl, Nat. Pflanzenf. 180: 62. 1930. *Mniopsis johnsonii* Wight, Ic. t. 191. f. 5. 1852. *Podostemon johnsonii* (Wight) Wedd. in DC., Prodr. 17: 75. 1873; Hook. f., FBI 5: 66. 1886. *Hydrobryum johnsonii* (Wight) Willis, Ann. Roy. Bot. Gard. (Peradeniya) 1: 241. 1902; Gamble, FPM 1198. 1925.

Thallus crustaceous, in circular, reddish green patches. Leaves linear, hair like, in scattered tufts, absent at flowering. Spathe boat shaped. Flowers zygomorphic; pedicel 5 mm in fruits; stamens monadelphous, anthers subequal; staminodes 2 on either side. Capsule to 3 x 2 mm, ellipsoid.

Fl & Fr.: November-December

Distr.: Endemic to Peninsular India. Occasional; in shola streams at high altitudes. ENP, Rajamala, *KKK 18079*.

Zeylanidium olivaceum (Gard.) Engl. in Engl. & Prantl, Pflanzenf. (ed. 2) 18a: 62. 1930; Matthew & Satheesh, Aquatic Bot. 57: 57: 271. 1997; Matthew, FPH 1051. 1999. *Podostemon olivaceum* Gard., Calcutta J. Nat. Hist. 7: 181. 1847; Hook. f., FBI 5: 66. 1886. *Hydrobryum olivaceum* (Gard.) Tul., Ann. Sci. Nat. Bot. ser. 3, 11: 104. 1849; Gamble, FPM 1198. 1925; Fyson, FSIHS 498. 1932.

Thallus thin, disc like, crustaceous, to 7 cm in diameter. Leaves small, subulate, all over the dorsal surface, often stalked; stalk to 5 x 0.4 cm, with several filiform segments, 4.5 cm long, secondary shoots many. Flowers one per shoot, zygomorphic,

bisexual. Spathe oblong, thin; stamens 2, staminodes 2; ovary globose, sub sessile. Capsule 3-5 mm long, 8 ribbed; seeds dark brown, ovoid..

Fl. & Fr.: November-March

Distr.: South India and Sri Lanka. Rare; in high altitude streams. ENP, Bhiman Odai, *KKK 18080.*

81. PIPERACEAE

1. Small succulent herbs; flowers bisexual..... **Peperomia**
1. Large scandent shrubs; flowers unisexual ..... **Piper**

PEPEROMIA Ruiz. *et* Pavon

Prodr. 8. 1794.

1. Leaves alternate, upper ones opposite, > 3 cm long, fleshy, 3 ribbed; spike glabrous. **P. portulacoides**
1. Leaves all whorled, < 1 cm long, coriaceous, ribs and nerves invisible; spike pubescent... **P. tetraphylla**

Peperomia portulacoides (Lam.) Dietr., Sp. Pl. ed. 6. 1: 172. 1831; Wight, Ic. t. 1922. 1853; Hook. f., FBI 5: 98. 1886; Gamble, FPM 1210. 1925. *Piper portulacoides* Lam., Encycl. 1: 82. 1791. *Peperomia courtallensis* Miq. in Hook. Lond. Journ. Bot. v. 549. 1846; Wight, Ic. t. 1923, 2. 1853.

Epiphytic or terrestrial herbs; stems succulent, glabrous. Leaves to 3.8 x 2.5 cm, almost orbicular, base cuneate, apex obtuse, glabrous, upper ones opposite, lower alternate, smaller. Spike 3 cm long, terminal and axillary; bracts orbicular, sessile, margins white. Nutlets ovoid, partially embedded in the rachis.

Fl. & Fr.: July-December

Distr.: Madagascar and India. Common at low and medium altitudes. MS, K-4.5, *KKK 16519* & *KKK 18132*; K-5, *KKK 18148.*

Peperomia tetraphylla (Forst.) Hook. & Arn., Bot. Beechy Voy. 97. 1832; Matthew, Ill. FPH t. 597. 1996 & FPH 1056. 1999. *Piper tetraphyllum* Forst., Prodr. 5. 1759. *P. reflexum* L. f., Suppl. Pl. 91. 1781. *Peperomia reflexa* (L. f.) Dietr., Sp. Pl. 1: 180. 1839; Wight, Ic. t. 1923, 1. 1853; Hook. f., FBI 5: 99. 1886; Gamble, FPM 1209. 1925; Fyson, FSIHS 501. t. 435. 1932.

Epiphytic herbs; branches diffuse, rooting at nodes; stem and leaves thinly pubescent. Leaves small, 4 at a node, to 1 cm wide, orbicular, obtuse. Spikes 2 x 0.15 cm, erect, stout; bracts sessile, with white margins. Flowers arranged densely. Nutlets 0.8 x 0.4 mm, ovoid, beaked, brown, glabrous.

Fl. & Fr.: December-February

Distr.: Pantropical. Common at low and medium altitudes. MS, K-3, *KKK 16106.*

PIPER Linnaeus

Sp. Pl. 28. 1753.

1. Fruiting spikes < 1.5 cm long, subglobose; mature spikes erect..... **P. mullesua**
1. Fruiting spikes > 4 cm long, cylindric; mature spikes pendulous..... **2**

2. Bracts forming a short cup under flowers ..... **P. nigrum**
2. Bracts does not form a cup under flowers 3
3. Leaves coriaceous 4
3. Leaves membranous 5
4. Leaves 3-5 ribbed from base; ribs, nerves and reticulations very prominent ..... **P. schmidtii**
4. Leaves 5-7 ribbed from base; reticulations not so prominent ..... **P. wightii**
5. Leaves and branchlets quite glabrous ..... **P. trioicum**
5. Leaves and branchlets hairy or scaly 6
6. Leaves pubescent with crisped hairs ..... **P. hymenophyllum**
6. Leaves beneath covered with round silvery scales, above often bullate ..... **P. argyrophyllum**

Piper argyrophyllum Miq., Syst. Piperac. 330. 1844; Wight, Ic. t. 1914. 1853; Hook. f., FBI 5: 93. 1886; Gamble, FPM 1207. 1925; Matthew, Ill. FPH t. 599. 1996 & FPH 1057. 1999. **Kattu Kurumulaku (EBIS) Plate 4.10.5.**

Leaves to 14 x 7 cm, broad-elliptic to lanceolate, base rounded to obtuse, apex acuminate, 5 nerved from base, membranous. Spikes pendulous; male spikes slender, 8 x 0.2 cm; female spikes larger, 14 x 0.35 cm; stamens 3; ovary 4 x 2.5 mm, ovate-ellipsoid, glabrous. Berry to 0.5 cm wide, globose.

Fl. & Fr.: March-May

Distr.: South India and Sri Lanka. Occasional; at high altitudes. MS, Idlimottai, *KKK 17631*; *KKK 18169.*

Piper hymenophyllum Miq., London J. Bot. 5: 554. 1846; Wight, Ic. t. 1942. 1853; Hook. f., FBI 5: 93. 1886; Gamble, FPM 1207. 1925; Matthew, Ill. FPH t. 600. 1996 & FPH 1057. 1999.

Leaves broadly ovate, to 12.5 x 7 cm, base rounded, apex abruptly acuminate, 7 ribbed, membranous, hairy beneath, along nerves and petiole. Male spikes long, slender, to 12 x 0.2 cm; peduncle 2 cm; female spikes 11 x 1 cm; ovary 3 mm long, ovoid. Berry 4 x 3 mm, ovoid.

Fl. & Fr.: Throughout the year

Distr.: Endemic to Peninsular India. Common in low altitude shola regions. MS, K-4, *KKK 16465*; Thalachorkadavu, *KKK 17623.*

Piper mullesua Buch.-Ham. *ex* D. Don, Prodr. Fl. Nep. 20. 1825; Matthew, Ill. FPH t. 601. 1996 & FPH 1058. 1999. *Chavica sphaerostachya* Miq., Syst. Piperac. 239. 1843; Wight, Ic. t. 1928. 1853. *Piper brachystachyum* Wall. *ex* Hook. f., FBI 5: 87. 1886; Gamble, FPM 1206. 1925; Fyson, FSIHS 499. t. 433. 1932. **Kattu Thippali. (EBIS) Plate 4.10.6.**

Leaves to 11 x 5 cm, elliptic-ovate to lanceolate, base acute, apex obtusely caudate-acuminate, 3 ribbed from base, glabrous. Spikes erect. Male spikes to 7 x 0.2 cm, elongate; female spikes 0.8 x 0.7 cm, globose-oblong; bracts orbicular; stamens 2; ovary to 1.5 x 1 mm, obovoid. Berry 3.5 x 2 mm, obovoid.

Fl. & Fr.: Throughout the year; peak period of flowering: June-July

Distr.: India and Bhutan. Common in medium altitude sholas. MS, K-6, *KKK 16175.* PUS, *KKK 18575 & KKK 18576.*

Piper nigrum L., Sp. Pl. 28. 1753; Hook. f., FBI 5: 90. 1886; Gamble, FPM 1206. 1925; Matthew, Ill. FPH t. 602. 1996 & FPH 1059. 1999. **Kattu Kurumulaku, Eya Kodi (EBIS).**

Leaves large, to 18 x 10 cm, broadly ovate (in females) or elliptic and narrow (in males) base rounded, apex caudate-acuminate, coriaceous, glabrous, 3 ribbed from base, another pair above. Male spikes slender, to 12 x 0.4 cm; stamens 2; female spikes 10 x 0.4 cm. Berries large, 9 x 7 mm, globose, few in a spike.

Fl. & Fr.: March-May

Distr.: Peninsular India, spread to many countries including Sri Lanka. Common; at all altitudes. MS, Methappu, *KKK* 16007; Thalachorkadavu, *KKK 17625*; Coupe road, *KKK 16583.* ENP, Mampallam Chola, *KKK 17559.*

Piper schmidtii Hook.f., FBI 5: 89. 1886; Gamble, FPM 1206. 1925; Fyson, FSIHS 500. t. 434. 1932. *P. arborescens* Miq., Syst. Piperac. 320. 1844 p.p. **Kattu Kurumulaku, Eya Kodi (EBIS). Plate 4.10.7.**

Leaves to 11 x 6 cm, elliptic-ovate or ovate-oblong, base rounded or obtuse, apex obtusely acute to acuminate, coriaceous, glabrous, margins wavy or recurved. Male spikes slender, to 5 cm long; female spikes stout, to 8 cm long. Berries to 6 x 5 mm, oblong-ovoid, yellow to orange when ripe, dense on the spike.

Fl. & Fr.: Throughout the year

Distr.: Endemic to Southern Western Ghats. Common at high altitudes only. MS, Idlimottai, *KKK 16026*; *KKK 17574*; *KKK 17591*; *KKK 18179;* K-5, *KKK 17616.* ENP, MPCA, *KKK 17523*; Plot 2, *KKK 17640*; V-Point, *KKK 17642.*

Piper trioicum Roxb., Fl. Ind. 1: 151. 1820 ; Wight, Ic. tt. 1935, 1936. 1853. *P. attenuatum* Buch.-Ham. *ex* Miq., Syst. Piperac. 306. 1843; Wight, Ic. t. 1933. 1853; Hook. f., FBI 5: 92. 1886; Gamble FPM 1207. 1925. *P. sylvestre* sensu Wight, Ic. t. 1937. 1853, non Lam. 1791; Hook. f., FBI 5: 93. 1886. **Kattu Kurumulaku (EBIS).**

Leaves to 11 x 6 cm, elliptic-ovate, ovate or sub-orbicular, base rounded or cordate, apex abruptly acuminate, 7-ribbed at base. Male spikes very slender, to 7 x 0.2 cm; female spikes to 13 cm. Berries 5 x 4 mm, fleshy, crowded.

Fl. & Fr.: February-March

Distr.: Indo-Malesia. Common in high altitude sholas. MS, Idlimottai, *KKK 17580*; *KKK 17585*; Methappu, *KKK 17593*; Thalachorkadavu, *KKK* 17624. ENP, MPCA, *KKK 17524*

Piper wightii Miq., London J. Bot. 5: 552. 1846; Wight, Ic. t. 1939. 1853; Hook. f., FBI 5: 94. 1886; Gamble, FPM 1207. 1925; Fyson, FSIHS 500. 1932; Matthew, Ill. FPH t. 603. 1996 & FPH 1059. 1999. **Kattu Kurumulaku, Eya (EBIS).**

Leaves to 17 x 11 cm, large, broadly ovate, base cordate to rounded, apex abruptly acuminate, 3-5 ribbed from base, glabrous. Male spikes slender, pendulous, to 8 cm long; stamens 3; female spikes to 9 cm; ovary to 5 mm, ellipsoid. Berry to 7 x 5 mm, ovoid-globose, smooth.

Fl. & Fr.: February-March

Distr.: Endemic to Southern Western Ghats. Common in low and medium altitude sholas. MS, K-3, *KKK 16110*; *KKK 16116*; K-4.5, *KKK 16171.*

82. LAURACEAE

1. Leaves 3-5 nerved from base 2
1. Leaves penninerved 4
2. Inflorescence an umbel; flowers unisexual 3
2. Inflorescence a panicle; flowers bisexual ..... **Cinnamomum**
3. Leaves subverticillate, fertile stamens 9 ..... **Actinodaphne**
3. Leaves alternate; fertile stamens 6 ..... **Neolitsea**
4. Inflorescence an umbel; flowers unisexual ..... **Litsea**
4. Inflorescence a panicle, flowers bisexual 5
5. Leaves alternate to sub-opposite; reticulations raised and areolate; berry oblong ..... **Beilschmiedia**
5. Leaves alternate; reticulations not raised and prominent; berry ovoid or globose 6
6. Anthers 4 celled 7
6. Anthers 2 celled 8
7. Leaves tawny pubescent below; fruiting perianth erect, persistent ..... **Phoebe**
7. Leaves glabrous to glaucous below; fruiting perianth reflexed, deciduous ..... **Persea**
8. Fruit surrounded by the enlarged perianth tube ..... **Cryptocarya**
8. Fruit not surrounded by the enlarged perianth tube ..... **Apollonias**

ACTINODAPHNE Nees

in Wallich, Pl. Asiat. Rar. 2: 68. 1831.

1. Leaves with lowest pair of opposite nerves ..... **A. bourneae**
1. Leaves penninerved; lowest pair not opposite 2
2. Leaves to 25 cm, oblanceolate; female flowers in peduncled umbels ..... **A. bourdillonii**
2. Leaves < 15 cm, elliptic-lanceolate; female flowers in sessile umbels ..... **A. malabarica**

Actinodaphne bourdillonii Gamble, Kew Bull. 1925: 129. 1925 & FPM 1231. 1925; Nair, J. Econ. Tax. Bot. 17: 266. 1993. **Vari Maram (EBIS).**

Large trees; branchlets densely tomentose. Leaves to 25 x 7 cm, acuminate at both ends, under surface grey or cinnamomeous tomentose; penninerved. Flowers 6-8; perianth tube short, lobes 5 mm long; tepals 5 mm long. Berry 9 mm across, globose.

Fl. & Fr.: February-June.

Distr.: Endemic to Southern Western Ghats (Kerala). Rare in medium altitude sholas. PAS, Top Station, *KKK 18600.*

Actinodaphne bourneae Gamble, Kew Bull. 1925: 128. 1925 & FPM 1231. 1925; Fyson, FSIHS 505. 1932; Matthew, Ill. FPH t. 605. 1996 & FPH 1065. 1999.

Medium sized trees. Leaves to 15 x 6 cm, elliptic-lanceolate, base acute, apex acuminate; branchlets, petiole, nerves and pedicels fulvous tomentose. Flowers 3-6, in sessile lateral clusters; perianth yellowish, 5 mm wide, tube 4 mm, lobes 6, ovate. Berry globose.

Fl. & Fr.: January-February.

Distr.: Endemic to Southern Western Ghats. Common in high altitude sholas. ENP, Anamudi slope, *KKK 18546.*

Notes: New record to the flora of Kerala. This species could not be collected during this century and was considered extinct (Nayar, 1997).

Actinodaphne malabarica Balakr., J. Bombay Nat. Hist. Soc. 63: 329. 1967; Matthew, Ill. FPH t. 606. 1996 & FPH 1065. 1999. *A. hirsuta* sensu Hook. f., FBI 5: 152. 1886, non Blume, 1851; Gamble, FPM 1231. 1925.

Large trees; branchlets and tender parts thickly villous. Leaves 5-6, whorled at top, to 13 x 4 cm, elliptic-lanceolate, base acute, apex long acuminate, younger leaves rusty tomentose. Flowers 5-6, in axillary, sessile clusters; perianth yellowish, to 8 mm wide, tube 2.5 mm, lobes ovate. Berry 1 cm wide, globose.

Fl. & Fr.: August-January

Distr.: Endemic to Southern Western Ghats. Occasional; in medium altitude sholas. MS, K-5, *KKK 31047.*

APOLLONIAS Nees

Laurin. Expos. 10. 1833.

Apollonias arnottii Nees, Syst. Laurin. 670. 1836; Wight, Ic. t. 1819. 1852; Hook. f., FBI 5: 121.1886; Gamble, FPM 1219. 1925. ***Chulunthu.***

Medium sized trees. Leaves scattered near the apex of branchlets, to 15 x 3 cm, lanceolate, acuminate at both ends. Flowers very small, in axillary or sub terminal racemes; perianth tube short, lobes 5, to 3 mm long, in two rows; stamens 9 perfect, stalk glandular; staminodes 3; ovary sessile, globose. Drupes ovoid, black.

Fl. & Fr.: January-March.

Distr.: Endemic to Southern Western Ghats. Common in high altitude sholas. ENP, Mampallam Chola, *KKK* 17563; Amara Chola, *KKK 18531*; Pannithavarnai, *KKK 18554.*

BEILSCHMIEDIA Nees

in Wallich, Pl. Asiat. Rar. 2: 61, 69. 1831.

Beilschmiedia wightii (Nees) Benth. *ex* Hook. f., FBI 5: 124. 1886; Gamble, FPM 1221. 1925; Matthew, Ill. FPH t. 608. 1996 & FPH 1067. 1999. *Haasia wightii* Nees, Syst. Laurin. 676. 1836; Wight, Ic. t. 1831. 1852. **Panthada, Nagara Maram (EBIS) Plate 4.11.1.**

Large trees. Leaves to 13 x 7 cm, ovate-elliptic, apex obtusely acute or acuminate, often oblique, glabrous, shining, reticulations prominent. Panicles to 8 cm long; perianth yellowish white, 5 mm wide, lobes 6, 2 mm long, ovate; stamens 9; staminodes 3. Berry 3.5 x 2 cm, smooth, purple when ripe.

Fl. & Fr.: May-July.

Distr.: Endemic to Southern Western Ghats. Common in medium altitude sholas. MS, K-4, *KKK 31001.*

CINNAMOMUM Schaeffer

Bot. Exped. 74. 1760, *nom. cons.*

1. Basal lateral nerves reaching the leaf tip ..... **C. malabatrum**
1. Basal lateral nerves not reaching the leaf tip **2**
2. Young leaves seriaceous underneath ..... **C. travancoricum**
2. Young leaves glabrous or sparingly tomentose underneath **3**

3. Flowers <2 .5 mm long, glabrous; pedicels filiform ..... **C. filipedicellatum**
3. Flowers > 2.5 mm long, seriaceous; pedicels not filiform **4**
4. Panicles long, lax **5**
4. Panicles very short ..... **C. wightii**
5. Fruit cup 5-6 mm high; bark odourless ..... **C. keralaense**
5. Fruit cup to 15 mm high; bark and leaves with clove-aniseed smell ..... **C. macrocarpum**

Cinnamomum filipedicellatum Kosterm., BBSI 25: 93. 1983(1985). *C. gracile* sensu Hook. f., FBI 5: 133. 1886; Gamble, FPM 1223. 1925, non Miq. 1864.

Small tree; branchlets slender, glabrous. Leaves to 12 x 6 cm, elliptic-ovate, base cuneate, apex obtusely acuminate, subcoriaceous, glabrous, glaucous beneath. Panicles axillary or pseudo-terminal, slender. Flowers to 2.5 mm long, glabrous; tepals 2 mm, ovate; stamens 3 whorled; staminodes aciculate; ovary ellipsoid. Berry to 1 x 0.8 cm, ellipsoid.

Fl. & Fr.: February-June

Distr.: Endemic to Southern Western Ghats. Rare; at medium altitudes. MS, K-4, *KKK 31109.*

Cinnamomum keralaense Kosterm., BBSI 25: 98. 1983. *C. litseaefolium* sensu Hook. f., FBI 5: 133. 1886, non Thw., 1861; Gamble, FPM 1225. 1925.

Medium trees; branchlets glabrous. Leaves to 11 x 5 cm, apex acuminate, base cuneate; ribs faint, subparallel. Panicles 5-10 cm long, axillary. Flowers 6 mm wide; tepals ovate, obtuse, densely tomentose; fertile stamens in second and fourth whorls, filaments sparsely tomentose; staminodes in first and third whorls, hairy.

Fl. & Fr.: December-January

Distr.: Endemic to Southern Western Ghats (Kerala). Occasional; at higher altitudes. MS, Idlimottai, *KKK 31105.*

Cinnamomum macrocarpum Hook. f., FBI 5: 133. 1886; Gamble, FPM 1225. 1925; Fyson, FSIHS 504. 1932; Kosterm, BBSI 25: 100. 1983. *C. iners* sensu Wight, Ic. tt. 122 & 130. 1839, non Reinw. *ex* Blume, 1826.

Tall trees; branchlets glabrous. Leaves to 12 x 6 cm, base cuneate, apex obtusely acute; ribs 1-1.5 cm above the base; nervules indistinct. Panicles axillary, long-peduncled, glabrous. Flowers 6 mm across; tepals hairy. Fruiting calyx 1 cm across, cupular. Berry 2 x 1 cm, ellipsoid, dark-brown.

Fl. & Fr.: January-April

Distr.: Endemic to Southern Western Ghats. Occasional; at higher altitudes. MS, Idlimottai, *KKK 31107.*

Cinnamomum malabatrum (Burm. f.) Blume, Bijdr. 568. 1826; Kosterm. in Manilal, Bot. Hist. Malab. 167. 1980 & BBSI 25: 102. 1983. *Laurus malabatrum* Burm. f., Fl. Ind. 92. 1768. *Cinnamomum iners* sensu Gamble, FPM 1224.1925, non Rainw. *ex* Blume, 1826. **Vella Kodala (EBIS).**

Medium sized trees; branchlets glabrous. Leaves to 32 x 8 cm, acute at both ends, ribbed from base or often 1.5 cm above. Panicle to 20 x 5 cm, upper axillary, densely

yellow-tomentose. Flowers 3-4 mm across; tepals ovate, acute; stamens in first and fourth whorls; staminodes in second and third whorls; ovary glabrous.

Fl. & Fr.: February-June

Distr.: Endemic to Southern Western Ghats. Rare; in low altitudes. MS, K-4, *KKK 31106.*

Cinnamomum travancoricum Gamble in Kew Bull. 1925:128.1925 & FPM 1224.1925.

Small tree; branchlets slender, angular. Leaves to 8 x 6 cm, elliptic, base acute, apex obtusely acuminate, subcoriaceous, glabrous above, thinly seriaceous glabrescent below. Racemes pseudo-terminal and axillary; perianth tube funnel shaped; tepals to 3.5 mm, oblong. Fruit not seen.

Fl. & Fr.: February-June

Distr.: Endemic to Southern Western Ghats. Rare; in low altitudes. MS, K-4, *KKK 31106.*

Cinnamomum wightii Meisner in DC., Prodr. 15(1): 11. 1864; Hook. f., FBI 5: 132. 1886; Gamble, FPM 1224. 1925; Fyson, FSIHS 503. t. 437. 1932; Kosterm., BBSI 25: 122. 1983; Matthew, Ill. FPH t. 610. 1996 & FPH 1069. 1999. **Vella Kodala, *Santha Maram* (EBIS) Plate 4.11.2.**

Tall trees. Leaves to 11 x 5 cm, slightly puberulous below, especially on the veins, nerves 1-2 pairs from base. Panicles rusty, to 8 cm; perianth yellowish, rusty, tube 3 mm, lobes 2 mm long, ovate; ovary sub globose. Berry 2.5 x 1 cm, on truncate perianth.

Fl. & Fr.: February-May

Distr.: Endemic to Southern Western Ghats. Common in medium high altitude sholas. MS, Idlimottai, *KKK* 17582; *KKK 18161.* ENP, MPCA, *KKK 17528.*

CRYPTOCARYA R. Brown

Prodr. Fl. Nov. Holland. 1: 402. 1810.

1. Medium sized trees; leaves to 11 cm long; nerves 5-6 pairs; drupes oblong, puberulus .....**C. beddomei**
1. Large trees; leaves to 16 cm long; nerves 9-10 pairs; drupes globose, smooth ..... **C. bourdillonii**

Cryptocarya beddomei Gamble, Kew Bull. 1925: 127. 1925 & FPM 1218. 1925. **Chembalava, Shembalava.**

Leaves to 11 x 6 cm, ovate or elliptic, base rounded, apex obtuse or abruptly acute, shining above, reddish glaucous and glabrous beneath. Panicles axillary or terminal, fulvous pubescent, to 8 cm long. Flowers bisexual; perianth tube ovoid; ovary sessile. Drupe 10 x 6 mm, puberulous.

Fl. & Fr.: January-April.

Distr.: Endemic to Southern Western Ghats. Common in medium altitude sholas. ENP, Pannithavarnai, *KKK 18557.*

Cryptocarya bourdillonii Gamble, Kew Bull. 1925: 125. 1925 & FPM 1218. 1925; Matthew, Ill. FPH t. 611. 1996 & FPH 1070. 1999. *C. wightiana* sensu Hook. f., FBI 5: 120. 1886 p.p., non Thw., 1861.

Leaves to 16 x 7 cm, oblong, apex abruptly acute to acuminate, glabrous. Panicle 5-7 cm across, axillary, rusty tomentose. Flowers 3-4 mm across, shortly pedicelled; perianth lobes 3 mm long, ovate, tomentose; stamens 12, filaments pubescent, outer ones with glands; ovary glabrous. Drupes with an obtuse beak, glabrous.

Fl. & Fr.: February-August

Distr.: Endemic to Western Ghats. Common; in low altitude sholas. MS, Idlimottai, *KKK 31114.*

LITSEA Lamarck

Encycl. Meth., Bot. 3: 574. 1792, *nom. cons.*

1. Leaves glabrous beneath or nearly so 2
1. Leaves pubescent or tomentose beneath 4
2. Umbellules subsessile, in axillary or lateral clusters ..... **L. coriacea**
2. Umbellules in racemes 3
3. Leaves elliptic-lanceolate, base cuneate, apex acuminate; berry ellipsoid ..... **L. glabrata**
3. Leaves obovate, base acute, apex rounded; berry depressed globose ..... **L. oleoides**
4. Leaves elliptic-lanceolate, acute at both ends; nerves 4-5 ..... **L. wightiana** var. **wightiana**
4. Leaves oblong-lanceolate, apex acuminate, narrower; nerves up to 10 .... **L. wightiana** var. **tomentosa**

Litsea coriacea (Heyne *ex* Meisner) Hook. f., FBI 5: 166. 1886; Gamble, FPM 1236. 1925. *Tetranthera coriacea* Heyne *ex* Meisner in DC., Prodr. 15(1): 186. 1864.

Small to medium trees; branchlets glabrous. Leaves to 12 x 4 cm, elliptic-obovate, base narrowed, apex shortly acute, green above, dull grey below. Umbellules 3-6 together, grey-silky in bud; perianth lobes 6; stamens 12. Berry small, ovoid in cup shaped perianth tube.

Fl. & Fr.: April-May.

Distr.: Endemic to Western Ghats. Occasional; in middle altitude sholas. MS, K-5, *KKK 31048.*

Litsea glabrata (Wall. *ex* Nees) Hook. f., FBI 5: 174. 1886; Gamble, FPM 1237. 1925; Matthew, Ill. FPH t. 614. 1996 & 1072. 1999. *Tetranthera glabrata* Wall. *ex* Nees in Wall., Pl. Asiat. Rar. 2: 67. 1831.

Small trees. Leaves to 18 x 4 cm, reddish brown beneath when dry, green above with globose galls. Umbellules axillary or lateral; perianth yellow, tube 3.5 cm, lobes 3+3; stamens 12, filaments hairy; pistillode subglobose; ovary 1.5 cm wide in female flowers. Berry 1.2 x 0.6 cm, covered by the perianth up to the middle.

Fl. & Fr.: November-February

Distr.: Endemic to Western Peninsular India. Occasional; in low and medium altitude sholas. MS, K-3, *KKK 16723*; Methappu, *KKK 31115.*

Litsea oleoides (Meisner) Hook. f., FBI 5: 175. 1886; Gamble, FPM 1236. 1925; Matthew, Ill. FPH t. 616. 1996 & FPH 1073. 1999. *Tetranthera oleoides* Meisner in DC., Prodr. 15(1): 195. 1864. **Chembalava, Shembalava (EBIS) Plate 4.11.3.**

Medium sized trees. Leaves to 13 x 6 cm, light green above, white below, nerves obscure. Umbellules axillary or lateral. Flowers 3-6 in an umbellule, pedicelled; stamens 12. Berry to 2 cm wide, on a short, undulate or cuplike perianth tube.
Fl. & Fr.: March-June.
Distr.: Endemic to Peninsular India. Common along shola borders at medium and high altitudes. ENP, Umayamala, *KKK 17641*; Rajamala, *KKK 31023*.

Litsea wightiana (Nees) Hook. f. in Benth. & Hook. f., Gen. Pl. 3: 162. 1880, var. **tomentosa** (Meisner) Gamble, FPM 1238. 1925. *Cylicodaphne wightiana* Nees var. *tomentosa* Meisner in DC., Prodr. 15: 200. 1864. **Manja Kodala (EBIS) Plate 4.10.8.**

Medium sized trees; branchlets ferruginous-tomentose. Leaves to 12 x 4 cm, subcoriaceous. Umbellules in axillary or lateral racemes; flowers 6-12; perianth rusty yellow, hairy, 7 mm wide, tube 4 mm, lobes 3+3, 3 mm long; ovary 1.5 mm wide; staminodes 12 or 16. Berry 1.7 x 0.8 cm, ellipsoid, cup deeper.
Fl. & Fr.: August-May.
Distr.: Endemic to Southern Western Ghats. Common in high altitude sholas. MS, Idlimottai, *KKK* 16023; *KKK 18183*.

Litsea wightiana (Nees) Hook. f in Benth. & Hook. f., Gen. Pl. 3: 162. 1880 & Hook. f., FBI 5: 176. 1886, p.p., var. **wightiana**; Gamble, FPM 1238. 1925; Fyson, FSIHS 507. t. 439. 1932; Matthew, Ill. FPH t. 618. 1996 & FPH 1074. 1999. *Cylicodaphne wightiana* Nees in Wall. Pl. Asiat. Rar. 2: 68. 1831. **Manja Kodala (EBIS).**

Small trees; branchlets ferruginous-tomentose. Leaves to 10 x 5 cm, coriaceous, densely rusty seriaceous below. Racemes axillary or lateral; umbellules compound; flowers 6-12; perianth rusty yellow, hairy, 7 mm wide, tube 4 mm, lobes 3+3, 3 mm long; ovary 1.5 mm wide; staminodes 12 or 16. Berry 1.3 x 0.7 cm, ellipsoid, perianth accrescent to about the middle.
Fl. & Fr.: August-May.
Distr.: Endemic to Southern Western Ghats. Common in high altitude sholas. MS, Methappu, *KKK 16006*. ENP, Mattukulam, *KKK 16600*; Amarachola, *KKK 17514*; Umayamala, *KKK 17543*.

NEOLITSEA (Bentham) Merrill

Phillip. J. Sci. 1 (Suppl.): 56. 1906. *nom. cons.*

1. Leaves > 6 cm wide, thick coriaceous, densely golden brown rusty-seriaceous below ..... **N. fischeri**
1. Leaves < 5 cm wide, subcoriaceous, glabrous or glaucous below **2**
2. Berry oblong; leaves elliptic to lanceolate, < 3 cm wide ..... **N. cassia**
2. Berry globose; leaves ovate to elliptic, 3 to 4.5 cm wide ..... **N. scrobiculata**

Neolitsea cassia (L.) Kosterm., J. Sci. Res. (Jakarta) 1: 85. 1952. *Laurus cassia* L., Sp. Pl. 369. 1753. *Litsea zeylanica* Nees in Amoen., Bot. Benn. Fasc. 1: 58. t. 5. 1823; Hook. f., FBI 5: 178. 1886. *Neolitsea zeylanica* (Nees) Merr., Philipp. J. Sci. 1 (Suppl.): 57. 1906; Gamble, FPM 1239. 1925; Fyson, FSIHS 508. t. 440. 1932; Matthew, Ill. FPH t. 620. 1996 & FPH 1077. 1999. **Mulaku Nari, *Pravari* (EBIS).**

Small trees. Leaves to 9 x 2.5 cm, elliptic to lanceolate, base cuneate, apex acute to acuminate, glaucous below. Umbellules simple, sessile; perianth cream to yellowish, tube 4 mm, silky, lobes 4 mm long; stamens 6, filaments bearded; ovary 1.5 cm. Berry 1.5 x 1 cm.

Fl. & Fr.: December-May.

Distr.: South India and Sri Lanka. Common in medium and high altitude sholas. MS, K-5, *KKK 16179*; Methappu, *KKK 17696.*

Neolitsea fischeri Gamble, Kew Bull. 1925: 132. 1925 & FPM 1239. 1925; Sharma *et al.*, J. Econ. Tax. Bot. 11: 53. 1987; Matthew, Ill. FPH t. 619. 1996 & FPH 1075. 1999. **Vari Maram (EBIS).**

Large trees. Leaves to 15 x 7 cm, broad-elliptic to obovate, base acute, apex obtusely acute to acuminate, shining above. Umbellules compound; perianth rusty yellow, 7 mm wide, tube 2 mm, hairy, lobes 4, 2+2, ovate; ovary globose. Berry 2.5 cm across, globose.

Fl. & Fr.: February-August

Distr.: Endemic to Southern Western Ghats. Common at all altitudes. MS, K-4, *KKK 16464*; K-6, *KKK 17605*; *KKK 18120*; K-8, *KKK 18137.* ENP, Umayamala, *KKK 17648.*

Note: New record to the flora of Kerala.

Neolitsea scrobiculata (Meisner) Gamble, FPM 1240. 1925; Matthew, FPH 1076. 1999. *Litsea scrobiculata* Meisner in DC., Prodr. 15(1): 223. 1864. *L. zeylanica* sensu Hook. f., FBI 5: 178. 1886 p.p., non Nees, 1823. **Vellatan, *Shantha Maram* (EBIS).**

Medium sized trees. Leaves to 9 x 4.5 cm, base acute, apex acute to acuminate, pitted on either side of the nerves (scrobiculate), glaucous below, midribs with 1-3 pairs of lateral nerves. Flowers 3-5, in axillary, sessile umbellules; ovary globose. Berry 12 x 10 mm, globose to obovoid, fruiting perianth cup shaped.

Fl. & Fr.: February-August.

Distr.: Endemic to Western Ghats. Common in medium and high altitude sholas. ENP, Amarachola, *KKK 17515.*

PERSEA P. Miller

Gard. Dict. Abr. ed. 4, 1754. *nom. cons.*

Persea macrantha (Nees) Kosterm., Reinwardtia 6: 193. 1962; Matthew, FPH 1078. 1999. *Machilus macrantha* Nees in Wall., Pl. Asiat. Rar. 2: 70. 1831; Wight, Ic. t. 1824. 1852; Hook. f., FBI 5: 140. 1886; Gamble, FPM 1227. 1925. *M. glaucescens* Wight, Ic. t. 1825. 1852. **Kulamavu (EBIS) Plate 4.11.4.**

Large trees; barks aromatic. Leaves 7-15 x 3-7 cm, obovate, elliptic or oblanceolate, base acute, rounded or cuneate, apex emarginate, rounded or acute. Flowers 6-10 mm wide; perianth tube short, lobes 6, 3 x 1.5 mm, lanceolate, greenish white; stamens 9,

3 seriate; staminodes 3; ovary sessile. Berry 2.5 cm across, globose, black, with a basal, persistent perianth rim having reflexed lobes.

Fl. & Fr.: October-June

Distr.: South India and Sri Lanka. Common at all altitudes. MS, Thalachorkadavu, *KKK* 16031; Kolathuvada, *KKK 16049*; K-4, *KKK 16660*; K-6.5, *KKK 16714* & *KKK 17630*. ENP, Amarachola, *KKK 18039*. PAS, Vandaravu, *KKK 18199*.

Note: Lower altitude specimens have large oblanceolate leaves and panicles. High altitude specimens have obovate leaves and short racemes, but bigger flowers.

PHOEBE Nees

Syst. Laurin. 98. 1836.

Phoebe wightii Meisner in DC., Prodr. 15(1): 38. 1864; Gamble, FPM 1228. 1925; Matthew, FPH 1079. 1999. *P. paniculata* auct. non Nees, 1836: Wight, Ic. t. 1820. 1852; Hook. f., FBI 5: 142. 1886. **Chudala, Mulaku Nari. Plate 4.11.5.**

Medium sized trees. Leaves to 14 x 5 cm, oblanceolate, base cuneate, apex long acuminate, rusty-tomentose below. Panicles axillary or subterminal, to 6 mm wide. Flowers 6-10, bisexual; perianth tube 2 mm, lobes 6, 3 mm long, ovate, densely hairy; stamens 9; ovary sessile, globose, thinly pubescent. Berry ovoid.

Fl. & Fr.: March-June.

Distr.: India and Burma. Common at low altitudes. MS, Chengalar, *KKK 17667*

83. PROTEACEAE

GREVILLEA R. Brown *ex* R. A. Salsibury

in J. Knight, On Cultivation Proteaceae 120. 1809 ("Grevillia") corr.
R. Brown, Trans. Linn. Soc. London 10: 167. 1810 *nom. et orth. cons.*

Grevillea robusta A. Cunn. *ex* R. Br., Proteac. Nov. 24. 1830; Gamble, FPM 1243. 1925; Matthew, FPH 1081. 1999. **Silver Oak (EBIS).**

Tall trees; branchlets rusty tomentose. Leaves bipinnatifid, to 40 x 18 cm, primary pinnae to 12 x 5 cm, lobes lanceolate, brown tomentose below, margin recurved. Racemes to 18 x 6 cm, on leafless wood. Flowers solitary or clustered; perianth tube yellowish-orange to reddish, 1 cm long, 4 lobed, recurved below the limb, expanding distally; stamens 4, sessile. Follicle 1.5 cm, boat shaped.

Fl. & Fr.: November-December

Distr.: Native of East Australia; cultivated in tropics and subtropics. Cultivated in grasslands adjacent to sholas, often found inside low altitude sholas. MS, Puthur, *KKK 16719*.

84. THYMELEACEAE

GNIDIA Linnaeus

Sp. Pl. ed. 1, 356. 1753

Gnidia glauca (Fresen.) Gilg, Bot. Jahrb. Syst. 19: 265. 1894; Matthew, Suppl. Ill. FPH t. 1133. 1998 & FPH 1083. 1999. *Lasiosiphon glauca* Fresen., Flora 21: 603.

1838. *Gnidia eriocephala* Meisner in Denkschr., Koenigl.-Baier. Bot. Ges. Regensburg 3: 292. 1841; Wight, Ic. t. 1859. 1852. *G. sisparensis* Gardner, Calcutta J. Nat. Hist. 7: 457. 1857; Wight, Ic. t. 1860. 1852. *Lasiosiphon eriocephalus* (Meisner) Decne. in Jacq., Voy. 148. 1844; Hook. f., FBI 5: 197. 1886; Gamble, FPM 1244. 1925; Fyson, FSIHS 510. t. 441. 1932. **Nachu Nar, Nanju Nar (EBIS) Plate 5.2.4.**

Small trees; branchlets purplish, striate. Leaves 8 x 1.5 cm, linear-oblong to oblanceolate, base acute or rounded, apex shortly acuminate or acute. Heads 3 cm wide, terminal. Flowers yellow drying brown; perianth tube 13 x 2 mm, cylindric, densely pilose, glabrous within, lobes 5, 5 x 2 mm, oblong, spreading; stamens 10 in 2 rows; ovary ellipsoid. Fruit 5 x 1.5 mm, ellipsoid, densely pilose, brown.

Fl. & Fr.: December-February

Distr.: Peninsular India and Sri Lanka. Occasional; found along shola borders at lower and medium altitudes. MS, Puthur, *KKK 16199*; K-4, *KKK 16788*. PAS, Vandaravu, *KKK 18196*.

85. ELAEAGNACEAE

ELAEAGNUS Linnaeus

Sp. Pl. 121. 1753

1. Leaves ovate, silvery below; < 2.5 cm wide; fascicles < 4 flowered; scales stellate ..... **E. indica**
1. Leaves elliptic, coppery below, > 3.5 cm wide; fascicles > 5 flowered; scales peltate ..... **E. kologa**

Elaeagnus indica Servett. in Bull. Herb. Boiss. ser. 2. 8: 393. 1908; Gamble, FPM 1246. 1925; Matthew, FPH 1085. 1999.

Slender straggling shrub. Leaves 4 x 2.5 cm, base rounded to obtuse, apex acute, thin, dull green above. Flowers small, 3-4, in a fascicle; perianth tube narrowly cylindric; stamens 4. Drupe 1.2 x 0.7 cm, ellipsoid-oblong.

Fl. & Fr.: November-February

Distr.: Indo-Malesia. Occasional; along shola margins. MS, Perumala, *KKK 31057*.

Elaeagnus kologa Schlecht. in DC., Prodr. 14: 611. 1857; Gamble, FPM 1246. 1925; Fyson, FSIHS 511. t. 442. 1932; Matthew, FPH 2: 1085. 1999. *E. latifolia* L., Sp. Pl. 121. 1753 p.p.; Wight, Ic. t. 1856. 1852; Hook. f. FBI 5: 202. 1886 p.p. **Poolam Palam (EBIS) Plate 5.2.5.**

Large, thorny straggling shrub. Leaves to 9 x 4.5 cm, base sub-acute, apex obtuse to acute, coriaceous, scales brown, orbicular. Flowers 5-7, in a fascicle, to 1 x 0.5 cm; perianth tube 9 mm, urceolate, lobes 3 mm long, sparsely scaly. Drupes orange, to 1.5 x 1 cm, obovoid.

Fl. & Fr.: December-March

Distr.: Indo-Malesia & China. Occasional; along shola margins. MS, K-5, *KKK 16186*.

86. LORANTHACEAE

1. Petals free; flowers actinomorphic ..... **Helixanthera**
1. Petals united; flowers zygomorphic **2**

2. Perianth lobes and stamens spirally curled ..... **Helicanthes**
2. Perianth lobes and stamens not curled **3**
3. Petals 6; inflorescence an apically crowded spike ..... **Macrosolen**
3. Petals 5; inflorescence umbellate or in sessile clusters ..... **Taxillus**

HELICANTHES Danser

Verh. Kon. Ned. Akad. Wetensch., Afd. Natuurk. Tweede Sect. 29(6): 5. 1933.

Helicanthes elastica (Desr.) Danser, Verh. Kon. Ned. Akad. Wetensch., Afd. Natuurk., Tweede Sect. 29(6): 55. 1933; Matthew, Ill. FPH t. 628. 1996 & FPH 1090. 1999. *Loranthus elasticus* Desr. in Lam., Encycl. 3: 599. 1792; Wight, Ic. t. 343. 1840; Hook. f., FBI 5: 216. 1886; Gamble, FPM 1254. 1925. *L. euphorbiae* Wight, Calcutta J. Nat. Hist. 6: 363. 1846 & Ic. t. 1063. 1846.

Erect parasitic shrubs; branches terete, thickened at nodes. Leaves opposite, to 8 x 4 cm, ovate, base and apex acute, glabrous. Flowers axillary, fascicled, subsessile; calyx red to pale pink, tube cupular, truncate; corolla greenish with red streaks, 2 cm long, lobes 5, reflexed; stamens 5. Berry 1.5 cm long, globose.

Fl. & Fr.: February-April.

Distr.: Endemic to Peninsular India. Occasional along stream sides at medium and high altitudes. ENP, Mampallam Chola, *KKK 17564*; V- Point, *KKK 17639.*

HELIXANTHERA Loureiro

Fl. Cochinch. 142. 1790.

1. Inflorescence dense; flowers < 1.5 cm. long; pedicels curved ..... **H. obtusata**
1. Inflorescence lax; flowers > 1.5 cm. long; pedicles not curved ..... **H. intermedia**

Helixanthera intermedia (Wight) Danser, Bull. Jard. Bot. Buitenzorg ser. 3, 10: 317. 1929; Matthew, Ill. FPH t. 630. 1996. *Loranthus intermedius* Wight, Calcutta J. Nat. Hist. 6: 361. 1846; Hook. f., FBI 5: 205. 1886; Gamble, FPM 1251. 1925; Fyson, FSIHS 514. 1932. **Puluri.**

Parasitic shrubs. Leaves to 16 x 8 cm, ovate, base cuneate, apex obtusely acute, glabrous. Racemes to 7 x 4 cm, to 20 flowered. Flowers pedicellate; corolla flame coloured turning red with green tip, to 2 cm long, lobes 4, 3 mm long, spathulate; stamens 4, ovary 2.5 mm long, sub globose. Drupe 7 x 4 mm, rusty.

Fl. & Fr.: March-May.

Distr.: South Western India. Rare; in high altitude sholas. PAS, Vandaravu, *KKK 18193.*

Helixanthera obtusata (Schult.) Danser, Bull. Jard. Bot. Buitenzorg ser. 3, 10: 317. 1929; Matthew, Ill. FPH t. 631. 1996 & FPH 1091. 1999. *Loranthus obtusatus* Schult. in Roem. & Schult., Syst. 7: 1650. 1830; Hook. f., FBI 5: 205. 1886; Gamble, FPM 1251. 1925; Fyson, FSIHS 514. t. 443. 1932. *L. blumeanus* Wight, Calcutta J. Nat. Hist. 6: 361. 1846, non Schult. 1829.

Parasitic shrubs; branchlets ferruginous-tomentose. Leaves to 10 x 5 cm, ovate, base cuneate, apex acute. Racemes to 7 x 3 cm, to 23 flowered; densely golden

tomentose. Flowers 1.5 cm long; calyx cupular, truncate; corolla red, 1-1.2 cm long, lobes 4, acute; stamens 4, dark brown; ovary sub globose. Drupe subglobose.

Fl. & Fr.: June-August

Distr.: Endemic to Southern Western Ghats. Common at low and medium altitudes. MS, Thalachorkadavu, *KKK 16039*; Conical patch, *KKK 16482*.

MACROSOLEN (Blume) Blume

in J. A. Schultes *et* J. H. Schultes in
J. J. Roemer *et* J. A. Schultes, Syst. Veg. 7: 1731. 1830.

1. Leaves elliptic-lanceolate; corolla < 2.5 cm long, tube not curved; drupe ovoid ..... **M. capitellatus**
1. Leaves ovate-oblong; corolla > 3 cm long, tube curved; drupe subglobose ..... **M. parasiticus**

Macrosolen capitellatus (Wight & Arn.) Danser, Blumea 2: 36. 1936; Matthew, Ill. FPH t. 633. 1996 & FPH 1093. 1999. *Loranthus capitellatus* Wight & Arn., Prodr. 382. 1834; Wight, Ic. t. 304. 1840; Hook. f., FBI 5: 221. 1886. *Elytranthe capitellata* (Wight & Arn.) Engl. in Engl. & Prantl, Pflanzenfam. 3(1): 189. 1889; Gamble, FPM 1255. 1925; Fyson, FSIHS 518. t. 451. 1932.

Parasitic shrubs. Leaves to 8 x 3 cm, acute at both ends. Spike apically crowded. Flowers 2-4 per cluster, sessile; calyx tube 5 cm; corolla 2.5 cm, tube 1.5 cm, red below, green with purple lines above, split on one side, lobes 6, longer than tube; stamens 6. Drupe 1.2 cm long.

Fl. & Fr.: March-July

Distr.: South India and Sri Lanka. Occasional in medium altitude sholas. MS, K-4, *KKK 16489*; K-6, *KKK 17636*.

Macrosolen parasiticus (L.) Danser, Blumea 2: 36. 1936; Matthew, Ill. FPH t. 633. 1996 & FPH 1093. 1999. *Lonicera parasitica* L., Sp. Pl. 175. 1753. *Loranthus loniceroides* L., Sp. Pl. ed. 2, 1: 473. 1762; Wight, Ic. t. 303. 1839; Hook. f., FBI 5: 221. 1886. *Elytranthe loniceroides* (L.) G. Don, Gen. Syst. 3: 427. 1834; Gamble, FPM 1255. 1925; Fyson, FSIHS 518. t. 450. 1932.

Parasitic shrubs, branches terete, lenticelled. Leaves to 12 x 7 cm, base obtuse to rounded, apex acute, glabrous. Spike apically crowded. Flowers 4-6 per cluster, sessile; calyx tube 7 mm, apex truncate; corolla 3.5 cm long, tube 2 cm, scarlet red turning yellow, split on one side; stamens 6, yellow. Drupe 1 cm long.

Fl. & Fr.: February-April

Distr.: South India and Sri Lanka. Occasional in low and medium altitude sholas. MS, Kolathuvada, *KKK 16048*. ENP, Mampallam Chola, *KKK 17558*.

TAXILLUS van Tieghem

Bull. Soc. Bot. France 42: 256. 1895.

1. Corolla glabrous; leaves obovate-spathulate ..... **T. cuneatus**
1. Corolla densely tomentose; leaves otherwise **2**
2. Calyx teeth regular; leaves densely floccose below ..... **T. tomentosus**
2. Calyx teeth irregular; leaves thinly grey-pubescent below ..... **T. recurvus**

Taxillus cuneatus (Heyne *ex* Roth) Danser, Bull. Jard. Bot. Buitenzorg ser. 3, 10: 354. 1929; Matthew, Ill. FPH t. 637. 1996 & FPH 1095. 1999. *Loranthus cuneatus* Heyne *ex* Roth., Nov. Pl. Sp. 193. 1821; Hook. f., FBI 5: 214. 1886; Gamble, FPM 1253. 1925; Fyson, FSIHS 515. t. 446. 1932. **Ottu Puluri.**

Bushy parasitic shrubs. Leaves to 5 x 2 cm, obovate, base cuneate, apex rounded. Flowers in decussate pairs; calyx 3 mm long, irregularly toothed; corolla yellowish green, 2.5 cm long, lobes spreading, red; stamens and filaments red; style green; stigma red. Drupe 6 mm long, ellipsoid, tomentose.

Fl. & Fr.: October-December

Distr.: South India and Sri Lanka. Common in low and medium altitude sholas growing on *Turpinia nepalensis*. MS, K-3, *KKK 16658*.

Taxillus recurvus (DC.) Teigh., Bull. Soc. Bot. France 42: 256. 1895; Matthew, Ill. FPH t. 639. 1996 & FPH 1096. 1999. *Loranthus recurvus* Wall. *ex* DC., Prodr. 4: 299. 1830; Hook. f., FBI 5: 213. 1886; Gamble, FPM 1252. 1925; Fyson, FSIHS 515. t. 445. 1932. *L. candolleanus* Wight & Arn., Prodr. 385. 1834; Wight, Ic. t. 305. 1840.

Parasitic shrubs. Leaves to 8 x 3.5 cm, ovate to obovate, base acute to cuneate, apex obtusely acute, blackish green above when dry. Cymes to 6 flowered, rusty; calyx 4 mm long, teeth long; corolla greenish-brown, to 1.5 cm, tube rusty villous, lobes silvery white; style green; stigma pinkish. Drupe 1 x 0.4 cm, oblong.

Fl. & Fr.: February-April

Distr.: Endemic to Western Ghats Occasional; at medium altitudes, usually growing on *Glochidion neilgherrense*. ENP, Mampallam Chola, *KKK 17550*.

Note: New record to the flora of Kerala.

Taxillus tomentosus (Heyne *ex* Roth) Tieghem, Bull. Soc. Bot. France 42: 256. 1895; Matthew, Ill. FPH t. 640. 1996 & FPH 1096. 1999. *Loranthus tomentosus* Heyne *ex* Roth, Nov. Pl. Sp. 191. 1821; Hook. f., FBI 5: 212. 1886; Gamble, FPM 1252. 1925; Fyson, FSIHS 514. t. 444. 1932.

Parasitic shrubs; branchlets black. Leaves to 6 x 3 cm, obovate, base cuneate, apex obtuse, black above when dry. Cymes 3-4 flowered; calyx tube 3 mm, rusty, teeth short; corolla yellow, 1.5 cm long, tube curved, split halfway, inflated below, densely rusty floccose; stamens red. Drupe 1 x 0.3 cm, ellipsoid.

Fl & Fr.: Throughout the year.

Distr.: South India and Sri Lanka. Common in low altitudes. MS, K-3, *KKK 16141*; K-4, *KKK 16487*.

87. VISCACEAE

1. Stems flattened in one plane, not ribbed; flowers not in triads; perianth 3-merous: ..... **Korthalsella**
1. Stems terete, ribbed; flowers in triads; perianth 4-merous: ..... **Viscum**

KORTHALSELLA van Tieghem

Bull. Soc. Bot. France 43: 83. 1896.

Korthalsella japonica (Thunb.) Engl. in Engl. & Prantl, Nat. Pflanzenfam. 157-158: 138. 1887; Gamble, FPM 1256. 1925; Fyson, FSIHS 519. t. 452. 1932; Matthew, FPH

1098. 1999. *Viscum japonicum* Thunb., Trans. Linn. Soc. London 2: 329. 1794; Hook. f., FBI 5: 226. 1886. *Korthalsella opuntia* (Thunb.) Merr., Bot. Mag. Tokyo 30: 68. 1916; Matthew, Ill. FPH t. 641. 1996. *Viscum opuntia* Thunb., Fl. Jap. 64. 1784. *V. moniliforme* Wight & Arn., Prodr. 380. 1834; Wight, Ic. t. 1018. 1845. **Plate 4.11.6.**

Highly clustered, small subshrubs; stems jointed, green, glabrous; internodes to 1 x 0.4 cm, obovate. Leaves absent. Flowers minute, unisexual, fascicled at the tips of internodes, sessile; tepals yellowish-green, deciduous in male and persistent in female flowers; stamens 3; ovary obovoid. Berry to 2 x 1.5 mm, obovoid, fleshy.

Fl. & Fr.: Almost throughout the year

Distr.: India, China, Mauritius and Australia. Very rare; usually found growing on ecotone tree species such as *Symplocos anamallayana* and *Microtropis ramiflora* at high altitudes. MS, Idlimottai, *KKK 16605.* ENP, Hut 10 km, *KKK 18051.*

VISCUM Linnaeus

Sp. Pl. 1023. 1753

Viscum ramosissimum Wall. *ex* Wight & Arn., Prodr. 380. 1834; Hook. f., FBI 5: 224. 1886; Gamble, FPM 1258. 1925; Fyson, FSIHS 520. 1932; Matthew, Ill. FPH t. 644. 1996 & FPH 1101. 1999. **Mara Theva. Plate 4.11.7.**

Highly branched bushy shrubs; branchlets drooping; stem terete, yellowish green, ridged when dried. Flowers 3-together, axillary; one female and 2 males, 3 female flowers or all the 3 male flowers; bracts and bracteoles orbicular. Berry ovoid, 3 mm across.

Fl. & Fr.: June-August

Distr.: South India and Sri Lanka. Common in medium altitude sholas. MS, K-4, *KKK 18099*; K-6, *KKK 31002.*

Notes: New record to the flora of Kerala. This species was once seen growing on another *Loranthaceae* member, *Taxillus tomentosus.*

88. BALANOPHORACEAE

BALANOPHORA J. R. Forster & G. Forster

Charact. Gen. 99, 100. 1776.

1. Tepals lanceolate; synandrium slightly obconical or compressed; leaves spiral 2
1. Tepals ovate; synandrium hemispherical; leaves distichous or spirally arranged ..... **B. dioica**
2. Tubers single, spherical 3
2. Tubers clustered, elongate, ovate or obovoid ..... **B. fungosa** subsp. **indica** var. **indica**
3. Very small plants, 6-8 cm tall, crimson red coloured ..... **B. sp. 1**
3. Medium sized plants, 15-17 cm tall, yellowish brown coloured ..... **B. sp. 2**

Balanophora dioica R.Br. in Wall., Cat. n. 7246. 1831 & Trans. Linn. Soc. 13: 227. 1831; Hook. f., FBI 5: 237. 1886; Gamble, FPM 1263. 1925. **Plate 4.11.8.**

Stems red-purple, to 10 cm tall; tubers usually single, to 2.5 cm wide, subspherical, granular. Leaves to 3 x 1.5 cm, apex obtuse. Male inflorescence ellipsoid; tepals 4, to 6 x 4 mm, apex acute; female inflorescence to 3 x 2 cm. Fruit not seen.

Fl.: February-March

Distr.: India and Myanmar. Occasional in lower and medium altitude sholas. MS, Perumala, *KKK 18103*; K-6, *KKK 18117.*

Balanophora fungosa J. R. & G. Forst., Charact. Gen. Pl. 100. t. 50. 1776, subsp. **indica** (Arn.) Hansen, Dansk., Bot. Ark 28: 100. ff. 20 & 21. 1972 var. **indica**; Matthew, FPH 1105. 1999. *Langsdorffia indica* Arn., Ann. Nat. Hist. 2: 37. 1838. *Balanophora indica* (Arn.) *ex* Griff., Trans. Linn. Soc. London 20: 95. 1846; Hook. f., FBI 5: 237. 1886; Gamble, FPM 1263. 1925; Fyson, FSIHS 523. 1932. **Kannukutti Madu. Plate 4.12.1.**

Root stock massive, clustered. Peduncle stout, to 15 x 2 cm, yellowish inside; covered by imbricating sheathing leaves. Leaves reddish brown. Heads globose or oblong; male and female flowers dissimilar. Male tepals 5-6, to 7 x 2 mm, oblong, yellowish; anthers 4, white, horse-shoe-shaped. Female inflorescence to 5 x 4 cm, subglobose; perianth absent; ovary globose. Capsule 1-seeded, crustaceous.

Fl. & Fr.: December-March

Distr.: India, Malesia & Australia. Occasional; along steam sides at lower altitudes (rarely at high altitudes). MS, K-3.5, *KKK 17621.* ENP, MPCA, *KKK 17521.*

Balanophora sp. 1.

Very small plant, 6-8 cm long including tuber, deep-crimson coloured; tubers < 2 cm across; stem 3 cm long. Leaves opposite decussate, to 2 x 1.5 cm, ovate, obtusely acute. Inflorescence to 3.5 x 2 cm. Flowers shortly pedicellate; tepals 5, lobes 4 x 2 mm; synandrium subglobose, shortly stalked. Fruit not seen.

Fl.: December-March

Distr.: Rare; usually found at medium altitudes. MS, K-6, *KKK 17619.*

Balanophora sp. 2

Plant yellowish to brown; 15-17 cm tall; tubers single, 3 cm across; stem 10-12 cm long. Leaves opposite decussate to spiral; upper ones to 3.5 x 2.5 cm. Female inflorescence to 5 x 4 cm, depressed-globose. Fruit not seen.

Fl.: December-March

Distr.: Occasional; at shola borders and roadsides at lower altitudes. MS, Perumala, *KKK 31058.*

89. EUPHORBIACEAE

Note: The broad family concept (ICBN, 2000) of *Euphorbiaceae* is followed, which includes *Bischofiaceae* and *Daphniphyllaceae.*

1. Herbs of shrubs 2
1. Trees 5

2. Capsule dehiscent 3
2. Capsule indehiscent ..... **Breynia**
3. Flowers in cyathea; perianth absent ..... **Euphorbia**
3. Flowers not in cyathea; perianth present 4
4. Herbs; leaves simple, penni nerved ..... **Phyllanthus**
4. Shrubs; leaves palmately lobed ..... **Ricinus**
5. Leaves compound ..... **Bischofia**
5. Leaves simple 6
6. Leaves opposite ..... **Excoecaria**
6. Leaves alternate 7
7. Fruit and indehiscent drupe 8
7. Fruit a dehiscent capsule 9
8. Leaves elliptic-lanceolate, not reticulate; tepals 3 ..... **Antidesma**
8. Leaves oblong-obovate, highly reticulate; tepals 5-9 ..... **Daphniphyllum**
9. Stamens 3-5 10
9. Stamens infinite ..... **Mallotus**
10. Leaves peltate; flowers in axillary panicles ..... **Macaranga**
10. Leaves not peltate; flowers in spike or axillary clusters 11
11. Flowers solitary or in axillary clusters ..... **Glochidion**
11. Flowers in cylindrical spikes ..... **Aporusa**

ANTIDESMA Linnaeus

Sp. Pl. 1027. 1753

Antidesma menasu (Tul.) Miq. *ex* Muell.-Arg. in DC., Prodr. 15(2): 257. 1866 p.p., Hook. f., FBI 5: 364. 1887 p.p.; Gamble, FPM 1297. 1925; Fyson, FSIHS 534. t. 466. 1932; Matthew, FPH 1114. 1999. *A. pubescens* Roxb. var. *menasu* Tul., Ann. Sci. Nat. Bot. ser. 3, 15: 215. 1851.

Small trees. Leaves to 16 x 6 cm, elliptic-lanceolate, base acute, apex acuminate. Panicles to 8 cm long, red. Flowers pedicellate, 2 mm across, reddish-green; tepals 3, ovate, free, concave, hispid; male racemes shorter; flowers sub-sessile; stamens 5; ovary globose. Drupes 6 x 3.5 mm, compressed-ellipsoid, glabrous, reddish.

Fl. & Fr.: April-October

Distr.: Endemic to Peninsular India. Occasional; along stream sides at low altitudes. MS, Pallang Mala, *KKK 16690*; Chengalar, *KKK 17668*.

APORUSA Blume

Bijdr. 514. 1824.

Aporusa fusiformis Thw., Enum. Pl. Zeyl. 288. 1861; Hook. f., FBI 5: 351. 1887; Gamble, FPM 1309. 1925; Mandal & Panigrahi, BBSI 26: 42. 1984 (1985); Chakr. & Gang., J. Econ. Tax. Bot. 17(1): 160. 1993.

Large shrubs to small trees. Leaves to 7 x 5 cm, elliptic-obovate, base acute, apex obtuse, entire, glabrous, often recurved. Male spikes 1.5 x 0.5 cm long; flowers 2 or 3

in each bract; tepals 4, free, ovate; stamens 5. Female flowers sessile, 0.5 cm long; tepals 4, ovate, acute, ciliate; ovary ellipsoid. Fruits not seen.

Fl.: February-April

Distr.: South India and Sri Lanka. Occasional; along shola margins at high altitudes. ENP, Mampallam Chola, *KKK 17551*; Anamudi route, *KKK 17643.*

BISCHOFIA Blume

Bijdr. 1168. 1826-1827

Bischofia javanica Blume, Bijdr. 1169. 1827; Bedd., Fl. Sylv. t. 259. 1872; Hook. f., FBI 5: 345. 1887; Gamble, FPM 1312. 1925; Matthew, FPH 1115. 1999. *Microelus roeperianus* Wight & Arn. in Edinburgh New Philos. J. 14: 298. 1833; Wight, Ic. t. 1880. 1852. **Thondi, Chorakkali (EBIS).**

Medium sized trees; exudation reddish; bark red inside, fibrous. Leaves 3-foliolate; leaflets to 10 x 8 cm, obovate to orbicular, base rounded, apex abruptly acuminate, serrate or entire. Racemes lax, axillary, panicled, to 20 cm long; male flowers 2 mm across, tepals 5, recurved; stamens 5, free; ovary 3-celled, globose. Berry 7 mm across, globose; seeds 3, trigonous.

Fl. & Fr.: March-October

Distr.: Indo-Malesia and Pacific Islands. Common in low and medium altitude sholas usually in disturbed sites. MS, Puthur, *KKK 16047*; Chengalar, *KKK 16668.*

BREYNIA J. R. Forster & G. Forster

Charact. Gen. 145. 1776, *nom. cons.*

Breynia retusa (Dennst.) Alston, Ann. Roy. Bot. Gard. 11: 204. 1929; Matthew, FPH 1116. 1999. *Phyllanthus retusus* Dennst., Schluess. Hort. Ind. Malab. 24. 1818. *P. patens* Roxb., Fl. Ind. 3: 667. 1832. *Melanthesa turbinata* Wight, Ic. t. 1897. 1852. *Breynia patens* (Roxb.) Rolfe, J. Bot. 11: 359. 1882; Hook. f., FBI 5: 329. 1887; Gamble, FPM 1304. 1925; Fyson, FSIHS 530. t. 461. 1932. **Aattacherukola (EBIS).**

Glabrous subshrubs. Leaves to 2.5 x 1.5 cm, elliptic-oblong, base rounded, apex obtuse, glaucous below, blackish above when dried. Male flowers solitary, axillary, to 0.4 cm across; tepals 6, retuse or bilobed at apex; stamens 3. Female flowers 3 mm across, solitary; tepals 6, obovate, thick fleshy; ovary cupular, 3 celled, 6 lobed. Capsule 0.8 cm wide, depressed-globose, pink; seeds 6, 5 x 3 mm, trigonous, white.

Fl. & Fr.: August-September

Distr.: Indo-Malesia. Common along shola ecotones at lower altitudes. MS, Kulachivayal, *KKK 16640.*

DAPHNIPHYLLUM Blume

Bijdr. 1152. 1826.

Daphniphyllum neilgherrense (Wight) K. Rosenth. in Engl., Pflanzenr. 4(147a): 7. 1919; Gamble, FPM 1311. 1925; Matthew, FPH 1149. 1999. *Goughia neilgherrensis* Wight, Ic. tt. 1878 & 1879. 1852. *Daphniphyllum glaucescens* sensu Muell.-Arg. in DC., Prodr. 16(2): 3. 1866, non Blume, 1826-1827; Hook. f., FBI 5: 353. 1887; Fyson, FSIHS 533. t. 465. 1932. **Vellakotlan, Peekkiri, *Kozhikulamavu*. Plate 4.12.2.**

Small trees with milky latex. Leaves to 10 x 4.5 cm, oblong-obovate, base acute, apex obtuse, white below with prominent reticulations. Flowers dioecious. Male flowers in axillary racemes, to 5 cm long; tepals 5, minute; stamens 12, free. Female flowers few, bracteate; perianth similar to male flowers; ovary superior, 2-celled. Drupe to 1.5 x 1 cm, reddish green; seeds oblong.

Fl. & Fr.: February-April

Distr.: India, Java and Korea. Common in lower and middle altitude shola ecotones. MS, K-3, *KKK 16136.*

EUPHORBIA Linnaeus

Sp. Pl. 450. 1753

Euphorbia rothiana Spreng. in L., Syst. Veg. 3: 796. 1826; Wight, Ic. t. 1864. 1852; Hook. f., FBI 5: 263. 1887; Gamble, FPM 1278. 1925; Fyson, FSIHS 527. t. 457. 1932; Matthew, FPH 1125. 1999. *E. laeta* sensu Heyne *ex* Roth, Nov. Pl. 230. 1821, non Ait., 1789. **Merasupal Chedi (EBIS). Plate 5.3.3.**

Stout herbs, stems glaucous. Leaves to 10 x 1 cm, linear to oblanceolate, base attenuate, apex acute to shortly apiculate, glaucous below; those on flowering shoots smaller. Cyathia 2 x 2 mm, in terminal panicled cymes. Involucre 2.5 x 3 mm, campanulate, glands 5. Male flowers 10-12, filaments glabrous. Female flowers erect; ovary 3 celled. Capsule 4 mm, cocci 3, globular; seeds 2.5 x 2 mm, obovoid.

Fl. & Fr.: July-August

Distr.: Peninsular India and Sri Lanka. Common along roadsides and other exposed regions at medium and high altitudes. MS, Methappu, *KKK 16423.*

EXCOECARIA Linnaeus

Syst. Nat. ed. 10, 2: 1288. 1759.

Excoecaria crenulata Wight, Ic. t. 1865. 1852; Hook. f., FBI 5: 473. 1888; Gamble, FPM 1345. 1925; Fyson, FSIHS 536. t. 470. 1932.

Small trees. Leaves to 10 x 3 cm, elliptic to oblanceolate, base acute, apex acuminate, serrate. Male racemes 5-6 cm long, slender. Flowers solitary, 1.5 mm, oblong; sepals 3; stamens 3; pistillode present. Female flowers 2-5 on short terminal racemes; sepals larger. Capsule 12 mm, 3 lobed, glabrous.

Fl. & Fr.: March-May

Distr.: Peninsular India and Sri Lanka. Occasional; in medium altitude sholas. MS, K-6, *KKK 17634.*

GLOCHIDION J. R. Forster & G. Forster

Charact. Gen. 113, t. 57. 1775, *nom. cons.*

1. Small trees; leaves elliptic-lanceolate, acuminate; unequal at base ..... **G. ellipticum**
1. Medium sized trees; leaves elliptic or oblong, acute; not unequal at base..... **G. neilgherrense**

Glochidion ellipticum Wight, Ic. t. 1906. 1852; Hook. f., FBI 5: 321. 1887; Gamble, FPM 1308. 1925; Chakr. & Gang., J. Econ. Tax. Bot. 10(1): 199. 1995; Matthew, FPH 1129. 1999. **Chendana, Chathakkadambu (EBIS) Plate 4.12.3.**

Leaves to 11 x 3.5 cm, base acute and oblique, apex abruptly acuminate. Flowers small, in axillary bisexual clusters. Female flowers 2 mm across, 6-10 together in an axil; sepals 6, 2 mm long, lobes obovate, obtuse, hispid inside; ovary densely hispid. Capsule 1 cm, depressed above, 5 lobed, hirsute; seeds 8, glabrous, brown.

Fl. & Fr.: February-April

Distr.: Endemic to Western Ghats. Common along shola borders and other disturbed zones. MS, K-6, *KKK 16185*; Mattupatty, Munnar, *KKK 31052*.

Glochidion candolleanum (Wight & Arn.) Chakrab. & Gangop., JETB 19: 191. 1995. *Lobocarpus candolleanus* Wight & Arn., Prodr. 1: 7. 1834. *Glochidion neilgherrense* Wight, Ic. 5: 229. 1852; Hook. f., FBI 5: 316. 1887; Gamble, FPM 1307. 1925; Fyson, FSIHS 531. t. 463. 1932; Matthew, FPH 1130. 1999. *G. arboreum* Wight, Ic. t. 1907. f. 1. 1852; Hook. f., FBI 5: 316. 1887; Gamble, FPM 1307. 1925. *G. sisparense* Gamble, FPM 1307. 1926. **Chendana, Chathakkadambu (EBIS).**

Medium sized trees, branches zigzag, glabrous. Leaves to 9 x 3 cm, base obtuse, apex acute to abruptly acuminate, black when dry. Flowers small, 2 mm across, 5-6 in a cluster; tepals obovate. Capsule 1 cm across, beaked with short, thick style.

Fl. & Fr.: July-September

Distr.: India and Sri Lanka. Common along shola borders at low altitudes. MS, K-3, *KKK 16488*.

MACARANGA Du Petit-Thouars

Gen. Nova Madag. 26. 1806.

Macaranga indica Wight, Ic. t. 1883. 1852; Hook. f., FBI 5: 446. 1887; Gamble, FPM 1326. 1925; Fyson, FSIHS 536. t. 469. 1932; Matthew, FPH 1133. 1999. **Vattakanni (EBIS).**

Trees; exudations reddish; branchlets fulvous tomentose, glaucous. Leaves to 20 cm across, orbicular, yellow-punctuate below; nerves radiating from the petiole. Panicles axillary, zigzag. Male flowers 2 mm, in globose clusters; sepals 3-5, orbicular, glandular; stamens 3, free. Female flowers solitary, in globose heads; ovary 3-celled. Capsule 0.7 cm wide, globose, pubescent.

Fl. & Fr.: August-December

Distr.: India and Sri Lanka. Common; in disturbed forest areas at low altitudes. MS, Chengalar, *KKK 31061*.

MALLOTUS Loureiro

Fl. Cochinch. 601. 1790.

1. Medium sized trees; leaves ovate-elliptic, 3 nerved, not peltate; flowers in spikes ..... **M. philippensis**
1. Small trees; leaves broadly ovate to orbicular, peltate; flowers in racemes ..... **M. tetracoccus**

Mallotus philippensis (Lam.) Muell.-Arg., Linnaea 34: 196. 1865; Hook. f., FBI 5: 442. 1887, "*philippinensis*"; Bedd., Fl. Sylv. t. 289. 1873; Gamble, FPM 1322. 1925; Fyson, FSIHS 535. t. 468. 1932; Airy Shaw, Kew Bull. 21: 392. 1968 & 26: 300. 1972; Matthew, FPH 1134. 1999. *Croton philippense* Lam., Encycl. 2: 206. 1786. **Thakiri.**

Leaves to 9 x 4 cm, base obtuse, apex acuminate, densely red-glandular beneath. Spikes rusty puberulus. Male flowers 4 mm across, sepals 3, ovate, acute, hairy. Capsule 3 valved, 1 cm across, globose, densely red-glandular; seeds 1-4, globose, glabrous, black.

Fl. & Fr.: November-February

Distr.: Indo-Malesia and Australia. Common; in shola borders and disturbed sites at lower altitudes. MS, Perumala, *KKK 31051.*

Mallotus tetracoccus (Roxb.) Kurz., J. Asiat. Soc. Bengal 16: 245. 1873; Matthew, FPH 1135. 1999. *Rottlera tetracocca* Roxb., Fl. India 3: 827. 1832. *R. peltata* Wight, Ic. t. 1873. 1852. *Mallotus albus* auct. non Muell.-Arg., Linnaea 34: 188. 1865 excl. basionym *Rottlera albus* var. *occidentalis*: Hook. f., FBI 5: 429. 1887; Gamble, FPM 1321. 1925; Fyson, FSIHS 535. 1932. **Vattakanni, Perakela (EBIS). Plate 4.12.4.**

Leaves to 17 x 13 cm, base rounded, apex abruptly acute, entire or shortly toothed; nerves prominent, densely rusty brownish tomentose beneath. Male flowers in groups of 3-6, sessile, sepals 4-5, orbicular, densely hairy. Female flowers in branched terminal panicles; sepals 5-6, ovate, stellate-tomentose; ovary globose, densely hairy. Capsule 1.5 cm across, 4-lobed, densely stellate hairy.

Fl. & Fr.: July-September

Distr.: India, Southwest China and Sri Lanka. Common; found along shola borders at lower altitudes. MS, Thalachorkadavu, *KKK 16043*; K-3, *KKK 16484.*

Note : The south Indian *Rottlera* specimens (*Rottlera alba* Roxb. and *R. tetracocca* Roxb.) were included by Mueller (1865), when he established *Mallotus albus*. But according to Croizat (1940), *R. alba* Roxb. is *Mallotus paniculatus* (Lam.) Mueller and *R. tetracocca* is *Mallotus tetracoccus* (Roxb.) Kurz.

PHYLLANTHUS Linnaeus

Sp. Pl. 981. 1753

1. Subshrubs; leaves elliptic; calyx lobes not white margined ..... **P. macraei**
1. Slender, diffuse herbs; leaves obovate; calyx lobes white margined ..... **P. rheedii**

Phyllanthus macraei Muell.-Arg., Linnaea 32: 29. 1863; Hook. f., FBI 5: 296. 1887; Gamble, FPM 1290. 1925; Fyson, FSIHS 529. t. 460. 1932. *Macraea rheedii* Wight, Ic. t. 1901. 1852, non *Phyllanthus rheedii* Wight, 1852.

Leaves to 2.5 x 1.2 cm, base obtusely acute, apex obtuse, slightly mucronate. Male flowers 3 mm across, axillary, fascicled; calyx lobes 6; stamens 3. Female flowers long pedicelled; ovary 3 celled. Capsule 3 valved.

Fl. & Fr.: November-January

Distr.: Endemic to Southern Western Ghats. Common along shola borders at low altitudes. MS, Thalachorkadavu, *KKK 16709.*

Phyllanthus rheedii Wight, Ic. t. 1895, f. 1. 1852; Hook. f., FBI 5: 293. 1887; Gamble, FPM 1289. 1925; Fyson, FSIHS 528. t. 459. 1932; Matthew, FPH 1140. 1999.

Leaves to 2.5 x 1.5 cm, base acute, apex obtusely acute, glaucous beneath. Male flowers 2 mm, in axillary clusters; calyx 6 lobed, 4 x 2 mm, obovate, obtuse, glabrous. Female flowers 8 mm across, solitary, on thickened pedicels; ovary globose. Capsule 6 mm across, glabrous, smooth; seeds 2 x 1.5 mm, trigonous.

Fl. & Fr.: October-January

Distr.: South India and Sri Lanka. Common; found in shola borders at all altitudes. MS, K-3, *KKK 16096*; K-5, *KKK 16157*; Idlimottai, *KKK 16425*; K-4, *KKK 16498*.

RICINUS Linnaeus

Sp. Pl. 1007. 1753

Ricinus communis L., Sp. Pl. 1007. 1753; Hook. f., FBI 5: 457. 1887; Gamble, FPM 1335. 1925; Matthew, FPH 1142. 1999. **Amanakku, Kotta Maram (EBIS).**

Shrubs; stem glaucous. Leaves to 40 cm across, peltate, palmately 8-9 lobed, lobes to 20 x 5 cm, lanceolate, serrate. Racemes long, terminal. Male flowers at base, 1.5 cm across; sepals 9, ovate; stamens many, free. Female flowers terminal; sepals similar to male flowers; ovary densely bristly. Capsule 1.5 cm across, 3-valved; seeds oblong, carunculate, mottled white and brown.

Fl. & Fr.: November-January

Distr.: Native of Tropical Africa and spread to other tropical countries. Occasional; along shola borders and roadsides at lower altitudes. MS, Puthur, *KKK 16717*.

90. BUXACEAE

SARCOCOCCA Lindley

Edwards's Bot. Reg. 1012. 1826.

Sarcococca saligna (D. Don) Muell.-Arg. in DC., Prodr. 16(1): 11. 1869. *Buxus saligna* D. Don, Prodr. Fl. Nepal 63. 1825. *Sarcococca pruniformis* Lindl., Bot. Reg. 12: t. 1012. 1826, p.p.; Hook. f., FBI 5: 266. 1887, p.p. *S. trinervia* Wight, Ic. t. 1877. 1852; Gamble, FPM 1265. 1925; Fyson, FSIHS 524. t. 456. 1932. **Mattu Vadi (EBIS).**

Scandent shrubs. Leaves to 14 x 4 cm, elliptic, apex acuminate, distinctly triplinerved. Male racemes 1-2 cm long, flowers densely packed; perianth lobes 4, 2 x 1.5 mm, ovate, acute, ciliate; stamens 4. Female racemes smaller; perianth lobes 6, ovate, ciliate; ovary 2 celled, globose. Berry 7 x 5 mm, ellipsoid, coriaceous, black.

Fl. & Fr.: April-July

Distr.: Indo-Malesia. Common; in ecotones and other disturbed regions at lower altitudes. MS, K-4, *KKK 16123*; K-6, *KKK 16469*.

91. URTICACEAE

1. Plants with stinging hairs 2
1. Plants without stinging hairs 3
2. Sub-shrubs; leaves pedately 5-7 lobed ..... **Girardinia**
2. Small herbs; leaves simple, elliptic to ovate-elliptic ..... **Laportea**
3. Large shrubs to trees 4
3. Herbs or sub-shrubs 5

4. Inflorescence a pendulous, elongate spike ..... **Boehmeria**
4. Inflorescence in axillary paniculate clusters ..... **Debregeasia**
5. Flowers aggregated on a fleshy receptacle **6**
5. Flowers not on a fleshy receptacle **7**
6. Lithophytic herbs; male and female flowers on receptacle; stamens 4 ..... **Elatostema**
6. Epiphytic herbs; only female flowers on receptacles; stamens 5 ..... **Procris**
7. Leaves decussate; margins serrate ..... **Pilea**
7. Leaves alternate or ternate; margins entire ..... **Pouzolzia**

BOEHMERIA Jacquin

Enum. Pl. Carib. 9. 1760.

Boehmeria macrophylla Hornem., Hort. Bot. Hafn. 2: 890. 1815; Matthew, Suppl. Ill. FPH t. 1146. 1998 & FPH 1151. 1999. *B. platyphylla* D. Don, Prodr. Fl. Nep. 60. 1825; Hook. f., FBI 5: 578. 1886, incl. var. *longissima*; Fischer in Gamble, FPM 1387. 1928.

Subshrubs; branchlets reddish. Leaves opposite-decussate, to 15 x 9 cm, broadly ovate, base obtuse to truncate, apex acuminate, crenate, pubescent below, 3-ribbed, shortly pilose along ribs. Spikes axillary, to 12 cm long, glabrous. Flowers clustered, 3-9 together; perianth-tube gibbous at base, tepals 4, ovate; stamens 4; ovary 1 celled. Achenes 2 x 1 mm, ovoid, beaked, puberulus, enveloped by tepals.

Fl. & Fr.: July-October

Distr.: South West India and Sri Lanka. Occasional along shola borders and roadsides at lower and medium altitudes. MS, K-4.5, *KKK 16509*; Methappu, *KKK 31054*.

DEBREGEASIA Gaudichaud-Beaupre

Voyage Bonite Bot. Atlas t. 90. 1844.

Debregeasia longifolia (Burm. f.) Wedd. in DC., Prodr. 16(1): 235. 1869; Matthew, FPH 1152. 1999. *Urtica longifolia* Burm. f., Fl. Ind. 197. 1768. *Debregeasia velutina* Gaud., Voy. Bonite Bot. t. 90. 1844-46; Hook. f., FBI 5: 590. 1888; Fischer in Gamble, FPM 1389. 1928. *Conocephalus niveus* Wight, Ic. t. 1959. 1853. **Neeranji, Narambili, *Vanchi* (EBIS) Plate 5.2.3.**

Small dioecious trees; tender parts hispid-pubescent. Leaves alternate, to 18 x 4 cm, ovate to oblong-lanceolate, base acute or obtuse, apex acuminate, serrulate, 3-ribbed, densely white tomentose below, scabrous above. Flowers subsessile, to 4 mm across; male perianth lobes 4, free, 1 mm long, ovate, densely woolly; stamens 4, free; ovary 1 celled. Achenes adnate to perianth.

Fl. & Fr.: December-March

Distr.: Indo-Malesia. Common along exposed stream sides at low and medium altitudes. MS, K-3.5, *KKK 16134*; K-5, *KKK 16450*.

Note: The species forms a favourite food for elephants, and they are found to move down along stream sides, especially in summer, in search of this species.

ELATOSTEMA J. R. & G. Forster

Charact. Gen. 105. 1776, *nom. cons.*

1. Leaves coriaceous; falcately linear-lanceolate; cystoliths large ..... **E. lineolatum** var. **falcigera**
1. Leaves chartaceous; obliquely lanceolate; cystoliths small ..... **E. sessile**

Elatostema lineolatum Wight, Ic. tt. 1984 & 2091. 1853, var. **falcigera** Thw., Enum. Pl. Zeyl. 260. 1861; Hook. f., FBI 5: 565. 1888; Fischer in Gamble, FPM 1377. 1928.

Bushy subshrubs; branchlets tawny tomentose. Leaves subsessile, to 6 x 1 cm, base cuneate, apex acuminate with 2-3 teeth, only midrib prominent. Flowers cream coloured, crowded in axillary, bracteate, sessile receptacles; ovary narrowly ellipsoid; stigma sessile. Achene ellipsoid, red.

Fl. & Fr.: May-August

Distr.: South India and Sri Lanka. Common; along stream sides at low altitudes. MS, K-3, *KKK 16114*; K-5, *KKK 31056.*

Elatostema sessile J.R. Forst. & G. Forst., Char. Gen. Pl., ed. 1: 53. 1775; Hook. f., FBI 5: 563. 1888; Fischer in Gamble, FPM 1376. 1928; Fyson, FSIHS 548. t. 478. 1932; Matthew, Ill. FPH t. 656. 1996 & FPH 1154. 1999.

Gregarious herb; branchlets slender, succulent, to 40 cm tall. Leaves to 13 x 5 cm, base obliquely acute, apex acuminate, margin crenate. Inflorescence axillary; flowers cream, sessile, densely crowded; perianth lobes free, 1.5 mm long, ovate, long-cuspidate. Achenes ovoid.

Fl. & Fr.: June-August

Distr.: Indo-Malesia. Common undergrowth at low and medium altitudes. MS, K-5, *KKK 16182* & *KKK 16449.*

Note: New record to the flora of Kerala.

GIRARDINIA Gaudichaud-Beaupre

in Freycinet Voyage Monde, Uranie Physicienne Bot. 498. 1830.

Girardinia diversifolia (Link) Friis, Kew Bull. 36: 145. 1981; Matthew, FPH 1155. 1999. *Urtica diversifolia* Link, Enum. Pl. Hort. Berol. 2: 385. 1822. *Girardinia heterophylla* Decne. in Jacq., Voy. 4: 151. t. 153. 1844; Hook. f., FBI 5: 551. 1888, incl. var. *palmata* Gaud; Fyson, FSIHS 544. 1932. *G. leschenaultiana* Decne. in Jacq., Voy. 4: 152. 1844; Wight, Ic. t. 1976. 1853; Fischer in Gamble, FPM 1372. 1928. *G. zeylanica* Decne. in Jacq., Voy. 4: 152. 1844; Fischer in Gamble, FPM 1373. 1928. *G. heterophylla* Decne. var. *zeylanica* (Decne.) Hook. f., FBI 5: 551. 1888. *Urtica heterophylla* Wight, Ic. t. 687. 1840. **Ana Chenthatti (EBIS) Plate 4.13.1.**

Erect shrubs; branchlets and leaves with sharp stinging hairs and shorter stiff hairs. Leaves to 15 x 20 cm, pedately 5-7 lobed, base truncate to subcordate, apex acuminate, margin inciso-crenate. Male inflorescence in dense clusters; tepals and stamens 4. Female inflorescence much branched; tepals 3; ovary 1 celled. Achenes 2.5 mm wide, biconvex, orbicular, smooth, compressed.

Fl. & Fr.: November-December

Distr.: Indo-Malesia. Common along water courses at lower and medium altitudes. MS, K-6, *KKK 16715.*

Note: Highly allergic plant. When touched, causes intolerable, painful and burning sensation associated with itching and inflammation for several hours.

LAPORTEA Gaudichaud-Beaupre

in Freycinet Voyage Monde, Uranie Physicienne Bot. 498. 1830, *nom. cons.*

Laportea terminalis Wight, Ic. t. 1972. 1853; Hook. f., FBI 5: 549. 1888; Fischer in Gamble, FPM 1373. 1928; Fyson, FSIHS 544. t. 475. 1932; Matthew, Ill. FPH t. 658. 1996 & FPH 1156. 1999. *L. bulbifera* (Sieb. & Zucc.) Wedd. in Arch., Mus. Hist. Nat. 9: 139. 1856. *Urtica bulbifera* Sieb. & Zucc., Abh. Math.-Phys. Cl. Koenigl. Bayer. Akad. Wiss. 4: 214. 1846. **Cheriya Chenthatti.**

Monoecious herbs; stinging hairs present everywhere. Leaves to 15 x 7 cm, elliptic or ovate-elliptic, base rounded, apex acuminate, margin coarsely toothed, 3 ribbed from base. Panicles terminal or in upper axils. Male flowers small in lower axils; tepals 5; stamens 5. Female ones larger in upper axils, to 20 x 8 cm; tepals 2-4, obovate; ovary oblique. Achenes to 3 mm across, obliquely obovoid, black.

Fl. & Fr.: November-February

Distr.: India and Sri Lanka. Fairly common at lower and medium altitude sholas. MS, K-7, *KKK 16559*; Conical patch, *KKK 16727.*

Note: Allergic plant, causing painful and burning itching sensation for hours.

PILEA Lindley

Collect. Bot. ad. t. 4. 1821, *nom. cons.*

1. Subshrubs; leaves to 19 cm long, nervules parallel, prominent ..... **P. melastomoides**
1. Herbs; leaves to 6 cm long, nervules not parallel **2**
2. Perianth lobes spurred; achenes narrowed at apex ..... **P. wightii**
2. Perianth lobes spurless; achenes rounded at apex ..... **P. kingii**

Pilea kingii Fischer, Kew Bull. 1927: 76. 1927 & in Gamble, FPM 1379. 1928; Fyson, FSIHS 546. 1932. *P. wightii* Wedd. var. *macrophylla* Hook. f., FBI 5: 555. 1888.

Leaves to 6 x 4 cm, broadly ovate-lanceolate, base rounded or cordate, apex acuminate with a cusp; spinous-serrate, 3-ribbed; lineoles scarce, glabrous. Cymes 2 cm across; peduncles slender, 6 cm long; perianth lobes rounded. Achenes 1 x 1 mm, suborbicular, biconvex, smooth.

Fl. & Fr.: July-December

Distr.: Endemic to Southern Western Ghats. Rare; found along water courses and shola fringes at low and medium altitudes. MS, K-5, *KKK 16158*; K-4, *KKK 16493.*

Pilea melastomoides (Poir.) Wedd., Ann. Sci. nat. Bot. ser. 4, 1: 186. 1854; Matthew, FPH 1159. 1999. *Urtica melastomoides* Poir. in Lam., Encycl. Suppl. 4: 223. 1816. *Urtica trinervia* Roxb., Fl. Ind. 3: 582.1832. *Pilea trinervia* (Roxb.) Wight, Ic. t. 1973. 1853; Hook. f., FBI 5: 557. 1888; Fischer in Gamble, FPM 1379. 1928; Fyson, FSIHS 546. t. 477. 1932. **Narali (EBIS).**

Leaves to 19 x 9 cm, ovate, base rounded, apex acuminate, sharply serrate, 3-ribbed; lineoles crowded. Male inflorescence 10 cm across, axillary; flowers sessile, 4 mm across; perianth lobes 4, ovate, acute; stamens 4. Female 2 cm across; flowers small; perianth lobes 1 mm long. Achenes 1 mm across, biconvex.

Fl. & Fr.: July-October

Distr.: Indo-Malesia. Common; found along stream sides and roadsides at lower altitudes. MS, Kulachivayal, *KKK 16682.*

Pilea wightii Wedd., Ann. Sci. Nat. Bot. ser. 4, 1: 186. 1854; Hook. f., FBI 5: 554. 1888; Fischer in Gamble, FPM 1379. 1928; Fyson, FSIHS 545. t. 476. 1932; Matthew, Ill. FPH t. 662. 1996 & FPH 1159. 1999. *P. radicans* Wight, Ic. t. 1974. 1853, non Wedd., 1852. **Valiya Narali (EBIS).**

Slender, glabrous herbs. Leaves to 3 x 2 cm, broadly ovate to suborbicular, base subcordate, apex acute, crenate, 3-ribbed. Female cymes 1-2 cm across, shortly peduncled, branches pink; perianth lobes smooth. Achenes 0.5 x 0.5 mm, ovoid, biconvex, smooth or tubercled.

Fl. & Fr.: July-December

Distr.: Indo-Malesia. Common; along roadsides and stream sides at medium altitudes. MS, K-3.5, *KKK 16119.*

POUZOLZIA Gaudichaud-Beaupre

in Freycinet, Voyage Monde Bot. 503. 1826

1. Male perianth lobes convex or gibbous; buds ovoid ..... **P. auriculata**
1. Male perianth lobes plicate and inflexed; buds truncate **2**
2. Stems running out into terminal or axillary spikes; leaves reduced upwards ..... **P. wightii** var. **scabra**
2. Stems not running out into a bracteate spike; leaves not reduced upwards ....**P. bennettiana** var. **acuta**

Pouzolzia auriculata Wight, Ic. t. 1980, f. 2. & t. 2099, f. 37. 1853; Hook. f., FBI 5: 582. 1888; Fischer in Gamble, FPM 1383. 1928; Matthew, FPH 1160. 1999.

Tall, erect herbs; stem scabrous. Leaves to 5 x 2 cm, ovate-lanceolate, acute at both ends; midrib with 2 pairs of forked, lateral nerves. Cymes in dense, sessile, axillary clusters. Male and female flowers together; male perianth lobes 1.5 mm long, oblanceolate, hispid above. Female flowers sessile; perianth tube 2-toothed at apex, pubescent; ovary 2-winged. Achenes 1.5 x 1 mm, ovoid, strigose.

Fl. & Fr.: July-October

Distr.: Peninsular India and Sri Lanka. Common in medium altitude sholas. PAS, *KKK 18569.*

Pouzolzia bennettiana Wight, Ic. t. 1978. 1853; Hook. f. FBI 5: 585. 1888, var. **acuta** (Wight) Fischer in Gamble, FPM 1385. 1928. *P. acuta* Wight, Ic. t. 2092, f. 2. 1853. *P. heterocarpa* Wight, Ic. t. 2094. f. 13. 1853. **Narali Kola, *Serathandan* (EBIS).**

Erect subshrubs; stem sparsely pubescent upwards. Leaves ternate, to 18 x 4 cm, oblong-lanceolate, base rounded or cordate, apex long acuminate, 3 ribbed, sessile. Racemes to 12 cm long, axillary. Flowers 3-5 together. Male flowers 2 mm across, truncate at apex; perianth lobes 4, transversally plicate. Female flowers smaller; perianth lobe 0.5 mm long, ciliate at apex. Achenes 1 mm long, ridged, brown.

Fl. & Fr.: June-October

Distr.: Peninsular India and Sri Lanka. Common in low and medium altitude sholas. MS, Gokanathapuram, *KKK 16533.* PAS, *KKK 18581.*

Pouzolzia wightii Benn., Pl. Jav. Rar. 1: 66. 1838; Wight, Ic. t. 2093. f. 8. 1853; Hook. f., FBI 5: 584. 1888, var. **scabra** (Wight) Fischer in Gamble, FPM 1383. 1928; Fyson, FSIHS 551. t. 481. 1932. *P. scabra* Wight, Ic. t. 2097. f. 29. 1853; Hook. f., FBI 5: 584. 1888. *P. aspera* Wight, Ic. t. 2095. f. 18. 1853. **Narali Kola (EBIS).**

Scabrid herbs. Leaves to 6.5 x 2.5 cm, ovate to elliptic, apex acuminate, 3-ribbed, hispid. Spike to 35 cm long, terminal. Flowers 3-6 together in the axils of bracts. Male and female flowers mixed. Male flowers hemispherical, truncate above, shortly pedicelled; perianth lobes 4, 2.5 mm long, ciliate. Female flowers sessile; perianth tube striate, hispid. Achenes 1.5 x 1 mm, ovoid, wingless.

Fl. & Fr.: July-October

Distr.: Endemic to South India. Occasional; along stream sides and roadsides at low altitudes. MS, Kulachivayal, *KKK 16667.*

PROCRIS Commerson *ex* Jussieu

Gen. 403. 1789.

Procris crenata Rob., Philipp. J. Sci. 5: 507. 1911; Matthew, FPH 1162. 1999. *P. wightiana* Wall. *ex* Wedd., Monog. Urtic. 336. 1856, *nom. illegit.*; Fischer in Gamble, FPM 1378. 1928. *P. laevigata* sensu Hook. f., FBI 5: 575. 1888, non Blume, 1826.

Epiphytic, succulent, herbs. Leaves to 8 x 2.5 cm, elliptic-lanceolate, crenate, penninerved, cystoliths linear. Flowers cream, monoecious, in axils of leaf scars; male flowers in small cymes; female flowers in peduncled receptacle; male tepals 5, free, fleshy; female tepals 3-5, free, fleshy, cucullate; stamens 5; ovary 1-celled, ovoid. Achenes 1 mm long, ovoid, apiculate, rugose.

Fl. & Fr.: July-October

Distr.: Africa, Eastwards to India, Eastern Asia and Philippines. Occasional; usually found on scandent tree trunks at medium altitudes. MS, K-4, *KKK 16669.* PAS, *KKK 18571.*

92. ULMACEAE

1. Leaves glaucous below, margin serrulate ..... **Trema**
1. Leaves not glaucous below, margin distantly serrate ..... **Celtis**

CELTIS Linnaeus

Sp. Pl. 1043. 1753

1. Perianth lobes 5; midrib of leaf without strong lateral nerves ..... **C. philippensis** var. **wightii**
1. Perianth lobes 4; midrib of leaf with 2 strong lateral nerves ..... **C. tetrandra**

Celtis philippensis Blanco, Fl. Filip. 197. 1837, var. **wightii** (Planch.) Soep., Fl. Males. ser. 1, 8: 62. 1977; Matthew, FPH 1164. 1999. *C. wightii* Planch., Ann. Sci. Nat. Bot. ser. 3, 10: 307. 1948; Wight, Ic. t. 1969. 1853; Hook. f., FBI 5: 483. 1888; Fischer in Gamble, FPM 1349. 1928; Fyson, FSIHS 538. t. 471. 1932. **Vellakkuyyan (EBIS).**

Medium sized trees; branchlets lenticellate, pubescent. Leaves to 9 x 5 cm, ovate, base rounded, apex long-acuminate, coriaceous, reddish brown below when dry. Cymes 3 x 2 cm, on new shoots. Flowers greenish yellow; sepals 2 x 1 mm, ovate, ciliate; stamens 5, free; ovary ovoid. Drupes 7 x 5 mm, ovoid, green turning orange-red.

Fl. & Fr.: April-July

Distr.: Indo-Malesia, Australia, Oceana and Tropical Africa. Common; in low altitude sholas. MS, Chengalar, *KKK 31063.*

Celtis tetrandra Roxb., Fl. Ind. 2: 63. 1832; Hook. f., FBI 5: 482. 1888; Fischer in Gamble, FPM 1348. 1928; Fyson, FSIHS 538. 1932; Matthew, FPH 1164. 1999. *C. serotina* Planch., Ann. Sci. Nat. Bot. ser. 3. 10: 301. 1848; Wight, Ic. t. 1570. 1850. **Karukkuyyan, Sarala Kuyyan (EBIS).**

Medium sized trees; branchlets slender, pubescent. Leaves to 11 x 5 cm, obliquely ovate, base unequal, apex acuminate, sharply serrate, punctate above, pubescent along the nerves below. Flowers fascicled or in short cymules; male sepals 1.5 mm long, ovoid-obtuse, ciliate; stamens 4; ovary obovoid. Drupes 7 x 6 mm, ovoid, glabrous, black when ripe.

Fl. & Fr.: February-April

Distr.: Indo-Malesia. Occasional; in low and medium altitude sholas, usually in disturbed regions. MS, K-5, *KKK 31055.*

TREMA Loureiro

Fl. Cochinch. 539, 562. 1790.

Trema orientalis (L.) Blume, Mus. Bot. Lugduno-Batavum 2: 61. 1856; Hook. f., FBI 5: 484. 1888; Fischer in Gamble, FPM 1350. 1928; Fyson, FSIHS 539. t. 472. 1932; Matthew, FPH 1166. 1999. *Celtis orientalis* L., Sp. Pl. 1044. 1753; Wight, Ic. tt. 602 & 603. 1842. **Oma Maram (EBIS).**

Medium sized, dioecious trees; branchlets adpressed pubescent. Leaves to 10 x 5 cm, ovate-lanceolate, base obliquely cordate, apex acuminate, 3-5 ribbed from base, scabrous above, adpressed-hirsute below. Cymes in axillary clusters. Flowers 5 merous, tepals equal, 2 mm long, curved; ovary ovate, 1-celled. Drupe, 3 mm across, globose; seeds ovoid, 3 mm long.

Fl. & Fr.: June-December

Distr.: India, eastwards to Malesia and Australia and to Africa. Occasional; in low altitude shola borders or other disturbed sites. MS, K-4, *KKK 16472.*

93. CANNABACEAE

CANNABIS Linnaeus

Sp. Pl. 1027. 1753

Cannabis sativa L., Sp. Pl. 1027; 1753; Hook. f., FBI 5: 487. 1888; Fischer in Gamble, FPM 1350. 1928; Matthew, FPH 1167. 1999. **Kanchavu (EBIS) Plate 5.2.2.**

Erect herbs. Leaves decussate below, alternate above, palmately 3-9-foliolate; leaflets to 12 x 1.5 cm, lanceolate, serrate, hispid above, glandular below. Flowers unisexual, in short axillary cymes of panicles. Male flowers 5 mm across; tepals 5, free; stamens 5. Female flowers enclosed in spathaceous bracts; perianth absent; ovary globose, 1-celled. Achenes 4 x 3 mm, compressed; seed 1 mm, shiny, brown.

Fl. & Fr.: Throughout the year

Distr.: Probably native of Central Asia; widespread. Rare; a cultivated plant often found growing along roadsides and scrublands at low and medium altitudes. MS, Perumala, *KKK 18114*.

94. MORACEAE

1. Small herbs; latex watery; flowers on obconical receptacles, not enclosed in syconia ..... **Dorstenia**
1. Large lianas; latex milky; flowers enclosed in syconia ..... **Ficus**

DORSTENIA Linnaeus

Sp. Pl. 121. 1753

Dorstenia indica Wall. *ex* Wight, Ic. t. 1964. 1853; Hook. f., FBI 5: 494. 1888; Fischer in Gamble, FPM 1370. 1928; Fyson, FSIHS 543. t. 474. 1932; Matthew, FPH 1171. 1999.

Leaves to 9 x 2.5 cm, obovate or oblanceolate, base attenuate or cuneate, apex acute, membranous, distantly toothed. Flowers unisexual. Receptacle axillary, solitary, 5-angled, to 1.5 cm across, marginal lobes 10, to 0.5 cm long. Male flowers found outside and female towards the centre; perianth connate and adnate with receptacle; stamens 3; ovary globose. Achenes ovoid, sunken in the receptacle.

Fl. & Fr.: August-December

Distr.: South India and Sri Lanka. Occasional; on shady and moist forest floors near stream banks. MS, K-4.5, *KKK 18147*; Idlimottai, MS, *KKK 18158*.

FICUS Linnaeus

Sp. Pl. 1059. 1753

Ficus laevis Blume, Bijdr. 437. 1825, var. **macrocarpa** (Miq.) Corner, Gard. Bull. Singapore 18: 7. 1960; Matthew, Ill. FPH t. 671. 1996 & FPH 1181. 1999. *Pogonotrophe macrocarpa* Miq., London J. Bot. 7: 74. 1848; Wight, Ic. t. 1965. 1853. *Ficus macrocarpa* (Miq.) Wight *ex* King, Ann. Roy. Bot. Gard. (Calcutta) 1: 166, t. 208. 1888 & in Hook. f., FBI 5: 534. 1888, non Blume, 1825: Fischer in Gamble, FPM 1365. 1928; Fyson, FSIHS 541. t. 473. 1932. *F. amplocarpa* Govind. & Masil., Proc. Indian Acad. Sci. (Pl. Sci.) 91: 117. 1982. **Peyathi. Plate 4.13.2.**

Stems terete, rooting. Leaves to 15 x 10 cm, ovate, base subcordate, apex abruptly acuminate, 3-nerved, hispid below. Figs on short shoots on old stem, to 6 cm, subglobose, yellowish-green mottled with pink, pubescent. Male figs larger than females; tepals 6; stamens 3; ovary oblique; seeds oblong, compressed.

Fl. & Fr.: November-February

Distr.: Endemic to Western Ghats. Common; growing on trees at low and medium altitudes. MS, K-5, *KKK 16080*.

95. SALICACEAE

SALIX Linnaeus

Sp. Pl. 1015. 1753

Salix tetrasperma Roxb., Pl. Corom. t. 97. 1798; Wight, Ic. t. 1954. 1853; Hook. f., FBI 5: 626. 1888; Fischer in Gamble, FPM 1390. 1928; Fyson, FSIHS 553. 1932; Matthew, FPH 1196. 1999. **Vanchi Maram (EBIS).**

Medium sized trees. Leaves to 11 x 4 cm, elliptic-lanceolate, base acute, apex acuminate, margin serrate, glaucous beneath. Flowers cream, unisexual, on long drooping, axillary, 6-10 cm long, catkins; perianth absent; stamens 6-9, subequal, free; ovary 4 mm long, stalked, 1-celled, tomentose. Capsule 5 mm across, 2-4 valved; seeds 1-4, oblong, crowned with long, cottony hairs.

Fl. & Fr.: January-May

Distr.: India, Sumatra and Java. Rare; along stream sides at low altitudes. MS, Thalachorkadavu, *KKK 16042.*

MONOCOTYLEDONS

96. ORCHIDACEAE

1. Epiphytic plants (rarely terrestrial as in *Chrysoglossum*) 2
1. Terrestrial plants 12
2. Leaves equitant, laterally compressed ..... **Oberonia**
2. Leaves not equitant, terete or reduced to scales 3
3. Leaves dorsiventral or terete 4
3. Leaves reduced to minute scales ..... **Taeniophyllum**
4. Normal dorsiventral leaves 5
4. Leaves terete ..... **Seidenfadeniella**
5. Fleshy or pseudobulbous stem; sympodial plants 6
5. Stems not fleshy or pseudobulbous; monopodial plants 10
6. Plants <5cm; leaves two or more 7
6. Plants >10 cm; leaves single ..... **Cirrhopetalum**
7. Pollinia 8 ..... **Eria**
7. Pollinia 2-4 8
8. Inflorescence terminal, many flowered ..... **Liparis**
8. Inflorescence axillary 9
9. Column with a raised hood behind the anther ..... **Coelogyne**
9. Column without a raised hood ..... **Dendrobium**
10. Lip with two short obtuse sacs besides each other ..... **Diplocentrum**
10. Lip with a single sac or spur, or no such sac or spur 11
11. Lip with a raised tongue at back of wall of spur, close to the column base ..... **Trichoglottis**
11. Lip with no such tongue at the back wall ..... **Aerides**
12. Flowers without spur or mentum 13
12. Flowers spurred or with a mentum 14

13. Lip superior ..... **Seidenfia**
13. Lip inferior, saccate at base ..... **Cheirostylis**
14. Spur single **15**
14. Spurs 2 from the back of the superior lip ..... **Satyrium**
15. Scape lateral **16**
15. Raceme of spike terminal **17**
16. Spur longer than the sepals, lip adnate to the top of column ..... **Calanthe**
16. Spur absent or shorter than the sepals, lip adnate to the base of the column ..... **Chrysoglossum**
17. Lip lobed **18**
17. Lip entire, obcordate ..... **Brachycorythis**
18. Root not tuberous ..... **Anoectochilus**
18. Roots with simple or lobed tubers **19**
19. Sepals subequal and more or less connivent ..... **Peristylus**
19. Sepals unequal, the lateral spreading or reflexed ..... **Habenaria**

AERIDES Loureiro

Fl. Cochinch. 2: 525. 1790

Aerides ringens (Lindl.) Fischer, Kew Bull. 1928: 284. 1928 & in Gamble, FPM 1442. 1928; Fyson, FSIHS 579. t. 505. 1932; Abraham & Vatsala, Intr. Orch. 446. 1981; Matthew, Ill. FPH t. 725. 1996 & FPH 1264. 1999. *Saccolabium ringens* Lindl. in Wall., Cat. 7313. 1832. *Aerides radicosa* A. Rich., Ann. Sci. Nat. Bot. (ser. 2) 15: 65. 1841; Hook. f., FBI 6: 46. 1890. *Saccolabium rubrum* auct. non Lindl.: Wight, Ic. t. 1673. 1851. *S. paniculatum* Wight, Ic. t. 1676. 1851. *Aerides linearis* Hook. f., FBI 6: 47. 1890. *A. radicosa* A. Rich. Ann. Sci. Nat. Bot. ser. 2. 15: 65. 1841; Hook. f., FBI 6: 46. 1890. **Plate 4.12.5.**

Epiphytic herbs; stem woody. Leaves to 15 x 0.5 cm, linear, keeled, obliquely bilobulate. Racemes to 20 cm long. Flowers white with pink, 2 x 1.5 cm; dorsal sepal 8 x 3 mm, oblong-ovate; laterals 5 x 3.5 mm, broadly ovate; petals 6 x 3 mm, oblong, obtuse; lip 6 x 2 mm, ovate, acute, side lobes oblong or orbicular, midlobe linear-oblong, acute; disc with fleshy callus; spur 6 x 2 mm, cylindrical.

Fl.: June-August

Distr.: South India and Sri Lanka. Fairly common; found along shola borders at high altitudes. MS, Idlimottai, *KKK 16022*; *KKK 17586*. ENP, Amarachola, *KKK 17645*.

ANOECTOCHILUS Blume

Bijdr. 8: 411, t. 15. 1825.

Anoectochilus elatus Lindl., Proc. Linn. Soc. Bot. 1: 178. 1857; Hook. f., FBI 6: 95. 1890 '*elatior*'; Fischer in Gamble, FPM 1453. 1928; Abraham & Vatsala., Intr. Orch. 196. f. 18. 1981; Matthew, FPH 1208. 1999.

Terrestrial succulent herbs. Leaves to 5 x 4 cm, ovate or elliptic, acute, reddish-brownish with white reticulations. Racemes to 25 cm long. Flowers white tinged pink, 2.5 x 1 cm; dorsal sepal 11 x 5 mm, ovate, acuminate; lateral sepals obovate-oblong, subacuminate; petals 10 x 4 mm, obliquely oblong, acuminate; lip 3-lobed, 20 x 20 mm, side lobes oblong, retuse, curved, mesochile with 5-7 pairs of long fimbriate epichile, bilobed; spur bilobulate, with spindle-shaped gland.

Fl.: November-December

Distr.: Endemic to Southern Western Ghats. Occasional; in damp, shady forest floors especially along stream sides. MS, K-4, *KKK 16118.*

BRACHYCORYTHIS Lindley

Gen. Sp. Orch. 363. 1838.

1. Leaves closely set; epichile of lip obovate or orbicular, with a central triangular apiculus..... **B. iantha**
1. Leaves well spaced; epichile broadly obcordate, sinus large, central apiculus very small... **B. splendida**

Brachycorythis iantha (Wight) Summerh., Kew Bull. 10: 238. 1955; Abraham & Vatsala, Intr. Orch. 254. t. 44. 1981; Matthew, Ill. FPH t. 685. 1996 & FPH 1209. 1999. *Platanthera iantha* Wight, Ic. t. 1692. 1851. *Habenaria iantha* (Wight) Benth. in Benth & Hook. f., Gen. Pl. 3: 626. 1883; Hook. f. FBI 6: 164. 1890, p.p. *Platanthera affinis* Wight, Ic. t. 1693. 1851. *Habenaria galeandra* Benth., Fl. Hongk. 263. 1861 & in Hook. f., FBI 6: 163. 1890. *H. obcordata* (D. Don) Fyson, FNPHT 1: 405. 1915, var. *galeandra* (Reich. f.) Fyson, *l. c. Phyllomphax obcordata* (D. Don) Schltr., Report 16: 119. 1906; Fischer in Gamble, FPM 1476. 1928; Fyson, FSIHS 594. t. 528. 1932, var. *iantha* Hook. f. *ex* Fyson, *l.c.*

Unbranched herbs. Leaves to 3 x 1 cm, elliptic-oblong, acute, 3-nerved, well spaced. Flowers pink, 1.5 x 1 cm; dorsal sepal 4.5 x 2 mm, ovate-lanceolate, acute, 3-veined; lateral sepals 7 x 2.5 mm, falcate, ovate-oblong, acute, 3-veined; petals 5 x 1.5 mm, lanceolate, obliquely acute at apex, 1-2 veined; lip 14 x 12 mm, obcordate with a large sinus, sac ovate, obtuse, 2 x 2 mm, biparted.

Fl.: June-August

Distr.: India and China. Rare; in low altitude scrubland regions. MS, K-3.5, *KKK 16412.*

Brachycorythis splendida Summerh., Kew Bull. 2: 240. 1955; Abraham & Vatsala, Intr. Orch. 256, t. 45. 1981; Matthew, FPH 1210. 1999. *Habenaria iantha* Hook. f., FBI 6: 164. 1890 p.p. descr. tantum, partim, exclu. synon. *Phyllomphax obcordata* (D. Don) Schltr. var. *iantha* (Hook. f.) Fischer in Gamble, FPM 1476. 1928. **Plate 4.13.3.**

Herbs. Leaves to 3.5 x 2 cm, ovate-lanceolate, acute. Racemes terminal to 10 cm long. Flowers rosy-white with pink base, to 3 x 2 cm; dorsal sepal and petals connated to form a hood; dorsal sepal 8 x 4.5 mm, ovate, acute, 3-veined; lateral sepals 10 x 4.5 mm, obliquely ovate-lanceolate, acute, 4-veined; petals 8 x 2.5 mm, falcate-linear, acuminate, 3-veined; lip 23 x 16 mm, obcordate, apiculus triangular.

Fl.: July-September

Distr.: Endemic to Southern Western Ghats. Occasional; in medium altitude scrublands. MS, K-5, *KKK 16066.* ENP, Rajamalai, *KKK 31024.*

CALANTHE R. Brown

Bot Reg. 7: sub t. 573. 1821, *nom. cons.*

1. Flowers pink; dorsal sepal oblong, apiculate, 7-veined; lateral lobes of lip obliquely ovate ...**C. sylvatica**
1. Flowers rose or white; dorsal sepal ovate, obtuse, 3-5-veined; lateral lobe of lip oblong.....**C. triplicata**

Calanthe sylvatica (Thouars) Lindl., Gen. SP. Orchid Pl. 250. 1833; Matthew, Ill. FPH t. 701. 1996 & FPH 1229. 1999. *Centrosis sylvatica* Thouars, Orch. Iles. Austr. Afr. t. 35, 36. 1822. *C. masuca* (D. Don) Lindl., Gen. Sp. Orch. 249. 1833; Hook. f., FBI 5: 850. 1890; Fischer in Gamble, FPM 1432. 1928; Abraham & Vatsala., Intr. Orch. 265, t. 50. 1981. *Bletia masuca* D. Don, Prodr. Fl. Nepal 30. 1825. *Calanthe emarginata* (Blume) Lindl., Gen. Sp. Orchid Pl. 249. 1833; Wight, Ic. t. 1918. 1845.

Terrestrial herbs. Leaves to 45 x 12 cm, broadly elliptic-oblong, base attenuate into 10-15 cm long petiole. Racemes terminal, to 80 cm long; dorsal sepal 21 x 8 mm; lateral sepals 23 x 9 mm, oblong-lanceolate, acuminate, 7-veined; petals 18 x 9 mm, elliptic-lanceolate, obtuse, 5-veined; lip 15 x 10 mm, 3-lobed, side lobes small, 3 x 1 mm, obtuse, midlobe obcordate; spur 31 x 2 mm, cylindrical, acute.

Fl.: October-November

Distr.: India to Malesia. Common undergrowth in low and medium altitude sholas. MS, K-4, *KKK 16407.*

Calanthe triplicata (Willem.) Ames, Philip. J. Sci. 2: 326. 1907; Abraham & Vatsala, Intr. Orch. 263, t. 48. 1981; Matthew, Ill. FPH t. 702. 1996 & FPH 1228. 1999. *Orchis triplicata* Willem., Ann. Bot. (Usteri) 6: 52. 1796. *Calanthe veratrifolia* (Willd.) Ker Gawl., Bot. Reg. 9: t. 720. 1823; Hook. f., FBI 5: 851. 1890; Fischer in Gamble, FPM 1432. 1928; Fyson, FSIHS 574. t. 498. 1932. *C. perrottetii* A. Rich., Ann. Sci. Nat., Bot. (ser. 2) 15: 68. 1841; Wight, Ic. t. 1664-65. 1851.

Terrestrial herbs. Leaves to 35 x 10 cm, broadly elliptic-oblong, acute, glabrous. Racemes terminal, 80-90 cm long; dorsal sepal 11 x 7 mm, ovate, obtuse, 3-5 veined; lateral sepals elliptic, apiculate; petals to 11 x 5 mm, obovate; lip 10 x 10 mm, 3-lobed, side lobes 5 x 2 mm, oblong, obtuse; midlobe, 2-lobuled, obovate-oblong, truncate at apex; spur 20 mm long, disc with fleshy calli at mouth.

Fl.: May-June

Distr.: India to Philippine Islands. Common undergrowth in medium altitude sholas. MS, K-5, *KKK 31007.*

CHEIROSTYLIS Blume

Bijdr. 413, t. 16. 1825.

Cheirostylis flabellata Wight, Ic. t. 1727. 1851; Hook. f., FBI 6: 105. 1890 p.p.; Fischer in Gamble, FPM 1454. 1928; Fyson, FSIHS 584. t. 512. 1932; Abraham & Vatsala, Intr. Orch. 194. 1981; Matthew, Ill. FPH t. 680. 1996 & FPH 1205. 1999.

Delicate terrestrial herbs, 20 cm tall; stem reddish. Leaves few, 2.5 cm long, ovate, acute, sessile, brownish red. Racemes terminal, 10-20 cm long, glandular pubescent. Flowers white, glandular pubescent, 1.2 cm long; sepals oblong; petals linear oblong; lip bilobed, lobules obovate, dentate.

Fl.: July-August

Distr.: India, Sri Lanka and Burma. Rare; found in damp, shady regions at low altitudes. MS, Puthur, *KKK 16073*; K-4, *KKK 17618.*

CHRYSOGLOSSUM Blume

Bijdr. 6: t. 4. f. 7; 7: 337. 1825.

Chrysoglossum maculatum (Thwaites) Hook. f., FBI 5: 784 & 6: 190, 1890; Fischer in Gamble, FPM 1421. 1928; Matthew, FPH 1249. 1999. *Ania maculata* Thwaites, Enum. Pl. Zeyl. 301. 1861.

Rhizomes stout. Leaves to 30 x 10 cm, elliptic-acuminate, base tapering to the petiole ending in a pseudobulb to 7 cm long. Scape and raceme to 45 cm. Flowers to 2.5 cm long; sepals and petals oblong, subequal; lower petals greenish yellow; standard white; lip erect, broadly 3-lobed with purple spots; spur knob like.

Fl.: July-September

Distr.: Peninsular India and Sri Lanka. Occasional; found in medium altitude sholas. ENP, Way to Idlimottai, *KKK 16595*; PUS, *KKK 17602.*

CIRRHOPETALUM Lindley

Bot. Reg. 10: sub. t. 852, 1824 nomen, Gen. & Sp. Orch. Pl. 1830: 29 *nom. cons.*

Cirrhopetalum gamblei Hook. f., FBI 5: 778. 1890; Fischer in Gamble, FPM 1420. 1928; Garay *et al.* 618. 1994; Matthew, FPH 1249. 1999. *C. thomsonii* Hook.f. l.c.; Fyson, FSIHS 567. 1932. *C. macraei* auct. non Lindl., 1820: Wight, Ic. t. 1652. 1851. *Bulbophyllum gamblei* (Hook. f.) J. J. Sm., Bull. Jard. Bot. Buitz. (ser. 2) 8: 24. 1912, non Hook. f., 1890. *B. fischeri* Seidenf., Dansk Bot. Ark. 29: 202. 1973; Abraham & Vatsala, Intr. Orch. 341. 1981. **Plate 4.12.6.**

Pseudobulb to 1 cm wide, ovoid, ridged. Leaves solitary, to 5.5 x 1.5 cm, elliptic-oblong, base subacute, apex emarginate. Flowers 4-8, yellow, in 5-8 cm long slender peduncle; dorsal sepal to 7.5 x 4 mm, ovate or elliptic, acute, hooded; lateral sepals to 20 x 4 mm, linear-lanceolate, subacuminate; petals to 4.5 x 3 mm, elliptic-oblong or orbicular, obtuse, 3-veined; lip 4 x 1-2 mm, ovate, obtuse, curved.

Fl.: April-May

Distr.: South India and Sri Lanka. Very rare; found on trees along shola borders or stream sides at low altitudes. MS, Chengalar, *KKK 17602 & KKK 31014*; K-4, *KKK 18088.*

COELOGYNE Lindley

Collect. sub t. 33. 1822.

Coelogyne mossiae Rolfe, Kew Bull. 1894: 156. 1894; Fischer in Gamble, FPM 1430. 1928; Fyson, FSIHS 573. t.497.1932; Matthew, Ill. FPH t. 705.1996 & FPH 1232.1999.

Pseudobulb ovoid, ridged, 4 x 1 cm, tapering towards apex, with 2 leaves, each to 17 x 1.5 cm, linear, acute. Racemes 10-13 cm long, 4-6-flowered. Flowers white; dorsal sepal 13 x 4 mm, oblong-lanceolate, acute, 5-veined; lateral sepals 11.5 x 4 mm, oblong-lanceolate, acute, 5-veined; petals 11 x 2.5 mm, linear, acute, 3-veined; lip 12 x 7-8 mm, 3-lobed, middle ovate.

Fl.: April-May

Distr.: Endemic to Southern Western Ghats. Rare; found on ecotone trees at high altitudes only. ENP, Hut, *KKK 17510*; Umaya mala, *KKK 17537.*

DENDROBIUM Swartz

Nova Acta Regiae Soc. Sci. Upsal. 6: 82. 1799, *nom. cons.*

1. Leaves linear-lanceolate ..... **D. anamalayanum**
1. Leaves elliptic-lanceolate ..... **D. nanum**

Dendrobium anamalayanum Chandr., Chandrasek. & Nair, J. Bombay Nat. Hist. Soc. 78: 575. 1981. **Plate 4.13.4.**

Pseudobulb ovoid, to 1.5 x 0.7 cm. Leaves 2-3 x 0.5 cm, linear-lanceolate, acute. Flowers 4-6, rosy-white, on slender racemes borne on the top of bulbs; dorsal sepal 11 x 4.5 mm, lanceolate; lateral sepals 10 x 5 mm, falcately ovate, apiculate; petals to 11 x 4 mm, oblanceolate, slightly falcate, apiculate, 5-veined; lip 9 x 9 mm, trilobed, side lobes ovate-acute; midlobe ovate, acute; margins thick, fleshy, crenate, disc with 3-tipped calli.

Fl.: April-May

Distr.: Endemic to Southern Western Ghats. Rare; found growing on ecotone trees at high altitudes. MS, Idlimottai, *KKK 16024* & *KKK 18159*. ENP, Rajamala, *KKK 31027.*

Dendrobium nanum Hook. f., FBI 5: 717. 1888; Fischer in Gamble, FPM 1415. 1928; Fyson, FSIHS 566. t. 490. 1932.

Pseudobulb ovoid, to 2 x 1.5 cm. Leaves to 6 x 2 cm, elliptic-lanceolate, subacute. Flowers 8-10, white, in racemes borne on the top of bulbs; lip long clawed; limb suborbicular, serrulate; side lobes small; mid lobe rounded; disk with a broad, depressed, fleshy, truncate ridge.

Fl.: July-September

Distr.: Endemic to South India. Very rare; found growing on ecotone trees at high altitudes. MS, Idlimottai, *KKK 16638.*

DIPLOCENTRUM Lindley

Bot. Reg. 18: sub t. 1522. 1832.

Diplocentrum recurvum Lindl., Bot. Reg. 18: sub t. 1522. 1832. & Gen. Sp. Orch. 218. 1833; Hook. f., FBI 6: 78. 1890; Fischer in Gamble, FPM 1449. 1928; Fyson, FSIHS 582. t. 510. 1932; Abraham & Vatsala, Intr. Orch. 469. 1981. *Diplocentrum longifolium* Wight, Ic. t. 1681. 1852. **Plate 4.12.7.**

Stem 6-8 cm long. Leaves linear, to 20 x 0.4 cm, keeled, or subterete, obtuse, mucronate. Racemes branched. Flowers pinkish-white; dorsal sepal 3 x 1 mm, oblanceolate, bimucronate; lateral sepals 4 x 2 mm, falcately oblong, obtuse; petals 3 x 1.5 mm, oblong-lanceolate, subacute, 3-veined; lip 6.9 x 3 mm, oblong-lanceolate, obtuse, with 2 collateral spurs; disc with a fleshy ridge, forking at apex.

Fl.: May-June

Distr.: South India and Sri Lanka. Rare; found on trunks of ecotone trees at low altitudes. MS, Perumala, *KKK 16032*; K-3, *KKK 17504.*

ERIA Lindley

Bot. Reg. 11: t. 904. 1825, *nom. cons.*

1. Stem reduced to small discoid, button like pseudobulb 2
1. Stem elongate, plurinodal pseudobulb ..... **E. pauciflora**
2. Inflorescence 2-flowered; flowers creamy-white; leaves linear-oblanceolate ..... **E. nana**
2. Inflorescence 4-12-flowered; flowers greenish-yellow; leaves linear-lanceolate ..... **E. dalzellii**

Eria dalzellii Lindl., J. Linn. Soc. 3: 47. 1859; Hook. f., FBI 5: 789. 1890; Wight, Ic. t. 1642. 1851; Fischer in Gamble, FPM 1425. 1928; Abraham & Vatsala, Intr. Orch. 375. 1981. *Dendrobium filiforme* Wight, Ic. t. 1642. 1851, p.p.

Pseudobulbs 1.5 cm across. Leaves 3 or 4, to 7 x 1 cm, obtuse, mucronate. Racemes to 10 cm long; sepals subsimilar, lanceolate, acuminate, margins with stalked glands, 3-veined; petals slightly, narrower than sepals; lip 3 x 1 mm, falcate panduriform, minutely papillate; disc with 2 thick yellowish orange ridges.

Fl.: September-October

Distr.: Endemic to South India . Rare; found in medium altitude sholas. MS, Chengalar, *KKK 18136.* ENP, Nilgiri Teri, *KKK 17651.*

Eria nana A. Rich., Ann. Sci. Nat. (ser. 2) 11: 19. 1841; Hook. f., FBI 5: 789. 1890; Fischer in Gamble, FPM 1425. 1928; Fyson, FSIHS 569. t. 492. 1932; Abraham & Vatsala, Intr. Orch. 337. 1981; Matthew, Ill. FPH t. 712. 1996 & FPH 1246. 1999. *Dendrobium filiforme* Wight, Ic. t. 1642. 1851, p.p.

Pseudobulb 0.5 cm across, yellowish-green. Leaves 2-3, 6 x 0.4 cm, cuspidate, sheathing at base, scabrous. Racemes to 2 cm. Flowers 8 mm; dorsal sepal 7.5 x 1 mm, lanceolate, long-acuminate; lateral sepals 3 x 1-2 mm, ovate-lanceolate, acuminate; petals 7 x 3 mm, lanceolate, acuminate, 3-veined; lip 4 x 1 mm, subsessile, ligulate; disc with 2 fleshy calli at base.

Fl.: October-November

Distr.: Endemic to Southern Western Ghats. Rare; found at high altitudes. ENP, Hut 10 km, *KKK 18043.*

Eria pauciflora Wight, Ic. t. 1636. 1851; Hook. f., FBI 5: 779. 1890; Fischer in Gamble, FPM 1425. 1928; Abraham & Vatsala, Intr. Orch. 377. 1981.

Stem clavate, 8-10 cm tall. Leaves 2, 4-6 x 1 cm, oblong-lanceolate, acute. Racemes terminal, to 2 cm long. Flowers 2, white; dorsal sepal 7.5 x 3 mm, obovate-oblong, acute; lateral sepals 10 x 5.5-7 mm, obliquely ovate, acute; petals 8.5 x 2 mm, oblong-lanceolate, subacute-obtuse, 3-veined; lip 6.5 x 3.6 mm, quadrate, apex emarginate; disc with fleshy bilobed calli; midlobe 3 ridged.

Fl.: August-September

Distr.: Endemic to Southern Western Ghats. Rare; at medium altitudes only. MS, K-5, *KKK 16700.*

HABENARIA Willdenow

Sp. Pl. 4(1): 5, 44. 1805.

1. Petals 2-lobulate or 2-partite ..... **H. pallideviridis**
1. Petals entire 2
2. Floral bracts not longer than pedicel plus ovary 3
2. Bracts large, leafy, almost concealing the flowers ..... **H. perrottetiana**
3. Side lobes of lip broad, midlobe narrow 4
3. Side lobes of lip narrow, midlobe broad 5
4. Lip not, or hardly longer than lateral sepals ..... **H. longicornu**
4. Lip much longer than lateral sepals ..... **H. longicorniculata**
5. Floral bracts not cucullate ..... **H. elliptica**
5. Floral bracts cucullate, flower second on rachis ..... **H. heyneana**

Habenaria elliptica Wight, Ic. 5: 13, t. 1706. 1851; Hook. f., FBI 6: 147. 1890; Fischer in Gamble, FPM 1471. 1928; Fyson, FSIHS 589. t. 520. 1932; Abraham & Vatsala, Intr. Orch. 233. 1981; Matthew, Ill. FPH t. 692. 1996 & FPH 1221. 1999.

Herbs, 40-70 cm tall. Leaves to 15 x 3.5 cm, elliptic or oblong-lanceolate, acuminate. Flowers 5 x 1 cm, in lax raceme; dorsal sepals green, 15 x 10 mm, elliptic, acute; laterals sepals green, 24 x 7 mm, elliptic, acuminate; petals white, 26 x 7 mm, bipartite, lobes linear; upper lobe bearded; lip greenish-white, 3 cm long, 3-lobed; lobes filiform; spur 2.3 cm long.

Fl.: October-December.

Distr.: Endemic to Southern Western Ghats. Fairly common; found in grassland ecotones at medium altitudes. MS, K-4, *KKK 16773*. ENP, Near Amarachola, *KKK 18002*.

Habenaria heyneana Lindl., Gen. Sp. Orch. 320. 1835; Wight, Ic. t. 923. 1844; Hook. f., FBI 6: 148. 1890; Fischer in Gamble, FPM 1471. 1928; Fyson, FSIHS 590. t. 521. 1932; Abraham & Vatsala, Intr. Orch. 231. 1981; Matthew, FPH 1222. 1999. *H. subpubens* A. Rich., Ann. Sci. Nat. Sci. Nat., Bot. (ser. 2) 15: 75. t. 4c. 1841; Hook. f., FBI 6: 148. 1890.

Stem 10-40 cm high. Leaves to 6 x 9 cm, oblong-lanceolate, acute. Flowers white; dorsal sepal 9 x 4 mm, elliptic-oblong, acute; lateral sepals 10 x 3.5 mm, elliptic-oblong, apiculate; petals 8.5 x 4.5 mm, obliquely ovate-lanceolate, obtuse; lip 10 x 6 mm, 3-lobed; lateral lobes 7 x 1.5 mm, obliquely oblong-lanceolate, obtuse; midlobe 7.5 x 2.5 mm, oblong-lanceolate, obtuse; spur 13 x 1 mm, cylindric, subacute.

Fl.: August-November

Distr.: Endemic to South India. Occasional; in grassland ecotones at medium altitudes. ENP, Amarachola, *KKK 18054*.

Habenaria longicorniculata Grah., Cat. Pl. Bombay Pl. 202. 1839; Abraham & Vatsala, Intr. Orch. 238, f. 35. 1981; Matthew, Ill. FPH t. 693. 1996 & FPH 1219. 1999. *H. longicalcarata* A. Rich., Ann. Sci. Nat., Bot. (ser. 2) 15: 71, t. 3B. 1841; Wight, Ic. t. 925. 1845; Hook. f., FBI 6: 141. 1890; Fischer in Gamble, FPM 1470. 1928; Fyson, FSIHS 588. t. 519. 1932.

Stem 20-60 cm high. Leaves clustered at base, to 15 x 2 cm, oblong-lanceolate, acute. Scape to 40 cm. Flowers white, 2.5 cm wide; sepals 1 x 0.6 cm, obliquely ovate; petals 1 x 0.3 cm, spathulate, obtuse; lip 3-partite, side lobes 1 x 0.6 cm, oblong, subcuneate, apex oblique, subentire; midlobe linear-oblong, narrower; spur to 12 cm long, linear, subclavate.

Fl.: July-August

Distr.: Endemic to Peninsular India. Occasional; in grassland ecotones at medium altitudes. ENP, Amarachola, *KKK 18001.*

Habenaria longicornu Lindl., Gen. Sp. Orch. 322. 1835; Hook. f., FBI 6. 139. 1890; Fischer in Gamble, FPM 1470. 1928; Fyson, FSIHS 588. t. 518. 1932; Abraham & Vatsala, Intr. Orch. 229. f. 30. 1981; Matthew, FPH 1221. 1999. *H. montana* A. Rich., Ann. Sci. Nat., Bot. (ser. 2) 15: 73, t. 4A. 1841; Wight, Ic. t. 1714. 1851, p.p.

Stem 10-40 cm high. Leaves clustered towards the middle of the stem, to 12 x 2.5 cm, linear-oblong, lanceolate, acuminate. Scape to 25 cm tall. Flowers to 8, 2.5 cm across; sepals ovate, acute; petals linear-oblong, narrower; lip 3-partite; side lobes 1.2 x 0.5 cm, cuneate, apex obliquely truncate, fimbriate; midlobe linear, shorter; spur to 12 cm long, apex clavate.

Fl.: September-October

Distr.: Endemic to Southern Western Ghats. Occasional; found in scrublands at low altitudes. MS, Pallang Mala, *KKK 16686.*

Habenaria pallideviridis Seidenf., Kew Bull. 48: 764. 1993; Matthew, Ill. FPH t. 694. 1996 & FPH 1217. 1999.

Leaves to 7 x 2.5 cm, elliptic-lanceolate, acute, 2-3 towards apex of stem. Spikes to 40 cm long. Flowers white; dorsal sepal 12 x 4.5 mm, elliptic-lanceolate, apiculate; lateral sepals 12 x 4.5 mm, elliptic-lanceolate, acute, 3-veined; petals 11 x 3 mm, oblong-lanceolate, acute; lip 11 x 2 mm, oblong-lanceolate, without spur.

Fl.: October-December

Distr.: Endemic to Southern Western Ghats. Very rare; in grassland ecotones at higher altitudes. ENP, Vattachirambu Shola, *KKK 18081.*

Habenaria perrottetiana A. Rich., Ann. Sci. Nat., Bot. (ser. 2) 15: 74, t. 4B. 1841; Wight, Ic. t. 919. 1845; Hook. f., FBI 6: 164. 1890; Fischer in Gamble, FPM 1471. 1928; Fyson, FSIHS 591. t. 523. 1932; Abraham & Vatsala, Intr. Orch. 236. 1981; Matthew, Ill. FPH t. 695. 1996 & FPH 1223. 1999.

Stem 20-50 cm high. Leaves to 7 x 3 cm, elliptic-oblong, acute. Flowers yellowish, few, in about 15 cm long spike; bracts almost concealing the flowers; dorsal sepal 15 x 9 mm, ovate-oblong, obtuse, 5-veined; lateral sepals 15 x 9 mm, elliptic, obtuse, 7-veined; petals 15 x 4 mm, obliquely oblong, acute, 4-veined; spur 15 mm long, clavate.

Fl.: September-December

Distr.: Endemic to Southern Western Ghats. Rare; in grassland ecotones at medium altitudes. MS, K-4, *KKK 16774.*

LIPARIS L. C. Richard

Mem. Mus. Hist. Nat. 4: 43, 52. 1818, *nom. cons.*

1. Plants 10-15 cm high; flowers white; lip broad, dull purple, flat or with deflexed sides .....**L. wightiana**
1. Plants 15-25 cm high; flowers purple; lip recurved, margins yellowish, laterals spreading ....**L. walkerae**

Liparis walkerae Grah. in Lindl., Edinb. New Philos. J. 20: 194. 1836; Hook. f., FBI 5: 698. 1890; Fischer in Gamble, FPM 1410. 1928; Fyson, FSIHS 565. 1932; Matthew, FPH 1237. 1999.

Leaves to 12 x 5 cm, ovate, subacuminate. Racemes to 15 cm long; dorsal sepal oblong, acute, 3-veined; lateral sepals subfalcate, oblong, obtuse, 5-veined; petals linear, retuse, 1-veined; lip 6.5 x 5 mm, ovate, orbicular, fleshy, margins crenate, disc with 2 fleshy calli.

Fl.: August-September

Distr.: South India and Sri Lanka. Rare; along stream sides at medium altitudes. MS, K-5, *KKK 31118.*

Liparis wightiana Thw., Enum. Pl. Zeyl. 295. 1861; Hook. f., FBI 5: 695. 1890; Fischer in Gamble, FPM 1410. 1928; Abraham & Vatsala, Intr. Orch. 405. 1981; Matthew, FPH 1237. 1999. *L. atropurpurea* Wight, Ic. t. 904. 1844, sensu Lindl.; Fyson, FSIHS 565. 1932. *L. beddomei* Ridley, J. Linn. Soc., Bot. 22: 268. 1886; Hook. f., FBI 5: 695. 1890; Fischer in Gamble, FPM 1410. 1928.

Leaves to 5.5 x 2 cm, ovate, acuminate. Racemes 4-8 cm long; dorsal sepal lanceolate, obtuse, 3-veined; lateral sepals subfalcately lanceolate, acute, 3-veined; petals linear, obtuse, 1-veined; lip 7 x 6 mm, oblong-orbicular, auricled at base, disc with 2 tubercled calli, margins hairy.

Fl.: August-September

Distr.: South India and Sri Lanka. Rare; found along stream sides at medium altitudes. MS, Thalachorkadavu, *KKK 16764*; K-7, *KKK 31076.*

OBERONIA Lindley

Gen. Sp. Orchid. Pl. 15. 1830, *nom. cons.*

1. Leaves usually < 15 cm long **2**
1. Leaves usually >20 cm long **5**
2. Leaves lanceolate, falcate; flowers yellow ..... **O. sp. 1**
2. Leaves oblong-ensiform; flowers orange-yellow **3**
3. Lateral sepals obliquely ovate; petals oblong or ovate **4**
3. Lateral sepals ovate-oblong; petals linear ..... **O. wightiana**
4. Dorsal sepals ovate, acute; scape < 20 cm long; flowers 2.5 mm long ..... **O. thwaitesii**
4. Dorsal sepals oblong-ovate; scape > 25 cm long; flowers 4.5 mm long ..... **O. verticillata**
5. Flowers 4 mm long, greenish-yellow; lateral lobes auriculiform; disc ovate ..... **O. chandrasekharanii**
5. Flowers 2.5 mm long, yellow; lateral lobes oblong-obovate; disc crescent shaped ..... **O. sebastiana**

Oberonia chandrasekharanii Nair *et al.*, Blumea 28: 361. 1983; Ansari & Balakr., Orch. Monogr. 4: 12, f. 5. 1990. *O. ranganniana* Murthy *et al.*, Curr. Sci. 56: 621. 1987.

Leaves articulated, to 25 x 15 cm, ensiform, acute. Scape flattened. Spike to 25 cm long, pendulous. Flowers 4 x 1 mm, in verticils; bracts 2 x 1.3 mm, ovate, acute, denticulate, gland-dotted; dorsal sepals ovate-obtuse; lateral sepals ovate, acute; petals linear, truncate and denticulate at apex; lip 1.5 x 2 mm, semi-orbicular in outline, 3-lobed, papillose, gland dotted; lateral lobes folded upwards, rounded the column by the proximal end; midlobe 2-lobuled with a broad sinus; lobules orbicular; disc ovate, concave, sac like.

Fl.: December-September

Distr.: Endemic to Southern Western Ghats (Kerala and Karnataka). Occasional; in high altitude sholas. MS, Methappu, *KKK 17697.*

Oberonia sebastiana Shetty & Vivek., BBSI 17: 157. 1975; Ansari & Balakr., Orch. Monogr. 4: 1, f. 4. 1990.

Leaves to 20 x 1.5 cm, ensiform, acute. Scape flattened. Spike to 30 cm long. Flowers 2.5 x 1 mm, yellow, subverticillate; dorsal sepal oblong, obtuse; lateral sepals ovate, subacute; petals oblong, obtuse; lip semi-orbicular, 3-lobed; lateral lobes wing-like; midlobe, 2-lobuled; lobules obovate, cuneate, diverging; disc saccate.

Fl.: October-December

Distr.: Endemic to Southern Western Ghats. Occasional; in high altitude sholas. ENP, Vattachirambu shola, *KKK 18083*; Umaya mala, *KKK 17544.*

Oberonia thwaitesii Hook. f., FBI 5: 678. 1888; Manilal & S. Kumar, Curr. Sci. 33: 1106. 1984; Ansari & Balakr., Orch. Monogr. 4: 27, f. 23. 1990.

Leaves to 10 x 1 cm, acute; scape terete. Spike to 25 cm long. Flowers 2.5 x 1.5 mm, in verticils; lateral sepals obliquely ovate; petals ovate, subacute; lip 3-lobed; lateral lobes rounded, auricular; midlobe 2-lobuled; lobules oblong, toothed; disc indistinct.

Fl.: May-June

Distr.: South India and Sri Lanka. Occasional; in low altitude sholas. MS, K-4, *KKK 16651.*

Oberonia verticillata Wight, Ic. t. 1626. 1851; Hook. f., FBI 5: 677. 1888; Fischer in Gamble, FPM 1405. 1928; Fyson, FSIHS 561. 1932; Abraham & Vatsala, Intr. Orch. 419. 1981; Ansari & Balakr., Orch. Monogr. 4: 28, f. 24. 1990; Matthew, Ill FPH t. 710. 1996 & FPH 1243. 1999.

Leaves to 12 x 0.8 cm, acute. Scape terete. Spike to 27 cm long. Flowers 4.5 x 2 mm, in verticils; lateral sepals obliquely ovate, acute; petals oblong or ovate, obtuse; lip 3-lobed; lateral lobes rounded, auricled; midlobe 2-lobuled; lobules orbicular or obovate, serrate, overlapping, sinus narrow; disc indistinct.

Fl.: September-January

Distr.: South India and Sri Lanka. Common; at lower altitudes. MS, K-3, *KKK 16107.*

Oberonia wightiana Lindl., Bot. Reg. 25. Misc. 9. 1839; Wight, Ic. t. 1627. 1851; Hook. f., FBI 5: 683. 1888; Fischer in Gamble, FPM 1407. 1928; Fyson, FSIHS 562. t. 487. 1932; Ansari & Balakr., Orch. Monogr. 4: 24, f. 19. 1990; Matthew, Ill. FPH t.

711. 1996 & FPH 1242. 1999. *O. stachyoides* A. Rich., Ann. Sci. Nat., Bot. ser. 2, 15: 15. t. 1A. 1841. *O. arnottiana* Wight, Ic. t. 1628. 1851; Ansari & Balakr., Orch. Monogr. 4: 23. t. 18. 1990. *O. wightiana* Lindl. var. *arnottiana* (Wight) Ansari *et al.*, JETB 3: 118. 1982. *O. wightiana* Lindl. var. *nilgirensis* Ansari *et al.*, JETB 3: 118. 1982.

Leaves to 15 x 1 cm, oblong-ensiform, acute. Scape terete. Spike to 25 cm long. Flowers 3.5 x 1.5 mm, orange yellow, scattered on the rachis; dorsal sepal oblong, obtuse, entire; lateral sepals ovate-oblong, subacute; petals linear, obtuse, entire; lip 2 mm across, 3-lobed; lateral lobes oblong, ligulate, wing like on spreading; midlobe 2-lobuled; lobules ligulate, toothed at apex, diverging; disc ovate, indistinct.

Fl.: August-November

Distr.: South India and Sri Lanka. Occasional in medium altitude sholas. MS, Methappu, *KKK 17698*; K-5, *KKK 31079.*

Oberonia sp. 1

Leaves to 6 x 1 cm, lanceolate, falcate, acute, narrowed to base. Scape terete. Spike to 15 cm long. Flowers yellow, 2 mm across, in verticils; sepals similar ovate, acute; petals linear, obtuse; lip 3-lobed, 2 x 1.5 mm; lateral lobes oblong, obtuse; midlobe 2-lobuled with a conical protuberance in between; lobules oblong, subacute; disc ovate, indistinct.

Fl.: September-November

Distr.: Occasional; found at high to very high altitudes. MS, K-5, *KKK 31078*; ENP, Anamudi top, *KKK 18540.*

Note: This specimen with very small leaves and spike needs more critical examination.

PERISTYLUS Blume

Bijdr. 404, t. 30. 1825, *nom. cons.*

1. Leaves clustered near the middle of the stem; petals oblanceolate-oblong; spur ellipsoid ..... **P. exilis**
1. Leaves scattered throughout the stem; petals elliptic-lanceolate; spur clavate..... **P. richardianus**

Peristylus exilis Wight, Ic. t. 1698. 1851; Matthew, FPH 1212. 1999. *Habenaria aristata* (Lindl.) Hook. f., in Trimen, Syst. cat. fl. pl. Ceylon 91. 1885 & FBI 6: 158. 1890. *Peristylus aristatus* auct. non Lindl. 1835; Abraham & Vatsala, Intr. Orch. 246. 1981. p.p.; Fischer in Gamble, FPM 1474. 1928; Fyson, FSIHS 593. t. 526. 1932.

Terrestrial herbs. Leaves 4-7 x 2 cm, elliptic-lanceolate, subacuminate. Spike lax, to 18 cm. Flowers white; dorsal sepal 5 x 1.8 mm, elliptic-oblong, obtuse; lateral sepals 4.1 x 1.8 mm, obliquely ovate-oblong, obtuse; petals 5.5 x 2.5 mm, obtuse; lip 5 x 2 mm, 3-lobed; lobes very unequal; lateral lobes to 8 x 0.5 mm, linear, acute, midlobe 2.5 x 0.9 mm, oblong, obtuse; spur 3.2 x 1.5 mm, acute, stalk cylindric.

Fl.: August-September

Distr.: India, Burma, Indochina and Sri Lanka. Rare; in grassland ecotones at medium altitudes. ENP, Mampallam Chola, *KKK 16070.*

Peristylus richardianus Wight, Ic. t. 1697. 1851; Fischer in Gamble, FPM 1474. 1928; Fyson, FSIHS 592. t. 524. 1932; Abraham & Vatsala, Intr. Orch. 246. 1981; Matthew, Ill. FPH t. 686. 1996 & FPH 1211. 1999. *P. robustior* Wight, Ic. t. 1699. 1851. *Habenaria bicornuata* Hook. f., FBI 6: 156. 1890.

Terrestrial herbs. Leaves 5 x 1.5 cm, lanceolate, acuminate. Spike dense, to 15 cm. Flowers creamy-white; dorsal sepal oblong, obtuse, keeled; lateral sepals oblong, obtuse, keeled; petals obtuse, 1-veined with 2 lateral veins from the middle; lip 6 x 18 mm, 3-lobed; lobes unequal; midlobe 3 x 1 mm, oblong, obtuse; lateral lobes 8 x 0.5 mm, linear, upcurved; spur acute at apex.

Fl.: September-November

Distr.: Nepal, Meghalaya, Nilgiris & Palnis. Rare; in grassland ecotones at high altitudes. ENP, Hut 10 km, *KKK 18052.*

SATYRIUM Swartz

Kongl. Vetensk. Acad. Nya Handl. 21: 214. 1800, *nom. cons.*

Satyrium nepalense D. Don, Prodr. Fl. Nepal. 26: 1825; Wight, Ic. t. 929. 1844; Hook. f., FBI 6: 168. 1890; Fischer in Gamble, FPM 1476. 1928; Matthew, Ill. FPH t. t. 699. 1996 & FPH 1224. 1999. *Satyrium wightianum* Lindl., Gen. Sp. Orch. 340. 1838; Wight, Ic. t. 1718. 1851. *S. neilgherrense* Wight *ex* Fyson, FSIHS 595. t. 529. 1932.

Terrestrial herbs, to 30 cm tall. Leaves 2 or 3, to 14 x 6 cm, ovate or elliptic-lanceolate, apex acute. Racemes to 35 cm long, dense, terminal. Flowers pink; dorsal sepal oblong-lanceolate; lateral sepals elliptic, obtuse, 5-veined; petals oblong, obtuse, 3-veined; lip, 21 x 6 mm, superior, concave, keeled, enclosing the column with two parallel spurs; column erect; pollinia 2, with recurved caudicle.

Fl.: August-September

Distr.: India, Sri Lanka, Burma and China. Common; in grassland ecotones at high altitudes. MS, Idlimottai, *KKK 16637.*

SEIDENFADENIELLA Sathish

Cat. India Orch. 47. 1994.

Seidenfadeniella filiformis (Reichb. f.) Chr. & Ormerod. in Matthew, FPH 1258. 1999. *Saccolabium filiforme* Reichb. f., Walp. Ann. 6: 887. 1864. *Saccolabium chrysanthum* Alston in Trimen, Handb. Fl. Ceylon 6: 277. 1931. *Sarcanthus filiformis* Wight, Ic. t. 1684. 1851, non Lindl. 1842. *Schoenorchis filiformis* (Wight) Schltr., Feddes Repert. 1: 986. 1913. *nom. illeg.*; Abraham & Vatsala, Intr. Orch. 475. 1981. *Saccolabium filiforme* (Wight) Lindl., J. Linn. Soc. 3: 36. 1859; Hook. f., FBI 6: 56. 1890; Fischer in Gamble, FPM 1446. 1928; Fyson, FSIHS 581. t. 507. 1932. *Schoenorchis juncifolia* Thw., Enum. Pl. Zeyl. 304. 1864, non Blume. *Seidenfadeniella chrysantha* (Alston) Sathish, Cat. India Orch. 47. 1994.

Pendulous epiphytes, to 30 cm long, stem woody, terete, green. Leaves 10-11, terete, linear. Racemes axillary. Flowers orange-yellow; dorsal sepal oblong, acute, serrulate; lateral sepals falcately oblanceolate; petals orbicular or broadly elliptic-oblong, rounded, 3-veined; lip 3-lobed, lateral lobes orbicular; midlobe ovate, acute, papillate; spur inflated, laterally compressed, base rounded.

Fl.: May-June

Distr.: Southern Western Ghats and Sri Lanka. Rare; growing on the trunks of ecotone trees at medium altitudes. MS, K-5, *KKK 16427.*

SEIDENFIA Szlach.

Syst. Orch., Fragm. Florist. Geobot. Suppl. 3: 67. 1995.

Seidenfia rheedii (Sw.) Szlach., Syst. Orch. (Fragm. Florist. Geobot.) Suppl. 3: 122. 1995; Matthew, FPH 1239. 1999. *Malaxis rheedii* Sw., Kongl. Vetensk. Acad. Nya Handl. 21: 235. 1800 (excl. syn. *Epidendrum resupinatum*); Matthew, Ill. FPH t. 707. 1996. *Microstylis versicolor* Lindl., Gen. Sp. Orchid Pl. 21. 1830; Fischer in Gamble, FPM 1408. 1928; Fyson, FSIHS 563. 1932. *M. rheedii* (Sw.) Lindl., Gen. Sp. Orchid. Pl. 21. 1830, p.p.; Wight, Ic. t. 902. 1845; Hook. f., FBI 5: 690. 1890. *Malaxis versicolor* (Lindl.) Abeyw., Ceylon J. Sci., Biol. Sci. 2(2): 147. 1959

Terrestrial herbs. Leaves 2-3, sessile, to 6 x 4 cm, elliptic, apex acuminate. Racemes terminal, resupinate. Flowers to 3.5 mm across, greenish yellow; dorsal sepal 3.5 x 1.2 mm, linear-oblong, lateral sepals 2.5 x 1.5 mm, obliquely-oblong, deflexed; petals 3 x 1 mm, lanceolate; lip sub-quadrate, pectinate, toothed; column 1 mm high, 2 horned. Capsule 0.7 x 0.4 cm, oblong-obovate.

Fl. & Fr.: September-March

Distr.: India and Sri Lanka. Rare; in medium altitude sholas. MS, K-6, *KKK* 31077. PUS, *KKK 18584.*

TAENIOPHYLLUM Blume

Bijdr. 6: t. 3, f. 70. 1825.

Taeniophyllum alwisii Lindl., J. Linn. Soc. Bot. 3: 42. 1859; Hook. f., FBI 6:76. 1890; Ansari *et al.*, Indian J. For. 17: 260. 1994; Matthew, FPH 1254. 1999. **Plate 4.12.8.**

Small leafless epiphytes. Roots green, to 5 x 0.25 cm, trigonous or subterete. Spikes 5-10 mm long, 1-3 flowered. Flowers sub-sessile, 5-6 mm long, creamy white; sepals and petals united into a 1 mm long tube; dorsal sepals oblong-lanceolate, obtuse; lateral sepals oblong-lanceolate, acute; free parts of petals ovate, acute; lip 2-2.5 x 0.7 mm, ovate, obtuse with a recurved, delicate mucro at apex; spur 1 x 0.6 mm, oblong, obtuse; column 0.8 x 0.5 mm, stigmatic arms oblong, obtuse; ovary 2 mm long, 9-ridged. Capsule 10 x 2 mm, oblong, curved, 9-ridged.

Fl. & Fr.: September - March

Distr.: Tamil Nadu, Kerala and Sri Lanka. Very rare; located only once growing on a *Syzygium densiflorum* tree. MS, K-7, *KKK 18506.*

Note: This species was considered as a Sri Lankan endemic (Jayaweera, 1981) until it was reported by Seidenfaden (1983) from the Servarayans (Yercad) plateau, Salem of Tamil Nadu. It was also reported from the Shevaroy and Kolli hills of Tamil Nadu (Ansari *et al.*, 1994). Since then, it was not reported from any other Indian states. So this collection forms a new record for the Kerala State and extends the distribution range of this rare and little known species (Rajesh and Kumar, 2004).

TRICHOGLOTTIS Blume

Bijdr. 6: t. 3. 1825.

Trichoglottis tenera (Lindl.) Schltr., Bull. Herb. Boiss. (Ser. 2) 6: 471. 1906; Matthew, FPH 1259. 1999. *Oeceoclades tenera* Lindl., Gen. Sp. Orch. 236. 1833;

Wight, Ic. t. 1683. 1851. *Cleisostoma tenerum* (Lindl.) Hook. f., FBI 6: 73. 1890; Fischer in Gamble, FPM 1448. 1928; Fyson, FSIHS 582. t. 509. 1932.

Epiphytes; stem terete, woody. Leaves to 3 x 1.5 cm, elliptic-oblong, obtuse. Racemes stout, to 20 cm long. Flowers yellow; dorsal sepal elliptic, obtuse; lateral sepals oblanceolate, falcate, obtuse; petals smaller than sepals, oblong, obtuse, 5-veined; lip adnate to the base of column, 3-lobed; lateral lobes oblong, lanceolate, obtuse; midlobe ovate, obtuse, 3-lobuled; spur 3 x 1 mm, cylindrical.

Fl.: April-May

Distr.: South India ad Sri Lanka. Fairly common; on trees along stream sides at medium altitudes. MS, K, *KKK 31119.*

97. ZINGIBERACEAE

1. Inflorescence to 40 cm long, basal, separate from stem; labellum white with pink stripes ..... **Alpinia**
1. Inflorescence to 20 cm long, terminal; labellum yellow ..... **Hedychium**

ALPINIA Roxburgh

Asiat. Res. 11: 350. 1810, *nom. cons.*

Alpinia abundiflora Burtt & Smith, Notes Roy. Bor. Gard. Edinburgh 34: 179. t. 5. 1975. *Elettaria floribunda* Thwaites, Enum. P. Zeyl. 319. 1861, non *Alpinia floribunda* Schum., 1904. *Amomum floribundum* (Thwaites) Trimen, Cat. 92. 1885; Baker in Hook. f., FBI 6: 233. 1892. *A. involucratum* auct. non Benth. *ex* Trimen, 1885: Fischer in Gamble, FPM 1487. 1928. **Kattu Elam. Plate 4.13.5.**

Tall fleshy herbs to 4 m high. Leaves to 85 x 15 cm, oblong-lanceolate, base attenuate, apex acuminate, subcoriaceous, glabrous. Spike 9 x 7 cm, truncate; sterile outer bracts deep red; outer fertile bracts subtending a single flower; inner ones narrower, subtending short stalked concinna of up to 7 flowers; calyx 15 x 2 cm long, tubular; corolla tube 3 cm long, lobes 9 x 8 mm, broadly ovate, laterals narrower; labellum small, obovate, unequally 3 lobed; ovary to 4 mm long, triangular. Capsule 18 x 11 mm, elliptic, compressed, thin walled, smooth.

Fl. & Fr.: February-October.

Distr.: Sri Lanka and South India. Very rare; only once found growing along a streamside in a disturbed shola patch at an altitude of 1650 m. MS, Kovil Route, *KKK 18135.*

Notes: This species is so far not reported from Kerala state (Sabu, 1991) and thus forms a new record to Kerala.

HEDYCHIUM Koenig

in Retzius, Observ. Bot. 3: 61. 1783.

Hedychium flavescens Carey *ex* Rosc., Monandr. t. 50. 1825; Wight, Ic. t. 2008. 1853; Fischer in Gamble, FPM 1485. 1928; Matthew, Suppl. Ill. FPH t. 1154. 1998 & FPH 1276. 1999. *H. coronarium* Koenig var. *flavescens* (Rosc.) Baker in Hook. f., FBI 6: 226. 1892. *H. subdictum* Turril, Kew Bull. 370. 1914. *H. coronarium* Koenig var.

subdictum (Turril) Naik in Naik & Panigrahi, BBSI 3: 71. 1961. **Navakkutti, Kooku Vala. Plate 4.13.6.**

Tall herbs, to 3 m high. Leaves to 50 x 8 cm, oblong-lanceolate, acuminate, base tapering, glabrous above, densely pubescent below. Bracts broadly ovate, margin membranous, ciliate, subtending a cincinna of 3-4 flowers; calyx to 4.5 cm long, sparsely pubescent, tip slightly 3 toothed, unilaterally split about half; corolla tube to 6 cm, slender, lobes linear, unequal; labellum 4.5 x 3.5 cm, broadly obcordate, bilobed, clawed at the base; ovary 5 x 3 mm long, densely pubescent.

Fl.: Throughout the year

Distr.: North-East Asia and Sri Lanka. Common; along stream sides and shola borders at low altitudes. MS, K-3, *KKK 16467.*

Notes: The species closely resembles *H. coronarium* but differs in ciliate bracts; calyx longer than the bracts; staminodes and stamen longer than lip.

98. HAEMODORACEAE

1. Leaves linear-oblong, flat, ribbed; scape to 35 cm long; staminal filaments free ..... **Ophiopogon**
1. Leaves elliptic, plicate; scape < 15 cm long; staminal filaments united into a ring ..... **Peliosanthes**

OPHIOPOGON Ker-Gawler

Bot. Mag. t. 1063. 1807.

Ophiopogon intermedius D. Don, Prodr. 48. 1825; Hook. f., FBI 6: 209. 1892; Fischer in Gamble, FPM 1499. 1928; Fyson, FSIHS 600. t. 534. 1932; Matthew, FPH 1293. 1999. *O. indicus* Wight, Ic. t. 2050. 1853.

Densely tufted, scapigerous, perennial herbs; rootstock rhizomatous. Leaves clustered, to 40 x 0.7 cm, narrowed to the base into a petiole. Flowers 4-10; tepals 6, white with pink shades, 6 x 4 mm, oblong, obtuse; stamens 6; ovary 3-celled. Berry 7 mm across, globose, glabrous, blue; seeds 1-3, globose or trigonous.

Fl. & Fr.: August-March

Distr.: India. Commonly found in medium altitude sholas. MS, K-5, *KKK 16451.*

PELIOSANTHES Andrews

Bot. Repos. tt. 605, 634. 1808.

Peliosanthes courtallensis Wight, Ic. t. 2051. 1853; Hook. f., FBI 6: 266. 1892; Fischer in Gamble, FPM 1498. 1928; Matthew, Ill. FPH t. 732. 1996 & FPH 1293. 1999. *P. teta* Andr., Bot. Repos. 10: t. 605. 1810, subsp. *humilis* (Andr.) Jessop., Blumea 23: 155. 1976 & in Steenis, Fl. Males. I. 9: 299. 1979. *P. humilis* Andr., Bot. Rep. 634. 1811. *P. neilgherrensis* Wight, Ic. t. 2052. 1853; Hook. f., FBI 6: 266. 1892; Fischer in Gamble, FPM 1498. 1928.

Scapigerous perennial herbs; stem solitary or loosely tufted, erect or oblique, covered with roots. Leaves few, clustered, to 32 x 10 cm, elliptic, acute at either ends, plicate. Racemes to 20 cm long. Flowers purple, many, 6-8 mm across; tepals 6, oblong, connate at base; stamens 6; ovary 3-celled. Berry 8 x 8 mm, top-shaped, glabrous, bluish black; seeds 1-3, globose.

Fl. & Fr.: August-February

Distr.: Indo-Malesia. Common; in medium altitude sholas. MS, K-6, *KKK 31130.*

99. IRIDACEAE

ARISTEA W. Aiton

Hortus Kew 1: 67; 3: 506. 1789

Aristea ecklonii Baker, J. Linn. Soc. Bot. 16: 112. 1877; Matthew, Suppl. Ill. FPH t. 1185. 1998 & FPH 1332. 1999. *A. dichotoma* Ecklon in Sched. *ex* Klatt, Linnaea 34: 555. 1865-66, non Ker. *A. paniculata* Pax, Bot. Jahrb. 15: 151. 1892.

Herbs; rootstock woody. Leaves basal, to 50 x 1 cm, linear, arching, base reddish, apex acute. Flowers in clusters of 2-4 arranged in panicles; perianth 2 cm wide, blue; tube short, lobes 3+3, emarginated; outer 10 x 5 mm, oblong; inner 15 x 9 mm, ovate; stamens 3; ovary oblong. Capsule 2.5 cm, woody, sharply angled; seeds plenty.

Fl. & Fr.: January-March

Distr.: Tropical America and South Africa. Common along shola borders, grasslands and roadsides at high altitudes. ENP, Umaya Mala, *KKK 17508.*

100. AMARYLLIDACEAE

CRINUM Linnaeus

Sp. Pl. 291. 1753

Crinum latifolium L., Sp. Pl. 291. 1753; Wight, Ic. tt. 2019 & 2020. 1853; Hook. f., FBI 6: 283. 1892; Fischer in Gamble, FPM 1504. 1928; Matthew, FPH 1321. 1999. **Plate 4.13.7.**

Perennial herbs; rootstock bulbous, to 6 cm wide. Leaves to 35 x 4 cm, widely channelled, oblong, curved, acute, fleshy. Umbels stout, to 60 cm tall, thick. Flowers large, sessile, 12-16 together; spathe membranous; perianth tube 10 cm long, narrow, lobes 6, 8 x 3 cm, oblong, acute, pinkish white, spreading or deflexed; stamens 6; ovary 3-celled. Capsule oblong; seeds many.

Fl. & Fr.: June-August

Distr.: Tropical Asia and Africa. Rare; in exposed grassy regions and along roadsides at higher altitudes. PAS, Vandaravu, *KKK 18200.*

101. HYPOXIDACEAE

1. Leaves elliptic-lanceolate, plicate; flowers polygamous; capsule indehiscent.....**Curculigo**
1. Leaves linear, not plicate; flowers bisexual; capsule circumscissile near the apex.....**Molineria**

CURCULIGO Gaertner

Fruct. 1: 63, t. 16, f. 11. 1788.

Curculigo orchioides Gaertn., Fruct. 1: 63, t. 16, f. 11. 1788; Hook. f., FBI 6: 279. 1892; Fischer in Gamble, FPM 1502. 1928; Fyson, FSIHS 602. t. 536. 1932; Matthew, Suppl. Ill. FPH. t. 1166. 1998 & FPH 1304. 1999. *C. malabarica* Wight, Ic. t. 2043a. 1853. **Nilaippana (EBIS).**

Perennial herbs; rhizome to 15 cm long, oblong, vertical. Leaves radical, subsessile, to 15 x 1.5 cm, base sheathing, pilose. Racemes short, axillary. Flowers yellow; scape hidden among leaves underground; perianth 1.5 cm across, lobes 3+3, 6 mm, oblong, tube 3 cm long, narrow, sparsely pilose; stamens 6; ovary villous. Capsule to 2.5 cm long, ovoid; seeds 8, globose.

Fl. & Fr.: August-January

Distr.: Indo-Malesia. Common; in grasslands at high altitudes. MS, Conical Patch, *KKK* 16446; Idlimottai, *KKK 17598.*

MOLINERIA Colla

Mem. Reale Accad. Sci. Torino 31 (Hortus Ripul. App. 2): 331. 1826.

Molineria trichocarpa (Wight) Balakr., J. Bomb. Nat. Hist. Soc. 63: 330. 1966; Matthew, Suppl. Ill. FPH. t. 1166. 1998 & FPH 1304. 1999. *Hypoxis trichocarpa* Wight, Ic. t. 2045. 1853. *H. latifolia* Wight, Ic. t. 2044. 1853. *H. leptostachya* Wight, Ic. t. 2045. 1853. *H. pauciflora* Wight, Ic. t. 2046. 1853. *Molineria finlaysoniana* Baker, J. Linn. Soc. Bot. 17: 121. 1878; Gamble, FPM 1502. 1928. *Curculigo finlaysoniana* (Baker) Wall. *ex.* Hook. f., FBI 6: 279. 1892.

Densely tufted perennial herbs; stem short, tuberous, covered with leaf sheaths forming a bulb. Leaves radical, sessile, to 20 x 0.3 cm, acuminate, hairy, strongly nerved. Flowers solitary or paired on 10 cm long axillary peduncle; perianth yellow, lobes 3+3, 10 x 2.5 mm, lanceolate, free, hairy outside; stamens 6; ovary 3-celled, densely hispid. Capsule 8 x 2.5 mm; seeds 9-12, globose, brown.

Fl. & Fr.: Throughout the year

Distr.: Peninsular India and Sri Lanka. Occasional; in low altitude sholas. MS, Perumala, *KKK 18122.*

102. LILIACEAE

1. Climbing or subscandent shrubs ..... **Protasparagus**
1. Erect herbs **2**
2. Flowers more than 15 cm long ..... **Lilium**
2. Flowers less than 3 cm long **3**
3. Flowers in long racemes ..... **Chlorophytum**
3. Flowers solitary or in short cymes ..... **Disporum**

CHLOROPHYTUM Ker-Gawler

Bot. Mag. t. 1071. 1807.

Chlorophytum attenuatum (Wight) Baker, J. Linn. Soc. Bot. 15: 332. 1876; Hook. f., FBI 6: 335. 1892; Fischer in Gamble, FPM 1526. 1928; Fyson, FSIHS 609. 1932; Matthew, FPH 1312. 1999. *Phalangium attenuatum* Wight, Ic. t. 2037. 1853. **Plate 4.13.8.**

Tufted perennials. Leaves many, to 50 x 1 cm, linear-lanceolate, acuminate, glabrous, with a white patch along the midrib. Raceme terminal, to 30 cm long, slender, unbranched. Flowers densely packed; perianth lobes white, to 8 x 3 mm,

oblong, obtuse, spreading. Capsule to 7 x 7 mm, obovoid, obtusely 3-winged, glabrous: seeds many, orbicular, flat, black.

Fl. & Fr.: July-September

Distr.: Endemic to Western Ghats. Rare; in scrublands and shola borders high altitudes. MS, Gudalar road, *KKK 18597.*

DISPORUM Salisbury

Trans. Hort. Soc. 1: 332. 1812.

Disporum leschenaultianum D. Don, Proc. Linn. Soc. London 1: 45. 1839; Wight, Ic. t. 2048. 1853; Hook. f., FBI 6: 360. 1892; Fischer in Gamble, FPM 1522. 1928; Fyson, FSIHS 611. t. 546.1932; Matthew, Ill. FPH t. 731.1996 & FPH 1292.1999. *D. ceylanicum* Wight, Ic. t. 2049. 1853. *D. mysorense* Wight, Ic. t. 2049. 1853. **Plate 4.13.9.**

Erect dichotomously branched herbs. Leaves to 8 x 4 cm, ovate-lanceolate, base rounded or cordate, 3-5 ribbed, sessile. Umbels terminal, also axillary. Flowers white, 3-6 together; perianth lobes 3+3, free, 10 x 5 mm, obovate, acute; stamens 6, free; ovary 3-celled, ovoid. Berry, 7 x 7 mm, depressed-globose, 1-seeded.

Fl. & Fr.: Throughout the year

Distr.: Western Ghats and Sri Lanka. Occasional; along shola borders and grasslands at medium and high altitudes. MS, K-6, *KKK 16419.* ENP, Umaya mala, *KKK 17518.* PUS, *KKK 18583.*

LILIUM Linnaeus

Sp. Pl. 302. 1753.

Lilium neilgherrense Wight, Ic. tt. 2031 & 2032. 1853; Hook.f., FBI 6:350.1892; Fischer in Gamble, FPM 1523. 1928; Fyson, FSIHS 611. t. 545. 1932; Matthew, Ill. FPH t. 737. 1996 & FPH 1331. 1999. *L. wallichianum* Schult. & Schult. f. in L., Syst. Veg. 7(2): 1689. 1830, var. *neilgherrense* (Wight) Hara in Ohashi, Fl. East. Himal. 3: 132. 1975. **Thatha Poovu, Thazhamboo.**

Erect unbranched herbs; stem leafy, to 1.5 m high. Leaves to 10 x 2 cm, lanceolate, base attenuate, apex acute, glabrous. Umbels terminal. Flowers white, 1-3 together; perianth 20 cm long, campanulate; lobes 3+3, ovate, acute, base tubular; stamens 6; ovary oblong. Capsule 4 x 0.5 cm, oblong, 3-valved; seeds many, compressed.

Fl. & Fr.: August-December

Distr.: Endemic to Southern Western Ghats. Rare; in grasslands or scrublands at low and medium altitudes. MS, K-5, *KKK 16546.*

PROTASPARAGUS Obermeyer

in S. Afr. J. Bot., 2(3): 243. 1983, *nom. nov.*

1. Flowers solitary, clustered or umbelled, not racemed ..... **P. fysonii**
1. Flowers racemed ..... **P. racemosus**

Protasparagus fysonii (Macbr.) Kamble, J. Econ. Taxon. Bot. 15(3): 709. 1991. *Asparagus fysonii* Macbr., Contr. Gray. Herb., n. s. 56: 17. 1918; Fischer in Gamble,

FPM 1517. 1928; Matthew, Ill. FPH t. 733. 1996 & FPH 1295. 1999. *A. asiaticus* Wight, Ic. t. 2053. 1853, non L. 1753. *A. subulatus* Steud. *ex* Baker, J. Linn. Soc. Bot. 14: 614. 1875; Hook. f., FBI 6: 315. 1892; Fyson, FSIHS 608. t. 543. 1932.

Spines to 1 cm, axillary. Cladodes 2-7 together, to 0.8 cm, 3-angled, compressed, curved; branches angled. Flower clusters 2-4 cm long; tepals obovate, white; lobes 3+3; stamens 6. Berry 7 mm across, globose, smooth.

Fl. & Fr.: July-September

Distr.: Endemic to Southern Western Ghats. Occasional; along shola borders and roadsides at lower altitudes. MS, K-4, *KKK 31081.*

Protasparagus racemosus (Willd.) Oberm., S. Afr. J. Bot. 2: 244. 1983. *Asparagus racemosus* Willd., Sp. Pl. 2: 152. 1799; Wight, Ic. t. 2056. 1853; Hook. f., FBI 6: 316. 1892; Fischer in Gamble, FPM 1517. 1928; Matthew, FPH 1296. 1999. **Pilichaviri, Thaali Periyan.**

Roots tuberous; cladodes triquetrous, 3-6 together, stout, acuminate, spreading, 1 cm long; branchlets angled; spines strong, recurved. Racemes fascicled, branched, 2-4 cm; bracts small, ovate; tepals obovate, white. Berry 6 mm across, globose, smooth.

Fl. & Fr.: July-September

Distr.: Paleotropics. Occasional along shola borders and roadsides at lower altitudes. K-3, *KKK 16541.*

103. SMILACACEAE

SMILAX Linnaeus

Sp. Pl. 1028. 1753

1. Umbels sessile; leaves widely cordate at base ..... **S. aspera**
1. Umbels not sessile; leaves acute or round at base, not cordate ..... **S. wightii**

Smilax aspera L., Sp. Pl. 1028. 1753; Hook. f., FBI 6: 306. 1892; Fischer in Gamble, FPM 1518. 1928; Fyson, FSIHS 606. t. 538. 1932; Matthew, Suppl. Ill. FPH t. 1162. 1998 & FPH 1290. 1999. *S. maculata* Roxb., Fl. Ind. 3: 796. 1832; Wight, Ic. t. 2059. 1853. **Pomburi Kodi.**

Stout tendril climbers, stem ridged, prickles few, scattered. Leaves to 10 x 7 cm, ovate-deltoid, apex acuminate, coriaceous, 9-ribbed, glabrous, midrib and petiole shortly prickled. Flowers unisexual; perianth 3+3, free, to 4.5 x 2 mm; stamens 3+3; ovary oblong, 3 celled. Berry 1 cm across, globose.

Fl.: June-September

Distr.: India, Sri Lanka, South Europe and North Africa. Rare; in shola borders at high altitudes. MS, Idlimottai, *KKK 16416.*

Smilax wightii A. DC., Monogr. Phan. 1: 174. 1878; Hook. f., FBI 6: 310. 1892; Fischer in Gamble, FPM 1519. 1928; Fyson, FSIHS 607. t. 541. 1932. *S. zeylanica* Wight, Ic. tt. 2057-8, 1853. **Choora Mullu.**

Stout tendril climbers; branches terete, armed with prickles. Leaves to 15 x 13 cm, broadly ovate-obtuse, apex cuspidate, 5-7 ribbed. Peduncle to 10 cm long; umbels alternate, 2-3. Flowers many, unisexual; perianth 3+3, to 5 x 2 mm; stamens 3+3; ovary trigonous. Berry 7 x 7 mm, globose.

Fl. & Fr.: November-May

Distr.: Endemic to Southern Western Ghats. Occasional in shola borders at lower altitudes. MS, K-3, *KKK 16470.*

104. XYRIDACEAE

XYRIS Linnaeus

Sp. Pl. 42. 1753

Xyris capensis Thunb., var. **schoenoides** (Mart.) Nilsson, Ueber die Afrik. Arten Gattung. Xyris 3: 154. 1891; Matthew, FPH 1338. 1999. *Xyris schoenoides* Mart. in Wall., Pl. Asiat. Rar. 3: 30. 1832; Hook. f., FBI 6: 365. 1892; Fischer in Gamble FPM 1532. 1928; Fyson, FSIHS 613. t. 549. 1932.

Erect, scapigerous herb. Leaves basal, to 15 x 0.3 mm, ensiform, apex curved. Scape to 50 cm, ribbed, winged. Heads terminal, to 1 cm wide, obovoid. Flowers yellow, sepals 3, to 6 x 3 mm, ovate; petals 3, limb 6 x 5 mm, obovate, fimbriate; stamens 3, staminodes 3; ovary 1 celled. Capsule 4 mm, oblong; seeds ellipsoid.

Fl. & Fr.: Throughout the year.

Distr.: Indo-Malesia. Common; in grassland bogs or stream sides at high altitudes. MS, Idlimottai, *KKK 17592.*

105. COMMELINACEAE

1. Fertile stamens 3; staminodes 1-3 2
1. Fertile stamens 6; staminodes 0 ..... **Cyanotis**
2. Cymes 1-2, arising from a spathaceous bract ..... **Commelina**
2. Cymes panicled, not arising from a spathaceous bract ..... **Murdannia**

COMMELINA Linnaeus

Sp. Pl. 40. 1753.

1. Two cells of ovary 2-ovuled; third cell 1-ovuled or obsolete ..... **C. clavata**
1. All the 3 cells of ovary 1-ovuled ..... **C. paleata**

Commelina clavata Clarke, Comm. Cyrt. Bengal t. 5. 1874; Hook. f., FBI 6: 371. 1890; Fischer in Gamble, FPM 1539. 1928; Fyson, FSIHS 615. t. 551. 1932; Matthew, Ill. FPH t. 741. 1996 & FPH 1340. 1999. **Kalani.**

Erect or procumbent herbs; stem fleshy. Leaves to 5 x 1 cm, elliptic-lanceolate, base tapering, apex acuminate. Spathe to 2.5 cm, ovate-lanceolate, base cordate, apex attenuate. Flowers blue; sepals 3, to 6 mm, obovate to lanceolate; petals 3, median one 3 mm, diminutive, laterals 7 mm, ovate; claw 6 mm; stamens 3, staminodes 3. Capsule constricted in the middle; seeds oblong, reticulate.

Fl. & Fr.: July-December

Distr.: India, Sri Lanka and Java. Common along roadsides and stream sides at low altitudes. MS, K-3, *KKK 16092.*

Commelina paleata Hassk. in Miq., Pl. Jungh. 139. 1852; Hook. f., FBI 6: 372. 1890; Fischer in Gamble, FPM 1540. 1928; Matthew, Ill. FPH t. 744. 1996 & FPH 1343. 1999.

Erect or procumbent herbs; stem fleshy; persistent dry leaves present at base. Leaves 7 x 1 cm, lanceolate, base cuneate, apex acuminate. Spathe 3.5 x 2 cm, ovate-acuminate. Flowers blue or purplish; sepals 3, middle lobe lanceolate, laterals obovate; petals 3, to 5 mm, odd one lanceolate, laterals rounded; claw 3 mm; stamens 3, staminodes 3. Capsule 6 x 4 mm, oblong, apex pointed; seeds 3 mm.

Fl. & Fr.: July-December

Distr.: Peninsular India and Indonesia. Common along roadsides at low altitudes. MS, K-4, *KKK 16768.*

CYANOTIS D. Don

Prodr. Fl. Nepal. 45. 1825, *nom. cons.*

1. Branchlets cottony **2**
1. Branchlets otherwise **3**
2. Shoots purplish, to 50 cm, cottony; leaves to 20 cm long; cymes dense ..... **C. arachnoidea**
2. Shoots not purple, < 30 cm, flocossely silky; leaves < 6 cm long; cymes lax ..... **C. fasciculata**
3. Bracts leafy, twice as long as cymes ..... **C. cristata**
3. Bracts not leafy, not exceeding cymes **4**
4. Leaves cauline, silky villous below, drying black above; seeds rugose ..... **C. villosa**
4. Leaves cauline and radical, glabrous or pilose below, drying grey above; seeds pitted ..... **C. pilosa**

Cyanotis arachnoidea Clarke in DC., Monogr. Phan. 3: 250. 1881; Hook. f., FBI 6: 386. 1892; Fischer in Gamble, FPM 1550. 1931; Fyson, FSIHS 618. t. 556. 1932; Matthew, Ill. FPH t. 745. 1996 & FPH 1344. 1999. *C. pilosa* Wight, Ic. t. 2083. 1853, non Roem. & Schult.

Suberect herbs, densely white-cottony hairy. Leaves to 20 x 1.5 cm, ovate to linear-lanceolate. Cymes terminal; bracts ovate, acute; bracteoles curved, falcate, 10-25 pairs, to 6 x 1.5 mm. Flowers bluish-violet; sepals 6 x 1.5 mm, base united, densely hairy; corolla tube 7 mm long, lobes triangular, acute; ovary densely hairy at apex. Capsule 2.5 mm long, oblong, hairy; seeds transversally rugose, black.

Fl. & Fr.: July-December

Distr.: Peninsular India and Sri Lanka. Common; in exposed rocky regions at low altitudes. MS, K-3, *KKK 31015.*

Cyanotis cristata (L.) D. Don, Prodr. Fl. Nepal 46. 1825; Wight, Ic. t. 2085. 1853; Hook. f., FBI 6: 385. 1892; Fischer in Gamble, FPM 1549. 1931; Matthew, Ill. FPH t. 746. 1996 & FPH 1345. 1999. *Commelina cristata* L., Sp. Pl. 42. 1753.

Erect or decumbent herbs, pubescent. Leaves to 5 x 2 cm, ovate, base cordate, apex obtuse, margin ciliate, often reddish. Cymes 15-30 flowered, recurved; bracts ovate, acute; bracteoles falcate, margins ciliate. Flowers bluish-purple, sessile; sepals 4 mm, oblanceolate, keeled; corolla tube 11 mm, lobes obtuse. Capsule 3.5 mm long, glabrous with few apical hairs; seeds to 1.5 mm, striate, brownish black.

Fl. & Fr.: September-December

Distr.: Paleotropics. Common; in exposed regions at low altitudes. MS, Conical Patch, *KKK 16453.*

Cyanotis fasciculata (Heyne *ex* Roth) Schult. f., Syst. Veg. 7: 1152. 1830; Wight, Ic. t. 2086. 1853; Hook. f., FBI 6: 387. 1892; Fischer in Gamble, FPM 1550. 1931; Fyson, FSIHS 619. 1932; Matthew, Ill. FPH t. 747. 1996 & FPH 1346. 1999. *Tradescantia fasciculata* Heyne *ex* Roth., Nov. Pl. Sp. 189. 1821. *Cyanotis rosea* Wight, Ic. t. 2086. 1853. *C. decumbens* Wight, Ic. t. 2088. 1853, p.p.

Procumbent herbs, stems tufted, cottony. Leaves to 3 x 0.8 cm, lanceolate, falcate, folded, base rounded, long-hairy; sheath saccate. Cymes axillary, solitary; bracts lanceolate, acuminate; bracteoles 2-4 pairs, falcate, acute. Flowers few, blue or purplish, sessile; sepals 5 x 2 mm, base united, not keeled, hairy; corolla tube 6 mm long, campanulate, lobes obtuse. Capsule 2.5 mm long, pilose at apex.

Fl. & Fr.: August-October

Distr.: Peninsular India and Sri Lanka. Occasional; on rocky regions in grasslands or scrublands at low altitudes. MS, K-5, *KKK 16574.*

Cyanotis pilosa Schult. f., Syst. Veg. 7: 1152. 1830; Hook. f., FBI 6: 387. 1892; Fischer in Gamble, FPM 1549. 1931; Fyson, FSIHS 617. t. 555. 1932; Matthew, Ill. FPH t. 748. 1996 & FPH 1346. 1999. *C. wightii* Clarke in Hook. f., FBI 6: 386. 1892. *C. longifolia* Wight, Ic. t. 2084. 1853. **Kalani (EBIS).**

Procumbent herbs. Leaves to 10 x 2.5 cm, narrowly lanceolate or elliptic, base cuneate-subcordate, apex acuminate, glabrous above. Cymes subcorymbose. Flowers blue; bracts lanceolate; bracteoles to 7 pairs, lanceolate; calyx 7 mm, lobes pilose; corolla 12 mm, lobes ovate. Capsule to 5 mm; seeds pyramidal.

Fl. & Fr.: Throughout the year

Distr.: Peninsular India and Sri Lanka. Fairly common; along roadsides at medium altitudes. MS, K-5, *KKK 16152.*

Cyanotis villosa (Spreng.) Schult. f., in L. Syst. Veg. 7: 1155. 1830; Hook. f., FBI 6: 387. 1892; Fischer in Gamble, FPM 1540. 1931; Fyson, FSIHS 618. 1932; Matthew, Ill. FPH t. 750. 1996 & FPH 1347. 1999. *Tradescantia villosa* Spreng., Syst. Veg. 2: 116. 1825. *Cyanotis lanceolata* Wight, Ic. t. 2085. 1853.

Erect or procumbent herbs; stem terete, villous. Leaves to 8 x 2 cm, ovate, sessile, base cordate. Cymes terminal and upper axillary, sessile; bracts ovate-lanceolate, villous; bracteoles ovate, curved, margins ciliate. Flowers few; sepals 6-7 mm long, free, lanceolate, keel ciliate; corolla tube to 7 mm, lobes 4 mm, obtuse, blue with red glands. Capsule 2-3 mm long, hairy at apex; seeds paired.

Fl. & Fr.: September-January

Distr.: Peninsular India and Sri Lanka. Common; along roadsides at medium altitudes. MS, K-5.5, *KKK 17685.*

MURDANNIA Royle

Ill. Bot. Himalayan Mts. t. 95. 1839, *nom. cons.*

1. Leaves linear-lanceolate, > 8 mm wide; staminal filaments bearded ..... **M. dimorpha**
1. Leaves linear, < 3 mm wide; staminal filaments naked ..... **M. juncoides**

Murdannia dimorpha (Dalz.) Brueck. in Engl. & Prantl, Pflanzenf. (ed. 2) 15a: 173. 1930; Karthik. *et al.,* Fl. Ind. Enum. 28. 1989; Matthew, Ill. FPH t. 751. 1996 & FPH 1348. 1999. *Aneilema dimorphum* Dalz. in Hook.'s J. Bot. Kew Gard. Misc. 3: 138. 1851; Hook. f., FBI 6: 377. 1892; Fischer in Gamble, FPM 1545. 1931; Fyson, FSIHS 616. t. 553. 1932. *A. paniculata* Wight, Ic. t. 2075. 1853.

Erect annuals, to 30 cm tall, pubescent. Leaves to 8 x 0.7 cm, linear-lanceolate, base cordate, apex acute, glandular below, thinly pubescent above; sheath open, minutely hairy, pink. Cymes panicled, terminal. Flowers pale blue, 8-9 mm across; sepals 3 mm long, ovate, acute; petals 4 x 3 mm, obovate, glabrous; stamens 3. Capsule 6 x 3 mm, oblong, glabrous; seeds cubical, pitted.

Fl. & Fr.: July-October

Distr.: Peninsular India and Sri Lanka. Common; in grassland marshes and along stream sides at high altitudes. ENP, Amarachola, *KKK 18056.*

Murdannia juncoides (Wight) Rau & Kammathy in Bull. Bot. Surv. Ind. 6: 3. 1964. *Dichaespermum juncoides* Wight, Ic. t. 2078. 1853. *Aneilema paniculatum* Wall *ex* Clarke in DC., Monogr. Phan. 3: 218. 1881; Hook. f., FBI 6: 381. 1892; Fischer in Gamble, FPM 1546. 1931.

Erect, tufted, slender annuals. Leaves to 6 x 0.2 cm, linear, apex acuminate. Panicles terminal. Flowers blue, 4-5 mm across; sepals 2 mm, ovate; petals 2 mm, oblong; ovary globose. Capsule to 3 mm, 3 valved; seeds smooth.

Fl. & Fr.: September-December

Distr.: Endemic to Peninsular India. Common along stream sides growing on rocks. ENP, Nilagiri Teri, *KKK 18012.*

106. JUNCACEAE

JUNCUS Linnaeus

Sp. Pl. 325. 1753.

1. Leaves grass-like, flat, non-septate or absent; tepals clearly unequal 2
1. Leaves culm-like, terete, septate within; tepals equal 4
2. Cymes terminal; leaves prominent ..... **J. bufonius**
2. Cymes (pseudo)lateral; leaves reduced to sheaths 3
3. Basal sheaths dark brown; culms distinctly ribbed; tepals brownish; stamens 6 ..... **J. inflexus**
3. Basal sheaths dull-brown; culms not ribbed; tepals greenish to yellowish; stamens 3 ..... **J. effusus**

4. Stems to 1 m tall ..... **J. leschenaultii**
4. Stems < 20 cm tall ..... **J. sp. 1**

Juncus bufonius L., Sp. Pl. 466. 1753; Hook. f., FBI 6: 392. 1892, p.p.; Fischer in Gamble, FPM 1553. 1931; Fyson, FSIHS 621. t. 559. 1932; Matthew, Ill. FPH t. 755. 1996 & FPH 1352. 1999.

Tufted herbs; stems to 40 cm tall, terete, ridged, glabrous, greenish-brown. Leaves to 11 x 0.1 cm, linear, channeled above. Panicles 2-3 cm across, lateral, sessile, 3-6 cm below the apex of the stem. Flowers mostly paired, globose, shortly pedicelled; tepals 3+3, 2 mm long, oblong-lanceolate, yellow; stamens 6. Capsule 2.5 x 1.5 mm, ovoid, obtuse; seeds curved-ellipsoid, brown.

Fl. & Fr.: July-October

Distr.: Northern temperate regions. Common; along roadsides at medium and high altitudes; K-6.5, *KKK 16556.*

Juncus effusus L., Sp. Pl. 326. 1753; Hook. f., FBI 6: 392. 1892, p.p.; Matthew, Ill. FPH t. 756. 1996 & FPH 1353. 1999.

Tufted herbs; stems to 50 cm tall, terete, ridged, glabrous, bluish-green. Sheaths to 8 cm long, rounded, with a cauducous awn. Cymes solitary, to 3 x 2 cm. Flowers many, straw coloured; tepals 2 x 0.5 mm, narrowly ovate-elliptic, acute; stamens 3; ovary obovoid. Capsule to 0.3 x 0.2 cm, obovoid, trigonous; seeds oblong, brownish.

Fl. & Fr.: May-September

Distr.: India, Sri Lanka Europe, North Asia, Africa, America and Australia. Common; along roadsides at medium and high altitudes; K-7, *KKK 16724.*

Juncus inflexus L., Sp. Pl. 326. 1753; Matthew, Ill. FPH t. 757. 1996 & FPH 1353. 1999. *J. glaucus* Ehrh. *ex* Sibth., Fl. Oxon. 113. 1794; Hook. f., FBI 6: 393. 1892; Fischer in Gamble, FPM 1553. 1931; Fyson, FSIHS 620. t. 557. 1932.

Tufted herbs; stems to 70 cm tall, terete, ridged, green, glabrous. Sheaths to 10 cm, acute, stem clasping, with an apical 5 mm long awn. Cymes sessile to 3.5 cm across. Flowers many, to 3 mm long; tepals to 3 mm, narrowly ovate-lanceolate; stamens 6; ovary ovoid. Capsule 2.5 x 1.5 mm, ovoid, trigonous; seeds 1 x 0.5 mm, oblong, brownish.

Fl. & Fr.: July-February

Distr.: India, Sri Lanka, Europe, North Asia and North Africa. Common; in marshy areas of grasslands at high altitudes. Idlimottai, *KKK 16626.*

Juncus leschenaultii Gay in Laharpe, Essai Monogr. Jonc. 137. 1827 ; Matthew, Ill. FPH t. 758. 1996 & FPH 1354. 1999. *J. prismatocarpus* R. Br., Prodr. 259. 1810, var. *leschenaultii* (Gay) Buchenau in Engl., Bot. Jahrb. Syst. 6: 205. 1885 & Pflanzenr. 25: 180. 1906. *J. prismatocarpus* auct. non R. Br. 1810: Hook. f., FBI 6: 395. 1892. p.p.; Fischer in Gamble, FPM 1553. 1931; Fyson, FSIHS 620. t. 558. 1932.

Tufted herbs; stems to 1 m tall, terete, ridged, green, glabrous. Leaves to 25 cm, linear, hollow with occasional transverse septa; sheaths to 7 cm with 2 apical auricles.

Corymbs to 20 cm, terminal; heads, subsessile, 4-12 flowered. Flowers sessile; tepals reddish-brown, to 4.5 mm, oblong-lanceolate, acute; stamens 3; ovary ovoid. Capsule to 4.5 mm, oblong, trigonous, brownish; seeds yellowish.

Fl. & Fr.: May- September

Distr.: Indo-Malesia to New Zealand. Common in grass land bogs at low and medium altitudes. MS, Idlimottai Route, *KKK 16588*; Methappu, *KKK 16004*.

Juncus sp. 1

Tufted herbs; stems to 20 cm tall, terete, ridged, green, glabrous. Leaves to 10 cm, linear, hollow with occasional transverse septa; sheaths to 4 cm with 2 apical auricles. Corymbs terminal, to 10 cm long; heads subsessile, 6-10 flowered. Flowers sessile; tepals to 4.5 mm, linear, acute; stamens 3; ovary ovoid. Capsule to 4 mm, oblong, trigonous, brownish; seeds ellipsoid, yellowish.

Fl. & Fr.: May- September

Distr.: Common in grass land bogs at high altitudes. MS, Methappu, *KKK 16004*.

Note: The specimen resembles *J. prismatocarpus* R. Br. of Fyson in description and figure, but differs from *J. leschenaultii* of Matthew by its extremely smaller size (< 20 cm). According to Matthew, the true *J. prismatocarpus* R. Br. is a non-Asian plant. So the identity of this specimen has to be ascertained.

107. ARECACEAE (Palmae)

CALAMUS Linnaeus
Sp. Pl. 325. 1753.

Calamus gamblei Becc. *ex* Becc. & Hook. f. in Hook. f., FBI 6: 493. 1893; Fischer in Gamble, FPM 1568. 1931. **Chooral (EBIS).**

Clustering moderate sized cane; stems to 15 m; sheaths green, armed with bulbous based spines, knee present. Leaves to 1 m long, leaflets to 40 x 2 cm, lanceolate. Inflorescence flagellate, arising well above the mouth of the sheath. Partial inflorescence 5-6, to 90 cm long. Fruit 1.5 cm across, turbinate globose, slightly tapers at base; scales deeply channelled, pale yellow, shining.

Fl. & Fr.: December-April

Distr.: Endemic to Western Ghats. Occasional; found along stream sides at low and medium altitudes. MS, K-5, *KKK 17620*.

108. ARACEAE (Aroideae)

ARISAEMA Martius
Flora 14: 459. 1831

1. Leaves pedate compound, not digitate ..... **A. tortuosum**
1. Leaves palmate compound 2
2. Leaflets usually 5-7 3
2. Leaflets 7-17 4

3. All leaflets sessile including central leaflet ..... **A. murrayi**
3. Leaflets petiolulate, central one distinctly so ..... **A. barnesii**
4. Limb of spathe erect or suberect **5**
4. Limb of spathe recurved or hooded **6**
5. Appendix clavate, tip obtuse ..... **A. leschenaultii**
5. Appendix tapering, tip acute or globulate ..... **A. attenuatum**
6. Spathe cylindrical with a hooded limb ..... **A. psittacus**
6. Spathe broad with a recurved limb ..... **A. tuberculatum**

Arisaema attenuatum Barnes & Fischer, Bull. Misc. Inform. 1936: 275. 1936; Chatterjee, Bull. Bot. Soc. Bengal 8: 121. 1959. **Pambu Cholam.**

Tuberous herbs, dioecious; corms to 3 cm across, oblate. Leaf solitary, petiole slender, to 75 cm long, mottled; leaflets 6-12, to 20 x 5 cm, elliptic-lanceolate to oblanceolate, base tapering, apex acuminate. Tube of spathe cylindric, to 9 x 1.5 cm; limb elongate-lanceolate, to 6 cm long, long acuminate. Spadix to 9 cm, tip acute and curved at right angles and shortly exserted. Male inflorescence 3 cm long, flowers crowded near base; female inflorescence 1.5 cm long, ovaries subglobose.

Fl. & Fr.: February-March

Distr.: Endemic to Southern Western Ghats. Occasional; found in shola borders or scrublands. MS, Chengalar, *KKK 31016*. ENP, MPCA, *KKK 17526*.

Arisaema barnesii Fischer in Kew Bull. 1933: 342. 1933 & in Gamble, FPM 1891. 1936 ; Chatterjee, Bull. Bot. Soc. Bengal 8: 121. 1959.

Tuberous herbs, dioecious; corms to 2.5 cm across, subglobose; petiole to 50 cm, smooth; leaves radiate, membranous leaflets 5-7, 15 x 3 cm, elliptic-lanceolate, acuminate, base caudate. Tube of spathe cylindric, to 7.5 x 1.5 cm, limb horizontal, shorter than the tube, tapering into a filiform tail. Spadix 5-6 cm long, clavate at apex. Female infloresence to 7 cm long; ovaries subglobose.

Fl. & Fr.: March-August

Distr.: Endemic to Southern Western Ghats. Rare; found along shola borders at low altitudes. MS, Thalachorkadavu, *KKK 18157*.

Arisaema leschenaultii Blume, Rumph. 1: 93. 1836; Hook. f., FBI 6: 504. 1893; Fischer in Gamble, FPM 1585. 1931; Fyson FSIHS 623. t. 562. 1932; Chatterjee, Bull. Bot. Soc. Bengal 8: 127. 1959; Matthew, FPH 1369. 1999. *A. papillosum* Steud. *ex* Schott, Prodr. Syst. Aroid. 46. 1860. *A. huegelii* Schott, Prodr. Syst. Aroid. 44. 1860. *A. pulchrum* N. E. Br., J. Linn. Soc. Bot. 18: 252, t. 6. 1880; Hook. f., FBI 6: 505. 1893; Fischer in Gamble, FPM 1585. 1931. **Pambu Cholam. Plate 4.14.1.**

Tuberous herbs, dioecious; corm to 3.5 cm across, globose; petiole 25-60 cm long, smooth. Leaves radiate, leaflets 5-10, to 15 x 5 cm, elliptic-lanceolate, base caudate, apex acuminate. Spathe to 18 x 4 cm, broadly lanceolate; limb as long as the tube, broadly ovate, greenish with 5-6 purple streaks. Spadix to 10 cm long, clavate at apex. Male florets dark, sparse; female florets with sessile obovoid ovaries; appendix to 5 cm long. Fruit to 8 mm across, obovoid.

Fl. & Fr.: March-August

Distr.: Endemic to Southern Western Ghats. Common along roadsides and exposed regions at all altitudes. MS, Thalachorkadavu, *KKK 18156*; Idlimottai, *KKK 18182.*

Arisaema murrayi (Graham) Hook. in Bot. Mag. 74: t. 4388. 1848; Hook. f., FBI 6: 507. 1893; Fischer in Gamble, FPM 1585. 1931; Chatterjee, Bull. Bot. Soc. Bengal 8: 129. 1959. *Arum murrayi* Graham, Cat. Pl. Bombay 229. 1839. **Pambu Cholam.**

Tuberous herbs, usually monoecious; corm to 4 cm across, subglobose. Leaf digitate compound, lobes 5-8, to 17 x 6 cm, elliptic or ovate-lanceolate, base cuneate, apex acuminate; petiole sheathing, to 40 cm long. Spathe striate, to 10 cm long, base to 3 x 1.5 cm, tubular; limb 10 x 5 cm, green with white streaks, reddish along margins. Spadix 6 cm long; male florets above. Berry to 6 x 5 mm, obovoid.

Fl. & Fr.: May-October

Distr.: Endemic to Western Ghats. Rare; along shola borders at lower elevations. MS, Chengalar, *KKK 16702.*

Arisaema psittacus Barnes in Hook., Icon. Pl. ser. 5, 5: t. 3405. 1940; Chatterjee, Bull. Bot. Soc. Bengal 8: 131. 1959; Nair *et al.*, Rheedea 7(2): 101-106. 1997. **Pambu Cholam. Plate 4.14.2.**

Tuberous herbs, dioecious; corm to 3.5 cm across, subglobose; petiole to 65 cm long, green with purplish mottlings. Leaves digitate compound, leaflets 8-10, to 20 x 5 cm, elliptic-lanceolate, base cuneate, apex caudate-acuminate, dark green above, light and glossy below. Spathe to 18 x 4 cm, tip caudate acuminate, recurved, tube striped with green and white; limb hemispherical to 15 x 4 cm. Spadix 8 cm long; appendix to 5 cm. Male flowers purplish; female flowers deep green; ovaries ovoid.

Fl. & Fr.: May-September.

Distr.: Endemic to Southern Western Ghats. Very rare and threatened species found at medium altitudes. MS, Idlimottai, *KKK 18180.* PAS, Vandaravu, *KKK 18192.*

Note: According to Nair *et al.* (1997) the species was so far collected only from Mannavan Shola (type locality) and Chundavurrai, Idukki District, Kerala. Now the specimens could be collected from Pambadam Shola also.

Arisaema tortuosum (Wall.) Schott in Melet. Bot. 1: 17. 1832; Hook. f., FBI 6: 502. 1893; Fischer in Gamble, FPM 1584. 1931; Fyson FSIHS 622. t. 561. 1932; Chatterjee, Bull. Bot. Soc. Bengal 8: 136. 1959; Matthew, FPH 1370. 1999. *Arum tortuosum* Wall., Pl. Asiat. Rar. 2: 10, t. 114. 1830. *Arisaema tortuosum* var. *curvatum* (Roxb.) Engl., Pflanzenr. 4: 23. F: 191. 1920. *Arum curvatum* Roxb., Fl. Ind. 3: 506. 1832. *Arisaema curvatum* (Roxb.) Kunth, Enum. Pl. Zeyl. 3: 20. 1841. *A. tortuosum* (Wall.) Schott var. *neglectum* (Schott) Fischer in Gamble, FPM 1585. 1931. *A. neglectum* Schott in Bonplandia 7: 26. 1859; Hook. f., FBI 6: 504. 1893. **Plate 4.14.3.**

Tuberous herbs, monoecious or dioecious; corm to 3 cm wide, depressed globose. Leaves paired, pedatisect; leaflets 8-12, to 12 x 4 cm, oblanceolate, base acute, apex abruptly acuminate, sparsely hispid below; petiole to 35 cm long, 2-together. Spathe to 12 cm long, lanceolate, green; limb ovate, acuminate, with white and purple

streaks; tube 4-6 cm long. Spadix 12-20 cm long; appendix sigmoidally curved, appendage narrow. Male florets long stipitate; ovaries obovoid.

Fl. & Fr.: August-December

Distr.: Himalayas, South India and Sri Lanka. Rare; in grassland ecotones at high altitudes. ENP, Rajamala, *KKK 31087.*

Arisaema tuberculatum Fischer, Kew Bull. 1935: errata slip opposite p. 66, nom nov. 1935 & in Gamble, FPM 1890. 1936. *A. convolutum* Fischer, Kew Bull. 1934: 167. 1934, non Nakai, 1929.

Tuberous herbs, dioecious; corm to 6 cm wide, subdiscoid. Leaves digitate; leaflets 9-12, to 12 x 6 cm, narrowly oblanceolate, apex caudate acuminate; petiole to 55 cm. Spathe to 12 cm, narrowly funnel shaped; limb ovate, acuminate; tube 6 cm long; appendage to 14 cm, filiform. Spadix straight, to 6 cm long; appendix cylindric, terminated in a knob. Male florets scattered; ovaries crowded, subglobose.

Fl. & Fr.: May-September.

Distr.: Endemic to Southern Western Ghats. Rare; in grassland ecotones at high altitudes. ENP, Rajamala, *KKK 31022.*

109. ERIOCAULACEAE

ERIOCAULON Linnaeus

Sp. Pl. 87. 1753.

1. Heads > 1.5 cm wide; involucral bracts pubescent; male petals triangular-ligulate..... **E. brownianum**
1. Heads < 1 cm wide; involucral bracts glabrous; male petals not triangular-ligulate 2
2. One petal much enlarged in male florets and extruded beyond the floral bracts..... 3
2. All petals equal in male florets ..... **E. collinum**
3. Mouth of sheath clearly oblique; heads subglobose, straw coloured; receptacle pilose ..... **E. odoratum**
3. Mouth of sheath truncate; heads globose, black; receptacle glabrous..... **E. melaleucum**

Eriocaulon brownianum Mart. *ex* Wall., Pl. Asiat. Rar. 3: 25, t. 248. 1832; Hook. f., FBI 6: 576. 1893; Ansari & Balakr., Eriocaul. India. 27. 1994. *E. nilagirense* Steud., Syn. Pl. Glumac. 2: 271. 1855. *E. brownianum* var. *nilagirense* (Steud.) Fyson, J. Indian Bot. Soc. 2: 262. 1921 & FSIHS 627. t. 565. 1932; Fischer in Gamble, FPM 1619. 1931. **Valiya Button Poovu (EBIS) Plate 5.6.1.**

Perennial herbs, larger in size. Leaves to 60 x 2 cm, linear-lanceolate, flat or folded, base pubescent, widely sheathing. Peduncle to 1 m high; heads to 2 cm across, depressed globose, white; involucral bracts black, obovate; floral bracts spathulate-cuneate, acute, white-papillose hairy. Male sepals 3, obovate; petals 3, triangular-ligulate, glandular; stamens 3+3. Female sepals 3, free, boat-shaped, hairy; petals oblong, pilose, black glandular; seeds subglobose.

Fl. & Fr.: July-December

Distr.: India, Myanmar and Sri Lanka. Occasional; found in grassland bogs at high altitudes. MS, Idlimottai, *KKK 16624; KKK 16625.*

Eriocaulon collinum Hook. f., FBI 6: 584. 1893; Fyson, FSIHS 628. t. 566. 1932; Ansari & Balakr., Eriocaul. India. 43. 1994; Matthew, Suppl. Ill. FPH t. 1197. 1998 & FPH 1385. 1999. *E. christopheri* Fyson, Kew Bull. 1914: 330. 1914 & J. Indian Bot. Soc. 2: 206. 1921. *E. oliveri* Fyson, Kew Bull. 1914: 331. 1914 & J. Indian Bot. Soc. 2: 206. 1921. **Button Poovu (EBIS) Plate 5.6.2.**

Perennial herbs, smaller in size. Leaves to 6 x 0.4 cm, linear-lanceolate, apex acuminate, glabrous. Peduncle to 30 cm, glabrous; heads to 0.8 cm wide, subglobose, dark grey; involucral bracts black, obovate-orbicular; floral bracts cuneate, white-papillose hairy. Male sepals 3, obovate, blackish; petals 3, unequal, with an apical black gland; stamens 3+3. Female sepals 3, free, bat shaped, white papillose towards apex; petals 3, spathulate, pilose; seeds ellipsoid.

Fl. & Fr.: July-December

Distr.: Peninsular India. Common; in grassland bogs at high altitudes. MS, Idlimottai, *KKK 16621.*

Eriocaulon melaleucum Mart. in Wall., Pl. Asiat. Rar. 3: 29. 1832; Hook. f., FBI 6: 574. 1893; Fischer in Gamble, FPM 1619. 1928 ; Matthew, FPH 1396. 1999. *E. geoffreyi* Fyson, Kew Bull. 1914 : 330. 1914 & FSIHS 629. t. 567. 1932. *E. leucomelas* Steud., Nom. Bot. (ed. 2) 1: 585. 1840; Ansari & Balakr., Eriocaul. India. 174. 1994. **Button Poovu (EBIS).**

Perennial herbs, smaller in size. Leaves to 4 x 0.3 cm, linear-lanceolate, apex acuminate, recurved. Peduncle to 15 cm, glabrous; heads to 0.8 cm wide, subglobose, white; involucral bracts black; floral bracts obovate-cuspidate, black. Male sepals 3, black; petals subequal with large black glands, tube slender; female sepals boat shaped; petals oblanceolate with long white hairs.

Fl. & Fr.: July-December.

Distr.: Endemic to Southern Western Ghats. Occasional; in grassland bogs at high altitudes. MS, Idlimottai, *KKK 16623.*

Eriocaulon odoratum Dalz. in Hook.'s J. Bot. Kew Gard. Misc. 3: 280. 1851; Hook. f., FBI 5: 574. 1893; Fischer in Gamble, FPM 1618. 1931; Fyson, FSIHS 629. 1932; Ansari & Balakr., Eriocaul. India 43. 1994; Matthew, Suppl. Ill. FPH t. 1199. 1998 & FPH 1387. 1999. **Button Poovu (EBIS).**

Perennial herbs, smaller in size. Leaves to 10 x 0.3 cm, lanceolate, apex acute, glabrous. Peduncles to 45 cm long, glabrous; heads depressed globose; involucral bracts obovate, obtuse, hyaline; floral bracts deltoid, acuminate to a sharp point, sparsely or densely hairy. Male sepals united into a 3-lobed sheath, black, hairy; petals 3, unequal, white. Female sepals 3, ovate, concave, hairy along the keel; petals oblanceolate, hairy, white; seed oblong, appendages many.

Fl. & Fr.: July-December.

Distr.: Endemic to Southern Western Ghats. Common; in marshy places in grasslands at higher elevations. MS, Idlimottai, *KKK 16622.*

110. CYPERACEAE

1. Florets unisexual ..... **Carex**
1. Florets bisexual 2
2. Hypogynous bristles present; leaves reduced to sheaths 3
2. Hypogynous bristles absent; leaves developed with blades 4
3. Style base dilated and constricted above the ovary ..... **Eleocharis**
3. Style base not dilated and not constricted above the ovary ..... **Schoenoplectus**
4. Style-base dilated and constricted above the nut; glumes spiral (rarely distichous) ..... **Fimbristylis**
4. Style-base continuous with the nut; glumes distichous 5
5. Rachilla persistent 6
5. Rachilla deciduous 7
6. Nut trigonous; stigmas 3 ..... **Cyperus**
6. Nut biconvex; stigmas 2 ..... **Pycreus**
7. Keels of nut bearing glumes usually winged or serrulate; stigmas 2 ..... **Kyllinga**
7. Keels of nut bearing glumes not winged or serrulate; stigmas 3 ..... **Mariscus**

CAREX Linnaeus

Gen. Pl. ed. 1, 280. 1737

1. Terminal spikelets wholly male ..... **C. phacota**
1. Terminal spikelets wholly bisexual 2
2. Stigmas 2 3
2. Stigmas 3 5
3. Spikelets ovoid to subglobose ..... **C. nubigena**
3. Spikelets elongate, cylindric 4
4. Utricle elliptic, base narrowed, dark brown, hispid ..... **C. brunnea**
4. Utricle elliptic-lanceolate, base stipitate, pale brown, glabrous ..... **C. longicruris**
5. Male portion of spikelet equal to female ..... **C. myosurus**
5. Male portion of spikelets shorter than female 6
6. Spikelets at least 20 mm long ..... **C. baccans**
6. Spikelets always <15 mm long 7
7. Partial panicle ovoid or oblong; mouth of utricle distinctly bifid 8
7. Partial panicle pyramical; mouth of utricle entire, rounded or very shortly bifid ..... **C. filicina**
8. Rachis appressed-pubescent; partial panicles contracted; utricle obscurely ribbed 9
8. Rachis densely patent-hairy; partial panicles expanded; utricle strongly ribbed ..... **C. raphidocarpa**
9. Spikelets 0.6 to 1 cm long; utricles narrower ..... **C. lindleyana** var. **lindleyana**
9. Spikelets 1.25 to 1.75 cm long; utricles distant ..... **C. lindleyana** var. **major**

Carex baccans Nees *ex* Wight, Contrib. Bot. India 122. 1834; Clarke in Hook. f., FBI 6: 722. 1894; Fischer in Gamble, FPM 1687. 1931; Fyson, FSIHS 650. 1932; Matthew, Ill. FPH t. 760. 1996 & FPH 1397. 1999. **Cheru Korappullu.**

Perennials; culms to 100 cm high, triquetrous, stout. Leaves to 80 x 1 cm, long-attenuate, 3-costate. Panicles pyramidal. Spikelets to 5 x 0.8 cm, cylindrical; male portion 1 cm long; staminate glumes to 4.5 mm long; stamens 3; pistillate glumes 3.5

x 1.5 mm, deep red; utricle 3-4 mm long, beak 2-cleft. Nut 3 x 1.5 mm, ellipsoid, dark brown.

Fl. & Fr.: July-December

Distr.: Indo-Malesia and China. Common along shola borders and roadsides at medium and high altitudes. MS, K-5, *KKK 16165.*

Carex brunnea Thunb., Fl. Jap. 38. 1784; Clarke in Hook. f., FBI 6: 705. 1894; Fischer in Gamble, FPM 1686. 1931; Fyson, FSIHS 648. 1932; Matthew, Ill. FPH t. 761. 1996 & FPH 1398. 1999.

Perennials; culms tufted, to 90 cm high, triquetrous. Leaves to 75 x 0.5 cm, linear-elongate, 3-costate. Panicles pyramidal. Spikelets to 5 x 0.4 cm, narrowly cylindrical; female portion 3 cm long; staminate glumes to 4 mm long, ovate; stamens 3; pistillate glumes 3.5 x 1.5 mm, deep red; utricle 3-5 mm long, ovoid, beak 2-cleft, dark brown. Nut 25 x 1.5 mm, ovoid-oblong, straw coloured.

Fl. & Fr.: July-December

Distr.: Indo-Malesia and Australia. Common along roadsides at medium altitudes. MS, K-5, *KKK 16706.*

Carex filicina Nees in Wight, Contrib. 123. 1834; Clarke in Hook. f., FBI 6: 717. 1894; Fischer in Gamble, FPM 1686. 1931; Fyson, FSIHS 648. t. 581. 1932; Matthew, FPH 1399. 1999.

Perennials; culms to 120 cm tall, slender. Leaves to 60 x 0.8 cm, linear, scabrous; sheaths reddish. Panicles decompound, to 40 cm; partial panicles to 10 x 3 cm, pyramidal. Spikelets 1.5 cm long, linear-oblong; male portion 3-4 mm long, narrower; staminate glumes 3 x 1.5 mm, ovate-oblong; pistillate glumes 2 mm long, reddish brown; utricle 3.5 mm long, scabrid, beak deeply bifid. Nut 2 mm, ellipsoid, trigonous, straw coloured.

Fl. & Fr.: July-December

Distr.: South and South East Asia. Common along roadsides at lower and medium altitudes. MS, K-4.5, *KKK 16792.*

Carex lindleyana Nees in Wight, Contrib. 121. 1834, var. **lindleyana** Clarke in Hook. f., FBI 6: 721. 1894; Fischer in Gamble, FPM 1686. 1931. *C. thyrsiflora* Boott, Ill. Carex 1: 12, t. 34. 1858. *C. cruciata* sensu Thw., Enum. Pl. Zeyl. 355. 1864. **Korappullu. Plate 4.14.6.**

Perennials; culms to 100 cm tall, slender. Leaves to 70 x 1.5 cm, long-attenuate, minutely puberulous; sheaths purplish-brown. Panicles decompound, to 30 cm; partial panicles to 6 x 3 cm, ovoid. Spikelets to 1.5 x 0.4 cm, linear-oblong; staminate glumes 4 x 1.5 mm, lanceolate; pistillate glumes 2 mm long, reddish brown; utricles ellipsoid below, scabrid, beak deeply bifid. Nut 3.5 mm, oblong-elliptic, trigonous, brownish-yellow.

Fl. & Fr.: July- December

Distr.: South India and Sri Lanka. Common; in grasslands at high altitudes. MS, Idlimottai, *KKK 16441.*

Carex lindleyana Nees in Wight, Contrib. 121. 1834, var. **major** (Steud.) Fischer in Gamble, FPM 3: 1687. 1931; Matthew, Suppl. Ill. FPH t. 1205. 1998 & FPH 1402. 1999. *C. mercarensis* Hochst. *ex* Steud., Syn. Pl. Glumac. 2: 194. 1855, var. *major* Steud., Syn. Syn. Pl. Glumac. 2: 194. 1855; Clarke in Hook. f., FBI 6: 719. 1894.

Perennials; culms to 110 cm tall. Leaves to 80 x 1.5 cm, long-attenuate, minutely puberulous. Panicles to 30 cm; partial panicles to 6 x 3 cm, ovoid, condensed. Spikelets to 1.75 x 0.3 cm, linear-oblong; staminate glumes 4 x 1.5 mm, lanceolate; pistillate glumes 2 mm long, reddish brown; utricles distant, scabrous hairy, beak deeply bifid. Nut 3.5 mm, oblong-elliptic, trigonous, brownish-yellow.

Fl. & Fr.: July- December

Distr.: South India and Sri Lanka. Common; along roadsides at high altitudes. MS, K-7, *KKK 16554.*

Carex longicruris Nees in Wight, Contrib. 124. 1834; Clarke in Hook. f., FBI 6: 705. 1894; Fischer in Gamble, FPM 1686. 1931.

Tufted annuals; culms to 45 cm tall, obtusely triangular. Leaves mostly basal, to 35 x 0.5 cm, linear-lanceolate; sheath keeled. Panicle unbranched with two distant solitary spikelets; lower female, upper male, each 2.5 cm long. Staminate glumes 2.5 x 1.5 mm, oblong; stamens 3; pistillate glumes 5-10, to 3 x 2 mm, broadly ovate, keeled; utricles 4 x 1.5 mm, ellipsoid, shortly beaked, 2-fid at apex.

Fl. & Fr.: July- December

Distr.: India, China and Sri Lanka. Common; along roadsides at medium altitudes. MS, Coupe road, *KKK 16596*; K-5, *KKK 16706.*

Carex myosurus Nees in Wight, Contrib. 122. 1834; Clarke in Hook. f., FBI 6: 723. 1894; Fischer in Gamble, FPM 1687. 1931; Fyson, FSIHS 649. t. 582. 1932; Matthew, FPH 1403. 1999.

Perennials; culms to 90 cm tall. Leaves to 75 x 0.8 cm, linear-lanceolate, scabrid; sheath 15 cm long, brown. Panicle to 25 cm, scabrid. Spikelets solitary or paired at nodes, 5-7 cm long; male portion above, to 2.5 cm long. Staminate glumes 5 x 1.5 mm, oblong, aristate; stamens 3; pistillate glumes 3.5 x 2 mm, 1-nerved, aristate; utricle 3.5 x 1 mm. Nut 3 mm long, oblong-ellipsoid, dark brown.

Fl. & Fr.: July- December

Distr.: Indo-Malesia and China. Rare; found along shola borders and scrublands at low altitudes. MS, Conical patch, *KKK 16729.*

Carex nubigena D.Don, Trans. Linn. Soc. London 14: 326. 1824; Clarke in Hook. f., FBI 6: 702. 1894; Fischer in Gamble, FPM 1685. 1931; Fyson, FSIHS 647. t. 579. 1932; Matthew, Ill. FPH t. 766. 1996 & FPH 1404. 1999. *C. nubigena* D. Don var. *fallax* Clarke, J. Linn. Soc. Bot. 36: 301. 1904.

Perennials; culms to 65cm tall. Leaves to 60 x 0.4 cm, narrowly linear, scabrid; sheaths brown. Spikes to 3 cm, pyramidal to oblong, scabrid. Spikelets 5-12, ovoid to subglobose, sessile; male portion above. Staminate glumes 3.5 x 1.5 mm, ovate, acute, shortly awned; stamens 3; pistillate glumes 3-nerved; utricle 4 x 1 mm, ovoid, plano-convex, beak bifid. Nut 1.5 mm, suborbicular, pale brown.

Fl. & Fr.: July- December

Distr.: Afghanistan, India, Sri Lanka, China, Sumatra and Java. Common in grasslands at high altitudes. MS, Idlimottai, *KKK 16634*.

Carex phacota Spreng., Syst. Veg. 3: 826. 1826; Clarke in Hook. f., FBI 6: 708. 1894; Fischer in Gamble, FPM 1686. 1931; Fyson, FSIHS 648. t. 580. 1932; Matthew, FPH 1405. 1999.

Perennials; culms to 100 cm tall. Leaves to 80 x 0.5 cm, linear, attenuate; sheaths brownish. Spikes to 16 cm; spikelets 4-7, to 5 x 0.5 cm, linear-cylindric; terminal one male. Staminate glumes 3 x 1.5 mm, oblong, emarginate; stamens 3; pistillate glumes 2 x 1 mm, obovate, truncate at apex, aristate; utricle 3 x 1.5 mm, ovoid-elongate, puberulus, deep brown. Nut to 2 mm, pyriform, brownish.

Fl. & Fr.: October-February

Distr.: Indo-Malesia and Sri Lanka. Common in grassland bogs at high altitudes. MS, Idlimottai, *KKK 16030*; *KKK 16631*; *KKK 18176*.

Carex raphidocarpa Nees in Wight, Contr. Bot. India 122. 1834; Clarke in Hook. f., FBI 6: 719. 1894; Fischer in Gamble, FPM 1687. 1931; Matthew, FPH 1405. 1999.

Perennials; culms to 130 cm. Leaves to 75 x 1.3 cm, long attenuate, glabrous; sheaths brownish. Panicles pyramidal; spikelets to 2.5 x 0.5 cm, oblong, at right angles to rachis; male portion to 0.8 cm; staminate glumes to 4 x 1 mm; stamens 3; pistillate glumes 3 mm long; utricle ovate, ribbed, spreading. Nut 2 mm long, pyriform.

Fl. & Fr.: August-December

Distr.: Endemic to Southern Western Ghats. Occasional; along roadsides at medium altitudes. MS, K-5, *KKK 31082*.

CYPERUS Linnaeus

Sp. Pl. ed. 1, 1: 44. 1753.

Cyperus compressus L., Sp. Pl. 46. 1753; Clarke in Hook. f., FBI 6: 605. 1893; Fischer in Gamble, FPM 1640. 1931; Matthew, FPH 1409. 1999.

Annuals; culms to 40 cm tall, obtusely trigonous, slender. Leaves to 20 x 0.4 cm, linear, glabrous; sheaths reddish-brown. Spikes 5-10 cm across, broadly ovoid; spikelets 6-12, to 3 x 0.4 cm, oblong, 30-40 flowered, much compressed; rachis narrowly winged; glumes 4 x 2.5 mm, ovate, mucronate, keeled; stamens 3. Nut 1.5 x 1 mm, broadly ovoid, trigonous, dark brown, smooth.

Fl. & Fr.: Throughout the year

Distr.: Pantropical. Common; at low altitudes. MS, Thalachorkadavu, *KKK 16748*.

ELEOCHARIS R. Brown

Prodr. Fl. Nov. Holl. 224. 1810.

Eleocharis congesta D. Don, Prodr. Fl. Nepal. 41. 1825; Clarke in Hook. f., FBI 6: 630. 1893; Fischer in Gamble, FPM 1648. 1931; Clarke in Hook. f., FBI 6: 630. 1894; Fischer in Gamble, FPM 1648. 1931; Fyson, FSIHS 637. t. 574. 1932; Matthew, FPH 1417. 1999.

Tufted annuals; culms to 25 cm tall, slender, ribbed, smooth; sheaths tubular, mouth oblique with small appendage, red glandular. Spikelets to 6 x 3 mm, ovoid, 20-40-flowered; glumes 2 x 1 mm, acute, 1-nerved, upper margin reddish-pink, rest hyaline; bristles 6, 2 mm long, golden yellow; stamens 3. Nut 1.5 mm long, obovoid, 3-angled, yellowish green.

Fl. & Fr.: July-March

Distr.: Indo-Malesia. Common; in marshy areas at lower altitudes. MS, Conical patch. *KKK 16569.*

FIMBRISTYLIS Vahl

Enum. Pl. 2: 285. 1806, *nom. cons.*

1. Glumes distichous; stigmas 3 ..... **F. kingii**
1. Glumes spirally imbricated; stigmas 3 or 2 2
2. Stigmas 2; nut biconvexed; ligule present ..... **F. dichotoma** var. **villosa**
2. Stigmas 3; nut trigonous; ligule absent ..... **F. uliginosa**

Fimbristylis dichotoma (L.) Vahl., Enum. Pl. 2: 287. 1806, var. **villosa** Fischer in Gamble, FPM 1658. 1931.

Annual herbs; culms to 15 cm tall, densely tufted, angular, glabrous. Leaves basal, to 7 x 0.1 cm, flat, acuminate, scabrid. Inflorescence simple; spikelets solitary, to 5 mm, ovoid, many flowered; glumes to 3 mm, ovate, mucronate, reddish brown; stamens 3; style base villous hairy. Nut 1.2 mm, obovoid, biconvex, straw coloured.

Fl. & Fr.: July-December

Distr.: Tropical Asia and Australia. Common in grasslands at high altitudes. MS, Idlimottai, *KKK 16630.*

Fimbristylis kingii Gamble *ex* Boeck., Beitr. Cyper. 2: 40. 1890; Clarke in Hook. f., FBI 6: 633. 1894; Fischer in Gamble, FPM 1658. 1931; Fyson, FSIHS 638. t. 575. 1932; Matthew, FPH 1421. 1999.

Annual herbs; culms to 20 cm tall, densely tufted, glabrous. Leaves to 18 x 0.1 cm, flat, acute, hairy; sheaths membranous. Inflorescence simple; spikelets solitary, to 5 mm, ovoid, many flowered; glumes to 2 mm, ovate, mucronate, membranous, reddish brown; stamens 3. Nut 1 mm, obovoid, trigonous, straw coloured.

Fl. & Fr.: July-December

Distr.: Endemic to Southern Western Ghats. Common in grasslands at high altitudes. MS, Idlimottai, *KKK 16629.*

Fimbristylis uliginosa Hochst. *ex* Steud., Syn. Pl. Glumeac. 109. 1855; Clarke in Hook. f., FBI 6: 648. 1894; Fischer in Gamble, FPM 1660. 1931; Fyson, FSIHS 640. t. 576. 1932; Matthew, FPH 1423. 1999.

Perennial herbs; culms tufted, to 25 cm tall. Leaves clustered, basal, to 15 x 0.2 cm, narrowed from a broad base, scabrid. Inflorescence compound; spikelets 1-4, to 8 x 3 mm, ellipsoid-oblong, sessile; glumes spiral, 4 x 3 mm, ovate, mucronate, reddish-brown; stamens 3. Nut 1.5 x 1 mm, obovoid, trigonous, dark brown.

Fl. & Fr.: July-December

Distr.: Endemic to South India. Common in grasslands at high altitudes. MS, Idlimottai, *KKK 16628.*

KYLLINGA Rottboel

Descr. & Ic. Rar. Nov. Pl. 12. 1773, *nom. cons.*

Kyllinga nemoralis (J. R. Forst. & G. Forst.) Dandy *ex* Hutch. & Dalz., Fl. W. Trop. Africa 2: 486,487. 1936; Matthew, FPM 1426. 1999. *Thryocephalon nemoralis* J. R. Forst. & G. Forst., Char. Gen. Pl. 130. 1776. *Kyllinga monocephala* Rottb., Descr. Ic. 13. 1773; Clarke in Hook. f., FBI 6: 588. 1893; Fischer in Gamble, FPM 1624. 1931. *Cyperus kyllinga* Endl., Cat. Hort. Acad. Vindb. 1: 1842.

Perennial herbs; rhizomes long creeping; culms to 40 cm tall. Leaves 30 x 0.3 cm, flat, scabrid; sheaths reddish-brown. Spike solitary, to 1 cm, globose or ovoid; spikelets rarely 1-3, lateral, ovate-elliptic, 1-2 flowered; glumes 4, to 3 mm, narrowly linear; keel acute; stamens 3. Nut to 1.5 mm long, oblong to obovoid, biconvex, brownish.

Fl. & Fr.: July-October

Distr.: Pantropical. Common along roadsides at medium altitudes. MS, K-5, *KKK 16550.*

MARISCUS Vahl

Enum. Pl. 2: 372. 1806, *typ. cons.*

Mariscus paniceus (Rottb.) Vahl, Enum. Pl. 2: 373. 1806; Clarke in Hook. f., FBI 6: 620. 1893; Fischer in Gamble, FPM 1644. 1931; Matthew, FPH 1433. 1999. *Kyllinga panicea* Rottb., Descr. Ic. 15. 1773. *Cyperus paniceus* (Rottb.) Boeck., Linnaea 36: 381. 1870.

Perennial herbs; rhizomes creeping; culms to 40 cm tall, 3-angled, smooth. Leaves to 30 x 0.4 cm, long-acute, glabrous; sheaths pale brownish. Umbel simple; spikes 3-6, each 1.5 x 0.8 cm. Spikelets 4 x 0.6 mm, linear-lanceolate, terete; glumes 4, lower two glumes smaller; third glume 3 x 1.5 mm, ovate-lanceolate, fourth glume scaly; stamens 3. Nut 2.5 mm long, oblong, yellowish brown.

Fl. & Fr.: August-January

Distr.: Indo-Malesia. Common along roadsides at low altitudes. MS, K-3, *KKK 16782.*

PYCREUS P. Beauvois

Fl. d'Oware & Benin 2: 48, t. 86. 1807.

Pycreus flavidus (Retz.) Koyama, J. Jap. Bot. 51: 31. 1976; Matthew, FPH 1434. 1999. *Cyperus flavidus* Retz., Obs. Bot. 5: 13. 1788. *Pycreus flavidus* (Retz.) Koyama var. *nilagiricus* (Steud.) Karth., Fl. Ind. Enum. (Monocot.) 65. 1989. *Cyperus nilagiricus* Hochst. *ex* Steud., Syn. Pl. Glumac. 2 : 2. 1855. *Pycreus globosus* (All.) Reichb. f., Fl. Germ. Excurs. 140. 1830; Fischer in Gamble, FPM 1627. 1931; Fyson, FSIHS 634. tt. 570, 571. 1932. *Cyperus globosus* All., Fl. Pedem. Auct. 49: 1789. *Pycreus capillaris* (Koenig *ex* Roxb.) Nees *ex* Clarke in Hook. f., FBI 6: 591. 1893. *Cyperus capillaris* Koenig *ex* Roxb., Fl. Ind. 1: 194. 1832.

Annual herbs; culms tufted, to 45 cm, smooth. Leaves 40 x 0.2 cm, flat or channeled, acuminate; sheaths reddish-brown. Inflorescence to 7 cm, simple or subcompound. Spikes to 2.5 cm, ovoid or subglobose; spikelets 4-12, linear-oblong, compressed; glumes to 2.5 mm, ovate-oblong, chartaceous; keel greenish; stamens 2. Nut to 1 mm, ellipsoid or obovoid, biconvex, dark brown.

Fl. & Fr.: July-December

Distr.: South Europe, Africa and Central and South Asia. Common along roadsides at low altitudes. MS, K-4, *KKK 16537.*

SCHOENOPLECTUS (Reichenbach) Palla

Sitzber. Zool. Bot. Ges. Wein 38: 49. 1888, *nom. cons.*

Schoenoplectus mucronatus (L.) Palla, Bot. Jahrb. Syst. 10: 299. 1889; Matthew, FPH 1438. 1999. *Scirpus mucronatus* L., Sp. Pl. 50. 1753; Clarke in Hook. f., FBI 6: 657. 1893; Fischer in Gamble, FPM 1666. 1931; Fyson, FSIHS 642. t. 577. 1932. *S. triangulatus* Roxb., Fl. Ind. 1: 219. 1820.

Perennial herbs; culms densely tufted, to 90 cm tall, subterete, spongy below; sheaths 3-4, upper one cylindrical, pale greenish, lower brownish. Spikelets to 1 x 0.6 cm, ovoid-oblong, 10-25, in a pseudolateral head below the stem tip; glumes 4 x 3 mm, obovate, shortly mucronate, pale brown; stamens 2-3. Nut 2 x 1.7 mm, obovoid, biconvex, base cuneate, apiculate, dark brown.

Fl. & Fr.: Throughout the year

Distr.: Eurasia, from Central and South Europe east to Japan. Common in water logged areas of grasslands at low altitudes. MS, Chengalar Dam, *KKK 16703.*

111. POACEAE

1. Culms woody, arborescent; leaf blade articulating with leaf-sheath 2
1. Culms not woody; herbs; leaf blade not articulating with leaf-sheath 3
2. Culm sheaths persistent; inflorescence simple; stamens 3, filaments free ..... **Arundinaria**
2. Culm sheaths deciduous; inflorescence compound; stamens 6, filaments united.. **Pseudoxytenanthera**
3. Spikelets 1-many flowered 4
3. Spikelets strictly 2-flowered 13
4. Spikelets containing 1 bisexual floret 5
4. Spikelets containing 2 or more bisexual florets ..... **Isachne**
5. Ligule membranous; lowest floret of a spikelet male or barren 6
5. Ligule split into fine cilia; lowest floret of a spikelet bisexual 8
6. Spikelets with only 1 barren floret below bisexual one ..... **Poa**
6. Spikelets with two male or barren florets below bisexual one 7
7. Spikelets 1-flowered ..... **Agrostis**
7. Spikelets 2-several flowered 8
8. Glumes or at least the upper one enclosing the florets ..... **Anthoxanthum**
8. Glumes not enclosing the florets ..... **Helictotrichon**
9. Spikelets disarticulating above glumes, laterally compressed 10
9. Spikelets falling entire, subterete 12

10. Lemma concealing palea ..... **Zenkeria**
10. Lemma not concealing palea **11**
11. Lemmas entire, awnless ..... **Eragrostis**
11. Lemmas 2-dentate, awned ..... **Tripogon**
12. Spikelets 2-flowered; upper lemma scaberulous **13**
12. Spikelets 1-flowered; upper lemma glabrous ..... **Garnotia**
13. Panicles much contracted, spiciform; base of leaves amplexicaule ..... **Jansenella**
13. Panicles lax or slightly contracted; base of leaves not cordate or amplexicaule ..... **Arundinella**
14. Upper lemma usually not awned; spikelets solitary, rarely paired **15**
14. Upper lemma often geniculately awned; spikelets paired, one sessile and the other pedicelled **18**
15. Spikelets not subtended by bristles, nor raceme-rachis prolonged into a subulate point **16**
15. Spikelets subtended by one or more bristles or raceme-rachis prolonged into a subulate point... **Setaria**
16. Lemma of upper floret with decurrent wings or scars at base ..... **Panicum**
16. Lemma of upper floret without basal wings or scars **17**
17. Inflorescence an open panicle; spikelets thickly covered with long silky hairs ..... **Rhynchelytrum**
17. Inflorescence of racemes arranged on a central axis; spikelets not as above ..... **Oplismenus**
18. Pedicelled spikelets similar to sessile ones in shape, both fertile **19**
18. Pedicelled spikelets differing from sessile, in shape and sex **20**
19. Culms erect; spikelets villous; lower glume not grooved ..... **Eulalia**
19. Culms rambling; spikelets glabrous; lower glume with a median groove ..... **Microstegium**
20. Lower glume flattened abaxially and keeled **21**
20. Lower glume rounded abaxially, not keeled **23**
21. Lower glume depressed or grooved between keels, not winged at apex ..... **Cymbopogon**
21. Lower glume not as above, winged at apex **22**
22. Racemes 1-noded, enclosed by a spathe ..... **Apluda**
22. Racemes many nodded, not enclosed by spathes ..... **Ischaemum**
23. Pedicelled spikelets without callus; awn of upper lemma glabrous **24**
23. Pedicelled spikelets with prominent callus; awn of upper lemma pubescent ..... **Themeda**
24. Spikelets dorsally compressed, paired or solitary ..... **Sorghum**
24. Spikelets laterally compressed, in three's ..... **Chrysopogon**

ANTHOXANTHUM Linnaeus

Sp. Pl. 28. 1753.

Anthoxanthum borii S. K. Jain & D. C. Pal, J. Bombay Nat. Hist. Soc. 72: 92. 1975; Matthew, Ill. FPH t. 781. 1996 & 1465. 1999. *A. hookeri* auct. non (Griseb.) Rendle: Fischer in Gamble, FPM 1846. 1934. *A.* sp. Bor, Grass. India 431-432. 1960.

Perennials; culms tufted, branched, to 1 m tall. Leaves to 30 x 0.8 cm, sparsely hairy. Panicles to 15 cm, contracted. Spikelets to 7 mm, oblong-lanceolate; lower glume to 5 mm, ovate-lanceolate, upper 7 mm, ovate-acuminate, 3-veined, keeled; sterile lemma 6 mm, brown-ciliate, awned; awn to 6 mm; fertile lemma 3 mm, shortly aristate; palea 2 mm. Grain elliptic-ovoid, laterally compressed.

Fl. & Fr.: September-February

Distr.: Endemic to Western Ghats. Common in grasslands at high altitudes. ENP, Way to hut, *KKK 17571.*

APLUDA Linnaeus

Sp. Pl. 82. 1753

Apluda mutica L., Sp. Pl. 82. 1753; Fischer in Gamble, FPM 1750. 1934; Bor, Grass. Burma, Ceylon, India & Pakistan 93.1960; Sreekumar & Nair, Fl. Kerala Grass. 32. 1991; Matthew, FPH 1585. 1999. *A. varia* Hack. in DC., Monogr. Phan. 6:197. 1889; Hook. f., FBI 7: 150. 1896.

Perennials; culms to 1.5 m tall. Leaves to 30 x 1 cm, linear-lanceolate. Panicle to 30 cm, lax. Spikelets 3 in a cluster; one sessile and two pedicelled; sessile spikelets 7 x 3 mm, oblong; glumes subequal, 5 x 1 mm, elliptic-ovate; lower lemma 5 x 1 mm, oblong, 3-nerved, paleate; upper lemma 4 x 1.5 mm, 2-cleft and awned; awn 10-15 mm long; palea oblong, 2-keeled, hyaline; stamens 3; ovary oblong. Grain to 2 mm, ellipsoid.

Fl. & Fr.: August-December

Distr.: India, South East Asia and Australia. Common in grasslands and other open areas at lower altitudes. MS, Kulachivayal, *KKK 16666.*

ARUNDINARIA Michx.

Fl. Bor. Amer. 1: 73. 1803

Notes: Munro (1868) described two species of *Arundinaria* from South India (*A. densifolia* and *A. walkeriana)* following the generic concept of Michaux (1803). Later two more species were described (*A. wightiana & A. floribunda*). All are high altitude plants usually found in grasslands or sholas above 1500 m altitude. Gamble (1896) and later workers followed Munro's concept. While revising *Arundinaria* of South East Asia and Africa, Chao and Renvoize (1989) transferred all the South Indian species to the genus *Sinarundinaria,* which was described by Nakai (1935) based on the vegetative structures. Later Seethalakshmi and Kumar (1998) also followed this generic concept. However, the genus *Sinarundinaria* became invalid when the type species flowered and it turned out to be *Fargesia.* Majumdar (1989) on the other hand transferred all the South Indian *Arundinaria* species to the genus *Yushania,* following Keng's (1957) generic concept. However, this concept is not widely accepted. Therefore, we are retaining *Arundinaria* and placed the three species under it.

1. Ovary with 3 plumose stigmatic lobes ..... **A. walkeriana**
1. Ovary with 2 plumose stigmatic lobes **2**
2. Spikelets with one fertile floret; palea with a sulcus ..... **A. densifolia**
2. Spikelets with more than one fertile floret; palea without sulcus ..... **A. floribunda**

Arundinaria densifolia Munro, Trans. Linn. Soc. London 26: 32. 1868; Gamble, Ann. Roy. Bot. Gard. Calcutta 7: 8, t. 7. 1896 & in Hook. f., FBI 7: 379. 1897; Fischer in Gamble, FPM 1857. 1934. *Chimonobambusa densifolia* (Munro) Nakai, J. Arnold Arbor. 6: 151. 1925. *Sinarundinaria densifolia* (Munro) Chao & Renv., Kew Bull. 44: 354. 1989; Seethalakshmi & M. Kumar, Bamb. India Comp. 264. 1998. *Yushania densifolia* (Munro) Majumdar in Karthikeyan *et al.*, Fl. Ind. Enum. Monocotyl. 282. 1989. **Plate 4.14.5. & 8.**

Shrubby bamboo; culms to 1 m tall and 1 cm dia., densely clumped; lateral branches 2-3; culm sheath striate, hirsute with small pointed auricles. Leaves 5-10 on each lateral branch, to 7 x 0.8 cm, lanceolate, entire, base rounded, apex sharply acuminate, glabrous. Racemes dense, in leafy branchlets. Spikelets 1 cm long, 10-15 together; glumes purplish; lower glume ovate, attenuate into a small awn; upper glume triangular, 7-nerved; lemma 8-10 mm long, ovate-lanceolate.

Fl. & Fr.: November-May.

Distr.: Endemic to Southern Western Ghats. Rare; found along stream sides and rock cliffs at high altitudes only. ENP, Bhiman Odai, *KKK 18041*; Anaimudi, *KKK 31020*; *SS & MR 20605*.

Notes: Only the vegetative specimens of this species could be collected earlier from Eravikulam National Park, and were misidentified as *Sinarundinaria microphylla* (which is actually a Bhutan endemic) following the vegetative identification keys of Munro and Gamble (Kumar & Kumar, 1999). Later flowering specimens were reported from the same location (Kumar *et al*, 2000), and were treated under *S. microphylla* itself. But recent rivisionary studies on the bamboos of India (at Kerala Forest Research Institute) have led to the final conclusion that the specimens belongs to *S. densifolia,* which is a rare Southern Western Ghats endemic species and also the shortest bamboo so far reported from India (Remesh, *pers. comm.*). However, it is ironical to note that the same workers have treated the specimens under *S. microphylla* as evidenced from the latest publications (Kumar, 2002). Since the genus *Sinarundinaria* itself has become invalid and so far there are no other reliable publications on this issue, here the specimen was treated as *Arundinaria densifolia* to avoid further complication.

Arundinaria floribunda Thw., Enum. Pl. Zeyl. 475. 1864; Munro in Trans. Linn. Soc. London 26: 20. 1868; Gamble, Ann. Roy. Bot. Gard. Calcutta 7: 5, t. 3. 1896 & in Hook. f., FBI 7: 377. 1897. *Sinarundinaria floribunda* (Thwaites) Chao & Renv., Kew Bull. 44: 356. 1989; Seethalakshmi & M. Kumar, Bamb. India Comp. 270. 1998. **Eeta. Plate 4.14.7.**

Shrubby bamboo; culms to 2 m tall and 1.2 cm dia.; node swollen; culm sheath striate, sparsely hirsute, deciduous when old. Leaves to 11 x 1.6 cm, lanceolate, base attenuate, apex acuminate, glabrous, margins scabrous. Panicles large; spikelets 5-8 flowered, purple, hirsute; sterile glumes 2, outer to 0.3 cm long, ovate, glabrous; inner to 0.5 cm long, ovate-lanceolate, glabrous; lemma 0.5-0.6 cm long, lanceolate, mucronate, scabrous; palea glabrous, 2 keeled and with 2 broad wings, sulcate between keels; ovary glabrous, globose. Grains linear-oblong.

Fl. & Fr.: June-October

Distr.: Sri Lanka and Western Ghats. Common at stream sides and ecotones at lower and medium altitudes. MS, K-3, *KKK 16401*.

Arundinaria walkeriana Munro, Trans. Linn. Soc. London 26: 21. 1868; Gamble, Ann. Roy. Bot. Gard. Calcutta 7: 3. 1896 & in Hook. f., FBI 7: 377, t.1. 1897; Fischer in Gamble, FPM 1857. 1934. *Sinarundinaria walkeriana* (Munro) Chao & Renv., Kew

Bull. 44. 354. 1989; Seethalakshmi & M. Kumar, Bamb. India Comp. 287. 1998; Matthew, FPH 1448. 1999. *Yushania walkeriana* (Munro) Majumdar in Karthikeyan *et al.*, Fl. Ind. Enum. Monocotyl. 282. 1989. **Eeta.**

Shrubby bamboo; culms hollow, to 8 m tall and 3.5 cm across; lateral branches densely clustered; culm sheath linear-lanceolate, ribbed, ciliate. Leaves 10-20 on lateral branches, to 20 x 3.5 cm, ovate-oblong, apex pointed, margins scabrous. Panicles large, spreading, to 30 cm long, glabrous. Spikelets to 20 mm long, purplish, solitary; glumes 2, unequal, lower shorter, 5.5 mm long, ovate-lanceolate, upper 6.5 mm long. Flowers 4 or 5; lowest flower bisexual and large; upper ones aborted; lower lemma 7 mm long, ovate, apiculate; palea shorter.

Fl. & Fr.: March-June

Distr.: Southern Western Ghats and Sri Lanka. Rare; along stream sides at high altitudes. ENP, Anaimudi slope, *KKK 31083.*

ARUNDINELLA Raddi

Agrost. Brass. 36, t. 1, f. 3. 1823.

Arundinella vaginata Bor, J. Bot. Ind. Bot. Soc. 27: 66. 1948; Matthew, Suppl. Ill. FPH t. 1216. 1998 & FPH 1560. 1999. *A. villosa* sensu Fischer in Gamble, FPM 1801. 1934. *A. villosa* Arn. *ex* Steud. var. *heynei* Hook. f., FBI 7: 73. 1896; Fischer in Gamble, FPM 1801. 1934; Sreekumar & Nair, Fl. Kerala Grass. 335. 1991. **Chonappullu.**

Perennials; culms tufted, to 70 cm, densely villous below panicles. Leaves to 40 x 0.8 cm, linear, recurved, pubescent. Panicles to 25 cm, axis villous. Spikelets to 7 mm, paired; lower glumes to 6 mm, elliptic, aristate, 3-5 nerved; upper glume to 7 mm, elliptic, acute, 5 veined; lower lemma to 6 mm, elliptic; palea to 4 mm, lanceolate; upper lemma 4 mm, elliptic-oblong, 2 lobed, awn to 5 mm, twisted.

Fl. & Fr.: July-December

Distr.: Endemic to South India. Common in grasslands at high altitudes. MS, Idlimottai, *KKK 16635.*

CHRYSOPOGON Trinius

Fund. Agrost. 187. 1820, *nom.cons.*

Chrysopogon nodulibarbis (Steud.) Henrard, Blumea 4: 543. 1941; Clayton in Dassan., Rev. Handb. Fl. Ceylon 8: 120. 1994. *Andropogon nodulibarbis* Steud., Syn. Pl. Glum. 1: 396. 1854. *Andropogon zeylanicus* Nees ex Steud., Syn. Pl. Glum. 1: 397. 1854; Hook. f., FBI 7: 192. 1896. *Chrysopogon zeylanicus* (Nees ex Steud.) Thw., Enum. Pl. Zeyl. 366. 1864; Fyson, FSIHS 667. t. 595. 1932; Fischer in Gamble, FPM 1739. 1934; Sreekumar & Nair, Fl. Kerala Grass. 65. 1991; Matthew, Ill. FPH t. 799. 1996 & FPH 1579. 1999.

Perennials; culms densely tufted, to 1 m tall. Leaves to 45 x 1 cm, tubercled, hairy, margins scabrid. Panicles to 15 cm, lax, branches spreading, purple and green coloured; rachis slender. Sessile spikelets to 1 cm, narrowly oblong, bearded on margins; lower glume 6 mm, linear; upper glume linear, 2 toothed at apex; awn to 6

mm, scabrid; lower lemma oblong, ciliate; upper lemma narrowly linear, apex 2 toothed; awn to 3 cm; palea absent.

Fl. & Fr.: July-December

Distr.: South India and Sri Lanka. Common along roadsides at low altitudes. MS, K-3, *KKK 16490*; Conical patch, *KKK 16568*; Idlimottai route, *KKK 16587*.

CYMBOPOGON Sprengel

Pl. Pugill. 2: 14. 1815.

1. Pedicel of lowest pedicelled spikelets not swollen; panicle flexuous ..... **C. flexuosus**
1. Pedicel of lowest pedicelled spikelets swollen; panicle effuse ..... **C. travancoricus**

Cymbopogon flexuosus (Nees *ex* Steud.) Wats., Atk. Gaz. N. W. Prov. Ind. 392. 1882; Fischer in Gamble, FPM 1756. 1934; Sreekumar & Nair, Fl. Kerala Grass. 71. 1991; Matthew, Ill. FPH t. 803. 1996 & FPH 1592. 1999. *Andropogon flexuosus* Nees *ex* Steud., Syn. Pl. Glum. 1: 388. 1854. *A. nardus* L. var. *flexuosus* (Nees *ex* Steud.) Hack. in DC., Monogr. Phan. 6: 603. 1889; Hook. f., FBI 7: 207. 1896. **Inchipullu, Teruvapullu, Vevvapullu (EBIS).**

Perennials; culms to 2 m tall, robust; nodes glabrous. Leaves to 65 x 1.5 cm, linear-lanceolate, scabrid, glaucous. Panicles to 60 cm long, lax, reddish with drooping racemes. Sessile spikelets 4 x 1 mm, lanceolate; lower glume 4 x 1 mm, oblong; upper glume ovate-oblong, apex winged, margins infolded; lower lemma hyaline, 3 mm long; upper lemma with filiform lobes; awn 10 mm. Pedicelled spikelets 4 mm long, lanceolate.

Fl. & Fr.: July-November.

Distr.: India and South East Asia. Common in open grasslands and roadsides at lower altitudes. MS, K-3, *KKK 16491*.

Cymbopogon travancorensis Bor, J. Bombay Nat. Hist. Soc. 52: 174. 1954; Sreekumar & Nair, Fl. Kerala Grass. 74. 1991; Matthew, Ill. FPH t. 806. 1996 & FPH 1594. 1999. **Kattuvevvapullu.**

Perennials; culms to 2 m tall, robust, loosely tufted. Leaves to 70 x 2 cm, linear, margins scabrid. Panicle to 60 cm long, lax, leaves intermixed with partial panicles. Sessile spikelets to 4 mm long, oblong; lower glume 3.5 x 1.2 mm, oblong, 4-nerved, 2-keeled, margins incurved; upper glume boat shaped, 1-nerved; lower lemma hyaline, 3 mm long, oblong; upper lemma 3 x 0.5 mm; awn to 9 mm. Pedicelled spikelets 3 mm long, elliptic; pedicels hairy along the margins.

Fl. & Fr.: October-January.

Distr.: Endemic to Southern Western Ghats (Kerala). Occasional; in low altitude grasslands. MS, Kulachivayal, *KKK 16676*.

ERAGROSTIS N. M. Wolf

Gen. Pl. 23. 1776.

1. Ligule a row of hairs ..... **E. tef**
1. Ligule a rim only or a membrane **2**

2. Spikelets grey or black... 3
2. Spikelets purplish black... **E. unioloides**
3. Pedicels with glandular bands; spikelets serrate by gapping of lemmas... **E. tenuifolia**
3. Pedicels without glandular bands; spikelets not serrate... **E. nigra**

Eragrostis nigra Nees *ex* Steud., Syn. Pl. Glum. 1: 267. 1854; Hook. f., FBI 7: 324. 1896; Fischer in Gamble, FPM 1827. 1934; Sreekumar & Nair, Fl. Kerala Grass. 384. 1991; Fyson, FSIHS 678. t. 606. 1932; Matthew, FPH 1491. 1999.

Tufted perennials; culms to 50 cm tall. Leaves to 20 x 0.5 cm, linear; sheath slightly keeled, ciliate towards the mouth. Panicles to 30 cm long, ovate, lax. Spikelets to 8 flowered, pedicelled, to 5 x 3 mm, oblong, black; glumes similar, 2.2 x 0.5 mm, 1-nerved, keeled; lemma 2.2 x 1 mm, ovate, acute, 3-nerved; palea 2 x 1 mm, oblong, curved, keels smooth. Grain to 8 mm, oblong.

Fl. & Fr.: July-December

Distr.: India, China and Sri Lanka. Common found at low altitude grasslands. MS, K-4, *KKK 16521.*

Eragrostis tef (Zucc.) Trotter, Bull. Soc. Bot. Ital. 62. 1918; Sreekumar & Nair, Fl. Kerala Grass. 388. 1991. *Poa tef* Zucc., Diss. Ist. Pianta Panizz. Abiss. 1774.

Annuals; culms to 40 cm tall, sub-erect, loosely tufted. Leaves to 20 x 0.5 cm, linear, base rounded, glabrous. Panicles to 8 cm long, effuse; branches filiform, axils of branches with long hairs. Spikelets 2 x 1 mm, solitary, pedicelled, black; glumes similar, 1 x 0.5 mm, ovate, acute, keeled; florets 3-5; lemmas 1.2 x 0.5 mm, ovate; palea 0.7 mm long, ciliate along the keels.

Fl. & Fr.: August-December

Distr.: Native of Ethiopia, now spread to Tropical countries. Rare; along roadsides at high altitudes. MS, K-7, *KKK 16557.*

Eragrostis tenuifolia (A. Rich.) Hochst. *ex* Steud., Syn. Pl. Glum. 1: 268. 1854; Hook. f., FBI 7: 322. 1896; Fischer in Gamble, FPM 1827. 1934; Fyson, FSIHS 677. t. 605. 1932; Sreekumar & Nair, Fl. Kerala Grass. 391. 1991; Matthew, FPH 1492. 1999. *Poa tenuifolia* A. Rich., Tent. Fl. Abyss. 2: 425. 1851.

Annuals or perennials; culms tufted, to 60 cm tall, erect. Leaves to 25 x 0.8 cm, linear; base rounded. Panicles to 20 cm long, effuse, glabrous. Spikelets to 12 mm long, linear-oblong, serrate; glumes similar, ovate-lanceolate, 1-nerved; florets 10-18, all bisexual; lemmas 2 x 1.5 mm, broadly ovate, mucronate, greyish black; palea curved, truncate at apex, persistent. Grain to 1.5 mm, oblong.

Fl. & Fr.: July-November

Distr.: South India and Tropical Africa. Common along roadsides and stream sides at low altitudes. MS, K-4, *KKK 16521.*

Eragrostis unioloides (Retz.) Nees *ex* Steud., Syn. Pl. Glum. 1: 264. 1854; Fischer in Gamble, FPM 1826. 1934; Sreekumar & Nair, Fl. Kerala Grass. 392. 1991; Matthew,

FPH 1494.1999. *Poa unioloides* Retz., Obs. Bot. 5: 19. 1789. *Eragrostis amabilis* auct. non Wight & Arn. *ex* Nees, 1838: Hook. f., FBI 7: 317. 1896. **Karayampullu.**

Annuals or perennials; culms to 40 cm tall, tufted. Leaves to 15 x 0.5 cm, linear. Panicles to 25 cm long, very lax, effuse, glabrous. Spikelets to 17 x 4 mm, ovate to oblong; glumes subequal, to 2 x 0.5 mm, ovate-lanceolate; florets 20-40, similar; lemmas 2 x 1.5 mm, ovate, acute; palea 2 mm, curved, keel scabrid; stamens 3. Grain to 8 mm, elliptic-oblong.

Fl. & Fr.: June-November

Distr.: South East Asia, India and Africa. Common in marshy grasslands at low altitudes. MS, K-3, *KKK 16405.*

EULALIA Kunth

Revis. Gram. 1: 160. 1829.

Eulalia phaeothrix (Hack.) O. Ktze., Rev. Gen. Pl. 2: 775. 1891; Fischer in Gamble, FPM 1715. 1934; Sreekumar and Nair, Fl. Kerala Grass. 103. 1991; Matthew, Ill. FPH t. 829. 1996 & FPH 1564. 1999. *Pollinia phaeothrix* Hack. in DC., Monogr. Phan. 6: 168. 1819; Hook. f., FBI 7: 112. 1896; Fyson, FSIHS 663. t. 592. 1932. **Plate 4.14.4.**

Perennials; culms to 1.5 m tall, base brownish red tomentose, nodes hairy. Leaves to 40 x 0.8 cm, linear-lanceolate, densely hairy above. Racemes 2-6, to 15 cm long, golden-brown hairy, sessile. Spikelets paired; sessile spikelets to 5 mm, elliptic-oblong, densely villous; lower glume 4.5 mm, oblong, margins involute; upper glume ovate-oblong; lower lemma 4.5 mm, oblong; upper lemma linear, awned, awn to 15 mm long. Pedicelled spikelets to 4.5 mm long, awned or not.

Fl. & Fr.: August-February

Distr.: South India and Sri Lanka. Common in grasslands at medium and high altitudes. MS, K-3, *KKK 16767*; Idlimottai, *KKK 16627.*

GARNOTIA Brongniart

in Duperrey, Voy. Coq. Bot. Phan. 2: 132, t. 21. 1832.

Garnotia tenella (Arn. *ex* Miq.) Janowski, Fedde. Repert Sp. Nov. 17: 86. 1921; Sreekumar & Nair, Fl. Kerala Grass. 413. 1991; Matthew, FPH 1562.1999. *Berghausia tenella* Arn. *ex* Miq. in Verh. Kon. Ned. Inst. III, 4: 34. 1851. *Garnotia stricta* auct. non Brongn., 1832: Hook. f., FBI 7: 243. 1896; Fischer in Gamble, FPM 1812. 1934.

Annuals or perennials; culms 10-50 cm high, tufted, reddish brown, nodes bearded. Leaves to 18 x 0.6 cm, lanceolate, margins scabrid; sheath rounded. Panicles to 30 cm long, effuse, branches angled. Spikelets 3.5 x 1 mm, lanceolate, glabrous; glumes subequal, 3-3.5 x 1 mm, aristate, 3-nerved; lemma 2.5 x 1 mm, lanceolate, 3-nerved; palea 2 x 0.5 mm, hyaline; stamens 3.

Fl. & Fr.: November-February

Distr.: South East Asia. Common along shola borders at low and medium altitudes. MS, Puthur, *KKK 16074.*

HELICTOTRICHON Besser *ex* J. A. Schultes *et* J. H. Schultes

Mant. 3: 526 ("326"). 1827.

Helictotrichon virescens (Nees *ex* Steud.) Henr., Blumea 3: 425. 1940; Matthew, Suppl. Ill. FPH t. 1221. 1998 & FPH 1464. 1999. *Trisetum virescens* Nees *ex* Steud., Syn. Pl. Glumac. 1: 226. 1854. *Helictotrichon asperum* (Munro *ex* Thwaites) Bor, Indian For. Rec. 1: Bot. 68. 1938. *Avena aspera* Munro *ex* Thwaites, Enum. Pl Zeyl. 372. 1864. *Avenastrum asperum* (Thwaites) Fischer in Gamble, FPM 1802. 1934.

Perennials; culms tufted, erect, to 1 m. Leaves to 25 x 1 cm, linear, glabrous. Panicles to 40 cm, oblong, nodding. Spikelets to 12 mm, ovate-oblong; lower glume to 7 mm, lanceolate, 1-3 veined, keel scabrid below; upper glume to 9 mm, ovate-lanceolate, 5 veined; lower lemma to 10 mm, ovate-lanceolate, scaberulous; awn to 20 mm; palea to 8 mm, 2-keeled, ciliate.

Fl. & Fr.: August-December

Distr.: India and Sri Lanka. Common at low altitudes. MS, Dam side, *KKK 16523*; Chengalar, *KKK 16527*.

ISACHNE R. Brown

Prodr. 196. 1810.

1. Florets equal in size and texture; perennials..... **I. walkeri**
1. Florets unequal, the lower one twice as long as upper; annuals..... **I. bourneorum**

Isachne bourneorum Fischer, Kew Bull. 1932: 324. 1932 & in Gamble, FPM 1796. 1934; Sreekumar & Nair, Fl. Kerala Grass. 4172. 1991; Matthew, Ill. FPH t. 838. 1996 & FPH 1553. 1999.

Culms to 70 cm tall, geniculate or trailing; nodes bearded. Leaves to 5 x 1 cm, lanceolate, base rounded, margins thickened, serrulate and glabrous. Panicle to 15 cm long, branches angled, serrulate. Spikelets 4 mm long, lanceolate; glumes unequal, 4 x 1 mm, ovate, acuminate, sparsely bulbous based hairy; lower floret empty; upper bisexual; lower lemma 3 x 1.5 mm, ovate, hyaline, epaleate; upper lemma 1 mm across, ovate-orbicular, pubescent; palea 1 x 1 mm; stamens 3.

Fl. & Fr.: July-September

Distr.: Endemic to Southern Western Ghats. Common along roadsides at low altitudes. MS, K-4, *KKK 16517*.

Isachne walkeri (Arn. *ex* Steud.) Wight & Arn. *ex* Thw., Enum. Pl. Zeyl. 361. 1864; Hook. f., FBI 7: 26. 1896; Fischer in Gamble, FPM 1797. 1934; Sreekumar & Nair, Fl. Kerala Grass. 426. 1991. *Panicum walkeri* Arn. *ex* Steud., Syn. Pl. Glum. 1: 97. 1854.

Culms trailing or erect, to 1.2 m tall, robust; nodes glabrous, rooting from lower ones. Leaves to 25 x 2.5 cm, lanceolate, subcoriaceous, glabrous; margins cartilaginous. Panicle very lax; branches with glandular bands. Spikelets 3-4 mm long, pedicelled, ovate, acute; glumes equal, 3 x 1 mm, ovate, obtuse, glabrous; lemmas 3 x 1.5 mm, ovate, coriaceous; palea 3 x 1 mm; stamens 3; ovary elliptic.

Fl. & Fr.: September-February

Distr.: South India and Sri Lanka. Common at low and medium altitudes. MS, Chengalar, *KKK 16540*; K-7, *KKK 18138*.

ISCHAEMUM Linnaeus

Sp. Pl. 1049. 1753.

Ischaemum indicum (Houtt.) Merr., J. Arnold Arbor. 19: 320. 1938. var. **indicum** subvar. **villosum** (Nees) Bor, Grass. Burma, Ceylon, India & Pakistan 180. 1960; Sreekumar & Nair, Fl. Kerala Grass. 138. 1991; Matthew, FPH 1586. 1999. *Spodiopogon villosum* Nees in Hook. et Arn., Bot. Beech. Voy. 242. 1838. *Ischaemum ciliare* Retz. var. *villosum* (Nees) Hack. in DC., Monogr. Phan. 6: 227. 1889; Hook. f., FBI 7: 134. 1896.

Perennials; culms to 70 cm high; nodes bearded. Leaves 15 x 1 cm, lanceolate, acuminate, thickly pubescent. Racemes purple, to 8 cm long; sessile. Spikelets 4-5 mm long; lower glume 2-winged at apex, glabrous; upper glume narrowly winged along the keel; lower lemma oblong, 1-nerved; upper lemma hyaline; awn 5-9 mm long. Pedicelled spikelets 4 x 2 mm, ovate-lanceolate, similar to lower spikelets.

Fl. & Fr.: July-December.

Distr.: Peninsular India and Sri Lanka. Common along shola borders and roadsides at high altitudes. MS, Idlimottai, *KKK 16585*; *KKK 16633*.

JANSENELLA N. L. Bor

Kew Bull. 10: 96. 1955.

Jansenella griffithiana (C. Muell.) Bor, Kew Bull. 1955: 98. 1955; Sreekumar & Nair, Fl. Kerala Grass. 348. 1991. *Danthonia griffithiana* C. Muell., Bot. Zeitung 2. 14: 347. 1856. *Arundinella avenacea* Munro *ex* Thw., Enum. Pl. Zeyl. 362. 1864; Hook. f., FBI 7: 69. 1896; Fischer in Gamble, FPM 1801. 1934.

Tufted annuals; culms to 30 cm tall, rooting from the lower nodes. Leaves to 7 x 0.7 cm, lanceolate. Heads 2-3 cm long, oblong, congested. Spikelets dense, 5-7 mm long; lower glume 4 x 1 mm, lanceolate, keeled, 3-nerved; upper glume 6.5 x 1 mm, acuminate; florets 2, lower empty, upper bisexual; lower lemma elliptic, cuspidate, 3-nerved; palea oblong, obtuse; upper lemma 3.5 mm long, oblong, densely ciliate; awn 9 mm long; palea oblanceolate, 2-keeled; stamens 3. Grain oblong.

Fl. & Fr.: September-December.

Distr.: India and Sri Lanka. Occasional; found in grassland ecotones and streamsides at high altitudes. ENP, Mampallam Chola, *KKK 18069*.

MICROSTEGIUM Nees

in Lindley, Nat. Syst. ed. 2, 447. 1836.

1. Racemes 3-6, spreading at right angles on rachis; stamens 2 ..... **M. nudum**
1. Racemes 2-10, not spreading at right angles on rachis; stamens 3 ..... **M. ciliatum**

Microstegium ciliatum (Trin.) A. Camus, Ann. Soc. Linn. Lyon 68: 201. 1921; Fischer in Gamble, FPM 1716. 1934; Sreekumar & Nair, Fl. Kerala Grass. 172. 1991; Matthew, Ill. FPH t. 847. 1996 & 1567. 1999. *Pollinia ciliata* Trin., Mem. Acad. Sci. St.-Petersb. ser. 6, 2: 306. 1834; Hook. f., FBI 7: 116. 1896.

Annuals; culms 80 cm tall; nodes glabrous. Leaves 10 x 1.2 cm, lanceolate, aristate, glabrous. Racemes slender, 6-7 cm long. Spikelets similar, to 5 x 1 mm, paired, one pedicelled and one sessile; lower glume 4 x 1 mm, elliptic, shortly 2-cleft at apex, glabrous; upper glume 4 x 1 mm, boat-shaped, acuminate, 4-nerved; lower floret absent; upper bisexual; upper lemma suborbicular; awn 5-6 mm long; palea 0.5 mm long, hyaline; ovary elliptic, glabrous.

Fl. & Fr.: June-December

Distr.: India and Burma. Common along roadsides at low altitudes. MS, K-3, *KKK 16403.*

Microstegium nudum (Trin.) A. Camus, Ann. Soc. Linn. Lyon 68: 201. 1921; Fischer in Gamble, FPM 1716. 1934; Sreekumar & Nair, Fl. Kerala Grass. 174. 1991; Matthew, FPH 1567. 1999. *Pollinia nuda* Trin., Bull. Acad. Sci. Petersb. ser. 6, 2: 307. 1832; Hook. f., FBI 7: 117. 1896.

Annuals; culms to 70 cm; nodes glabrous. Leaves to 9 x 0.8 cm, sparsely hairy. Racemes to 6 cm, linear. Spikelets to 4 mm, linear-lanceolate; lower glume to 4 mm, linear-lanceolate, 2-keeled; upper glume to 4 mm, deltoid-lanceolate, 1-keeled; lower lemma to 3 mm, lanceolate, epaleate; upper lemma to 2 mm, linear, 1-vieed; awn to 12 mm; palea chartaceous.

Fl. & Fr.: June-December

Distr.: India, China, Japan and South Africa. Common along roadsides at lower altitudes. MS, K-4, *KKK 16516.*

OPLISMENUS P. Beauvois

Fl. Oware 2: 14, t. 68, f. 1. 1809, *nom. cons.*

1. Perennials; culms to 100 cm tall; panicles to 30 cm; awns needle like ..... **O. compositus**
1. Annuals; culms < 50 cm tall; panicles < 10 cm; awns capillary ..... **O. burmannii**

Oplismenus burmannii (Retz.) P. Beauv., Ess. Agrost. 54. 168. 1812; Hook. f., FBI 7: 68. 1896; Fischer in Gamble, FPM 1778. 1934; Sreekumar & Nair, Fl. Kerala Grass. 256. 1991; Matthew, FPH 1522. 1999. *Panicum burmannii* Retz., Obs. Bot. 3: 10. 1783.

Culms rooting from lower nodes. Leaves to 5 x 1 cm, elliptic. Racemes to 2 cm long, distant or close. Spikelets to 3 mm long; glumes subequal, keeled upwards; lemmas dissimilar

awns capillary, minutely scaberulous, to 1 cm long. Grain oblong.

Fl. & Fr.: July-December

Distr.: Pantropical. Common along roadsides at lower altitudes. MS, K-4, *KKK 16515.*

Oplismenus compositus (L.) P. Beauv., Ess. Agrost. 54. 168. 1812; Hook. f., FBI 7: 66. 1896; Fyson, FSIHS 659. 1932; Fischer in Gamble, FPM 1778. 1934; Sreekumar & Nair, Fl. Kerala Grass. 257. 1991; Matthew, FPH 1522. 1999. *Panicum compositum* L., Sp. Pl. 57. 1753.

Culms erect or trailing, rooting from lower nodes. Leaves to 16 x 2.5 cm, elliptic, base cuneate, covered with bulbous based hairs. Racemes 5-10, to 6 cm long; rachis

triquetrous. Spikelets 4 mm long; lower glume 2 x 1 mm, awned; awn 4 mm long; upper glume 3 x 1.5 mm, 7-nerved, awnless; lower lemma 3 x 2.5 mm, awnless; palea oblong; upper lemma 3 x 0.5 mm, lanceolate, 3-nerved; palea 3 x 0.5 mm, hyaline. Grain to 1 mm, ellipsoid.

Fl. & Fr.: September-February

Distr.: Pantropical. Common along roadsides at medium altitudes. MS, K-5.5, *KKK 16163.*

PANICUM Linnaeus

Sp. Pl. 55. 1753.

Panicum gardneri Thw., Enum. Pl. Zeyl. 359. 1864; Fischer in Gamble, FPM 1783. 1934; Sreekumar & Nair, Fl. Kerala Grass. 264. 1991; Matthew, Ill. FPH t. 852. 1996 & FPH 1524. 1999. *Isachne gardneri* (Thw.) Benth. in Benth & Hook. f., Gen. Pl. 3: 100. 1883; Hook. f., FBI 7: 26. 1896. **Kolapullu.**

Perennials; culms to 1 m tall, rooting from lower nodes. Leaves to 15 x 2.5 cm, lanceolate, base rounded, glabrous. Panicles to 16 cm, obovate-oblong, lax, glabrous. Spikelets to 5.5 mm long, pubescent; lower glume 2.5 x 1 mm, ovate-lanceolate, 1-nerved; upper glume 4 x 1.5 mm, ovate, 7-nerved; lower floret empty; lower lemma 3.5 x 1.5 mm, 7-9 nerved; palea oblong; upper lemma 2.5 x 1.5 mm, ovate, concave; palea 2.5 x 1 mm, ovate, margins recurved.

Fl. & Fr.: September-February

Distr.: South India and Sri Lanka. Common along roadsides at medium altitudes. MS, K-5.5, *KKK 16166.*

POA Linnaeus

Sp. Pl. 67. 1753.

Poa annua L., Sp. Pl. 68. 1753; Hook. f., FBI 7: 345. 1896; Fyson, FSIHS 679. t. 609. 1932; Fischer in Gamble, FPM 1850. 1934; Sreekumar & Nair, Fl. Kerala Grass. 406. 1991; Matthew, FPH 1459.1999.

Annuals; culms to 20 cm tall, tufted; nodes pilose. Leaves to 8 x 0.3 cm, base rounded. Panicles terminal, to 6 x 2 cm, ovate, contracted; branches filiform, glabrous. Spikelets similar, 5-6 mm long, ovoid, glabrous; lower glume 2 x 0.5 mm, ovate-lanceolate, 1-nerved; upper glume 2.5 x 1 mm, elliptic, 3-nerved; florets 2-5, similar; upper florets exerted; lemmas 3 x 1 mm, ovate-lanceolate, 5-nerved; palea 3 x 0.75 mm, lanceolate, 2-nerved; stamens 3; ovary oblong. Grain 1.5 mm, terete.

Fl. & Fr.: September-February

Distr.: Cosmopolitan. Occasional; in high altitude scrublands and ecotones. MS, K-7, *KKK 16799*; Idlimottai, *KKK 16018.*

PSEUDOXYTENANTHERA Soderstrom & Ellis

Smithsonian Contr. Botany 72: 52. 1988.

Pseudoxytenanthera monadelpha (Thw.) Soderstrom & Ellis, Smiths. Contrib. Bot. 72: 52. 1988; Matthew, FPH 1452. 1999. *Dendrocalamus monadelphus* Thw., Enum.

Pl. Zeyl. 376. 1864. *Oxytenanthera thwaitesii* Munro, Trans. Linn. Soc. London 26: 129. 1868; Gamble in Hook. f., FBI 7: 402. 1896. *O. monadelpha* (Thw.) Alston in Trim., Suppl. Handb. Fl. Ceylon 6: 342. 1931; Fischer in Gamble, FPM 1861. 1934. **Kaattu Mula.**

Straggling bamboo; culms to 15 x 3 m, scandent, smooth; sheaths to 15 x 7 cm, brown hairy below; blade to 10 x 1.5 cm, ovate, glabrous, base rounded with thick ring of callus and strong bristles. Leaves to 40 x 5 cm, petiolate; sheath glabrous. Spikelets to 1.2 cm long, lanceolate, compressed; glumes 2; lower larger, acute, glabrous; florets 3; lower lemmas sterile, lanceolate, epaleate; upper most one fertile, lanceolate, glabrous; palea oblong, 2-keeled; keels glabrous.

Fl. & Fr.: February-May

Distr.: South India and Sri Lanka. Occasional; along stream sides at lower altitudes. MS, Thalachorkadavu, *KKK 18155.*

RHYNCHELYTRUM Nees

in Lindley, Intr. Nat. Syst. Bot. ed. 2. 446. 1836.

Rhynchelytrum repens (Willd.) C.E. Hubb., Kew Bull. 1934: 110. 1934; Sreekumar & Nair, Fl. Kerala Grass. 297. 1991. *Saccharum repens* Willd., Sp. Pl. ed. 4, 1: 322. 1798. *Tricholaena wightii* Nees & Arn. *ex* Steud., Syn. Pl. Glum. 1: 93. 1854, *pro syn.*; Hook. f., FBI 7: 65. 1896. *Rhynchelytrum villosum* Chisu, Annuar R. Inst. Bot. Roma 8: 310. 1908; Fischer in Gamble, FPM 1791. 1934.

Annuals; culms to 50 cm tall; nodes hairy. Leaves to 20 x 0.5 mm, lanceolate, acuminate; sheath rounded. Panicles to 10 cm long. Spikelets 5-6 mm long, similar, pedicelled, densely silky hairy; lower glume 1 x 0.5 mm, oblong, obtuse; upper glume 5 x 2 mm, aristate; florets 2, lower male, upper bisexual; lower lemma keeled; palea 3 x 1 mm, lanceolate; upper lemma 2 x 1 mm, 3-nerved, hyaline; palea 2-keeled, chartaceous; stamens 3; ovary elliptic.

Fl. & Fr.: January-April

Distr.: Africa and drier parts of India. Common along ecotones at lower altitudes. MS, K-3, *KKK 17626.*

SETARIA P. Beauvois

Essai Agrost. 51, 178, t. 13, f. 3. 1812. *nom. cons.*

1. Panicles spiciform, cylindrical; bristles in clusters ..... **S. pumila**
1. Panicles open, not cylindrical; contracted or effuse; bristles not in clusters ..... **S. paniculifera**

Setaria paniculifera (Steud.) Fourn. *ex* Hemsl., Biol. Centr. Amer. Bot. 3. 505. 1855; Sreekumar & Nair, Fl. Kerala Grass. 308. 1991; Matthew, Ill. FPH t. 864. 1996 & FPH 1536. 1999. *Panicum paniculiferum* Steud., Syn. Pl. Glum. 1: 54. 1854. **Nayurippullu.**

Perennials; culms few together, to 2 m tall, robust; nodes sparsely bearded. Leaves to 40 x 2.5 cm, linear-elliptic, plicately folded; sheath strongly keeled. Panicles to 25 cm, linear-oblong, lax. Spikelets 3 x 1 mm, ellipsoid; lower glume 1.5 mm, broadly ovate, obtuse; upper glume 2 x 1.5 mm, ovate, obtuse, 5-nerved; lower floret barren;

lower lemma 2 mm, ovate, 5-nerved, acute; palea lanceolate; upper lemma 3 x 1 mm, ovate-orbicular; palea to 2.5 mm, subcoriaceous.

Fl. & Fr.: February-May

Distr.: Native of Tropical America; introduced as a fodder. Occasional; along ecotones and roadsides at low altitudes. MS, School curve, *KKK 18145*; Chengalar, *KKK 16707.*

Setaria pumila (Poir.) Roem. & Schult., Syst. Veg. 2: 891. 1817; Sreekumar & Nair, Fl. Kerala Grass. 309. 1991; Matthew, FPH 1537. 1999. *Panicum pumilum* Poir. in Lam., Encycl. Meth. Bot. (Suppl.) 4: 273. 1816. *P. pallida-fuscum* Schum., Beskr. Guin. Pl. 58. 1827. *Setaria glauca* sensu Hook. f., FBI 7: 78. 1896. non P. Beauv., 1812; Fyson, FSIHS 661. t. 590. 1932. *S. pallida-fusca* (Schum.) Stapf & Hubb., Kew Bull. 1930: 259. 1930; Fischer in Gamble, FPM 1789. 1934. **Kambilipullu.**

Tufted annuals; culms to 1 m tall, decumbent or erect; nodes glabrescent. Leaves to 25 x 0.6 cm, linear, scabrid; sheath keeled. Panicle to 15 cm; bristles 5-10 mm long. Spikelets 2.5 mm long, ovoid, acute; lower glume 1 mm long, ovate, 3-nerved; upper glume 1.5 mm long, ovate, 5-nerved; lower floret barren; lower lemma 2.5 mm long, broadly ovate, 3-nerved; upper lemma 2 mm, cymbiform, rugose.

Fl. & Fr.: August-December

Distr.: Tropics of the Old World and introduced to North America. Common along stream sides at lower altitudes. MS, K-3, *KKK 16657.*

SORGHUM Moench

Methodus 207. 1794, *nom. cons.*

1. Culm nodes glabrous or pubescent; panicle branches subdivided ..... **S. bicolor**
1. Culm nodes densely villous; panicle branches simple ..... **S. nitidum**

Sorghum bicolor (L.) Moench., Meth. Bot. 207. 1794; Fischer in Gamble, FPM 1736. 1934; Matthew, Ill. FPH t. 868. 1996 & FPH 1582. 1999. *Holcus bicolor* L., Mant. Pl. 2: 301. 1771. *Sorghum vulgare* Pers., Syn. Pl. 1: 101. 1805. *S. margaritiferum* Stapf in Prain, Fl. Trop. Afr. 9: 125. 1917. **Cholam.**

Perennials; culms solitary or loosely tufted, to 2 m tall; nodes pubescent. Leaves to 50 x 5 cm, lanceolate, base rounded, margins scabrid. Panicle to 20 cm, dense. Sessile spikelet to 6 x 4 mm, elliptic or obovate ; glumes subequal, yellowish-brown ; lower lemma sterile, epaleate; upper lemma to 3 mm, broadly ovate, 2-lobed at apex, awn to 1 cm or mucronate; palea absent. Pedicelled spikelet to 4 mm, lanceolate. Grain broadly obovoid or spherical.

Fl. & Fr.: September-December

Distr.: Native of Tropical Africa; introduced elsewhere. Common; in low altitude grasslands. MS, Kulachivayal, *KKK 16685.*

Sorghum nitidum (Vahl) Pers., Syn. Pl. 1: 101. 1805; Fischer in Gamble, FPM 1735. 1934; Matthew, Ill. FPH t. 870. 1996 & FPH 1584. 1999. *Holcus nitidus* Vahl, Symb. Bot. 2: 102. 1791. *Andropogon serratus* Thunb., Fl. Jap. 41. 1784; Hook. f., FBI 7: 185. 1896. *Sorghum serratum* (Thunb.) O. Ktze., Rev. Gen. Pl. 2: 792. 1891.

Perennials; culms to 2 m tall; nodes bearded. Leaves to 40 x 1 cm, linear-lanceolate, base narrowed, scabrid; sheath keeled. Panicle to 25 cm, pyramidal; branches whorled. Spikelets in pairs, dimorphic. Sessile spikelets 4 x 2 mm, oblong; lower glume 4 x 2 mm, oblong, dark brown; upper glume 4 x 1.5 mm, ovate, acute; lower floret empty; upper bisexual; lower lemma 3.5 mm, broadly ovate, hyaline; palea absent; lower glume coriaceous; upper chartaceous; lower floret male.

Fl. & Fr.: September-December

Distr.: India, Sri Lanka, Myanmar, extending through Indo-China to Australia. Common in low altitude grasslands. MS, Kulachivayal, *KKK* 16684.

THEMEDA Forsskal

Fl. Aegypt.- Arab. 178. 1775.

Themeda triandra Forssk., Fl. Aeg.-Arab. 178. 1775; Fischer in Gamble, FPM 1746. 1934; Sreekumar & Nair, Fl. Kerala Grass. 202. 1991; Matthew, FPH 1600. 1999. *Anthistiria imberbis* Retz., Obs. Bot. 3: 11. 1783; Hook. f., FBI 7: 211. 1896. **Chekkanampullu.**

Densely tufted perennials; culms to 2 m tall, white or yellowish white. Leaves to 40 x 1.2 cm, base rounded. Panicle to 45 cm long; racemes dense. Involucral spikelets to 9 x 2 mm, lanceolate; lower glume elliptic; upper glume oblong. Bisexual spikelets to 10 mm, solitary, callus brown hairy; lower glume to 9 mm, oblong, brown, apically hairy; upper glume 6 mm long, pubescent; lower lemma 3 mm long, lanceolate, brown; upper lemma linear, stipitate, awn to 8 cm long.

Fl. & Fr.: September-December

Distr.: Old World Tropics. Common in low altitude grasslands. MS, Kulachivayal, *KKK 16675.*

TRIPOGON Roemer & Schultes

Syst. Veg. 2: 34, 600. 1817.

Tripogon bromoides Roem. & Schult., Syst. Veg. 2: 600. 1817; Fischer in Gamble, FPM 1834. 1934; Fyson, FSIHS 675. 1932; Sreekumar & Nair, Fl. Kerala Grass. 399. 1991; Matthew, FPH 1498. 1999.

Densely tufted perennials; culms to 40 cm tall; nodes glabrous. Leaves usually basal, to 30 x 0.3 cm, linear, base rounded, sparsely hairy above; mouth of sheath with long hairs. Raceme to 30 cm long; spikelets 0.5-1 cm long, oblong, glabrous, sessile; lower glume 3 x 0.5 mm, keeled; upper glume 6 x 1 mm, notched below the apex, 3-nerved. Flowers 10-16; lemma to 4 x 2 mm, 4-lobed at apex, 3-awned; one median and two laterals; median one twice the length of laterals; palea 3 x 1 mm, elliptic, scabrid along the keels. Grain to 2 mm, linear-elliptic.

Fl. & Fr.: August-December

Distr.: Western Ghats and Sri Lanka. Common in high altitude grasslands. MS, Idlimottai, *KKK 16632.*

ZENKERIA Trinius

Linnaea 11: 150. 1837.

Zenkeria elegans Trin., Linnaea 11: 150. t. 3. 1837; Fyson, FSIHS 673. t. 601. 1932; Fischer in Gamble, FPM 1805. 1934; Sreekumar & Nair, Fl. Kerala Grass. 363. 1991; Matthew, FPH 1476.1999.

Densely tufted perennials; culms to 1 m tall; nodes glabrous. Leaves to 60 x 0.8 cm, linear-lanceolate, flat, glabrous; margins serrulate, glabrous; sheath keeled, glabrous. Panicles purplish, to 30 cm long, pyramidal, lax; branches filiform, glabrous. Spikelets to 6 x 3 mm, pedicelled, glabrous; glumes equal, 3 x 1 mm, lanceolate, 1-nerved; lemma 5 x 1 mm, lanceolate, acuminate, sparsely hairy; palea 3 x 1 mm, 2-nerved, sparsely hairy; stamens 3. Grain to 3.5 mm, narrowly oblong.

Fl. & Fr.: August-December

Distr.: Endemic to Southern Western Ghats. Common in low altitude grassland regions. MS, Conical patch, *KKK 16564*; Chengalar, *KKK 16539*.

II. PTERIDOPHYTES

ENUMERATION OF THE TAXA

About 93 taxa of pteridophytes coming under 48 genera and 25 families were collected. A complete list of the species collected is given as Appendix 1. The species are arranged according to the alphabetical sequence of the family.

4.4. FLORISTIC ANALYSIS AND DISCUSSION

4.4.1. Basic statistics

During this study, 669 taxa (661 species and 8 infraspecific taxa) of flowering plants belonging to 369 genera under 110 families were collected and described (Appendix 2). Dicotyledons were represented by 536 taxa (529 species and 7 infraspecific taxa) belonging to 295 genera under 94 families. Monocotyledons were represented by 133 taxa (132 species and 1 variety) in 74 genera under 16 families. Among the total of 669 taxa, there were 14 subspecies and 41 varieties. In the case of pteridophytes, there were 93 taxa (92 species) belonging tc 48 genera under 25 families. In total there were 3 varieties also (Table 4.1.)

Table 4.1. Preliminary information regarding the floristic analysis

No	PLANT GROUPS	FAMILY	GENERA	TAXA	SPECIES	SUB-SPECIES	VARIETY
A	**ANGIOSPERMS**	**110**	**369**	**669**	**661**	**14**	**41**
1.	Dicots	94	295	536	529	14	37
2.	Monocots	16	74	133	132	0	4
B	**PTERIDOPHYTES**	**25**	**48**	**93**	**92**	**0**	**3**
TOTAL		**135**	**417**	**762**	**753**	**14**	**44**

Among the dicots, *Asteraceae* with 50 taxa belonging to 29 genera is the largest family. It is followed by *Fabaceae* (42/22), *Rubiaceae* (36/17), *Acanthaceae* (26/7), *Lamiaceae* (24/10) etc. Among the monocots, *Orchidaceae* with 37 taxa under 20 families is the largest family. It is followed by *Poaceae* (35/26), *Cyperaceae* (19/8), *Commelinaceae* (9/3), *Araceae* (7/1), *Juncaceae* (5/1) etc. When the South Indian flora is considered, *Fabaceae* holds the prime position in dominance followed by *Poaceae* and *Rubiaceae* (Gamble, 1915). But in this study, these families hold the second, fifth and fourth positions respectively, while *Asteraceae*, which holds the seventh position in South Indian, flora stands first here.

When the tree species alone are considered, *Lauraceae* with 23 taxa under 9 genera is the largest. It is followed by *Rubiaceae* (15/7), *Euphorbiaceae* (10/7),

Symplocaceae (10/1), *Myrtaceae* (9/4), *Myrsinaceae* (7/4), etc. (Table 4.2.). The relative dominance of these families, which constitute the tree flora, is the case prevailing in all shola regions. But the undergrowth flora shows a different picture as indicated by the earlier figures. In this study only the shola vegetation was given much importance. The dominance figures would have changed if the grassland vegetation was also given equal importance.

Table 4.2. Floristic richness of the different taxonomic hierarchies*

No.	FAMILY	GENERA	TAXA
	Dicotyledons		
1.	Asteraceae	**29**	**50**
2.	Fabaceae	22	42
3.	Rubiaceae	17	36
4.	Acanthaceae	7	26
5.	Lamiaceae	10	24
6.	Balsaminaceae	1	23
	Monocotyledons		
1.	Orchidaceae	**20**	**37**
2.	Poaceae	26	35
3.	Cyperaceae	8	19
4.	Commelinaceae	3	9
5.	Araceae	1	7
6.	Juncaceae	1	5
	Tree species only		
1.	Lauraceae	**9**	**23**
2.	Rubiaceae	7	15
3.	Euphorbiaceae	7	10
4.	Symplocaceae	1	10
5.	Myrtaceae	4	9
6.	Myrsinaceae	4	7
	Pteridophytes		
1.	Aspleniaceae	**1**	**12**
2.	Polypodiaceae	5	8
3.	Dryopteridaceae	3	9
4.	Lycopodiaceae	3	8
5.	Thelypteridaceae	5	7
6.	Athyriaceae	4	6

(*only the first six families are included)

Among the pteridophytes, *Aspleniaceae* with 12 taxa under 1 genus was the largest. It is followed by *Polypodiaceae* (8/5), *Dryopteridaceae* (9/3), *Lycopodiaceae* (8/3), *Thelypteridaceae* (7/5), *Athyriaceae* (6/4) etc.

4.4.2. Habit and Habitat

Regarding the habit of the plants, out of the 536 dicot taxa, 219 (41%) belonged to herbs, 179 (33%) were shrubs and 138 (26%) were trees (Table 4.3.). Out of the 219 herbs, 20 were climbers and 14 were parasitic. Climbers include species of *Tylophora, Diplocyclos, Solena, Trichosanthes, Zehneria, Cajanus, Canavalia, Desmodium, Dumasia, Rhynchosia, Shuteria, Vigna, Clematis,* etc. Parasitic herbs include various species of *Balanophora, Utricularia, Christisonia, Striga asiatica,* etc. The lianas reported (7 nos.) include *Cayratia pedata, Cissampelopsis corymbosa, C. walkeri, Connarus wightii, Derris brevipes, Ficus amplocarpa* and *Parthenocissus semicordata.* Out of the 179 shrubs, 10 were parasitic. Parasitic shrubs mainly belong to *Loranthaceae* and *Viscaceae* (*Helicanthes, Helixanthera, Macrosolen, Taxillus, Korthalsella, Viscum,* etc). Among the 133 monocot taxa, 126 (95%) belonged to herbs and only 7 are shrubs. Shrubs include reed bamboo species such as *Arundinaria densifolia, A. floribunda* and *A. walkeriana* other than *Pseudoxytenanthera monadelpha, Protasparagus fysonii, P. racemosa,* etc. A complete list of plants showing the adaptations and habitat specificity is given as Appendix 3.

Table 4.3. Table showing the Habit & Habitat wise distribution of shola plants

I. DICOTS (Total 536 taxa)				
No.	**Habit**	**Code**	**No of taxa**	**Total**
1.	Herbs	H	181	
2.	Climbing Herbs	HCl	20	
3.	Parasitic Climbing Herbs	HClP	1	**219**
4.	Epiphytic Herbs	HE	3	
5.	Parasitic Herbs	HP	14	
6.	Lianas	L	7	
7.	Shrubs	S	92	
8.	Climbing Shrubs	SCl	20	
9.	Epiphytic Shrubs	SE	2	**179**
10.	Parasitic Shrubs	SP	10	
11.	Subshrubs	SS	40	
12.	Straggling Shrubs	SSt	8	
13.	Trees	T	138	**138**

Table 4.3. (contd.)

II. MONOCOTS (Total 133 taxa)				
No.	**Habit**	**Code**	**No of taxa**	**Total**
1.	Herbs	H	104	
2.	Climbing Herbs	HCl	2	**126**
3.	Epiphytic Herbs	HE	20	
4.	Shrubs	S	4	
5.	Climbing Shrubs	SCl	1	**7**
6.	Straggling Shrubs	SSt	2	
III. PTERIDOPHYTES (Total 93 taxa)				
No.	**Habit**	**Code**	**No of taxa**	**Total**
1.	Epiphytic Herbs	HE	21	
2.	Epiphytic or Lithophytic Herbs	HE/L	13	
3.	Terrestrial Herbs	HT	49	**93**
4.	Terrestrial or Lithophytic Herbs	HT/L	8	
5.	Trees	T	2	

Among the 93 pteridophytes, terrestrial taxa are more (51) than the epiphytes, and lithophytes. Eight taxa are either terrestrial or lithophytic. Similarly plants, which grow both as epiphytic and lithophytic, constituted 13 taxa. The genus *Asplenium* is distributed in all the above-mentioned groups. Family members of *Grammitidaceae, Lomariopsidaceae, Loxogrammaceae, Hymenophyllaceae, Vittariaceae,* etc. are epiphytic. Similarly, *Athyriaceae, Dryopteridaceae, Pteridaceae* and *Thelypteridaceae* members are terrestrial. The tree fern species include *Alsophila nilgirensis* and *Sphaeropteris crinita,* which were formerly included under the genus *Cyathea.* The pteridophytes constitute a major part of the shola vegetation.

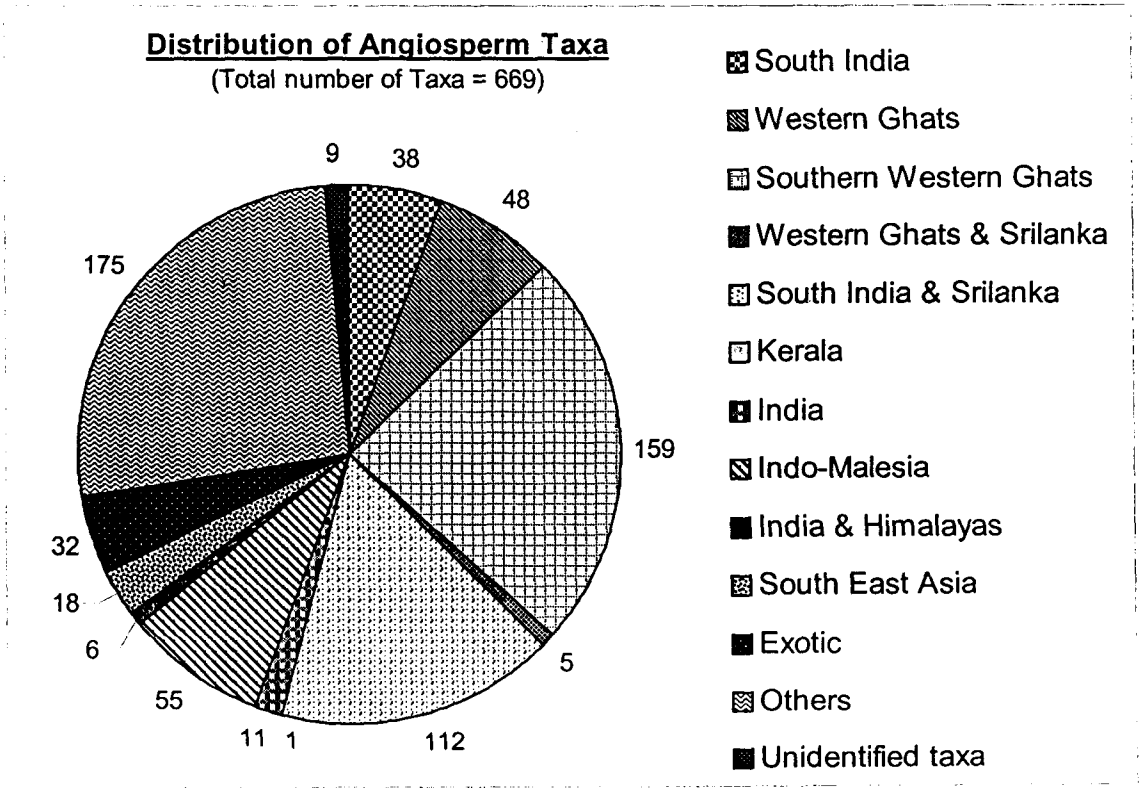
4.4.3. Distribution of the species

It is understood from the figures that more than 30 percent of the plants are restricted to Western Ghats (Table 4.4). About 16 percent of plants are common to South India and Srilanka. Indo-Malesian species constitute about 8 percentage. About 3 percentage of plants are of Southeast Asian distribution. Out of the total number of 669 angiosperm taxa, 32 (4.8%) are exotics.

Table 4.4. Pattern and percentage of geographical distribution of Angiosperm taxa

No	DISTRIBUTION	DICOTS	MONOCOTS	TOTAL	PERCENTAGE
1.	South India	31	7	**38**	5.68
2.	Western Ghats	43	5	**48**	7.18
3.	Southern Western Ghats	131	28	**159**	23.77
4.	Western Ghats & Srilanka	5	0	**5**	0.75
5.	South India & Srilanka	78	34	**112**	16.74
6.	Kerala	1	0	**1**	0.15
7.	India	10	1	**11**	1.64
8.	Indo-Malesia	48	7	**55**	8.22
9.	India & Himalayas	5	1	**6**	0.90
10.	South East Asia	15	3	**18**	2.69
11.	Exotic	32	0	**32**	4.78
12.	Others	129	46	**175**	26.16
13.	Unidentified taxa	8	1	**9**	1.35
	TOTAL	**536**	**133**	**669**	**100**

Fig. 4.1. Pie Diagram showing the geographical distribution of the Angiosperm Taxa



Some of these are introduced ornamentals escaped from the gardens or mere weeds (*Acanthospermum hispidum, Ageratina adenophora, Ageratum houstonianum, Calceolaria gracilis, Desmodium uncinatum, Erigeron karvinskianus, Galinsoga parviflora. Gamochaeata coarctata, Lantana camara, Oenothera laciniata, Parthenium hysterophorus, Chenopodium ambrosioides* etc). The introduction of exotic fodder grasses by the Livestock development board has resulted in the influx of the seeds of several other herbaceous plants also, which have now naturalised in the wild. Some introduced and widely cultivated trees have also entered into sholas (*Acacia dealbata, A. mearnsii, A. dealbata, Eucalyptus globulus, E. grandis, Grevillea robusta* etc). Several introduced vegetables such as *Cyphomandra betacea, Lycopersicon lycopersicum, Passiflora edulis, P. ligularis, P. mollissima,* etc. are also now seen growing in low altitude shola regions. The role of birds, animals and man in the dispersal of the seeds of these species is noteworthy.

4.4.4. Endemism

Identification of endemic species of a region or a country is considered a priority exercise in any programme of conservation of biodiversity. Since endemic species usually have specific ecological niches (mountain peaks, islands) and edaphic gradients, the habitats of endemic species are far more vulnerable than other species. It is generally considered that endemic floristic elements of a country or geographical region throw light on the biogeography of the area, adaptive evolution of the flora and centres of speciation. Endemic species once lost, it is a loss of biodiversity forever (Nayar, 1997).

In India, there are about 5725 endemic taxa of angiosperms, which represent 33.5 % of Indian flora (17,000 species). They are located in mainly the 'hotspots' (Nayar, 1996). 'Anamala-High Ranges' where most part of this study is concentrated is one among these hotspots. Ahmedullah & Nayar (1987) have reported that there are 1,923 taxa of flowering plants endemic to Peninsular India. Out of the estimated 3,800 species of flowering plants in Kerala, 1272 (22.6 % of Indian endemics) are endemic to the Southern Western Ghats (Nayar, 1996). These endemic flora belong to a paleotropic one, a part of the peninsular Indian endemic flora of Gondwanaland origin.

Kerala is the natural habitat of about 120 taxa of *paleoendemic* angiosperms belonging to 75 genera and 40 families. This number excludes *neoendemic* species and also those endemic taxa of Western Ghats/Peninsular India, which also occur in Kerala. Together with the Western Ghats/ Peninsular Indian endemics and Kerala endemics, endemism of the flora of our state is very high.

The importance of shola forests in this regard which are considered, as the megacentres of endemism becomes evident (Basha & Nair, 1991; Nair & Basha, 1995). This is evidenced from the present study also. Out of the total 669 angiosperm taxa, 246 (36.8 %) are endemics. This ratio is very huge, when compared with the scenario of the country (only 33.5 %). Out of this 206 taxa (30.7 %) belong to dicots, while monocots constitute only 40 taxa (5.97 %). Among the pteridophytes, out of the 93 taxa, only 6 taxa (6.5 %) are found to be endemic. This indicates that pteridophytes comparatively have a wide range of (often cosmopolitan) distribution (Table 4.5.).

Table 4.5. Categorisation of the taxa into various distributional/conservational statuses

No	Plant groups	Total Taxa	Endemics	Rare	Endangered /Threatened	Ethno-botanically important	Possibly extinct
A	**Angiosperms**	**669**	**246**	**111**	**20**	**182**	**7**
1.	Dicots	536	206	78	15	167	5
2.	Monocots	133	40	33	5	15	2
B	**Pteridophytes**	**93**	**6**	**34**	**8**	**6**	**0**
Total		**762**	**252**	**145**	**28**	**188**	**7**

A list of the Peninsular Indian endemic genera (6 nos.) reported from the shola forests is given as Table 4.6. This includes *Campbellia, Diplocentrum, Helicanthes, Nilgirianthus, Phlebophyllum* and *Vanasushava*. Among these, *Nilgirianthus* and *Phlebophyllum* are now treated under *Strobilanthes*. Genera such as *Arisaema, Hedyotis, Impatiens, Strobilanthes, Ophiorrhiza* and *Vernonia* are represented by more than 3 endemic species in Kerala, many of which are reported from the shola forests only. The representation of the families under various endemic regions is provided in Table 4.7. Among the dicots, majority of the South Indian endemics (6 taxa) belong the family *Lamiaceae,* while *Asteraceae* (7 taxa) and *Rubiaceae* (21 taxa) have the highest

number taxa as Western Ghat and Southern Western Ghat endemics. Out of the total number of 23 *Impatiens* reported, 18 (73 %) are endemics (14 species are Southern Western Ghat endemics and 4 are Western Ghat endemics). Similarly, out of the total number of 19 *Strobilanthes* reported, 16 (84 %) are endemics (15 are Southern Western Ghat endemics and 1 is Western Ghat endemic).

Table 4.6. List of the Endemic genera* and the species reported from the sholas

No	Name of the genera	Family	Name of the species	Name as in this work
1.	*Campbellia* Wight	Orobanchaceae	*C. cytinoides* Wight	*Christisonia neilgherrica* Gardner
2.	*Diplocentrum* Lindl.	Orchidaceae	*D. recurvum* Lindl.	(no change)
3.	*Helicanthes* Danser	Loranthaceae	*H. elastica* (Desr.) Danser	(no change)
4.	*Nilgirianthus* Bremek. #	Acanthaceae	*N. foliosus* (Wight) Bremek.	*Strobilanthes foliosus* T. Anders.
		Acanthaceae	*N. neilgherrensis* (Bedd.) Bremek.	*Strobilanthes neilgherrensis* Bedd.
		Acanthaceae	*N. papillosus* (T. Anders.) Bremek.	*Strobilanthes papillosus* T. Anders.
		Acanthaceae	*N. perrottetianus* (Nees) Bremek.	*Strobilanthes perrottetianus* Nees
		Acanthaceae	*N. urceolaris* (Gamble) Bremek.	*Strobilanthes urceolaris* Gamble
		Acanthaceae	*N. wightianus* (Nees) Bremek.	*Strobilanthes wightianus* Nees
5.	*Phlebophyllum* Nees #	Acanthaceae	*P. kunthianum* Nees	*Strobilanthes kunthianus* (Nees) T. Anders. *ex* Benth.
6.	*Vanasushava* Mukh. & Constance	Apiaceae	*V. pedata* (Wight) Mukh. & Constance	(no change)

(* Ref.: Ahmedullah & Nayar, 1997; # now treated under *Strobilanthes*)

Table 4.7. Distribution of the Endemic taxa within various regions and families*

Sl. No	PLANTS	ENDEMICS					
		South India	No	Western Ghats	No	S. Western Ghats	No
1.	Dicots	Lamiaceae	6	Asteraceae	7	Rubiaceae	21
		Asteraceae	5	Balsaminaceae	4	Acanthaceae	18
		Fabaceae	3	Acanthaceae	3	Lauraceae	14
		Lauraceae	2	Ranunculaceae	3	Balsaminaceae	14
2.	Monocots	Orchidaceae	4	Araceae	1	Orchidaceae	12
		Cyperaceae	1	Arecaceae	1	Poaceae	4
		Poaceae	1	Commelinaceae	1	Araceae	5
		..		Liliaceae	1	Cyperaceae	2
		..		Poaceae	1	Eriocaulaceae	2
		..		..		Liliaceae	2
3.	Pteridophytes	Lomariopsidaceae	2	..		Gleicheniaceae	1
		Thelypteridaceae	2	..		..	
		Cyatheaceae	1	..		..	

- * Only those families ranking first are listed out;
- 'No' indicate the number of taxa within different families.

Among the *Rubiaceae,* all the species of *Hedyotis* (4), *Lasianthus* (5) and *Psychotria* (3) are S. W. Ghat endemics. Same is the case with all the species of *Actinodaphne* (3) and *Cinnamomum* (6) of *Lauraceae.*

In the case of monocots, out of the 37 *Orchidaceae* members, 13 (35 %) are S. W. Ghats endemics and 5 are South Indian endemics. Among the 7 *Arisaema* (*Araceae*) collected, 5 are S. W. Ghats endemics and one is W. Ghats endemic.

Among the pteridophytes, *Elaphoglossum, Psuedocyclosorus, Sphaeropteris* (earlier name *Cyathea*) and *Gleichenia* coming under *Lomariopsidaceae, Thelypteridaceae, Cyatheaceae* and *Gleicheniaceae* are the four genera, which have representation of endemic taxa (Table 4.7).

4.4.5. Plants under different threat categories

Joseph (1977), Henry *et al* (1979), Jain & Sastry (1984), Ahmedullah & Nayar (1987) and Nayar & Sastry (1987, 1988, 1990) have well documented the rare and threatened plants of South India. Nayar (1997) listed out 1272 endemic taxa in Kerala and 460 of them are placed under threat categories. Since sholas are centers of endemism, with more than one third (39.3 %) of the taxa being endemic as evidenced from the present study, chances of local extinction of species is far great. The habitat destruction and other anthropological activities have speeded up this process. So the figures of rare and threatened plants as documented in the above works are always not dependable, since majority of these works are based on secondary data or those based on the earlier herbarium collections. Thorough field investigation studies are necessary to validate many of this information.

It is a fact that a lot of other species, which are not reported in the works cited earlier, are found locally in very rare and threatened conditions. Since sholas are facing several threats, documentation of such information deserves attention in the conservation point of view. Because many of such locally endangered taxa may face extinction, if proper conservational measures are not taken up. Complete lists of plants which are documented in the above-mentioned works are given as Appendix 4.

4.4.6. Rediscovery of plants categorized as '*Possibly extinct*'

During the study seven species of angiosperms (all dicots), earlier documented as '*Possibly extinct*' could be rediscovered (Table 4.8.). *Actinodaphne bourneae* could not be collected during this century and was considered extinct (Nayar, 1997). This species could be collected from the Anamudi slope of Eravikulam National Park.

Table 4.8. 'Possibly extinct'* plants rediscovered during the study

No.	Name of the species	Habit	Family	References
1.	*Actinodaphne bourneae* Gamble	Tree	Lauraceae	Nayar, 1997
2.	*Arisaema attenuatum* Barnes & C.E.C. Fisch.	Herb	Araceae	Shetty & Vivekananthan, 1991; Nair & Basha, 1995
3.	*Arisaema psittacus* Barnes	Herb	Araceae	Shetty & Vivekananthan, 1991; Nair & Basha, 1995
4.	*Impatiens anaimudica* C.E.C. Fisch.	Herb	Balsaminaceae	Nayar & Sastry, 1988
5.	*Impatiens platyadena* C.E.C. Fisch.	Herb	Balsaminaceae	Ahmedullah & Nayar, 1987; Hajra *et al.*, 1997
6.	*Pimpinella pulneyensis* Gamble	Herb	Apiaceae	Nayar, 1997; Matthew, 1999
7.	*Symplocos monantha* Wight	Tree	Symplocaceae	Nayar, 1997

Arisaema attenuatum and *A. psittacus* were treated as *'possibly extinct'* by Shetty & Vivekananthan (1991). *A. attenuatum* could be collected from the Chengalar dam region at Mannavan Shola and also from the Umayamala valleys (MPCA plots) at Eravikulam. This species is occasionally found in the shola borders or scrublands. *A. psittacus* is a threatened, narrow endemic species which could not be relocated after the type collection by Barnes in 1937 from Chunduvurrai & Mannavan Shola. It was so considered extinct in its natural habitat. However the species was recently rediscovered from the same localities by Nair *et al.* (1997). I could collect the species from both these locations and also from another locality named Pambadam Shola, which is situated nearby.

Impatiens anaimudica was considered as *'possibly extinct'* by Nayar & Sastry (1988), since it was not collected after the type collection by Barnes (1933) from Anamudi. I could collected this species during October 1996 from the Umayamala ranges of Eravikulam. Biju (2001) also relocated this species from Anamudi. *Impatiens platyadena* was considered as *'possibly extinct'* by

Ahmedullah & Nayar (1987) and Hajra *et al* (1997). It was Barnes who made the type collection from the Nyamakkad gap of Idukki District during 1933 and after that it could not be collected. The species was collected from the Nilagiri teri region of Eravikulam. *Pimpinella pulneyensis* was so far reported from it's type locality (Palni hills) only and was considered *'possibly extinct'* (Nayar, 1997; Matthew, 1999). Present collection from Idlimottai region of Mannavan Shola thus forms both a rediscovery and extension of distribution of the species to Kerala. *Symplocos monantha* was also considered extinct by Nayar (1997) since it could not be relocated after the type collection, which was made from the Shevagherry Hills of Tamil Nadu by Robert Wight, until it was reported from Periyar Tiger Reserve recently (Sasidharan, 1998). Present collection from the Idlimottai regions of Mannavan Shola extends the distribution of the species.

4.4.7. New records

About 70 plants are reported for the first time from Kerala as a result of this study. This include 55 angiosperms and 15 pteridophytes. These figures form about 8.2 % of the total angiosperms collected (669 taxa) and 16 % of the total pteridophytes collected (93 taxa), which is a substantially high figure. Among these, three are rediscoveries of plants considered as *'possibly extinct'* (*Actinodaphne bourneae, Pimpinella pulneyensis* and *Symplocos monantha*), while one is a new record to the country (*Oenothera laciniata* – Onagraceae). Among these new records, 14 species are ethnobotanically important also. A detailed list of the plants are given as Appendix 5.

4.4.8. Diversity of Pteridophytes

The total number of 93 pteridophytes collected from the shola regions of Kerala forms 28.1 % of the total pteridophyte flora of the state (331 species: Easa, 2003). The significance of this figure becomes clear when we compare the area of shola forests with that of Kerala as a whole. We have earlier seen that Shola forests occupy only about 70 sq. km area, while Kerala as a whole occupy 38,863 sq. km of land, with about 9400 sq. km area under forests (Nair, 1997). It is quite interesting to see that shola forests which form only less than one percentage (0.7 %) of the total forested land of Kerala (0.2 % of the whole area of the State), is supporting 28.1 % of the pteridophytes of the

state. The present figure also forms 54 % of the total collections made from the Malabar region by Nayar & Geevarghese (1993).

Very rare and interesting tree ferns, which are considered as *'fossil plants'*, are found to grow only in the shola forests, where they are facing several threats of destruction (see Table 5.2 and Plate 5.5.4). The need for conserving the shola forests, which acts as a refugium of pteridophyte diversity, becomes evident here.

Table 4.9. A comparison of species diversity of Pteridophytes

No.	Area	No. of species	References
1.	**S. W. Ghats**	**251**	Manickam & Irudayaraj (1992)
2.	**Kerala State**	**246**	Nair *et al.* (1988-1994)
3.	Southern India	240	Beddome (1863-64)
4.	Karnataka State	174	Rajagopal & Bhat (1998)
5.	Malabar	170	Nayar & Geevarghese (1993)
6.	Periyar Tiger Reserve	167	Rajesh (2001)
7.	Palni hills	135	Manickam (1986)
8.	Wayanad District	119	Leena & Madhusoodanan (1998)
9.	**Shola forests of Kerala**	**92***	**Present study**

(*Total no. of taxa = 93)

4.4.9. Doubtful/New taxa

Some 15 specimens remain unidentified even after thorough examinations (Table 4.10). This include 10 angiosperms (8 dicots and 2 monocots) and 5 pteridophytes. These collections on further critical examinations may prove to be new taxa. Difficulty in identifying some of these collections is the non-availability of all the necessary plant parts (flowers, fruits and seeds) required for identification.

Table 4.10. Taxa whose identity remains doubtful

No	Name	Family	Collection numbers & Locations
ANGIOSPERMS			
1.	*Strobilanthes* sp. 1	Acanthaceae	ENP, Amarachola, *KKK* 18526; ENP, Umayamala, *KKK 18553.*
2.	*Balanophora* sp. 1	Balanophoraceae	MS, K-6, *KKK 17619.*
3.	*Balanophora* sp. 2	Balanophoraceae	MS, Perumala, *KKK 31058.*
4.	*Impatiens* sp. 1	Balsaminaceae	MS, K-4, *KKK 16659.*
5.	*Crotalaria* sp. 1	Fabaceae	MS, Idlimottai, *KKK 16618.*

No	Name	Family	Collection numbers & Locations
6.	*Crotalaria* sp. 2	Fabaceae	MS, Methappu, *KKK 16431.*
7.	*Eugenia* sp. 1	Myrtaceae	ENP, Umayamala, *KKK 17520*
8.	*Ophiorrhiza* sp. 1	Rubiaceae	MS, K- 5, *KKK 16426*
9.	*Oberonia* sp. 1	Orchidaceae	MS, K-5, *KKK 31078*; ENP, Anamudi top, *KKK 18540.*
10.	*Juncus* sp. 1	Juncaceae	MS, Methappu, *KKK 16004.*
PTERIDOPHYTES			
1.	*Asplenium* sp. 1	Aspleniaceae	PUS, *KKK 18578*
2.	*Polystichum* sp. 1	Dryopteridaceae	ENP, Anamudi, *KKK 18538*
3.	*Polystichum* sp. 2	Dryopteridaceae	MS, IM, *KKK 17600*; MS, IM, *KKK 18174*
4.	*Grammitis* sp. 1	Grammitidaceae	MS, Chengalar, *KKK 18130*
5.	Unidentified sp. 1	Thelypteridaceae	MS, K-6, *KKK 17694*

Since sholas harbour most remote and hostile mountainous tracts having diverse microclimates, thorough investigations will certainly yield several other taxa new to the world.

4.5. CONCLUSIONS

The taxonomical studies mainly aimed to make a detailed floristic account of the shola forests of Kerala, based on studies at the most important shola regions of Kerala. The study also aimed to answer two hypotheses (i) whether the shola forest is a refugium for a number of endemic, rare, endangered and threatened plants that their preservation is very important and (ii) whether the shola forest is a highly rich resource, both biologically and economically.

From the study it is becoming clear that sholas are one of the most diverse ecosystems in the Western Ghats, which is considered as one of the 'hottest' of the hotspots of biodiversity. The total of 669 angiosperm taxa collected from a small area certainly indicates the high diversity prevailing in these regions. The 93 taxa of pteridophytes which contribute about 28.1 % of the total flora of the state, collected from such a small area also signifies the high pteridophyte diversity of the region. From the study it is becoming clear that out of the total of 669 angiosperm taxa collected, 246 (36.8%) belong to endemics. These figures substantiates the general view that sholas as megacentres of endemism. Perhaps the unique altitudinal and climatic factors, which favour diverse microclimatic situations, might be leading to the high endemic concentration and diversity in these regions.

A number of plants belonging to various threat categories could be located by this study. About seven plants, which were considered as 'possibly extinct', could also be rediscovered. Some 70 plants including 15 pteridophytes were also reported for the first time from Kerala. All this points out the need for conservation of sholas, which face several threats of destruction. More than a dozen of unidentified taxa indicate that, thorough explorations in the area may lead to the discovery of more new taxa, since many of the regions remain still unexplored due to inaccessibility and hostile environments.

Therefore in short, the sholas, which are floristically unique in all respects, have to be protected and explored thoroughly to elucidate the floral diversity and status of the endemics, before they get extinct due to degradation, depletion or conversion of natural vegetation.



1. *Berberis tinctoria*



2. *Hydnocarpus alpina*



3. *Pittosporum neelgherrense*



4. *Polygala arillata* var. *chartacea*



5. *Gordonia obtusa*



6. *Ternstroemia gymnanthera*



7. *Grewia umbellifera*



8. *Elaeocarpus munronii*

Plate 4.1



1. *Impatiens chinensis*



2. *Impatiens cordata*



3. *Impatiens cuspidata*



4. *Impatiens hensloviana*



5. *Impatiens parasitica*



6. *Impatiens phoenicea*



7. *Impatiens tangachee*



8. *Impatiens wightiana*

Plate 4.2

16

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1. *Aglaia apiocarpa*



2. *Gomphandra coriacea*



3. *Bhesa indica*



4. *Parthenocissus semicordata*



5. *Meliosma pinnata* ssp. *barbulata*



6. *Meliosma simplicifolia* ssp. *simplicifolia*



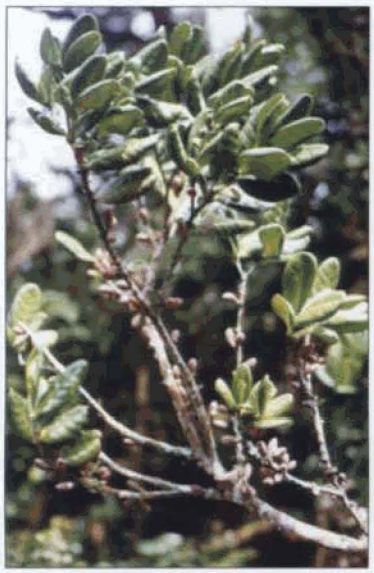
7. *Archidendron clypearia*



8. *Photinia integrifolia*

Plate 4.3

296C



1. *Microtropis ramiflora*



2. *Desmodium repandum*



3. *Rubus fairholmianus*



4. *Prunus ceylanica*



5. *Rosa leshenaultiana*



6. *Rubus niveus*



7. *Kalanchoe grandiflora*

Plate 4.4

296 D



1. *Syzygium caryophyllatum*



2. *Syzygium cumini*



3. *Syzygium densiflorum*



4. *Osbeckia reticulata*



5. *Viburnum coriaceum*



6. *Viburnum punctatum*



7. *Ixora notoniana*



8. *Lasianthus acuminatus*

Plate 4.5



1. *Heracleum sprengelianum*



2. *Pimpinella leschenaultii*



3. *Mussaenda hirsutissima*



4. *Ophiorrhiza brunonis*



5. *Saprosma foetens*



6. *Ageratum houstonianum*



7. *Cissampelopsis corymbosa*



8. *Gamochaeta coarctata*

Plate 4.6

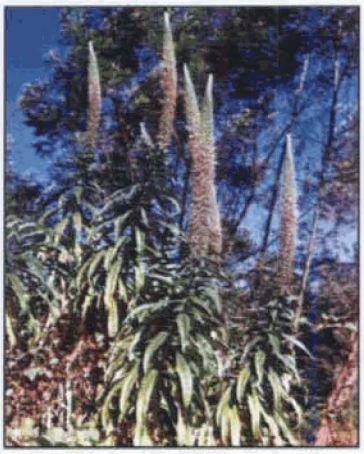
296 F



1. *Senecio scandens*



2. *Vernonia peninsularis*



3. *Lobelia leschenaultiana*



4. *Vaccinium leschenaultii*



5. *Myrsine wightiana*



6. *Isonandra lanceolata*



7. *Isonandra perrottetiana*



8. *Ligustrum perrottetii*



9. *Rauvolfia densiflora*

Plate 4.7

296 G



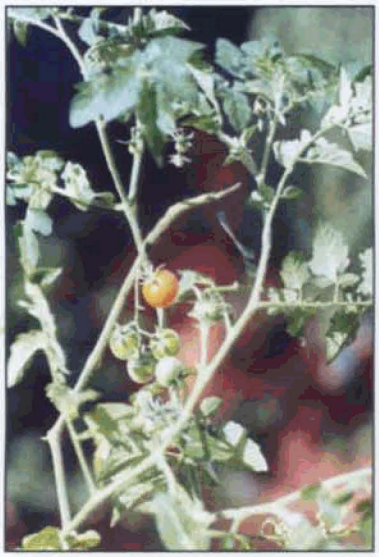
1. *Wattakaka volubilis*



2. *Fagraea ceylanica*



3. *Cynoglossum zeylanicum*



4. *Lycopersicon lycopersicum*



5. *Physalis peruviana*



6. *Solanum virginianum*



7. *Solanum anguivi* var. *anguivi*



8. *Calceolaria gracilis*

Plate 4.8

22

296 H



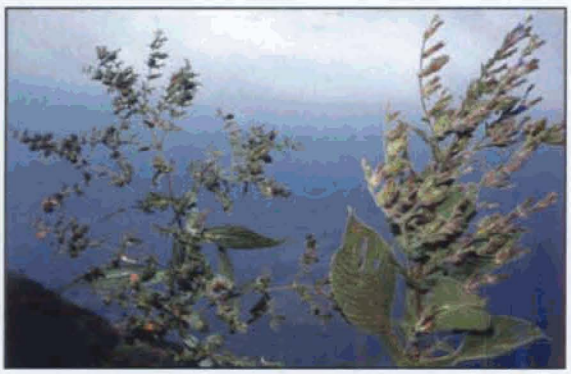
1. *Pedicularis zeylanica & P. perrottetii*



2. *Christisonia neilgherrica*



3. *Christisonia tubulosa*



4. *Strobilanthes gracilis* & *S.* sp. 1.



5. *Strobilanthes kunthianus*



6. *Strobilanthes luridus*



7. *Strobilanthes micranthus*



8. *Strobilanthes violaceus*

Plate 4.9



1. *Leucas suffruticosa*



2. *Prunella vulgaris*



3. *Persicaria chinensis*



4. *Persicaria glabra*



5. *Piper argyrophyllum*



6. *Piper mullesua*



7. *Piper schmidtii*



8. *Litsea wightiana* var. *tomentosa*

Plate 4.10

296J



1. *Beilschmiedia wightii*



2. *Cinnamomum wightii*



3. *Litsea oleoides*



4. *Persea macrantha*



5. *Phoebe wightii*



6. *Korthalsella japonica* on *Symplocos* sp.



7. *Viscum ramosissimum*



8. *Balanophora dioica* (♂ and ♀ plants)

Plate 4.11



1. *Balanophora fungosa* ssp. *indica* (♂)



2. *Daphniphyllum neilgherrense*



3. *Glochidion ellipticum*



4. *Mallotus tetracoccus*



5. *Aerides ringens*



6. *Cirrhopetalum gamblei*



7. *Diplocentrum recurvum*



8. *Taeniophyllum alwisii*

Plate 4.12

296 K



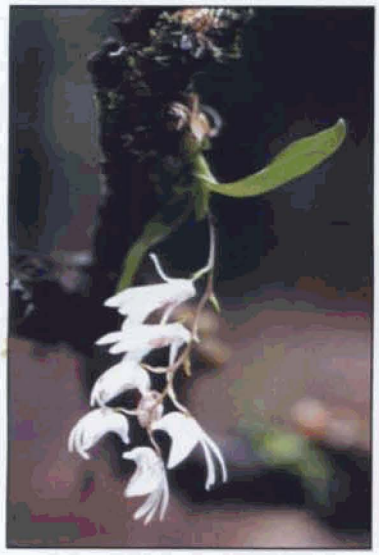
1. *Girardinia diversifolia*



2. *Ficus laevis* var. *macrocarpa*



3. *Brachycorythis splendida*



4. *Dendrobium anamalayanum*



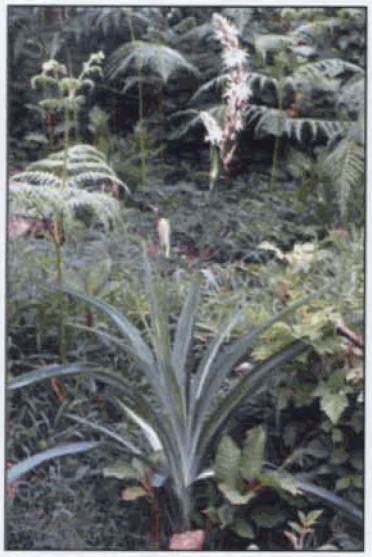
5. *Alpinia abundiflora*



6. *Hedychium flavescens*



7. *Crinum latifolium*



8. *Chlorophytum attenuatum*



9. *Disporum leschenaultianum*

Plate 4.13

27

296 L



1. *Arisaema leschenaultii*



2. *Arisaema psittacus*



3. *Arisaema tortuosum*



4. *Eulalia phaeothrix* - Habitat



5. *Arundinaria densifolia* - Habitat



6. *Carex lindleyana*



7. *Arundinaria floribunda*



8. *Arundinaria densifolia*

Plate 4.14

28

296M



1. *Alsophila nilgiriensis*



2. *Sphaeropteris crinita*



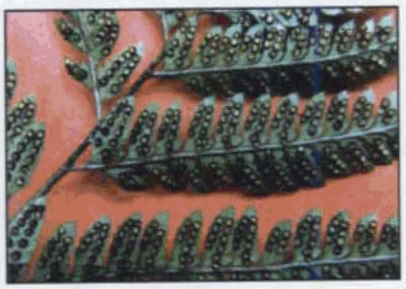
3. *Antrophyuum plantagineum*



4. *Asplenium decrescens*



5. *Asplenium formosum*



6. *Arachniodes aristata*



7. *Cheilanthes farinosa*



8. *Crepidomanes schmidianum*



9. *Ctenopteris perplexa*



10. *Dicranopteris linearis*



11. *Diplazium esculentum*



12. *Elaphoglossum stelligerum*



13. *Grammitis attenuata*



14. *Huperzia ceylanica*



15. *Huperzia hilliana*

Plate 4.15

29

296 N



1. *Lepochilus decurrens*



2. *Odontosoria chinensis*



3. *Parahemionitis cordata*



4. *Pleopeltis macrocarpa*



5. *Pteris confusa*



6. *Selaginella involvens*



7. *Asplenium auritum*



8. *Botrychium daucifolium*



9. *Huperzia hamiltonii*



10. *Lindsea odorata*



11. *Lycopodiella cernua*



12. *Lycopodium wightianum*



13. *Microlepia speluncae*



14. *Vittaria elongata*

Plate 4.16

ETHNOBOTANICAL STUDIES

K. Kishore kumar “Taxonomic and ecological studies on the shola forests of Kerala” Thesis. Kerala Forest Research Institute Thrissur, University of Calicut, 2004



ETHNOBOTANICAL STUDIES

"I look forward to the day when from a hundred laboratories scattered in every part of the union, the healing principles of our new plant wealth will be made available to a sick world"

E. K. Janaki Ammal (1897-1984)
('Father' of Modern Indian Ethnobotany)

30

296 P

5. ETHNOBOTANICAL STUDIES

5.1. INTRODUCTION

5.1.1. Ethnobotany: the term

The science of Ethnobotany was codified by explanation of the term by John William Harsh Berger in a lecture on 4-12-1895 (Anonymous, 1895). He defined the term as '*the study of plants used by primitive and aboriginal people*' and later published it in *Botanical Gazette* (1896). This initial concept of ethnobotanical investigation was typified in a paper by J. Walter Fewkes (1896). Another term '*Aboriginal Botany*' coined by Steven Powers (1873-1875) was in use for about two decades before Harsh Berger. This term meant '*all forms of the vegetable world which the aboriginals used for medicine, food, textile fabrics, ornaments, etc.*' (Chandra, 1991; Balick, 1996).

Several events in the second half of the 19th century prepared the ground for conceptualization of Ethnobotany as a science. This has led numerous workers to assume the knowledge of ethnobotany was of recent origin. However according to S. K. Jain, the nester of Indian Ethnobotany, the science is as old as human civilization and experience. According to him, '*the first individual (man or woman) who searched for shelter and food was the world's first ethno botanist*'(Chandra, 1991).

Today ethnobotany has become an interdisciplinary subject including several disciplines apart from botany and anthropology. Several branches and aspects of ethnobotany such as *Archaeoethnobotany, Ethnomedicine, Ethnopharmacology, Ethnoecology, Ethnotaxonomy, Palaeoethnobotany, Ethnogynaecology* and a few others are now recognised (Jain, 1987; Rao, 1989a)

Some treat the term Ethnobotany synonymous with Economic botany, others with traditional medicine. A few words to distinguish between Ethnobotany and Economic botany is useful. The latter deals mainly with plants in commerce and trade, it confines to man's material needs and man's viewpoint. The plant's response to survival becomes secondary. Ethnobotany, does not confine to man's socio economic gains, it is the natural and total relationship of plants with man (Jain, 1989b; 1995).

There are several modern terminology describing ethno-scientific knowledge (see Cotton, 1996). Some of the more common ones are:

1. Indigenous Technical Knowledge (ITK) – (Rocheleau *et al.*, 1989.)
2. Indigenous Agricultural Knowledge (IAK) – (Scoones & Thompson, 1994).
3. Traditional Ecological Knowledge (TEK) – (Johnson, 1992).
4. Rural People's Knowledge (RDK) – (Scooner & Thomas, 1994; Millar, 1993).
5. Traditional Botanical Knowledge (TBK) – (Cotton, 1996).
6. Integrated Knowledge System (IKS) – (Millar, 1993).

Ethnobotanical work leads to much closer study and a deeper insight into the plant and plant products because in include detailed queries about the occurrence, time of flowering and fruiting, parts utilized, how utilized, association with local language and customs and such other intimate aspects of the plant life (Jain, 1980).

5.1.2. The Indian Scenario

Though the term Ethnobotany is of recent origin, the concept is not new to our country, which has a very ancient history of civilization. The contribution of our country towards the field of ethnobotany is outstanding. India being a mega biodiversity centre in all respects is the most diverse area known for varied human races that inhabit diverse geographic, floristic and climatic regions. Thus medicinal knowledge of each and every community differs a lot, which enriched the field of ethnobotany.

The most ancient records on the medicinal usages of plants of our country is available in the form of Vedas (*Rigveda, Atharva Veda*, etc.), Samhitas (*Sushruth Samhitha, Charak Samhitha, Kashapya Samhitha,* etc.) and Epics such as *Ramayana* and *Mahabharatha*. Rigveda which is the most ancient available record dating back to 5000 BC, reveals the medicinal properties and usages of several plants, description of various diseases and the mode of application of drugs with examples (Varier, 1980). Atharva Veda, which is another classical work, describes about 2000 plants having medicinal properties. Sushruta Samhita (1000 BC.), further records the medicinal virtues of 700 plants.

Among the Indian systems of medicine, *Ayurveda*, the most ancient and prevalent system in the country, uses about 700 species of plants. Other systems like, *Sidha* uses 500 species, *Unani* 400 species and *Emchi* or *Tibetan system* about 300 species. The folklore systems play an important role in meeting the health care needs of the rural community in India and use more number of plants than in the Indian systems of medicine (Sasidharan & Muraleedharan, 2000).

The fact that such interesting information were started to be documented at such an ancient age when documentation methods were crude and insufficient, is rather appealing. But on the other hand, those undocumented precious information (mainly the tribal knowledge), rather greater than the documented ones and passed on by verbal means only from one generation to another, would have faced a great deal of loss, to become extinct for ever.

5.1.3. Tribes: the torch bearers of ethnobotanical knowledge

We all know that it is the tribals who depend on plants than any other community. The tribal people and ethnic races throughout the world have developed their own culture, customs, cults, religious rites, taboos, totems, legends and myths, folk tales and songs, food, medicinal practices, etc. Numerous wild and cultivated plants play a very important role among these cultures and this interrelationship has evolved over generations of experience and practices (Lalramnghinglova & Jha, 1999).

Here it is interesting to note that the word 'tribe' is nowhere defined in the constitution of India. The tribals of India are differentially termed as *'Adivasi'* (original settlers), *'Adim Nivasi'* (eldest ethnological sector of the population), *'Adimijati'* (primitive caste), *'Aboriginal'* (indigenous), *'Girijan'* (hills men), *'Vanyajati'* (forest caste), *'Vanavasi'* (forest inhabitants), *'Janjati'* (folk communities), *'Anusuchit Janjati'* (scheduled tribes) and several such other names signifying either ethnic, ecological, economic, historical or cultural characteristics. Among these terms, the most popular is *Adivasi* which means *'original inhabitants or indigenous people, which identifies certain peoples as having a distinct socio-cultural identity compared to mainstream people'* (Gupta, 1995; Bijoy, 1999).

According to 1991 census, Scheduled Tribes population in the country was 67,758,380 constituting about 8.08% of the total population belonging to over 550 tribal communities of 227 ethnic groups, as per the classification made by anthropologists on linguistic basis (Census India 1991-*Website*; Bijoy, 1999). This makes India the nation with the largest number of indigenous people in the world. They speak about 106 different languages and 227 subsidiary dialects (Pushpangadan, 1994) and occupy about 20 percentage of the total area of the country. Their vocation ranges from hunting-gathering, cave-dwelling nomadics to societies with settled culture, living in complete harmony with nature. Out of the total, about one fourth of the community (154.03 lakhs) are concentrated in Madhya Pradesh while Mizoram is the state with highest proportion of scheduled tribes (94.8 %). In South India, there are about 42 lakhs in Andra Pradesh (33 communities), 19.2 lakhs in Karnataka (49 communities), 5.7 lakhs in Tamil Nadu (36) and 3.2 lakhs in Kerala (35). They belong to the proto-australoid racial stock and speak dialects of the Dravidian family.

There are 35 tribal communities in Kerala with a population of 3,20,967 forming 1.1% of the total population of the state (Radhakrishnan *et al.*, 1996; Bijoy, 1999). They are: 1. *Adiyan* 2. *Arayan* 3. *Eravallan* 4. *Hill Pulayan* 5. *Irular* 6. *Kadar* 7. *Kammara* (in Malabar only) 8. *Kanikkar* 9. *Kattu Naikan* 10. *Kochu Velan* 11. *Kondakapoos* 12. *Kondareddis* 13. *Koraga* 14. *Koda* 15. *Kudiya* 16. *Kurichiyan* 17. *Kuruman* 18. *Kurumbars* 19. *Malamalasar* 20. *Mala Arayan* 21. *Malampandaram* 22. *Mala Vedan* 23. *Mala Kuravan* 24. *Malasar* 25. *Malayan* (excluding Malabar) 26. *Mala Arayan* 27. *Mannan* 28. *Maratti* (in Kasargod only) 29. **Muthuvan** 30. *Palaiyan* 31. *Palliyan* 32. *Palliyar* 33. *Paniyan* 34. *Ulladan* 35. *Oorali*. Among these Kanikkar is the largest tribal group in Kerala (Karunakaran, 1984). Nair (1994) has reported that only Muthuvans, Mannans, Malapulayans, Ooralis and Mala Arayans are the important surviving communities in the High Ranges. Muthuvans are the only group inhabiting the high altitude shola forest regions.

5.1.4. Muthuvans – the 'shola tribes'

The Muthuvans (*Muduvans/Mudavars*) are a tribe of hill cultivators in Coimbatore, Madras, Malabar and Travancore. They have a dialect of their own, closely allied to Tamil, with a few Malayalam words. In addition to this, the

younger generation knows to read Hindi and English also, although to a base minimum (thanks to the various formal and non-formal educational reforms). Their population in Kerala is about 11, 213 with about 5664 males and 5549 females (1991 census).

The Muthuvans do not believe themselves to be indigenous to the hills, the legend handed down from father to son, is that they originally lived in Madurai. Owing to troubles, or a war in which the Pandyan Raja of the times was engaged, they fled to the hills mainly to the High Ranges of North Travancore and a few to Nilgiris. Those came to the High Ranges carried their children up the Ghats [or according to another legend, the image of the goddess *Minakshi* (Kannaki/Durga) on their backs], and it was thereupon decided to name the tribe *'Muduvan'*, or back people. Even now, they used to carry their young ones on their back in a pouch made of cloth (see Plate 5.1.2.). The approximate time of the exodus from Madura is believed to be in the fourteenth century (Nair, 1994; Singh, 1994; Thurston, 1909).

As regards appearance, the Muthuvans who claim superiority over all the other hill tribes are probably the tallest, and have the best features of all, with curved noses, beards and moustaches. They also grow their hair long and roll it over their head on which they wear a white turban. Since they live in high altitude regions, they wear thick clothes and blankets. Their senses are, from constant use, keenly developed, and can hear sounds and see distant objects, which other people would not notice (Bourdillon, 1893).

This hill tribe prefers an isolated life in the forest and generally do not mingle with the local people. Their settlements (*'kudies'*) are usually found at altitudes of 1500-1800 m asl, but those located even at 2000 m are also not uncommon. Huts are usually small, rectangular and rather flat roofed, made of jungle sticks, grass and bamboo. But nowadays most of them live in houses made of bricks and tiles – constructed under various tribal welfare programmes. Each *'kudi'* is lead by a headman, usually the oldest member, but often the post is hereditary also. Most of the tribes cultivate ganja, often restricted to a few plants, the leaves of which they dry and smoke. Some of them also have locally made guns with which they shoot wild boars, monkeys, giant squirrels, birds, etc. They were shifting cultivators until recently, when they were

forced to live in permanent settlements constructed by the government. Even though they cultivate rice, wheat, millets, pulses, sugarcanes, vegetables, lemon grasses, etc., they depend upon the forests for their day-to-day life. Some of the Muthuvans are now employed as forest watchers and as casual labourers by the Forest Department. Their immense knowledge about the interior forest areas benefits the officials in management. The Non Wood Forest Products (NWFP's) collected by them include honey, bee-wax, bamboos, reeds, canes, seeds of certain trees like *Elaeocarpus*, edible fruits belonging to the species of *Syzygium, Elaeocarpus, Rubus, Elaeagnus, Passiflora,* etc. and a variety of medicinal herbs. Species like *Anaphalis, Helichrysum, Eriocaulon, Drosera* and *Gaultheria* are collected for sale.

Near Mannavan Shola there are two Muthuva settlements, one at Kulachivayal and the other at Gudalar. At Kulachivayal, there are 57 houses with a population around 300. Gudalar kudi is also near to Pullaradi Shola. Here there are 77 houses with a population around 450 [Thomas (Forest Watcher) – *pers. comm.*].

5.1.5. The Tamilian Natives

Apart from the Muthuvans, Tamilians who migrated from the Madurai District centuries ago also inhabit the area. They belong to *Vellala Chetti* and *Telungu Chetti* communities and are basically farmers living in well-established settlements ('*Oors*'). They also collect NWFP's from the forests. The crops mainly cultivated by them include cereals and millets such as Rice, Wheat, Finger Millet/Ragi (*Eleusine coracana*), Italian Millet/Thina (*Setaria italica*) and a variety of vegetables such as Beans, Cabbage, Cauliflower, Garlic, Onion, Potato, Turnip, Carrot, Beetroot, etc. Fruit trees such as Pear, Pomegranate, Apple, Orange, etc. are also cultivated by some, although in a small scale. Lemon grass and Sugarcane are the widely cultivated crops in these areas. For distilling lemon grass and for processing sugar cane juice into jaggery, large amount of firewood is required in addition to the needs for cooking, room heating and other house hold activities. So their dependence on forest for firewood is more than that of Muthuva tribes.

Near Mannavan Shola there are mainly four Tamilian settlements with around 500 houses in total. These include Kilandur with 160 houses, Kanthallur (137), Puthur (80) and Perumala (120). The average population density is 4.37 (Ref. Kanthallur Panchayat records) and the estimated population is around 2000.

5.2. METHODOLOGY

There are various tools employed in the ethno botanical work (see Jain, 1980). They are:

1. Field studies
2. Literature
3. Information from Herbaria and Musea
4. Archaeological remains
5. Other information (*from tribal markets, tribal festivals and other ceremonies*)

Field study which holds the prime status, includes exploring new regions and recording of information among the tribal people with the plants collected or described in the area as the actual object of discussion and recording of notes. This is the most significant method for studying ethnobotany. There are two ways of gathering ethnobotanical information about medicinal plants in the field. In one way, the knowledgeable informants are taken to the field and along with collection of plants for the voucher specimens, the use of the plants as given by the tribal informants are recorded. The other way is to collect all the surrounding plants of the area and showing one by one to the informants for recording the information on them (Rao, 1989a; Martin, 1995).

Elder Muthuva tribes and other local Tamilians who are knowledgeable about the ethnobotanical details of the plants of the area were contacted personally and gathered the details. For the purpose of confirming the identity of plants, they were taken to the field to show and collect the plants. Often youngsters were taken to the field for collection purposes, after receiving proper instructions from the elder medical practitioners, since many of the elders were unhealthy to accompany me to the dense jungles.

Collected plants were brought to their settlements in front of a group of elder medical practitioners. Information gathered from each of them was

authenticated by consulting other members, and only those information which were found identical were recorded. All information on the local names of the plants, parts that are used, medicines prepared, formulation of the drugs and their application, etc. were gathered and the mode of applications were often eye witnessed.

To ascertain the authenticity of the information gathered on plant utilization, '*Credibility Rating*' were given to each and every documentation based on Balick (1996) – see Table 5.1.

Table 5.1. Credibility rating for use information collected

No.	Category	Credibility Rating
A.	Collector uses or directly observed use	**1**
B.	Informant uses or directly observed use	**2**
C.	Informant heard/knew from a further source	**3**
D.	Use reported from the literature	**4**
E.	Common knowledge	**5**
F.	Credibility of use information unknown	**6**

This innovative idea was first implemented at The New York Botanical Garden's (NYBG) *Institute of Economic Botany* (IEB). In the past there was little opportunity to evaluate the quality of data based on the way it was collected during ethnobotanical studies. Here the data with a rating of **1** have a reasonable certainty of being accurate, while those with a rating of **5** or **6** may be less authoritative. By adopting this standardization method, the credibility of the information gathered is assured.

Plant specimens collected were neatly processed, preserved or prepared into herbaria following Jain and Rao (1977). Sincere attempts were made to collect data on the common/tribal names of the plant, medicinal use(s), parts used, other ingredients added (if any), mode of preparation of drugs and method of their administration, dose and duration of treatment, etc.

Before attempting field studies, authentic literature that are available on the tribes and other residents of the area were collected and analysed. This include publications such as *Reports on the forests of Travancore* (Bourdillon, 1893); *Castes and tribes of Southern India* (Thurston, 1909); *Encyclopedia of Indian Tribes* (Shashi, 1944), *Kanikkar* (Karunakaran, 1989); *The Scheduled*

Tribes (Singh, 1994), *High Ranges* (Nair, 1994) and other valuable information from various Panchayath offices, Tea estate manuals, Forest working and management plans, etc. It was astonishing to know that literature on the ethnobotanical knowledge of the Muthuva tribals and the Tamilian natives residing in the high range areas were practically nil, even though a few but similar publications were available from our neighbouring state, Tamil Nadu (Rajan, 1992).

Shola plant specimens represented in the local regional herbaria such as KFRI, MH, CALI, etc. were studied and ethnobotanical notes if any, were gathered.

Archeological evidences from the region such as dolmens, rock carvings, etc. were studied and attempts made to trace out their historical importance and connection with the tribal culture. Tribal festivals, other ceremonies, taboos, etc. were also studied to get an overall idea about the community, their culture and their dependence on plants and forest. This also helped to identify the plants having religious and other social importance.

5.3. RESULTS

Ethnobotanical data thus collected are arranged alphabetically according to the botanical names of the plants in Table 5.2. The botanical names are followed by respective family, local name(s), habit, uses of the plant, use code, credibility ranking (CR), etc. The detailed description of the plants and nomenclatural details are provided in Chapter no. 4. Abbreviations used to denote the *'Uses Code'* include: Agricultural Implements (**AI**), Agricultural Purpose (**AP**), Cosmetic Use (**CU**), Fencing (**FE**), Fish Poison (**FP**), Fodder (**FR**), Food & Food supplements (**FD**), House Construction (**HC**), Household Utensils (**HU**), Magico-Religious Beliefs (**MB**), Marketing Purpose (**MP**), Medicinal Use (**MD**), Miscellaneous Use (**MU**), Ornamental Purpose (**OP**), Poisonous Plants (**PP**), Religious Purpose (**RP**), Spices and Condiments (**SC**), Timber Use (**TU**), etc. Photographs of the species if any, are given at the end of this chapter and also after Chapter 4, which deals with the Taxonomical studies.

Table 5.2. Ethnobotanical information on various plant species collected from the Shola Forests of Kerala

No.	Botanical Name	Family	Local name	Habit	Uses of Plants	Use Code	CR
1.	*Acacia dealbata*	Fabaceae	Wattle, Karuva	Tree	Bark yields tannin; timber	MU, TU	1
2.	*Acacia mearnsii*	Fabaceae	Wattle, Karuva	Tree	Bark yields tannin; timber	MU, TU	1
3.	*Acacia melanoxylon*	Fabaceae	Acacia	Tree	Timber	MU, TU	1
4.	*Acmella calva*	Asteraceae	Nai Koppu, Nai Manjal	Herb	For dog bites, flowers are crushed and mixed with urine of little children (of opposite sex) and applied	MD	1
5.	*Acronychia pedunculata*	Rutaceae	Verugu Theeni, Vella Maram,	Tree	Spade handle; house construction	AI, HC	1
6.	*Actinodaphne bourdillonii*	Lauraceae	Vari Maram	Tree	Timber; as pillars	TU, HC	1
7.	*Ageratina adenophora*	Asteraceae	Neelagiri, Thravada	Herb	Crushed leaves are applied on wounds; used as green manure in plantations	MD, AP	1
8.	*Ageratum houstonianum*	Asteraceae	Michangala, Kaliyamman Pathiri Chedi	Herb	Leaf paste mixed with lime is applied on cuts by iron knives and machetes; leaf paste is applied to cure *Alopacia ariata* (abnormal and regional hair loss from head)	MD	1

No.	Botanical Name	Family	Local name	Habit	Uses of Plants	Use Code	CR
9.	*Alsophila nilgirensis* (Tree fern)	Cyatheaceae	Pana Edaval, Kalyana Thevai	Tree	Leaves and even the whole tree used for decorating houses and temples during festivals	RP, OP	1
10.	*Alstonia venenata*	Apocynaceae	Thipli, Thippili	Shrub	Flowers used in temples for decoration during the month of *Chithirai* (April)	RP	1
11.	*Amaranthus viridis*	Amaranthaceae	Arakkeera	Herb	Used as vegetable or in the preparation of *Rasams* (a soup made out of spices and used as an appetizer)	FD	1
12.	*Anaphalis aristata*	Asteraceae	Panji Poovu	Herb	Collected for sale to dry flower industry	MP	1
13.	*Anaphalis bournei*	Asteraceae	Panji Poovu	Herb	Collected for sale to dry flower industry	MP	1
14.	*Anaphalis lawii*	Asteraceae	Panji Poovu	Herb	Collected for sale to dry flower industry	MP	1
15.	*Anaphalis leptophylla*	Asteraceae	Panji Poovu	Herb	Collected for sale to dry flower industry	MP	1
16.	*Anaphalis meeboldii*	Asteraceae	Panji Poovu	Herb	Collected for sale to dry flower industry	MP	1
17.	*Anaphalis subdecurrens*	Asteraceae	Panji Poovu	Herb	Collected for sale to dry flower industry	MP	1
18.	*Anaphalis travancorica*	Asteraceae	Panji Poovu	Herb	Collected for sale to dry flower industry	MP	1
19.	*Artemisia nilagirica*	Asteraceae	Velipathiri	Shrub	Leaves burnt to repel mosquitoes; used for decorating temples during festivals	PP, RP	1
20.	*Arundinaria floribunda*	Poaceae	Eetta	Shrub	Used for making baskets, fencing, in house construction etc	HU, HC, FE	1
21.	*Arundinaria walkeriana*	Poaceae	Eetta	Shrub	Used for making baskets, fencing, in house construction etc	HU, HC, FE	1
22.	*Asparagus racemosus*	Liliaceae	Thaali Periyan, Pilichavari	Straggler	Against oedematous swellings; also as an ingredient in certain other medicinal preparations	MD	2
23.	*Atalantia wightii*	Rutaceae	Kattu Elumachan	Shrub	Children having cold are advised to inhale the fumes evolving out when some fruits and *damar* are put over burning coal.	MD	2
24.	*Athyrium* sp. (a fern)	Athyriaceae	Theva	Herb	Whole plant pounded in milk is given to ladies once in a day (for 3 days) to cure leucorrhoea	MD	2
25.	*Balanophora fungosa* ssp. *indica* var. *indica*	Balanophoraceae	Kannukutti Madu	Root Parasite	The plant is said to possess powers in curing piles	MD	3
26.	*Begonia malabarica*	Begoniaceae	Minukki	Herb	Plant used for cleaning brass utensils	MU	1
27.	*Beilschmiedia wightii*	Lauraceae	Panthada, Nagara Maram	Tree	Timber	TU	1
28.	*Bhesa indica*	Celastraceae	Penali	Tree	Timber	TU	1

No.	Botanical Name	Family	Local name	Habit	Uses of Plants	Use Code	CR
29.	*Bischofia javanica*	Euphorbiaceae	Thondi	Tree	Timber; as planks	TU	1
30.	*Breynia retusa*	Euphorbiaceae	Aattacherukola	Shrub	Fodder for goats	FR	1
31.	*Calamus gamblei*	Arecaceae	Chooral	Straggler	Used for making chairs, baskets etc	HU	1
32.	*Cannabis sativa*	Cannabinaceae	Kanchavu Chedi	Shrub	An ingredient of many medicinal preparations and antidotes against poisoning; also used as a hallucinogen.	MD, MU	1
33.	*Canthium dicoccum*	Rubiaceae	Edali Maram	Tree	Strong, durable wood used in house construction	HC	1
34.	*Cassia laevigata*	Fabaceae	Kattu Konna	Tree	Leaf juice applied over young children and cattle to ward off evil eyes	MB	2
35.	*Celtis tetrandra*	Ulmaceae	Karu Kuyyan, Sarala Kuyyan	Tree	Saw dust used in making incense sticks, used in making knife handles	CU, HU	3, 2
36.	*Celtis philippensis* var. *wightii*	Ulmaceae	Vellakkuyyan	Tree	Used as planks	TU	2
37.	*Centella asiatica*	Apiaceae	Kuthirakulambu Chedi, Vallara	Herb	Crushed along with fennel and onion, boiled and the soup is drunk to cure arthritis; used against boils and skin diseases; crushed along with jaggery (*Karupatti*) and taken in as health tonic.	MD	2
38.	*Chenopodium ambrosioides*	Chenopodiaceae	Naattachedi	Herb	To cure oedematous swellings, leaves are boiled in rice soup and a cloth dipped in it is kept over the problematic area.	MD	2
39.	*Chionanthus ramiflorus* var. *peninsularis*	Oleaceae	Kattu Chakkalathy, Vella Edali	Tree	Strong wood used for making ploughs, roof rafters etc	AI, HC	1
40.	*Chukrasia tabularis*	Meliaceae	Vella Nangu, Chandana Vembu	Tree	Timber	TU	2
41.	*Cinnamomum malabatrum*	Lauraceae	Vella Kodala	Tree	Bark dipped in tea or coffee as a condiment; timber	SC, TU	1
42.	*Cinnamomum wightii*	Lauraceae	Vella Kodala, ShanthaMaram	Tree	Bark dipped in tea or coffee as a condiment; timber	SC, TU	
43.	*Cirsium wallichii* var. *wightii*	Asteraceae	Chakku Mullu	Shrub	A roaring sound is made by blowing forcibly through a two feet long hollow stem (as a signal or for fun)	MU	1
44.	*Cissampelopsis corymbosa*	Asteraceae	Vettuva Marunnu Chedi	Climber	Crushed plants are applied over cuts and wounds made by iron knives and machetes	MD	2
45.	*Clerodendrum viscosum*	Verbenaceae	Kattu Padappa	Tree	Used as roof rafters after keeping over smoke for a few days; leaves used to carry or pack food materials	HC	1

No.	Botanical Name	Family	Local name	Habit	Uses of Plants	Use Code	CR
46.	*Cocculus laurifolius*	Menispermaceae	Aadu Kolli, Marpingi	Shrub	Poisonous shrub, often leading to the death of goats; bushy stem used in making brooms (Aadu = Goat, Kolli = killer; Mar = Broom)	HU, PP	2, 1
47.	*Crotalaria semperflorens*	Fabaceae	Chunda	Shrub	Given to goats as fodder	FR	1
48.	*Curculigo orchioides*	Hypoxidaceae	Nilappana	Herb	Roots used as a purgative.	MD	2
49.	*Cyanotis pilosa*	Commelinaceae	Kalani, Thengapullu Kola	Herb	Used as a laxative in cattle; given to young calves for about a month before they are fed with grasses	MD	1
50.	*Cymbopogon flexuosus*	Poaceae	Theruva Pullu	Herb	Used for thatching houses and cattle sheds	HC	1
51.	*Cymbopogon travancorensis*	Poaceae	Inchi Pullu	Herb	Plant distilled for Lemon grass oil which is either marketed or self used	MD, MP	1
52.	*Cyphomandra betaceae*	Solanaceae	Mara Thakkali	Shrub	Ripe fruits are eaten	FD	1
53.	*Debregeasia longifolia*	Urticaceae	Neer Vanji, Vanji, Neeranji, Narambili	Tree	As cattle feed; also yields fibre for making ropes; to ripen banana, they are covered with these leaves	FR, MU	1
54.	*Derris brevipes*	Fabaceae	Karinkodi	Climber	Used as a strong rope for house construction	HC	1
55.	*Desmodium uncinatum*	Fabaceae	Moschio, Pottu Kola, Kolagu Kola	Herb	Cattle feed	FO	1
56.	*Dodonaea viscosa* var. *angustifolia*	Sapindaceae	Vrali	Shrub	For head aches, leaves are stuck on fore head; for relieving back aches, people lie over cots where fresh leaves are spread	MD, HC	1
57.	*Drosera peltata*	Droseraceae	Koshukotti Pullu	Herb	To remove corns on feet, plants are crushed and applied; also an ingredient in some secret medicinal preparations.	MD, CU	1, 2
58.	*Dumasia villosa*	Fabaceae	Pullooran Charadu Kodi	Climber	Used as rope for tying twigs and fodder grasses	MU	1
59.	*Elaeagnus kologa*	Elaeagnaceae	Poolan Palam	Straggler	Ripe fruits edible	FD	1
60.	*Elaeocarpus glandulosus*	Elaeocarpaceae	Kottlam Pazham	Tree	Ripe fruits and the cotyledons are edible	FD, TU	1
61.	*Elaeocarpus recurvatus*	Elaeocarpaceae	Rudraksham	Tree	Leaves sold to the dry flower industry	MP	1
62.	*Elaeocarpus tuberculatus*	Elaeocarpaceae	Shembara Maram, Koduvasi Maram	Tree	Timber; the crescent shaped abnormal seeds, which are of rare occurrence, are extremely valuable and so collected by the tribes for sale. For the purpose, all the undergrowths beneath are cleared.	MP	1
63.	*Emilia scabra*	Asteraceae	Poosha Thala	Herb	Used in sprains and muscle spasms	MD	2

No.	Botanical Name	Family	Local name	Habit	Uses of Plants	Use Code	CR
64.	*Erigeron karvinskianus*	Asteraceae	Pottu Poovu	Herb	Flowers ornamental; used in decoration	OP	1
65.	*Eriocaulon brownianum*	Eriocaulaceae	Button Poovu	Herb	Collected for sale to dry flower industry	MP	1
66.	*Eriocaulon collinum*	Eriocaulaceae	Button Poovu	Herb	Collected for sale to dry flower industry	MP	1
67.	*Eriocaulon melaleucum*	Eriocaulaceae	Button Poovu	Herb	Collected for sale to dry flower industry	MP	1
68.	*Eriocaulon odoratum*	Eriocaulaceae	Button Poovu	Herb	Collected for sale to dry flower industry	MP	1
69.	*Eucalyptus globulus*	Myrtaceae	Eucali	Tree	Oil distilled out from the leaves is used against coughs, colds, head and back aches; also marketed; branches are used as fire wood for distillation	MD	1
70.	*Eucalyptus grandis*	Myrtaceae	Grandis	Tree	Timber; used as fire wood for distilling Eucalyptus and Lemon grass oil.	TU	1
71.	*Euphorbia rothiana*	Euphorbiaceae	Merashupal Chedi	Herb	Latex obtained from the stem is applied on the leather of *'Merashu'* (a type of *tabor*) for good sound reproduction.	MU	2
72.	*Eurya japonica*	Tiliaceae	Koora Mar	Shrub	For constructing roofs of huts, cattle sheds etc.	HC	1
73.	*Eurya nitida*	Tiliaceae	Koora Mar	Shrub	For constructing roofs of huts and cattle sheds	HC	1
74.	*Exacum wightianum*	Gentianaceae	Vella Thavalakkal Chedi	Herb	An antidote against snake poison. The plant is crushed along with some *'Ganja'* and tobacco and made into pills after drying. When required, it is pounded in opposites sex's urine (of children) and administered orally. Such preparation made out of *Acmella calva* is put over the bitten area also	MD	3
75.	*Garcinia gummi-gutta* var. *papilla*	Clusiaceae	Kodampuli	Tree	Ripe fruits are dried and used in curries; crushed along with *Capsicum* and given to goats to cure diarrhoea	SC, MD	2
76.	*Gaultheria fragrantissima*	Ericaceae	Kolgatte	Herb	Massively collected and exported (yields the *Winter green oil* which is an ingredient in several ointments and a flavouring agent in various tooth pastes and tooth powders)	MP	1
77.	*Girardinia diversifolia*	Urticaceae	Ana Chenthatti	Shrub	Highly allergic plant with stinging hairs; if touched, causes itching with burning sensation for hours	MU	1
78.	*Glochidion ellipticum*	Euphorbiaceae	Chendana, Chatha - Kadambu	Tree	Used for making planks and spade handles; also used as pillars for houses and cattle sheds	HC	2
79.	*Glochidion neilgherrense*	Euphorbiaceae	Chendana, Chatha-Kadambu	Tree	Used for making planks and spade handles; also used as pillars for houses and cattle sheds	HC	2

No.	Botanical Name	Family	Local name	Habit	Uses of Plants	Use Code	CR
80.	*Gnidia glauca*	Thymeleaceae	Nanju Naar, Nachi Naar	Tree	Stem along with the bark of *Syzygium cumini* are crushed and used as fish poison; crushed stems are allowed to putrefy in fields to repel pests; peeled off bark is used as ropes.	FP, PP	2
81.	*Gomphandra coriacea*	Icacinaceae	Chotta, Shotta, Chakkimaram	Tree	Used as pillars for huts	HC	1
82.	*Grevillea robusta*	Proteaceae	Silver Oak	Tree	Used as timber	TU	1
83.	*Gynura travancorica*	Asteraceae	Moyalu Kola, Koppu Chedi	Herb	Fodder for rabbits	FR	2
84.	*Hedychium flavescens*	Zingiberaceae		Herb	Young buds are used as vegetable	FD	2
85.	*Helichrysum buddleioides*	Asteraceae	Panji Poovu	Herb	Collected and sold as dry flowers	MP	1
86.	*Hydnocarpus alpina*	Flacourtiaceae	Vila Maram, Marotti	Tree	Timber; used as spade and plough handles also as roof rafters	TU, AI	1
87.	*Hydrocotyle javanica*	Apiaceae	Vaite Kala, Vella Vaite	Herb	Plants crushed along with stems of *Gnidia glauca* and bark of *Syzygium cumini* are used as fish poison	FP	2
88.	*Hypericum mysurense*	Hypericaceae	Avaram Chedi	Shrub	To remove hair from legs, leaf paste is applied and after sometime rubbed hard with a cloth piece; flowers used in funeral ceremonies; used as cattle feed	CU, FR	2
89.	*Ilex walkeri*	Aquifoliaceae	Parasal, Noola Maram	Tree	As pillars in house construction	HC	2
90.	*Ilex wightiana*	Aquifoliaceae	Parasal, Noola Maram	Tree	As pillars in house construction	HC	2
91.	*Impatiens balsamina*	Balsaminaceae	Thotta Chinungi	Herb	Fodder for goats	FR	1
92.	*Impatiens cordata*	Balsaminaceae	Thotta Chinungi	Herb	Fodder for goats	FR	1
93.	*Impatiens tangachee*	Balsaminaceae	Thotta Chinungi	Herb	Used for poojas during *'Mattu Pongal'* festival (a festival of cattle worship)	RP	
94.	*Indigofera cassioides*	Fabaceae		Herb	Fodder for goats	FR	1
95.	*Isonandra lanceolata*	Sapotaceae	Vellappala	Tree	Timber	TU	1
96.	*Isonandra perrottetiana*	Sapotaceae	Karimbala	Tree	Timber	TU	1
97.	*Jasminum brevilobum*	Oleaceae	Kattu Mulla	Climber	Flowers ornamental	OP	1
98.	*Lablab purpureus*	Fabaceae	Kattavara	Climber	Flowers and fruits are used as vegetable	FD	1
99.	*Lantana camara* var. *aculeata*	Verbenaceae	Unni Mullu, Sanku Theva Mullu	Shrub	Used in fencing	FE	2

No.	Botanical Name	Family	Local name	Habit	Uses of Plants	Use Code	CR
100.	*Lantana indica*	Verbenaceae	Kuzhaloothi Pazham	Shrub	Fruits are given to cure dysentery	MD	2
101.	*Leucas lamifolia*	Lamiaceae	Perum Thumba	Herb	For stomach ache, plants are crushed along with the seeds of *Toddalia, Solanum anguivi, Myristica,* fennel etc and used	MD	2
102.	*Ligustrum perrottetii*	Oleaceae	Pingan, Pingi	Tree	Leaves boiled in Gingelly oil is applied over wounds; used as spade handles	MD	2
103.	*Litsea oleoides*	Lauraceae	Chembalava	Tree	Timber	TU	1
104.	*Litsea wightiana*	Lauraceae	Manja Kodala	Tree	Timber	TU	1
105.	*Lobelia leschenaultiana*	Lobeliaceae	Thonnali	Shrub	Used as a tick repellent in cattle; crushed leaves are allowed to putrefy in paddy fields to repel destructive worms and beetles	MD, AP	2
106.	*Lycopersicon lycopersicum* (wild)	Solanaceae	Chirangu Thakkali, Cheru Thakkali	Herb	Leaves are ground into a paste and applied over scabies and itches (skin diseases); leaf juice is applied over burns; fruits are used as vegetable	MD, FD	1
107.	*Macaranga peltata*	Euphorbiaceae	Vatta Kanni	Tree	Leaves used for packing food, fish etc	MU	1
108.	*Mahonia leschenaultii*	Berberidaceae	Manjanathi	Tree	Ripe fruits are edible	FD	2
109.	*Mallotus tetracoccus*	Euphorbiaceae	Vatta Kanni, Perakela	Tree	Leaves used for packing food, fish etc	MU	1
110.	*Mastixia arborea*	Cornaceae	Kunthirikkam, Eramba Maram	Tree	To repel flies and mosquitoes resin is burnt; mushrooms growing on dead trees are considered edible	MU	1
111.	*Meliosma simplicifolia*	Sabiaceae	Kolakkatta Maram, Chengoini	Tree	Leaves used in the preparation of *Kolakkatta* (a type of flour cake (*Ada*) prepared by baking the sweetened flour packed in leaves)	MU	2
112.	*Murraya paniculata*	Meliaceae	Pala Kanni, Vellakkal Thirukan	Shrub	Handle for spades	AI	2
113.	*Mussaenda hirsutissima*	Rubiaceae	Chandrakala - Sooryakala	Straggler	The whitish petalloid sepal is said to possess powers to cure Conjunctivitis, if taken in arms and looked stealthily in darkness	MB	3
114.	*Myrsine capitellata* var. *sessilis*	Myrsinaceae	Cheera Maram	Tree	Timber; roof rafters and beams	TU, HC	1
115.	*Myrsine thwaitesii*	Myrsinaceae	Valiya Cheera Maram	Tree	Timber; roof rafters and beams	HC	1
116.	*Myrsine wightiana*	Myrsinaceae	Cheera Maram	Tree	Timber; rafter for roofs	TU	1
117.	*Neolitsea cassia*	Lauraceae	Mulaku Nari,Pravari	Tree	Timber	TU	1
118.	*Neolitsea fischeri*	Lauraceae	Vari Maram	Tree	Handles for ploughs	AU	1

No.	Botanical Name	Family	Local name	Habit	Uses of Plants	Use Code	CR
119.	*Neolitsea scrobiculata*	Lauraceae	ShanthaMaram	Tree	Timber	TU	1
120.	*Nothopegia colebrookeana*	Anacardiaceae	Era	Tree	Allergic plant causing hard callus like swellings and itching when touched	MU	2
121.	*Oxalis corniculata*	Oxalidaceae	Pulichan, Kottampulichan	Herb	Used as vegetable; leaves chewed as a mouth freshener; whole plant is crushed in goat's milk and used against stomachache and diarrhoea.	FD, CU, MD	1, 2
122.	*Parahemionitis cordata* (a fern)	Hemionitidaceae	Pattichevi, Poonakkathi	Herb	Leaves are made into a paste with turmeric and applied to dog bites; relieves pain and infection.	MD	2
123.	*Passiflora edulis*	Passifloraceae	Passion Palam	Climber	Ripe fruit pulp is sweet and edible	FD	1
124.	*Passiflora leschenaultii*	Passifloraceae	Thattu Pootan, Murumurukkan Kodi, Kodi Kai	Climber	Ripe fruit pulp is sweet and edible	FD	1
125.	*Persea macrantha*	Lauraceae	Kula Mavu	Tree	Timber used for preparing planks	TU	1
126.	*Persicaria chinensis*	Polygonaceae	Mukkala, Oduthan	Herb	Roots ground in milk or water is used in diarrhoea, plant used as vegetable, also given to cattle, leaves used as shampoo	MD, FD, FR, CU	2
127.	*Phoebe wightii*	Lauraceae	Chudala, Mulaku Nari	Tree	Used as planks or as pillars	TU	1
128.	*Photinia integrifolia* var. *sublanceolata*	Rosaceae	Choluvan, Kalappa Maram	Tree	For making plough and spade handles	AI	1
129.	*Physalis peruviana*	Solanaceae	Pottapala Chedi, Malathakkali Keera	Herb	Concentrated leaf decoction is used against Jaundice; fruits are used as vegetable	MD, FD	2
130.	*Pilea melastomoides*	Urticaceae	Narali	Herb	Fodder for goats	FR	1
131.	*Piper argyrophyllum*	Piperaceae	Kattu Kurumulaku	Climber	Stem crushed and applied for tooth aches; Fruits used for head and stomach aches; used as spice	MD, SC	2
132.	*Piper mullesua*	Piperaceae	Kattu Thippalli	Climber	Stem crushed and applied for tooth aches; Fruits used for head and stomach aches; used as spice	MD, SC	1
133.	*Piper nigrum*	Piperaceae	Kattu Kurumulaku, Eya Kodi	Climber	Fruits used for headaches and stomachache; also used as spice in preparing *Rasams* (a spice soup).	MD, SC	1
134.	*Piper schmidtii*	Piperaceae	Kattu Kurumulaku, Eya	Climber	Fruits used for head aches and stomach aches; also used as spice	MD, SC	2
135.	*Piper trioicum*	Piperaceae	Kattu Kurumulaku, Eya	Climber	Fruits used for head aches and stomach aches; also used as spice	MD, SC	2
136.	*Piper wightii*	Piperaceae	Kattu Kurumulaku, Eya Kodi	Climber	Fruits used for head aches and stomach aches; also used as spice	MD, SC	1

No.	Botanical Name	Family	Local name	Habit	Uses of Plants	Use Code	CR
137.	*Plantago erosa*	Plantaginaceae	Nila Chakka, Njaramboori	Herb	For treating Varicose vein problems, plants are crushed and applied; used as an antiseptic in treating wounds	MD	2
138.	*Plectranthus coleoides*	Lamiaceae	Padappayila	Herb	Crushed leaves are applied over athlete's foot (a fungal disease) and cracks	MD	2
139.	*Pogostemon atropurpureus*	Lamiaceae	Kuzhaloothi Pazham	Herb	For germinating *'Komban'* rice variety which needs more temperature, the seeds are laid in a bamboo basket covered inside with the leaves of this plant and later some cow dung mixture is poured over the seeds and again covered with the leaves and kept as such for a couple of days	AP	2
140.	*Pouzolzia bennettiana* var. *acuta*	Urticaceae	Narali Kola, Sera Thandan	Herb	Plant ground along with Crabs and eggs is used against cuts and fractures; fodder for goats	MD, FR	2
141.	*Pouzolzia wightii*	Urticaceae	Valiya Narali	Herb	Fodder for goats	FR	1
142.	*Pouzolzia wightii* var. *scabra*	Urticaceae	Narali Kola	Herb	Fodder for goats	FR	1
143.	*Prunus ceylanica*	Rosaceae	Kodi, Chembakam	Tree	Used in the construction of huts, handle for spades etc	HC, AI	1
144.	*Prunus persica*	Rosaceae	Pikkies	Tree	Ripe fruits are sweet and edible	FD	1
145.	*Pseudoxytenanthera monadelpha*	Poaceae	Kattu Mula	Shrub	Used for making baskets, mats and other house hold utensils	MU	1
146.	*Psychotria nilgiriensis* var. *nilgiriensis*	Rubiaceae	Morana, Pavadakkambu	Shrub	Used as supports for beans cultivation	AP	1
147.	*Pteris quadriaurita* (a fern)	Pteridaceae	Njandu Thuravan	Herb	The pinnate fronds are slowly inserted into crab holes and quickly and carefully pulled out along with the crab (*Njandu*), when it catches hold of it	MU	2
148.	*Rhododendron arboreum* subsp. *nilagiricum*	Ericaceae	Alangi	Tree	Flowers used during *Mattu Pongal* festivals for decorating cattle; it is purgative; leaves are collected and exported for dry flower industry	RP, MP, MD	1
149.	*Rhodomyrtus tomentosa*	Myrtaceae	Kirattan, Cheru-kotlan Pazham	Shrub	Ripe fruits are sweet and edible; leafy twigs are cut, dried, coloured and used in dry flower industry	FD, MP	1
150.	*Ricinus communis*	Euphorbiaceae	Aavanakku, Kottamaram	Shrub	Oil extracted from the seeds are used as laxative	MD	2
151.	*Rubus ellipticus*	Rosaceae	Cheechi Palam	Straggler	Ripe fruits edible	FD	1
152.	*Rubus fairholmianus*	Rosaceae	Eruma Cheechi Palam, Vettila Mullu	Straggler	Ripe fruits edible; young leaves and the bark of *Prunus persica* are used for mastication; used in fence construction	FD, MU	1

No.	Botanical Name	Family	Local name	Habit	Uses of Plants	Use Code	CR
153.	*Rubus niveus*	Rosaceae	Karim Cheechi	Straggler	Ripe fruits edible	FD	1
154.	*Rumex nepalensis*	Polygonaceae	Chethakkala	Herb	Young stems and petioles are used for souring *Colocasia* curries	MU	2
155.	*Salix tetrasperma*	Salicaceae	Vanchi Maram	Tree	Used for making yoke of ploughs and bullock carts; as timber	AI, TU	2
156.	*Saprosma foetens*	Rubiaceae	Theetta Nari	Tree	Children having diarrhoea and vomiting are advised to inhale the smoke by burning the wood	MD	2
157.	*Sarcococca saligna*	Buxaceae	Mattu Vadi	Shrub	Shepherds use the strong flexible stems to make beating sticks	MU	1
158.	*Scolopia crenata*	Flacourtiaceae	Mullu Kara, Karim Kara	Tree	Strong and durable wood used as pillars and spade handles	AI, HC	1
159.	*Selaginella brachystachya* (Pteridophyte)	Selaginellaceae	Urakkenni Poovu	Herb	A piece of the plant kept over both the ears is said to induce sleep	MB	2
160.	*Senecio scandens*	Asteraceae	Pomburi Kodi	Climber	Used as rope for tying fire wood; wound into a ring and used as a cushion to keep earthern pots.	MU	1
161.	*Solanum anguivi* var. *anguivi*	Solanaceae	Kandanka Mullu	Shrub	Crushed plant is applied over throat to relieve pain	MD	2
162.	*Solanum nigrum*	Solanaceae	Eeradukukeera	Shrub	To cure intestinal ulcers, the plant is boiled with a little water and the juice extracted is taken early in the morning before food; also used as vegetable	MD, FD	3
163.	*Solanum virginianum*	Solanaceae	Kandam Kathiri	Shrub	Fruit pulp is applied to repel leeches	MU	1
164.	*Sonchus oleraceus*	Asteraceae	Varapputhannal	Herb	Leaves used as vegetable along with *Amaranthus*	FD	1
165.	*Sphaeropteris crinita* (Tree fern)	Cyatheaceae	Pana Edaval, Kalyana Thevai	Tree	Leaves and even the whole tree used for decorating houses and temples during festivals	RP, OP	1
166.	*Strobilanthes cuspidatus*	Acanthaceae	Kannarkkurinji	Shrub	Used for thatching walls of huts and cattle sheds before filling with mud	HC	1
167.	*Strobilanthes foliosus*	Acanthaceae	Kallukurinji, Vettila kurinji	Shrub	Used for mastication; fodder for goats	MU, FR	1
168.	*Strobilanthes gracilis*	Acanthaceae	Thoka Kurinji	Shrub	Massively harvested and used as poles for beans cultivation	AP	1
169.	*Symplocos cochin-chinensis* ssp. *laurina*	Symplocaceae	Parala, Pasari	Tree	Used in constructing huts and cattle sheds; seeds used for making garlands	OP	1
170.	*Symplocos foliosa*	Symplocaceae	Parala	Tree	Used in constructing huts, cattle sheds; seeds used for making garlands	HC, OP	1

No.	Botanical Name	Family	Local name	Habit	Uses of Plants	Use Code	CR
171.	*Syzygium caryophyllatum*	Myrtaceae	Potti Njaval	Tree	Timber used for house construction	TU	2
172.	*Syzygium cumini*	Myrtaceae	Valiya Njaval	Tree	Timber; ripe fruits are edible	FD, TU	1
173.	*Syzygium densiflorum*	Myrtaceae	Pilla Njaval, Kuru Njaval, Kuruthal	Tree	Timber	TU	2
174.	*Tetrastigma leucostaphylum*	Vitaceae	Pashala Kodi	Climber	Plants crushed in castor oil is applied over boils	MD	2
175.	*Themeda triandra*	Poaceae	Chekkanampullu	Herb	Given to goats	FR	2
176.	*Toddalia asiatica*	Rutaceae	Kantham Kolunthu	Straggler	Leaves and buds ground along with rice flour are made into cakes and given to children to cure coughs and colds; fruits crushed along with young leaves of *Leucas lamifolia* and *Solanum anguivi* are given to cure stomach ache.	MD	2
177.	*Trema orientalis*	Ulmaceae	Oma Maram	Tree	Used as plough handles; as cattle feed	AP, FR	2
178.	*Trichilia connaroides*	Meliaceae	Kozhi Penali, Kedumbu	Tree	Used as planks; holy tree for Muthuvans	MB	1
179.	*Trichosanthes lobata*	Cucurbitaceae	Kovan Kodi, Pepparal Kodi, Kattu Padavalam	Climber	Fruits which is a vegetable are collected and sold, either raw or dry (Rs. 60/- per 1kg of dry seeds)	MP	1
180.	*Triumfetta pilosa*	Sterculiaceae	Eruma Chappu	Herb	Cattle feed	FR	1
181.	*Turpinia cochinchinensis*	Staphyleaceae	Kanali, Kambili Vetti	Tree	Handle for spades and ploughs	AI	1
182.	*Vaccinium leschenaultii*	Vacciniaceae	Kela maram, Kelan	Tree	Ripe fruits edible	FD	1
183.	*Vernonia conyzoides*	Asteraceae	Kaliyamman Pathiri	Herb	Plant ground with lime is applied over wounds	MD	1
184.	*Viburnum punctatum*	Caprifoliaceae	Konakkara	Tree	The most preferred fire wood next to wattle	MU	1
185.	*Wattakaka volubilis*	Asclepiadaceae	Kakkan Kodi	Climber	Used as rope for tying fire wood	MU	1
186.	*Zanthoxylum tetraspermum*	Rutaceae	Kokki Mullu	Straggler	For fencing	FE	1
187.	*Zehneria maysorensis* var. *umbellata*	Cucurbitaceae	Musumusukan Chedi	Climber	Used as vegetable along with *Amaranthus*	FD	2
188.	*Zizyphus rugosa*	Rhamnaceae	Kottamullu	Straggler	Ripe fruits edible	FD	1

5.4. ANALYSIS AND DISCUSSION

High altitude shola forests were neglected for a long time considering it as unproductive. The main reason was that the trees are stunted, profusely branched with short bole, and of very little timber value (Balasubramaniam & Kumar, 2000). The regions. are highly fragmented and inaccessible. Ethnobotanical knowledge on the shola plants or about the tribal or other native communities was very meager. Nair (2000) has reported that the only NWFP plants characteristic to this area are a few aromatic grasses, medicinal orchids and balsams. 'Valuable plants' include trees like *Cinnamomum,* a few sedges and grasses used for mat weaving, broom making, thatching, etc. Thus vast areas of grasslands and sholas in these regions have been converted to plantations of Wattle *(Acacia dealbata, A. mearnsii* and *A. decurrens*), Eucalyptus (*E. grandis* and *E. globulus*) and Silver Oak (*Grevillea robusta*). Within the study area, Eravikulam is the only area free from plantation and other exploitation activities being declared as a National Park in 1978. Even then, unauthorized collection of firewood and NWFP 's is still continuing (Ramesan, 1991).

5.4.1. Utilisation pattern

The analysis of the data gathered during the study revealed interesting results. The Muthuva tribes and Tamilian natives were found to use about **188** plant species for various purposes, which form 25 percent of the plant species in the study area. This includes 59 herbs, 31 shrubs, 70 trees, 18 climbers and 10 stragglers. Among them, 37 species (20 %) are either rare or endangered, 31 species (16.5 %) are endemic to Western Ghats and 16 (8.5 %) are new records for the state of Kerala (see Figs. 5.1 & 5.2). The high proportion of rare and endemic species having ethnobotanical significance, also finds importance in the conservational point of view, since many of species are drastically exploited from the area.

The so called 'unproductive' shola plants were found to be put into a variety of broad category uses such as medicinal, agricultural, religious, ornamental, cosmetic and marketing purposes, as timber, food and food supplements, fodder, fish poisons, in house construction, making of agricultural and house hold utensils, fencing, etc. Some plants were attributed to have certain magical powers.

Fig. 5.1. Habit wise categorization of the ethnobotanically important species

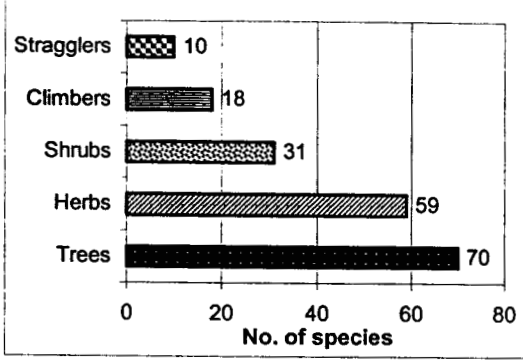


Fig. 5.2. Distributional status of ethnobotanically important species

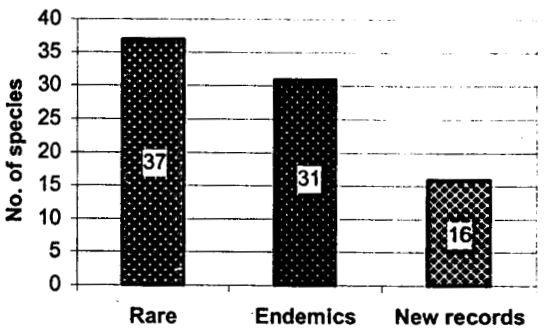
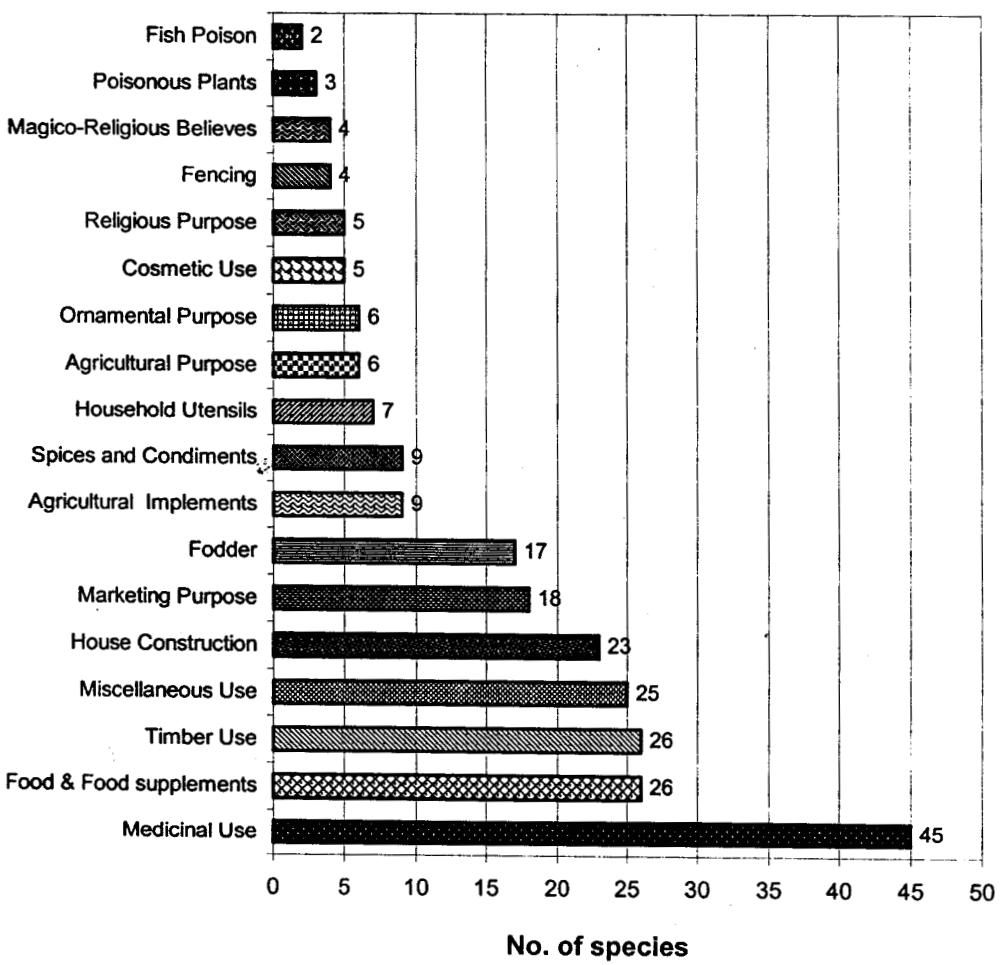


Fig. 5.3. Categorization of various uses of the ethnobotanically important shola species



Certain broad categories and codes were assigned in consideration with the usage of plants to simplify the analysis of the data (see Fig. 5.3 & Table 5.3).

Table 5.3. Categorization of the different uses of shola forest species

No.	Plant Uses	Code	Examples of uses	No. of species
1.	Agricultural Implements	**AI**	For making spade, plough handles, yoke, etc.	10
2.	Agricultural Purpose	**AP**	As green manure; as poles for beans cultivation	6
3.	Cosmetic Use	**CU**	Hair and Corn removers; making of incense sticks, shampoos, etc.	6
4.	Fencing	**FE**	For houses, cattle sheds and cultivated lands	5
5.	Fish Poison	**FP**	To poison streams, ponds etc for catching fish	3
6.	Fodder	**FR**	Fodder for cattle, rabbits etc.	17
7.	Food & Food supplements	**FD**	Fruits, seeds, buds, young shoot, leaves, whole plant etc.	26
8.	House Construction	**HC**	Roof rafters, beams, pillars, roof thatching, making of walls etc.	23
9.	Household Utensils	**HU**	Knife, machete handles, chair, basket making	5
10.	Magico-Religious Beliefs	**MB**	Superstitious beliefs, black magic	5
11.	Marketing Purpose	**MP**	For pharmaceutical, medicinal, cosmetic, ornamental and dry flower industries	18
12.	Medicinal Use	**MD**	For various medicinal preparations, antiseptics, pain killers, treatment of cuts and fractures, poisoning	**45**
13.	Miscellaneous Use	**MU**	Ropes, leech repellents, crab catching, brooms, musical instruments	25
14.	Ornamental Purpose	**OP**	For decorations, garland making	6
15.	Poisonous Plants	**PP**	Allergic or poisonous plants, mosquito and pest repellents	2
16.	Religious Purpose	**RP**	Temple and house decorations, poojas, funeral functions	6
17.	Spices and Condiments	**SC**	Food adjuncts, flavouring agents	9
18.	Timber Use	**TU**	Furniture making, construction of doors, windows etc.	28
No. of uses reported				**245**
No. of ethnobotanically important species				**188**

5.4.2. Credibility rating

On the analysis of the credibility of the data, assigned based on the ranking procedures described earlier in the methodology, it was seen that out of the

188 plants studied, about 125 (66.4 %) belonged to rank 1, 58 belonged to rank 2 (30.9 %) and the remaining 5 (2.7 %) belonged to rank 3. Since most of the data were collected from the knowledgeable people and elder medical practitioners, the authenticity of the gathered information is guaranteed which is also evident from the credibility status of the information.

5.4.3. Medicinal uses

It is clear from the figure that majority of species are put into medicinal uses (45 nos.; 18 % of the total uses). Although the tribals revealed the medicinal importance of several species, in many cases they were reluctant to disclose the formulation of the drugs they employ. This was due to the inherited belief that the medicinal property will be lost by disclosing to an outsider. Usually an elder medical practitioner discloses these secrets to the next generation only when he is in the deathbed or seriously ill. This is a general practice among the various tribal groups throughout the world and is already documented elsewhere. It was only by love, faith and friendship for years that they disclosed whatever information is recorded here.

Among the 36 medicinal species under mention, at least 16 are used for more than one disease. *Dodonaea viscosa* var. *angustifolia, Eucalyptus globulus, Piper mullesua, P. wightii, Persicaria chinensis, Ageratum houstonianum,* etc. are some the species. Similarly different species are used to cure the same disease. Oils extracted from Eucalyptus and Lemon grass, fruits of Pepper, etc. are collected for both self-use and sale. Trees used for medicinal purposes are *Eucalyptus globulus, Gnidia glauca, Saprosma foetens, Syzygium cumini* and *Mastixia arborea.*

Major diseases such as jaundice, abnormal regional hairfall (*Alopacia ariata*), piles, varicose veins, etc. are treated with traditional medicines. Minor diseases or aliments such as coughs, colds, aches of head, back, stomach and tooth are also treated using traditional medicines. There are several antiseptic herbs in use against cuts and wounds. Medicines for fractures, sprains, muscle spasms, painful joints and oedematous swellings are also in use. *Acmella calva* and *Exacum wightianum* are used against snakebite and dog bite, whereas the fern, *Parahemionitis cordata* is used only against the latter. Certain plants are used as tick, fly or leech repellents or as fish poisons. Some

plants are used as laxatives whereas certain others are used as anti-diarrhoeals and anti-emetic. A few species have cosmetic value. *Oxalis corniculata* is used as a mouth freshener; *Persicaria chinensis* as a shampoo; *Drosera peltata* as a corn remover and *Hypericum mysorense* as a hair remover.

Uses of certain species are associated with curious traditional beliefs. *Selaginella brachystachya* is said to possess powers to induce sleep when kept over both the ears, *Mussaenda hirsutissima* to cure *Conjunctivitis* if taken in arms and looked stealthy in darkness, *Acmella calva* to cure dog and snake bite when used along with the urine of the opposite sex of the patient. *Drosera peltata,* the insectivorous plant is said to have enough power to detach the arm, if a bunch of the plant is kept in the armpit for a while. Such beliefs that were referred to as '*Magico-religious*' beliefs by Rao and Shampru (1981) have a strong hold on the tribes, but need further tests to prove their truthfulness. The diseases or ailments under cure along with the species used for the purpose are tabulated below.

- **Athlet's foot & cracks:** *Plectranthus coleoides*
- **Alopacia ariata (abnormal hair loss)**: *Ageratum houstonianum*
- **Anti-diarrhoeals**: *Persicaria chinensis, Saprosma foetens, Garcinia gummi-gutta* var. *papilla, Oxalis corniculata*
- **Anti-emetic**: *Cyanotis pilosa, Saprosma foetens*
- **Arthritis:** *Centella asiatica*
- **Boils and skin diseases**: *Centella asiatica, Tetrastigma leucostaphylum*
- **Conjunctivitis**: *Mussaenda hirsutissima*
- **Coughs and colds**: *Cirsium wallichii, Cymbopogon travancorensis, Atalantia wightii, Eucalyptus globulus, Toddalia asiatica*
- **Cuts and wounds**: *Ageratina adenophora, Ageratum houstonianum, Plantago erosa, Cissampelopsis corymbosa, Vernonia conyzoides, Ligustrum perrottetii, Pouzolzia bennettiana* var. *acuta*
- **Dog bite**: *Parahemionitis cordata, Acmella calva, Cannabis sativa*
- **Fractures**: *Pouzolzia bennettiana* var. *acuta*
- **Head and back aches**: *Dodonaea viscosa, Eucalyptus globulus, Piper mullesua, Piper wightii*
- **Intestinal ulcers:** *Solanum nigrum*

- **Jaundice**: *Physalis peruviana*
- **Laxatives**: *Cyanotis pilosa, Ricinus communis*
- **Leucorrhoea:** *Athyrium* sp.
- **Mouth freshener**: *Oxalis corniculata*
- **Painful joints and oedematous swellings**: *Asparagus racemosus, Dodonaea viscosa* var. *angustifolia, Chenopodium ambrosioides*
- **Piles**: *Balanophora fungosa* ssp. *indica* var. *indica*
- **Purgatives:** *Curculigo orchioides*
- **Scabies and itches:** *Lycopersicon lycopersicum* (wild)
- **Sleeplessness**: *Selaginella brachystachya*
- **Snake bite**: *Acmella calva, Cannabis sativa, Exacum wightianum*
- **Sprains and muscle spasms**: *Emilia scabra, Eucalyptus globulus, Gaultheria fragrantissima*
- **Stomach aches**: *Piper mullesua, Piper wightii, Leucas lamifolia, Oxalis corniculata*
- **Throat pain:** *Solanum anguivi* var. *anguivi*
- **Tooth aches**: *Piper mullesua, Acmella calva*
- **Varicose veins**: *Plantago erosa*

Among the information gathered during the present study, it was found that many of them were not documented in the available publications (Anonymous, 1948-76; Chopra *et al,* 1956; Ramanathan, 1983; Nambiar *et al,* 1985; Jain, 1991, Mahadevan *et al,* 1998). And in contrast, many of the plants present in the area, which are otherwise documented of their medicinal value, are not used for those purposes by the tribes. Further studies to prove the medicinal value and efficacy of the various drugs employed in the traditional medicines are to be taken up.

5.4.4. Miscellaneous uses

Several species are used as food or food supplements (about 26 nos.). This include wild fruits such as that of *Elaeagnus kologa, Elaeocarpus glandulosus, Rhodomyrtus tomentosa*, different species of *Rubus, Syzygium, Vaccinium,* etc. Fruits of some exotic species colonized in the wild such as *Prunus, Passiflora, Cyphomandra,* etc. are also used.

Even though the timber value is not so good when compared to the deciduous forest species, several species are used locally to satisfy the timber needs (about 26 nos.). Some are used as pillars only (*Actinodaphne bourdillonii, Hydnocarpus alpina, Ilex* spp., etc.), while more sturdy ones are cut into planks (*Persea macrantha, Phoebe wightii, Cinnamomum* spp., *Syzygium* spp., *Litsea* spp., etc.). Species such as *Myrsine wightiana, Rapanea capitellata,* etc. are preferred to be used as roof rafters and beams in house construction. Exotic species such as *Grevillea robusta, Eucalyptus grandis, E. globulus, Acacia dealbata, A. mearnsii, A. melanoxylon,* etc. provide very durable timbers. It should be noted that, low altitude species are preferred the most because they are tall with more or less straight bole in comparison with high altitude ones, which are stunted and profusely branched.

Certain species find their use in specific purposes. In certain cases their local names are also indicative of their use. *Photinia integrifolia* which is known as 'Kalappa Maram' (*Kalappa=Plough; Maram=tree*) is the best-preferred species for making plough and spade handles, followed by *Scolopia crenata*. *Salix tetrasperma* is the best-preferred wood for making yoke of ploughs and bullock carts. The shepherds use *Sarcococca saligna* locally known as 'Mattu Vadi' (*Madu=Cattle; Vadi=Stick*) for making beating sticks. *Cissampelopsis corymbosa* (Vettuva Marunnu Chedi: *Vettuva=cut portion*; *Marunnu Chedi=Medicinal Plant*), a climber is used against cuts and wounds made by iron knives and machetes. The latex (*pal*) obtained from Merashupal Chedi (*Euphorbia rothiana*) is applied on the leather of *'Merashu'* (a type of tabor) for good sound reproduction.

5.4.5. Destructive activities and threats to the vegetation

It was noticed that some of the religious customs and festivals including decorative works becoming destructive to plants. Flowers of *Alstonia venenata, Rauwolfia densiflora* and *Artemisia nilagirica* are used for decorating temples during festivals. It is very sad to say that, during such occasions people enter forests in search of some beautiful plants, the 'tree ferns'. These *'fossil plants'* already facing great threat of extinction are massively cut during these days, for decoration (see Plates 5.5.1-4). The tree fern species found in the shola regions are *Alsophila nilgirensis* and *Sphaeropteris crinita* (earlier names

Cyathea nilgiriensis and *C. crinita* respectively) of which the latter species that is golden coloured is considered as the most beautiful among the tree ferns. These slow growing trees having beautiful foliage usually take hundreds of years to attain a few meters height. The trees cut at the base are brought to the spot and planted along roadsides and entrances. They dry up in the sun and die within a few hours. Ignorance of the people is thus leading to the fast extinction of the species. I have tried to bring forward this alarming situation before the conservationists earlier itself, for taking urgent steps to stop the process (Kumar, 1999). Attempts made to educate the public, which proved fruitful at least in some areas.

Several species are collected for sale. Recently the trend has increased owing to the demand of certain plants, which find different uses in the market. *Gaultheria fragrantissima*, the winter green plant is the one, which has great demand (see Plate 5.3.4). This North American species, which grow in the ecotones and scrublands, is the source of the active ingredient used in several insecticides, pain balms and also as flavouring agents in certain foodstuffs, tooths pastes and tooth powders. So they are ruthlessly harvested without any consideration. Similarly the insectivorous plant, *Drosera peltata,* (see Plate 5.3.2) which finds its use in the pharmaceutical industry is also widely smuggled from the high range regions and even exported to other countries (Kumar, 1999b; Surya TV news – 21/12/03). It is interesting to notice that the abnormal 'crescent' shaped fruits of *Elaeocarpus tuberculatus* ('rudraksha tree') fetch a good price (upto Rs. 70-80/- per seed). There are several agents who come in search of these types of abnormal seeds and the outcome is not pleasing. This tree found in low altitude sholas is so huge, buttressed, attains upto 30 m height and even 5 m gbh and has a spreading canopy. The crescent shaped seeds is a very unusual phenomenon. Muthuva tribals who go in search of these seeds, completely clear out all the undergrowth beneath these trees, and often burn the litter to facilitate the search for these seeds. Since this species form the dominant member at low altitudes and its canopy is widespread, this sort of clearing almost makes the forest undergrowth barren, drastically affecting the natural regeneration of other species. Vast areas at Pullaradi shola have been seen cleared like this (see Plates 5.4.7 & 5.4.8). If tribals are not educated and proper measures not taken, the forest stand will be wiped out within a few decades.

Dry flower industry has its eye on the high ranges. Various types of herbs such as different species of *Anaphalis, Helichrysum, Eriocaulon* (button flower), certain grasses and sedges (see Plates 5.4.1 & 5.6.1-4) are massively uprooted and smuggled from the grasslands. Leaves of the trees such as *Rhododendron, Rhodomyrtus tomentosa* and *Elaeocarpus recurvatus* are also collected for the same purpose (see Plates 5.4.5 & 6 & 5.6.6). Recently coloured and dried leaves of these ornamental plants has found their place in the super markets, on the tables of big offices, restaurants and houses. In this context, one should think about the paper news boasting that India has earned **6 Billion rupees** in 1996 by exporting dry flowers to America and Europe (see *Malayala Manorama Daily*, 29/4/1997). Tons and tons of these plants are uprooted to find their places on some foreign tables. The agents pay local people well for this job. Such smuggling has often resulted in frequent clashes between tribals/natives and the forest department officials (see Plate 5.6.3 & 4). At the end of the story, agents cleverly escape, and it is the poor tribe/native who is punished when caught. This matter has already been pointed out by Karunakaran (1997), Kumar *et al.* (1999, 2000) and Kumar & Sasidharan (2002). If urgent measures are not taken to stop this process, these species will soon become extinct in the near future.

5.4.6. Need for documenting the tribal knowledge

It is a known fact that even in a developed country such as the United States of America, where the synthetic chemicals dominate the drug market, plant products still represent an important source of prescription drugs, approximating one fourth of all prescriptions dispensed (Farnsworth & Morris, 1976; Manilal, 1998). It is recorded that 74% of the 121 biologically active plant derived compounds now in use world wide, have been discovered through follow-up research work to verify the authenticity of information obtained from ethnobotany (Anonymous, 1982).

The utilization pattern of wild plants by the tribals of India shows that about 9500 species are used for various purposes, out of which about 7500 species are used for various medicinal purposes, other uses include edible use (3900), other material and cultural requirements (700), fibre and cordage (525), fodder (400), pesticides, piscicides, etc. (300), gum, resin and dye (300),

incense and perfumes (100) (Pushapangadan, 1994). From this study it is becoming clear that there are still hundreds of such undocumented information remaining hidden among the various tribal groups. Measures should also be taken to safeguard the tribal knowledge thereby promoting their welfare by obtaining patent rights, so that they will the end beneficiaries. In this context, steps taken by recently formed organizations such as the *Indian Indigenous People Service Society* (IIPSS) and *Centre for Research in Indigenous Knowledge Science and Culture* (CRIKSC), both situated at Kozhikode, Kerala are worth mentioning. It is to be remembered here that even a bill named '*Kerala Tribal Intellectual Property Rights* (Determination, Preservation, Protection & Improvement) *Bill'* was submitted to the Govt. of Kerala in 1996 by the *Kerala Institute for Research, Training and Development Studies of Scheduled Castes and Scheduled Tribes* (KIRTADS). This is perhaps the only known attempt to make a special law to protect TIPR, especially related to medicines (Latheef, 1999).

5.5. CONCLUSIONS

Tribes who are the traditional collectors of Non Wood Forest Produce (NWFP's), do not basically commercialize the forest produces, instead they make use of NWFP for domestic consumption and sell only part of these to outsiders to meet their small necessities of life. They utilized the resources without disturbing the delicate balance of the ecosystem. Thus they mostly remained as stable societies and were unaffected by the social, cultural, material and economic evolutions that were taking place with the so-called 'civilized societies'. But this peaceful co-existence of the tribals has been evidently shaken in the recent past by the interference of market forces in their habitats.

Forests, the tribes guarded so scrupulously for centuries have now become the scene of ruthless onslaught for their wealth by the so called civilized society to feed the ever increasing demand of their technology based civilization. Helpless tribes became mute victims of this onslaught on their homelands. Utilization of forest resources assumed the form of exploitation and over-exploitation, which depleted the resources and degraded the forests undermining the economic bases of tribes. The situation became so serious that it effected

profound changes in the tribal life. For survival they had no option but to change their traditional '*constructive dependence*' to a '*destructive dependence*' on forests. To get food and other basic necessities of life, they began to fell trees and shrubs and sell them to the outsiders. Some of them drifted to the fringes of industrial working sites of nearly cities and towns to become casual or bonded labourers for survival.

Future of Ethnobotany is dependent on the preservation of '*Adivasi*' (tribal) culture. Due to the recent policies of the government, tremendous progress has taken place in all tribal areas. Through various tribal development programmes, which aided facilities such as good roads, electrified settlements outside the forests, education and literacy programmes, mass communication facilities such as radio and television in the settlements, the age-old tribal culture has changed and the Muthuva tribes have now become more or less a civilized group. Their lifestyle has changed considerably in the recent past, mainly due to mingling with the settlers from the plains. It is surprising to see that now they have even entered politics and there are a few political leaders among them.

The outcome of these sorts of changes is highly depressing. They have almost abandoned cultivation of traditional food crops to replace them with cash crops like Lemon grass, Sugar cane and Cardamom, which are more remunerative. Muthuvans who were once self-reliant have thus become more or less a consumer community. Money spent for dress materials and cosmetics is on the increase. They have now started depending more on modern medicines and those who practice traditional herbal medicines are also declining. Younger generations are not depending on their traditional medicines nowadays due to their inefficacy. According to elder medical practitioners some of the reasons for the inefficacy of the traditional medicines are the use of pesticides, chemical fertilizers, changes in the food and life habits and above all, loss of faith in the traditional medicines. The same trend has been reported by Sajeev & Sasidharan (1997) from Chinnar Wildlife Sanctuary, a rain shadow region lying adjacent to the present study areas.

The term *'civilization'* should not only mean imposing 'knowledge' of the civilized world on the so called 'uncivilized' classes, but also should include

methods and measures to learn from them. Ongoing tribal developmental programmes in the area do not include serious programmes to document the valuable ethnobotanical information, which are facing extinction. No one would be able to retrieve this kind of undocumented knowledge, which are conveyed verbally from one generation to the other. So it becomes the need of the time to take advantages of the extensive knowledge of these forest dwellers, for scientific scrutiny and adoption for posterity, lest it be lost under the debris of modernism. Urgent measures are so needed, to fill in this lacuna, because if lost it will be lost forever.

The words of Alam (1997) seem relevant here, that '*the unstudied flora of our country represents a vast emporium of unknown chemical compounds awaiting discovery*'. As ethnobotany moves into 21st century, the mute message relayed through its relation with tribals is clear. Although modern civilization has reached almost all tribal areas, what they want is not computers or such modern equipments. What they want is the forest, the innumerable plants, animals and birds that have inspired and sustained them through the centuries.



1. Gudalar Muthuva colony: Pullaradi Shola behind



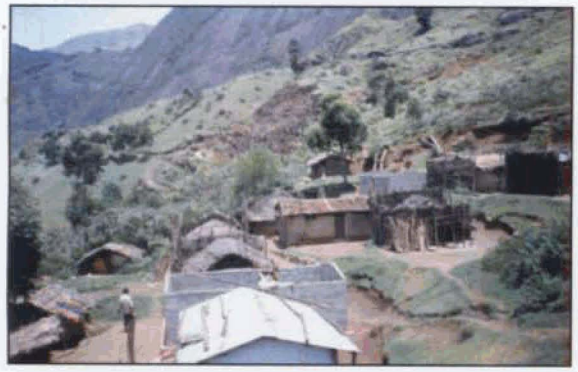
2. Muthuvans of Gudalar. Note a baby kept in a pouch on the back



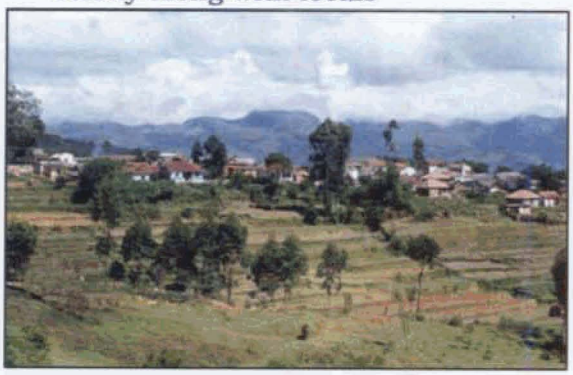
3. Kulachivayal Muthuva Colony



4. Muthuva headmen of Kulachivayal colony along with locals



5. Lakkam Muthuva Colony (Eravikulam)



6. Perumala Tamilian colony



7. Lemongrass cultivation at Gudalar



8. Lemongrass distillation unit

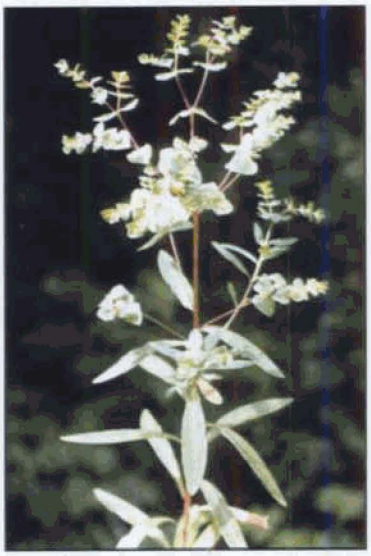
Plate 5.1



1. *Dodonaea viscosa*



2. *Drosera peltata*



3. *Euphorbia rothiana*



4. *Gaultheria fragrantissima*



5. *Eurya nitida*



6. *Plantago erosa*



7. *Scolopia crenata*



8. *Symplocos cochinchinensis*



9. *Mastixia arborea* - Trunk

Plate 5.3

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1. *Anaphalis travancorica*



2. *Erigeron karvinskianus*



3. *Ageratina adenophora*



4. *Acmella calva*



5. *Elaeocarpus recurvatus*



6. *Rhododendron arboreum* ssp. *nilagiricum*



7. Normal and crescent shaped seeds of *Elaeocarpus tuberculatus*



8. Undergrowths destroyed to collect the seeds (Pullaradi Shola)

Plate 5.4

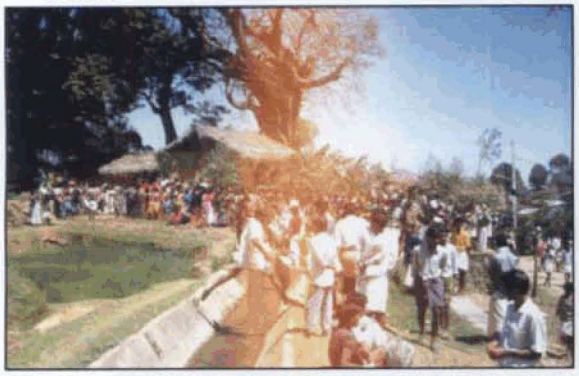
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1. Tree fern community at Mannavan Shola



2. Cut end of an *Alsophila* tree showing the stelar ornamentations



3. Pongal festival at Perumala Malayala Bhagavathi (Kannaki) temple



4. *Alsophila* trees planted on either sides of the road supported by wooden poles



5. A ritual performed during the festival



6. Temple of Muthuva tribes at Gudalar



7. Ladies collecting poles of *Strobilanthes*



8. Cultivated lands at Kilandur

Plate 5.5





1. & **2.** Different species of Button flower (*Eriocaulon*) plants growing together





3. & **4.** *Eriocaulon* plants caught from the smugglers and kept under the custody of Forest officials





5. & **6.** *Rhodomyrtus tomentosa* flowers in close up; coloured leaves and branches of the same plant along with the flowers of *Helichrysum luteum* (everlasting flower) forms an expensive bouquet in the market

Plate 5.6

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ECOLOGICAL STUDIES

K. Kishore kumar “Taxonomic and ecological studies on the shola forests of Kerala” Thesis. Kerala Forest Research Institute Thrissur, University of Calicut, 2004



ECOLOGICAL STUDIES

"The biodiversity is increasingly threatened by the environmental crisis and we have entered a phase of mass extinction of species"

E. O. Wilson (1985)
(Ecologist)

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6. ECOLOGICAL STUDIES

6.1. INTRODUCTION

6.1.1. The term and its explanation

The ecosystem concept fits into an ordered view of nature that was developed by scientists to simplify the study of the relationships between organisms and their physical environment, a field known as *ecology*. The science of ecology is the study of the interactions that determine the abundance and distribution of organisms. In other words, ecology attempts to explain why individuals live, where they do and why their populations are the sizes they are. It is the study of the relationship of plants and animals to their physical and biological environment. The physical environment includes light and heat or solar radiation, moisture, wind, oxygen, carbon dioxide, nutrients in soil, water, and atmosphere. The biological environment includes organisms of the same kind as well as other plants and animals.

The term *ecology* was introduced by the German biologist, Ernst Heinrich Haeckel in 1866 (Odum, 1971). It is derived from the Greek *'oikos'* (household), sharing the same root word as *economics*. Thus, the term implies the study of the economy of nature. Modern ecology, in part, began with Charles Darwin. In developing his theory of evolution, Darwin stressed the adaptation of organisms to their environment through natural selection. Also making important contributions were plant geographers, such as Alexander von Humboldt, who were deeply interested in the *'how'* and *'why'* of vegetational distribution around the world.

Community ecology or Phytosociology, are terms often used synonymous with plant ecology and that refers to structural attributes of plant community, which can be divided as *qualitative* characters (physiognomy, stratification, dispersion, sociability, etc.) and *quantitative* characters (density, dominance, frequency, etc.). It examines the result of differentiation of individual parametric properties of the different sectors of the community, often relating the facts to the integrated results. In the ecology of higher plants therefore, phytosociology forms a major domain of ecological research (Mueller-Dombois and Ellenberg, 1974; Kimmins, 1987)

6.1.2. Ecosystems and Plant communities

A more useful way of looking at the terrestrial and aquatic landscapes is to view them as *ecosystems,* a word coined in 1935 by the British plant ecologist Sir Arthur George Tansley to stress the concept of each locale or habitat as an integrated whole. The functional units of an ecosystem are the populations of organisms and these interdependent populations of plants and animals make up the *community*, which encompasses the biotic portion of the ecosystem.

The community has certain attributes, among them dominance and species diversity. Dominance results when one or several species control the environmental conditions that influence associated species. In a forest, for example, the dominant species may be one or more species of trees. Dominance can influence diversity of species in a community because diversity involves not only the number of species in a community, but also how numbers of individual species are apportioned.

The physical nature of a community is evidenced by layering, or *stratification.* In terrestrial communities, the growth form of the plants influences stratification. Simple communities such as grasslands, with little vertical stratification, usually consist of two layers, the ground layer and the herbaceous layer. A forest has up to six layers: ground, herbaceous, low shrub, low tree/high shrub, lower canopy, and upper canopy. These strata influence the physical environment and diversity of habitats for wildlife.

6.1.3. Dynamism in the ecosystems

Ecosystems are dynamic, in that the populations constituting them do not remain the same. This is reflected in the gradual changes of the vegetational community over time, known as succession. It begins with the colonization of a disturbed area, by species able to reach and to tolerate the environmental conditions present. Mostly these are opportunistic species that hold on to the site for a variable length of time. Being short-lived and poor competitors, they are eventually replaced by more competitive, longer-lived species such as shrubs, and then trees. The pace at which succession proceeds depends on the competitive abilities of the species involved; tolerance to the environmental conditions brought about by changes in vegetation; the interaction with

animals, particularly the grazing herbivores; and fire. Eventually the ecosystem arrives at a point called the *climax,* where further changes take place very slowly, and the site is dominated by long-lived, highly competitive species.

No population, human or otherwise, can grow indefinitely; eventually, some biotic or abiotic variable will begin to limit the population growth. This basic ecological principle was first established in 1840 by German chemist Justus von Liebig and has been called the *Law of the Minimum.* From a human standpoint, this means that all of the world's physical resources are in finite supply. Ecologists also have discovered that all species in an ecosystem interact with one another, either directly or indirectly. Typically, because the species that coexist in natural communities have evolved together for many generations, they have established a balance, and their populations remain relatively stable.

The structural and functional dynamics of communities are some important ecological aspects in vegetation ecology, because of the reciprocal influence of vegetation and micro/macro environment. These structural dynamics differ regionally and also vary within the landscape, as a function of topography and other site variables.

6.1.4. Ecology of Tropical Rain Forests and Montane Forests

Tropical rain forest is one of the major vegetation types of the globe (Richards, 1996; Whitmore, 1998; Turner, 2001). They occur in regions of the tropics where temperatures are always high and where rainfall exceeds about 1,800 to 2,500 millimetres annually and occurs fairly evenly throughout the year. It is defined physiognomically with typical features being a closed, evergreen canopy of 25 m or more in height dominated by mesophyll-sized leaves, with an abundance of thick-stemmed woody climbers and both herbaceous and woody epiphytes.

Altitude has a marked effect on forest physiognomy above about 1500 m, and montane facies have to be distinguished. The so-called tropical diurnal climate has a temperature regime in which the major periodicity is the daily march from nigh-time lows to afternoon highs (Turner, 2001). It is this

montane facies occurring in South India called locally by the name *Sholas* or technically as *Tropical Montane forests* (Meher-Homji, 1984). In geographical terms these high altitude regions falls within the tropical and subtropical latitudes. However the cold and frost prevailing in these regions suggest affinity with temperate zones.

Ecology of tropical rain forests is a highly discussed matter among ecologists (Pascal, 1988; Bazzaz, 1991; Burkey, 1994; Condit, 1995; Condit *et al.*, 1996; Richards, 1996; Whitmore, 1996, 1998; Turner, 2001). On the contrary high altitude rain forests *viz.*, Tropical Montane Forests received only a little attention as indicated by the paucity of literature. According to Swarupanandan *et al.*, (1998) this neglect was due to the poor economic bearing of the shola forest resources, their restricted extent, remote access, hostile climate and less knowledge about the vegetal type. A perusal of the published literature on the ecology of the shola-grassland ecosystem of the Western Ghats shows that Nilgiris and Palnis are better-studied regions compared to Anamalai hills. Most of these studies were concentrated in the low altitude subtropical hill forest regions and the ecological situations at the highest altitudes of South India remained a mystery. Altitudinal effect on the shola vegetation was also a subject of question and controversy among ecologists.

6.2. METHODOLOGY

6.2.A. FIELD METHODS:

There are four steps which have to be considered in any sampling of vegetation *viz.*, (a) Segmentation of the vegetation cover or recognition of entities, (b) Selection of samples in the recognized segments, (c) the decision of what size and shape the samples should take and (d) the decision of what to record once the samples or plants are established (Mueller-Dombois and Ellenberg, 1974).

It is a known fact that altitude has a marked effect in determining the physiognomy of the forest. With regard to Tropical Montane Forests, it is a highly decisive factor, where the so-called tropical diurnal climate has a temperature regime in which the major periodicity is the daily march from the

nighttime lows to afternoon highs. Since the major objective of this study also aims to throw light in this regard, *viz.*, the effect of altitude on the physiognomy, species composition, richness, diversity, etc, sampling procedures were also selected accordingly.

A thorough reconnaissance survey was conducted throughout the study area so as to gather precise information about the forest. This procedure could be completed with a less effort, since several thorough expeditions throughout the area were carried out earlier as a part of floristic studies. So almost every nook and corner of the area and each and every plant from herbs to trees, their associations, niche specificity and distribution pattern, etc. could be learned earlier itself, before attempting detailed ecological studies.

6.2.A.1. Species-Area relations and Sample size determination

It is a known fact that species richness values go on increasing proportional to the extent of area surveyed. But to cut limit the sample size, a minimal sample size has to be determined which represents a meaningful number of species. Minimal area is the smallest area on which the species composition of the community in question is adequately represented (Mueller-Dombois and Ellenberg, 1974). This smallest area gives an indication of the '*releve*' (French for '*abstract*') or quadrat size that should be used. Swarupanandan *et al.* (1998) has opined that a sample size of 600 m^2 is sufficient for studying trees ≥ 1 cm dbh and about 1000 m^2 for studying trees ≥ 10 cm dbh. Jose *et al.* (1994) has found that the species area curve reaches a plateau at 2500 m^2 in his study at Eravikulam. This figure is substantially high in comparison with the earlier study mentioned. Scientifically speaking a cut off point in the species area curve, ie. when only there is a 5 percentage increase in species number is taken to determine the sample size (Cain, 1938). Based on this idea, species area relations were established for each 100 m altitudinal intervals ranging from 1600-2400 m altitudes at Mannavan Shola and at 200 m intervals at Eravikulam (from 1800-2600 m). Number of species recorded in each quadrats were plotted against the area sampled.

6.2.A.2. Sampling procedure

Stratified random sampling technique was adopted for vegetation sampling. In this form of sampling, the vegetation is arbitrarily subdivided (stratified)

into more or less even sized sub segments (localities). Here in this study stratification was based on the altitude of the area. Every 100 m altitudinal interval was selected to represent a stratum where the samples were laid out at random.

It is a general rule that a large number of small quadrats is preferable to a small number of large quadrats (Chalmers and Parker, 1986; Magurran, 1988). At Mannavan Shola, which was the main study site, linear transects (of 0.1 ha. size), consisting of ten, 10 x 10 m non contiguous quadrats were established at each 100 m altitudinal intervals starting at 1600 m and up to 2400 m which was the higher limit (at certain regions where 10 m x 10 m size were not possible, 20 m x 5 m were also employed). The altitudes were determined by using an altimeter and the quadrats were laid randomly in consideration with the terrain of the area. So altogether such nine transects were established at Mannavan Shola.

Girth at breast height and vertical height of all the plants ≥ 1 cm dbh were measured from these quadrats. The point for determining the gbh was determined based on Dallmeier *et al.* (1996) (see Plate 6.8). For determining height, ocular measurements were taken since visibility of the canopy was very poor due to the continuous representation of individuals at all height strata. However, correct measurements of heights were taken wherever possible using a multimeter.

In addition to this other site information from the quadrats were also taken such as aspect, slope, herbaceous under growth species, percentage of canopy gaps and disturbances if any. Samples of all the doubtful specimens from the field were properly tagged, collected, dried and preserved for further analyses.

At Eravikulam also, all these methods were followed except in the number of quadrats laid out in a transect and in the altitudinal intervals chosen. Here only five quadrats of 10 m x 10 m size (or 20 m x 5 m) were taken in an altitudinal belt and that too in each 200 m intervals starting from the minimum altitudinal range of 1800 m up to the maximum range of 2600 m (at Anamudi, the highest peak south of Himalayas). The main reason to cut short the number of quadrats was the reduction in the minimal sample area as revealed by the species area relation studies. Also we were not permitted to

work for more days at Eravikulam since the study sites fell in the core zone of the national park where the entry is highly restricted.

6.2.B. ANALYTICAL METHODS:

6.2.B.1. STRUCTURAL AND COMPOSITIONAL ANALYSES

6.2.B.1.1. Density (D)

This vegetation characteristic is one among the three quantitative aspects other than abundance and frequency, used to describe the general nature of vegetation (Bharucha & De Leeuw, 1957). It is actually a measure of dominance, an expression of numerical strength of a species in a community and relates to the counting of individuals per unit area. It is calculated as follows.

$$\text{Density (D)} = \frac{\text{Total number of individuals}}{\text{Total number of quadrats studied}}$$

The relative numerical strength of a species with respect to total number of individuals of all species form another useful comparative figure called Relative Density (RD) which were determined according to Phillips (1959)

$$\text{Relative Density (RD)} = \frac{n_i}{N}$$

(where ni = number of individuals of i^{th} species; N = total number of individuals in the plot).

6.2.B.1.2. Abundance (Ab)

This is a parameter, which is often used, in a broader sense to denote measures of dominance such as density, frequency, cover (basal area), etc. In the strict sense it refers to the number of individuals of different species in a community per the number of quadrats in which they occur. It is calculated as follows

$$\text{Abundance (Ab)} = \frac{\text{Total number of individuals}}{\text{Number of quadrats of occurrence}}$$

6.2.B.1.3. Frequency (F)

This is another measure of estimating abundance. It indicate the number of sampling units in which a given species occur and so expresses the distribution and dispersion of various species in a community

$$\text{Frequency (F)} = \frac{\text{Number of quadrats of occurrence of a species}}{\text{Total number of quadrats studied}}$$

For comparison of different communities, frequency is expressed in terms of percentage values (frequency %) or *'Frequency index'*.

$$\text{Percentage Frequency (PF)} = \frac{c_i}{C}$$

(where ci = number of plots where species present; C = total number of plots studied)

Raunkiaer (1934) divided the percentage frequency in to 5 classes such as

Class **A** = 0 to 20 % frequency
Class **B** = 21 to 40 % "
Class **C** = 41 to 60 % "
Class **D** = 61 to 80 % "
Class **E** = 81 to 100 % "

and derived the *'Law of frequency'* which states that for a homogeneous vegetation **A > B > C <=> D < E**

The Relative Fequency (RF) (Phillips, 1959) was calculated as

$$RF = \frac{PF}{F} \times 100 \quad (\text{where } F = \Sigma PF)$$

6.2.B.1.4. Basal Area (BA)

This is another index of dominance. It refers to the ground actually occupied by the stems. Higher the basal area, greater the dominance. This is usually measured at the breast level (1.3 m) from the ground.

Basal area (BA) = sum of the basal areas of individuals of same species

Basal area of an individual = πr^2 (where r = radius derived from gbh)

$$\text{Relative Basal Area (RBA)} = \frac{BA}{d} \times 100$$

(where 'd' is the basal area of all the species in the plot)

6.2.B.1.5. Importance Value Index (IVI)

Curtis and Mc-Intosh (1950) developed a single value index in order to express dominance and ecological success of any species. This index which is called '*Importance Value Index* (IVI)' is derived from three quantitative parameters of vegetation *viz.*, Relative Fequency (RF), Relative Density (RD), and Relative Basal Area (RBA).

$$IVI = RF + RD + RBA$$

6.2.B.1.6. Distributional Index (DI)

Distribution of species is another interesting aspect of ecological studies, which has attracted the attention of a number of ecologists (Ashby, 1948; Cole, 1949). One of the aspects of such a study is contiguous distribution of species in a stand. Whitford (1948) suggested the abundance/frequency ratio (Distributional Index) as a measure of contiguousness. As a rule the high frequency and low abundance indicate regular distribution whereas the converse, indicates contiguous distribution. Precisely < 0.025 indicate **Regular**, 0.025 to 0.05 **Random** and > 0.05 **Contiguous** distribution (Curtis and Cottom, 1956). Since the pattern of species distribution is one of the controlling factors in species association, such information will lead to more satisfactory explanation.

$$DI = \frac{\text{Abundance}}{\text{Frequency}}$$

6.2.B.1.7. Maturity Index (MI)

According to Tansley (1920) succession is "a gradual change, which occurs in vegetation of a given area of the earth's surface on which the population succeeds the other". As a general rule, when the succession has entered into a final stage or nearing the final stage, the total number of species will reduce and those which are adapted to the changing environment will only survive

and multiply to form the dominant community. That is, the higher the frequency percentage of the species and the smaller the number of sporadic species, the more mature is the community (Phillips, 1934). To assess the community status in relation to the stages in successional pattern, Pichi-Sermoli (1948) suggested an index, which determines the maturity in the plant communities, based on the frequency percent of all species in the stands of a community. The index is calculated as follows:

$$\text{Maturity index (MI)} = \frac{\text{total frequency (\%) of a community}}{\text{total number of species present}}$$

6.2.B.1.8. Stratification of the Forest stand

All the plants enumerated were segregated according to their maximum vertical height by grouping into height classes of 5 m intervals, in order to assess the pattern of stratification in the forest. This will also reveal the pattern of height distribution of various species at different altitudes and also the maximum height attainted by various species at different altitudes.

6.2.B.1.9. Girth class distribution pattern

Plants enumerated were grouped into several size classes of 10 cm – 20 cm intervals, according to their girth at breast height (1.3 m), to analyze the diameter frequency distribution and regeneration pattern.

6.2.B.1.10. Structural status of the Vegetation

The enumerated species at all altitudes were arranged according the descending order of the IVI value, to find out the dominant and character species. Character species may be interpreted as key species by which individual communities in the field can be identified as members of a particular community type (Mueller-Dombois and Ellenberg, 1974).

6.2.B.1.11. Species compositional difference across altitude

Total species recorded from all altitudes at both the study areas (Mannavan Shola and Eravikulam) were independently clumped together to analyse the compositional difference of species across altitudes. Those species whose

distribution is concentrated at low altitudes, medium altitudes, high and very high altitudes, etc. were segregated.

6.2.B.2. DIVERSITY ANALYSES

Whittaker (1960) distinguished three levels of diversity: *alpha* diversity (within habitat or within community diversity), *beta* diversity (intercommunity diversity) and *gamma* diversity (diversity of entire landscape).

Diversity measures takes into account two factors: species richness (ie., number of species) and evenness (ie. how equally abundant the species are). It is the most direct measure of ecosystem fitness. So the diversity indices form an indication of the relative importance of the factors that are affecting the population as a whole. There are several ways in which species diversity can be assessed.

6.2.B.2.1. Species Richness Indices

Species richness is the first and oldest concept of species diversity, which is an indicator of the relative importance of a species in a community (Peet, 1974). Number of species encountered in the sample itself is a measure of Species Richness. It is usually represented by the total number of species in a given community or the number of species per unit area. The following indices are of common use.

(a) Margalef's index $(R_1) = \frac{S-1}{\ln(n)}$ (Margalef, 1958)

(b) Menhinick's index $(R_2) = \frac{S}{\sqrt{n}}$ (Menhinick, 1964)

(where S = number of species and $\sqrt{n}$ = number of individuals).

6.2.B.2.2. Evenness/Equitability Index

Evenness or equitability represents the distribution of individuals among the species. It is some times defined as the ratio of observed diversity to maximum diversity (Margalef, 1958). The most commonly used method is the evenness measure of Pielou (1975), which expresses H' (Shannon-Weiner

function) relative to the maximum value that H' can obtain when all the species in the sample have the same number of individuals (one individual per species), ie. lnS

$$E = \frac{H'}{H'\,max} = \frac{H'}{\ln S} \quad \text{(where } H'max = \log_2 S\text{)}$$

6.2.B.2.3. Indices based on the proportional abundance of the species:

These indices provide an alternative approach to the measurement of diversity. Peet (1974) terms these indices as '*heterogeneity indices*' because they take both evenness and species richness into account. Out of the two categories, Shannon's index is derived from Information theory and Simpson's index is an investigation of the concentration of dominance.

a) Shannon's Index (H')

This index is based on the rationale that the diversity, or information in a natural system could be measured in a similar way to the information contained in a code or message (Magurran, 1988). Shannon and Weiner (1949) independently derived this function, which has become known as the Shannon's index of diversity. It is sometimes incorrectly referred to as *Shannon-Weaver Index* (Krebs, 1985; Magurran, 1988). This index assumes that individuals are randomly sampled from an 'indefinitely large' population (Pielou, 1975). It also assumes that all species are represented in the sample. It is calculated from the equation.

$$H' = \sum_{i=1}^{n} \frac{n_i}{N} \log_2 \left(\frac{n_i}{N} \right)$$

(where n*i* = total number of individual of species '*i*' in the sample and N = total number of individuals of all species in the area).

b) Simpson's Index (D)

This index proposed by Simpson (1949) is weighted towards the abundances of the commonest species rather than providing a measure of species richness. This index also known as *Yule Index*, measures the

probability that two individuals selected at random from a sample will belong to the same species, and ranges from 0-1. For infinite sample the index is calculated as

(where p*i*= the proportional of individuals of '*i*' th species).

For finite sample it is expressed as

$$D = \sum_{i=1}^{S} \frac{n_i(n_i - 1)}{N(N-1)}$$

(where n*i* = the number of individuals in the i^{th} species and N the total number of individuals).

As 'D' increases, diversity decreases. So Simpson's index is therefore usually expressed as 1-D or 1/D.

6.2.B.2.4. Community Coefficients or Index of Similarity (IS)

A very simple mathematical expression for the similarity of the plant communities of different localities is the *Community Coefficient* of Jaccard (1912). It is based on the presence-absence relationship between the number of species common to two areas and total number of species. It assesses the overall similarity of different localities with respect to species diversity. Thus it express the ratio of the common species to all species found in the vegetation (Muller-Dombois and Ellenberg, 1974). Ever since the publication of Jaccard's formula it has undergone several quantitative and qualitative modifications. Sorenson's (1948) modification is the one, widely accepted because it is mathematically more satisfactory in terms of statistical probability. Sorenson's Similarity Index expresses, the actually measured coinciding species occurrences against the theoretically possible ones. His formula for similarity index is:

$$\%\,IS = \frac{2C}{A+B} \times 100$$

(where 'C' is the number of species common to two releves, 'A' is the total number of species in releve A and 'B' is the total number of species in releve B).

6.3. RESULTS

A thorough reconnaissance survey throughout the study area yielded information on the structure of the forests. At Mannavan Shola, lower most boundary is 1600 m, which can be considered as disturbed ecotone outside which there is a scrubland gradually merging into tribal settlement areas. Here the stand is about 20 m high, the biggest trees being *Elaeocarpus tuberculatus*. Often exotic trees and escapes from the plantations such as *Acacia mearnsii, A. dealbata, Prunus persica* (pears), *Eucalyptus globulus, E. grandis, Cyphomandra betaceae* (tree tomato), etc. are found growing here. From 1800 m onwards the forest is almost undisturbed with large trees (mainly *Syzygium* spp.) often growing up to 30 m tall. The forest remains as a continuous patch from 1600-2000 m. At 2000 m also there is an ecotonal region characterized by reed bamboos such as *Arundinaria floribunda*. Other species include *Rhodomyrtus tomentosa, Daphniphyllum neilgherrense, Pittosporum tetraspermum, Rhododendron arboreum* subsp. *nilagiricum, Vaccinium leschenaultii, Hypericum mysorense, Ilex walkeri,* etc. Here also a scrubland characterized by shrubby species such as *Gaultheria fragrantissima, Hypericum mysorense, Vernonia bourneana, Pteridium aquilinum* (fern), *Eurya nitida,* several species of *Osbeckia* and trees such as *Vaccinium leschenaultii, Rhododendron arboreum* subsp. *nilagiricum,* etc. are seen. Above 2100 m (Idlimottai region), sholas are found as patches confined to gullies and depressions often veiling small streams flowing through them. The size of these shola patches decrease by altitude and at 2400 m region, only a few such patches are seen those encircled by grasslands where afforestation experiments by *Acacia* and *Eucalyptus* were carried out in the past (Plates 6.7.5 & 6.7.6).

At Eravikulam also the low altitude shola regions at 1800 m (at Rajamala, Nilagiri Teri, Panni Thavaranai) are found as comparatively big patches where the trees are taller. At 2000 m (Amara Chola region) forests are gradually reduced to small patches to get extremely reduced at 2600 m where the forests are seen as highly stunted in a narrow strip of 2-5 m width and heights generally less than 3 m (Plates 6.1.1 and 6.1.2). Tree species such as *Garcinia cambogia, Euonymus crenulatus, Ixora notoniana,* etc., which were not recorded from Mannavan Shola, were reported from here. Similarly *Archidendron clypearia* (*Pithecellobium subcoriaceum*), a species found in the

low altitude riparian belts were common at Rajamala regions. *Ilex walkeri* is the species, which was found to grow to enormous girth even at altitudes above 2400 m. Above 2600 m, the vegetation is characterised by the dominance of *Rhododendrons* which indicates the high adaptability of the species in such hostile environments. However in the open areas at 2650 m the species was found growing as extremely stunted not growing more than 50 cm (Plate 6.1.3) forming a dense carpet with a *'bonsai'* type look. Other species, which were predominant at these altitudes, include *Eurya nitida, Myrsine thwaitesii, Casearia thwaitesii, Symplocos foliosa, Microtropis ramiflora, Elaeocarpus recurvatus, Vaccinium leschenaultii,* etc. Above 2500 m, dense populations of reed bamboo species such as *Arundinaria walkeriana* and *A. densifolia* are also met with. The latter species was found to grow as dense carpets of < 50 cm height even at the altitudes of 2670 m (Plate 4.14.5), above which only grasses and a few herbs and shrubs such as *Gaultheria fragrantissima, Hedyotis buxifolia, Leucas lanceaefolia, Osbeckia leschenaultii, Kalanchoe grandiflora, Scutellaria wightiana, Anaphalis travancorica, Ageratina adenophora* and ferns such as *Pteridium aquilinum, Polystichum* spp., etc. were present.

6.3.A. FIELD STUDIES

6.3.A.1. Species Area Relation studies

Species area curves were established for both the study sites for each 100 m (at Eravikulam 200 m) altitudinal intervals following Cain (1938). At both the study sites, since the diversity showed a decreasing trend with increase in altitude, higher releve sizes were obtained at lower altitudes only.

At Mannavan shola a releve size of 900 m^2 was found sufficient for altitudes 1600-1900 m, when the girth limit was not considered. Here about 800 m^2 was found sufficient for trees >10 cm dbh also. At 2000-2200 m, 800 m^2 was sufficient when all life forms were considered. At the altitudes of 2300 m and 2400 m, the releve size showed a decreasing trend. Here about 700 m^2 and 600m^2 respectively were found enough for trees > 10 cm dbh, when 800 m^2 and 700 m^2 were needed when the dbh categories were not considered. At Eravikulam also a similar trend was observed. However at 2400 and 2600 m, 500 m^2 was found enough when the dbh categories were not considered (Table 6.1.).

Table 6.1. Minimal Area required for ecological studies at various altitudes

No	Altitude (m)	Location	Plants < 3 cm dbh	Plants 3-10 cm dbh	Plants >10 cm dbh	TOTAL >1 cm dbh
1.	1600	MS	900 m^2	1000 m^2	700 m^2	900 m^2
2.	1700	MS	800 m^2	1000 m^2	1000 m^2	900 m^2
3.	1800	MS	800 m^2	700 m^2	800 m^2	800 m^2
4.	1900	MS	900 m^2	700 m^2	900 m^2	900 m^2
5.	2000	MS	1000 m^2	700 m^2	900 m^2	1000 m^2
6.	2100	MS	800 m^2	700 m^2	700 m^2	800 m^2
7.	2200	MS	800 m^2	1000 m^2	1000 m^2	800 m^2
8.	2300	MS	800 m^2	700 m^2	700 m^2	800 m^2
9.	2400	MS	700 m^2	700 m^2	600 m^2	700 m^2
10.	2600	ENP	500 m^2	500 m^2	500 m^2	500 m^2

* **MS**=Mannavan Shola, **ENP**=Eravikulam National Park.

6.3.B. ANALYTICAL STUDIES:

6.3.B.1. STRUCTURAL AND COMPOSITIONAL ANALYSES:

6.3.B.1.1. Density (D)

At Mannavan Shola density of individuals (≥1 cm dbh) were found to increase with altitude. Although altitudes 1600 m and 1700 m showed not much difference (~8600 stems/ha.), there was about 45-50 percent increase in density at the altitudes between 1800-2100 m (~12500-12700 stems/ha.). Maximum value (~63 percent: 14090 stems/ha.) was observed at 2300 m from where there was a decrease to about 46 percentage at 2400 m altitude. It is to be noted that 80-90 percent of this value were contributed by understorey species coming under 1-10 cm dbh category. But these species were not the same at all altitudes.

At 1600 m, maximum density/ha. (1140 stems) were contributed by a shrub, *Strobilanthes cuspidatus*, followed by a small tree, *Phoebe wightii*. At 1700 and 1800 m, other species such as *Strobilanthes gracilis, Lasianthus acuminatus* and *Ardisia rhomboidea* stood at the top. These three species continued to be the dominant undergrowths at altitudes upto 2100 m. Above that *Psychotria nilgiriensis* var. *astephana* was found to dominate contributing 20-30 percentage of density, followed by *Strobilanthes gracilis* whose absence was noted at 2400 m (see Table 6.2, Appendices 6 to 14).

At altitudes ranging from 1800-2200 m, Eravikulam also showed a similar trend. However, at 2200 m, *Ardisia rhomboidea* stood at the top constituting 19 percentage of total density. At 2400 m, tree members such as *Myrsine thwaitesii* and *Ligustrum perrottetii* came into the scene and unlike Mannavan Shola, presence of *Strobilanthes gracilis* was also noted. At 2600 m, a reed bamboo species *Arundinaria densifolia* and an ecotone shrub *Gaultheria fragrantissima* dominated, followed by *Rhododendron*. Almost all the species that showed higher density were the ones, which were either absent or poorly represented at lower altitudes (see Table 6.3, Appendices 15 to 19).

Table 6.2. Density* distribution among various girth classes (Mannavan Shola)

No	Altitude (m)	< 10 cm gbh	10-30 cm gbh	> 30 cm gbh	TOTAL
1.	1600	5690	1230	1680	**8600**
2.	1700	5610	1610	1350	**8570**
3.	1800	**9080**	2200	1260	**12540**
4.	1900	6780	**4160**	1090	**12030**
5.	2000	6990	**4080**	1350	**12420**
6.	2100	6480	**4400**	**1890**	**12770**
7.	2200	6800	2080	1650	**10530**
8.	2300	**9750**	2610	**1730**	**14090**
9.	2400	**7150**	3220	**2180**	**12550**

* Density of individuals/Ha.

Table 6.3. Density* distribution among various girth classes (Eravikulam)

No	Altitude (m)	< 10 cm gbh	10-30 cm gbh	> 30 cm gbh	TOTAL
1	**1800**	**17920**	6080	1680	**25680**
2	**2000**	12400	5840	**2180**	**20420**
3	**2200**	**16880**	**6160**	2060	**25100**
4	**2400**	**13120**	**9600**	**3340**	**26060**
5	**2600**	7840	**8560**	**2480**	**18880**

* Density of individuals/Ha.

6.3.B.1.2. Abundance (Ab)

At Mannavan Shola the species with highest abundance values were almost the same, which showed high density except at the lowest (1600 m) and the highest altitudes (2400 m). At 1600 m *Strobilanthes cuspidatus* continued to be the most abundant species, followed by *Clerodendron viscosum*. From 1700-2000 m, *Strobilanthes gracilis* showed the highest abundance value, followed either by *Lasianthus acuminatus* or *Ardisia rhomboidea*. At 1900 m and 2300 m *Strobilanthes gracilis* showed substantially high values of

abundance. At 2200 m and 2400 m *Psychotria nilgiriensis* var. *astephana* continued to dominate.

At Eravikulam also *Strobilanthes gracilis* was the species, which showed highest abundance values at altitudes ranging from 1800-2400 m, followed by *Lasianthus acuminatus, Ardisia rhomboidea* or *Psychotria nilgiriensis* var. *astephana.* However, at 2200 m *Strobilanthes gracilis* stood beneath *Ardisia, Psychotria* and *Strobilanthes micranthus.* At 2600 m, *Gaultheria fragrantissima* and *Arundinaria densifolia* were the species, which showed highest abundance values (Appendices 6-19).

6.3.B.1.3. Frequency (F)

At Mannavan Shola, species such as *Phoebe wightii* and *Persea macrantha* were the ones, which showed highest percentage frequency values at 1600 m (100 and 90 percent respectively). These two species showed the highest values at 1700 m also in addition to *Lasianthus acuminatus* and *Neolitsea zeylanica. Lasianthus acuminatus* and *Ardisia rhomboidea* often showed 100 percent values at 1800-2100 m. Above 2100 m *Litsea wightiana, Psychotria nilgiriensis* var. *astephana* and *Cinnamomum wightii* were the species which showed cent percent frequency. At 2400 m, ecotone species such as *Mahonia leschenaultii, Microtropis ramiflora* and *Myrsine thwaitesii* showed 100 percent frequency values.

At Eravikulam, *Strobilanthes gracilis* showed highest frequency at 1800 and 2000 m only, while at 2000 m and 2400 m *Elaeocarpus recurvatus* was the most frequent one. At 2200-2400 m *Psychotria nilgiriensis* var. *astephana, Turpinia nepalensis, Ilex walkeri,* etc. showed highest frequency. At 2600 m *Rhododendron arboreum* subsp. *nilagiricum, Arundinaria densifolia, Rubus fairholmianus, Ageratina adenophora* are the species, which showed 100 percent frequency (see Tables 6.5 to 6.18).

Law of Frequency – Raunkier's Frequency Classes

Percentage frequency values from all the transects were grouped into five frequency classes following Raunkier (1934) and the values tested based on the Law of Frequency for homogeneity using the formula A > B> C <=> D < E.

Seven out of the nine transects established at Mannavan Shola showed heterogeneous distribution. Only that transects established at 1900 m and 2300 m were homogenous. At Eravikulam also, only one (at 1800 m) out of the five transects showed homogenous distribution. Here unlike Mannavan Shola, no high altitude regions showed homogeneous distribution of individuals. (see Table 6.4 and Figs. 6.1 & 6.2).

Table 6.4. Distribution of individuals among Raunkier's Frequency Classes

1. Locality: Mannavan Shola						
Altitude (m)	A (0-20%)	B (21-40%)	C (41-60%)	D (61-80%)	E (81-100%)	Remarks
1600	41	11	9	6	2	-
1700	33	23	9	5	0	-
1800	36	16	7	5	4	-
1900	26	9	7	1	5	*
2000	25	7	7	6	5	-
2100	30	8	9	7	5	-
2200	33	20	7	7	5	
2300	30	14	10	5	7	*
2400	24	10	14	3	8	-
2. Locality: Eravikulam						
Altitude (m)	A (0-20%)	B (21-40%)	C (41-60%)	D (61-80%)	E (81-100%)	Remarks
1800	17	13	6	5	6	*
2000	28	20	11	4	1	-
2200	23	9	11	6	4	-
2400	15	7	6	9	7	-
2600	6	2	10	5	4	-

* indicates homogeneous distribution of individuals

Fig. 6.1. Percentage Frequency distribution with respect to altitudes - I

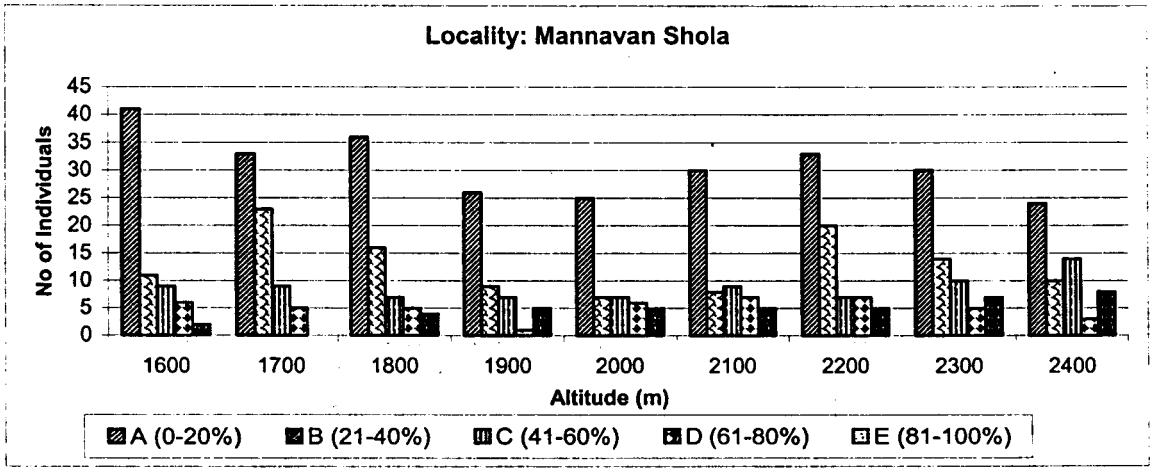
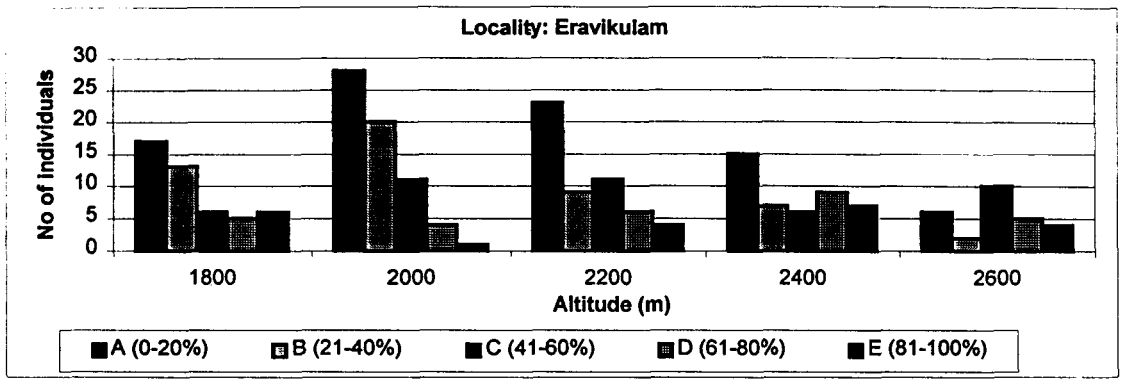


Fig. 6.2. Percentage Frequency distribution with respect to altitudes - II



6.3.B.1.4. Basal Area (BA)

The figures obtained from Mannavan Shola indicate that majority of basal area were contributed by gigantic trees of the various species of *Elaeocarpus, Syzygium, Ilex, Cinnamomum,* etc. At 1600 m, *Meliosma simplicifolia* with 19.03 m^2/ha. stood at the top. *Elaeocarpus tuberculatus*, a large tree species contributed the highest basal area at 1700 and 1800 m. At 1900 m another *Elaeocarpus* species, *E. glandulosus* was the dominant member. At 2000-2300 m *Syzygium caryophyllatum* stood in the first or second place in dominance, in addition to other species such as *S. gardneri* and *S. densiflorum.* Above 2200 m, *Arundinaria floribunda* with their high density stood among the top contributing to the high basal area. At 2400 m, first five species that contributed the highest basal area (*Ilex denticulata, Microtropis ramiflora, Cinnamomum wightii, Elaeocarpus recurvatus,* etc.) were the ones, which were not dominant at the lower altitudes.

At Eravikulam, *Chionanthes linoceiroides* was the one, which showed highest basal area at 1800 m. *Arundinaria floribunda*, and *Syzygium densiflorum* showed high dominance at 2000-2200 m altitudes. Above 2400 m *Rhododendron arboreum* subsp. *nilagiricum, Ilex walkeri, I. denticulata, Elaeocarpus recurvatus,* etc. showed dominance. At 2600 m reed bamboo species such as *Arundinaria densifolia, A. walkeriana,* etc. with their high density stood among the top (see Appendices 6-19).

6.3.B.1.5. Importance Value Index (IVI)

Since all the plants ≥1 cm dbh were enumerated, in most cases, understorey species due to their high frequency and density, stood among the top in IVI figures, overtopping the dominant tree species.

At Mannavan Shola, tree species such as *Phoebe wightii, Meliosma simplicifolia, Persea macrantha,* etc. were the species, which showed the highest IVI values at 1600 m, contributing more than 20 percentages of total IVI values. From 1700 m to 2000 m, understorey shrubs such as *Strobilanthes gracilis* stood at the top (IVI values: 24 to 47) followed by either *Lasianthus acuminatus* or *Ardisia rhomboidea.* These three species contributed 30 percentage of the total IVI. However at 1700 m, gigantic trees of *Elaeocarpus tuberculatus* with their high basal area stood third in the IVI list. From 2100 m onwards, a different pattern was observed. At 2100 m, *Syzygium caryophyllatum* and *Cinnamomum wightii* stood top above the fore mentioned understorey species association. At 2200-2400 m *Psychotria nilgiriensis* var. *astephana, Syzygium caryophyllatum, Arundinaria floribunda* were the most dominant species. However at 2400 m, ecotone species such as *Microtropis ramiflora, Ilex denticulata,* and *Cinnamomum wightii* were the species that stood beneath *Psychotria* in the IVI values (see Appendices 6-14).

At Eravikulam, the species associations showed a little difference. However, the principle dominant species remained the same. At 1800 m, understorey species such as *Lasianthus acuminatus, Strobilanthes gracilis, etc.* were the highest dominant ones contributing more than 20 percent of IVI. At 2000 m, *Strobilanthes gracilis* and *Syzygium densiflorum* stood at the top. At 2200-2400 m altitudes, similar to Mannavan shola, *Psychotria nilgiriensis* var. *astephana* stood at the second place in IVI. Here *Ilex walkeri* and *Rhododendron arboreum* subsp. *nilagiricum* were the most dominant species. At 2600 m *Arundinaria densifolia* and *Gaultheria fragrantissima* stood below the *Rhododendron*, which alone contributed the highest percent (20 %) of IVI (see Appendices 15-19).

When tree species (≥ 10 cm dbh) alone were considered, at Mannavan Shola, *Meliosma simplicifolia* showed highest IVI at 1600 and 1700 m altitudes. At 1800-2000 m altitudes, *Beilschmiedia wightii* showed highest values. *Litsea wightiana, Syzygium caryophyllatum, Ilex walkeri, Cinnamomum wightii* were the other species which showed highest IVI values at 2000-2200 m. Above 2200 m, reed bamboo species *Arundinaria foribunda, Elaeocarpus recurvatus, Syzygium caryophyllatum,* etc. stood at the top. At 2400 m, *Microtropis ramiflora* and *Cinnamomum wightii* were the dominant ones.

At Eravikulam also the plants observed a high degree of altitudinal specificity. *Beilschmiedia wightii, Chionanthus linocieroides, Syzygium densiflorum, Ilex walkeri, Euonymus crenulatus* and *Rhododendron* were the species, which showed the highest IVI values at 1800, 2000, 2200, 2400 and 2600 m respectively (Appendices 20 & 21).

6.3.B.1.6. Distributional Index (DI)

From the results obtained, it was seen that at all altitudes proportionately very high number of species showed contiguous (clumped) distribution. In those transects at Mannavan Shola, about 90 percent of the species showed Contiguous distribution at 1600 m and 2100 m altitudes. At 1800 and 1900 m, this value were the lowest (< 70 %), where a high proportion of species (28 % & 31 %) showed Random distribution. Regularly distributed species were comparatively very less at all altitudes (Fig. 6.3).

In most of the transects established at Eravikulam also, plants showed Contiguous distribution. Also a gradual percentage increase of the species distributed contiguously was observed with respect to altitude (except at 2000 m). At 2400 m, 42 out of the 46 species (96 %) and at 2600 m all the 27 species (100 %) showed Contiguous distribution (see Fig. 6.4 & Table 6.5).

Fig. 6.3. Distributional pattern of species with respect to altitude - I

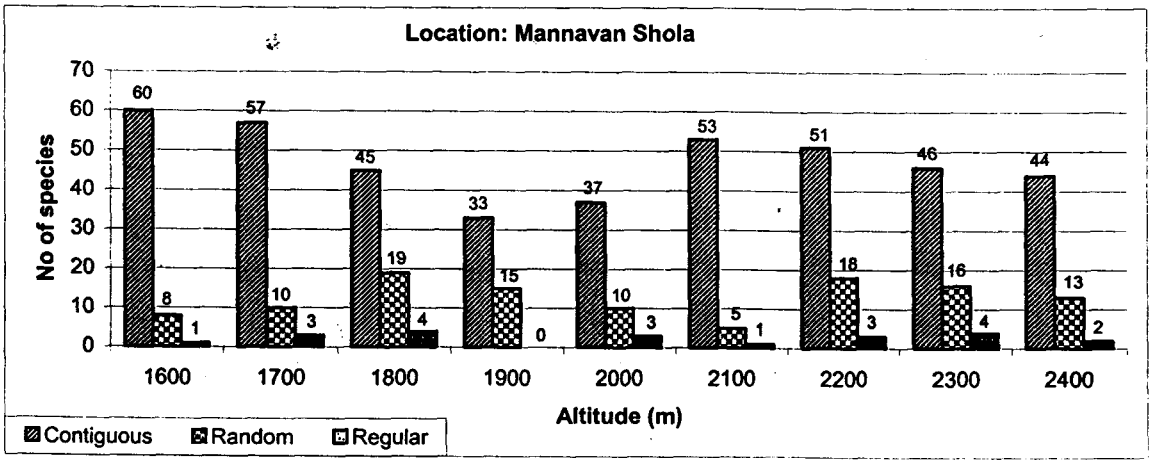


Fig. 6.4. Distributional pattern of species with respect to altitude - II

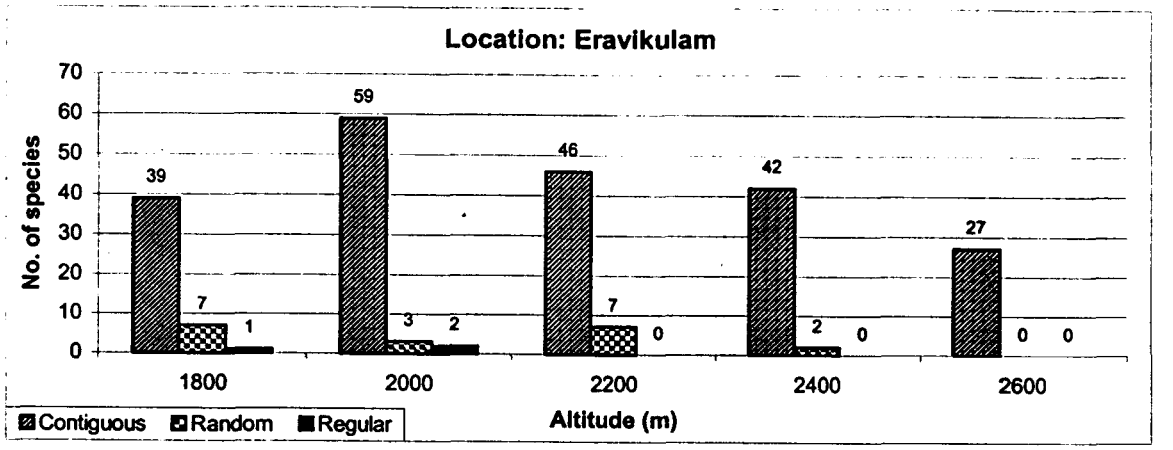


Table 6.5. Distributional Index of species with respect to locations and altitude

Location: MANNAVAN SHOLA										Location: ERAVIKULAM				
Altitude (m) ► Distrubution	1600	1700	1800	1900	2000	2100	2200	2300	2400	1800	2000	2200	2400	2600
Contiguous	60	57	45	33	37	53	51	46	44	39	59	46	42	27
Random	8	10	19	15	10	5	18	16	13	7	3	7	2	0
Regular	1	3	4	0	3	1	3	4	2	1	2	0	0	0

6.3.B.1.7. Maturity Index (MI)

The results obtained from Mannavan Shola showed two peaks at 2000 m and 2400 m respectively. It is to be noted here that it is at 2000 m that the continuous forest patch at Mannavan Shola ends. The highest altitude here is at 2400 m, above which the sholas are absent. When at 1600 m, MI values were 30 percent only, at 2000 m it increased to 38.8 percent and at 2400 m it again increased to 41.7 percentage. (Fig. 6.5).

At Eravikulam also a similar trend was obtained. There was a depression in MI value at 2000 m (38 %), which is a transition point from the large continuous forest patches to small patchy sholas. So at 1800 m, the MI values was 47 percentage, but substantially higher than Mannavan Shola. From 2000 m onwards, there was a gradual increase of MI values from 38 percent to a very higher value of 59 percentage at 2600 m altitude, indicating the march to a climax vegetation (Fig. 6.6).

Fig. 6.5. Variation of Maturity Index with respect to altitude (Location: Mannavan Shola)

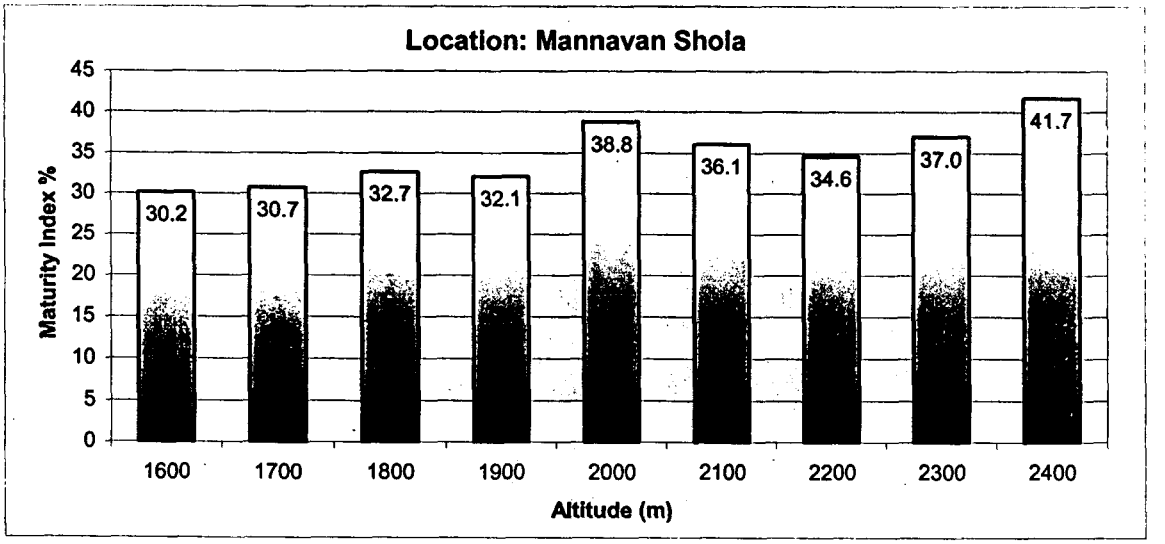
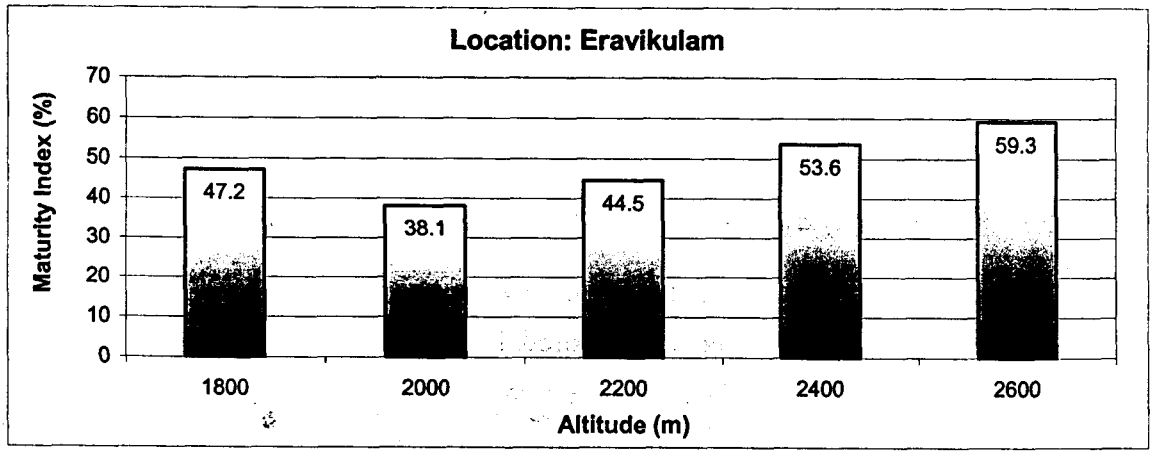


Fig. 6.6. Variation of Maturity Index with respect to altitude (Location: Eravikulam)



6.3.B.1.8. Stratification of the forest stand

The results obtained from Mannavan Shola indicate that majority of the individuals (87-96 %) belong to the < 10 m height category. About 60-76 % of the individuals were under 5 m height. So these dense strata practically cut off any light reaching the forest floor, so only a few shade-loving herbs and ferns thrive here (see Table 6.6). High density of individuals in these strata was contributed mainly by a few under wood species, but they differed with respect to altitudes. When at 1600 m species such as *Strobilanthes cuspidatus*,

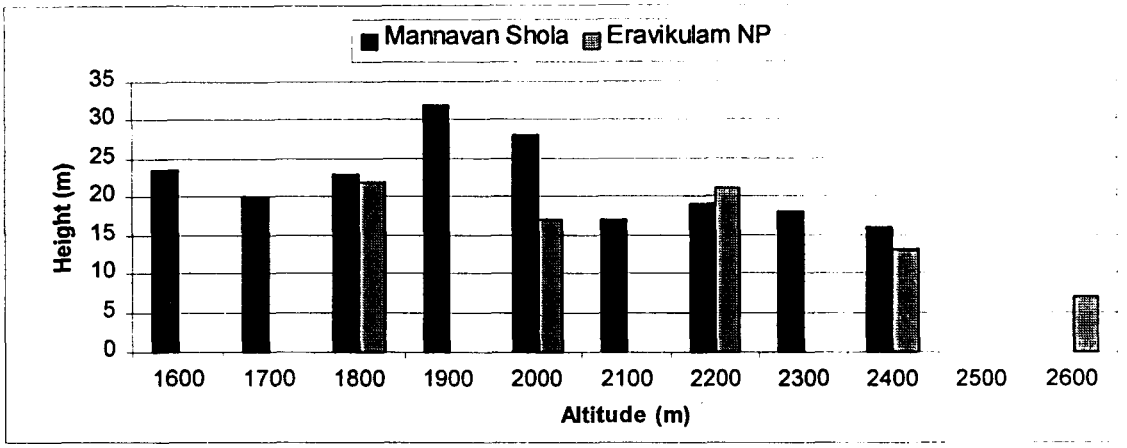
Viburnum punctatum and *Phoebe wightii* were dominant, from 1700-2100 m *Strobilanthes gracilis, Lasianthus acuminatus* and *Ardisia rhomboidea* were the dominant species in this strata. Above 2200 m *Psychotria nilgiriensis* var. *astephana, Strobilanthes gracilis, Syzygium caryophyllatum, Arundinaria floribunda, Microtropis ramiflora,* etc were the dominant species (Fig. 6.7).

Table 6.6. Stratification of Mannavan Shola forest at various altitudes (Plot size: 0.1 ha.)

No	Altitude (m)	Individuals in different height classes (in m)							Total no. of individuals
		1-5	5-10	10-15	15-20	20-25	25-30	30-35	
1.	1600	636	115	83	19	7	-	-	860
2.	1700	594	172	69	20	2	-	-	857
3.	1800	783	342	65	54	10	-	-	1254
4.	1900	533	514	87	21	22	25	1	1203
5.	2000	709	418	63	38	12	1	-	1242
6.	2100	835	347	84	10	-	-	-	1277
7.	2200	780	186	68	19	-	-	-	1053
8.	2300	1024	314	66	5	-	-	-	1409
9	2400	948	257	47	3	-	-	-	1255

Even though there was no clear-cut stratification above this layer, but a gradual transformation to the upper storey species, there was some concentration of individuals in < 15 m height strata mainly contributed by the understorey tree species. At 1600-1700 m small trees such as *Meliosma simplicifolia, Turpinia nepalensis, Clerodendron viscosum, Persea macrantha, Daphniphyllum neilgherrense,* etc, were the dominant ones. At 1800 m, *Hydnocarpus alpina, Isonandra perrottetiana, Prunus ceylanica,* etc were the species. At 1800-2100 m, *Strobilanthes gracilis* was also found to grow to enormous size to contribute to this layer. At 1900-2000 m trees such as *Syzygium densiflorum* and *S. gardneri* often reaches > 30 m height. However, here the top canopy species such as *Actinodaphne bourneae, Chionanthes ramiflorus, Litsea oleoides, Prunus ceylanica, Syzygium cumini, Beilschmiedia wightii,* etc generally attain 25-30 m. Above 2100 m trees seldom attains more than 20 m. Here the top canopy species include *Cinnamomum filipedicellatum, C. macrocarpum, Ilex wightiana, Neolitsea zeylanica, Phoebe wightii, Syzygium densiflorum, Bischofia javanica, Myrsine wightiana, Symplocos foliosa, Turpinia nepalensis,* etc. Here the second storey tree layer is not prominent. Above 2300 m *Elaeocarpus recurvatus, Cinnamomum wightii, Ilex denticulata, Myrsine thwaitesii, Syzygium caryophyllatum,* etc are also seen in the top canopy layer.

Fig. 6.7. Variation in maximum tree height with respect to altitudes and locations



* Eravikulam is represented at 200 m intervals only

At Eravikulam also, there is no much difference in the stratification of the forest stand. At 1800 m, the average height of the stand was 15-20 m. However a few species (eg. *Litsea wightiana*) grew upto 22 m. The tallest species were *Actinodaphne bourneae, Casearia zeylanica, Chionanthes linocieroides, Litsea wightiana, Cinnamomum wightii, Myrsine wightiana,* etc. Here about 84 percentage of the total individuals belonged to less than 10 m height category, out of which 65 percentage were of < 5 m height. The dominant species, which contributed to these strata, are *Ardisia rhomboidea, Lasianthus acuminatus* and *Strobilanthes gracilis.*

At 2000 m, about 90 percentage of the individuals belonged to the < 10 m height category. Here *Psychotria nilgiriensis* var. *astephana* was the other species which contributed more in the < 5 m category. The tallest species were *Mastixia arborea, Ternstroemia japonica* (17 m), etc. Above this altitude the overall height of the vegetation decreased. At 2200 m, even though a few members of *Ilex walkeri* stood upto 20 m, the average height was between 10-15 m, the other tallest species being *Syzygium densiflorum, Neolitsea zeylanica, N. scrobiculata,* etc. Here *Strobilanthes micranthus, Ardisia rhomboidea, Psychotria nilgiriensis* var. *astephana,* etc. were the species, which were dominant in the < 5 m category.

At 2400 m, the average height of the vegetation was < 10 m represented by about 97 percentage of individuals. However a few species such as *Ilex walkeri, Cinnamomum wightii, Syzygium densiflorum,* etc. grew to 12-13 m tall standing above the canopy. It is interesting to note that such tall trees are

located in the center of the sholas, often in ditches bordering the streamlets flowing through. Here the shrubby understorey (< 5 m) were dominated by *Psychotria nilgiriensis* var. *astephana*, *Strobilanthes gracilis, S. zenkerianus, Arundinaria walkeriana,* etc. Just above this layer species such as *Euonymus crenulatus, Ligustrum perrottetii, Pittosporum tetraspermum, Turpinia nepalensis,* etc. showed a good number of population.

At 2600 m, about 94 percentage of the vegetation was under 5 m height. Here the tallest members are *Rhododendron arboreum* subsp. *nilagiricum* and *Ilex denticulata*, which attained a maximum of 7 m height. Here the under shrub species were mainly constituted by reed bamboo species such as *Arundinaria densifolia* and *A. walkeriana, Scutellaria wightiana, Eurya nitida, Hedyotis buxifolia, Rubus fairholmianus,* etc. are the other members (Appendices 22 & 23).

6.3.B.1.9. Girth class distribution pattern

The results obtained from Mannavan Shola indicate that 75-90 percent of the total individuals came under the < 10 cm dbh category. Highest figure were obtained at 1900 m and 2300 m. With the increase in altitude there was a decrease in the number of individuals in the 10-20 cm dbh group upto 1800-1900 m, above which there showed an increase to about 100 percent at 2400 m.

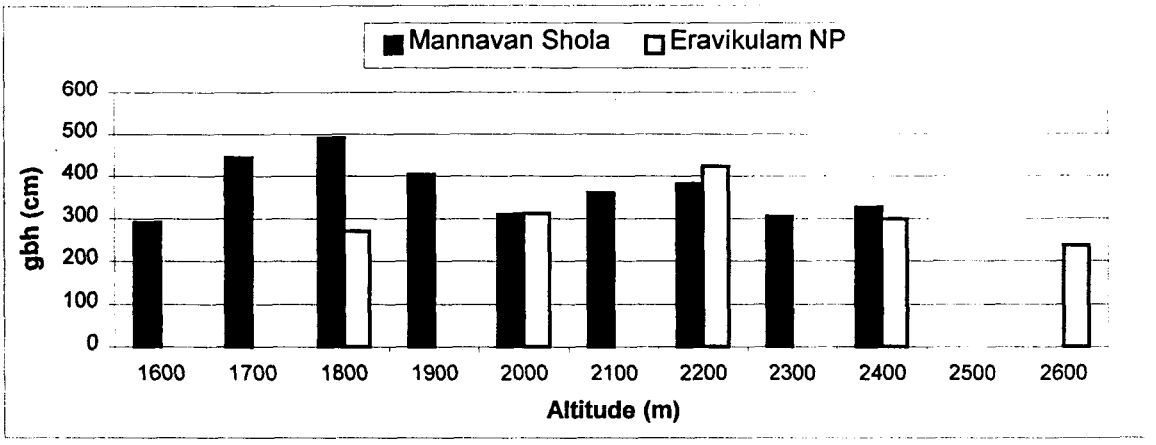
Table 6.7. Girth class distribution (in dbh) with respect to altitude

Location: Mannavan Shola (Plot size: 0.1 ha.)

No	Altitude (m)	Saplings	Poles	Trees							Total
		1-10 cm	10-20	20-40	40-60	60-80	80-100	100-120	120-140	140-160	
1	**1600**	700	53	51	19	7	1	-	-	-	**860**
2	**1700**	655	57	40	7	3	-	-	-	1	**857**
3	**1800**	1093	28	24	16	8	2	-	-	-	**1254**
4	**1900**	1098	30	26	12	1	2	2	1	-	**1203**
5	**2000**	1095	53	33	13	6	-	-	-	-	**1242**
6	**2100**	1097	79	54	9	7	2	-	-	-	**1277**
7	**2200**	889	55	35	17	4	2	3	1	-	**1053**
8	**2300**	1241	67	35	15	5	-	-	-	-	**1409**
9	**2400**	1052	109	57	3	1	-	1	-	-	**1255**

Regarding the pattern of variability of tree diameter, there showed two peaks with respect to altitude. The diameter (and height) of trees showed a steady increase from 1600 to 1800 m from where it showed a fall up to 2000 m. Above 2000 m, another increase was observed upto 2200 m, above which there showed another fall (Fig. 6.8).

Fig. 6.8. Variation in maximum tree diameter with respect to altitudes and locations



Tree storey with highest diameter recorded from the lower altitudes mainly include species of *Syzygium* and *Elaeocarpus*. The highest diameter recorded was that of an *Elaeocarpus tuberculatus* (490 cm gbh) at 1900 m altitude. This species is concentrated mainly at low altitudes. *Syzygium cumini, S. caryophyllatum, S. gardneri,* etc. are the other species, which contributed highest diameters below 2000 m. Above 2100 m, *Cinnamomum macrocarpum, Ilex wightiana, I. denticulata, Ligustrum perrottetii,* etc. were the trees having highest diameter. Even at 2400 m trees having > 300 cm gbh were not uncommon (*Ilex denticulata*: 326 cm gbh). When *Elaeocarpus tuberculatus* showed the highest diameter at lower altitudes, *E. glandulosus* was the highest one at medium altitudes and *E. recurvatus* at higher altitudes (Appendix 24).

At Eravikulam also, a similar trend was obtained. The highest girth recorded was 423 cm (*Ilex walkeri*). There showed a decreasing trend of tree girth to both sides. At 1800 m, all the first three trees with maximum girth belonged to *Chionanthus linocieroides* (270 cm gbh max.) At 2400 m, *Ilex walkeri, Cinnamomum wightii, Elaeocarpus recurvatus,* etc. were the biggest species.

However at 2600 m, *Rhododendron arboreum* subsp. *nilagiricum* was the most dominant species showing the highest girth (upto 237 cm gbh) (Appendix 25).

6.3.B.1.10. Structural status of the vegetation

The results are given in Appendices 26 and 27. It is seen from the figures that trees at 1600 m, which is an ecotone region at Mannavan Shola exhibit a very different species dominance pattern. Here *Phoebe wightii, Meliosma simplicifolia* and *Persea macrantha* are the dominant species. The dominant *Strobilanthes* member is *S. cuspidatus. Bischofia javanica, Clerodendrum viscosum,* etc. are the Character species. From 1700-2000 m, *Strobilanthes gracilis* continued to be the most dominant species followed by *Lasianthus acuminatus, Ardisia rhomboidea, Mastixia arborea, Elaeocarpus tuberculatus Beilschmiedia wightii,* etc. However the Character species showed a great deal of difference with respect to altitude indicating the altitudinal specificity. Above 2100 m, *Psychotria nilgiriensis* var. *astephana, Cinnamomum wightii, Litsea wightiana, Ilex walkeri, Elaeocarpus recurvatus,* etc. were the dominant species. At these altitudes *Microtropis ramiflora, Arundinaria floribunda, Rhododendron arboreum* subsp. *nilagiricum, Myrsine thwaitesii, Symplocos anamalayana,* etc. were the Character species.

At Eravikulam also *Strobilanthes gracilis, Lasianthus acuminatus, Ardisia rhomboidea,* etc. were the dominant species at 1800 m. Above 2000 m, *Psychotria nilgiriensis* var. *astephana, Ilex walkeri, Arundinaria floribunda, Cinnamomum wightii, Elaeocarpus recurvatus,* etc. were the most dominant ones. At 2600 m, *Rhododendron, Arundinaria densifolia, Gaultheria fragrantissima, Eurya nitida, Rubus fairholmianus,* etc. were dominant. When *Psychotria nilgiriensis, Symplocos macrophylla* subsp. *rosea* were the Character species at lower altitudes, other species or varieties of the same genera such as *Psychotria nilgiriensis* var. *astephana, Symplocos cochinchinensis* subsp. *laurina,* etc. were the Character species at higher altitudes.

6.3.B.1.11. Species compositional difference across altitude

All the species recorded from the transects established at both the study sites were independently clumped to analyse the altitudinal specificity

exhibited by the species. Certain species were found only at lower altitudes while certain others only at higher altitudes. About ten categories of occurrence (such as **1**. *low altitudes only*, **2**. *low and medium altitudes*, **3**. *low to high altitudes*, **4**. *low to very high altitudes*, **5**. *medium altitudes only*, **6**. *medium to high altitudes*, **7**. *medium to very high altitudes*, 8. *high altitudes only*, **9**. *high and very high altitudes* and **10**. *very high altitudes only*) were assigned and species were grouped according to their occurrence. Here low altitudes means 1600-1700 m, medium altitudes means 1800-2000 m, high altitudes means 2100-2400 m, very high altitudes means > 2400 m. The results are tabulated as Appendices 28, 29 & 30. It is seen that majority of the species (37 %) are found at low-medium altitudes where high diversity is observed. Species restricted to medium and high altitudes only were lesser in number (9 % and 5 %). However there were comparatively more species distributed in high and very high altitudes (13 %) indicating their altitudinal specificity. In many cases different species of the same genus were found to inhabit different altitudes (Table 6.9).

Table 6.9. Altitudinal variability of species within a genus

No	Genera	Species found in various altitudes			
		Low	Medium	High	Very high
1.	***Arundinaria***	..	*floribunda*	*floribunda* *walkeriana*	*walkeriana* *densifolia*
2.	***Celtis***	*phillipensis* var. *wightii*	*tetrandra*	..	..
3.	***Cinnamomum***	*malabatrum* *travancoricum*	*filipedicillatum* *malabatrum* *keraleanse* *wightii*	*keraleanse* *macrocarpum* *wightii*	*wightii*
4.	***Clerodendron***	*serratum* *viscosum*	*viscosum*	..	..
5.	***Elaeocarpus***	*tuberculatus*	*glandulosus* *munronii*	*recurvatus*	*recurvatus*
6.	***Exacum***	..	*wightianum*	*wightianum*	*anamalayanum*
7.	***Ilex***	*malabarica* *wightiana*	*wightiana*	*wightiana* *walkeri* *denticulata*	*walkeri* *denticulata*
8.	***Lasianthus***	..	*acuminatus* *coffeoides* *blumeanus*	*acuminatus* *ciliatus* *venulosus*	*venulosus*
9.	***Litsea***	*glabrata* *coriacea*	*oleoides* *wightiana*	*oleoides* *wightiana*	*wightiana*
10.	***Mallotus***	*phillipensis* *tetracoccus*	*tetracoccus*	..	..
11.	***Meliosma***	*pinnata* subsp. *barbatula*	*simplicifolia* subsp. *simplicifolia*	*simplicifolia* subsp. *pungens*	..
12.	***Myrsine***	*wightiana*	*wightiana* *capitellata* var. *sessilis*	*thwaitesii* *capitellata* var. *sessilis*	*thwaitesii*
13.	***Psychotria***	*glandulosus*	*glandulosus* *nilgiriensis* var. *nilgiriensis*	*nilgiriensis* var. *astephana*	*nilgiriensis* var. *astephana*
14.	***Strobilanthes***	*asperrimus* *cuspidatus* *foliosus* *luridus*	*gracilis* *luridus* *micranthus* *kunthianus* *pulneyensis*	*gracilis* *luridus* *kunthianus* *violacea*	*zenkerianus* *kunthianus*
15.	***Symplocos***	*cochinchinensis*	*cochinchinensis* *gardneri* *obtusa* *oligandra*	*foliosa* *anamalayana* *gardneri*	*foliosa* *anamalayana*
16.	***Syzygium***	*cumini*	*caryophyllatum* *densiflorum* *gardneri*	*caryophyllatum* *densiflorum* *gardneri*	*densiflorum*

6.3.B.2. DIVERSITY ANALYSES

6.3.B. 2. 1. Species Richness Indices

The total number of species encountered from each localities themselves provided information on the richness of the area. At Mannavan Shola, highest number of species were recorded at 1700 m (70) and 2200 m (72), while it was at medium altitude shola regions (1900 & 2000 m) the values were less (48 and 50 respectively). At Eravikulam, highest number of species was recorded at 2000 m (64). From there onwards the value showed a gradual decrease to a lowest figure (27) at 2600 m (Figs. 6.9 & 6.10).

Fig. 6.9. No. of species encountered at different altitudes in Mannavan Shola

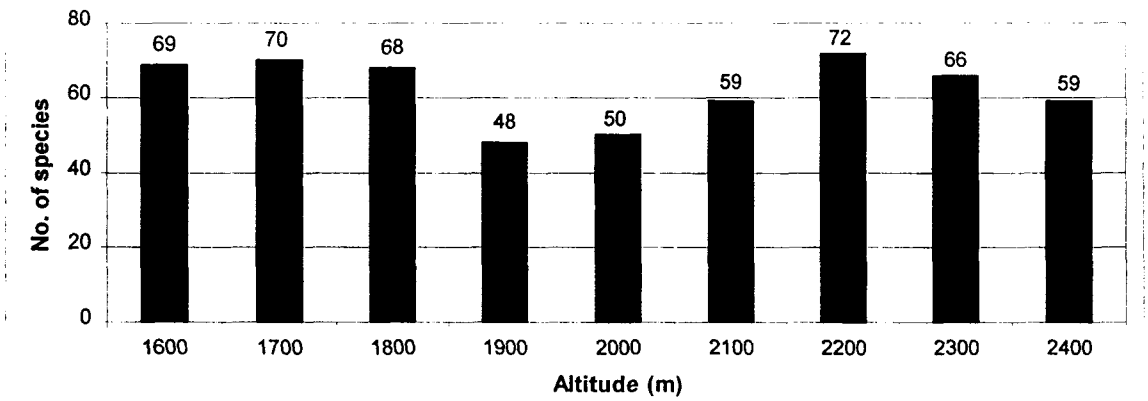
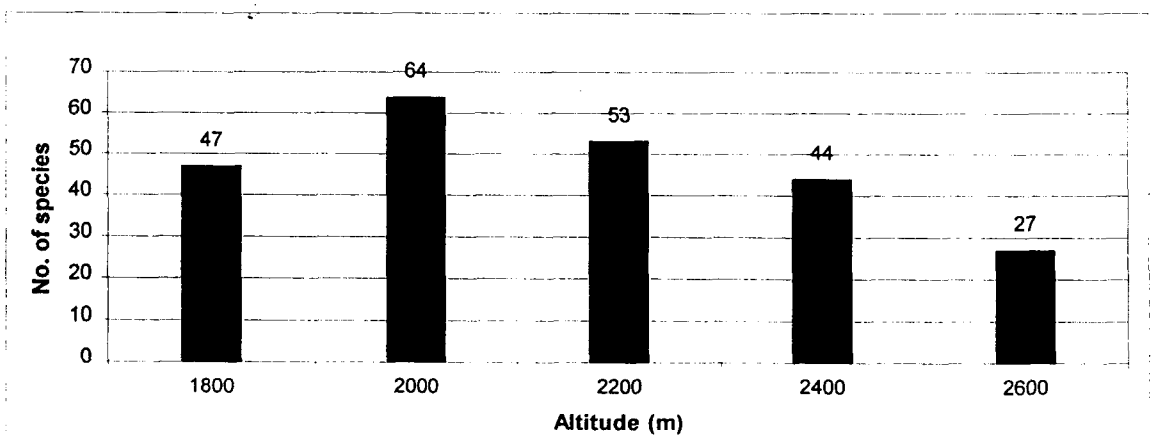
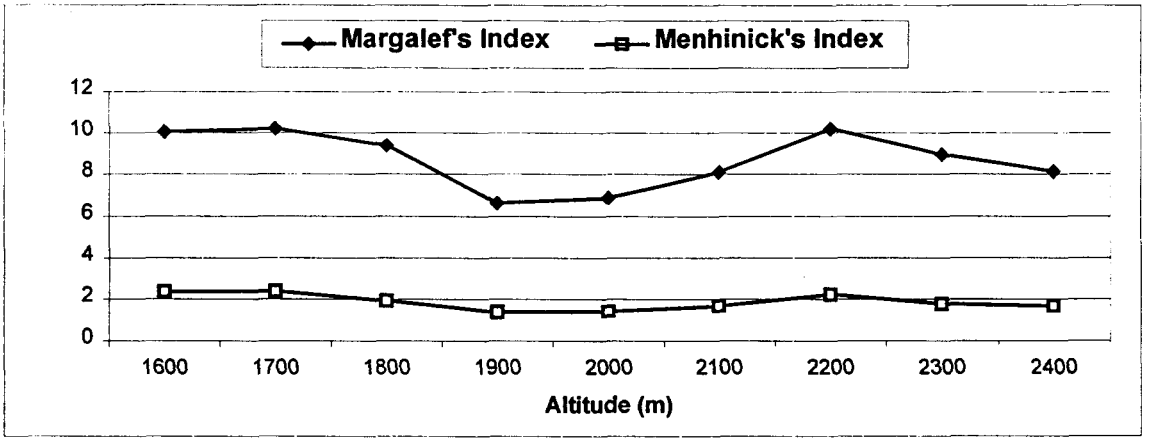


Fig. 6.10. No. of species encountered at different altitudes in Eravikulam



At Mannavan Shola, both Margalef's and Menhinick's indices showed two peak values, one at 1600 m and the other at 2200 m, indicating the high diversity there. It is to be noted that both the sites can be considered as ecotonal regions where active competition between different species are taking place. These richness values, which decreased from 1700 m onwards, showed a sharp decline at 1900 m, where the sholas are practically undisturbed evidenced by the species composition and the presence of gigantic trees. After 2200 m also, there was gradual decline of Margalaf's value from 10.02 to 8.13 at 2400 m (Fig. 6.11; Appendix 31).

Fig. 6.11. Species Richness Indices of Mannavan Shola

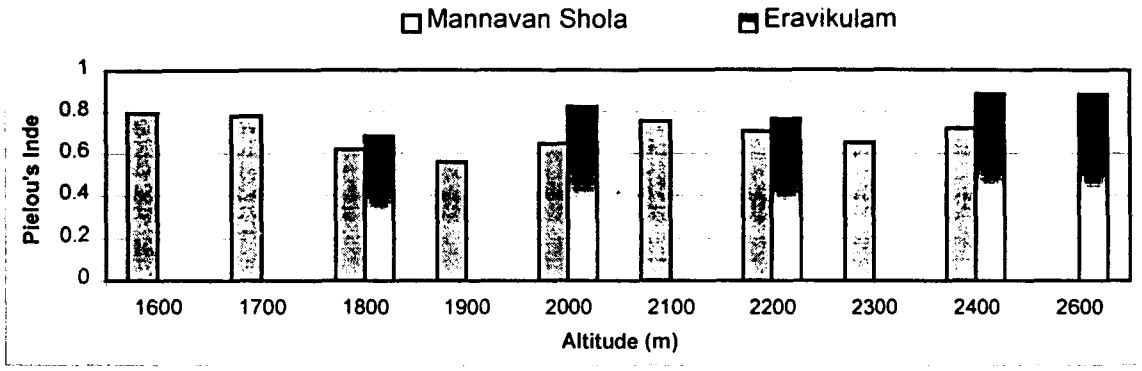


At Eravikulam also, a similar trend was observed. But here only one peak at 2000 m was observed. Here Margalef's and Menhinick's indices values were 9.09 and 1.78 respectively. From 2000 m onwards there was a gradual decline of richness and so at 2600 m the values declined to 3.79 and 0.88 respectively (Appendix 31).

6.3.B.2.2. Evenness/Equitability Index

At Mannavan Shola, Pielou's evenness index showed higher values at the two ecotonal points. At 1600-1700 m altitudes the values were 0.79 and 0.78 respectively. From these onwards there was a decrease in the values and at 1900 m the value was 0.56 only. At 2100 m, the value again raised to 0.76. It slowly decreased to have another peak (0.72) at 2400 m, which was the highest altitudinal limit.

Fig. 6.12. Pielou's Evenness Index figures of Mannavan Shola and Eravikulam



At Eravikulam also, a similar trend was observed. The values showed an increase at 2000 m (0.08) and decreased to 0.77 at 2200 m. It later increased to 0.89 at 2400 and 2600 m (Appendix 31 & Fig. 6.12).

6.3.B.2.3. Indices based on the proportional abundance of species

a) Shannon's Index

This index showed highest values (3.36) at lowest altitude (1600 m) under study. The value decreased to a minimum of 2.17 at 1900 m to again increase at 2100-2200 m (3.08 and 3.02 respectively). Above 2300 m, the values again decreased, although a slight increase was noticed again at 2400 m. For the *t*-values obtained by the comparison of indices (for plants ≥ 1 cm dbh) see Table 6.10.

Fig. 6.13. Shannon's Index figures of Mannavan Shola and Eravikulam

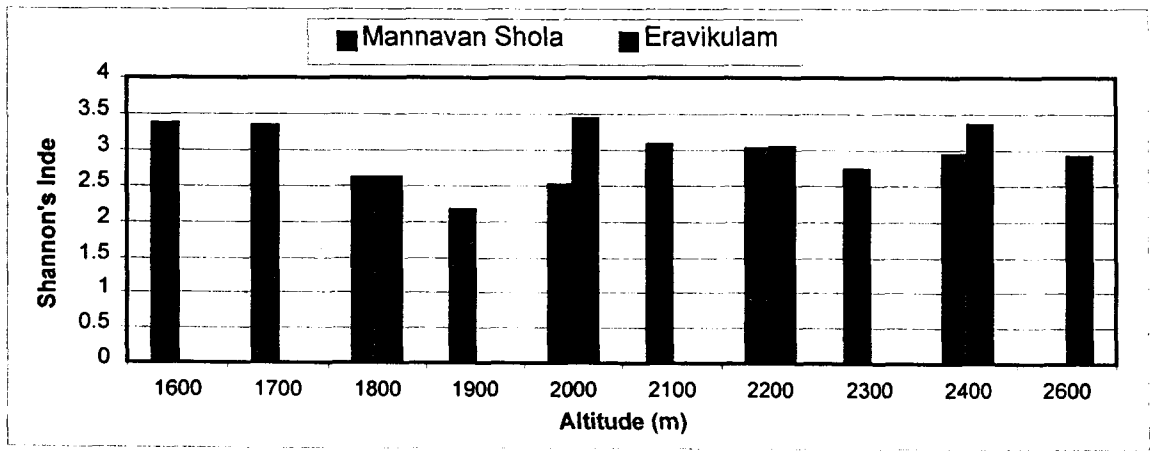


Table 6.10. *t* - values obtained by the comparison between Shannon's Indices

(Locality: Mannavan Shola; Plants: ≥ 1 cm dbh; Plot size: 0.1 ha.)

No	Altitude	N	H'	var(H)	1600 m	1700 m	1800 m	1900 m	2000 m	2100 m	2200 m	2300 m	2400 m
1.	**1600 m**	860	3.363	0.0016									
2.	**1700 m**	857	3.334	0.0021	0.48								
3.	**1800 m**	1254	2.610	0.0022	**12.31**	**11.09**							
4.	**1900 m**	1203	2.167	0.0017	**20.88**	**18.93**	**7.09**						
5.	**2000 m**	1242	2.519	0.0017	**14.85**	**13.31**	1.47	-6.04					
6.	**2100 m**	1277	3.078	0.0009	**5.71**	**4.66**	-8.41	-17.74	-11.00				
7.	**2200 m**	1053	3.015	0.0023	**5.58**	**4.81**	-6.03	-13.34	-7.85	1.12			
8.	**2300 m**	1409	2.727	0.0019	**10.87**	**9.66**	-1.84	-9.36	-3.51	**6.66**	**4.45**		
9.	**2400 m**	1255	2.936	0.0018	**7.39**	**6.41**	-5.18	-13.01	-7.11	**2.75**	1.23	-3.46	

* Figures in **Bold** indicate values that are significant (> 2.56)
(**N** = No of individuals in 0.1 ha.; **H'** = Shannon's Index of diversity)

At Eravikulam, the highest value was obtained at 2000 m (3.43). At 2400 m, another increase was also observed. At 2600 m, the value decreased to 2.92 (Fig. 6.13; Appendix 31). For the T-values obtained by the comparison of indices (for trees ≥ 30 cm dbh) see Table 6.11.

Table 6.11. *t* - values obtained by the comparison between Shannon's Indices

(Locality: Eravikulam; Plants: ≥ 30 cm dbh; Plot size: 0.05 ha.)

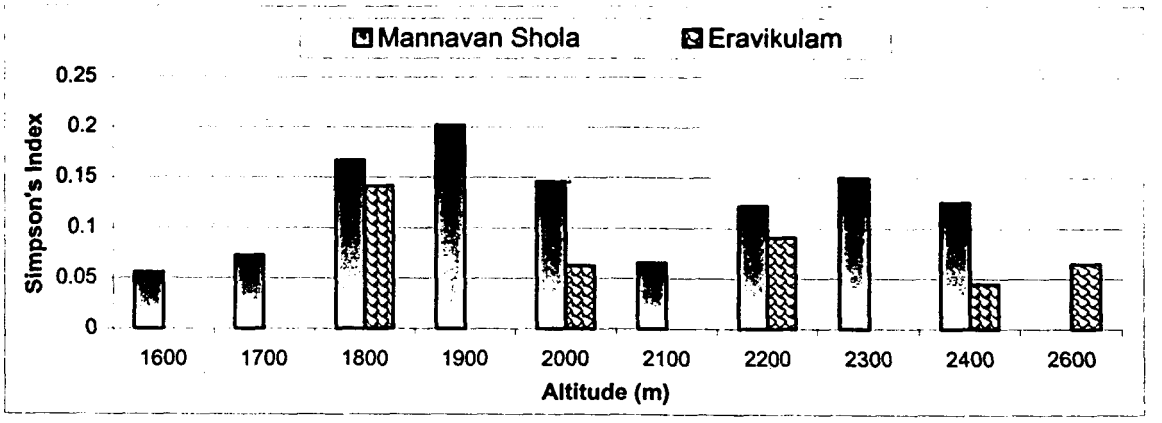
No	Altitude	N	H'	var(H)	1800 m	2000 m	2200 m	2400 m	2600 m
1	1800 m	84	2.9891	0.0032					
2	2000 m	109	3.017	0.0058	-0.30				
3	2200 m	103	3.279	0.0042	-3.37	-2.62			
4	2400 m	167	3.103	0.0029	-1.45	-0.91	2.09		
5	2600 m	124	1.707	0.0089	**11.64**	**10.78**	**13.71**	**12.80**	

* Figures in **Bold** indicate values that are significant (> 2.56)
(**N** = No of individuals in 0.05 ha.; **H'** = Shannon's Index of diversity)

b) Simpson's Index

This measure of dominance is inversely proportional to diversity. The highest value obtained at Mannavan Shola (0.20) was at 1900 m where the lowest Shannon's Index was reported. Another increase (0.15) was at 2300 m where another decrease in Shannon's value (2.73) obtained (Appendix 31).

Fig. 6.14. Simpson's Index figures of Mannavan Shola and Eravikulam



At Eravikulam, the highest value (0.14) was obtained at 1800 m. Other higher values were obtained at 2200 m (0.09) and 2600 m (0.07) where the diversity values were less.

6.3.B.2.4. Community Coefficient/Index of Similarity

At Mannavan shola, three altitudinal groups were designated: 1600-1800 m, 1900-2100 m and 2200-2400 m as evidenced from the Cluster analyses and Dendrograms (Table 6.12 & Fig. 6.15). Highest similarity was observed between altitudes of 2300 m and 2400 m (68.8 %). The altitudes 2200 m and 2300 m showed about 68.12 % similarity. Altitudes 1600-1800 m showed more similarity with 1900-2100 m group than with the 2200-2400 m group. It is to be noted here that it is at higher altitudes, patchiness of the shola increases. Highest values of dissimilarity were obtained between the first (1600-1800 m) and the third group (2200-2400 m).

Table 6.12. Matrix of similarity between altitudes (Locality: Mannavan Shola)

Altitude	1600 m	1700 m	1800 m	1900 m	2000 m	2100 m	2200 m	2300 m	2400 m
1600 m		58.99	49.64	41.03	40.34	45.31	35.46	26.67	25.00
1700 m			**63.77**	44.07	33.33	37.21	33.80	23.53	18.60
1800 m				56.90	52.54	47.24	28.57	22.39	18.90
1900 m					48.98	44.86	26.67	22.81	20.56
2000 m						56.88	32.79	27.59	18.35
2100 m							51.91	48.00	49.15
2200 m								**68.12**	61.07
2300 m									**68.80**
2400 m									

Fig. 6.15. Dendrogram obtained by Hierarchical Cluster Analysis – I (Locality: Mannavan Shola)

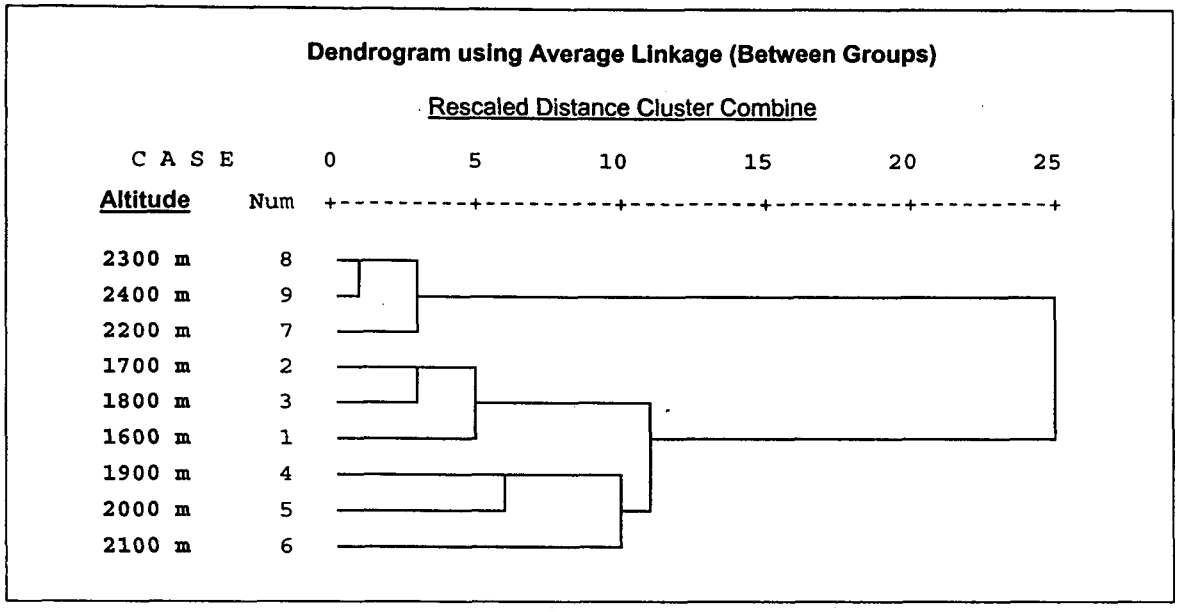
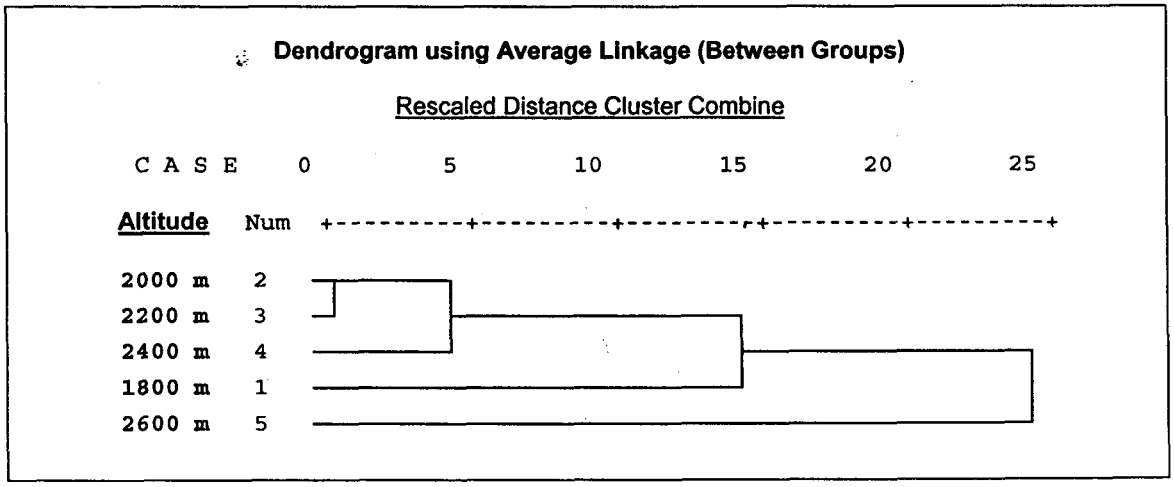


Table 6.13. Matrix of similarity between altitudes (Locality: Eravikulam)

Altitude	1800 m	2000 m	2200 m	2400 m	2600 m
1800 m		46.8	34.0	22.0	2.7
2000 m			58.1	46.3	19.8
2200 m				53.6	20.0
2400 m					42.3
2600 m					

Fig. 6.16. Dendrogram obtained by Hierarchical Cluster Analysis – II (Locality: Eravikulam)



At Eravikulam, highest percentage of similarity (58.1 %) was obtained between 2000 m and 2200 m. Similarly higher percentage of similarity was

shown between 2200 m and 2400 m. Sholas located at the altitudes of 2600 m showed the highest dissimilarity with all the other groups, the highest being (97 %) with 1800 m (Table 6.13; Fig. 6.16).

6.4. ANALYSIS AND DISCUSSIONS

It becomes clear from the study that with the increase in altitude, there occur tremendous changes in the forest structure, species composition, height and girth of trees and the size and shape of sholas.

When at lower altitudes (1500-1800 m), a high preponderance of evergreen sub-tropical hill forest species is met with, the height of the stand is about 20 m. These localities serve as ecotonal region of the typical evergreen forest of lower elevations and shola forests of high altitudes. Here the diversity is also very high contributed by a varied species, which are typical to both the vegetational types. At lower altitudes, several exotics (which are escapes from the plantations) such as different species of *Eucalyptus, Acacia,* etc. are seen growing intermingled with the shola species. These regions are also characterized by the presence of trees of gigantic girth such as *Elaeocarpus tuberculatus, Chukrasia tabularis, Syzygium cumini,* etc. A gradual increase in the height of the forest was observed from this altitude onwards up to 1800-1900 m, from where the height again decreased. It is to be noted here that this height growth is observed where there is enough soil depth and moisture and in valleys where the forest is well protected from the effect of wind and insolation.

At Mannavan shola, where the forest is well protected on the east and west by the Gudalar range and Tirthalar cum Eravikulam range respectively, the trees are comparatively taller. So the same species and sholas in general, which are located in different aspects and topographic, conditions but in the same altitude may not have the same height. Also where the forest is found as big patches, the trees are comparatively taller. Generally trees found towards the centre and nearby the streams are taller and broader.

Even at higher altitudes (> 2200 m) only the trees bordering the sholas are smaller in size. These species are often of temperate stock represented by *Rhododendron arboreum* subsp. *nilagiricum, Ligustrum perrottetii, Symplocos*

sp., *Microtropis ramiflora, Casearia thwaitesii, Mahonia leschenaultii, Turpinia nepalensis,* etc. Here also there are taller trees, but they are found near to the centre of sholas bordering the streams flowing through. The extreme stunted nature of *Rhododendron* trees to about 50 cm which at 2650 m, resembles a *'bonsai'* can be attributed to the combined effect of water stress, low soil depth, deficiency of nutrients, high velocity of wind and incident light intensity and the effect of low temperature and frost.

Generally speaking, three structural forms can be noticed in the vegetation. Those found at 1500-1700 m forms the first group, from 1800-2100 m forms the second group and above 2200 m forms the third group. It is the last group, which shows all the structural features of patchy sholas (*Montane temperate forests* of Champion and Seth, 1968). Suresh *et al.* (2000) has opined that, with increase in altitude, the size of the sholas decrease but their numbers increase.

6.4.A. FIELD STUDIES

6.4.A.1. Species Area relation studies

From the results obtained (Table 6.1), it is becoming clear that the releve size is also dependent on altitude. When at lower altitudes, due to high diversity, releve sizes were bigger, it gradually reduced with increase in altitude. When at 1600-2000 m a size of 900 m^2 was found sufficient, it got reduced to 800 m^2 up to 2400 m and above which even 400 m^2 was sufficient. So before attempting any ecological studies the altitude of the study sites gives a direct clue on the releve size. But for general purpose a releve size of 1000 m^2 holds good for ecological studies when the altitude is not the criterion.

6.4.B. ANALYTICAL STUDIES

6.4.B.1. Structural and Compositional analyses

6.4.B.1.1. Density (D)

This measure of dominance of a species in a community is also an indication of the competition and the suitability of the habitat in maintaining a particular species. A general trend was observed in the pattern of diversity

concentration. The values ranged between 8570 stems/ha to 14090 stems/ha when all the individuals ≥1 cm dbh were measured. These high values also enable more effective energy capture, thereby contributing to more biomass. The lowest density values were observed at low altitudes and the highest values (at Mannavan shola) at 2300 m above which the values again decreased. There was a gradual increase in the density with increase in altitude (Tables 6.2 & 6.3).

At Eravikulam, a substantially high figure of density was observed (18,880-26,060 stems/ha). This may be attributed to the prevalence of more favourable environment with high precipitation (more than double that of Mannavan Shola). Here also a reduction in density was noticed above 2500 m. It has to be noted that these density figures are mainly contributed by non-tree members or by under trees. But the species contributing to high density differed with respect to altitude indicating their altitudinal, climatic and topographical specificity.

A general trend observed is that understorey species such as *Strobilanthes gracilis, Lasianthus acuminatus,* and *Ardisia rhomboidea* are the ones, which contribute a lion's share of density at almost all altitudes. However a slight variation in species composition at lower and higher altitudes is noticeable indicating the adaptability of the species. When at low altitudes *Strobilanthes cuspidatus, Phoebe wightii* and *Viburnum punctatum* took the place of the above-mentioned species, at higher altitudes (2300-2400 m), *Arundinaria floribunda, Psychotria nilgiriensis* var. *astephana, Litsea wightiana,* etc were dominant.

At Eravikulam, *Arundinaria densifolia, Gaultheria fragrantissima, Rhododendron arboreum* subsp. *nilagiricum* were the dominant species at 2600 m altitude. At all other altitudes, the same species composition was observed indicating that this is the general trend irrespective of locations. It also proves that these species are the well-adapted ones to flourish in these environments, which do not favour many of the other evergreen species.

Earlier studies conducted in similar shola sites are tabulated in Appendix 35. Since the area of study, plot size selected and girth class considered differ in most of these studies, often the comparability is lost. However, higher density is reported in the sholas in comparison to other vegetation types.

6.4.B.1.2. Abundance (Ab)

In a typical community abundant species will be a few only but common and rare species will be more. Abundance actually forms a measure of distance between the plants (Alok, 1953) and it forms an important factor in understanding community organization (Hainsten, 1959). Generally speaking, when there were only 7-10 percentages of abundant species in the quadrats studied, rare species were more than 30 percentages.

The most abundant species included *Strobilanthes gracilis, Lasianthus acuminatus* and *Ardisia rhomboidea.* However at low and high altitudes *Strobilanthes cuspidatus* and *Psychotria nilgiriensis* var. *astephana* respectively were the most abundant ones indicating the suitability of the ecological niche for the species.

6.4.B.1.3. Frequency (F)

The importance of a species in an association is determined by the degree of its presence (Bharucha and De Leeuw, 1957). When at low altitudes *Phoebe wightii, Persea macrantha,* etc. showed the highest frequency at medium altitudes, *Lasianthus acuminatus, Ardisia rhomboidea, Beilshmiedia wightii, Mastixia arborea, Neolitsea zeylanica,* etc were the more frequent ones. At higher altitudes *Psychotria nilgiriensis* var. *astephana, Litsea wightiana, Cinnamomum wightii, Mahonia leschenaultii, Microtropis ramiflora, Symplocos foliosa,* etc. showed hundred-percentage frequency. It is to be noted that all these species are highly altitudinal specific.

At Eravikulam (2600 m) *Rhododendron arboreum* subsp. *nilagiricum, Arundinaria densifolia, Ageratina adenophora,* etc showed hundred-percentage frequency, indicating their importance and the pattern of distribution. These species, which are strong light demanders are also fire and frost resistant.

When the Frequency classes (Raunkier's) were considered, high frequency classes (D and E) were represented by a very few species indicating that only a few species are adapted to a given niche. As a result in majority of cases the vegetation turned out to be heterogeneous, not following the Raunkier's law. Out of the nine transects established at Mannavan Shola, only two (at 1900 m and 2300 m) turned out to be homogeneous indicating the stability of the

vegetation. These regions are neither ecotones nor altitudinal cut off limits, where high stress and competition exists.

Another interesting fact is that in the lower frequency class (A), there was a drastic decrease in the number of species with respect to altitude (see Table 6.4). This indicates that number of rare species is becoming less with increase in altitude. Absence of these species, which contribute to the diversity make the vegetation less diverse and more stable, fully adapted to that particular environment.

6.4.B.1.4. Basal Area (BA)

The basal area figures at Mannavan shola ranged between 108-211 m^2/ha, the mean value being 150 m^2/ha. The least value was obtained at 1700 m and the highest at 2200 m. It is interesting to note that the highest value (216 m^2/ha) at Eravikulam was also obtained at 2200 m. Moreover in all the other cases (except at 1800 m), the values were very higher than that of Mannavan shola (see Appendices 6-19). Here the mean value obtained was also higher (170 m^2/ha).

It is still interesting to note that it is the high dominance of reed bamboo species *Arundinaria floribunda,* that is contributing a high basal area at 2200 m, both at Mannavan shola and Eravikulam. Even though there shows a little trend of increase in basal area with respect to altitude, it has to be borne in mind that it is contributed mainly by the above mentioned reed bamboo species. *Arundinaria walkeriana* and *A. densifolia* are the other species, which form the dominant undergrowth above 2400 m.

Even though gigantic trees of *Elaeocarpus tuberculatus, E. glandulosus,* etc. with more than 4 m girth were common at low altitudes, such big trees but of different species (*Ilex walkeri*) were also not uncommon at higher altitudes such as 2200 m. Indirectly this indicates the stability and the age of the stand and also shows that altitude is not a criterion for the trees to grow to enormous sizes, provided all other features are supportive. It is to be noted that such trees are located at the center of the sholas bordering the streamlets flowing through, and growing tall to reach the overall height of the canopy (Plate. 6.1.4). So even at the height of 2600 m, trees such as *Rhododendron* were found to attain even 2.5 m girth.

Earlier studies (Appendix 34) by Menon (1997) (25 m^2/ha: ≥15 cm girth), Pascal (1988) (59.6 m^2/ha: ≥10 cm gbh) and Jose *et al.* (1994) (48 m^2/ha: ≥10 cm gbh) were not found comparable with this study due to the difference in the size class considered for the studies. However, studies by Sudhakara *et al.* (2001) in Mannavan Shola and Pambadam Shola (≥1 cm dbh), recorded a basal area of 372.5 m^2/ha and 114.9 m^2/ha respectively. But the figure recorded by them at Mannavan Shola is found astounding, since such a high figure was not obtained from anywhere else before. The only reason behind this may be due to the smaller size of plots (5 x 5 m) selected for the study. Since at this altitude (< 1900 m) a very high density of understorey species such as *Strobilanthes gracilis, Lasianthus acuminatus, Ardisia rhomboidea,* etc. are met with, there are every chances for an over estimation of individuals which is also evidenced by the high density.

6.4.B.1.5. Importance value Index (IVI)

An important fact becomes clear that the understorey species have a decisive role in shola vegetation. Since all the plants ≥1 cm dbh were enumerated, it gave a very authentic picture about the importance of different species in various ecological niches and their characteristic distribution across altitudes.

Since this index is a combined figure derived from Density, Frequency and Basal Area, exceedingly high values of any of these measures contribute to the increase of IVI. It is already understood that most of the shola understorey species have enormous density and frequency. So naturally they stood top in the IVI figures. However at lower altitudes, certain tree species with their enormous girth (often more than 4 m) stood top among the IVI figures.

The dominant role of various *Strobilanthes* species especially *S. gracilis* is evident from their very high IVI figures. Their IVI values 24 to 47 (RIVI values 8 to 16) indicate their adaptability and ecological success in the shola vegetation. This species with their enormous density and frequency made the forest often difficult to penetrate and also cut off the last ray of light reaching the forest floor.

But it is still interesting to know that these species have a life span of less than 10 years. On attaining maturity, they flower gregariously to perish

completely after shedding the seeds, which germinate during the next monsoon (Plates 6.1.5 to 6.1.8). At maturity this species is found to attain about 12 m of height with often more than 40 cm gbh (Plates 6.2.1 & 6.2.2). The life cycle of this species has a very important role in the nutrient cycling and maintaining the microclimate. Other *Strobilanthes* species such as *S. luridus, S. micranthus,* etc. which are also dominant undergrowths, but usually at ecotones (Plates 6.2.3 to 6.2.5) also follow a similar pattern of life cycle, their life span often lesser than that of the former species.

Similar is the case with other understorey shrubs such as *Lasianthus acuminatus* and *Ardisia rhomboidea.* These species together with the above-mentioned *Strobilanthes* species dominate in the sholas below 2000 m altitude. Above 2100 m, another species named *Psychotria nilgiriensis* var. *astephana* forms the dominant undergrowth (another variety of the same species *Psychotria nilgiriensis* var. *nilgiriensis*, is found only at lower altitudes). This also indicates the process of evolution taking place in the sholas.

Above 2200 m, instead of all the above-mentioned undergrowths, reed bamboo species such as *Arundinaria floribunda, A. walkeriana,* etc. are found to dominate. These species are often found to act as 'fire bridges' connecting grasslands and sholas, while majority of ecotone species such as *Rhododendron, Strobilanthes, Ageratina adenophora,* etc. as 'fire barriers'. However the perennating nature of these species helps them to regenerate soon after fire, when majority of the dominant shola vegetation are drastically affected by fire. Since the dominant tree members belong to *Lauraceae* and *Euphorbiaceae* with high amounts of volatile oils, tannins or latex in their stem, they are more susceptible to fire. So fire problems in sholas are more severe in altitudes above 2100 m where these reed bamboos are dominant. It is also to be noted that it is only above these altitudes the typical shola-grassland ecosystem exists. Above 2500 m another reed bamboo species namely *A. densifolia* is found to dominate. But this species is more abundant in open grasslands than inside sholas. Since these bamboos have all the adaptive features of grasses such as perennating adventitious roots, multiple shoots, drought tolerance, bulliform cells with which they can roll the leaves thereby reducing transpiration rates and withstand water stress, frost and fire tolerance, bushy and microphyllous nature by which they can withstand high

velocity winds, they are well adapted to these hostile climates (Plate 6.4.3). Similarly *Rhododendron* with 21-percentage RIVI is the best-adapted tree species. Since it is a frost and fire tolerant species, more common in temperate latitudes, there is no wonder that it can withstand the extremes of climates prevailing in the shola regions.

6.4.B.1.6. Distributional Index (DI)

The nature of distribution of species gives indication on the successional status of the vegetation, niche specificity of a particular species, competition ability of the plants and the environmental factors favouring their growth.

According to Odum (1971), Contiguous distribution is the more common one existing in nature. It is in a very uniform environment that Random distribution exists. Regular distribution occurs where severe competition exists between the individuals. At the initial stages of succession, plants show contiguous distribution. But when the community progress towards climax, the distribution pattern changes to random or regular.

From the results obtained (Table 6.5), it is becoming clear that at all altitudes majority of the species showed contiguous distribution. The values were high (about 90 %) at 1600 and 2100 m, which are, transition points where succession is in the initial stages. At medium altitudes (1800 m and 1900 m) the highest numbers of randomly distributed species were obtained indicating a uniform environment prevailing in these areas.

At high altitudes comparatively more species showed contiguous distribution. At 2400 m, when 97 percentage were contiguous, at 2600 m hundred percentage were of this type, indicating the absence of competition, stability of the ecosystem and the high ecological adaptability of species inhabiting these areas.

6.4.B.1.7. Maturity Index (MI)

Generally speaking, mature vegetation has less diversity because it has entered into the final stage of succession. Only those species with high adaptability will survive and multiply to form the dominant community. So this index gives a clear-cut picture about the successional status of the

vegetation, whether the vegetation is in a primary stage or whether it has reached a climax stage.

The results obtained (Figs. 6.5 & 6.6) indicate two different successional stages prevailing in the study areas. Vegetation upto 2000 m are usually found as large continuous patches often mimicking typical evergreen forests in physiognomy although the species composition differs. From 2100 m onwards sholas are more typical, exactly resembling what their names indicate.

So the lowest values of MI were obtained at the altitudes of 1600 m (30 %) and 2200 m (34.5 %), indicating that here the vegetation is in the earliest stage of succession and also in high competition. Highest MI values were obtained at 2000 m (39 %) and 2400 m (42 %) indicating that they are successionally more advanced in comparison with other altitudes. At 2600 m in Anaimudi regions, MI values were the highest (upto 60 %) indicating that here the shola vegetation has attained a climax stage.

Babu (2000) who had earlier conducted studies at Eravikulam has reported MI values ranging between 26.4 and 37.9. Even the minimum values obtained from Eravikulam during the present study (38.1 % at 2000 m) were substantially higher than the maximum value obtained in the above-mentioned study. Perhaps this might have caused by the exclusion of ≤10 cm dbh class in the above-mentioned study. Moreover altitudes >2400 m were also not studied by him.

It is to be noted that the MI values were comparatively higher at Eravikulam in comparison to the same altitudes selected at Mannavan Shola. Indirectly this shows the topographical and climatologically differences prevailing in between the two areas. Eravikulam, which receives almost double the rainfall at Mannavan Shola, is successionally in a more advanced stage.

6.4.B.1.8. Stratification of the Forest stand

Most of the earlier studies (Jose *et al.,* 1994; Babu, 1997) indicate that there is no definite stratification in the shola forests. Also in many of these studies, the average height of the vegetation is considered to be 6 m even though trees attaining even 20 m are also not uncommon. It is a known fact that from the period of Champion and Seth (1968) itself the lower limit of the

shola is designated as 1500 m and differences in the forests with respect to altitude were pointed out by several workers although serious studies in this respect was so far not conducted.

So the earlier mentioned analyses were the result of the studies not considering the altitudinal differences within the sholas. Moreover, in majority of the studies plants ≥ 10 cm dbh alone were considered. This means that the most abundant shrubby vegetation was not taken into account. In fact it is this shrubby undergrowth, that has the most decisive role in the nutrient cycling, water balance, runoff, soil and moisture retention, preventing solar radiation reaching forest floor thereby affecting the regeneration, etc.

At all altitudes the shrubby vegetation formed the lowest and more compact layer, even though the species composition differed with respect to altitude. When at lower altitudes (1600-1700 m) where the general height of the tree vegetation was around 20-25 m, the shrubby strata dominated in the 5-10 m height, with a species composition comprising of *Strobilanthes cuspidatus, Viburnum punctatum, Phoebe wightii,* etc. At 1700-2000 m altitudes also such stratification was seen but the species composition changed to *Strobilanthes gracilis* - *Lasianthus acuminatus* - *Ardisia rhomboidea* association indicating the high adaptability of these species at a wide range of altitudes. While *Psychotria nilgiriensis* var. *nilgiriensis* is found usually at lower altitudes, another variety of the same species named var. *astephana* forms the dominant undergrowth above 2200 m.

Above these undergrowth strata, there is another concentration of individuals in the 15-20 m height strata mainly contributed by medium sized trees. In fact this strata forms the general height of the vegetation. However gigantic trees often attaining more than > 30 m raise their heads up these strata. Such tall trees are but the characteristics of medium altitude sholas (1800-2000 m) only above which there is a drastic reduction in the overall height of the forest. So at 2500-2600 m altitudes the general height of the forest gets reduced to less than 6-7 m height.

From this it is becoming clear that, it is the topographic and microclimatic features, which determine the height growth and stratification of the species. In those regions where there is enough water availability, soil depth, protection

from the effects of wind and high insolation, trees attain gigantic size. The extreme stunted nature of *Rhododendron* trees (< 50 cm height) growing in the grasslands at 2670 m (Plate. 6.1.3.) is also indicative of the above-mentioned fact.

6.4.B.1.9. Girth class distribution pattern

It is found that irrespective of altitudes, majority (75 to 90 %) of the individuals came under the <10 cm category. This indicates an inverse 'J' pattern of distribution of individuals indicating ample regeneration taking place inside the sholas.

However, regeneration of ecotone species such as *Rhododendron arboreum* subsp. *nilagiricum, Elaeocarpus recurvatus,* etc. inside the sholas was found poor as indicated by very meagre representation of individuals in the lower gbh categories. *Mastixia arborea, Bhesa indica, Gomphandra coriaceae*, etc., which are medium altitude members (1800-1900 m) also showed poor regeneration, indicating the stresses occurring in the regeneration of seeds. Since majority of shola species bear drupaceous and recalcitrant fruits, which generally have lesser viability, there are great chances of seed and seedling mortality. Germination trends in *Bhesa indica,* a medium altitude shola species were earlier studied by this student (Kumar & Chacko, 1998) and the results indicated that the seeds are highly recalcitrant, losing viability within a few months (Plate 6.3.3). This also indicates that even though seeds are set in plenty, such species are more likely prone to become extremely rare in future, mainly due to germination problems.

Regarding the pattern of tree diameter variability, highest dbh groups were found at 1800-1900 m altitude and again at 2200 m altitudes, indicating the effect of climatic conditions that promote tree growth. At 1800-1900 m the forest is somewhat stable and the climatic conditions are promoting. Here the diversity and the competition between species are also less, promoting more vegetative growth. So trees with greater gbh and height are found at these altitudes. Similar is the case at 2200 m. Here even though the forest has attained a patchy shola configuration, it is somewhat stable with less diversity and competition.

Trees of gigantic girth (> 4 m gbh) comprising of *Syzygium* and *Elaeocarpus* spp. were common at low altitudes (Plate 6.3.1), even though girth size showed a decreasing trend with altitude. This indicates the stability of the topography, which promotes tree growth. Slope and altitude generally do not promote height and girth increment. That is why sholas remain stunted. However in those areas, which are protected from the effects of erosion and wind, altitude does not matter. This becomes evident from the fact that trees of even > 3 m girth (*Ilex denticulata*) is found at 2400 m altitude.

6.4.B.1.10. Structural status of the vegetation

The composition of species dominating in different altitudinal zones is indicative of their adaptive abilities and ecological specificities. Generally speaking, low altitude (1600-1700 m) species are high light demanders, usually found in disturbed or ecotonal regions. Moreover, they are restricted to low altitudes only (Plate 6.3.2). Comparatively greater depth and fertility of the soil promote many of the species to grow to enormous girth. The dominant species found in this area such as *Phoebe wightii, Persea macrantha, Strobilanthes cuspidatus, Viburnum punctatum, Vaccinium leschenaultii, Bischofia javanica, Clerodendrum viscosum, Glochidion neilgherrense, Daphniphyllum neilgherrense, Measa indica,* etc. are actually good light demanders found in ecotones.

Medium altitude species are taller than low and high altitude species. They are not at all light demanders and the dominant undergrowth species such as *Strobilanthes gracilis, Lasianthus acuminatus,* and *Ardisia rhomboidea* are strict shade lovers. *Hydnocarpus alpina, Beilshmiedia wightii, Mastixia arborea, Litsea oleoides, Syzygium caryophyllatum,* etc. are the dominant tree members. Out of these species the first three are usually not found above these altitudes. The last ones have more ecological adaptability that they are equally abundant at higher altitudes (Appendix 33).

At higher altitudes the vegetation changes to patchy shola type. Here there is clear cut ecotonal region for each shola patch and a high preponderance of light demanding, fire and frost tolerant species are met with, many of which are of temperate stock (see Tables 6.28 & 6.29 and Plate 6.3.4).

6.4.B.1.11. Species compositional difference across altitude

Out of the 181 species recorded from the 9000 m^2 study area at Mannavan Shola, 105 (58 %) are found distributed in the lower altitudes (1600-1700 m) although many of them are found in medium and high altitudes also, indicating the diversity and competition existing in those areas (Table 6.8). Wide amplitude species that are found everywhere irrespective of altitudes (low to very high) constitute about 9.5 %. Species restricted to medium altitudes were comparatively less indicating the less diversity prevailing there. High altitude species constituted about 24 %, which was substantially higher than that of medium altitudes and very high altitudes where the diversity is less. This indicates that certain species mainly ecotonal ones, which are resistant to extremes of climates such as fire and frost, inhabit the high altitudes. Many of these species are temperate ones and are generally not found in lower altitudes. At very high altitudes competition is less indicated by the less diversity and high dominance by a few species. Here only highly adaptable species such as *Rhododendron* can survive the extremes of climates (Appendices 28 to 30).

It is also interesting to note that the species within a genus are differing with respect to altitude. Very often there is varietal difference within the same species such as in the case of *Psychotria nilgiriensis*. When the var. *nilgiriensis* is found at low altitudes, var. *astephana* is restricted to higher altitudes only. All these factors indicate the process of adaptive evolution taking place in sholas.

Table 6.8. Distribution pattern of species (≥ 1 cm dbh) across altitude

No	Species distribution pattern	Altitudinal range	No. of species	Percentage
1.	Low altitudes only	1600-1700 m	22	12
2.	Low and medium altitudes	1600-2000 m	44	24
3.	Low to high altitudes	1600-2400 m	22	12
4.	Low to very high altitudes	1600-2695 m	17	9.5
5.	Medium altitudes only	1800-2000 m	16	8.5
6.	Medium to high altitudes	1800-2400 m	14	8
7.	Medium to very high altitudes	1800-2695 m	4	2
8.	High altitudes only	2100-2400 m	12	7
9.	High and very high altitudes	2100-2695 m	25	14
10.	Very high altitudes only	2400-2695 m	5	3
TOTAL			181	100

6.4.B.2. DIVERSITY ANALYSES

6.4.B.2.1. Species richness Indices

The total number of species (N) present in various quadrats is an indication of the species richness. It is becoming evident from the results that the species richness shows interesting changes with respect to altitudes. At lower altitudes where subtropical hill forest composition is met with, number of species was high. Similarly where the forest transforms to patchy sholas type also, high species number was obtained. This indicates the ecotonal effect in increasing the competition and thereby diversity. Several species adaptable to either of the climatic situations thrive hard to establish in these localities. So a mixture of species which dominate in either of the environments are seen here (Figs. 6.9 & 6.10)

Regarding the Margalef's and Menhinick's indices also a similar pattern were observed. The graph obtained (Fig. 6.11) showed two peaks, one at 1600-1700 m altitude and the other at 2100-2200 m, indicating high richness prevailing there. It was at the medium altitudes (1800-1900 m) that the values were the least. Here the vegetation is somewhat stable with high dominance of a few adaptable species and so the competition is also less. Most of these species are either absent in low and high altitudes or very meagrely represented. At high altitudes only those species with high adaptability, those, which can tolerate the extremes of climate, could survive. So the diversity was less indicated by lesser richness values.

Babu (1997) during his study at Eravikulam could not find any significant variation in richness values among different localities. This might have happened since he didn't make an altitudinal comparison and almost all his studies were restricted to the 2000-2350 m altitudinal belt.

6.4.B.2.2. Evenness/Equitability Index

Communities with the same richness values may differ in diversity based on the distribution of individuals among the species. In fact this index is inversely related to Whittaker's (1965) dominance values because where there is high evenness, there will be more diversity. In other words, if there is more concentration of individuals of one or a few species, evenness will be minimal so also diversity.

The results obtained indicate more evenness in the 1600-1700 m altitudes and again at 2100 m and 2400 m altitudes. In fact these figures correspond to the richness figures although with a minimal changes. The three peaks as obtained in the graph (Fig. 6.12) indicate the ecotonal effect where there is high evenness and diversity. At 1600 m the species composition is very much different from typical shola vegetation, since it represents a low altitudinal ecotonal region, where a high preponderance of low altitude evergreen species is met with. At 2100 m where the forest slowly gets transformed from large continuous patch to small patchy sholas restricted to depressions in the hills, high evenness is observed in the vegetation. At Mannavan Shola, the highest altitudinal limit is 2400 m, which is another boundary where high evenness is obtained. At Eravikulam also high evenness values were obtained at 2400 and 2600 m altitudes indicating uniform distribution of individuals among the most adapted species that can thrive in those altitudes.

6.4.B.2.3. Indices based on the proportional abundance of species

a) Shannon's Index

It is interesting to see that the Shannon's index values showed two peaks in the graph (Fig. 6.13), one at 1600-1700 m and the other at 2100-2200 m. The minimum value (2.17) was obtained at 1900 m. The highest value obtained (3.36) at low altitude region indicates that subtropical hill forests are more diverse than sholas. This is in contradiction to some of the earlier studies conducted by Jose *et al.* (1994), which recorded an amazingly high value of 4.86 in the sholas of Eravikulam.

The fact becomes clear, when we learn about the nature of the study area of Jose *et al.* (1994). At low altitude shola (subtropical hill forest) regions, which serve as an ecotone between lower evergreen forests and higher montane wet temperate forests, there is high degree of competition between individuals. So both the typical evergreen (eg. *Elaeocarpus tuberculatus, Chukrasia tabularis* etc.) and montane shola species (*Rhododendron arboreum* subsp. *nilagiricum, Daphniphyllum neilgherrense, Ternstroemia japonica* etc.) are found here, as a result of which there is high diversity. It was at such an ecotonal (subtropical hill forest) region at Eravikulam that Jose *et al.* restricted their study. So naturally their diversity figures got boosted up. Moreover the species with

highest IVI (*Pithecellobium subcoriaceum/Archidendron clypearia*) as mentioned in their study were also not of a typical shola stock, but a species common along low altitude stream-sides (Plate 6.3.5).

High diversity values (H' = 3.1) at 2100-2200 m indicate the effect of another transitional point. At Mannavan Shola, it is upto 2000 m that the forest exists as a large continuous patch. Above 2100 m (Idlimottai regions), the forest gets transformed to small patchy sholas (Plate 6.3.4). The case is similar at Amarachola regions at Eravikulam also. So these regions show ecotonal effects with a more proportion of montane wet temperate species usually concentrating the shola ecotones. So naturally diversity showed an increase. Above 2100 m, the values again showed a decreasing trend due to the stabilization of the vegetation characterised by the most adaptable species showing less competition. The values again increased at 2400 m where the altitudinal features posed severe stress on the vegetation, which resulted in high competition among individuals. Moreover, a high preponderance of wet temperate species, which are not seen in lower altitudes, is also seen here thereby increasing the diversity figures. Above 2400 m, altitude and the resulting climatic factors pose heavy stress on the vegetation, that only the most adaptable species, which can withstand the effect of heat, drought, wind, frost, scarcity of soil, humus, etc. can survive. So here plants belonging to the montane wet temperate stock such as *Rhododendron arboreum* subsp. *nilagiricum, Gaultheria fragrantissima, Ilex denticulata, Arundinaria densifolia,* etc. dominate. At 2600 m (Anamudi regions) *Rhododendron* showed an IVI figure (122) almost 3 to 4 times more than any other species obtained at lower altitudes.

The ***t*** - values obtained (Table 6.10) from Mannavan shola indicate that low altitude sholas (1600-1700 m) are significantly different in diversity from the medium and high altitude sholas. Medium altitude sholas (1800-2000 m) didn't show any significant difference with high altitude ones. But within the high altitude sholas (2100-2400 m), those at 2100-2200 m altitudes showed significant difference in diversity from the others. At Eravikulam, sholas at 2600 m showed significant difference from all the rest (Table 6.11) while those at other altitudes didn't show any significant difference.

b) Simpson's index

It is evident from the results (Appendix 31 & Fig. 6.14) that high dominance values were obtained at 1900 m (0.2) where least diversity was observed. Similarly lowest values of dominance were obtained at 1600 m (0.056) and at 2100 m (0.066) highest diversity was observed.

This index is heavily weighted towards the most abundant species in the sample. So the higher values indicate high abundance. When all the 100 m altitudinal intervals ranging between 1600-2600 m were considered, highest values were obtained at 1900 m and 1800 m indicating high dominance of a few adaptable species. These values are pretty high when compared to the values (0.037 - 0.083) obtained by Lakshmi (1995) from the subtropical hill forests of Kolli hills. Varghese (1997) also reported a comparatively lower value (0.08) from his studies in the same forest type at Peppara wildlife sanctuary. The present study indicates that the medium altitude shola regions (1800-2000 m) are less diverse in comparison to low and high altitude sholas.

6.4.B.2.4. Community coefficient and Index of similarity (IS)

The Similarity matrices (Tables 6.12 & 6.13) and the Dendrograms (Figs. 6.15 & 6.16) obtained indicate 4 altitudinal groups that show unique vegetation characteristics and differ from each other to a certain extent. These altitudinal groups are: (**1**) *Low*: 1600-1800 m (**2**) *Medium*: 1900-2100 m (**3**) *High*: 2200-2400 m (**4**) *Very high*: > 2500 m.

Within these groups, the altitudes showing highest similarity (69 %) are 2300 and 2400 m as far as Mannavan Shola is concerned. Altitudes 2200 and 2300 m were 68 % similar while 1700 and 1800 m were 64 % similar.

Eravikulam also followed a similar trend indicating the acceptance of the above-mentioned grouping. Even though the area receives almost double the rainfall than Mannavan shola, it is showing the same pattern of similarity between various altitudes. It is interesting to note that sholas at 2600 m altitude stood unique from the rest. Here there is a high dominance of temperate species with high ecological tolerance and adaptability. However the region showed 42 % similarities with 2400 m altitude indicating some similarity in species composition although with all the other altitudes, the similarities were practically nil.

6.5. CONCLUSIONS

The study indicates there is marked difference in the shola vegetation with respect to altitude. So whenever anybody speaks of shola or its phytosociological aspects, the altitude under consideration needs prime importance before arriving into any conclusions. Only with the clear-cut knowledge about the altitude and climatic features of the locality one can arrive into any logistic conclusions about the vegetation.

From the study it is becoming clear that physiognomy of the vegetation, its structural aspects, diversity, dominance, similarity, etc. are changing with respect to altitude. With regard to the general physiognomy and stratification, it is becoming clear that the general height of the vegetation is decreasing with respect to altitudes. However in those areas well protected from the effects of wind and where there is enough soil, water, nutrients and absence of disturbance, trees grow to gigantic size even at higher altitudes. In contrast, if these factors are limiting, the trees becomes stunted even at lower altitudes.

Species area curves established at different altitudes indicate that about 1000 m^2 is more than enough for low and medium altitude sholas (ie. 1600-2000 m), even though at 1800 m and 1900 m, 800 m^2 and 900 m^2 respectively were found sufficient, since the diversity was less here. Above 2100 m, 800 m^2 was found enough while at 2400 m, 700 m^2 was found enough. At 2600 m, no increase in the number of species was observed above 500 m^2, indicating high dominance by a few adaptable species and sufficiency of the sampled area.

Both the qualitative and quantitative results obtained from this study indicate that marked difference exists in the shola vegetation, with respect to altitude. At least four distinct altitudinal groups with striking features were found to exist within the altitudinal range of 1600 - 2600 m. This includes *Low* (1600-1700 m), *Medium* (1800-2000 m), *High* (2100-2400 m) and *Very High* (>2500 m).

The species composition, stratification, structural attributes such as Density, Abundance, Frequency, Basal Area, IVI, etc. were found to differ between these altitudinal zones. Diversity and Dominance figures also responded according to these groups. Similarity matrices and Dendrograms worked out also supports this type of sub-classification.

The overall height of the vegetation showed a decreasing trend with respect to altitude, although the tallest trees were found at the medium altitudes. When the general height of the vegetation at Low altitudes was 17-23 m, it was 25-30 m at Medium altitudes. At High altitudes it was 15-20 m while at Very High altitudes it was further reduced to less than 7 m. In those areas such as in steep valleys or ditches where they are protected from the effects of lashing winds, trees were found to grow to very large size, irrespective of altitude. Similarly in well-exposed regions, leeward sides, slopes and in other difficult terrains trees are found stunted even at low altitudes. Bigger trees that are found at very high altitudes are restricted to the centre of the shola, bordering the streamlets and growing high to reach the general height of the canopy. At higher altitudes *Ilex* spp. are found to behave in this way.

Stratification in the strict sense was seen to exist mainly in the lower and medium altitudes. Here at least 4 strata were observed: such as the ground flora (<1 m) composed of herbaceous vegetation, the dense shrubby undergrowth (<10 m) composed mainly of *Strobilanthes* spp., *Lasianthus, Ardisia,* etc., a large proportion of medium sized trees (15-20 m), and a few large top canopy trees (20-30 m). At higher altitudes, since the forests are found as small patches, the overall height of the vegetation being low, stratification, especially in the tree layer is not so marked. Even then, a sparse ground flora and shrubby undergrowth composed of *Psychotria* spp. and several reed bamboo species (*Arundinaria*) can be seen distinctly. At very high altitudes stratification is practically meagre.

Regarding the girth of trees, those with highest girth (often upto 5 m) were found at medium altitudes indicating the suitability of the climatic and edaphic factors and comparatively lesser competition. However trees with girth upto 4 m were found even at 2200 m (usually *Ilex walkeri, Rhododendron,* etc.), indicating that in well-protected areas where the growth factors are promoting, height and girth increment is not a problem.

Species composition and plant associations were found to change with respect to altitudes. Species within the same genus also were found to change across the altitude. However the composition remained moreover the same within the four altitudinal limits as discussed earlier. Trees such as *Cinnamomum wightii, Turpinia nepalensis, Persea macrantha, Eurya nitida*

and shrubs such as *Ageratina adenophora, Gaultheria fragrantissima* etc. are found universally at all altitudes. The trees due to altitude and exposure also exhibited high degree of morphological variation. Leaves usually become thicker, dark, brittle, recurved or bear more hairs.

Density of plants showed a gradual increase from low to high altitudes from where onwards it showed a decrease. Major portion of the density were contributed by underwood species such as *Strobilanthes, Lasianthus, Ardisia*, etc. At higher altitudes it was species of *Psychotria* and *Arundinaria*, which contributed to the density. Abundance, Frequency and Basal Area didn't show any significant trend. However the highest values were obtained at higher altitudes (2200-2400 m) above, which the values decreased drastically.

Highest Species richness values were obtained at lower altitude shola regions (1600-1700 m) and at the transition zones of higher altitude patchy sholas (2100-2200 m) indicating the ecotonal effect in contributing to the diversity. Highest Shannon index (*H*) value (3.36) was obtained at 1600 m in Mannavan Shola and at 2000 m (3.43) in Eravikulam. These values are in tune with those obtained for evergreen forests and are in contradiction with the findings of Jose *et al.* (1994). Mean *H'* values obtained for medium and high altitudes are 2.43 and 2.94 and thus resemble that of Moist deciduous forests. Highest dominance (Simpson's index: 0.2) and lowest evenness values (Pielou's index: 0.5) were obtained for medium altitude sholas (1800 –1900 m).

Distributional Indices show that at majority of areas species show high degree of Contiguous distribution, which is indicative of the role of microclimatic features in distribution. High Maturity Index values obtained such as 60 % (at 2600 m) is indicative of the climax status of the vegetation.

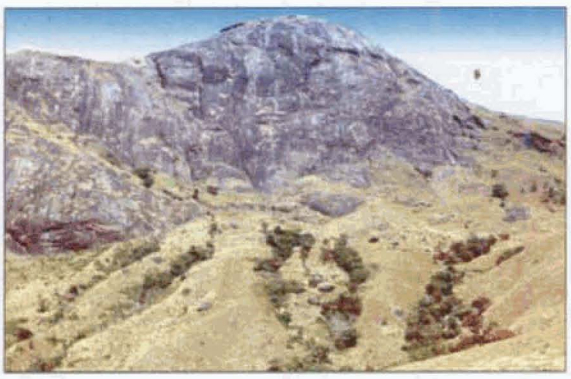
Sholas were found to regenerate even in regions were massive afforestation activities were done, provided biotic pressures are prevented. Patches of *Pteridium aquilinum* (Bracken fern), *Gaultheria fragrantissima* (Wintergreen plant), etc. occurring in grasslands are found to be active centres of initial colonization mostly by temperate species such as *Rhododendron arboreum* subsp. *nilagiricum, Vaccinium leschenaultii, Eurya nitida, Microtropis ramiflora, Pittosporum tetraspermum, Symplocos cochinchinensis, Rubus* spp., etc., provided moisture conditions are also promoting. Scrubland

regions, which are dominated by *Strobilanthes kunthianus, Hypericum mysorense, Osbeckia* spp., etc, were also found to be active centres of colonisation.

From these facts it is becoming clear that sholas are highly sensitive vegetation responding to altitude and other macro and microclimatic features. So any slight change or imbalance could result in the devastation of in this ecosystem, since the chances to recover if disturbed is only remote. The study also indicates that only temperate species are found to colonize new regions at higher altitudes, under whose shade the typical shola species of tropical stock flourish. So during afforestation programmes one should take this factor into account, in addition to the selection of suitable species. The sholas, which are considered as the hottest 'hotspots' of biodiversity should be given high protection status of National Parks. Hope this study will give insights to the policy makers and forest managers in conserving this beautiful and unique ecosystem.



1. Amara chola region at Eravikulam



2. Narrow shola strips at Anamudi slopes



3. *Rhododendron* trees growing as dense stunted patch at 2650 m (Anamudi)



4. General pattern of high altitude sholas with trees at the centre being taller



5. *Strobilanthes gracilis* plants drying up



6. *Strobilanthes luridus* plants drying up



7. Regeneration of *Strobilanthes* plants



8. Fully grown *S. gracilis* and *S. luridus* plants

Plate 6.1

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1. *Strobilanthes gracilis* measuring 48 cm gbh



2. Base of the trunk of the same plant



3. *Strobilanthes gracilis* in flowers



4. *Strobilanthes luridus* and *S. micranthes* in the ecotones



5. Dense undergrowth of *Strobilanthes* spp.



6. Stilt roots of *Strobilanthes gracilis*



7. Stilt roots of *Strobilanthes luridus*

Plate 6.2

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386 B



1. Measuring a large tree of *Elaeocarpus tuberculatus*



2. Low altitude shola region at 1600 m (Mannavan Shola)



3. Germination studies on the seeds of *Bhesa indica*



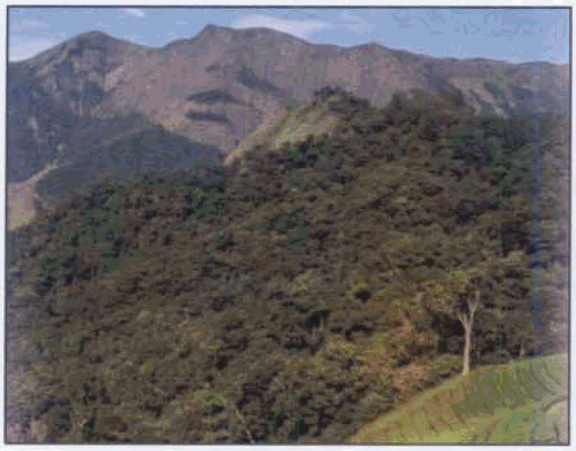
4. Sholas getting transformed to small patches at the valleys of Anamudi



5. *Archidendron clypearia* in flowers



6. Sholas and adjoining scrublands at Vellari Mala dominated by *Strobilanthes lawsonii*



7. Tail of Pambadam Shola bordering Ellappetti tea estate: a view from the Top station

Plate 6.3

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1. View of Anamudi peak and the sholas nearby; see the reduction in the size of the sholas



2. *Rhododendrons* invading into the grass lands at Anamudi slope



3. *Arundinaria densifolia* community at Anamudi peak



4. Vast expanses of grasslands without any trees: scene from Eravikulam



5. A wet patch in the grasslands inhabited by *Pteridium aquilinum* (Bracken fern)



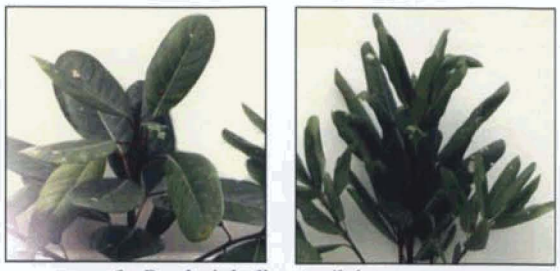
6. *Rhododendron* established in a *Pteridium* patch: a new shola in the formation



7. A vast *Pteridium* patch at Idlimottai region (Mannavan Shola)

Plate 6.4

386 D



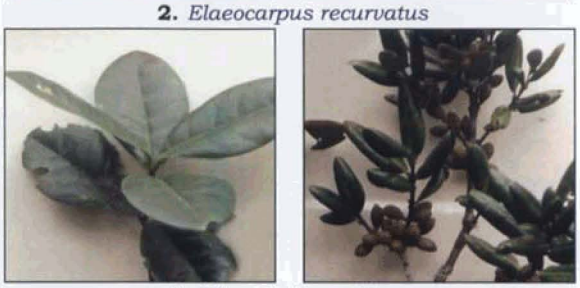
1. *Daphniphyllum neilgherrense*



2. *Elaeocarpus recurvatus*



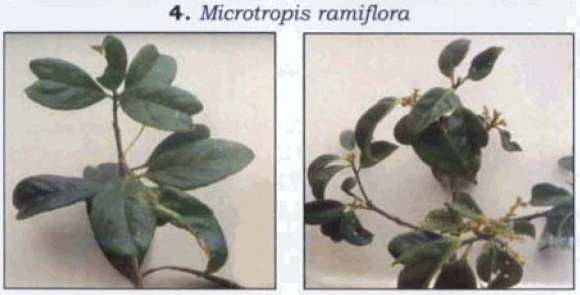
3. *Ilex walkeri*



4. *Microtropis ramiflora*



5. *Rhododendron arboreum* ssp. *nilagiricum*



6. *Symplocos cochinchinensis*

Plate 6.5. Photos showing morphological variations exhibited by different tree species due to altitude and exposure



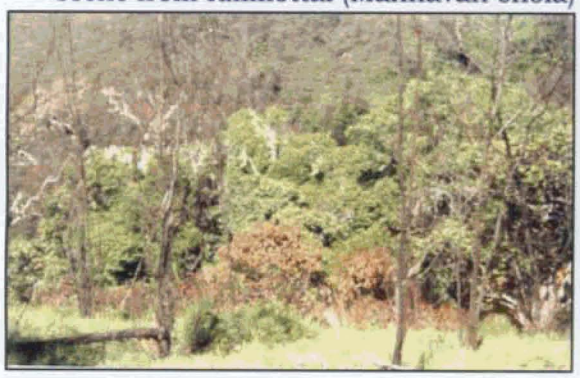
1. Devastating fire entering into the *Eucalyptus* plantations: a scene from Munnar



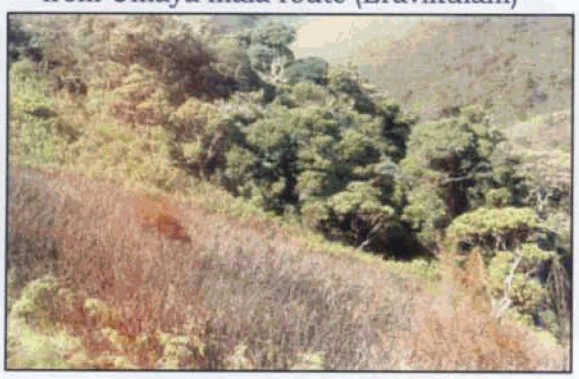
2. Wattle plantation completely destroyed: scene from Idlimottai (Mannavan shola)



3. An emerging shola badly damaged: scene from Umaya mala route (Eravikulam)



4. Fire destroyed shola border trees



5. Burned *Gaultheria* patch (Idlimottai)



6. Controlled burned grasslands (dark coloured) at Anamudi and its valleys

Plate 6.6

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1. A small shola in the formation (Idlimottai)



2. An established shola at 2400 m (Idlimottai)



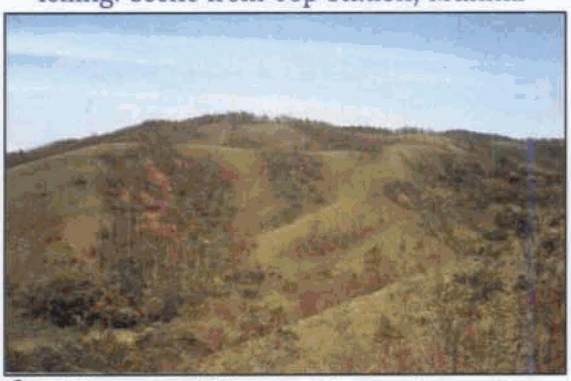
3. *Rhododendron* and *Eurya* trees growing in a *Gaultheria* patch: sign of a new shola formation



4. Shola forest getting regenerated after clear felling: scene from Top station, Munnar



5. Sholas, Wattle and Eucalyptus plantations existing side by side at Idli mottai



6. Failures of Wattle plantations at Idli mottai regions above Mannavan



7. Sholas converted to Tea plantations: scene from Upper Vaguvarai (Eravikulam)



8. Sholas converted to cultivated lands: scene from Vattavada, Munnar

Plate 6.7

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ANALYSIS AND DISCUSSION

K. Kishore kumar “Taxonomic and ecological studies on the shola forests of Kerala ” Thesis. Kerala Forest Research Institute Thrissur , University of Calicut, 2004



ANALYSIS & DISCUSSION

"Nothing can be learnt without association"

Johann Friedrich Herbart (1776-1841)
(German Philosopher & Educationist)

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7. ANALYSIS AND DISCUSSION

Before attempting any discussion regarding the present study, it would be wise to recollect the main objectives of the study as detailed in the first chapter. The study had about half a dozen objectives, and I have tried to fulfil them giving maximum effort, time, care and precision.

The objectives were:

1. To undertake a detailed floristic account of the shola forests of Kerala, based on studies at the important shola regions such as Mannavan Shola, Eravikulam (National Park) Sholas, Pullaradi Shola, Pambadam Shola, etc.
2. To generate benchmark information on the biodiversity content, structural, community ecological and dynamic details of shola forests.
3. To analyse the effect of altitude on the physiognomy of the vegetation, stratification and on the girth and height of the plants.
4. To analyse the effect of altitude on structural factors such as density, frequency, abundance, basal area, etc.
5. To evaluate the effect of altitude on the diversity, species distribution, diameter distribution, etc.

The study also aimed to answer a few hypotheses as listed below:

1. The shola forest is a refugium for a number of endemic, rare, endangered and threatened plants so that their preservation is very important.
2. The shola forest is a rich resource, both biologically and economically.
3. There is significant difference in the diversity content of the shola forests within different elevational belts.
4. There is no stratification of trees in the shola forests.
5. Density and diversity of plants are very high in the sholas.

As discussed in the objectives of the study, all the major shola forest regions in the state was covered as part of the study. Eventhough the shola forests are distributed from the Agasthya hills in the south to Brahmagiri hills in the north (where the mountains attain more than 1800m height), the great share of shola forests is met with in the High Ranges of the Idukki district. So the major part of the study was concentrated in this region. Mannavan Shola,

the largest shola forest of the State was selected for detailed study. Here the sholas are seen at an altitude of 1600 to 2400 m (Idlimottai regions), so that the ecological studies on an altitudinal gradient could be attempted fairly easier. Two single and large shola patches namely Pullaradi Shola and Pamabadam Shola lying adjacent to Mannavan Shola also formed part of the study. In addition to this, hundreds of sholas at Eravikulam National Park, situated in the valleys of Anamudi formed excellent areas for floristic exploration and for the ecological studies. In addition to these, Vellarimala sholas in the north, situated in the border of Kozhikode, Wayanad and Malappuram districts, also were explored.

The discussion is treated under three headings, *viz.*, (i) Taxonomical studies, (ii) Ethnobotanical studies and (iii) Ecological studies.

7.1. Taxonomical studies

During this study, 669 taxa (661 species and 8 infraspecific taxa)) of flowering plants belonging to 369 genera under 110 families were collected and described. Dicotyledons were represented by 536 taxa (529 species and 7 infraspecific taxa) belonging to 295 genera under 94 families. Monocotyledons were represented by 133 taxa (132 species and 1 variety) in 74 genera under 16 families. Among the total of 669 taxa, there were 14 subspecies and 41 varieties. In the case of pteridophytes, there were 93 taxa (92 species and 1 variety) belonging to 48 genera under 25 families. This is certainly a huge figure when we consider the small extent of shola forests.

Shola forests were considered as the megacentres of endemism. This become evident in the present study also. Out of the total of 669 angiosperm taxa, 246 (36.8 %) are endemics. This ratio is very huge, when compared with the scenario of the country (only 33.5 % of the total). Out of this 206 taxa (30.7 %) belong to dicots, while monocots constitute only 40 taxa (5.97 %). Among the pteridophytes, out of the 93 taxa, only 6 taxa (6.5 %) are found to be endemic. This indicates that pteridophytes comparatively have a wider range of (often cosmopolitan) distribution.

A lot of species, which were not documented as rare and threatened, were found locally in very rare and threatened conditions. Since sholas are facing

several threats of destruction, documentation of such information deserves attention in the conservational point of view. Because many of such locally endangered taxa may face extinction, if proper conservational measures are not taken.

About 70 plants were reported for the first time from Kerala as a result of this study. This includes 55 angiosperms and 15 pteridophytes. These figures form about 8.2 % of the total angiosperms collected (669 taxa) and 16 % of the total pteridophytes collected (93 taxa), which is a substantially high figure.

The total number of 93 taxa of pteridophytes collected from the shola regions of Kerala forms 28.1 % of the total pteridophyte flora of the state (331 taxa: Easa, 2003). This figure is highly significant, when we learn that the shola forests which form only less than one percent (0.7 %) of the total forested land of Kerala (9400 sq. km: Nair, 1997), is supporting 28.1 % of the pteridophyte flora of the state.

During the study seven species of angiosperms (all dicots), earlier documented as *'Possibly extinct'* could also be rediscovered. This includes *Actinodaphne bourneae, Arisaema attenuatum, Arisaema psittacus, Impatiens anaimudica, Impatiens platyadena, Pimpinella pulneyensis* and *Symplocos monantha.* Out of these seven species, three are collected from Mannavan Shola, which is nowadays facing several dangers of destruction, in the form of road construction, over exploitation of resources, large scale collection of firewood and other NWFP's, conversion to plantations, encroachment, etc. More than a dozen of unidentified taxa indicate that, thorough explorations in the area may lead to the discovery of more new taxa, since many of the regions remain still unexplored due to inaccessibility and hostile environments. The importance to conserve sholas, the mega diversity centres, which act as a refugia of several rare taxa, deserves attention here.

7.2. Ethnobotanical studies

Sholas were neglected for a long time considering them as unproductive in all respects. The main reason was that the trees are stunted, profusely branched with short bole, and of very little timber value. Moreover, the sholas are highly fragmented, inaccessible and other ethnobotanical knowledge of the

plants or about the tribal and other native communities were very meagre. This part of the study was intended to analyse the biological and economical resource potential of the shola vegetation.

The Muthuva tribes and Tamilian natives inhabiting the shola regions were found to use about 188 plant species for various purposes, which is certainly an enormous figure. This includes 59 herbs, 31 shrubs, 70 trees, 18 climbers and 10 stragglers. Among them, 37 species (20%) are either rare or endangered, 31 species (16.5 %) are endemic to Western Ghats and 16 (8.5 %) are new records for the state of Kerala. The high proportion of rare and endemic species having ethnobotanical significance is important in the conservational point of view, since many of these species are drastically exploited from the area.

The so called 'unproductive' shola plants were found to be put into a variety of broad category uses such as medicinal, agricultural, religious, ornamental, cosmetic and marketing purposes, as timber, food and food supplements, fodder, fish poisons, in house construction, making of agricultural and house hold utensils, fencing, etc. Majority of species are put into medicinal uses (45 nos.). Although the tribals revealed the medicinal importance of several species, in many cases they were reluctant to disclose the formulation of the drugs they employ. This was due to the inherited belief that the medicinal property will be lost by disclosing to an outsider. Among the 36 medicinal species under mention, at least 16 are used for more than one disease. *Dodonaea viscoşa* var. *angustifolia, Piper mullesua, P. wightii, Persicaria chinensis, Ageratum houstonianum,* etc. are some the species. Similarly different species are used to cure the same disease. Major diseases such as jaundice, abnormal regional hairfall (*Alopacia ariata*), piles, varicose veins, etc. are treated with traditional medicines. Minor diseases or aliments such as coughs, colds, aches of head, back, stomach and tooth are also treated using traditional medicines. There are several antiseptic herbs in use against cuts and wounds. Medicines for fractures, sprains, muscle spasms, painful joints and oedematous swellings are also in use. About 26 species of plants are used as food or food supplements. Several species such as *Gaultheria fragrantissima, Drosera peltata, Eriocaulon* spp., *Anaphalis* spp., *Helichrysum* spp., etc. are collected for sale. Recently the trend has increased owing to the

demand of certain plants, which find different uses in the market. If this is not prevented, there is no doubt that many of them will become locally extinct in the near future. Similarly, the large scale collection of fire wood from the area also poses serious threat to the vegetation. Alternative measures such as raising firewood plantations outside shola areas and waste lands should be employed to reduce the pressure on forests.

Many of the ethnobotanical information gathered during the present study were not documented earlier and hence new to science. And in contrast, many of the plants present in the area, which are otherwise documented of their medicinal value, are not used for those purposes by the tribes. Furthering studies to prove the medicinal value and efficacy of the various drugs employed in the traditional medicines are to be taken up. Above all, immediate measures should be taken to document the tribal knowledge, because the younger generation are not interested in practicing their traditional knowledge and if it is lost, it would be a loss for ever.

To conclude, the study proved that it was the paucity of detailed study on this vegetation and on the tribal or other native communities residing in this area, which led to the belief that sholas are unproductive.

7.3. Ecological studies

Majority of the objectives were aimed to answer several questions on various ecological aspects. This include information on the biodiversity content, structural, community ecological and dynamic details, altitudinal specificities in species distribution, diameter distribution, effect of altitude on the physiognomy of the vegetation, stratification, structural factors such as density, frequency, abundance, basal area, on the girth and height of the plants and also on the diversity and species distribution pattern in sholas.

The study indicates there is marked difference in the shola vegetation with respect to altitude. So whenever we consider shola vegetation, the altitude under consideration needs prime importance before arriving into any conclusions. Only with the clear-cut knowledge about the altitude and climatic features of the locality that one can arrive into any logistic conclusions about the vegetation.

Both the qualitative and quantitative results obtained from this study indicate that marked difference exists in the shola vegetation, with respect to altitude. At least four distinct altitudinal groups with striking features were found to exist within the altitudinal range of 1600 - 2600 m. This includes 'Low' (1600-1700 m), 'Medium' (1800-2000 m), 'High' (2100-2400 m) and 'Very High' (>2500 m). The species composition, stratification, structural attributes such as Density, Abundance, Frequency, Basal Area, IVI, etc. were found to differ between these altitudinal zones. Diversity and Dominance figures also responded according to these groups. Similarity matrices and Dendrograms worked out also supports this type of sub-classification.

Regarding the general physiognomy and stratification, the overall height of the vegetation showed a decreasing trend with respect to altitude, although the tallest trees were found at the medium altitudes. When the general height of the vegetation at 'Low altitudes' was 17-23 m, it was 25-30 m at 'Medium altitudes'. At 'High altitudes' it was 15-20 m while at 'Very High altitudes' it was further reduced to less than 7 m. In those areas such as in steep valleys or ditches where they are protected from the effects of lashing winds, trees were found to grow to very large size, irrespective of altitude. Similarly in well-exposed regions, leeward sides, slopes and in other difficult terrains trees are found stunted even at low altitudes. Bigger trees that are found at very high altitudes are restricted to the centre of the shola, bordering the streamlets and growing high to reach the general height of the canopy. At higher altitudes *Ilex* sp. are found to behave in this way. Regarding the girth of trees, those with highest girth (often upto 5 m) were found at medium altitudes indicating the suitability of the climatic and edaphic factors and comparatively lesser competition. However trees with girth upto 4 m were found even at 2200 m (usually *Ilex walkeri, Rhododendron,* etc.), indicating that in well-protected areas where the growth factors are promoting, height and girth increment is not a problem.

Stratification in the strict sense was seen to exist mainly in the lower and medium altitudes. Here at least 4 strata were observed: such as the ground flora (<1 m) composed of herbaceous vegetation, the dense shrubby undergrowth (<10 m) composed mainly of *Strobilanthes* spp., *Lasianthus, Ardisia,* etc., a large proportion of medium sized trees (15-20 m), and a few

large top canopy trees (20-30 m). At higher altitudes, since the forests are found as small patches, the overall height of the vegetation being low, stratification, especially in the tree layer is not so marked. Even then, a sparse ground flora and shrubby undergrowth composed of *Psychotria* sp. and several reed bamboo species (*Arundinaria*) can be seen distinctly. At very high altitudes stratification is practically meagre. These findings disprove the earlier hypothesis that there is no stratification in sholas.

Species composition and plant associations were found to change with respect to altitudes. Species within the same genus also were found to change across the altitude. However the composition remained moreover the same within the four altitudinal limits as discussed earlier. Trees like *Cinnamomum wightii, Turpinia nepalenis, Persea macrantha, Eurya nitida* and shrubs like *Ageratina adenophora, Gaultheria fragrantissima,* etc. are found universally at all altitudes. The trees also exhibited high degree of morphological variation due to altitude and exposure. At higher altitudes, leaves usually become dark, thicker, brittle, recurved or more hairy.

Density of plants were very high in sholas, but it showed a gradual increase from low to high altitudes from where onwards it showed a decrease. Major portion of the density were contributed by underwood species such as *Strobilanthes, Lasianthus, Ardisia,* etc. At higher altitudes it was species of *Psychotria* and *Arundinaria,* which contributed to the density. Abundance, Frequency and Basal Area didn't show any significant trend. However the highest values were obtained at higher altitudes (2200-2400 m), above which the values decreased drastically.

Highest Species richness values were obtained at lower altitude shola regions (1600-1700 m) and at the transition zones of higher altitude patchy sholas (2100-2200 m) indicating the ecotonal effect in contributing to the diversity. Highest Shannon index (*H'*) value (3.36) was obtained at 1600 m in Mannavan Shola and at 2000 m (3.43) in Eravikulam. These values are in tune with those obtained for evergreen forests and are in contradiction with the findings of Shibu Jose *et al.* (1994). Mean *H'* values obtained for medium and high altitudes are 2.43 and 2.94 and thus resemble that of Moist deciduous forests. Highest dominance (Simpson's index: 0.2) and lowest evenness values (Pielou's index: 0.5) were obtained for medium altitude sholas

(1800 –1900 m). The changing pattern of diversity in various altitudinal belts is an interesting finding, which proves the hypothesis that there is significant difference in the diversity content of shola forests within different elevational belts. This also disproves another hypothesis that the diversity content of sholas is very high.

Distributional Indices show that at majority of areas species show high degree of Contiguous distribution, which is indicative of the role of microclimatic features in distribution. High Maturity Index values obtained such as 60 % (at 2600 m) is indicative of the climax status of the vegetation.

Sholas were found to regenerate even in regions were massive afforestation activities were done, provided biotic pressures are prevented. Patches of *Pteridium aquilinum* (Bracken fern), *Gaultheria fragrantissima* (Wintergreen plant), etc. found in grasslands are found to be active centres of initial colonization mostly by temperate species such as *Rhododendron arboreum* ssp. *nilagiricum, Vaccinium leschenaultii, Eurya nitida, Microtropis ramiflora, Pittosporum tetraspermum, Symplocos cochinchinensis, Rubus* sp., etc., provided moisture conditions are also promoting. Scrubland regions, which are dominated by *Strobilanthes kunthianus, Hypericum mysorense, Osbeckia* sp., etc, were also found to be active centres of colonisation. A few workers have already reported that ample regeneration is taking place inside sholas, although seedlings experience wilting in the high altitude open grassland areas due to physiological dryness.

Since only temperate species are found to colonize new regions at higher altitudes under whose shade the typical shola species of tropical stock flourish, during afforestation programmes one should take this factor into account, in addition to the selection of species. Ecotone tree species and initial colonisers such as *Symplocos cochinchinensis, Syzygium cumini, S. densiflorum, Myrsine wightiana, Microtropis ramiflora, Eurya nitida, E. japonica, Ternstroemia gymnanthera, Rhododendron arboreum* subsp. *nilagiricum, Bischofia javanica, Turpinia nepalensis, Daphniphyllum neilgherrense, Celtis philippensis, Dodonaea viscosa, Glochidion neilgherrense, Ilex wightiana, Viburnum punctatum*, etc. may be tried first, since they will come up well, especially in low and medium altitudes.

From all these facts it is becoming clear that sholas are highly sensitive vegetation responding to altitude and other macro and microclimatic features. So any little imbalance in the stability of the ecosystem drastically affects the vegetation. All necessary measures to conserve this beautiful and unique ecosystem are the need of the time. The recent move to declare these regions as two separate national Parks, *viz.*, '*Pampadum Shola National Park*' with an area of 131.8 hectares and '*Anamudi Shola National Park*', by clubbing *Mannavan Shola*, *Idivara Shola* and *Pullaradi Shola* covering a total area around 750 hectares (The Hindu Daily, 21/11/2003), is a good news for conservationists.

SUMMARY AND CONCLUSIONS

K. Kishore kumar “Taxonomic and ecological studies on the shola forests of Kerala ” Thesis. Kerala Forest Research Institute Thrissur , University of Calicut, 2004



SUMMARY AND CONCLUSION

"Printed words are mummified until some one imparts life to it"

Otto Harry Jespersen (1860-1943)
(Danish linguist)

395A

8. SUMMARY AND CONCLUSIONS

A detailed study on the taxonomical, ethnobotanical and ecological aspects was carried out in the major shola forest regions of Kerala. The study sites include *Mannavan Shola* (the largest shola forest of the state), *Idlimottai sholas*, *Eravikulam* (National Park) *Sholas*, *Pullaradi Shola*, *Pambadam Shola* and *Vellarimala Sholas*.

The major objectives of the study were (i) To make a detailed floristic account of the shola forests of Kerala, based on studies at the important shola regions such as Mannavan Shola, Eravikulam (National Park) sholas, Pullaradi Shola, Pambadam Shola, etc. (ii) To generate a benchmark information on the biodiversity content, structural, community ecological and dynamic details of shola forests (iii) To analyse the effect of altitude on the physiognomy of the vegetation, stratification, on the girth and height of the plants (iv) To analyse the effect of altitude on structural factors such as density, frequency, abundance, basal area, etc. and (v) To analyse the effect of altitude on the diversity, species distribution, diameter distribution, etc. The study also aimed to answer the following hypotheses (i) The shola forest is a refugium for a number of endemic, rare, endangered and threatened plants that their preservation is very important (ii) The shola forest is a highly rich resource, both biologically and economically (iii) There is significant difference in the diversity content of the shola forests within different elevational belts (iv) There is no stratification of trees in the shola forests (v) Density and diversity of plants is very high in the sholas.

During this study, 669 taxa (661 species and 8 infraspecific taxa) of flowering plants belonging to 369 genera under 110 families were collected and described. Dicotyledons were represented by 536 taxa (529 species and 7 infraspecific taxa) belonging to 295 genera under 94 families. Monocotyledons were represented by 133 taxa (132 species and 1 variety) in 74 genera under 16 families. Among the total of 669 taxa, there were 14 subspecies and 41 varieties. In the case of pteridophytes, there were 93 taxa (92 species and 1 variety) belonging to 48 genera under 25 families. This figure is highly significant when the small extent of shola forests is considered.

Out of the total of 669 angiosperm taxa, 246 (36.8 %) were endemics. This ratio is very high, when compared with the scenario of the country (only 33.5% of the total). Out of the 93 pteridophyte taxa, only 6 (6.5 %) were found to be endemic, which indicated that pteridophytes have a wider range of distribution.

About 70 plants were reported for the first time from Kerala as a result of this study. This included 55 angiosperms and 15 pteridophytes. These figures formed about 8.2 % of the total angiosperms collected (669 taxa) and 16 % of the total pteridophytes collected (93 taxa), which is substantially high. The total number of 92 species of pteridophytes (93 taxa) collected from the shola regions of Kerala forms 28.1 % of the total pteridophyte flora of the state (331 taxa). The significance of this figure become clear when the area of shola forests is compared with that of Kerala state. It is quite interesting to see that shola forests which formed only less than one percentage (0.7 %) of the total forested land of Kerala (0.2 % of the whole area of the state), is supporting 28.1 % of the total pteridophytes.

During the study seven species of angiosperms (all dicots), earlier documented as *'Possibly extinct'* could be rediscovered. This included *Actinodaphne bourneae, Arisaema attenuatum, Arisaema psittacus, Impatiens anaimudica, Impatiens platyadena, Pimpinella pulneyensis* and *Symplocos monantha.* Out of these seven species, three were collected from Mannavan Shola, which is nowadays facing several dangers of destruction, in the form of road construction, exploitation of resources, large scale collection of firewood and other NWFP's, conversion to plantations, encroachment, etc. The importance to conserve such mega centres of diversity, which acts as a refugium of several such taxa is highlighted here.

Regarding the ethnobotanical aspects, the so called 'unproductive' shola plants were found to be put into a variety of uses such as medicinal, agricultural, religious, ornamental, cosmetic and marketing purposes, as timber, food and food supplements, fodder, fish poisons, house construction, making of agricultural and house hold utensils, fencing, etc. The Muthuva tribes and Tamilian natives inhabiting the shola regions were found to use about 188 plant species for various purposes, which is certainly an enormous figure. This included 59 herbs, 31 shrubs, 70 trees, 18 climbers and 10

stragglers. Among them, 37 species (20 %) are either rare or endangered, 31 species (16.5 %) are endemic to Western Ghats and 16 (8.5 %) are new records for the state of Kerala. The high proportion of rare and endemic species having ethnobotanical significance, also is of importance in the conservational point of view, since many of species are drastically exploited from the area. The study proved that it was the paucity of detailed study on this vegetation and on the tribal or other native communities residing in this area, which led to the belief that sholas are unproductive.

The study indicated there was marked difference in the shola vegetation with respect to altitude. Only with the clear-cut knowledge about the altitude and climatic features of the locality, one can arrive into any logistic conclusions about the vegetation. Both the qualitative and quantitative results obtained from this study indicated that marked difference exists in the shola vegetation, with respect to altitude. At least four distinct altitudinal groups with striking features were found to exist within the altitudinal range of 1600-2600 m. This includes *'Low'* (1600-1700 m), *'Medium'* (1800-2000 m), *'High'* (2100-2400 m) and *'Very High'* (>2500 m). The species composition, stratification, structural attributes such as Density, Abundance, Frequency, Basal Area, IVI, etc. were found to differ between these altitudinal zones. Diversity and Dominance figures also responded according to these groups. Similarity matrices and Dendrograms worked out also supported this type of sub-classification. Among these, only the low and medium altitude sholas which have the highest diversity in comparison to the high altitude sholas are facing greater threats due to anthropogenic activities. So priority of conservation should be given to such regions.

The overall height of the vegetation showed a decreasing trend with respect to altitude, although the tallest trees were found at the medium altitudes. When the general height of the vegetation at 'Low altitudes' was 17-23 m, it was 25-30 m at 'Medium altitudes'. At 'High altitudes' it was 15-20 m while at 'Very High altitudes' it was further reduced to less than 7 m. In those areas such as in steep valleys or ditches where they are protected from the effects of lashing winds, trees were found to grow to very large size, irrespective of altitude. Similarly in well-exposed regions, leeward sides, slopes and in other difficult terrains trees are found stunted even at low altitudes. Regarding the

girth of trees, those with highest girth (often upto 5 m) were found at medium altitudes indicating the suitability of the climatic and edaphic factors and comparatively lesser competition. However trees with girth upto 4 m were found even at 2200 m (usually *Ilex walkeri, Rhododendron,* etc.), indicating that in well-protected areas where the growth factors are promoting, height and girth increment is not a problem.

Stratification in the strict sense was seen to exist mainly in the lower and medium altitudes. Here at least 4 strata were observed: such as the ground flora (<1 m) composed of herbaceous vegetation, the dense shrubby undergrowth (<10 m) composed mainly of *Strobilanthes* sp, *Lasianthus, Ardisia,* etc., a large proportion of medium sized trees (15-20 m), and a few large top canopy trees (20-30 m). At higher altitudes, since the forests are found as small patches, the overall height of the vegetation being low, stratification, especially in the tree layer was not so marked. Even then, a sparse ground flora and shrubby undergrowth composed of *Psychotria* sp. and several reed bamboo species (*Arundinaria*) can be seen distinctly. At very high altitudes stratification was practically absent.

Species composition and plant associations were found to change with respect to altitudes. Species within the same genus also were found to change across the altitude. However the composition remained moreover the same within the four altitudinal limits as discussed earlier. Trees such as *Cinnamomum wightii, Turpinia nepalenis, Persea macrantha, Eurya nitida* and shrubs such as *Ageratina adenophora, Gaultheria fragrantissima,* etc. were found universally at all altitudes. The trees due to altitude and exposure also exhibited high degree of morphological variation. Leaves were found usually thicker, dark, brittle, recurved or bear more hairs.

Density of plants were very high in sholas, but it showed a gradual increase from low to high altitudes from where onwards it showed a decrease. Major portion of the density were contributed by underwood species such as *Strobilanthes, Lasianthus, Ardisia,* etc. At higher altitudes it was species of *Psychotria* and *Arundinaria,* which contributed to the density. Abundance, Frequency and Basal Area didn't show any significant trend. However the highest values were obtained at higher altitudes (2200-2400 m), above which the values decreased drastically. Distributional Indices show that at majority

of areas species show high degree of Contiguous distribution, which is indicative of the role of microclimatic features in distribution. High Maturity Index values obtained such as 60 % (at 2600 m) is indicative of the climax status of the vegetation.

Highest Species richness values were obtained at lower altitude shola regions (1600-1700 m) and at the transition zones of higher altitude patchy sholas (2100-2200 m) which indicated the ecotonal effect in contributing to the diversity. Highest Shannon index (H') value (3.36) was obtained at 1600 m in Mannavan Shola and at 2000 m (3.43) in Eravikulam. These values were in tune with those obtained for evergreen forests and are in contradiction with the findings of Jose *et al.* (1994). Mean Shannon (*H'*) values obtained for medium and high altitudes were 2.43 and 2.94 and thus resembled that of Moist deciduous forests. Highest dominance (Simpson's index: 0.2) and lowest evenness values (Pielou's index: 0.5) were obtained for medium altitude sholas (1800 –1900 m).

Sholas were found to regenerate even in regions were massive afforestation activities were done, provided biotic pressures are prevented. Patches of *Pteridium aquilinum* (Bracken fern), *Gaultheria fragrantissima* (Wintergreen plant) etc found in grasslands were found to be active centres of initial colonization mostly by temperate species such as *Rhododendron arboreum* ssp. *nilagiricum, Vaccinium leschenaultii, Eurya nitida, Microtropis ramiflora, Pittosporum tetraspermum, Symplocos cochinchinensis, Rubus* sp. etc., provided moisture conditions are also promoting. Scrubland regions, which are dominated by *Strobilanthes kunthianus, Hypericum mysorense, Osbeckia* sp., etc, were also found to be active centres of colonisation.

It becomes clear that all the objectives were satisfactorily attained and the results obtained were in tune to answer all the hypotheses. The results also indicate that the sholas are highly sensitive vegetation responding to altitude and other macro and microclimatic features. So any little imbalance in the stability of the ecosystem drastically affects the vegetation. All necessary measures to conserve this beautiful and unique ecosystem are the need of the time.

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APPENDICES

"I hear, I forget;
I see, I remember;
I do, I know"

Anonymous
(a Chinese saying)

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Appendix 1. ENUMERATION OF PTERIDOPHYTES

[**Status of the species**: **EB**: Ethnobotanically important; **R**: Rare; **ED**: Endemic; **NR**: New Record to Kerala]
[**Locality**: **MS**: Mannavan Shola; **ENP**: Eravikulam National Park; **PAS**: Pambadam Shola; **PUS**: Pullaradi Shola; **T. K.**: Thalachor Kadavu.; **K**: Kanthallur; **IM**: Idlimottai]

No	NAMES OF FAMILY AND TAXA (Local names in brackets)	Locality, Altitude and Collection Numbers	Plate	EB	R	ED	NR
I.	**ADIANTACEAE**						
1.	*Adiantum raddianum* C. Presl	MS, K-3.5, 1850 m, *KKK 167333*					
II.	**ASPLENIACEAE**						
1.	*Asplenium aethiopicum* (Burm. f.) Becherer	MS, K-5, 1800 m, *KKK 16429*; PAS, 2000 m, *KKK 18589*			*		
2.	*Asplenium auritum* Sw.	MS, T. K., 1750 m, *KKK 16736*	4.16.7		*		*
3.	*Asplenium decrescens* Kunze	MS, K-4, 1800 m, *KKK 16789*; ENP, Plot-2, 2100 m, *KKK 17646*	4.15.4				
4.	*Asplenium erectum* Bory *ex* Willd.	MS, K-5, 1800 m, *KKK 18517*			*		*
5.	*Asplenium formosum* Willd.	MS, K-5, 1850 m, *KKK 31141*	4.15.5				
6.	*Asplenium inaequilaterale* Willd.	MS, T. K., 1730 m, *KKK 16744*; MS, K-3, 1750 m, *KKK 16646*					
7.	*Asplenium normale* D. Don	MS, K-7, 1950 m, *KKK 17686*					
8.	*Asplenium polyodon* G. Forst.	MS, K-6, 1900 m, *KKK 17609*					
9.	*Asplenium tenuifolium* D. Don	MS, K-4.5, 1800 m, *KKK 18503*			*		*
10.	*Asplenium unilaterale* Lam.	MS, K-6, 2000 m, *KKK 16705*					
11.	*Asplenium zenkeranum* Kunze	MS, K-4.5, 1800 m, *KKK 18518*					
12.	*Asplenium* sp.	PUS, 1850 m, *KKK 18578*			*		
III.	**ATHYRIACEAE**						
1.	*Athyrium lanceum* (Kunze) T. Moore	ENP, Anamudi, 2600 m, *KKK 18542*					

No	NAMES OF FAMILY AND TAXA (Local names in brackets)	Locality, Altitude and Collection Numbers	Plate	EB	R	ED	NR
2.	*Athyrium solenopteris* (Kunze) T. Moore	MS, K-7, 1950 m, *KKK 17611*; ENP, Anamudi, 2550 m, *KKK 18539*					
3.	*Deparia petersenii* (Kunze) M. Kato	MS, K-7, 1950 m, *KKK 17610*					
4.	*Diplazium dialatatum* Bl.	MS, K-5, 1850 m, *KKK 17691*					
5.	*Diplazium esculentum* (Retz.) Sw.	MS, K-5, 1800 m, *KKK 31140*	4.15.11				
6.	*Dryoathyrium boryanum* (Willd.) Ching	MS, K-3, 1700 m, *KKK 16745*; MS, K-5, 1800 m, *KKK 17617*			*		
IV.	**CYATHEACEAE**						
1.	*Alsophila nilgirensis* (Holttum) R. M. Tryon (Local names: Pana Edaval, Kalyana Thevai)	MS, K-7, 1950 m, *KKK 17610*	4.15.1	*	*	*	
2.	*Sphaeropteris crinita* (Hook.) R. M. Tryon (Local names: Pana Edaval, Kalyana Thevai)	MS, K-4, 1750 m, *KKK 16647*; MS, K-3, 1720 m, *KKK 16778*	4.15.2	*	*		
V.	**DAVALLIACEAE**						
1.	*Araiostegia pulchra* (D. Don) Copel	MS, K-6, 1900 m, *KKK 31123*					
2.	*Leucostegia alternifrons* (Dennst.) M. R. Almeida & S. M. Almeida	ENP, Rajamala, 1650 m, *KKK 31029*					
VI.	**DENNSTAEDTIACEAE**						
1.	*Microlepia speluncae* (L.) T. Moore		4.16.13				
2.	*Pteridium aquilinum* (L.) Kuhn (Local name: Chulliveru Chedi)	MS, T. K., 1750 m, *KKK 16758*	6.4.7				
VII.	**DRYOPTERIDACEAE**						
1.	*Arachniodes aristata* (G. Forst.) Tindale	MS, K-5, 1850 m, *KKK 16648*	4.15.6		*		*
2.	*Arachniodes tripinnata* (Goldm.) Sledge	MS, T. K., 1730 m, *KKK 16750*					

No	NAMES OF FAMILY AND TAXA (Local names in brackets)	Locality, Altitude and Collection Numbers	Plate	EB	R	ED	NR
3.	*Dryopteris cochleata* (D.Don) C.Chr	MS, K-8, 1950 m, *KKK 18513*					
4.	*Dryopteris hirtipes* (Blume) Kuntze	MS, K-5, 1850 m, *KKK* 16649; MS, K-7, 1850 m, *KKK 17687*					
5.	*Dryopteris sparsa* (Buch. - Ham. *ex* D. Don) Kuntze	MS, Methappu, 2100 m, *KKK 17579*					
6.	*Polystichum harpophyllum* (Zenker *ex* Kunze) Sledge	MS, T. K., 1730 m, *KKK 16649*;					
7.	*Polystichum piceopalaceum* Tagawa	MS, IM, 2100 m, *KKK 17573*					
8.	*Polystichum* sp. 1	ENP, Anamudi, 2600 m, *KKK 18538*					
9.	*Polystichum* sp. 2	MS, IM, 2350 m, *KKK 17600*; MS, IM, 2100 m, *KKK 18174*					
VIII.	**GLEICHENIACEAE**						
1.	*Dicranopteris linearis* var. *sebastiana* Panigrahi & Dixit	MS, K-3, 1700 m, *KKK 16766*; MS, K-6, 1850 m, *KKK 17635*	4.15.10		*	*	*
IX.	**GRAMMITIDACEAE**						
1.	*Ctenopteris perplexa* Parris	MS, K-5, 1840 m, *KKK 16549*	4.15.9		*		*
2.	*Grammitis attenuata* Kunze	ENP, Nilgiri Teri, 1950 m, *KKK 17650b*; MS, IM, 2400 m, *KKK 18181*	4.15.13		*		*
3.	*Grammitis* sp.	MS, Chengalar, 1700 m, *KKK 18130*					
X.	**HEMIONITIDACEAE**						
1.	*Parahemionitis cordata* (Roxb. *ex* Hook. & Grev.) Fraser-Jenk. (Local names: Pattichevi, Poonakkathi)	MS, K-5, 1875 m, *KKK 16594*	4.16.3	*			
2.	*Pityrogramma austro-americana* Domin	MS, Chengalar, 1700 m, *KKK 18141*					
XI.	**HYMENOPHYLLACEAE**						
1.	*Crepidomanes plicatum* (Bosch.) R. C. Ching	Nilgiri Teri, 1950 m, *KKK 17649*; ENP, Umayamala, 1950 m, *KKK 17653*					
2.	*Crepidomanes schmidianum* (Zenker *ex* Taschn.) K. Iwats	ENP, Umayamala, 2100 m, *KKK 17658*	4.15.8		*		*

No	NAMES OF FAMILY AND TAXA (Local names in brackets)	Locality, Altitude and Collection Numbers	Plate	EB	R	ED	NR
XII.	**LINDSAEACEAE**						
1.	*Lindsaea odorata* Roxb. *ex* Griffith	ENP, Mampallam, 1850 m, *KKK 17566*	4.16.10				
2.	*Odontosoria chinensis* (L.) J. Sm.	MS, K-5, 1850 m, *KKK 16712*	4.16.2				
XIII.	**LOMARIOPSIDACEAE**						
1.	*Elaphoglossum beddomei* Sledge	ENP, Nyamakkad, 1550 m, *KKK 18521*			*	*	
2.	*Elaphoglossum nilgiricum* Krajina *ex* Sledge	ENP, Rajamala, 1500 m, *KKK 18524*			*	*	
3.	*Elaphoglossum stelligerum* (Wall. *ex* Baker) T. Moore *ex* Alston & Bonner	MS, T. K., 1650 m, *KKK 16046*; MS, K-5, 1900 m, *KKK 16178*	4.15.12		*		*
XIV.	**LOXOGRAMMACEAE**						
1.	*Loxogramme chinensis* Ching	ENP, Nilgiri Teri, 1950 m, *KKK 17650a*			*		*
2.	*Loxogramme cuspidata* (Zenker) M. G. Price	MS, K-6, 1860 m, *KKK 16548*			*		
XV.	**LYCOPODIACEAE**						
1.	*Huperzia ceylanica* (Spring) Trevis	ENP, Bhiman Odai, 2150 m, *KKK 18025*; ENP, Anamudi Top, 2650 m, *KKK 18535*	4.15.14		*		
2.	*Huperzia hamiltonii* (Spring) Trevis	ENP, Amarachola, 2100 m, *KKK 18516*	4.16.9		*		
3.	*Huperzia hilliana* (Nessel) Holub	MS, K-9, 2000 m, *KKK 31126*	4.15.15				
4.	*Huperzia phlegmaria* Rothm.	MS, K-7, 1900 m, *KKK 31127*					
5.	*Huperzia macrostachys* (Hook. *ex* Spring) Holub	MS, T. K., 1550 m, *KKK 16045*					
6.	*Lycopodiella cernua* (L.) Pic. Serm.	MS, Methappu, 2100 m, *KKK 31125*	4.16.11				
7.	*Lycopodium japonicum* Thunb.	MS, Methappu, 2100 m, *KKK 16794*			*		
8.	*Lycopodium wightianum* Wall. *ex* Hook. & Grev.	MS, Methappu, 2100 m, *KKK 18515*	4.16.12				

No	NAMES OF FAMILY AND TAXA (Local names in brackets)	Locality, Altitude and Collection Numbers	Plate	EB	R	ED	NR
XVI.	**MARATTIACEAE**						
1.	*Marattia.fraxinea* Sw.	MS, K-5, 1850 m, *KKK 18090*			*		
XVII.	**NEPHROLEPIDACEAE**						
1.	*Nephrolepis auriculata* (L.) Trimen	MS, T. K., 1730 m, *KKK 16045* ENP, Nilgiri Teri, 1940 m, *KKK 18073*					
XVIII.	**OPHIOGLOSSACEAE**						
1.	*Botrychium daucifolium* Wall. *ex* Hook. & Grev.	MS, K-4, 1800 m, *KKK 16787*	4.16.8		*		
2.	*Botrychium lanuginosum* Wall. *ex* Hook. & Grev.	ENP, Umayamala, 2150 m, *KKK 18013*			*		*
XIX.	**POLYPODIACEAE**						
1.	*Crypsinus montanus* Sledge	MS, K-4, 1750 m, *KKK 18089*					
2.	*Lepisorus amaurolepidus* (Sledge) Bir & Trikha	MS, T. K., 1730 m, *KKK 16757*			*		
3.	*Lepisorus nudus* (Hook.) Ching	MS, K-7, 2000 m, *KKK 16701*; MS, K-5, 1900 m, *KKK 17690*					
4.	*Leptochilus axillaris* (Cav.) Kaulf.	MS, K-4, 1800 m, *KKK 18146*					
5.	*Leptochilus decurrens* Blume	MS, K-4, 1700 m, *KKK 16738*	4.16.1				
6.	*Leptochilus decurrens* Blume forma *lanceolatus*	MS, K-6, 1900 m, *KKK 31124*					
7.	*Pleopeltis macrocarpa* (Bory *ex* Willd.) Kaulf	MS, Perumala, 1650 m, *KKK 18102*; PAS, Vandaravu, 1950 m, *KKK 18197*	4.16.4				*
8.	*Pyrrosia porosa* Hovenkamp	MS, K-6, 1900 m, *KKK 18119*					
XX.	**PSILOTACEAE**						
1.	*Psilotum nudum* (L.) P. Beauv	MS, K-4, 1750 m, *KKK 16495*			*		

No	NAMES OF FAMILY AND TAXA (Local names in brackets)	Locality, Altitude and Collection Numbers	Plate	EB	R	ED	NR
XXI.	**PTERIDACEAE**						
1.	*Pteris argyrea* T. Moore	MS, K-6, 1950 m, *KKK 16800*			*		
2.	*Pteris confusa* T. G. Walker	MS, K-4, 1750 m, *KKK 16645*; PUS, 1850 m, *KKK 18579*	4.16.5		*		
3.	*Pteris cretica* L.	MS, K-5, 1850 m, *KKK 17692*			*		*
4.	*Pteris quadriaurita* Retz. (Local name: *Njandu Thuravan*)	MS, T. K., 1750 m, *KKK 16735*; MS, K-7, 1950 m, *KKK 17604*		*			
XXII.	**SELAGINELLACEAE**						
1.	*Selaginella brachystachya* (Hook. & Grev.) Spring (Local name: Urakkenni Poovu)	MS, K-7, 1950 m, *KKK 18512*		*			
2.	*Selaginella tenera* (Hook. & Grev.) Spring	MS, K-3.5, 1700 m, *KKK 18092*					
3.	*Selaginella involvens* (Swarts) Spring	MS, K-4, 1780 m, *KKK 16536*	4.16.6		*		
XXIII.	**SINOPTERIDACEAE**						
1.	*Cheilanthes bullosa* Kunze	ENP, Amarachola, 2000 m, *KKK 18038*					
2.	*Cheilanthes farinosa* (Forsk.) Kaulf.	ENP, Vaguvarai, 1800 m, *KKK 31041*	4.15.7		*		
3.	*Cheilanthes thwaitesii* Mett.	PAS, Vandaravu, 2100 m, *KKK 18198*					
4.	*Doryopteris concolor* (Langsd. & Fischer) Kuhn	MS, T. K., 1650 m, *KKK 16723*					
5.	*Pellaea falcata* Bedd.	MS, T. K., 1730 m, *KKK 16739*					
XXIV.	**THELYPTERIDACEAE**						
1.	*Macrothelypteris torresiana* (Gaudich.) Ching	ENP, Umayamala, 2150 m, *KKK 17545*					
2.	*Pseudocyclosorus ochthodes* (Kunze) Holttum var. *annamalayensis* Manickam & Irudayaraj	MS, K-6, 1900 m, *KKK 18525*			*	*	

No	NAMES OF FAMILY AND TAXA (Local names in brackets)	Locality, Altitude and Collection Numbers	Plate	EB	R	ED	NR
3.	*Pseudocyclosorus ochthodes* (Kunze) Holttum var. *palniensis* Manickam & Irudayaraj	MS, K-6, 1950 m, *KKK 17606*			*	*	
4.	*Pseudocyclosorus tylodes* (Kunze) Ching	MS, K-3, 1700 m, *KKK 16753*					
5.	*Pseudophegopteris pyrrhorhachis* (Kunze) Ching	MS, IM, 2100 m, *KKK 17577*					
6.	*Stegnogramma pozoi* (Lagasca) K. Iwats	MS, IM, 2100 m, *KKK 17587*; PUS, 1850 m, *KKK 18577*					*
7.	*Thelypteris dentata* (Forssk.) E. P. St. John	MS, K-8, 2000 m, *KKK 31128*					
XXV.	**VITTARIACEAE**						
1.	*Antrophyum plantagineum* (Cav.) Kaulf.	MS, Chengalar, 1700 m, *KKK 16765*	4.15.3				*
2.	*Vittaria elongata* Sw.	MS, K-4, 1800 m, *KKK 16670*; MS, T.K., 1700 m, *KKK 18125*	4.16.14				

Appendix 2. ANGIOSPERM FAMILIES REPRESENTED IN THIS WORK

(According to Bentham & Hooker's classification, with relevant modifications)

No.	DICOTS							MONOCOTS
	POLYPETALAE			GAMOPETALAE			MONOCHLAMYDEAE	
	Thalamiflorae	Disciflorae	Calyciflorae	Inferae	Heteromerae	Bicarpellatae		
1.	Ranunculaceae	Geraniaceae	Fabaceae	Caprifoliaceae	Ericaceae	Oleaceae	Amarantaceae	Orchidaceae
2.	Magnoliaceae	Oxalidaceae	Rosaceae	Rubiaceae	Vacciniaceae	Apocynaceae	Chenopodiaceae	Zingiberaceae
3.	Menispermaceae	Balsaminaceae	Saxifragaceae	Valerianaceae	Primulaceae	Asclepiadaceae	Phytolaccaceae	Haemodoraceae
4.	Berberidaceae	Rutaceae	Crassulaceae	Asteraceae	Myrsinaceae	Loganiaceae	Polygonaceae	Iridaceae
5.	Brassicaceae	Meliaceae	Droseraceae	Campanulaceae	Sapotaceae	Gentianaceae	Podostemaceae	Amaryllidaceae
6.	Violaceae	Icacinaceae	Haloragaceae		Symplocaceae	Boraginaceae	Piperaceae	Hypoxidaceae
7.	Flacourtiaceae	Aquifoliaceae	Myrtaceae			Convolvulaceae	Lauraceae	Liliaceae
8.	Pittosporaceae	Celastraceae	Melastomataceae			Solanaceae	Proteaceae	Smilacaceae
9.	Polygalaceae	Rhamnaceae	Lythraceae			Scrophulariaceae	Thymeleaceae	Xyridaceae
10.	Caryophyllaceae	Vitaceae	Onagraceae			Orobanchaceae	Elaegnaceae	Commelinaceae
11.	Portulacaceae	Staphyleaceae	Passifloraceae			Lentibulariaceae	Loranthaceae	Juncaceae
12.	Hypericaceae	Sapindaceae	Cucurbitaceae			Gesneriaceae	Balanophoraceae	Arecaceae
13.	Clusiaceae	Sabiaceae	Begoniaceae			Acanthaceae	Euphorbiaceae	Araceae
14.	Ternstroemiaceae	Anacardiaceae	Apiaceae			Verbenaceae	Buxaceae	Eriocaulaceae
15.	Malvaceae	Connaraceae	Araliaceae			Lamiaceae	Urticaceae	Cyperaceae
16.	Tiliaceae		Cornaceae			Plantaginaceae	Ulmaceae	Poaceae
17.	Elaeocarpaceae						Cannabaceae	
18.							Moraceae	
19.							Salicaceae	
TOT	45	62	101	98	26	103	101	133
TOT	208 taxa			227 taxa			101 taxa	133 taxa

Total number of Angiosperm Taxa = Dicots (208+227+101) + Monocots (133) = **669 taxa**

Appendix 3. Adaptations and habitat specificity exhibited by the shola plants

No.	Initial colonisers
1.	*Casearia thwaitesii*
2.	*Elaeagnus kologa*
3.	*Elaeocarpus recurvatus*
4.	*Eurya japonica*
5.	*Eurya nitida*
6.	*Gaultheria fragrantissima*
7.	*Hypericum mysorense*
8.	*Ilex denticulata*
9.	*Ilex walkeri*
10.	*Ligustrum perrottetii*
11.	*Litsea wightiana*
12.	*Microtropis ramiflora*
13.	*Myrsine wightiana*
14.	*Osbeckia leschenaultiana*
15.	*Pittosporum tetraspermum*
16.	*Pteridium aquilinum*
17.	*Myrsine thwaitesii*
18.	*Rhododendron arboreum* ssp. *nilagiricum*
19.	*Rhodomyrtus tomentosa*
20.	*Rubus ellipticus*
21.	*Rubus fairholmianus*
22.	*Rubus niveus*
23.	*Symplocos anamalayana*
24.	*Symplocos cochinchinensis* ssp. *laurina*
25.	*Syzygium caryophyllatum*
26.	*Syzygium densiflorum*
27.	*Ternstroemia japonica*
28.	*Turpinia nepalensis*
29.	*Vaccinium leschenaultii*

No.	Low altitude colonisers
1.	*Celtis philippensis*
2.	*Celtis tetrandra*
3.	*Cipadessa baccifera*
4.	*Clerodendrum viscosum*
5.	*Daphniphyllum neilgherrense*
6.	*Dicranopteris linearis*
7.	*Dodonaea viscosa*
8.	*Gaultheria fragrantissima*
9.	*Glochidion neilgherrense*
10.	*Ilex wightiana*
11.	*Mallotus tetracoccus*
12.	*Maesa perrottetiana*
13.	*Myrsine wightiana*
14.	*Osbeckia aspera*
15.	*Pteridium aquilinum*
16.	*Sarcococca saligna*
17.	*Strobilanthes foliosus*
18.	*Symplocos cochinchinensis*
19.	*Syzygium cumini*
20.	*Viburnum punctatum*

No.	Latex yielding plants
1.	*Euphorbia rothiana*
2.	*Garcinia gummi-gutta* var. *pappilla*
3.	*Gomphandra coriacea*
4.	*Isonandra lanceolata*
5.	*Isonandra perrottetiana*
6.	*Phyllanthus macrai*
7.	*Ricinus communis*

No.	Resin yielding plants
1.	*Mastixia arborea*

No.	Plants with Stilt roots
1.	*Strobilanthes gracilis*
2.	*Strobilanthes luridus*
3.	*Strobilanthes micranthus*

No.	Riparian Plants
1.	*Alsophila neilgherrensis* (tree fern)
2.	*Anoectochilus elatus*
3.	*Archidendron clypearia*
4.	*Carex lindleyana*
5.	*Debregeasia velutina*
6.	*Elatostema lineolatum* var. *falcigera*
7.	*Elatostema sessile*
8.	*Fimbristylis kingii*
9.	*Fagraea ceilanica*
10.	*Girardinia diversifolia*
11.	*Gordonia obtusa*
12.	*Ilex malabarica*
13.	*Impatiens elegans*
14.	*Impatiens goughii*
15.	*Impatiens herbicola*
16.	*Impatiens latifolia*
17.	*Impatiens munronii*
18.	*Impatiens parvifolia*
19.	*Impatiens phoenicea*
20.	*Impatiens platyadena*
21.	*Impatiens tangachee*
22.	*Michelia nilagirica*
23.	*Phoebe wightii*
24.	*Pilea kingii*
25.	*Pilea melastomoides*
26.	*Pilea wightii*
27.	*Polygonum glabrum*
28.	*Polyscias acuminata*
29.	*Pouzolzia auriculata*
30.	*Pouzolzia bennettiana* var. *acuta*
31.	*Pouzolzia wightii* var. *scabra*
32.	*Pseudoxytenanthera monadelpha*
33.	*Rumex nepalensis*
34.	*Scirpus articulatus*

Appendix 3. (contd.)

No.	Plants with thorns/prickles
1.	*Alsophila nilgirensis* (tree fern)
2.	*Protasparagus racemosus*
3.	*Atalantia wightii*
4.	*Barleria involucrata*
5.	*Berberis tinctoria*
6.	*Canthium dicoccum*
7.	*Cirsium wallichii*
8.	*Cynoglossum zeylanicum*
9.	*Grewia umbellifera*
10.	*Lantana camara* var. *aculeata*
11.	*Mahonia leschenaultii*
12.	*Pseudoxytenanthera monadelpha*
13.	*Rhamnus wightii*
14.	*Rosa leschenaultiana*
15.	*Rubus ellipticus*
16.	*Rubus fairholmianus*
17.	*Rubus niveus*
18.	*Sageretia hamosa*
19.	*Scolopia crenata*
20.	*Solanum anguivi*
21.	*Solanum virginianum*
22.	*Toddalia asiatica*
23.	*Triumfetta pilosa*
24.	*Zanthoxylum tetraspermum*
25.	*Zizyphus rugosa*

No.	Parasitic plants
1.	*Aeginetia pedunculata*
2.	*Balanophora dioica*
3.	*Balanophora fungosa* ssp. *indica* var. *indica*
4.	*Balanophora* sp. 1
5.	*Balanophora* sp. 2
6.	*Christisonia bicolor*
7.	*Christisonia neilgherrica*
8.	*Christisonia tubulosa*
9.	*Helicanthes elastica*
10.	*Helixanthera intermedia*
11.	*Helixanthera obtusata*
12.	*Macrosolen capitellatus*
13.	*Macrosolen parasiticus*
14.	*Taxillus cuneatus*
15.	*Taxillus recurvus*
16.	*Taxillus tomentosus*

No.	Allergic Plants
1.	*Girardinia diversifolia*
2.	*Laportea bulbifera*
3.	*Nothopegia colebrookeana*

No.	Succulents plants/Water lovers
1.	*Begonia malabarica*
2.	*Impatiens balsamina*
3.	*Impatiens campanulata*
4.	*Impatiens chinensis*
5.	*Impatiens coelotropis*
6.	*Impatiens cordata*
7.	*Impatiens cuspidata*
8.	*Impatiens elegans*
9.	*Impatiens goughii*
10.	*Impatiens herbicola*
11.	*Impatiens latifolia*
12.	*Impatiens modesta*
13.	*Impatiens munronii*
14.	*Impatiens parasitica*
15.	*Impatiens parvifolia*
16.	*Impatiens phoenicea*
17.	*Impatiens platyadena*
18.	*Impatiens tangachee*
19.	*Impatiens umbellata*
20.	*Impatiens uncinata*
21.	*Impatiens verticillata*
22.	*Impatiens wightiana*
23.	*Impatiens tenella*
24.	*Kalanchoe grandiflora*
25.	*Peperomia portulacoides*
26.	*Peperomia tetraphylla*
27.	*Pilea kingii*
28.	*Pilea melastomoides*
29.	*Pilea wightii*
30.	*Pouzolzia auriculata*
31.	*Pouzolzia wightii* var. *scabra*
32.	*Procris crenata*
33.	*Rotala indica*
34.	*Utricularia graminifolia*
35.	*Utricularia nayarii*
36.	*Utricularia roseopurpurea*

No.	Lianas
1.	*Cissampelopsis corymbosa*
2.	*Cissampelopsis wightii*
3.	*Connarus wightii*
4.	*Derris brevipes*
5.	*Ficus amplocarpa*
6.	*Parthenocissus semicordata*
7.	*Rhamnus wightii*

No.	Buttressed trees
1.	*Elaeocarpus tuberculatus*

Appendix 4. Plants belonging to different threat categories#

Sl. No.	SPECIES NAMES	FAMILY	Status*
1.	*Actinodaphne bourneae* Gamble	Lauraceae	PE
2.	*Actinodaphne malabarica* Balakr.	Lauraceae	R
3.	*Anaphalis travancorica* W. W. Smith	Asteraceae	R
4.	*Anisochilus argenteus* Gamble	Lamiaceae	V
5.	*Arisaema attenuatum* Barnes & Fischer	Araceae	T
6.	*Arisaema barnesii* Fischer	Araceae	T
7.	*Arisaema psittacus* Barnes	Araceae	T
8.	*Arisaema tuberculatum* Fischer	Araceae	R
9.	*Campanula alphonsii* Wall. ex A. DC.	Campanulaceae	R
10.	*Cinnamomum filipedicellatum* Kosterm.	Lauraceae	R
11.	*Cinnamomum travancoricum* Gamble	Lauraceae	CE
12.	*Coelogyne mossiae* Rolfe	Orchidaceae	V
13.	*Crotalaria fysonii* Dunn var. *glabra* Gamble	Fabaceae	E
14.	*Elaeocarpus munronii* (Wight) Mast.	Elaeocarpaceae	R
15.	*Elaeocarpus recurvatus* Corner	Elaeocarpaceae	R
16.	*Eria nana* A. Rich.	Orchidaceae	CE
17.	*Eugenia calcadensis* Bedd.	Myrtaceae	CE
18.	*Exacum anamallayanum* Bedd.	Gentianaceae	R
19.	*Hedyotis articularis* R. Br. ex Wight & Arn. subsp. *santapaui* (Shetty & Vivek.) Deb. & Dutta	Rubiaceae	R
20.	*Hedyotis buxifolia* Bedd.	Rubiaceae	R
21.	*Hedyotis swertioides* Hook. f.	Rubiaceae	R
22.	*Impatiens anaimudica* Fischer	Balsaminaceae	E
23.	*Impatiens coelotropis* Fischer	Balsaminaceae	V
24.	*Impatiens elegans* Bedd.	Balsaminaceae	C
25.	*Impatiens herbicola* Hook. f.	Balsaminaceae	V
26.	*Impatiens phoenicea* Bedd.	Balsaminaceae	E
27.	*Impatiens platyadena* Fischer	Balsaminaceae	C
28.	*Impatiens tenella* Heyne ex Hook. f.	Balsaminaceae	E
29.	*Impatiens wightiana* Bedd.	Balsaminaceae	E
30.	*Lasianthus blumeanus* Wight	Rubiaceae	E
31.	*Lasianthus ciliatus* Wight	Rubiaceae	R
32.	*Medinilla malabarica* Bedd.	Melastomataceae	V
33.	*Memecylon flavescens* Gamble	Melastomataceae	R
34.	*Neanotis monosperma* (Wall. ex Wight. & Arn.) W. H. Lewis	Rubiaceae	R
35.	*Ophiorrhiza brunonis* Wight & Arn.	Rubiaceae	PE
36.	*Ophiorrhiza roxburghiana* Wight	Rubiaceae	R
37.	*Pimpinella pulneyensis* Gamble	Apiaceae	PE
38.	*Pogostemon atropurpureus* Benth.	Lamiaceae	R
39.	*Ranunculus reniformis* Wall. ex Wight & Arn.	Ranunculaceae	R

Sl. No.	SPECIES NAMES	FAMILY	Status
40.	*Rhododendron arboreum* J. E. Smith subsp. *nilagirium* (Zenk.) Tagg.	Ericaceae	R
41.	*Sonerila grandiflora* Wall.	Melastomataceae	R
42.	*Symplocos anamallayana* Bedd.	Symplocaceae	R
43.	*Symplocos monantha* Wight	Symplocaceae	PE
44.	*Symplocos oligandra* Bedd.	Symplocaceae	CE
45.	*Valeriana hookeriana* Wight & Arn.	Valerianaceae	E
46.	*Vanasushava pedata* (Wight) Mukh. & Constance	Apiaceae	R
47.	*Vernonia saligna* DC. var. *nilghirensis* Hook. f.	Asteraceae	V
48.	*Zehneria maysorensis* (Wight & Arn.) Arn. var. *umbellata* (Chakravarthy) Kumari	Cucurbitaceae	R

(R = Rare; E = Endangered; V = Vulnerable; CE = Critically Endangered; PE = Possibly Extinct; T = Threatened)

(**Source:* Ahmedullah and Nayar, 1987; Nayar and Sastry, 1987, 1988, 1990; Nayar, 1997)

(# About 111 angiosperms and 34 pteridophytes are locally found rare in the study areas; see Table 4.5).

Appendix 5. New records of plants collected from the shola forests of Kerala

1. ANGIOSPERMS

No.	NAME OF THE SPECIES	FAMILY	EBIS
1.	*Actinodaphne bourneae* Gamble[$]	Lauraceae	..
2.	*Alpinia abundiflora* Burtt & Smith	Zingiberaceae	..
3.	*Anisochilus argenteus* Gamble	Lamiaceae	..
4.	*Berberis tinctoria* Lesch.	Berberidaceae	..
5.	*Campanula alphonsii* Wall. *ex* A. DC.	Campanulaceae	..
6.	*Cerastium indicum* Wight & Arn.	Caryophyllaceae	..
7.	*Chionanthus ramiflorus* Roxb. var. *peninsularis* Ravikumar & Lakshmanan	Oleaceae	*
8.	*Circaea alpina* L. subsp. *imaicola* (Asch. & Magn.) Kitamura	Onagraceae	..
9.	*Clinopodium umbrosum* (M. Bieb.) K. Koch	Lamiaceae	..
10.	*Cocculus laurifolius* DC.	Menispermaceae	..
11.	*Coronopus didymus* (L.) Sm.	Brassicaceae	..
12.	*Cyphomandra betaceae* (Cav.) Sendt.	Solanaceae	*
13.	*Elatostema sessile* J. R. Forst. & J. G. A. Forst	Urticaceae	..
14.	*Garcinia gummi-gutta* var. *papilla* (Wight) N. P. Singh	Clusiaceae	*
15.	*Heracleum ceylanicum* Gardner *ex* C. B. Clarke	Apiaceae	..
16.	*Ilex malabarica* Bedd.	Aquifoliaceae	..
17.	*Impatiens campanulata* Wight	Balsaminaceae	..
18.	*Impatiens parvifolia* Bedd.	Balsaminaceae	..
19.	*Jasminum brevilobum* A. DC.	Oleaceae	*
20.	*Kalanchoe grandiflora* Wight & Arn.	Crassulaceae	..
21.	*Leucas lamifolia* Desf.	Lamiaceae	*
22.	*Leucas rosmarinifolia* Benth.	Lamiaceae	..
23.	*Mahonia leschenaultii* (Wall. *ex* Wight & Arn.) Takeda *ex* Gamble	Berberidaceae	..
24.	*Michelia nilagirica* Zenk.	Magnoliaceae	..
25.	*Myrsine capitellata* Wall. var. *sessilis* Gamble	Myrsinaceae	..
26.	*Neolitsea fischeri* Gamble	Lauraceae	*
27.	*Oenothera laciniata* Hill [#]	Onagraceae	..
28.	*Ophiorrhiza roxburghiana* Wight	Rubiaceae	..
29.	*Osbeckia parvifolia* Arn.	Melastomataceae	..
30.	*Osbeckia reticulata* Bedd.	Melastomataceae	..
31.	*Oxalis latifolia* Juss.	Oxalidaceae	..
32.	*Passiflora ligularis* Juss.	Passifloraceae	*
33.	*Passiflora mollissima* (H. B. K.) L. H. Bailey	Passifloraceae	*
34.	*Pentapanax leschenaultii* (DC.) Seem	Araliaceae	..
35.	*Phytolacca octandra* L.	Phytolaccaceae	..
36.	*Pimpinella leschenaultii* DC.	Apiaceae	..
37.	*Pimpinella pulneyensis* Gamble[$]	Apiaceae	..
38.	*Plectranthus coleoides* Benth	Lamiaceae	*
39.	*Prunus persica* (L.) Batsch.	Rosaceae	*

No.	NAME OF THE SPECIES	FAMILY	EBIS
40.	*Rhamnus wightii* Wight & Arn.	Rhamnaceae	..
41.	*Solanum anguivi* Lam. var. *anguivi*	Solanaceae	*
42.	*Strobilanthes asperrimus* Nees	Acanthaceae	..
43.	*Strobilanthes cuspidatus* T. Anders	Acanthaceae	*
44.	*Strobilanthes papillosus* T. Anders	Acanthaceae	..
45.	*Strobilanthes perrottetianus* Nees	Acanthaceae	..
46.	*Strobilanthes violacea* Bedd.	Acanthaceae	..
47.	*Symplocos monantha* Wight [$]	Symplocaceae	..
48.	*Taeniophyllum alwisii* Lindl.	Orchidaceae	..
49.	*Taxillus recurvus* (DC) Tiegh.	Loranthaceae	..
50.	*Tetrastigma nilagiricum* (Miq.) B.V. Shetty	Vitaceae	*
51.	*Thalictrum javanicum* Blume	Ranunculaceae	..
52.	*Vernonia fysonii* Calder	Asteraceae	..
53.	*Viburnum erubescens* Wall. *ex* DC.	Caprifoliaceae	..
54.	*Viscum ramosissimum* Wall. ex Wight & Arn.	Viscaceae	..
55.	*Zehneria maysorensis* (Wight & Arn.) Arn. var. *umbellata* (Chakravarthy) Kumari	Cucurbitaceae	*

* **EBIS** = Ethnobotanically Important Species; [#] New record to India; [$] 'Possibly extinct' rediscovered.

2. PTERIDOPHYTES

No.	NAME OF THE SPECIES	FAMILY	EBIS
1.	*Asplenium auritum* Swarts	Aspleniaceae	..
2.	*Asplenium erectum* Bory *ex* Willd.	Aspleniaceae	..
3.	*Asplenium tenuifolium* D. Don	Aspleniaceae	..
4.	*Arachniodes aristata* (Forster f.) Tindale	Dryopteridaceae	..
5.	*Dicranopteris linearis* var. *sebastiana* Panigrahi & Dixit	Gleicheniaceae	..
6.	*Ctenopteris perplexa* Parris	Grammitidaceae	..
7.	*Grammitis attenuata* Kunze	Grammitidaceae	..
8.	*Trichomanes schmidianum* Zenker *ex* Taschn.	Hymenophyllaceae	..
9.	*Elaphoglossum stelligerum* (Wall. *ex* Baker) T. Moore *ex* Alston & Bonner	Lomariopsidaceae	..
10.	*Botrychium lanuginosum* Wall *ex* Hook. & Grew.	Ophioglossaceae	..
11.	*Loxogramme chinensis* Ching	Loxogrammaceae	..
12.	*Pleopeltis macrocarpa* (Bory *ex* Willd.) Kaulf	Polypodiaceae	..
13.	*Pteris cretica* L.	Pteridaceae	..
14.	*Stegnogramma pozoi* (Lagasca) K. Iwats	Thelypteridaceae	..
15.	*Antrophyum plantagineum* (Cav.) Kaulf.	Vittariaceae	..

* **EBIS** = Ethnobotanically Important Species

Appendix 6. Phytosociological attributes of Mannavan Shola (Plants 1 cm dbh)

(Altitude: **1600 m**; Plot size: (10 m x 10 m) x 10 nos. = **0.1 ha.**)

No	SPECIES	N	D	AB	F	BA	RD	RAB	RF	RBA	DI	IVI	RIVI
1	*Phoebe wightii*	103	**1030**	**10.3**	100	9.5883	11.98	4.97	4.81	6.34	0.1	23.13	7.71
2	*Meliosma simplicifolia*	34	340	4.25	80	19.027	3.95	2.05	3.85	12.58	0.05	20.38	6.79
3	*Persea macrantha*	54	540	6	90	14.639	6.28	2.9	4.33	9.68	0.07	20.29	6.76
4	*Strobilanthes cuspidatus*	114	**1140**	**22.8**	50	0.6259	13.26	11.01	2.4	0.41	0.46	16.07	5.36
5	*Viburnum punctatum*	65	**650**	9.29	70	7.5108	7.56	4.49	3.37	4.96	0.13	15.89	5.3
6	*Syzygium cumini*	21	210	3	70	15.063	2.44	1.45	3.37	9.96	0.04	15.77	5.26
7	*Symplocos cochinchinensis*	50	500	8.33	60	8.697	5.81	4.02	2.88	5.75	0.14	14.44	4.81
8	*Turpinia nepalensis*	24	240	3	80	8.9486	2.79	1.45	3.85	5.91	0.04	12.55	4.18
9	*Vaccinium leschenaultii*	14	140	2.33	60	9.9114	1.63	1.13	2.88	6.55	0.04	11.06	3.69
10	*Gordonia obtusa*	8	80	1.6	50	9.7198	0.93	0.77	2.4	6.42	0.03	9.75	3.25
11	*Bischofia javanica*	8	80	2	40	10.396	0.93	0.97	1.92	6.87	0.05	9.72	3.24
12	*Clerodendrum viscosum*	42	420	**10.5**	40	3.0996	4.88	5.07	1.92	2.05	0.26	8.85	2.95
13	*Myrsine wightiana*	33	330	4.13	80	1.1765	3.84	1.99	3.85	0.78	0.05	8.47	2.82
14	*Glochidion neilgherrense*	14	140	1.75	80	3.0495	1.63	0.85	3.85	2.02	0.02	7.5	2.5
15	*Daphniphyllum neilgherrense*	21	210	4.2	50	3.3963	2.44	2.03	2.4	2.24	0.08	7.08	2.36
16	*Ilex malabarica*	4	40	2	20	6.8978	0.47	0.97	0.96	4.56	0.1	5.99	2
17	*Acronychia laurifolia*	26	260	4.33	60	0.1048	3.02	2.09	2.88	0.07	0.07	5.97	1.99
18	*Maesa indica*	20	200	4	50	0.5198	2.33	1.93	2.4	0.34	0.08	5.07	1.69
19	*Neolitsea zeylanica*	16	160	2.67	60	0.0741	1.86	1.29	2.88	0.05	0.04	4.79	1.6
20	*Rhododendron arboreum ssp. nilagiricum*	6	60	3	20	3.4687	0.7	1.45	0.96	2.29	0.15	3.95	1.32
21	*Hydnocarpus alpina*	17	170	4.25	40	0.0415	1.98	2.05	1.92	0.03	0.11	3.93	1.31
22	*Cocculus laurifolius*	13	130	2.6	50	0.0191	1.51	1.26	2.4	0.01	0.05	3.92	1.31
23	*Viburnum coriaceum*	2	20	1	20	3.8865	0.23	0.48	0.96	2.57	0.05	3.76	1.25
24	*Ilex walkeri*	3	30	1	30	2.4611	0.35	0.48	1.44	1.63	0.03	3.42	1.14
25	*Meliosma pinnata*	3	30	1.5	20	2.8235	0.35	0.72	0.96	1.87	0.08	3.18	1.06
26	*Sarcococca coriacea*	7	70	1.75	40	0.0179	0.81	0.85	1.92	0.01	0.04	2.74	0.91
27	*Strobilanthes urceolaris*	15	150	7.5	20	0.0228	1.74	3.62	0.96	0.02	0.38	2.72	0.91
28	*Psychotria glandulosa*	9	90	3	30	0.0466	1.05	1.45	1.44	0.03	0.1	2.52	0.84
29	*Piper mullesua*	9	90	3	30	0.0131	1.05	1.45	1.44	0.01	0.1	2.5	0.83
30	*Lasianthus acuminatus*	4	40	1	40	0.018	0.47	0.48	1.92	0.01	0.03	2.4	0.8
31	*Schefflera racemosa*	4	40	2	20	1.3606	0.47	0.97	0.96	0.9	0.1	2.33	0.78
32	*Ilex wightiana*	1	10	1	10	2.5347	0.12	0.48	0.48	1.68	0.1	2.28	0.76
33	*Litsea glabrata*	6	60	2	30	0.1975	0.7	0.97	1.44	0.13	0.07	2.27	0.76
34	*Neolitsea scrobiculata*	6	60	2	30	0.028	0.7	0.97	1.44	0.02	0.07	2.16	0.72
35	*Syzygium densiflorum*	6	60	2	30	0.0147	0.7	0.97	1.44	0.01	0.07	2.15	0.72
36	*Archidendron clypearia*	3	30	1.5	20	1.0308	0.35	0.72	0.96	0.68	0.08	1.99	0.66
37	*Murraya paniculata*	7	70	3.5	20	0.0564	0.81	1.69	0.96	0.04	0.18	1.81	0.6
38	*Litsea wightiana*	6	60	3	20	0.0093	0.7	1.45	0.96	0.01	0.15	1.67	0.56
39	*Elaeocarpus glandulosus*	3	30	1.5	20	0.5274	0.35	0.72	0.96	0.35	0.08	1.66	0.55
40	*Prunus ceylanica*	3	30	1.5	20	0.0107	0.35	0.72	0.96	0.01	0.08	1.32	0.44
41	*Piper attenuatum*	3	30	1.5	20	0.0038	0.35	0.72	0.96	0	0.08	1.31	0.44
42	*Sageretia hamosa*	3	30	1.5	20	0.004	0.35	0.72	0.96	0	0.08	1.31	0.44
43	*Strobilanthes gracilis*	7	70	7	10	0.01	0.81	3.38	0.48	0.01	0.7	1.3	0.43
44	*Nothopegia colebrookeana*	2	20	1	20	0.0093	0.23	0.48	0.96	0.01	0.05	1.2	0.4

No	SPECIES	N	D	AB	F	BA	RD	RAB	RF	RBA	DI	IVI	RIVI
45	*Scolopia crenata*	2	20	1	20	0.0049	0.23	0.48	0.96	0	0.05	1.19	0.4
46	*Strobilanthes foliosus*	5	50	5	10	0.0255	0.58	2.41	0.48	0.02	0.5	1.08	0.36
47	*Strobilanthes luridus*	5	50	5	10	0.0162	0.58	2.41	0.48	0.01	0.5	1.07	0.36
48	*Piper wightii*	3	30	3	10	0.0177	0.35	1.45	0.48	0.01	0.3	0.84	0.28
49	*Xantolis tomentosa*	3	30	3	10	0.0046	0.35	1.45	0.48	0	0.3	0.83	0.28
50	*Litsea oleoides*	2	20	2	10	0.0932	0.23	0.97	0.48	0.06	0.2	0.77	0.26
51	*Psychotria nilgiriensis*	2	20	2	10	0.0366	0.23	0.97	0.48	0.02	0.2	0.73	0.24
52	*Pavetta breviflora*	2	20	2	10	0.002	0.23	0.97	0.48	0	0.2	0.71	0.24
53	*Zanthoxylum tetraspermum*	1	10	1	10	0.0097	0.12	0.48	0.48	0.01	0.1	0.61	0.2
54	*Allophylus concanicus*	1	10	1	10	0.0029	0.12	0.48	0.48	0	0.1	0.6	0.2
55	*Antidesma menasu*	1	10	1	10	0.0029	0.12	0.48	0.48	0	0.1	0.6	0.2
56	*Cassia laevigata*	1	10	1	10	0.0013	0.12	0.48	0.48	0	0.1	0.6	0.2
57	*Celtis tetrandra*	1	10	1	10	0.0007	0.12	0.48	0.48	0	0.1	0.6	0.2
58	*Chassalia curviflora*	1	10	1	10	0.0013	0.12	0.48	0.48	0	0.1	0.6	0.2
59	*Cinnamomum wightii*	1	10	1	10	0.0007	0.12	0.48	0.48	0	0.1	0.6	0.2
60	*Clerodendrum serratum*	1	10	1	10	0.0013	0.12	0.48	0.48	0	0.1	0.6	0.2
61	*Cyphomandra betacea*	1	10	1	10	0.0013	0.12	0.48	0.48	0	0.1	0.6	0.2
62	*Derris brevifolia*	1	10	1	10	0.0007	0.12	0.48	0.48	0	0.1	0.6	0.2
63	*Elaeagnus kologa*	1	10	1	10	0.0065	0.12	0.48	0.48	0	0.1	0.6	0.2
64	*Eurya nitida*	1	10	1	10	0.002	0.12	0.48	0.48	0	0.1	0.6	0.2
65	*Piper hymenophyllum*	1	10	1	10	0.0009	0.12	0.48	0.48	0	0.1	0.6	0.2
66	*Pogostemon pubescens*	1	10	1	10	0.0013	0.12	0.48	0.48	0	0.1	0.6	0.2
67	*Polygala arillata*	1	10	1	10	0.0029	0.12	0.48	0.48	0	0.1	0.6	0.2
68	*Syzygium caryophyllatum*	1	10	1	10	0.0013	0.12	0.48	0.48	0	0.1	0.6	0.2
69	*Toddalia asiatica*	1	10	1	10	0.0029	0.12	0.48	0.48	0	0.1	0.6	0.2
	TOTAL	**860**	**8600**	**207.08**	**2080**	**151.3**	**100**	**100**	**100**	**100**	**8.81**	**300**	**100**

	MS 1600 m - IVI sorted	
1	TOTAL NO. OF SPECIES	69
2	TOTAL NO. OF INDIVIDUALS	860
3	MARGALEF'S RICHNESS INDEX	10
4	MENHINICK'S RICHNESS INDEX	6
5	PIELOU'S EVENNESS INDEX	0.8
6	SHANNON'S DIVERSITY INDEX	3.4
7	SIMPSON'S DOMINANCE INDEX	0.1

N = No of individuals
D = Density / Ha.
AB = Abundance
F = Frequency
BA = Basal Area (m^2/ Ha.)
DI = Distributional index
IVI = Importance value Index
RD, RAB, RF, RBA, RIVI = Relative Values

Appendix 7. Phytosociological attributes of Mannavan Shola (Plants □1 cm dbh)

(Altitude. **1700 m**; Plot size: (10 m x 10 m) x 10 nos. = **0.1 ha.**)

No	SPECIES	N	D	AB	F	BA	RD	RAB	RF	RBA	DI	IVI	RIVI
1	*Strobilanthes gracilis*	174	1740	29	60	0.703	20.3	13.48	2.79	0.65	0.48	23.74	7.91
2	*Lasianthus acuminatus*	113	1130	14.13	80	0.6667	13.19	6.57	3.72	0.62	0.18	17.53	5.84
3	*Elaeocarpus tuberculatus*	1	10	1	10	15.771	0.12	0.46	0.47	14.58	0.1	15.17	5.06
4	*Ilex wightiana*	5	50	1.25	40	10.768	0.58	0.58	1.86	9.95	0.03	12.39	4.13
5	*Syzygium cumini*	7	70	1.75	40	9.798	0.82	0.81	1.86	9.06	0.04	11.74	3.91
6	*Persea macrantha*	25	250	3.13	80	4.7208	2.92	1.46	3.72	4.36	0.04	11	3.67
7	*Phoebe wightii*	47	470	5.88	80	1.4857	5.48	2.73	3.72	1.37	0.07	10.57	3.52
8	*Meliosma simplicifolia*	22	220	3.67	60	5.4987	2.57	1.71	2.79	5.08	0.06	10.44	3.48
9	*Hydnocarpus alpina*	52	520	13	40	2.5745	6.07	6.04	1.86	2.38	0.33	10.31	3.44
10	*Mastixia arborea*	21	210	7	30	6.2038	2.45	3.25	1.4	5.73	0.23	9.58	3.19
11	*Daphniphyllum neilgherrense*	15	150	3	50	4.7562	1.75	1.39	2.33	4.4	0.06	8.48	2.83
12	*Acronychia pedunculata*	24	240	4	60	2.2702	2.8	1.86	2.79	2.1	0.07	7.69	2.56
13	*Turpinia nepalensis*	10	100	1.43	70	3.1207	1.17	0.66	3.26	2.88	0.02	7.31	2.44
14	*Neolitsea zeylanica*	24	240	3	80	0.1958	2.8	1.39	3.72	0.18	0.04	6.7	2.23
15	*Glochidion neilgherrense*	9	90	1.8	50	2.5337	1.05	0.84	2.33	2.34	0.04	5.72	1.91
16	*Isonandra perrottetiana*	5	50	1.67	30	3.5654	0.58	0.78	1.4	3.3	0.06	5.28	1.76
17	*Viburnum punctatum*	22	220	5.5	40	0.7451	2.57	2.56	1.86	0.69	0.14	5.12	1.71
18	*Murraya paniculata*	20	200	5	40	0.5972	2.33	2.32	1.86	0.55	0.13	4.74	1.58
19	*Atalantia wightii*	3	30	1	30	2.9903	0.35	0.46	1.4	2.76	0.03	4.51	1.5
20	*Gomphandra coriacea*	8	80	2	40	1.6304	0.93	0.93	1.86	1.51	0.05	4.3	1.43
21	*Mallotus tetracoccus*	4	40	2	20	3.11	0.47	0.93	0.93	2.87	0.1	4.27	1.42
22	*Cinnamomum malabatrum*	3	30	1	30	2.6076	0.35	0.46	1.4	2.41	0.03	4.16	1.39
23	*Trichilia connaroides*	17	170	4.25	40	0.3361	1.98	1.98	1.86	0.31	0.11	4.15	1.38
24	*Cryptocarya bourdillonii*	8	80	2	40	1.1259	0.93	0.93	1.86	1.04	0.05	3.83	1.28
25	*Strobilanthes urceolaris*	12	120	2.4	50	0.0128	1.4	1.12	2.33	0.01	0.05	3.74	1.25
26	*Bischofia javanica*	5	50	5	10	2.8348	0.58	2.32	0.47	2.62	0.5	3.67	1.22
27	*Symplocos cochinchinensis*	2	20	0.33	60	0.6872	0.23	0.15	2.79	0.64	0.01	3.66	1.22
28	*Neolitsea scrobiculata*	9	90	2.25	40	0.7683	1.05	1.05	1.86	0.71	0.06	3.62	1.21
29	*Saprosma foetens*	17	170	5.67	30	0.2431	1.98	2.64	1.4	0.22	0.19	3.6	1.2
30	*Sarcococca saligna*	12	120	4	30	0.8312	1.4	1.86	1.4	0.77	0.13	3.57	1.19
31	*Symplocos cochinchinensis ssp. laurina*	9	90	2.25	40	0.6852	1.05	1.05	1.86	0.63	0.06	3.54	1.18
32	*Myrsine wightiana*	10	100	2	50	0.012	1.17	0.93	2.33	0.01	0.04	3.51	1.17
33	*Scolopia crenata*	2	20	1	20	2.3235	0.23	0.46	0.93	2.15	0.05	3.31	1.1
34	*Schefflera racemosa*	6	60	1.2	50	0.2414	0.7	0.56	2.33	0.22	0.02	3.25	1.08
35	*Psychotria glandulosa*	11	110	2.75	40	0.0394	1.28	1.28	1.86	0.04	0.07	3.18	1.06
36	*Psychotria nilgiriensis*	13	130	4.33	30	0.0848	1.52	2.01	1.4	0.08	0.14	3	1
37	*Ternstroemia japonica*	3	30	1.5	20	1.8292	0.35	0.7	0.93	1.69	0.08	2.97	0.99
38	*Vaccinium leschenaultii*	5	50	2.5	20	1.5654	0.58	1.16	0.93	1.45	0.13	2.96	0.99
39	*Strobilanthes foliosus*	12	120	4	30	0.0738	1.4	1.86	1.4	0.07	0.13	2.87	0.96
40	*Rhododendron arboreum ssp. nilagiricum*	2	20	2	10	2.196	0.23	0.93	0.47	2.03	0.2	2.73	0.91
41	*Litsea glabrata*	7	70	1.75	40	0.0219	0.82	0.81	1.86	0.02	0.04	2.7	0.9
42	*Clerodendrum viscosum*	6	60	2	30	0.6185	0.7	0.93	1.4	0.57	0.07	2.67	0.89
43	*Meliosma pinnata*	3	30	1.5	20	1.171	0.35	0.7	0.93	1.08	0.08	2.36	0.79
44	*Vaccinium neilgherrense*	1	10	1	10	1.8	0.12	0.46	0.47	1.66	0.1	2.25	0.75
45	*Ardisia rhomboidea*	10	100	5	20	0.0518	1.17	2.32	0.93	0.05	0.25	2.15	0.72

No	SPECIES	N	D	AB	F	BA	RD	RAB	RF	RBA	DI	IVI	RIVI
46	*Chionanthus ramiflorus var. peninsularis*	5	50	1.67	30	0.0921	0.58	0.78	1.4	0.09	0.06	2.07	0.69
47	*Rhamnus wightii*	6	60	3	20	0.343	0.7	1.39	0.93	0.32	0.15	1.95	0.65
48	*Eurya nitida*	5	50	5	10	0.943	0.58	2.32	0.47	0.87	0.5	1.92	0.64
49	*Toddalia asiatica*	3	30	1	30	0.1598	0.35	0.46	1.4	0.15	0.03	1.9	0.63
50	*Hedyotis anamalayana*	5	50	2.5	20	0.0168	0.58	1.16	0.93	0.02	0.13	1.53	0.51
51	*Zanthoxylum tetraspermum*	4	40	2	20	0.0494	0.47	0.93	0.93	0.05	0.1	1.45	0.48
52	*Chassalia curviflora var. ophioxyloides*	3	30	1.5	20	0.0066	0.35	0.7	0.93	0.01	0.08	1.29	0.43
53	*Rauvolfia densiflora*	3	30	1.5	20	0.01	0.35	0.7	0.93	0.01	0.08	1.29	0.43
54	*Clerodendrum serratum*	2	20	1	20	0.0177	0.23	0.46	0.93	0.02	0.05	1.18	0.39
55	*Syzygium caryophyllatum*	2	20	1	20	0.0042	0.23	0.46	0.93	0	0.05	1.16	0.39
56	*Cocculus laurifolius*	5	50	5	10	0.0557	0.58	2.32	0.47	0.05	0.5	1.1	0.37
57	*Piper nigrum*	4	40	4	10	0.0046	0.47	1.86	0.47	0	0.4	0.94	0.31
58	*Photinia notoniana*	1	10	1	10	0.3175	0.12	0.46	0.47	0.29	0.1	0.88	0.29
59	*Ilex walkeri*	1	10	1	10	0.1693	0.12	0.46	0.47	0.16	0.1	0.75	0.25
60	*Elaeocarpus glandulosus*	2	20	2	10	0.0218	0.23	0.93	0.47	0.02	0.2	0.72	0.24
61	*Cinnamomum wightii*	1	10	1	10	0.0423	0.12	0.46	0.47	0.04	0.1	0.63	0.21
62	*Chionanthus linocieroides*	1	10	1	10	0.0353	0.12	0.46	0.47	0.03	0.1	0.62	0.21
63	*Olea paniculata*	1	10	1	10	0.018	0.12	0.46	0.47	0.02	0.1	0.61	0.2
64	*Cinnamomum keralaense*	1	10	1	10	0.0157	0.12	0.46	0.47	0.01	0.1	0.6	0.2
65	*Parthenocissus neilgherriensis*	1	10	1	10	0.003	0.12	0.46	0.47	0.01	0.1	0.6	0.2
66	*Aglaia apiocarpa*	1	10	1	10	0.0013	0.12	0.46	0.47	0	0.1	0.59	0.2
67	*Bhesa indica*	1	10	1	10	0.0007	0.12	0.46	0.47	0	0.1	0.59	0.2
68	*Maesa perrottetiana*	1	10	1	10	0.0013	0.12	0.46	0.47	0	0.1	0.59	0.2
69	*Nothapodytes nimmoniana*	1	10	1	10	0.0029	0.12	0.46	0.47	0	0.1	0.59	0.2
70	*Strobilanthes asperrimus*	1	10	1	10	0.0013	0.12	0.46	0.47	0	0.1	0.59	0.2
	TOTAL	**857**	**8570**	**215.06**	**2150**	**108.2**	**100**	**100**	**100**	**100**	**8.42**	**300**	**100**

	MS 1700 m - IVI sorted	
1	TOTAL NO. OF SPECIES	70
2	TOTAL NO. OF INDIVIDUALS	857
3	MARGALEF'S RICHNESS INDEX	10
4	MENHINICK'S RICHNESS INDEX	6.1
5	PIELOU'S EVENNESS INDEX	0.8
6	SHANNON'S DIVERSITY INDEX	3.3
7	SIMPSON'S DOMINANCE INDEX	0.1

N = No of individuals
D = Density / Ha.
AB = Abundance
F = Frequency
BA = Basal Area (m^2) / Ha.
DI = Distributional index
IVI = Importance value Index
RD, RAB, RF, RBA, RIVI = Relative Values

Appendix 8. Phytosociological attributes of Mannavan Shola (Plants □1 cm dbh)

(Altitude. **1800 m**; Plot size: (10 m x 10 m) x 10 nos. = **0.1 ha.**)

No	SPECIES	N	D	AB	F	BA	RD	RAB	RF	RBA	DI	IVI	RIVI
1	*Strobilanthes gracilis*	435	4350	48.33	90	2.2664	34.69	18.86	4.05	1.15	0.54	39.89	13.3
2	*Lasianthus acuminatus*	232	2320	23.2	100	1.6959	18.5	9.05	4.5	0.86	0.23	23.86	7.95
3	*Beilshmiedia wightii*	35	350	3.5	100	19.411	2.79	1.37	4.5	9.84	0.04	17.13	5.71
4	*Mastixia arborea*	62	620	6.89	90	13.997	4.94	2.69	4.05	7.09	0.08	16.08	5.36
5	*Elaeocarpus tuberculatus*	4	40	1	40	22.864	0.32	0.39	1.8	11.59	0.03	13.71	4.57
6	*Hydnocarpus alpina*	39	390	4.88	80	10.025	3.11	1.9	3.6	5.08	0.06	11.79	3.93
7	*Ardisia rhomboidea*	92	920	13.14	70	0.3938	7.34	5.13	3.15	0.2	0.19	10.69	3.56
8	*Isonandra perrottetiana*	12	120	3	40	14.656	0.96	1.17	1.8	7.43	0.08	10.19	3.4
9	*Litsea oleoides*	4	40	1	40	13.323	0.32	0.39	1.8	6.75	0.03	8.87	2.96
10	*Chionanthus linocieroides*	10	100	1.67	60	9.6423	0.8	0.65	2.7	4.89	0.03	8.39	2.8
11	*Cinnamomum wightii*	6	60	1.5	40	11.374	0.48	0.59	1.8	5.77	0.04	8.05	2.68
12	*Saprosma foetens*	18	180	2.25	80	3.5415	1.44	0.88	3.6	1.8	0.03	6.84	2.28
13	*Chionanthus ramiflorus* var. *peninsularis*	8	80	1.6	50	5.5682	0.64	0.62	2.25	2.82	0.03	5.71	1.9
14	*Cryptocarya bourdillonii*	7	70	3.5	20	8.3493	0.56	1.37	0.9	4.23	0.18	5.69	1.9
15	*Syzygium gardneri*	3	30	1	30	7.3431	0.24	0.39	1.35	3.72	0.03	5.31	1.77
16	*Actinodaphne bourdillonii*	10	100	1.67	60	3.297	0.8	0.65	2.7	1.67	0.03	5.17	1.72
17	*Neolitsea zeylanica*	17	170	2.43	70	0.6225	1.36	0.95	3.15	0.32	0.03	4.83	1.61
18	*Strobilanthes luridus*	47	470	23.5	20	0.2265	3.75	9.17	0.9	0.11	1.18	4.76	1.59
19	*Prunus ceylanica*	8	80	1.33	60	2.3592	0.64	0.52	2.7	1.2	0.02	4.54	1.51
20	*Scolopia crenata*	1	10	1	10	7.688	0.08	0.39	0.45	3.9	0.1	4.43	1.48
21	*Piper mullesua*	21	210	3.5	60	0.047	1.67	1.37	2.7	0.02	0.06	4.39	1.46
22	*Gomphandra coriacea*	7	70	1	70	0.9522	0.56	0.39	3.15	0.48	0.01	4.19	1.4
23	*Isonandra lanceolata*	4	40	1.33	30	3.9417	0.32	0.52	1.35	2	0.04	3.67	1.22
24	*Cinnamomum malabatrum*	4	40	1.33	30	3.7982	0.32	0.52	1.35	1.93	0.04	3.6	1.2
25	*Persea macrantha*	4	40	1	40	2.9214	0.32	0.39	1.8	1.48	0.03	3.6	1.2
26	*Ilex walkeri*	2	20	1	20	4.4637	0.16	0.39	0.9	2.26	0.05	3.32	1.11
27	*Phoebe wightii*	4	40	1.33	30	3.121	0.32	0.52	1.35	1.58	0.04	3.25	1.08
28	*Clerodendrum viscosum*	31	310	31	10	0.5245	2.47	12.1	0.45	0.27	3.1	3.19	1.06
29	*Turpinia nepalensis*	6	60	3	20	2.9781	0.48	1.17	0.9	1.51	0.15	2.89	0.96
30	*Chassalia curviflora*	2	20	0.33	60	0.0305	0.16	0.13	2.7	0.02	0.01	2.88	0.96
31	*Piper wightii*	13	130	3.25	40	0.0191	1.04	1.27	1.8	0.01	0.08	2.85	0.95
32	*Acronychia pedunculata*	5	50	1.25	40	1.1587	0.4	0.49	1.8	0.59	0.03	2.79	0.93
33	*Chassalia curviflora* var. *ophioxyloides*	5	50	1	50	0.0157	0.4	0.39	2.25	0.01	0.02	2.66	0.89
34	*Piper nigrum*	10	100	2.5	40	0.0246	0.8	0.98	1.8	0.01	0.06	2.61	0.87
35	*Bhesa indica*	4	40	2	20	2.5524	0.32	0.78	0.9	1.29	0.1	2.51	0.84
36	*Sarcococca coriacea*	5	50	1.25	40	0.0189	0.4	0.49	1.8	0.01	0.03	2.21	0.74
37	*Alseodaphne semecarpifolia*	2	20	2	10	2.7074	0.16	0.78	0.45	1.37	0.2	1.98	0.66
38	*Aglaia apiocarpa*	7	70	7	10	1.7589	0.56	2.73	0.45	0.89	0.7	1.9	0.63
39	*Lasianthus coffeoides*	11	110	5.5	20	0.0767	0.88	2.15	0.9	0.04	0.28	1.82	0.61
40	*Canthium rheedii*	2	20	1	20	1.3326	0.16	0.39	0.9	0.68	0.05	1.74	0.58
41	*Murraya paniculata*	4	40	1.33	30	0.012	0.32	0.52	1.35	0.01	0.04	1.68	0.56
42	*Toddalia asiatica*	3	30	1	30	0.1213	0.24	0.39	1.35	0.06	0.03	1.65	0.55
43	*Ternstroemia japonica*	1	10	1	10	2.1517	0.08	0.39	0.45	1.09	0.1	1.62	0.54
44	*Apollonias arnottii*	3	30	1	30	0.0046	0.24	0.39	1.35	0	0.03	1.59	0.53
45	*Lasianthus venulosus*	7	70	3.5	20	0.0116	0.56	1.37	0.9	0.01	0.18	1.47	0.49
46	*Myrsine wightiana*	1	10	1	10	1.4797	0.08	0.39	0.45	0.75	0.1	1.28	0.43
47	*Nothapodytes nimmoniana*	3	30	1.5	20	0.2129	0.24	0.59	0.9	0.11	0.08	1.25	0.42
48	*Syzygium densiflorum*	2	20	1	20	0.3188	0.16	0.39	0.9	0.16	0.05	1.22	0.41

No	SPECIES	N	D	AB	F	BA	RD	RAB	RF	RBA	DI	IVI	RIVI
49	*Eurya nitida*	2	20	1	20	0.0059	0.16	0.39	0.9	0	0.05	1.06	0.35
50	*Neolitsea fischeri*	2	20	1	20	0.0026	0.16	0.39	0.9	0	0.05	1.06	0.35
51	*Psychotria nilgiriensis*	2	20	1	20	0.0036	0.16	0.39	0.9	0	0.05	1.06	0.35
52	*Zanthoxylum tetraspermum*	2	20	1	20	0.0052	0.16	0.39	0.9	0	0.05	1.06	0.35
53	*Elaeocarpus munronii*	1	10	1	10	0.8989	0.08	0.39	0.45	0.46	0.1	0.99	0.33
54	*Syzygium caryophyllatum*	6	60	6	10	0.0094	0.48	2.34	0.45	0	0.6	0.93	0.31
55	*Glochidion neilgherrense*	1	10	1	10	0.6919	0.08	0.39	0.45	0.35	0.1	0.88	0.29
56	*Litsea wightiana*	3	30	3	10	0.0062	0.24	1.17	0.45	0	0.3	0.69	0.23
57	*Parthenocissus semicordata*	1	10	1	10	0.1843	0.08	0.39	0.45	0.09	0.1	0.62	0.21
58	*Clerodendrum serratum*	1	10	1	10	0.0135	0.08	0.39	0.45	0.01	0.1	0.54	0.18
59	*Derris brevipes*	1	10	1	10	0.0157	0.08	0.39	0.45	0.01	0.1	0.54	0.18
60	*Ilex wightiana*	1	10	1	10	0.0231	0.08	0.39	0.45	0.01	0.1	0.54	0.18
61	*Gnidia glauca*	1	10	1	10	0.0013	0.08	0.39	0.45	0	0.1	0.53	0.18
62	*Olea paniculata*	1	10	1	10	0.0039	0.08	0.39	0.45	0	0.1	0.53	0.18
63	*Piper hymenophyllum*	1	10	1	10	0.0013	0.08	0.39	0.45	0	0.1	0.53	0.18
64	*Strobilanthes micranthus*	1	10	1	10	0.0007	0.08	0.39	0.45	0	0.1	0.53	0.18
65	*Strobilanthes urceolaris*	1	10	1	10	0.0013	0.08	0.39	0.45	0	0.1	0.53	0.18
66	*Symplocos cochinchinensis ssp. laurina*	1	10	1	10	0.0013	0.08	0.39	0.45	0	0.1	0.53	0.18
67	*Symplocos oligandra*	1	10	1	10	0.0065	0.08	0.39	0.45	0	0.1	0.53	0.18
68	*Trichilia connaroides*	1	10	1	10	0.008	0.08	0.39	0.45	0	0.1	0.53	0.18
	TOTAL	**1254**	**12540**	**256.29**	**2220**	**197.28**	**100**	**100**	**100**	**100**	**11.17**	**300**	**100**

	MS 1800 m - IVI sorted	
1	**TOTAL NO. OF SPECIES**	**68**
2	TOTAL NO. OF INDIVIDUALS	1254
3	MARGALEF'S RICHNESS INDEX	9.39
4	MENHINICK'S RICHNESS INDEX	5.92
5	PIELOU'S EVENNESS INDEX	0.62
6	SHANNON'S DIVERSITY INDEX	2.61
7	SIMPSON'S DOMINANCE INDEX	0.17

N = No of individuals
D = Density / Ha.
AB = Abundance
F = Frequency
BA = Basal Area (m^2/ Ha.)
DI = Distributional index
IVI = Importance value Index
RD, RAB, RF, RBA, RIVI = Relative Values

Appendix 9. Phytosociological attributes of Mannavan Shola (Plants □1 cm dbh)

(Altitude: **1900 m**; Plot size: (10 m x 10 m) x 10 nos. = **0.1 ha.**)

No	SPECIES	N	D	AB	F	BA	RD	RAB	RF	RBA	DI	IVI	RIVI
1	*Strobilanthes gracilis*	461	4610	51.22	90	4.3703	38.32	28.62	5.84	2.9	0.57	47.06	15.69
2	*Ardisia rhomboidea*	185	1850	18.5	100	2.4994	15.38	10.34	6.49	1.66	0.19	23.53	7.84
3	*Lasianthus acuminatus*	166	1660	16.6	100	2.5166	13.8	9.28	6.49	1.67	0.17	21.96	7.32
4	*Beilshmiedia wightii*	34	340	3.4	100	11.258	2.83	1.9	6.49	7.47	0.03	16.79	5.6
5	*Mastixia arborea*	30	300	3.33	90	11.829	2.49	1.86	5.84	7.85	0.04	16.18	5.39
6	*Strobilanthes luridus*	92	920	13.14	70	0.2861	7.65	7.34	4.55	0.19	0.19	12.39	4.13
7	*Strobilanthes micranthus*	90	900	15	60	0.6633	7.48	8.38	3.9	0.44	0.25	11.82	3.94
8	*Cinnamomum wightii*	10	100	1.67	60	10.446	0.83	0.93	3.9	6.93	0.03	11.66	3.89
9	*Syzygium caryophyllatum*	7	70	1.75	40	9.9045	0.58	0.98	2.6	6.57	0.04	9.75	3.25
10	*Elaeocarpus glandulosus*	1	10	1	10	13.057	0.08	0.56	0.65	8.67	0.1	9.4	3.13
11	*Syzygium gardneri*	6	60	1.5	40	9.3758	0.5	0.84	2.6	6.22	0.04	9.32	3.11
12	*Isonandra perrottetiana*	11	110	2.2	50	7.5952	0.91	1.23	3.25	5.04	0.04	9.2	3.07
13	*Actinodaphne bourneae*	8	80	1.6	50	5.673	0.67	0.89	3.25	3.77	0.03	7.69	2.56
14	*Syzygium cumini*	1	10	1	10	9.248	0.08	0.56	0.65	6.14	0.1	6.87	2.29
15	*Persea macrantha*	10	100	2	50	3.5738	0.83	1.12	3.25	2.37	0.04	6.45	2.15
16	*Symplocos oligandra*	17	170	2.83	60	1.2597	1.41	1.58	3.9	0.84	0.05	6.15	2.05
17	*Gomphandra coriacea*	8	80	2.67	30	4.2122	0.67	1.49	1.95	2.8	0.09	5.42	1.81
18	*Saprosma foetens*	7	70	1.4	50	2.0278	0.58	0.78	3.25	1.35	0.03	5.18	1.73
19	*Syzygium densiflorum*	1	10	1	10	5.832	0.08	0.56	0.65	3.87	0.1	4.6	1.53
20	*Litsea oleoides*	4	40	1	40	2.4181	0.33	0.56	2.6	1.61	0.03	4.54	1.51
21	*Prunus ceylanica*	2	20	1	20	4.3808	0.17	0.56	1.3	2.91	0.05	4.38	1.46
22	*Neolitsea fischeri*	4	40	1.33	30	3.0324	0.33	0.74	1.95	2.01	0.04	4.29	1.43
23	*Glochidion ellipticum*	3	30	1	30	2.7105	0.25	0.56	1.95	1.8	0.03	4	1.33
24	*Scolopia crenata*	1	10	1	10	4.9203	0.08	0.56	0.65	3.27	0.1	4	1.33
25	*Celtis tetrandra*	2	20	1	20	3.3761	0.17	0.56	1.3	2.24	0.05	3.71	1.24
26	*Isonandra lanceolata*	3	30	1	30	2.0465	0.25	0.56	1.95	1.36	0.03	3.56	1.19
27	*Ternstroemia japonica*	1	10	1	10	3.872	0.08	0.56	0.65	2.57	0.1	3.3	1.1
28	*Myrsine wightiana*	3	30	1	30	0.761	0.25	0.56	1.95	0.51	0.03	2.71	0.9
29	*Symplocos foliosa*	4	40	2	20	1.4453	0.33	1.12	1.3	0.96	0.1	2.59	0.86
30	*Piper mullesua*	4	40	1.33	30	0.0129	0.33	0.74	1.95	0.01	0.04	2.29	0.76
31	*Connarus wightii*	1	10	1	10	1.8483	0.08	0.56	0.65	1.23	0.1	1.96	0.65
32	*Turpinia nepalensis*	1	10	1	10	1.352	0.08	0.56	0.65	0.9	0.1	1.63	0.54
33	*Neolitsea zeylanica*	3	30	1.5	20	0.0117	0.25	0.84	1.3	0.01	0.08	1.56	0.52
34	*Ficus amplocarpa*	2	20	1	20	0.0533	0.17	0.56	1.3	0.04	0.05	1.51	0.5
35	*Nothapodytes nimmoniana*	1	10	1	10	0.8653	0.08	0.56	0.65	0.57	0.1	1.3	0.43
36	*Microtropis ramiflora*	1	10	1	10	0.8487	0.08	0.56	0.65	0.56	0.1	1.29	0.43
37	*Chionanthus ramiflorus* var. *peninsularis*	3	30	3	10	0.259	0.25	1.68	0.65	0.17	0.3	1.07	0.36
38	*Eurya japonica*	1	10	1	10	0.392	0.08	0.56	0.65	0.26	0.1	0.99	0.33
39	*Cocculus laurifolius*	3	30	3	10	0.0137	0.25	1.68	0.65	0.01	0.3	0.91	0.3
40	*Symplocos pendula*	2	20	2	10	0.1237	0.17	1.12	0.65	0.08	0.2	0.9	0.3
41	*Debregeasia velutina*	2	20	2	10	0.0578	0.17	1.12	0.65	0.04	0.2	0.86	0.29
42	*Ilex wightiana*	1	10	1	10	0.0871	0.08	0.56	0.65	0.06	0.1	0.79	0.26
43	*Excoecaria crenulata*	1	10	1	10	0.0541	0.08	0.56	0.65	0.04	0.1	0.77	0.26
44	*Psychotria nilgiriensis*	1	10	1	10	0.0423	0.08	0.56	0.65	0.03	0.1	0.76	0.25
45	*Neolitsea scrobiculata*	1	10	1	10	0.018	0.08	0.56	0.65	0.01	0.1	0.74	0.25

No	SPECIES	N	D	AB	F	BA	RD	RAB	RF	RBA	DI	IVI	RIVI
46	*Phoebe wightii*	1	10	1	10	0.0115	0.08	0.56	0.65	0 01	0.1	0.74	0.25
47	*Clerodendrum serratum*	1	10	1	10	0.002	0.08	0.56	0.65	0	0.1	0.73	0.24
48	*Toddalia asiatica*	1	10	1	10	0.0013	0.08	0.56	0.65	0	0.1	0.73	0.24
	TOTAL	**1203**	**12030**	**178.97**	**1540**	**150.65**	**100**	**100**	**100**	**100**	**5.06**	**300**	**100**

* Figures in **Bold** indicate highest values

	MS 1900 m - IVI sorted	
1	TOTAL NO. OF SPECIES	48
2	TOTAL NO. OF INDIVIDUALS	1203
3	MARGALEF'S RICHNESS INDEX	6.63
4	MENHINICK'S RICHNESS INDEX	4.18
5	PIELOU'S EVENNESS INDEX	0.56
6	SHANNON'S DIVERSITY INDEX	2.17
7	SIMPSON'S DOMINANCE INDEX	0.2

N = No of individuals
D = Density / Ha.
AB = Abundance
F = Frequency
BA = Basal Area (m^2/ Ha.)
DI = Distributional index
IVI = Importance value Index
RD, RAB, RF, RBA, RIVI = Relative Values

Appendix 10. Phytosociological attributes of Mannavan Shola (Plants □1 cm dbh)

(Altitude: **2000 m**; Plot size: (10 m x 10 m) x 10 nos. = **0.1 ha.**)

No	SPECIES	N	D	AB	F	BA	RD	RAB	RF	RBA	DI	IVI	RIVI
1	*Lasianthus acuminatus*	302	3020	30.2	100	3.1015	24.32	15.91	5.15	2.46	0.3	31.93	10.64
2	*Strobilanthes gracilis*	272	2720	30.22	90	2.2794	21.9	15.92	4.64	1.81	0.34	28.35	9.45
3	*Ardisia rhomboidea*	225	2250	22.5	100	2.79	18.12	11.86	5.15	2.21	0.23	25.48	8.49
4	*Syzygium gardneri*	19	190	2.38	80	17.927	1.53	1.25	4.12	14.22	0.03	19.87	6.62
5	*Cinnamomum wightii*	45	450	4.5	100	12.434	3.62	2.37	5.15	9.86	0.05	18.63	6.21
6	*Beilshmiedia wightii*	24	240	2.67	90	13.6	1.93	1.41	4.64	10.79	0.03	17.36	5.79
7	*Syzygium caryophyllatum*	20	200	2.5	80	14.523	1.61	1.32	4.12	11.52	0.03	17.25	5.75
8	*Litsea wightiana*	25	250	3.57	70	11.435	2.01	1.88	3.61	9.07	0.05	14.69	4.9
9	*Litsea oleoides*	26	260	3.25	80	8.9437	2.09	1.71	4.12	7.09	0.04	13.3	4.43
10	*Ilex wightiana*	7	70	1.4	50	7.9195	0.56	0.74	2.58	6.28	0.03	9.42	3.14
11	*Strobilanthes micranthus*	60	600	10	60	0.3996	4.83	5.27	3.09	0.32	0.17	8.24	2.75
12	*Gomphandra coriacea*	15	150	2.5	60	4.7528	1.21	1.32	3.09	3.77	0.04	8.07	2.69
13	*Turpinia nepalensis*	11	110	1.38	80	3.6722	0.89	0.73	4.12	2.91	0.02	7.92	2.64
14	*Neolitsea zeylanica*	18	180	2.57	70	3.4506	1.45	1.35	3.61	2.74	0.04	7.8	2.6
15	*Casearia thwaitesii*	6	60	1.2	50	3.5905	0.48	0.63	2.58	2.85	0.02	5.91	1.97
16	*Casearia zeylanica*	10	100	2.5	40	2.5943	0.81	1.32	2.06	2.06	0.06	4.93	1.64
17	*Mastixia arborea*	21	210	7	30	1.9385	1.69	3.69	1.55	1.54	0.23	4.78	1.59
18	*Neolitsea scrobiculata*	10	100	2.5	40	1.941	0.81	1.32	2.06	1.54	0.06	4.41	1.47
19	*Cinnamomum filipedicellatum*	13	130	2.6	50	0.3416	1.05	1.37	2.58	0.27	0.05	3.9	1.3
20	*Prunus ceylanica*	6	60	1.2	50	0.6598	0.48	0.63	2.58	0.52	0.02	3.58	1.19
21	*Psychotria elongata*	7	70	1.4	50	0.2135	0.56	0.74	2.58	0.17	0.03	3.31	1.1
22	*Litsea coriacea*	9	90	3	30	1.0508	0.72	1.58	1.55	0.83	0.1	3.1	1.03
23	*Derris brevipes*	6	60	1.5	40	0.5615	0.48	0.79	2.06	0.45	0.04	2.99	1
24	*Strobilanthes luridus*	23	230	11.5	20	0.0485	1.85	6.06	1.03	0.04	0.58	2.92	0.97
25	*Litsea glabrata*	5	50	1.25	40	0.1094	0.4	0.66	2.06	0.09	0.03	2.55	0.85
26	*Symplocos foliosa*	3	30	1.5	20	1.5621	0.24	0.79	1.03	1.24	0.08	2.51	0.84
27	*Microtropis ramiflora*	3	30	1.5	20	1.121	0.24	0.79	1.03	0.89	0.08	2.16	0.72
28	*Chassalia curviflora var. ophioxyloides*	6	60	2	30	0.0133	0.48	1.05	1.55	0.01	0.07	2.04	0.68
29	*Neolitsea fischeri*	1	10	1	10	1.4365	0.08	0.53	0.52	1.14	0.1	1.74	0.58
30	*Pavetta breviflora*	3	30	1.5	20	0.3902	0.24	0.79	1.03	0.31	0.08	1.58	0.53
31	*Hedyotis anamalayana*	5	50	2.5	20	0.0342	0.4	1.32	1.03	0.03	0.13	1.46	0.49
32	*Piper mullesua*	4	40	2	20	0.0152	0.32	1.05	1.03	0.01	0.1	1.36	0.45
33	*Strobilanthes wightianus*	4	40	2	20	0.0158	0.32	1.05	1.03	0.01	0.1	1.36	0.45
34	*Lasianthus venulosus*	3	30	1.5	20	0.0529	0.24	0.79	1.03	0.04	0.08	1.31	0.44
35	*Psychotria nilgiriensis*	3	30	1.5	20	0.0207	0.24	0.79	1.03	0.02	0.08	1.29	0.43
36	*Piper wightii*	3	30	1.5	20	0.0091	0.24	0.79	1.03	0.01	0.08	1.28	0.43
37	*Elaeagnus kologa*	2	20	1	20	0.0807	0.16	0.53	1.03	0.06	0.05	1.25	0.42
38	*Nothapodytes nimmoniana*	2	20	1	20	0.0279	0.16	0.53	1.03	0.02	0.05	1.21	0.4
39	*Piper hymenophyllum*	2	20	1	20	0.004	0.16	0.53	1.03	0	0.05	1.19	0.4
40	*Symplocos macrophylla ssp. rosea*	2	20	2	10	0.4112	0.16	1.05	0.52	0.33	0.2	1.01	0.34
41	*Isonandra perrottetiana*	1	10	1	10	0.45	0.08	0.53	0.52	0.36	0.1	0.96	0.32
42	*Phoebe wightii*	2	20	2	10	0.0144	0.16	1.05	0.52	0.01	0.2	0.69	0.23
43	*Celtis tetrandra*	1	10	1	10	0.0769	0.08	0.53	0.52	0.06	0.1	0.66	0.22
44	*Cinnamomum travancoricum*	1	10	1	10	0.0259	0.08	0.53	0.52	0.02	0.1	0.62	0.21
45	*Antidesma menasu*	1	10	1	10	0.0097	0.08	0.53	0.52	0.01	0.1	0.61	0.2

No	SPECIES	N	D	AB	F	BA	RD	RAB	RF	RBA	DI	IVI	RIVI
46	*Clerodendrum viscosum*	1	10	1	10	0.0051	0.08	0.53	0.52	0	0.1	0.6	0.2
47	*Cryptocarya bourdillonii*	1	10	1	10	0.0029	0.08	0.53	0.52	0	0.1	0.6	0.2
48	*Rungia laeta*	1	10	1	10	0.002	0.08	0.53	0.52	0	0.1	0.6	0.2
49	*Strobilanthes calycinus*	1	10	1	10	0.002	0.08	0.53	0.52	0	0.1	0.6	0.2
50	*Symplocos oliqandra*	1	10	1	10	0.0013	0.08	0.53	0.52	0	0.1	0.6	0.2
	TOTAL	1242	12420	189.79	1940	126.06	100	100	100	100	5.05	300	100

* Figures in **Bold** indicate highest values

	MS 2000 m - IVI sorted	
1	**TOTAL NO. OF SPECIES**	**50**
2	TOTAL NO. OF INDIVIDUALS	1242
3	MARGALEF'S RICHNESS INDEX	6.88
4	MENHINICK'S RICHNESS INDEX	4.35
5	PIELOU'S EVENNESS INDEX	0.64
6	SHANNON'S DIVERSITY INDEX	2.52
7	SIMPSON'S DOMINANCE INDEX	0.15

N = No of individuals
D = Density / Ha.
AB = Abundance
F = Frequency
BA = Basal Area (m^2/ Ha.)
DI = Distributional index
IVI = Importance value Index
RD, RAB, RF, RBA, RIVI = Relative Values

Appendix 11. Phytosociological attributes of Mannavan Shola (Plants □1 cm dbh)

(Altitude: **2100 m**; Plot size: (10 m x 10 m) x 10 nos. = **0.1 ha.**)

No	SPECIES	N	D	AB	F	BA	RD	RAB	RF	RBA	DI	IVI	RIVI
1	*Syzygium caryophyllatum*	70	700	8.75	80	15.098	5.48	3.99	3.76	10.12	0.11	19.4	6.45
2	*Cinnamomum wightii*	97	970	10.78	90	10.245	7.6	4.91	4.23	6.87	0.12	18.7	6.23
3	*Lasianthus acuminatus*	149	1490	14.9	100	1.563	11.67	6.79	4.69	1.05	0.15	17.4	5.8
4	*Strobilanthes gracilis*	152	1520	21.71	70	2.6068	11.9	9.89	3.29	1.75	0.31	16.9	5.65
5	*Ardisia rhomboidea*	152	1520	25.33	60	3.1358	11.9	11.54	2.82	2.1	0.42	16.8	5.61
6	*Syzygium densiflorum*	42	420	5.25	80	11.747	3.29	2.39	3.76	7.87	0.07	14.9	4.97
7	*Ilex walkeri*	14	140	2.8	50	16.097	1.1	1.28	2.35	10.79	0.06	14.2	4.75
8	*Litsea wightiana*	73	730	7.3	100	4.2077	5.72	3.33	4.69	2.82	0.07	13.2	4.41
9	*Neolitsea zeylanica*	53	530	5.3	100	5.6811	4.15	2.41	4.69	3.81	0.05	12.7	4.22
10	*Litsea oleoides*	27	270	3.86	70	9.5693	2.11	1.76	3.29	6.42	0.06	11.8	3.94
11	*Turpinia nepalensis*	33	330	4.13	80	7.0765	2.58	1.88	3.76	4.74	0.05	11.1	3.69
12	*Psychotria nilgiriensis*	68	680	7.56	90	0.9221	5.32	3.44	4.23	0.62	0.08	10.2	3.39
13	*Arundinaria floribunda*	28	280	5.6	50	8.1673	2.19	2.55	2.35	5.48	0.11	10	3.34
14	*Cinnamomum macrocarpum*	8	80	2	40	10.529	0.63	0.91	1.88	7.06	0.05	9.57	3.19
15	*Strobilanthes micranthus*	76	760	15.2	50	0.668	5.95	6.92	2.35	0.45	0.3	8.75	2.92
16	*Phoebe wightii*	3	30	3	10	10.877	0.23	1.37	0.47	7.29	0.3	7.99	2.66
17	*Casearia thwaitesii*	23	230	3.83	60	3.8353	1.8	1.74	2.82	2.57	0.06	7.19	2.4
18	*Cinnamomum filipedicellatum*	23	230	3.29	70	2.3028	1.8	1.5	3.29	1.54	0.05	6.63	2.21
19	*Myrsine thwaitesii*	20	200	4	50	3.7982	1.57	1.82	2.35	2.55	0.08	6.47	2.16
20	*Beilshmiedia wightii*	15	150	2.5	60	2.8467	1.17	1.14	2.82	1.91	0.04	5.9	1.97
21	*Ilex wightiana*	4	40	1.33	30	5.2738	0.31	0.61	1.41	3.54	0.04	5.26	1.75
22	*Persea macrantha*	12	120	2.4	50	2.9392	0.94	1.09	2.35	1.97	0.05	5.26	1.75
23	*Derris brevipes*	13	130	2.17	60	1.1584	1.02	0.99	2.82	0.78	0.04	4.62	1.54
24	*Piper schmidtii*	12	120	1.71	70	0.0619	0.94	0.78	3.29	0.04	0.02	4.27	1.42
25	*Strobilanthes wightianus*	29	290	7.25	40	0.0429	2.27	3.3	1.88	0.03	0.18	4.18	1.39
26	*Myrsine wightiana*	8	80	2.67	30	2.4336	0.63	1.22	1.41	1.63	0.09	3.67	1.22
27	*Symplocos anamalayana*	9	90	3	30	1.7077	0.7	1.37	1.41	1.14	0.1	3.25	1.08
28	*Lasianthus venulosus*	7	70	1.75	40	0.4549	0.55	0.8	1.88	0.3	0.04	2.73	0.91
29	*Neolitsea scrobiculata*	4	40	1.33	30	0.653	0.31	0.61	1.41	0.44	0.04	2.16	0.72
30	*Rhododendron arboreum ssp. nilagiricum*	2	20	1	20	1.4967	0.16	0.46	0.94	1	0.05	2.1	0.7
31	*Eurya nitida*	7	70	2.33	30	0.1793	0.55	1.06	1.41	0.12	0.08	2.08	0.69
32	*Daphniphyllum neilgherrense*	3	30	1.5	20	0.5457	0.23	0.68	0.94	0.37	0.08	1.54	0.51
33	*Nothapodytes nimmoniana*	3	30	1.5	20	0.1203	0.23	0.68	0.94	0.08	0.08	1.25	0.42
34	*Piper wightii*	3	30	1.5	20	0.0122	0.23	0.68	0.94	0.01	0.08	1.18	0.39
35	*Piper hymenophyllum*	3	30	1.5	20	0.0046	0.23	0.68	0.94	0	0.08	1.17	0.39
36	*Symplocos macrophylla ssp. macrophylla*	3	30	1.5	20	0.0038	0.23	0.68	0.94	0	0.08	1.17	0.39
37	*Hedyotis corymbosa*	2	20	1	20	0.0026	0.16	0.46	0.94	0	0.05	1.1	0.37
38	*Elaeocarpus recurvatus*	2	20	2	10	0.53	0.16	0.91	0.47	0.36	0.2	0.99	0.33
39	*Connarus wightii*	3	30	3	10	0.3089	0.23	1.37	0.47	0.21	0.3	0.91	0.3
40	*Piper argyrophyllum*	3	30	3	10	0.0103	0.23	1.37	0.47	0.01	0.3	0.71	0.24
41	*Mastixia arborea*	1	10	1	10	0.1549	0.08	0.46	0.47	0.1	0.1	0.65	0.22
42	*Isonandra perrottetiana*	1	10	1	10	0.0259	0.08	0.46	0.47	0.02	0.1	0.57	0.19
43	*Schefflera racemosa*	1	10	1	10	0.0231	0.08	0.46	0.47	0.02	0.1	0.57	0.19
44	*Glochidion neilgherrense*	1	10	1	10	0.008	0.08	0.46	0.47	0.01	0.1	0.56	0.19
45	*Piper mullesua*	1	10	1	10	0.0097	0.08	0.46	0.47	0.01	0.1	0.56	0.19

No	SPECIES	N	D	AB	F	BA	RD	RAB	RF	RBA	DI	IVI	RIVI
46	*Celtis tetrandra*	1	10	1	10	0.002	0.08	0.46	0.47	0	0.1	0.55	0.18
47	*Elaeagnus kologa*	1	10	1	10	0.0013	0.08	0.46	0.47	0	0.1	0.55	0.18
48	*Gomphandra coriacea*	1	10	1	10	0.0013	0.08	0.46	0.47	0	0.1	0.55	0.18
49	*Hedyotis anamalayana*	1	10	1	10	0.0029	0.08	0.46	0.47	0	0.1	0.55	0.18
50	*Ligustrum perrottetii*	1	10	1	10	0.0051	0.08	0.46	0.47	0	0.1	0.55	0.18
51	*Parthenocissus semicordata*	1	10	1	10	0.0029	0.08	0.46	0.47	0	0.1	0.55	0.18
52	*Piper attenuatum*	1	10	1	10	0.001	0.08	0.46	0.47	0	0.1	0.55	0.18
53	*Polygala arillata*	1	10	1	10	0.0065	0.08	0.46	0.47	0	0.1	0.55	0.18
54	*Prunus ceylanica*	1	10	1	10	0.0013	0.08	0.46	0.47	0	0.1	0.55	0.18
55	*Senecio scandens*	1	10	1	10	0.0029	0.08	0.46	0.47	0	0.1	0.55	0.18
56	*Symplocos foliosa*	1	10	1	10	0.0013	0.08	0.46	0.47	0	0.1	0.55	0.18
57	*Symplocos macrophylla* ssp. *rosea*	1	10	1	10	0.0051	0.08	0.46	0.47	0	0.1	0.55	0.18
58	*Symplocos pendula*	1	10	1	10	0.0013	0.08	0.46	0.47	0	0.1	0.55	0.18
59	*Tylophora mollissima*	1	10	1	10	0.0013	0.08	0.46	0.47	0	0.1	0.55	0.18
	TOTAL	**1277**	**12770**	**219.53**	**2130**	**149.17**	**100**	**100**	**100**	**100**	**6.42**	**300**	**100**

	MS 2100 m - IVI sorted	
1	TOTAL NO. OF SPECIES	59
2	TOTAL NO. OF INDIVIDUALS	1277
3	MARGALEF'S RICHNESS INDEX	8.11
4	MENHINICK'S RICHNESS INDEX	5.14
5	PIELOU'S EVENNESS INDEX	0.75
6	SHANNON'S DIVERSITY INDEX	3.08
7	SIMPSON'S DOMINANCE INDEX	0.07

N = No of individuals
D = Density / Ha.
AB = Abundance
F = Frequency
BA = Basal Area (m^2/ Ha.)
DI = Distributional index
IVI = Importance value Index
RD, RAB, RF, RBA, RIVI = Relative Values

Appendix 12. Phytosociological attributes of Mannavan Shola (Plants ≥1 cm dbh)

(Altitude: **2200 m**; Plot size: (10 m x 10 m) x 10 nos. = **0.1 ha.**)

No	SPECIES	N	D	AB	F	BA	RD	RAB	RF	RBA	DI	IVI	RIVI
1	*Psychotria nilgiriensis* var. *astephana*	334	3340	33.4	100	3.7742	31.72	17.13	4.02	1.79	0.33	37.53	12.51
2	*Arundinaria floribunda*	58	580	7.25	80	40.299	5.51	3.72	3.21	19.07	0.09	27.79	9.26
3	*Syzygium caryophyllatum*	67	670	7.44	90	17.559	6.36	3.81	3.61	8.31	0.08	18.28	6.09
4	*Turpinia nepalensis*	30	300	3.75	80	15.011	2.85	1.92	3.21	7.1	0.05	13.16	4.39
5	*Elaeocarpus recurvatus*	14	140	1.56	90	15.075	1.33	0.8	3.61	7.14	0.02	12.08	4.03
6	*Litsea wightiana*	54	540	5.4	100	3.3615	5.13	2.77	4.02	1.59	0.05	10.74	3.58
7	*Syzygium densiflorum*	44	440	5.5	80	6.8275	4.18	2.82	3.21	3.23	0.07	10.62	3.54
8	*Ilex walkeri*	8	80	2	40	16.428	0.76	1.03	1.61	7.78	0.05	10.15	3.38
9	*Cinnamomum wightii*	29	290	3.22	90	7.7137	2.75	1.65	3.61	3.65	0.04	10.01	3.34
10	*Strobilanthes gracilis*	76	760	15.2	50	0.4188	7.22	7.79	2.01	0.2	0.3	9.43	3.14
11	*Rhododendron arboreum* ssp. *nilagiricum*	12	120	2.4	50	12.666	1.14	1.23	2.01	6	0.05	9.15	3.05
12	*Ilex wightiana*	3	30	1.5	20	15.613	0.28	0.77	0.8	7.39	0.08	8.47	2.82
13	*Symplocos foliosa*	14	140	2	70	6.8804	1.33	1.03	2.81	3.26	0.03	7.4	2.47
14	*Mahonia leschenaultii*	30	300	3.75	80	1.1184	2.85	1.92	3.21	0.53	0.05	6.59	2.2
15	*Cinnamomum keralaense*	7	70	2.33	30	9.039	0.66	1.19	1.2	4.28	0.08	6.14	2.05
16	*Microtropis ramiflora*	23	230	4.6	50	2.4205	2.18	2.36	2.01	1.15	0.09	5.34	1.78
17	*Vaccinium leschenaultii*	7	70	1.75	40	5.5557	0.66	0.9	1.61	2.63	0.04	4.9	1.63
18	*Neolitsea zeylanica*	20	200	2.86	70	0.055	1.9	1.47	2.81	0.03	0.04	4.74	1.58
19	*Ligustrum perrottetii*	3	30	1.5	20	7.3511	0.28	0.77	0.8	3.48	0.08	4.56	1.52
20	*Piper schmidtii*	16	160	2.29	70	0.1758	1.52	1.17	2.81	0.08	0.03	4.41	1.47
21	*Cinnamomum macrocarpum*	4	40	2	20	5.3189	0.38	1.03	0.8	2.52	0.1	3.7	1.23
22	*Symplocos macrophylla* ssp. *rosea*	20	200	5	40	0.2568	1.9	2.56	1.61	0.12	0.13	3.63	1.21
23	*Myrsine thwaitesii*	7	70	1.75	40	2.774	0.66	0.9	1.61	1.31	0.04	3.58	1.19
24	*Ageratina adenophora*	14	140	2.8	50	0.0265	1.33	1.44	2.01	0.01	0.06	3.35	1.12
25	*Myrsine wightiana*	6	60	3	20	3.6213	0.57	1.54	0.8	1.71	0.15	3.08	1.03
26	*Daphniphyllum neilgherrense*	7	70	1.4	50	0.3622	0.66	0.72	2.01	0.17	0.03	2.84	0.95
27	*Symplocos cochinchinensis* ssp. *laurina*	12	120	3	40	0.0865	1.14	1.54	1.61	0.04	0.08	2.79	0.93
28	*Pteridium aquilinum*	10	100	2.5	40	0.0118	0.95	1.28	1.61	0.01	0.06	2.57	0.86
29	*Pittosporum neelgherrense*	2	20	2	10	3.9968	0.19	1.03	0.4	1.89	0.2	2.48	0.83
30	*Meliosma simplicifolia*	3	30	0.6	50	0.3065	0.28	0.31	2.01	0.15	0.01	2.44	0.81
31	*Elaeagnus kologa*	7	70	1.75	40	0.1132	0.66	0.9	1.61	0.05	0.04	2.32	0.77
32	*Arachniodes aristata* (fern)	7	70	1.75	40	0.005	0.66	0.9	1.61	0	0.04	2.27	0.76
33	*Piper argyrophyllum*	6	60	1.5	40	0.0093	0.57	0.77	1.61	0	0.04	2.18	0.73
34	*Meliosma simplicifolia* ssp. *pungens*	5	50	1.25	40	0.164	0.47	0.64	1.61	0.08	0.03	2.16	0.72
35	*Symplocos cochinchinensis*	1	10	0.2	50	0.0885	0.09	0.1	2.01	0.04	0	2.14	0.71
36	*Lasianthus venulosus*	9	90	3	30	0.0581	0.85	1.54	1.2	0.03	0.1	2.08	0.69
37	*Symplocos macrophylla* ssp. *macrophylla*	4	40	1.33	30	0.89	0.38	0.68	1.2	0.42	0.04	2	0.67
38	*Cinnamomum filipedicellatum*	8	80	2.67	30	0.0186	0.76	1.37	1.2	0.01	0.09	1.97	0.66
39	*Myrsine capitellata*	1	10	1	10	2.4781	0.09	0.51	0.4	1.17	0.1	1.66	0.55
40	*Michelia nilagirica*	2	20	1	20	1.3571	0.19	0.51	0.8	0.64	0.05	1.63	0.54
41	*Syzygium gardneri*	2	20	1	20	1.3533	0.19	0.51	0.8	0.64	0.05	1.63	0.54
42	*Neolitsea scrobiculata*	4	40	1.33	30	0.0233	0.38	0.68	1.2	0.01	0.04	1.59	0.53
43	*Osbeckia leschenaultiana*	7	70	3.5	20	0.0706	0.66	1.79	0.8	0.03	0.18	1.49	0.5
44	*Rubus ellipticus*	3	30	1	30	0.0149	0.28	0.51	1.2	0.01	0.03	1.49	0.5
45	*Sageretia hamosa*	3	30	1	30	0.0106	0.28	0.51	1.2	0.01	0.03	1.49	0.5

No	SPECIES	N	D	AB	F	BA	RD	RAB	RF	RBA	DI	IVI	RIVI
46	*Litsea glabrata*	3	30	1	30	0.0035	0.28	0.51	1.2	0	0.03	1.48	0.49
47	*Polygonum chinense*	3	30	1	30	0.0038	0.28	0.51	1.2	0	0.03	1.48	0.49
48	*Rubus niveus*	3	30	1	30	0.0033	0.28	0.51	1.2	0	0.03	1.48	0.49
49	*Pilea trinervia*	4	40	2	20	0.0552	0.38	1.03	0.8	0.03	0.1	1.21	0.4
50	*Rubus fairholmianus*	4	40	2	20	0.0046	0.38	1.03	0.8	0	0.1	1.18	0.39
51	*Schefflera rostrata*	2	20	1	20	0.1076	0.19	0.51	0.8	0.05	0.05	1.04	0.35
52	*Toddalia asiatica*	2	20	1	20	0.0272	0.19	0.51	0.8	0.01	0.05	1	0.33
53	*Casearia thwaitesii*	3	30	3	10	0.0122	0.28	1.54	0.4	0.01	0.3	0.69	0.23
54	*Leucas lanceaefolia*	3	30	3	10	0.011	0.28	1.54	0.4	0.01	0.3	0.69	0.23
55	*Plectranthus coleoides*	3	30	3	10	0.0046	0.28	1.54	0.4	0	0.3	0.68	0.23
56	*Nothapodytes nimmoniana*	2	20	2	10	0.0641	0.19	1.03	0.4	0.03	0.2	0.62	0.21
57	*Derris brevipes*	2	20	2	10	0.0058	0.19	1.03	0.4	0	0.2	0.59	0.2
58	*Notonia walkeri*	2	20	2	10	0.0027	0.19	1.03	0.4	0	0.2	0.59	0.2
59	*Bischofia javanica*	1	10	1	10	0.098	0.09	0.51	0.4	0.05	0.1	0.54	0.18
60	*Alsophila nilgirensis* (tree fern)	1	10	1	10	0.0583	0.09	0.51	0.4	0.03	0.1	0.52	0.17
61	*Eurya nitida*	1	10	1	10	0.018	0.09	0.51	0.4	0.01	0.1	0.5	0.17
62	*Ilex denticulata*	1	10	1	10	0.0135	0.09	0.51	0.4	0.01	0.1	0.5	0.17
63	*Gaultheria fragrantissima*	1	10	1	10	0.0007	0.09	0.51	0.4	0	0.1	0.49	0.16
64	*Hedyotis anamalayana*	1	10	1	10	0.0013	0.09	0.51	0.4	0	0.1	0.49	0.16
65	*Hypericum mysurense*	1	10	1	10	0.008	0.09	0.51	0.4	0	0.1	0.49	0.16
66	*Impatiens hensloviana*	1	10	1	10	0.0013	0.09	0.51	0.4	0	0.1	0.49	0.16
67	*Persea macrantha*	1	10	1	10	0.008	0.09	0.51	0.4	0	0.1	0.49	0.16
68	*Piper mullesua*	1	10	1	10	0.0013	0.09	0.51	0.4	0	0.1	0.49	0.16
69	*Piper wightii*	1	10	1	10	0.0013	0.09	0.51	0.4	0	0.1	0.49	0.16
70	*Smilax wightii*	1	10	1	10	0.0013	0.09	0.51	0.4	0	0.1	0.49	0.16
71	*Solanum viarum*	1	10	1	10	0.0013	0.09	0.51	0.4	0	0.1	0.49	0.16
72	*Vernonia bourneana*	1	10	1	10	0.0013	0.09	0.51	0.4	0	0.1	0.49	0.16
	TOTAL	1053	10530	195.03	2490	211.28	100	100	100	100	6.66	300	100

* Figures in **Bold** indicate highest values

	MS 2200 m - IVI sorted	
1	TOTAL NO. OF SPECIES	72
2	TOTAL NO. OF INDIVIDUALS	1053
3	MARGALEF'S RICHNESS INDEX	10.2
4	MENHINICK'S RICHNESS INDEX	6.27
5	PIELOU'S EVENNESS INDEX	0.7
6	SHANNON'S DIVERSITY INDEX	3.01
7	SIMPSON'S DOMINANCE INDEX	0.12

N = No of individuals
D = Density / Ha.
AB = Abundance
F = Frequency
BA = Basal Area (m^2/ Ha.)
DI = Distributional index
IVI = Importance value Index
RD, RAB, RF, RBA, RIVI = Relative Values

Appendix 13. Phytosociological attributes of Mannavan Shola (Plants □1 cm dbh)

(Altitude: **2300 m**; Plot size: (10 m x 10 m) x 10 nos. = **0.1 ha.**)

No	SPECIES	N	D	AB	F	BA	RD	RAB	RF	RBA	DI	IVI	RIVI
1	*Strobilanthes gracilis*	448	4480	89.6	50	2.1997	31.8	31.53	2.05	1.44	1.79	35.3	11.76
2	*Psychotria nilgiriensis* var. *astephana*	271	2710	27.1	100	2.4824	19.23	9.54	4.1	1.62	0.27	25	8.32
3	*Syzygium caryophyllatum*	42	420	4.67	90	22.147	2.98	1.64	3.69	14.5	0.05	21.2	7.06
4	*Arundinaria floribunda*	36	360	4.5	80	20.739	2.56	1.58	3.28	13.57	0.06	19.4	6.47
5	*Elaeocarpus recurvatus*	18	180	2	90	21.057	1.28	0.7	3.69	13.78	0.02	18.8	6.25
6	*Litsea wightiana*	79	790	7.9	100	7.0824	5.61	2.78	4.1	4.64	0.08	14.4	4.78
7	*Microtropis ramiflora*	97	970	10.78	90	5.0731	6.88	3.79	3.69	3.32	0.12	13.9	4.63
8	*Symplocos foliosa*	25	250	2.78	90	11.463	1.77	0.98	3.69	7.5	0.03	13	4.32
9	*Turpinia nepalensis*	18	180	2.25	80	11.772	1.28	0.79	3.28	7.71	0.03	12.3	4.09
10	*Rhododendron arboreum* ssp. *nilagiricum*	7	70	1.4	50	8.8801	0.5	0.49	2.05	5.81	0.03	8.36	2.79
11	*Syzygium densiflorum*	27	270	3.38	80	3.9552	1.92	1.19	3.28	2.59	0.04	7.79	2.6
12	*Cinnamomum wightii*	14	140	2.33	60	4.0123	0.99	0.82	2.46	2.63	0.04	6.08	2.03
13	*Elaeagnus kologa*	14	140	1.75	80	2.4457	0.99	0.62	3.28	1.6	0.02	5.87	1.96
14	*Mahonia leschenaultii*	23	230	2.56	90	0.452	1.63	0.9	3.69	0.3	0.03	5.62	1.87
15	*Neolitsea zeylanica*	9	90	1.8	50	4.393	0.64	0.63	2.05	2.88	0.04	5.57	1.86
16	*Myrsine wightiana*	16	160	2.67	60	1.9411	1.14	0.94	2.46	1.27	0.04	4.87	1.62
17	*Cinnamomum keralaense*	11	110	1.57	70	1.3503	0.78	0.55	2.87	0.88	0.02	4.53	1.51
18	*Myrsine thwaitesii*	15	150	3	50	1.5129	1.06	1.06	2.05	0.99	0.06	4.1	1.37
19	*Symplocos anamalayana*	6	60	1.2	50	2.2483	0.43	0.42	2.05	1.47	0.02	3.95	1.32
20	*Ageratina adenophora*	10	100	1.67	60	0.0094	0.71	0.59	2.46	0.01	0.03	3.18	1.06
21	*Piper argyrophyllum*	14	140	2.8	50	0.204	0.99	0.99	2.05	0.13	0.06	3.17	1.06
22	*Pittosporum tetraspermum*	2	20	1	20	3.17	0.14	0.35	0.82	2.07	0.05	3.03	1.01
23	*Ilex wightiana*	1	10	1	10	3.528	0.07	0.35	0.41	2.31	0.1	2.79	0.93
24	*Eurya nitida*	15	150	3.75	40	0.0792	1.06	1.32	1.64	0.05	0.09	2.75	0.92
25	*Cissampelopsis corymbosa*	9	90	1.8	50	0.0662	0.64	0.63	2.05	0.04	0.04	2.73	0.91
26	*Ilex walkeri*	3	30	1.5	20	2.3586	0.21	0.53	0.82	1.54	0.08	2.57	0.86
27	*Ligustrum perrottetii*	3	30	1.5	20	2.1886	0.21	0.53	0.82	1.43	0.08	2.46	0.82
28	*Vaccinium leschenaultii*	2	20	1	20	2.1699	0.14	0.35	0.82	1.42	0.05	2.38	0.79
29	*Pteridium aquilinum*	10	100	2.5	40	0.0106	0.71	0.88	1.64	0.01	0.06	2.36	0.79
30	*Symplocos macrophylla* ssp. *rosea*	8	80	2	40	0.2198	0.57	0.7	1.64	0.14	0.05	2.35	0.78
31	*Hedyotis corymbosa*	14	140	4.67	30	0.048	0.99	1.64	1.23	0.03	0.16	2.25	0.75
32	*Ardisia rhomboidea*	24	240	24	10	0.1824	1.7	8.45	0.41	0.12	2.4	2.23	0.74
33	*Symplocos macrophylla* ssp. *macrophylla*	13	130	4.33	30	0.014	0.92	1.52	1.23	0.01	0.14	2.16	0.72
34	*Rubus ellipticus*	7	70	1.75	40	0.0091	0.5	0.62	1.64	0.01	0.04	2.15	0.72
35	*Polygonum chinense*	11	110	3.67	30	0.0184	0.78	1.29	1.23	0.01	0.12	2.02	0.67
36	*Rubus fairholmianus*	5	50	1.25	40	0.0053	0.35	0.44	1.64	0	0.03	1.99	0.66
37	*Rubus niveus*	5	50	1.25	40	0.0059	0.35	0.44	1.64	0	0.03	1.99	0.66
38	*Piper schmidtii*	9	90	3	30	0.1506	0.64	1.06	1.23	0.1	0.1	1.97	0.66
39	*Ilex denticulata*	4	40	2	20	1.028	0.28	0.7	0.82	0.67	0.1	1.77	0.59
40	*Notonia walkeri*	5	50	1.67	30	0.0104	0.35	0.59	1.23	0.01	0.06	1.59	0.53
41	*Pilea trinervia*	4	40	1.33	30	0.0053	0.28	0.47	1.23	0	0.04	1.51	0.5
42	*Polygala arillata*	3	30	1	30	0.0117	0.21	0.35	1.23	0.01	0.03	1.45	0.48
43	*Strobilanthes zenkerianus*	3	30	1	30	0.0054	0.21	0.35	1.23	0	0.03	1.44	0.48
44	*Cinnamomum macrocarpum*	8	80	4	20	0.0422	0.57	1.41	0.82	0.03	0.2	1.42	0.47
45	*Symplocos oligandra*	2	20	2	10	1.2318	0.14	0.7	0.41	0.81	0.2	1.36	0.45
46	*Leucas lanceaefolia*	5	50	2.5	20	0.1275	0.35	0.88	0.82	0.08	0.13	1.25	0.42
47	*Euphorbia rothiana*	4	40	2	20	0.0034	0.28	0.7	0.82	0	0.1	1.1	0.37
48	*Helichrysum buddleioides*	2	20	1	20	0.0148	0.14	0.35	0.82	0.01	0.05	0.97	0.32

No	SPECIES	N	D	AB	F	BA	RD	RAB	RF	RBA	DI	IVI	RIVI
49	*Piper hymenophyllum*	7	70	7	10	0.0974	0.5	2.46	0.41	0.06	0.7	0.97	0.32
50	*Cinnamomum filipedicellatum*	3	30	3	10	0.0043	0.21	1.06	0.41	0	0.3	0.62	0.21
51	*Hedyotis leschenaultiana*	3	30	3	10	0.0038	0.21	1.06	0.41	0	0.3	0.62	0.21
52	*Pittosporum neelgherrense*	1	10	1	10	0.1693	0.07	0.35	0.41	0.11	0.1	0.59	0.2
53	*Daphniphyllum neilgherrense*	1	10	1	10	0.128	0.07	0.35	0.41	0.08	0.1	0.56	0.19
54	*Eurya japonica*	1	10	1	10	0.128	0.07	0.35	0.41	0.08	0.1	0.56	0.19
55	*Alsophila nilgirensis* (tree fern)	1	10	1	10	0.0769	0.07	0.35	0.41	0.05	0.1	0.53	0.18
56	*Vaccinium neelgherrense*	1	10	1	10	0.032	0.07	0.35	0.41	0.02	0.1	0.5	0.17
57	*Clematis munroiana*	1	10	1	10	0.0007	0.07	0.35	0.41	0	0.1	0.48	0.16
58	*Crotalaria beddomeana*	1	10	1	10	0.0013	0.07	0.35	0.41	0	0.1	0.48	0.16
59	*Hedyotis anamalayana*	1	10	1	10	0.0007	0.07	0.35	0.41	0	0.1	0.48	0.16
60	*Litsea glabrata*	1	10	1	10	0.0007	0.07	0.35	0.41	0	0.1	0.48	0.16
61	*Osbeckia leschenaultiana*	1	10	1	10	0.0013	0.07	0.35	0.41	0	0.1	0.48	0.16
62	*Piper wightii*	1	10	1	10	0.0007	0.07	0.35	0.41	0	0.1	0.48	0.16
63	*Sageretia hamosa*	1	10	1	10	0.0013	0.07	0.35	0.41	0	0.1	0.48	0.16
64	*Toddalia asiatica*	1	10	1	10	0.0007	0.07	0.35	0.41	0	0.1	0.48	0.16
65	*Vernonia bourneana*	1	10	1	10	0.0007	0.07	0.35	0.41	0	0.1	0.48	0.16
66	*Vernonia fysonii*	1	10	1	10	0.0013	0.07	0.35	0.41	0	0.1	0.48	0.16
	TOTAL	**1409**	**14090**	**284.18**	**2440**	**152.77**	**100**	**100**	**100**	**100**	**10.24**	**300**	**100**

* Figures in **Bold** indicate highest values

	MS 2300 m - IVI sorted	
1	**TOTAL NO. OF SPECIES**	**66**
2	TOTAL NO. OF INDIVIDUALS	1409
3	MARGALEF'S RICHNESS INDEX	8.96
4	MENHINICK'S RICHNESS INDEX	5.74
5	PIELOU'S EVENNESS INDEX	0.65
6	SHANNON'S DIVERSITY INDEX	2.73
7	SIMPSON'S DOMINANCE INDEX	0.15

N = No of individuals
D = Density / Ha.
AB = Abundance
F = Frequency
BA = Basal Area (m^2/ Ha.)
DI = Distributional index
IVI = Importance value Index
RD, RAB, RF, RBA, RIVI = Relative Values

Appendix 14. Phytosociological attributes of Mannavan Shola (Plants □1 cm dbh)

(Altitude **2400 m**; Plot size: (10 m x 10 m) x 10 nos. = **0.1 ha.**)

No	SPECIES	N	D	AB	F	BA	RD	RAB	RF	RBA	DI	IVI	RIVI
1	*Psychotria nilgiriensis var. astephana*	403	4030	40.3	100	7.6086	32.11	19.49	4.07	6.79	0.4	43	14.32
2	*Microtropis ramiflora*	86	860	8.6	100	12.166	6.85	4.16	4.07	10.86	0.09	21.8	7.26
3	*Ilex denticulata*	28	280	5.6	50	17.181	2.23	2.71	2.03	15.34	0.11	19.6	6.53
4	*Cinnamomum wightii*	72	720	7.2	100	10.359	5.74	3.48	4.07	9.25	0.07	19.1	6.35
5	*Litsea wightiana*	103	1030	10.3	100	6.8856	8.21	4.98	4.07	6.15	0.1	18.4	6.14
6	*Symplocos foliosa*	49	490	4.9	100	6.2867	3.9	2.37	4.07	5.61	0.05	13.6	4.53
7	*Elaeocarpus recurvatus*	16	160	2	80	9.6714	1.27	0.97	3.25	8.64	0.03	13.2	4.39
8	*Myrsine thwaitesii*	50	500	5	100	1.6825	3.98	2.42	4.07	1.5	0.05	9.55	3.18
9	*Pittosporum tetraspermum*	15	150	2.5	60	5.9801	1.2	1.21	2.44	5.34	0.04	8.98	2.99
10	*Syzygium densiflorum*	24	240	2.67	90	3.4219	1.91	1.29	3.66	3.06	0.03	8.63	2.88
11	*Mahonia leschenaultii*	27	270	2.7	100	1.4993	2.15	1.31	4.07	1.34	0.03	7.56	2.52
12	*Arundinaria floribunda*	20	200	4	50	3.8384	1.59	1.93	2.03	3.43	0.08	7.05	2.35
13	*Symplocos anamalayana*	22	220	3.67	60	2.1932	1.75	1.78	2.44	1.96	0.06	6.15	2.05
14	*Turpinia nepalensis*	13	130	2.17	60	2.8774	1.04	1.05	2.44	2.57	0.04	6.05	2.02
15	*Hedyotis corymbosa*	29	290	3.63	80	0.3982	2.31	1.76	3.25	0.36	0.05	5.92	1.97
16	*Eurya nitida*	18	180	3.6	50	2.7488	1.43	1.74	2.03	2.45	0.07	5.91	1.97
17	*Ligustrum perrottetii*	4	40	1.33	30	4.362	0.32	0.64	1.22	3.9	0.04	5.44	1.81
18	*Rhododendron arboreum ssp. nilagiricum*	12	120	4	30	3.3221	0.96	1.93	1.22	2.97	0.13	5.15	1.72
19	*Ilex walkeri*	5	50	1.25	40	2.9887	0.4	0.6	1.63	2.67	0.03	4.7	1.57
20	*Ilex wightiana*	5	50	1.25	40	2.9809	0.4	0.6	1.63	2.66	0.03	4.69	1.56
21	*Elaeagnus kologa*	14	140	1.75	80	0.1333	1.12	0.85	3.25	0.12	0.02	4.49	1.5
22	*Helichrysum buddleioides*	21	210	4.2	50	0.6382	1.67	2.03	2.03	0.57	0.08	4.27	1.42
23	*Strobilanthes zenkerianus*	16	160	2.67	60	0.0218	1.27	1.29	2.44	0.02	0.04	3.73	1.24
24	*Rubus fairholmianus*	19	190	3.8	50	0.0456	1.51	1.84	2.03	0.04	0.08	3.58	1.19
25	*Gaultheria fragrantissima*	31	310	15.5	20	0.0468	2.47	7.5	0.81	0.04	0.78	3.32	1.11
26	*Myrsine wightiana*	13	130	2.6	50	0.056	1.04	1.26	2.03	0.05	0.05	3.12	1.04
27	*Ageratina adenophora*	10	100	2	50	0.0083	0.8	0.97	2.03	0.01	0.04	2.84	0.95
28	*Polygonum chinense*	14	140	3.5	40	0.0192	1.12	1.69	1.63	0.02	0.09	2.77	0.92
29	*Piper attenuatum*	8	80	1.6	50	0.0431	0.64	0.77	2.03	0.04	0.03	2.71	0.9
30	*Arachniodes aristata*	7	70	1.4	50	0.0106	0.56	0.68	2.03	0.01	0.03	2.6	0.87
31	*Rubus niveus*	6	60	1.2	50	0.0065	0.48	0.58	2.03	0.01	0.02	2.52	0.84
32	*Cissampelopsis corymbosa*	8	80	2	40	0.1226	0.64	0.97	1.63	0.11	0.05	2.38	0.79
33	*Hedyotis leschenaultiana*	8	80	2.67	30	0.3014	0.64	1.29	1.22	0.27	0.09	2.13	0.71
34	*Cinnamomum keralaense*	5	50	1.67	30	0.5067	0.4	0.81	1.22	0.45	0.06	2.07	0.69
35	*Cinnamomum filipedicellatum*	15	150	7.5	20	0.0375	1.2	3.63	0.81	0.03	0.38	2.04	0.68
36	*Pilea trinervia*	9	90	3	30	0.0151	0.72	1.45	1.22	0.01	0.1	1.95	0.65
37	*Eurya japonica*	2	20	1	20	0.7124	0.16	0.48	0.81	0.64	0.05	1.61	0.54
38	*Polygala arillata*	3	30	1	30	0.0516	0.24	0.48	1.22	0.05	0.03	1.51	0.5
39	*Pittosporum neelgherrense*	2	20	1	20	0.5133	0.16	0.48	0.81	0.46	0.05	1.43	0.48
40	*Rubus ellipticus*	6	60	3	20	0.0298	0.48	1.45	0.81	0.03	0.15	1.32	0.44
41	*Piper schmidtii*	5	50	2.5	20	0.0579	0.4	1.21	0.81	0.05	0.13	1.26	0.42
42	*Litsea glabrata*	4	40	2	20	0.0107	0.32	0.97	0.81	0.01	0.1	1.14	0.38
43	*Pteridium aquilinum*	4	40	2	20	0.004	0.32	0.97	0.81	0	0.1	1.13	0.38
44	*Jasminum bignoniaceum*	3	30	1.5	20	0.0027	0.24	0.73	0.81	0	0.08	1.05	0.35
45	*Piper wightii*	2	20	1	20	0.0033	0.16	0.48	0.81	0	0.05	0.97	0.32
46	*Scutellaria violacea*	2	20	1	20	0.002	0.16	0.48	0.81	0	0.05	0.97	0.32
47	*Polystichum sp. 1*	3	30	3	10	0.0022	0.24	1.45	0.41	0	0.3	0.65	0.22
48	*Cinnamomum macrocarpum*	1	10	1	10	0.1095	0.08	0.48	0.41	0.1	0.1	0.59	0.2

No	SPECIES	N	D	AB	F	BA	RD	RAB	RF	RBA	DI	IVI	RIVI
49	*Piper argyrophyllum*	2	20	2	10	0.0049	0.16	0.97	0.41	0	0.2	0 57	0.19
50	*Symplocos macrophylla ssp. macrophylla*	2	20	2	10	0.0014	0.16	0.97	0.41	0	0.2	0.57	0.19
51	*Clematis munroiana*	1	10	1	10	0.0013	0.08	0.48	0.41	0	0.1	0.49	0 16
52	*Neolitsea zeylanica*	1	10	1	10	0.0029	0.08	0.48	0.41	0	0.1	0.49	0 16
53	*Notonia walkeri*	1	10	1	10	0.0039	0.08	0.48	0.41	0	0.1	0.49	0 16
54	*Persea macrantha*	1	10	1	10	0.0013	0.08	0.48	0.41	0	0.1	0.49	0.16
55	*Plectranthus malabaricus*	1	10	1	10	0.0013	0.08	0.48	0.41	0	0.1	0.49	0.16
56	*Myrsine wightiana*	1	10	1	10	0.0013	0.08	0.48	0.41	0	0.1	0.49	0.16
57	*Senecio scandens*	1	10	1	10	0.0013	0.08	0.48	0.41	0	0.1	0.49	0.16
58	*Symplocos macrophylla ssp. rosea*	1	10	1	10	0.0007	0.08	0.48	0.41	0	0.1	0.49	0.16
59	*Toddalia asiatica*	1	10	1	10	0.002	0.08	0.48	0.41	0	0.1	0.49	0.16
	TOTAL	**1255**	**12550**	**206.73**	**2460**	**111.99**	**100**	**100**	**100**	**100**	**5.96**	**300**	**100**

* Figures in **Bold** indicate highest values

	MS 2400 m - IVI sorted	
1	TOTAL NO. OF SPECIES	59
2	TOTAL NO. OF INDIVIDUALS	1255
3	MARGALEF'S RICHNESS INDEX	8.13
4	MENHINICK'S RICHNESS INDEX	5.14
5	PIELOU'S EVENNESS INDEX	0.72
6	SHANNON'S DIVERSITY INDEX	2.94
7	SIMPSON'S DOMINANCE INDEX	0.13

N = No of individuals
D = Density / Ha.
AB = Abundance
F = Frequency
BA = Basal Area (m^2/ Ha.)
DI = Distributional index
IVI = Importance value Index
RD, RAB, RF, RBA, RIVI = Relative Values

Appendix 15. Phytosociological attributes of Eravikulam (Plants ≥1 cm dbh)

(Altitude: **1800 m**; Plot size: (10 m x 10 m) x 5 nos. = **0.05 ha.**)

No	SPECIES	N	D	AB	F	BA	RD	RAB	RF	RBA	DI	IVI	RIVI
1	*Lasianthus acuminatus*	318	**6360**	**63.6**	**100**	7.8928	24.77	17.02	4.5	4.95	0.64	34.22	11.41
2	*Strobilanthes gracilis*	308	**6160**	**61.6**	**100**	3.0369	23.99	16.49	4.5	1.9	0.62	30.39	10.13
3	*Chionanthus linocieroides*	15	300	3.75	80	**31.109**	1.17	1	3.6	19.49	0.05	24.26	8.09
4	*Ardisia rhomboidea*	160	**3200**	**32**	**100**	1.6864	12.46	8.56	4.5	1.06	0.32	18.02	6.01
5	*Mastixia arborea*	15	300	3	100	**17.956**	1.17	0.8	4.5	11.25	0.03	16.92	5.64
6	*Actinodaphne bourneae*	61	1220	12.2	100	**10.969**	4.75	3.27	4.5	6.87	0.12	16.12	5.37
7	*Garcinia gummi-gutta* var. *papilla*	5	100	1.25	80	10.559	0.39	0.33	3.6	6.62	0.02	10.61	3.54
8	*Casearia zeylanica*	14	280	3.5	80	8.7237	1.09	0.94	3.6	5.47	0.04	10.16	3.39
9	*Prunus ceylanica*	15	300	3	100	6.9987	1.17	0.8	4.5	4.39	0.03	10.06	3.35
10	*Gomphandra coriacea*	7	140	2.33	60	7.2964	0.55	0.62	2.7	4.57	0.04	7.82	2.61
11	*Symplocos macrophylla* ssp. *rosea*	33	660	8.25	80	1.5193	2.57	2.21	3.6	0.95	0.1	7.12	2.37
12	*Chionanthus ramiflorus* var. *peninsularis*	12	240	12	20	7.5202	0.93	3.21	0.9	4.71	0.6	6.54	2.18
13	*Isonandra candolleana*	7	140	2.33	60	3.8499	0.55	0.62	2.7	2.41	0.04	5.66	1.89
14	*Neolitsea scrobiculata*	20	400	5	80	0.4104	1.56	1.34	3.6	0.26	0.06	5.42	1.81
15	*Psychotria nilgiriensis*	28	560	9.33	60	0.6815	2.18	2.5	2.7	0.43	0.16	5.31	1.77
16	*Glochidion neilgherrense*	21	420	10.5	40	2.8636	1.64	2.81	1.8	1.79	0.26	5.23	1.74
17	*Persea macrantha*	3	60	1.5	40	4.9538	0.23	0.4	1.8	3.1	0.04	5.13	1.71
18	*Cinnamomum wightii*	5	100	2.5	40	4.665	0.39	0.67	1.8	2.92	0.06	5.11	1.7
19	*Meliosma simplicifolia*	17	340	5.67	60	1.5518	1.32	1.52	2.7	0.97	0.09	4.99	1.66
20	*Apollonias arnottii*	32	640	16	40	0.3571	2.49	4.28	1.8	0.22	0.4	4.51	1.5
21	*Bhesa indica*	3	60	1.5	40	3.645	0.23	0.4	1.8	2.28	0.04	4.31	1.44
22	*Chassalia curviflora*	28	560	14	40	0.1333	2.18	3.75	1.8	0.08	0.35	4.06	1.35
23	*Neolitsea zeylanica*	16	320	5.33	60	0.048	1.25	1.43	2.7	0.03	0.09	3.98	1.33
24	*Psychotria nilgiriensis* var. *astephana*	24	480	12	40	0.3902	1.87	3.21	1.8	0.24	0.3	3.91	1.3
25	*Myrsine wightiana*	1	20	1	20	4.5158	0.08	0.27	0.9	2.83	0.05	3.81	1.27
26	*Litsea wightiana*	1	20	1	20	4.489	0.08	0.27	0.9	2.81	0.05	3.79	1.26
27	*Schefflera racemosa*	1	20	1	20	4.356	0.08	0.27	0.9	2.73	0.05	3.71	1.24
28	*Litsea oleoides*	12	240	4	60	0.1032	0.93	1.07	2.7	0.06	0.07	3.69	1.23
29	*Saprosma foetens*	8	160	4	40	1.1974	0.62	1.07	1.8	0.75	0.1	3.17	1.06
30	*Maesa indica*	16	320	8	40	0.0342	1.25	2.14	1.8	0.02	0.2	3.07	1.02
31	*Ilex walkeri*	1	20	1	20	2.916	0.08	0.27	0.9	1.83	0.05	2.81	0.94
32	*Eugenia bracteata*	9	180	4.5	40	0.4457	0.7	1.2	1.8	0.28	0.11	2.78	0.93
33	*Cryptocarya bourdillonii*	9	180	4.5	40	0.3092	0.7	1.2	1.8	0.19	0.11	2.69	0.9
34	*Aglaia apiocarpa*	5	100	2.5	40	0.424	0.39	0.67	1.8	0.27	0.06	2.46	0.82
35	*Nothapodytes nimmoniana*	8	160	4	40	0.0157	0.62	1.07	1.8	0.01	0.1	2.43	0.81
36	*Toddalia asiatica*	8	160	8	20	0.3328	0.62	2.14	0.9	0.21	0.4	1.73	0.58
37	*Canthium dicoccum*	4	80	4	20	0.3842	0.31	1.07	0.9	0.24	0.2	1.45	0.48
38	*Casearia thwaitesii*	1	20	1	20	0.7508	0.08	0.27	0.9	0.47	0.05	1.45	0.48
39	*Scolopia crenata*	4	80	4	20	0.185	0.31	1.07	0.9	0.12	0.2	1.33	0.44
40	*Strobilanthes micranthus*	4	80	4	20	0.0518	0.31	1.07	0.9	0.03	0.2	1.24	0.41
41	*Calamus gamblei*	4	80	4	20	0.0314	0.31	1.07	0.9	0.02	0.2	1.23	0.41
42	*Microtropis ramiflora*	4	80	4	20	0.0314	0.31	1.07	0.9	0.02	0.2	1.23	0.41
43	*Actinodaphne bourdillonii*	4	80	4	20	0.0078	0.31	1.07	0.9	0	0.2	1.21	0.4
44	*Daphniphyllum neilgherrense*	4	80	4	20	0.0078	0.31	1.07	0.9	0	0.2	1.21	0.4
45	*Lycianthes laevis*	4	80	4	20	0.0078	0.31	1.07	0.9	0	0.2	1.21	0.4
46	*Rauvolfia densiflora*	4	80	4	20	0.0078	0.31	1.07	0.9	0	0.2	1.21	0.4
47	*Ixora notoniana*	1	20	1	20	0.1588	0.08	0.27	0.9	0.1	0.05	1.08	0.36
TOTAL		**1284**	**25680**	**373.64**	**2220**	**159.58**	**100**	**100**	**100**	**100**	**7.75**	**300**	**100**

* Figures in Bold indicate highest values

ENP 1800 m - IVI sorted		
1	TOTAL NO. OF SPECIES	47
2	TOTAL NO. OF INDIVIDUALS	1284
3	MARGALEF'S RICHNESS INDEX	6.43
4	MENHINICK'S RICHNESS INDEX	4.09
5	PIELOU'S EVENNESS INDEX	0.68
6	SHANNON'S DIVERSITY INDEX	2.62
7	SIMPSON'S DOMINANCE INDEX	0.14

N = No of individuals
D = Density / Ha
AB = Abundance
F = Frequency
BA = Basal Area (m^2/ Ha)
DI = Distributional index
IVI = Importance value Index
RD, RAB, RF, RBA, RIVI = Relative Values

Appendix 16. Phytosociological attributes of Eravikulam (Plants ≥1 cm dbh)

(Altitude: **2000 m**; Plot size: (10 m x 10 m) x 5 nos. = **0.05 ha.**)

No	SPECIES	N	D	AB	F	BA	RD	RAB	RF	RBA	DI	IVI	RIVI
1	*Strobilanthes gracilis*	204	**4080**	**51**	**80**	2.5663	19.98	10.86	3.28	1.57	0.64	24.83	8.28
2	*Syzygium densiflorum*	29	580	7.25	**80**	**25.269**	2.84	1.54	3.28	15.49	0.09	21.61	7.2
3	*Ternstroemia japonica*	12	240	3	80	**19.917**	1.18	0.64	3.28	12.21	0.04	16.67	5.56
4	*Mastixia arborea*	11	220	3.67	60	**20.852**	1.08	0.78	2.46	12.78	0.06	16.32	5.44
5	*Arundinaria floribunda*	7	140	3.5	40	20.322	0.69	0.75	1.64	12.45	0.09	14.78	4.93
6	*Lasianthus acuminatus*	96	**1920**	**32**	60	2.8666	9.4	6.81	2.46	1.76	0.53	13.62	4.54
7	*Elaeocarpus recurvatus*	11	220	2.2	**100**	10.353	1.08	0.47	4.1	6.34	0.02	11.52	3.84
8	*Cinnamomum wightii*	34	680	8.5	80	3.0736	3.33	1.81	3.28	1.88	0.11	8.49	2.83
9	*Vaccinium leschenaultii*	13	260	4.33	60	6.4121	1.27	0.92	2.46	3.93	0.07	7.66	2.55
10	*Rhododendron arboreum* ssp. *nilagiricum*	10	200	3.33	60	6.149	0.98	0.71	2.46	3.77	0.06	7.21	2.4
11	*Psychotria nilgiriensis* var. *astephana*	44	880	14.67	60	0.3617	4.31	3.12	2.46	0.22	0.24	6.99	2.33
12	*Strobilanthes foliosus*	48	**960**	**24**	40	0.4579	4.7	5.11	1.64	0.28	0.6	6.62	2.21
13	*Pittosporum tetraspermum*	13	260	6.5	40	5.3508	1.27	1.38	1.64	3.28	0.16	6.19	2.06
14	*Derris brevipes*	40	800	20	40	0.612	3.92	4.26	1.64	0.38	0.5	5.94	1.98
15	*Ageratina adenophora*	32	640	16	40	1.8438	3.13	3.41	1.64	1.13	0.4	5.9	1.97
16	*Symplocos macrophylla* ssp. *rosea*	26	520	8.67	60	0.9698	2.55	1.85	2.46	0.59	0.14	5.6	1.87
17	*Rhodomyrtus tomentosa*	27	540	13.5	40	1.7464	2.64	2.87	1.64	1.07	0.34	5.35	1.78
18	*Eurya nitida*	6	120	2	60	3.3262	0.59	0.43	2.46	2.04	0.03	5.09	1.7
19	*Mahonia leschenaultii*	18	360	6	60	0.9216	1.76	1.28	2.46	0.56	0.1	4.78	1.59
20	*Glochidion neilgherrense*	3	60	1	60	3.1283	0.29	0.21	2.46	1.92	0.02	4.67	1.56
21	*Ilex walkeri*	2	40	2	20	5.8536	0.2	0.43	0.82	3.59	0.1	4.61	1.54
22	*Neolitsea scrobiculata*	20	400	6.67	60	0.284	1.96	1.42	2.46	0.17	0.11	4.59	1.53
23	*Ilex walkeri*	12	240	6	40	1.8881	1.18	1.28	1.64	1.16	0.15	3.98	1.33
24	*Photinia notoniana*	21	420	10.5	40	0.4649	2.06	2.24	1.64	0.28	0.26	3.98	1.33
25	*Jasminum bignoniaceum*	20	400	10	40	0.3368	1.96	2.13	1.64	0.21	0.25	3.81	1.27
26	*Persea macrantha*	25	500	25	20	0.8615	2.45	5.32	0.82	0.53	1.25	3.8	1.27
27	*Hedyotis anamalayana*	20	400	10	40	0.1436	1.96	2.13	1.64	0.09	0.25	3.69	1.23
28	*Strobilanthes micranthus*	20	400	10	40	0.0532	1.96	2.13	1.64	0.03	0.25	3.63	1.21
29	*Meliosma simplicifolia* ssp. *pungens*	9	180	3	60	0.4343	0.88	0.64	2.46	0.27	0.05	3.61	1.2
30	*Syzygium gardneri*	2	40	1	40	2.6517	0.2	0.21	1.64	1.63	0.03	3.47	1.16
31	*Euonymus crenulatus*	16	320	8	40	0.0954	1.57	1.7	1.64	0.06	0.2	3.27	1.09
32	*Litsea oleoides*	5	100	2.5	40	1.5135	0.49	0.53	1.64	0.93	0.06	3.06	1.02
33	*Archidendron clypearia*	5	100	2.5	40	1.3928	0.49	0.53	1.64	0.85	0.06	2.98	0.99
34	*Ardisia rhomboidea*	12	240	6	40	0.1466	1.18	1.28	1.64	0.09	0.15	2.91	0.97
35	*Gomphandra coriacea*	4	80	2	40	1.422	0.39	0.43	1.64	0.87	0.05	2.9	0.97
36	*Casearia zeylanica*	8	160	4	40	0.1158	0.78	0.85	1.64	0.07	0.1	2.49	0.83
37	*Neolitsea zeylanica*	8	160	4	40	0.0181	0.78	0.85	1.64	0.01	0.1	2.43	0.81
38	*Saprosma foetens*	5	100	2.5	40	0.4782	0.49	0.53	1.64	0.29	0.06	2.42	0.81
39	*Medinilla malabarica*	12	240	12	20	0.4956	1.18	2.55	0.82	0.3	0.6	2.3	0.77
40	*Myrsine thwaitesii*	12	240	12	20	0.18	1.18	2.55	0.82	0.11	0.6	2.11	0.7
41	*Pouzolzia bennettiana*	12	240	12	20	0.09	1.18	2.55	0.82	0.06	0.6	2.06	0.69
42	*Daphniphyllum neilgherrense*	1	20	1	20	1.7306	0.1	0.21	0.82	1.06	0.05	1.98	0.66
43	*Moonia heterophylla*	8	160	8	20	0.6272	0.78	1.7	0.82	0.38	0.4	1.98	0.66
44	*Myrsine wightiana*	1	20	1	20	1.5524	0.1	0.21	0.82	0.95	0.05	1.87	0.62
45	*Turpinia nepalensis*	1	20	1	20	1.3838	0.1	0.21	0.82	0.85	0.05	1.77	0.59

No	SPECIES	N	D	AB	F	BA	RD	RAB	RF	RBA	DI	IVI	RIVI
46	*Elaeagnus kologa*	8	160	8	20	0.0928	0.78	1.7	0.82	0.06	0.4	1.66	0.55
47	*Chassalia curviflora*	8	160	8	20	0.0205	0.78	1.7	0.82	0.01	0.4	1.61	0.54
48	*Apollonias arnottii*	5	100	5	20	0.424	0.49	1.06	0.82	0.26	0.25	1.57	0.52
49	*Litsea ligustrina*	4	80	4	20	0.3098	0.39	0.85	0.82	0.19	0.2	1.4	0.47
50	*Isonandra candolleana*	4	80	4	20	0.196	0.39	0.85	0.82	0.12	0.2	1.33	0.44
51	*Gaultheria fragrantissima*	4	80	4	20	0.1254	0.39	0.85	0.82	0.08	0.2	1.29	0.43
52	*Rubus fairholmianus*	4	80	4	20	0.1166	0.39	0.85	0.82	0.07	0.2	1.28	0.43
53	*Hedyotis swertioides*	4	80	4	20	0.041	0.39	0.85	0.82	0.03	0.2	1.24	0.41
54	*Scolopia crenata*	4	80	4	20	0.0518	0.39	0.85	0.82	0.03	0.2	1.24	0.41
55	*Cinnamomum keralaense*	4	80	4	20	0.027	0.39	0.85	0.82	0.02	0.2	1.23	0.41
56	*Calamus gamblei*	4	80	4	20	0.0102	0.39	0.85	0.82	0.01	0.2	1.22	0.41
57	*Ligustrum perrottetii*	4	80	4	20	0.0102	0.39	0.85	0.82	0.01	0.2	1.22	0.41
58	*Pavetta breviflora*	4	80	4	20	0.016	0.39	0.85	0.82	0.01	0.2	1.22	0.41
59	*Symplocos macrophylla* ssp. *macrophylla*	4	80	4	20	0.0194	0.39	0.85	0.82	0.01	0.2	1.22	0.41
60	*Protasparagus racemosus*	4	80	4	20	0.0068	0.39	0.85	0.82	0	0.2	1.21	0.4
61	*Nothapodytes nimmoniana*	4	80	4	20	0.0078	0.39	0.85	0.82	0	0.2	1.21	0.4
62	*Actinodaphne bourneae*	1	20	1	20	0.4326	0.1	0.21	0.82	0.27	0.05	1.19	0.4
63	*Arundinaria densifolia*	1	20	1	20	0.3686	0.1	0.21	0.82	0.23	0.05	1.15	0.38
64	*Alsophila nilgiriensis*	1	20	1	20	0.185	0.1	0.21	0.82	0.11	0.05	1.03	0.34
	TOTAL	**1021**	**20420**	**469.79**	**2440**	**163.18**	**100**	**100**	**100**	**100**	**13.87**	**300**	**100**

* Figures in **Bold** indicate highest values

ENP 2000 m - IVI sorted		
1	TOTAL NO. OF SPECIES	64
2	TOTAL NO. OF INDIVIDUALS	1021
3	MARGALEF'S RICHNESS INDEX	9.09
4	MENHINICK'S RICHNESS INDEX	5.57
5	PIELOU'S EVENNESS INDEX	0.83
6	SHANNON'S DIVERSITY INDEX	3.43
7	SIMPSON'S DOMINANCE INDEX	0.06

N = No of individuals
D = Density / Ha.
AB = Abundance
F = Frequency
BA = Basal Area (m^2/ Ha.)
DI = Distributional Index
IVI = Importance value Index
RD, RAB, RF, RBA, RIVI = Relative Values

Appendix 17. Phytosociological attributes of Eravikulam (Plants ≥1 cm dbh)

(Altitude: **2200 m**; Plot size: (10 m x 10 m) x 5 nos. = **0.05 ha.**)

No	SPECIES	N	D	AB	F	BA	RD	RAB	RF	RBA	DI	IVI	RIVI
1	*Ilex walkeri*	13	260	2.6	**100**	**67.871**	1.04	0.58	4.24	31.39	0.03	36.67	12.22
2	*Psychotria nilgiriensis* var. *astephana*	233	**4660**	**46.6**	**100**	4.2639	18.57	10.4	4.24	1.97	0.47	24.78	8.26
3	*Ardisia rhomboidea*	234	**4680**	**58.5**	80	3.1075	18.65	13.05	3.39	1.44	0.73	23.48	7.83
4	*Arundinaria floribunda*	22	440	11	40	**22.609**	1.75	2.45	1.69	10.46	0.28	13.9	4.63
5	*Strobilanthes micranthus*	125	**2500**	**41.67**	60	0.9175	9.96	9.3	2.54	0.42	0.69	12.92	4.31
6	*Syzygium densiflorum*	8	160	2.67	60	19.581	0.64	0.6	2.54	9.06	0.04	12.24	4.08
7	*Meliosma simplicifolia* ssp. *pungens*	18	360	4.5	80	15.717	1.43	1	3.39	7.27	0.06	12.09	4.03
8	*Vaccinium leschenaultii*	3	60	3	20	**21.716**	0.24	0.67	0.85	10.05	0.15	11.14	3.71
9	*Cinnamomum wightii*	83	1660	20.75	80	2.2161	6.61	4.63	3.39	1.03	0.26	11.03	3.68
10	*Litsea oleoides*	51	1020	10.2	**100**	3.776	4.06	2.28	4.24	1.75	0.1	10.05	3.35
11	*Turpinia nepalensis*	18	360	3.6	100	9.4741	1.43	0.8	4.24	4.38	0.04	10.05	3.35
12	*Elaeocarpus recurvatus*	8	160	2	80	7.2112	0.64	0.45	3.39	3.34	0.03	7.37	2.46
13	*Microtropis ramiflora*	30	600	10	60	2.8038	2.39	2.23	2.54	1.3	0.17	6.23	2.08
14	*Pavetta breviflora*	10	200	2.5	80	4.1332	0.8	0.56	3.39	1.91	0.03	6.1	2.03
15	*Euonymus crenulatus*	37	740	12.33	60	0.7829	2.95	2.75	2.54	0.36	0.21	5.85	1.95
16	*Eugenia calcadensis*	25	500	8.33	60	2.8155	1.99	1.86	2.54	1.3	0.14	5.83	1.94
17	*Litsea wightiana*	15	300	3.75	80	1.29	1.2	0.84	3.39	0.6	0.05	5.19	1.73
18	*Symplocos macrophylla* ssp. *macrophylla*	18	360	9	40	4.0986	1.43	2.01	1.69	1.9	0.23	5.02	1.67
19	*Strobilanthes gracilis*	36	720	18	40	0.3499	2.87	4.02	1.69	0.16	0.45	4.72	1.57
20	*Mahonia leschenaultii*	21	420	7	60	0.6749	1.67	1.56	2.54	0.31	0.12	4.52	1.51
21	*Symplocos foliosa*	18	360	6	60	0.9932	1.43	1.34	2.54	0.46	0.1	4.43	1.48
22	*Elaeagnus kologa*	20	400	6.67	60	0.1884	1.59	1.49	2.54	0.09	0.11	4.22	1.41
23	*Ligustrum perrottetii*	6	120	2	60	2.1109	0.48	0.45	2.54	0.98	0.03	4	1.33
24	*Ageratina adenophora*	17	340	8.5	40	1.2519	1.35	1.9	1.69	0.58	0.21	3.62	1.21
25	*Cinnamomum filipedicellatum*	12	240	4	60	0.0283	0.96	0.89	2.54	0.01	0.07	3.51	1.17
26	*Lasianthus acuminatus*	20	400	10	40	0.3052	1.59	2.23	1.69	0.14	0.25	3.42	1.14
27	*Lasianthus venulosus*	6	120	2	60	0.4579	0.48	0.45	2.54	0.21	0.03	3.23	1.08
28	*Neolitsea zeylanica*	2	40	2	20	4.5376	0.16	0.45	0.85	2.1	0.1	3.11	1.04
29	*Rhododendron arboreum* ssp. *nilagiricum*	2	40	2	20	4.5366	0.16	0.45	0.85	2.1	0.1	3.11	1.04
30	*Derris brevipes*	9	180	4.5	40	0.4009	0.72	1	1.69	0.19	0.11	2.6	0.87
31	*Pittosporum tetraspermum*	9	180	4.5	40	0.2668	0.72	1	1.69	0.12	0.11	2.53	0.84
32	*Garcinia gummi-gutta* var. *papilla*	8	160	4	40	0.1856	0.64	0.89	1.69	0.09	0.1	2.42	0.81
33	*Piper mullesua*	8	160	4	40	0.0678	0.64	0.89	1.69	0.03	0.1	2.36	0.79
34	*Strobilanthes calycinus*	16	320	16	20	0.0362	1.27	3.57	0.85	0.02	0.8	2.14	0.71
35	*Moonia heterophylla*	13	260	13	20	0.3346	1.04	2.9	0.85	0.15	0.65	2.04	0.68
36	*Ilex denticulata*	5	100	5	20	1.6515	0.4	1.12	0.85	0.76	0.25	2.01	0.67
37	*Eurya nitida*	8	160	8	20	0.853	0.64	1.79	0.85	0.39	0.4	1.88	0.63
38	*Litsea glabrata*	9	180	9	20	0.4572	0.72	2.01	0.85	0.21	0.45	1.78	0.59
39	*Neolitsea scrobiculata*	6	120	6	20	0.6724	0.48	1.34	0.85	0.31	0.3	1.64	0.55
40	*Rubus niveus*	8	160	8	20	0.1357	0.64	1.79	0.85	0.06	0.4	1.55	0.52
41	*Rhodomyrtus tomentosa*	5	100	5	20	0.2362	0.4	1.12	0.85	0.11	0.25	1.36	0.45
42	*Senecio scandens*	4	80	4	20	0.2074	0.32	0.89	0.85	0.1	0.2	1.27	0.42
43	*Gaultheria fragrantissima*	4	80	4	20	0.0706	0.32	0.89	0.85	0.03	0.2	1.2	0.4
44	*Actinodaphne bourneae*	4	80	4	20	0.013	0.32	0.89	0.85	0.01	0.2	1.18	0.39
45	*Gardneria ovata*	4	80	4	20	0.016	0.32	0.89	0.85	0.01	0.2	1.18	0.39

No	SPECIES	N	D	AB	F	BA	RD	RAB	RF	RBA	DI	IVI	RIVI
46	*Lasianthus coffeoides*	4	80	4	20	0.016	0.32	0.89	0.85	0.01	0.2	1.18	0.39
47	*Prunus ceylanica*	4	80	4	20	0.0314	0.32	0.89	0.85	0.01	0.2	1.18	0.39
48	*Actinodaphne bourdillonii*	4	80	4	20	0.0078	0.32	0.89	0.85	0	0.2	1.17	0.39
49	*Hedyotis anamalayana*	4	80	4	20	0.0102	0.32	0.89	0.85	0	0.2	1.17	0.39
50	*Schefflera rostrata*	2	40	2	20	0.3485	0.16	0.45	0.85	0.16	0.1	1.17	0.39
51	*Strobilanthes zenkerianus*	4	80	4	20	0.0102	0.32	0.89	0.85	0	0.2	1.17	0.39
52	*Mastixia arborea*	1	20	1	20	0.1742	0.08	0.22	0.85	0.08	0.05	1.01	0.34
53	*Ternstroemia japonica*	1	20	1	20	0.1638	0.08	0.22	0.85	0.08	0.05	1.01	0.34
	TOTAL	**1255**	**25100**	**448.17**	**2360**	**216.19**	**100**	**100**	**100**	**100**	**11.2**	**300**	**100**

* Figures in Bold indicate highest values

ENP 2200 m - IVI sorted		
1	TOTAL NO. OF SPECIES	53
2	TOTAL NO. OF INDIVIDUALS	1255
3	MARGALEF'S RICHNESS INDEX	7.29
4	MENHINICK'S RICHNESS INDEX	4.61
5	PIELOU'S EVENNESS INDEX	0.77
6	SHANNON'S DIVERSITY INDEX	3.04
7	SIMPSON'S DOMINANCE INDEX	0.09

N = No of individuals
D = Density / Ha.
AB = Abundance
F = Frequency
BA = Basal Area (m^2/ Ha.)
DI = Distributional index
IVI = Importance value Index
RD, RAB, RF, RBA, RIVI = Relative Values

Appendix 18. Phytosociological attributes of Eravikulam (Plants ≥1 cm dbh)

(Altitude: **2400 m**; Plot size: (10 m x 10 m) x 5 nos. = **0.05 ha.**)

No	SPECIES	N	D	AB	F	BA	RD	RAB	RF	RBA	DI	IVI	RIVI
1	*Rhododendron arboreum* ssp. *nilagiricum*	15	300	3.75	80	29.656	1.15	0.84	3.39	14.48	0.05	19.02	6.34
2	*Psychotria nilgiriensis* var. *astephana*	150	3000	30	100	4.53	11.51	6.69	4.24	2.21	0.3	17.96	5.99
3	*Ilex thwaitesii*	25	500	6.25	80	24.184	1.92	1.39	3.39	11.81	0.08	17.12	5.71
4	*Ligustrum perrottetii*	86	1720	17.2	100	11.364	6.6	3.83	4.24	5.55	0.17	16.39	5.46
5	*Elaeocarpus recurvatus*	32	640	6.4	100	18.642	2.46	1.43	4.24	9.1	0.06	15.8	5.27
6	*Euonymus crenulatus*	58	1160	14.5	80	10.67	4.45	3.23	3.39	5.21	0.18	13.05	4.35
7	*Symplocos anamalayana*	32	640	6.4	100	12.823	2.46	1.43	4.24	6.26	0.06	12.96	4.32
8	*Myrsine thwaitesii*	104	2080	26	80	2.7248	7.98	5.8	3.39	1.33	0.33	12.7	4.23
9	*Cinnamomum wightii*	20	400	6.67	60	14.15	1.53	1.49	2.54	6.91	0.11	10.98	3.66
10	*Pittosporum tetraspermum*	42	840	8.4	100	6.7158	3.22	1.87	4.24	3.28	0.08	10.74	3.58
11	*Microtropis ramiflora*	47	940	23.5	40	10.825	3.61	5.24	1.69	5.28	0.59	10.58	3.53
12	*Syzygium densiflorum*	43	860	10.75	80	6.9978	3.3	2.4	3.39	3.42	0.13	10.11	3.37
13	*Turpinia nepalensis*	22	440	4.4	100	6.8442	1.69	0.98	4.24	3.34	0.04	9.27	3.09
14	*Arundinaria walkeriana*	29	580	9.67	60	8.9691	2.23	2.16	2.54	4.38	0.16	9.15	3.05
15	*Arachniodes aristata*	45	900	9	100	2.9277	3.45	2.01	4.24	1.43	0.09	9.12	3.04
16	*Symplocos cochinchinensis* ssp. *laurina*	54	1080	18	60	4.1321	4.14	4.01	2.54	2.02	0.3	8.7	2.9
17	*Strobilanthes gracilis*	80	1600	40	40	0.3104	6.14	8.92	1.69	0.15	1	7.98	2.66
18	*Ilex denticulata*	14	280	3.5	80	7.0218	1.07	0.78	3.39	3.43	0.04	7.89	2.63
19	*Actinodaphne bourneae*	35	700	8.75	80	3.6869	2.69	1.95	3.39	1.8	0.11	7.88	2.63
20	*Schefflera rostrata*	53	1060	13.25	80	0.6159	4.07	2.95	3.39	0.3	0.17	7.76	2.59
21	*Mahonia leschenaultii*	30	600	7.5	80	1.5936	2.3	1.67	3.39	0.78	0.09	6.47	2.16
22	*Eurya nitida*	26	520	8.67	60	2.4591	2	1.93	2.54	1.2	0.14	5.74	1.91
23	*Strobilanthes zenkerianus*	48	960	24	40	0.648	3.68	5.35	1.69	0.32	0.6	5.69	1.9
24	*Litsea wightiana*	20	400	6.67	60	2.9008	1.53	1.49	2.54	1.42	0.11	5.49	1.83
25	*Elaeagnus kologa*	28	560	9.33	60	0.3735	2.15	2.08	2.54	0.18	0.16	4.87	1.62
26	*Gaultheria fragrantissima*	24	480	12	40	0.4978	1.84	2.68	1.69	0.24	0.3	3.77	1.26
27	*Ageratina adenophora*	18	360	9	40	0.6833	1.38	2.01	1.69	0.33	0.23	3.4	1.13
28	*Vaccinium leschenaultii*	20	400	20	20	2.0688	1.53	4.46	0.85	1.01	1	3.39	1.13
29	*Hedyotis stylosa*	20	400	10	40	0.1004	1.53	2.23	1.69	0.05	0.25	3.27	1.09
30	*Polystichum* sp.2 (fern)	16	320	8	40	0.3885	1.23	1.78	1.69	0.19	0.2	3.11	1.04
31	*Tylophora mollissima*	16	320	16	20	0.0538	1.23	3.57	0.85	0.03	0.8	2.11	0.7
32	*Arundinaria densifolia*	9	180	9	20	0.7214	0.69	2.01	0.85	0.35	0.45	1.89	0.63
33	*Lasianthus venulosus*	1	20	1	20	1.8318	0.08	0.22	0.85	0.89	0.05	1.82	0.61
34	*Cinnamomum keralaense*	8	160	8	20	0.5248	0.61	1.78	0.85	0.26	0.4	1.72	0.57
35	*Jasminum bignoniaceum*	8	160	8	20	0.1869	0.61	1.78	0.85	0.09	0.4	1.55	0.52
36	*Casearia thwaitesii*	1	20	1	20	1.1834	0.08	0.22	0.85	0.58	0.05	1.51	0.5
37	*Derris brevipes*	5	100	5	20	0.1845	0.38	1.11	0.85	0.09	0.25	1.32	0.44
38	*Osbeckia melastomoides*	4	80	4	20	0.0518	0.31	0.89	0.85	0.03	0.2	1.19	0.4
39	*Crotalaria spectabilis*	4	80	4	20	0.0102	0.31	0.89	0.85	0.01	0.2	1.17	0.39
40	*Rubus fairholmianus*	4	80	4	20	0.0058	0.31	0.89	0.85	0	0.2	1.16	0.39
41	*Scutellaria wightiana*	4	80	4	20	0.0058	0.31	0.89	0.85	0	0.2	1.16	0.39
42	*Symplocos foliosa*	1	20	1	20	0.2822	0.08	0.22	0.85	0.14	0.05	1.07	0.36
43	*Symplocos macrophylla* ssp. *rosea*	1	20	1	20	0.1538	0.08	0.22	0.85	0.08	0.05	1.01	0.34
44	*Daphniphyllum neilgherrense*	1	20	1	20	0.144	0.08	0.22	0.85	0.07	0.05	1	0.33
	TOTAL	**1303**	**26060**	**448.56**	**2360**	**204.84**	**100**	**100**	**100**	**100**	**10.48**	**300**	**100**

* Figures in **Bold** indicate highest values

	ENP 2400 m - IVI sorted	
1	TOTAL NO. OF SPECIES	44
2	TOTAL NO. OF INDIVIDUALS	1303
3	MARGALEF'S RICHNESS INDEX	5.99
4	MENHINICK'S RICHNESS INDEX	3.83
5	PIELOU'S EVENNESS INDEX	0.89
6	SHANNON'S DIVERSITY INDEX	3.35
7	SIMPSON'S DOMINANCE INDEX	0.04

N = No of individuals
D = Density / Ha.
AB = Abundance
F = Frequency
BA = Basal Area (m^2/ Ha.)
DI = Distributional index
IVI = Importance value Index
RD, RAB, RF, RBA, RIVI = Relative Values

Appendix 19. Phytosociological attributes of Eravikulam (Plants ≥1 cm dbh)

(Altitude: **2600 m**; Plot size: (10 m x 10 m) x 5 nos. = **0.05 ha.**)

No	SPECIES	N	D	AB	F	BA	RD	RAB	RF	RBA	DI	IVI	RIVI
1	*Rhododendron arboreum* ssp. *nilagiricum*	97	**1940**	19.4	**100**	**49.363**	10.28	7.24	6.25	47.25	0.19	63.78	21.26
2	*Arundinaria densifolia*	116	**2320**	**23.2**	**100**	**18.476**	12.29	8.66	6.25	17.69	0.23	36.23	12.08
3	*Gaultheria fragrantissima*	104	**2080**	**26**	80	**7.8749**	11.02	9.71	5	7.54	0.33	23.56	7.85
4	*Rubus fairholmianus*	76	1520	15.2	**100**	0.7995	8.05	5.68	6.25	0.77	0.15	15.07	5.02
5	*Eurya nitida*	43	860	14.33	60	3.8098	4.56	5.35	3.75	3.65	0.24	11.96	3.99
6	*Hedyotis buxifolia*	47	940	15.67	60	3.1274	4.98	5.85	3.75	2.99	0.26	11.72	3.91
7	*Anaphalis travancorica*	60	1200	**20**	60	1.1244	6.36	7.47	3.75	1.08	0.33	11.19	3.73
8	*Ageratina adenophora*	32	640	6.4	100	1.2858	3.39	2.39	6.25	1.23	0.06	10.87	3.62
9	*Ilex walkeri*	25	500	6.25	80	3.284	2.65	2.33	5	3.14	0.08	10.79	3.6
10	*Arundinaria walkeriana*	29	580	9.67	60	4.082	3.07	3.61	3.75	3.91	0.16	10.73	3.58
11	*Polygonum chinense*	44	880	11	80	0.7234	4.66	4.11	5	0.69	0.14	10.35	3.45
12	*Scutellaria wightiana*	44	880	11	80	0.6521	4.66	4.11	5	0.62	0.14	10.28	3.43
13	*Ilex denticulata*	15	300	5	60	3.9279	1.59	1.87	3.75	3.76	0.08	9.1	3.03
14	*Arachniodes aristata*	32	640	8	80	0.5811	3.39	2.99	5	0.56	0.1	8.95	2.98
15	*Myrsine thwaitesii*	41	820	13.67	60	0.4846	4.34	5.1	3.75	0.46	0.23	8.55	2.85
16	*Hedyotis articularis*	28	560	9.33	60	0.6989	2.97	3.48	3.75	0.67	0.16	7.39	2.46
17	*Osbeckia leschenaultiana*	21	420	7	60	0.7039	2.22	2.61	3.75	0.67	0.12	6.64	2.21
18	*Hedyotis stylosa*	24	480	8	60	0.3226	2.54	2.99	3.75	0.31	0.13	6.6	2.2
19	*Leucas lanceaefolia*	20	400	6.67	60	0.7336	2.12	2.49	3.75	0.7	0.11	6.57	2.19
20	*Kalanchoe grandiflora*	20	400	10	40	0.5596	2.12	3.73	2.5	0.54	0.25	5.16	1.72
21	*Pogostemon artopurpureus*	8	160	4	40	0.4547	0.85	1.49	2.5	0.44	0.1	3.79	1.26
22	*Knoxia* sp. 1	4	80	4	20	0.3313	0.42	1.49	1.25	0.32	0.2	1.99	0.66
23	*Senecio scandens*	1	20	1	20	0.5476	0.11	0.37	1.25	0.52	0.05	1.88	0.63
24	*Pittosporum tetraspermum*	1	20	1	20	0.4326	0.11	0.37	1.25	0.41	0.05	1.77	0.59
25	*Pteridium aquilinum*	4	80	4	20	0.0706	0.42	1.49	1.25	0.07	0.2	1.74	0.58
26	*Jasminum bignoniaceum*	4	80	4	20	0.0078	0.42	1.49	1.25	0.01	0.2	1.68	0.56
27	*Polystichum* sp. 1	4	80	4	20	0.0068	0.42	1.49	1.25	0.01	0.2	1.68	0.56
	TOTAL	**944**	**18880**	**267.79**	**1600**	**104.47**	**100**	**100**	**100**	**100**	**4.49**	**300**	**100**

* Figures in **Bold** indicate highest values

	ENP 2600 m - IVI sorted	
1	**TOTAL NO. OF SPECIES**	**27**
2	TOTAL NO. OF INDIVIDUALS	944
3	MARGALEF'S RICHNESS INDEX	3.8
4	MENHINICK'S RICHNESS INDEX	2.35
5	PIELOU'S EVENNESS INDEX	0.88
6	SHANNON'S DIVERSITY INDEX	2.92
7	SIMPSON'S DOMINANCE INDEX	0.07

N = No of individuals
D = Density / Ha.
AB = Abundance
F = Frequency
BA = Basal Area (m^2/ Ha.)
DI = Distributional index
IVI = Importance value Index
RD, RAB, RF, RBA, RIVI = Relative Values

Appendix 20. Importance Values of Trees >30 cm gbh (first 10 species only)

Location: Mannavan Shola

Altitude: 1600 m		
No	**Species**	**IVI**
1	*Meliosma simplicifolia*	**33.89**
2	*Persea macrantha*	**25.36**
3	*Turpinia nepalensis*	**22.87**
4	*Viburnum punctatum*	**20.92**
5	*Symplocos cochinchinensis*	**20.17**
6	*Vaccinium leschenaultii*	**18.64**
7	*Phoebe wightii*	**17.78**
8	*Syzygium cumini*	**17.45**
9	*Bischofia javanica*	**14.26**
10	*Gordonia obtusa*	**12.62**
Total no of species = 27		

Altitude: 1700 m		
No	**Species**	**IVI**
1	*Daphniphyllum neilgherrense*	**19.06**
2	*Meliosma simplicifolia*	**18.07**
3	*Ilex wightiana*	**17.61**
4	*Mastixia arborea*	**17.57**
5	*Elaeocarpus tuberculatus*	**17.49**
6	*Persea macrantha*	**15.35**
7	*Turpinia nepalensis*	**15.09**
8	*Syzygium cumini*	**13.79**
9	*Acronychia pedunculata*	**10.67**
10	*Isonandra perrottetiana*	**10.6**
Total no of species = 41		

Altitude: 1800 m		
No	**Species**	**IVI**
1	*Hydnocarpus alpina*	**24.12**
2	*Beilshmiedia wightii*	**24.02**
3	*Mastixia arborea*	**23.44**
4	*Elaeocarpus tuberculatus*	**17.92**
5	*Isonandra perrottetiana*	**17.56**
6	*Litsea oleoides*	**14.9**
7	*Chionanthus linocieroides*	**12.58**
8	*Cryptocarya bourdillonii*	**12.31**
9	*Saprosma foetens*	**11.69**
10	*Cinnamomum wightii*	**11.49**
Total no of species = 39		

Altitude: 1900 m		
No	**Species**	**IVI**
1	*Beilshmiedia wightii*	**32.94**
2	*Mastixia arborea*	**21.61**
3	*Isonandra perrottetiana*	**18.8**
4	*Cinnamomum wightii*	**15.68**
5	*Gomphandra coriacea*	**14.01**
6	*Syzygium caryophyllatum*	**13.46**
7	*Syzygium gardneri*	**13.04**
8	*Lasianthus acuminatus*	**13.02**
9	*Actinodaphne bourneae*	**12.57**
10	*Persea macrantha*	**11.97**
Total no of species = 34		

Altitude: 2000 m		
No	**Species**	**IVI**
1	*Beilshmiedia wightii*	**30.16**
2	*Litsea wightiana*	**29.59**
3	*Syzygium caryophyllatum*	**27.03**
4	*Syzygium gardneri*	**25.88**
5	*Cinnamomum wightii*	**23.89**
6	*Litsea oleoides*	**23.29**
7	*Turpinia nepalensis*	**15.07**
8	*Ilex wightiana*	**14.6**
9	*Gomphandra coriacea*	**13.97**
10	*Casearia thwaitesii*	**10.87**
Total no of species = 28		

Altitude: 2100 m		
No	**Species**	**IVI**
1	*Ilex walkeri*	**24.13**
2	*Cinnamomum wightii*	**23.65**
3	*Syzygium caryophyllatum*	**23.57**
4	*Turpinia nepalensis*	**22.95**
5	*Syzygium densiflorum*	**19.7**
6	*Sinarundinaria floribunda*	**19.18**
7	*Litsea wightiana*	**16.14**
8	*Litsea oleoides*	**13.54**
9	*Neolitsea zeylanica*	**12**
10	*Casearia thwaitesii*	**11.28**
Total no of species = 31		

Appendix 20. Location: Mannavan Shola (contd.)

Altitude: 2200 m		
No	**Species**	**IVI**
1	*Arundinaria floribunda*	**45.93**
2	*Turpinia nepalensis*	**28.96**
3	*Elaeocarpus recurvatus*	**20.66**
4	*Rhododendron arboreum* ssp. *nilagiricum*	**16.49**
5	*Syzygium caryophyllatum*	**14.15**
6	*Syzygium densiflorum*	**13.78**
7	*Symplocos foliosa*	**13.14**
8	*Cinnamomum wightii*	**11.77**
9	*Ilex wightiana*	**11.64**
10	*Ilex walkeri*	**11.5**
Total no of species = 34		

Altitude: 2300 m		
No	**Species**	**IVI**
1	*Arundinaria floribunda*	**37.79**
2	*Syzygium caryophyllatum*	**29.25**
3	*Elaeocarpus recurvatus*	**28.48**
4	*Turpinia nepalensis*	**23.65**
5	*Symplocos foliosa*	**20.44**
6	*Litsea wightiana*	**20.2**
7	*Microtropis ramiflora*	**17.96**
8	*Rhododendron arboreum* ssp. *nilagiricum*	**14.87**
9	*Psychotria nilgiriensis* var. *astephana*	**11.64**
10	*Cinnamomum wightii*	**10.32**
Total no of species = 32		

Altitude: 2400 m		
No	**Species**	**IVI**
1	*Microtropis ramiflora*	**36.33**
2	*Cinnamomum wightii*	**30.3**
3	*Litsea wightiana*	**25.57**
4	*Ilex denticulata*	**24.65**
5	*Psychotria nilgiriensis* var. *astephana*	**20.4**
6	*Elaeocarpus recurvatus*	**18.49**
7	*Symplocos foliosa*	**15**
8	*Pittosporum tetraspermum*	**14.9**
9	*Arundinaria floribunda*	**14.03**
10	*Eurya nitida*	**10.14**
Total no of species = 26		

Appendix 21. Importance Values of Trees >30 cm gbh (first 10 species only)

Location: Eravikulam

Altitude: 1800 m		
No	**Species**	**IVI**
1	*Chionanthus linocieroides*	**37.41**
2	*Mastixia arborea*	**29.65**
3	*Garcinia gummi-gutta* var. *papilla*	**20.57**
4	*Actinodaphne bourneae*	**20.34**
5	*Prunus ceylanica*	**20.23**
6	*Gomphandra coriacea*	**18.88**
7	*Casearia zeylanica*	**18.54**
8	*Lasianthus acuminatus*	**17.22**
9	*Chionanthus ramiflorus* var. *peninsularis*	**11.88**
10	*Isonandra candolleana*	**11.65**
Total no of species = 26		

Altitude: 2000 m		
No	**Species**	**IVI**
1	*Glochidion neilgherrense*	**57.06**
2	*Syzygium densiflorum*	**31.43**
3	*Ternstroemia japonica*	**24.97**
4	*Mastixia arborea*	**18.9**
5	*Elaeocarpus recurvatus*	**16.97**
6	*Vaccinium leschenaultii*	**15.53**
7	*Arundinaria floribunda*	**13.27**
8	*Rhododendron arboreum* ssp. *nilagiricum*	**12.85**
9	*Eurya nitida*	**11.85**
10	*Pittosporum tetraspermum*	**9.85**
Total no of species = 31		

Altitude: 2200 m		
No	**Species**	**IVI**
1	*Ilex walkeri*	**43.82**
2	*Arundinaria floribunda*	**23.63**
3	*Turpinia nepalensis*	**22.29**
4	*Syzygium densiflorum*	**18.46**
5	*Meliosma simplicifolia* ssp. *pungens*	**18.43**
6	*Pavetta breviflora*	**18.05**
7	*Vaccinium leschenaultii*	**15.44**
8	*Elaeocarpus recurvatus*	**12.18**
9	*Eugenia calcadensis*	**9.22**
10	*Litsea oleoides*	**8.89**
Total no of species = 36		

Altitude: 2400 m		
No	**Species**	**IVI**
1	*Euonymus crenulatus*	**23.39**
2	*Elaeocarpus recurvatus*	**21.8**
3	*Rhododendron arboreum* ssp. *nilagiricum*	**21.48**
4	*Symplocos anamalayana*	**20.87**
5	*Ilex walkeri*	**20.31**
6	*Ligustrum perrottetii*	**20.18**
7	*Turpinia nepalensis*	**16.35**
8	*Pittosporum tetraspermum*	**15.41**
9	*Cinnamomum wightii*	**14.36**
10	*Arundinaria walkeriana*	**13.92**
Total no of species = 32		

Altitude: 2600 m		
No	**Species**	**IVI**
1	*Rhododendron arboreum* ssp. *nilagiricum*	**121.98**
2	*Arundinaria densifolia*	**58.76**
3	*Gaultheria fragrantissima*	**23.46**
4	*Arundinaria walkeriana*	**21.18**
5	*Eurya nitida*	**15.57**
6	*Ilex walkeri*	**15.1**
7	*Ilex denticulata*	**14.1**
8	*Hedyotis buxifolia*	**10.98**
9	*Microtropis ramiflora*	**4.98**
10	*Pittosporum tetraspermum*	**4.82**
Total no of species = 12		

Appendix 22. Maximum height attained by trees* (≥ 30 cm gbh) at Mannavan Shola

Altitude	No	Species	Height (m)	gbh (cm)
1600 m	1	*Gordonia obtusa*	**23.5**	235
	2	*Syzygium cumini*	22	245
(N=168)	3	*Gordonia obtusa*	22	207
	4	*Persea macrantha*	21	243
	5	*Bischofia javanica*	21	194
	6	*Persea macrantha*	20.5	185
	7	*Syzygium cumini*	20	190
	8	*Phoebe wightii*	19.5	160
	9	*Gordonia obtusa*	19	135
	10	*Bischofia javanica*	19	160
1700 m	1	*Elaeocarpus tuberculatus*	**20**	444
	2	*Mallotus tetracoccus*	20	131
(N=135)	3	*Mastixia arborea*	18	117
	4	*Isonandra perrottetiana*	18	200
	5	*Rhamnus wightii* (climber)	18	30
	6	*Mastixia arborea*	17	95
	7	*Rhamnus wightii*	17	43
	8	*Mastixia arborea*	16.5	101
	9	*Ilex wightiana*	16.5	142
	10	*Syzygium cumini*	16	310
1800 m	1	*Elaeocarpus tuberculatus*	**23**	490
	2	*Litsea oleoides*	23	280
(N=126)	3	*Ilex walkeri*	22	235.5
	4	*Cinnamomum wightii*	21.5	139
	5	*Beilschmiedia wightii*	21	214
	6	*Syzygium gardneri*	21	248
	7	*Aglaia apiocarpa*	21	148
	8	*Mastixia arborea*	20.5	156
	9	*Cinnamomum wightii*	20	201
	10	*Chionanthus linocieroides*	20	192
1900 m	1	*Syzygium densiflorum*	**31**	186
	2	*Syzygium gardneri*	30	270
(N=109)	3	*Prunus ceylanica*	30	255
	4	*Syzygium caryophyllatum*	29	316
	5	*Syzygium cumini*	28	340
	6	*Cinnamomum wightii*	28	223
	7	*Litsea oleoides*	28	170
	8	*Elaeocarpus glandulosus*	28	404
	9	*Scolopia crenata*	28	248
	10	*Ternstroemia japonica*	28	220
2000 m	1	*Syzygium gardneri*	**28**	214
	2	*Litsea wightiana*	23	104
(N=135)	3	*Casearia thwaitesii*	23	146
	4	*Cinnamomum wightii*	22	207
	5	*Litsea oleoides*	22	173
	6	*Cinnamomum wightii*	22	105
	7	*Litsea oleoides*	22	108
	8	*Derris brevipes*	22	40
	9	*Beilschmiedia wightii*	22	236
	10	*Syzygium gardneri*	22	178

Appendix 22. (contd.)

Location: **Mannavan Shola (Trees ≥ 30 cm gbh)**

Altitude	No	Species	Height (m)	gbh (cm)
2100 m	1	*Syzygium densiflorum*	**17**	207
	2	*Syzygium densiflorum*	16.5	196
(N=189)	3	*Cinnamomum wightii*	16	190
	4	*Derris brevipes*	16	31
	5	*Phoebe wightii*	16	180
	6	*Cinnamomum wightii*	15	125
	7	*Ilex wightiana*	15	199
	8	*Litsea oleoides*	15	275
	9	*Cinnamomum filipedicellatum*	14.5	122
	10	*Neolitsea zeylanica*	14.5	198
2200 m	1	*Cinnamomum wightii*	**19**	241
	2	*Cinnamomum keralaense*	18.5	336
(N=165)	3	*Cinnamomum macrocarpum*	18.5	245
	4	*Bischofia javanica*	18	35
	5	*Symplocos foliosa*	17.5	132
	6	*Myrsine capitellata*	17	176
	7	*Syzygium gardneri*	17	130
	8	*Symplocos macrophylla* ssp. *macrophylla*	17	94
	9	*Symplocos foliosa*	17	88
	10	*Ilex wightiana*	16.5	381
2300 m	1	*Syzygium caryophyllatum*	**18**	305
	2	*Neolitsea zeylanica*	16	174
(N=173)	3	*Symplocos foliosa*	15	170
	4	*Symplocos foliosa*	15	80
	5	*Elaeocarpus recurvatus*	14.5	304
	6	*Symplocos foliosa*	14	130
	7	*Cinnamomum wightii*	14	90
	8	*Elaeocarpus recurvatus*	13.5	198
	9	*Syzygium caryophyllatum*	13.5	190
	10	*Syzygium densiflorum*	12.5	194
2400 m	1	*Ilex denticulata*	**16**	326
	2	*Cinnamomum wightii*	15.5	115
(N=218)	3	*Elaeocarpus recurvatus*	15	163
	4	*Ilex denticulata*	14.5	182
	5	*Ilex denticulata*	14	125
	6	*Cinnamomum wightii*	14	120
	7	*Ilex wightiana*	14	162
	8	*Cinnamomum wightii*	14	160
	9	*Elaeocarpus recurvatus*	14	148
	10	*Ilex denticulata*	13.5	180

(* Plants ≥30 cm gbh only; only the tallest 10 individuals included; Plot size: 0.1 ha.)

Appendix 23. Maximum height attained by trees* (≥ 30 cm gbh) at Eravikulam

Altitude	No	Species	Height (m)	gbh (cm)
1800 m	1	*Litsea wightiana*	**22**	167.5
	2	*Myrsine wightiana*	20	168
(N = 84)	3	*Chionanthus linocieroides*	20	199
	4	*Casearia zeylanica*	20	134
	5	*Actinodaphne bourneae*	20	161
	6	*Cinnamomum wightii*	20	170
	7	*Mastixia arborea*	19	137.5
	8	*Actinodaphne bourneae*	18.5	136
	9	*Garcinia gummi-gutta* var. *pappilla*	18	126
	10	*Actinodaphne bourneae*	18	127
2000 m	1	*Mastixia arborea*	**17**	161
	2	*Ternstroemia japonica*	17	149
(N = 109)	3	*Mastixia arborea*	17	123.5
	4	*Myrsine wightiana*	16	98.5
	5	*Syzygium densiflorum*	16	132
	6	*Mastixia arborea*	16	152.5
	7	*Syzygium densiflorum*	16	118
	8	*Elaeocarpus recurvatus*	16	113.5
	9	*Cinnamomum wightii*	15	128
	10	*Syzygium gardneri*	15	68.5
2200 m	1	*Ilex walkeri*	**21**	203
	2	*Ilex walkeri*	21	316
(N = 103)	3	*Ilex walkeri*	20	200
	4	*Ilex walkeri*	20	253
	5	*Syzygium densiflorum*	18	190
	6	*Ilex walkeri*	18	423
	7	*Meliosma simplicifolia* ssp. *pungens*	16	213
	8	*Neolitsea zeylanica*	16	162
	9	*Neolitsea zeylanica*	15	46
	10	*Neolitsea scrobiculata*	14	56
2400 m	1	*Ilex walkeri*	**13**	298
	2	*Cinnamomum wightii*	12	246
(N = 167)	3	*Symplocos anamalayana*	12	140
	4	*Cinnamomum wightii*	12	65
	5	*Ilex walkeri*	11	220
	6	*Syzygium densiflorum*	11	73
	7	*Elaeocarpus recurvatus*	11	128
	8	*Derris brevipes* (Liana)	11	33
	9	*Elaeocarpus recurvatus*	10	107
	10	*Elaeocarpus recurvatus*	9	230
2600 m	1	*Rhododendron arboreum* ssp. *nilagiricum*	**7**	62
	2	*Rhododendron arboreum* ssp. *nilagiricum*	6.5	86
(N = 124)	3	*Rhododendron arboreum* ssp. *nilagiricum*	6	237
	4	*Rhododendron arboreum* ssp. *nilagiricum*	5.5	189.5
	5	*Rhododendron arboreum* ssp. *nilagiricum*	5.5	142
	6	*Rhododendron arboreum* ssp. *nilagiricum*	5.5	66
	7	*Rhododendron arboreum* ssp. *nilagiricum*	5.5	64
	8	*Ilex denticulata*	5.5	64
	9	*Rhododendron arboreum* ssp. *nilagiricum*	5.5	41
	10	*Ilex denticulata*	5	129

Appendix 24. Maximum girth attained by trees at different altitudes - I

Location: **Mannavan Shola** (N = Trees ≥ 30 cm gbh only)

Altitude	No	Species	gbh (cm)	Height (m)
1600 m	1	*Syzygium cumini*	**290**	14
	2	*Meliosma simplicifolia*	253	12
(N = 168)	3	*Syzygium cumini*	245	22
	4	*Persea macrantha*	243	21
	5	*Gordonia obtusa*	235	23.5
	6	*Vaccinium leschenaultii*	223	14
	7	*Ilex malabarica*	215.5	17.5
	8	*Gordonia obtusa*	207	22
	9	*Bischofia javanica*	201	18
	10	*Bischofia javanica*	194	21
1700 m	1	*Elaeocarpus tuberculatus*	**444**	20
	2	*Syzygium cumini*	310	16
(N = 135)	3	*Ilex wightiana*	290	15
	4	*Meliosma simplicifolia*	205	12
	5	*Isonandra perrottetiana*	200	18
	6	*Atalantia wightii*	193	13
	7	*Cinnamomum malabatrum*	179	15
	8	*Scolopia crenata*	170	8
	9	*Ilex wightiana*	164	13
	10	*Syzygium cumini*	162	16
1800 m	1	*Elaeocarpus tuberculatus*	**490**	23
	2	*Scolopia crenata*	310	14
(N = 126)	3	*Litsea oleoides*	280	23
	4	*Litsea oleoides*	254	19.5
	5	*Syzygium gardneri*	248	21
	6	*Isonandra perrottetiana*	245	18
	7	*Cinnamomum wightii*	243	16
	8	*Ilex walkeri*	235.5	22
	9	*Mastixia arborea*	220	18.5
	10	*Beilschmiedia wightii*	214	21
1900 m	1	*Elaeocarpus glandulosus*	**404**	28
	2	*Syzygium cumini*	340	28
(N = 109)	3	*Syzygium caryophyllatum*	316	29
	4	*Syzygium densiflorum*	270	31
	5	*Syzygium gardneri*	255	31
	6	*Scolopia crenata*	248	28
	7	*Mastixia arborea*	233	27
	8	*Cinnamomum wightii*	223	28
	9	*Syzygium gardneri*	222	25
	10	*Ternstroemia japonica*	220	28
2000 m	1	*Syzygium gardneri*	**310**	18
	2	*Beilschmiedia wightii*	236	22
(N = 135)	3	*Syzygium caryophyllatum*	228	18
	4	*Litsea wightiana*	227	19
	5	*Syzygium gardneri*	214	28

Appendix 24. (contd.)

Altitude	No	*Species*	gbh (cm)	Height (m)
	6	*Cinnamomum wightii*	207	22
	7	*Ilex wightiana*	205	17
	8	*Syzygium caryophyllatum*	198	18
	9	*Syzygium caryophyllatum*	193	12
	10	*Gomphandra coriacea*	190	8
2100 m	1	*Cinnamomum macrocarpum*	**360**	12
	2	*Litsea oleoides*	275	15
(N = 189)	3	*Phoebe wightii*	272	11
	4	*Ilex walkeri*	215	12
	5	*Syzygium densiflorum*	207	17
	6	*Ilex walkeri*	202	12.5
	7	*Ilex wightiana*	199	15
	8	*Neolitsea zeylanica*	198	14.5
	9	*Syzygium densiflorum*	196	16.5
	10	*Cinnamomum wightii*	190	16
2200 m	1	*Ilex wightiana*	**381**	16.5
	2	*Arundinaria floribunda*	360	3.5
(N = 165)	3	*Cinnamomum keralaense*	336	18.5
	4	*Ilex walkeri*	336	11
	5	*Arundinaria floribunda*	320	6.5
	6	*Syzygium caryophyllatum*	310	15
	7	*Ligustrum perrottetii*	290	10
	8	*Ilex walkeri*	280	13
	9	*Rhododendron arboreum* ssp. *nilagiricum*	278	10
	10	*Cinnamomum macrocarpum*	245	18.5
2300 m	1	*Syzygium caryophyllatum*	**305**	18
	2	*Elaeocarpus recurvatus*	304	14.5
(N = 173)	3	*Arundinaria floribunda*	240	2.5
	4	*Syzygium caryophyllatum*	228	10
	5	*Ilex walkeri*	210	12.5
	6	*Elaeocarpus recurvatus*	198	13.5
	7	*Syzygium densiflorum*	194	12.5
	8	*Syzygium caryophyllatum*	190	13.5
	9	*Rhododendron arboreum* ssp. *nilagiricum*	190	10.5
	10	*Pittosporum tetraspermum*	180	13
2400 m	1	*Ilex denticulata*	**326**	16
	2	*Ligustrum perrottetii*	210	9
(N = 218)	3	*Ilex denticulata*	182	14.5
	4	*Ilex denticulata*	180	13.5
	5	*Elaeocarpus recurvatus*	163	15
	6	*Syzygium densiflorum*	163	12
	7	*Ilex wightiana*	162	14
	8	*Cinnamomum wightii*	160	14
	9	*Ilex walkeri*	150	11
	10	*Elaeocarpus recurvatus*	148	14

Appendix 25. Maximum girth attained by trees at different altitudes - II

Location: **Eravikulam** (N = Trees > = 30 cm gbh only)

Altitude	No	Species	gbh (cm)	Height (m)
1800 m	1	*Chionanthus linocieroides*	**270**	18
	2	*Chionanthus linocieroides*	199	20
(N = 84)	3	*Chionanthus linocieroides*	198	17
	4	*Garcinia gummi-gutta* var. *papilla*	175	11
	5	*Mastixia arborea*	172	14
	6	*Cinnamomum wightii*	170	20
	7	*Myrsine wightiana*	168	20
	8	*Litsea wightiana*	167.5	22
	9	*Mastixia arborea*	165	18
	10	*Schefflera racemosa*	165	16
2000 m	1	*Arundinaria floribunda*	**312**	3
	2	*Mastixia arborea*	194	14
(N = 109)	3	*Ternstroemia japonica*	166	5.5
	4	*Elaeocarpus recurvatus*	164	14.5
	5	*Mastixia arborea*	161	17
	6	*Arundinaria floribunda*	160	1.25
	7	*Mastixia arborea*	152.5	16
	8	*Ternstroemia japonica*	149	17
	9	*Ternstroemia japonica*	147	15
	10	*Syzygium densiflorum*	147	14
2200 m	1	*Ilex walkeri*	**423**	18
	2	*Ilex walkeri*	316	21
(N = 103)	3	*Arundinaria floribunda*	312	3
	4	*Syzygium densiflorum*	267	8.5
	5	*Ilex walkeri*	253	20
	6	*Vaccinium leschenaultii*	230	7
	7	*Meliosma simplicifolia* ssp. *pungens*	213	16
	8	*Vaccinium leschenaultii*	204	8.5
	9	*Ilex walkeri*	203	21
	10	*Vaccinium leschenaultii*	203	9
2400 m	1	*Ilex walkeri*	**298**	13
	2	*Cinnamomum wightii*	246	12
(N = 167)	3	*Elaeocarpus recurvatus*	230	9
	4	*Ilex walkeri*	220	11
	5	*Rhododendron arboreum* ssp. *nilagiricum*	212.5	8
	6	*Microtropis ramiflora*	211	8
	7	*Ilex denticulata*	182	9
	8	*Rhododendron arboreum* ssp. *nilagiricum*	176	7
	9	*Rhododendron arboreum* ssp. *nilagiricum*	148	9
	10	*Cinnamomum wightii*	143	9
2600 m	1	*Rhododendron arboreum* ssp. *nilagiricum*	**237**	6
	2	*Rhododendron arboreum* ssp. *nilagiricum*	189.5	5.5
(N = 124)	3	*Rhododendron arboreum* ssp. *nilagiricum*	142	5.5
	4	*Rhododendron arboreum* ssp. *nilagiricum*	141	2.5
	5	*Ilex denticulata*	129	5
	6	*Rhododendron arboreum* ssp. *nilagiricum*	120	4
	7	*Ilex walkeri*	111	4.5
	8	*Arundinaria densifolia*	94.5	1
	9	*Rhododendron arboreum* ssp. *nilagiricum*	92	3
	10	*Rhododendron arboreum* ssp. *nilagiricum*	86.5	4.5

Appendix 26. Structural status of vegetation with respect to altitudes

Location: Mannavan Shola (Stems ≥1 cm dbh)

Altitude	No	Most dominant species	Character species	Least dominant species
1600 m	1	*Phoebe wightii*	*Bischofia javanica*	*Clerodendrum serratum*
(N = 69)	2	*Meliosma simplicifolia*	*Clerodendrum viscosum*	*Cyphomandra betacea*
	3	*Persea macrantha*	*Myrsine wightiana*	*Derris brevifolia*
	4	*Strobilanthes cuspidatus*	*Glochidion neilgherrense*	*Elaeagnus kologa*
	5	*Viburnum punctatum*	*Daphniphyllum neilgherrense*	*Eurya nitida*
	6	*Syzygium cumini*	*Ilex malabarica*	*Piper hymenophyllum*
	7	*Symplocos cochinchinensis*	*Acronychia laurifolia*	*Pogostemon pubescens*
	8	*Turpinia nepalensis*	*Maesa indica*	*Polygala arillata*
	9	*Vaccinium leschenaultii*	*Neolitsea zeylanica*	*Syzygium caryophyllatum*
	10	*Gordonia obtusa*	*Rhododendron arboreum* ssp. *nilagiricum*	*Toddalia asiatica*
1700 m	1	*Strobilanthes gracilis*	*Daphniphyllum neilgherrense*	*Cinnamomum wightii*
(N = 70)	2	*Lasianthus acuminatus*	*Acronychia pedunculata*	*Chionanthus linocieroides*
	3	*Elaeocarpus tuberculatus*	*Turpinia nepalensis*	*Olea paniculata*
	4	*Ilex wightiana*	*Neolitsea zeylanica*	*Cinnamomum keralaense*
	5	*Syzygium cumini*	*Glochidion neilgherrense*	*Parthenocissus neilgherriensis*
	6	*Persea macrantha*	*Isonandra perrottetiana*	*Aglaia apiocarpa*
	7	*Phoebe wightii*	*Viburnum punctatum*	*Bhesa indica*
	8	*Meliosma simplicifolia*	*Murraya paniculata*	*Maesa perrottetiana*
	9	*Hydnocarpus alpina*	*Atalantia wightii*	*Nothapodytes nimmoniana*
	10	*Mastixia arborea*	*Gomphandra coriacea*	*Strobilanthes asperrimus*
1800 m	1	*Strobilanthes gracilis*	*Cinnamomum wightii*	*Derris brevipes*
(N = 68)	2	*Lasianthus acuminatus*	*Saprosma foetens*	*Ilex wightiana*
	3	*Beilschmiedia wightii*	*Chionanthus ramiflorus* var. *peninsularis*	*Gnidia glauca*
	4	*Mastixia arborea*	*Cryptocarya bourdillonii*	*Olea paniculata*
	5	*Elaeocarpus tuberculatus*	*Syzygium gardneri*	*Piper hymenophyllum*
	6	*Hydnocarpus alpina*	*Actinodaphne bourdillonii*	*Strobilanthes micranthus*
	7	*Ardisia rhomboidea*	*Neolitsea zeylanica*	*Strobilanthes urceolaris*
	8	*Isonandra perrottetiana*	*Strobilanthes luridus*	*Symplocos cochinchinensis* ssp *laurina*
	9	*Litsea oleoides*	*Prunus ceylanica*	*Symplocos oligandra*
	10	*Chionanthus linocieroides*	*Scolopia crenata*	*Trichilia connaroides*
1900 m	1	*Strobilanthes gracilis*	*Syzygium gardneri*	*Cocculus laurifolius*
(N = 48)	2	*Ardisia rhomboidea*	*Isonandra perrottetiana*	*Symplocos pendula*
	3	*Lasianthus acuminatus*	*Actinodaphne bourneae*	*Debregeasia velutina*
	4	*Beilschmiedia wightii*	*Syzygium cumini*	*Ilex wightiana*
	5	*Mastixia arborea*	*Persea macrantha*	*Excoecaria crenulata*
	6	*Strobilanthes luridus*	*Symplocos oligandra*	*Psychotria nilgiriensis*
	7	*Strobilanthes micranthus*	*Gomphandra coriacea*	*Neolitsea scrobiculata*
	8	*Cinnamomum wightii*	*Saprosma foetens*	*Phoebe wightii*
	9	*Syzygium caryophyllatum*	*Syzygium densiflorum*	*Clerodendrum serratum*
	10	*Elaeocarpus glandulosus*	*Litsea oleoides*	*Toddalia asiatica*
2000 m	1	*Lasianthus acuminatus*	*Strobilanthes micranthus*	*Isonandra perrottetiana*
(N = 50)	2	*Strobilanthes gracilis*	*Gomphandra coriacea*	*Phoebe wightii*
	3	*Ardisia rhomboidea*	*Turpinia nepalensis*	*Celtis tetrandra*
	4	*Syzygium gardneri*	*Neolitsea zeylanica*	*Cinnamomum travancoricum*

*** N = Total number of species**

Appendix 26. (contd.)

Altitude	No	Most dominant species	Character species	Least dominant species
	5	*Cinnamomum wightii*	*Casearia thwaitesii*	*Antidesma menasu*
	6	*Beilschmiedia wightii*	*Casearia zeylanica*	*Clerodendrum viscosum*
	7	*Syzygium caryophyllatum*	*Mastixia arborea*	*Cryptocarya bourdillonii*
	8	*Litsea wightiana*	*Neolitsea scrobiculata*	*Rungia laeta*
	9	*Litsea oleoides*	*Cinnamomum filipedicellatum*	*Strobilanthes calycinus*
	10	*Ilex wightiana*	*Prunus ceylanica*	*Symplocos oligandra*
2100 m	1	*Syzygium caryophyllatum*	*Turpinia nepalensis*	*Ligustrum perrottetii*
(N = 59)	2	*Cinnamomum wightii*	*Psychotria nilgiriensis*	*Parthenocissus neilgherriensis*
	3	*Lasianthus acuminatus*	*Arundinaria floribunda*	*Piper attenuatum*
	4	*Strobilanthes gracilis*	*Cinnamomum macrocarpum*	*Polygala arillata*
	5	*Ardisia rhomboidea*	*Strobilanthes micranthus*	*Prunus ceylanica*
	6	*Syzygium densiflorum*	*Phoebe wightii*	*Senecio scandens*
	7	*Ilex walkeri*	*Casearia thwaitesii*	*Symplocos foliosa*
	8	*Litsea wightiana*	*Cinnamomum filipedicellatum*	*Symplocos macrophylla* ssp. *rosea*
	9	*Neolitsea zeylanica*	*Myrsine thwaitesii*	*Symplocos pendula*
	10	*Litsea oleoides*	*Beilschmiedia wightii*	*Tylophora mollissima*
2200 m	1	*Psychotria nilgiriensis* var. *astephana*	*Rhododendron arboreum* ssp. *nilagiricum*	*Gaultheria fragrantissima*
(N = 72)	2	*Arundinaria floribunda*	*Ilex wightiana*	*Hedyotis anamalayana*
	3	*Syzygium caryophyllatum*	*Symplocos foliosa*	*Hypericum mysurense*
	4	*Turpinia nepalensis*	*Mahonia leschenaultii*	*Impatiens hensloviana*
	5	*Elaeocarpus recurvatus*	*Cinnamomum keralaense*	*Persea macrantha*
	6	*Litsea wightiana*	*Microtropis ramiflora*	*Piper mullesua*
	7	*Syzygium densiflorum*	*Vaccinium leschenaultii*	*Piper wightii*
	8	*Ilex walkeri*	*Neolitsea zeylanica*	*Smilax wightii*
	9	*Cinnamomum wightii*	*Ligustrum perrottetii*	*Solanum viarum*
	10	*Strobilanthes gracilis*	*Piper schmidtii*	*Vernonia bourneana*
2300 m	1	*Strobilanthes gracilis*	*Syzygium densiflorum*	*Clematis munroiana*
(N = 66)	2	*Psychotria nilgiriensis* var. *astephana*	*Cinnamomum wightii*	*Crotalaria beddomeana*
	3	*Syzygium caryophyllatum*	*Elaeagnus kologa*	*Hedyotis anamalayana*
	4	*Arundinaria floribunda*	*Mahonia leschenaultii*	*Litsea glabrata*
	5	*Elaeocarpus recurvatus*	*Neolitsea zeylanica*	*Osbeckia leschenaultiana*
	6	*Litsea wightiana*	*Myrsine wightiana*	*Piper wightii*
	7	*Microtropis ramiflora*	*Cinnamomum keralaense*	*Sageretia hamosa*
	8	*Symplocos foliosa*	*Myrsine thwaitesii*	*Toddalia asiatica*
	9	*Turpinia nepalensis*	*Symplocos anamalayana*	*Vernonia bourneana*
	10	*Rhododendron arboreum* ssp. *nilagiricum*	*Ageratina adenophora*	*Vernonia fysonii*
2400 m	1	*Psychotria nilgiriensis* var. *astephana*	*Mahonia leschenaultii*	*Symplocos macrophylla* ssp. *macrophylla*
(N = 59)	2	*Microtropis ramiflora*	*Arundinaria floribunda*	*Clematis munroiana*
	3	*Ilex denticulata*	*Symplocos anamalayana*	*Neolitsea zeylanica*
	4	*Cinnamomum wightii*	*Turpinia nepalensis*	*Notonia walkeri*
	5	*Litsea wightiana*	*Hedyotis corymbosa*	*Persea macrantha*
	6	*Symplocos foliosa*	*Eurya nitida*	*Plectranthus malabaricus*
	7	*Elaeocarpus recurvatus*	*Ligustrum perrottetii*	*Myrsine wightiana*
	8	*Myrsine thwaitesii*	*Rhododendron arboreum* ssp. *nilagiricum*	*Senecio scandens*
	9	*Pittosporum tetraspermum*	*Ilex walkeri*	*Symplocos macrophylla* ssp. *rosea*
	10	*Syzygium densiflorum*	*Ilex wightiana*	*Toddalia asiatica*

Appendix 27. Structural status of vegetation with respect to altitudes

Location: Eravikulam (Stems > = 1 cm dbh)

Altitude	N	Most dominant Species	Character species	Least dominant species
1800 m	1	*Lasianthus acuminatus*	*Symplocos macrophylla* ssp. *rosea*	*Casearia thwaitesii*
(N = 47)	2	*Strobilanthes gracilis*	*Chionanthus ramiflorus* var. *peninsularis*	*Scolopia crenata*
	3	*Chionanthus linocieroides*	*Isonandra candolleana*	*Strobilanthes micranthus*
	4	*Ardisia rhomboidea*	*Neolitsea scrobiculata*	*Calamus gamblei*
	5	*Mastixia arborea*	*Psychotria nilgiriensis*	*Microtropis ramiflora*
	6	*Actinodaphne bourneae*	*Glochidion neilgherrense*	*Actinodaphne bourdillonii*
	7	*Garcinia cowa*	*Persea macrantha*	*Daphniphyllum neilgherrense*
	8	*Casearia zeylanica*	*Cinnamomum wightii*	*Lycianthes laevis*
	9	*Prunus ceylanica*	*Meliosma simplicifolia*	*Rauvolfia densiflora*
	10	*Gomphandra coriacea*	*Apollonias arnottii*	*Ixora notoniana*
2000 m	1	*Strobilanthes gracilis*	*Psychotria nilgiriensis* var. *astephana*	*Cinnamomum keralaense*
(N = 64)	2	*Syzygium densiflorum*	*Strobilanthes foliosus*	*Calamus gamblei*
	3	*Ternstroemia japonica*	*Pittosporum tetraspermum*	*Ligustrum perrottetii*
	4	*Mastixia arborea*	*Derris brevipes*	*Pavetta breviflora*
	5	*Arundinaria floribunda*	*Ageratina adenophora*	*Symplocos macrophylla* ssp. *macrophylla*
	6	*Lasianthus acuminatus*	*Symplocos macrophylla* ssp. *rosea*	*Protasparagus racemosus*
	7	*Elaeocarpus recurvatus*	*Rhodomyrtus tomentosa*	*Nothapodytes nimmoniana*
	8	*Cinnamomum wightii*	*Eurya nitida*	*Actinodaphne bourneae*
	9	*Vaccinium leschenaultii*	*Mahonia leschenaultii*	*Arundinaria densifolia*
	10	*Rhododendron arboreum* ssp. *nilagiricu*	*Glochidion neilgherrense*	*Alsophila nilgirensis*
2200 m	1	*Ilex walkeri*	*Turpinia nepalensis*	*Actinodaphne bourneae*
(N = 53)	2	*Psychotria nilgiriensis* var. *astephana*	*Elaeocarpus recurvatus*	*Gardneria ovata*
	3	*Ardisia rhomboidea*	*Microtropis ramiflora*	*Lasianthus coffeoides*
	4	*Arundinaria floribunda*	*Pavetta breviflora*	*Prunus ceylanica*
	5	*Strobilanthes micranthus*	*Euonymus crenulatus*	*Actinodaphne bourdillonii*
	6	*Syzygium densiflorum*	*Eugenia calcadensis*	*Hedyotis anamalayana*
	7	*Meliosma simplicifolia* ssp. *pungens*	*Litsea wightiana*	*Schefflera rostrata*
	8	*Vaccinium leschenaultii*	*Symplocos macrophylla* ssp. *macrophylla*	*Strobilanthes zenkerianus*
	9	*Cinnamomum wightii*	*Strobilanthes gracilis*	*Mastixia arborea*
	10	*Litsea oleoides*	*Mahonia leschenaultii*	*Ternstroemia japonica*
2400 m	1	*Rhododendron arboreum* ssp. *nilagiricu*	*Microtropis ramiflora*	*Jasminum bignoniaceum*
(N = 44)	2	*Psychotria nilgiriensis* var. *astephana*	*Syzygium densiflorum*	*Casearia thwaitesii*
	3	*Ilex thwaitesii*	*Turpinia nepalensis*	*Derris brevipes*
	4	*Ligustrum perrottetii*	*Arundinaria walkeriana*	*Osbeckia melastomoides*
	5	*Elaeocarpus recurvatus*	*Arachniodes aristata*	*Crotalaria spectabilis*
	6	*Euonymus crenulatus*	*Symplocos cochinchinensis* ssp. *laurina*	*Rubus fairholmianus*
	7	*Symplocos anamalayana*	*Strobilanthes gracilis*	*Scutellaria wightiana*
	8	*Myrsine thwaitesii*	*Ilex denticulata*	*Symplocos foliosa*
	9	*Cinnamomum wightii*	*Actinodaphne bourneae*	*Symplocos macrophylla* ssp. *rosea*
	10	*Pittosporum tetraspermum*	*Schefflera rostrata*	*Daphniphyllum neilgherrense*

* N = Total number of species

Appendix 27. (contd.)

Location: Eravikulam (Stems > = 1 cm dbh)

Altitude	N	Most dominant Species	Character species	Least dominant species
2600 m (N = 27)	1	*Rhododendron arboreum* ssp *nilagiricum*	*Polygonum chinense*	*Pogostemon artopurpureus*
	2	*Arundinaria densifolia*	*Scutellaria wightiana*	*Knoxia* sp. 1
	3	*Gaultheria fragrantissima*	*Ilex denticulata*	*Senecio scandens*
	4	*Rubus fairholmianus*	*Arachniodes aristata*	*Pittosporum tetraspermum*
	5	*Eurya nitida*	*Myrsine thwaitesii*	*Pteridium aquilinum*
	6	*Hedyotis buxifolia*	*Hedyotis articularis*	*Jasminum bignoniaceum*
	7	*Anaphalis travancorica*	*Osbeckia leschenaultiana*	*Polystichum* sp. 1
	8	*Ageratina adenophora*	*Hedyotis leschenaultiana*	
	9	*Ilex walkeri*	*Leucas lanceaefolia*	
	10	*Arundinaria walkeriana*	*Kalanchoe grandiflora*	

* N = Total number of species

Appendix 28. Species compositional difference with respect to altitude

C. No	No	SPECIES
1. Low altitudes only (1600–1700 m)		
1.	1	*Allophylus concanicus*
2.	2	*Archidendron clypearia*
3.	3	*Atalantia wightii*
4.	4	*Cassia laevigata*
5.	5	*Cyphomandra betacea*
6.	6	*Gordonia obtusa*
7.	7	*Ilex malabarica*
8.	8	*Maesa indica*
9.	9	*Mallotus tetracoccus*
10.	10	*Meliosma pinnata*
11.	11	*Nothopegia colebrookeana*
12.	12	*Pogostemon pubescens*
13.	13	*Psychotria glandulosa*
14.	14	*Rauvolfia densiflora*
15.	15	*Rhamnus wightii*
16.	16	*Strobilanthes asperrimus*
17.	17	*Strobilanthes cuspidatus*
18.	18	*Strobilanthes foliosus*
19.	19	*Symplocos cochinchinensis*
20.	20	*Viburnum coriaceum*
21.	21	*Viburnum punctatum*
22.	22	*Xantolis tomentosa*

(C. No. = Cumulative number)

C. No	No	SPECIES
2. Low and medium altitudes only (1600-2000 m)		
23.	1	*Acronychia laurifolia*
24.	2	*Actinodaphne bourdillonii*
25.	3	*Aglaia apiocarpa*
26.	4	*Alseodaphne semecarpifolia*
27.	5	*Antidesma menasu*
28.	6	*Apollonias arnottii*
29.	7	*Bhesa indica*
30.	8	*Bischofia javanica*
31.	9	*Canthium rheedii*
32.	10	*Chassalia curviflora*
33.	11	*Chassalia curviflora* var. *ophioxyloides*
34.	12	*Chionanthus linocieroides*
35.	13	*Chionanthus ramiflorus* var. *peninsularis*
36.	14	*Cinnamomum malabatrum*
37.	15	*Cinnamomum travancoricum*
38.	16	*Clerodendrum serratum*
39.	17	*Clerodendrum viscosum*
40.	18	*Cocculus laurifolius*
41.	19	*Connarus wightii*
42.	20	*Cryptocarya bourdillonii*
43.	21	*Debregeasia velutina*
44.	22	*Elaeocarpus glandulosus*
45.	23	*Elaeocarpus tuberculatus*
46.	24	*Ficus amplocarpa*
47.	25	*Hydnocarpus alpina*
48.	26	*Isonandra perrottetiana*
49.	27	*Lasianthus coffeoides*
50.	28	*Meliosma simplicifolia*
51.	29	*Murraya paniculata*
52.	30	*Olea paniculata*
53.	31	*Pavetta breviflora*
54.	32	*Photinia notoniana*
55.	33	*Piper nigrum*
56.	34	*Pygeum gardneri*
57.	35	*Saprosma foetens*
58.	36	*Sarcococca coriacea*
59.	37	*Schefflera racemosa*
60.	38	*Scolopia crenata*
61.	39	*Strobilanthes luridus*
62.	40	*Strobilanthes urceolaris*
63.	41	*Syzygium cumini*
64.	42	*Ternstroemia japonica*
65.	43	*Trichilia connaroides*
66.	44	*Zanthoxylum tetraspermum*

Appendix 28. (contd.)

C. No	No	SPECIES
3. Low to high altitudes (1600-2400 m)		
67.	1	*Celtis tetrandra*
68.	2	*Cirsium wallichii*
69.	3	*Daphniphyllum neilgherrense*
70.	4	*Derris brevipes*
71.	5	*Glochidion neilgherrense*
72.	6	*Gomphandra coriacea*
73.	7	*Lasianthus acuminatus*
74.	8	*Litsea glabrata*
75.	9	*Litsea oleoides*
76.	10	*Myrsine wightiana*
77.	11	*Neolitsea scrobiculata*
78.	12	*Phoebe wightii*
79.	13	*Piper hymenophyllum*
80.	14	*Piper mullesua*
81.	15	*Polygala arillata*
82.	16	*Prunus ceylanica*
83.	17	*Psychotria nilgiriensis*
84.	18	*Rubus ellipticus*
85.	19	*Sageretia hamosa*
86.	20	*Strobilanthes gracilis*
87.	21	*Syzygium caryophyllatum*
88.	22	*Vaccinium leschenaultii*
4. Low to very high altitudes (1600-2600 m)		
89.	1	*Ageratina adenophora*
90.	2	*Cinnamomum wightii*
91.	3	*Elaeagnus kologa*
92.	4	*Eurya nitida*
93.	5	*Gaultheria fragrantissima*
94.	6	*Ilex walkeri*
95.	7	*Litsea wightiana*
96.	8	*Neolitsea zeylanica*
97.	9	*Persea macrantha*
98.	10	*Piper attenuatum*
99.	11	*Piper wightii*
100.	12	*Rhododendron arboreum* ssp. *nilagiricum*
101.	13	*Rubus fairholmianus*
102	14	*Rubus niveus*
103.	15	*Syzygium densiflorum*
104.	16	*Toddalia asiatica*
105.	17	*Turpinia nepalensis*

C. No	No	SPECIES
5. Medium altitudes only (1800-2000 m)		
106.	1	*Actinodaphne bourneae*
107.	2	*Ardisia rhomboidea*
108.	3	*Casearia zeylanica*
109.	4	*Euphorbia rothiana*
110.	5	*Excoecaria crenulata*
111.	6	*Glochidion ellipticum*
112.	7	*Ilex wightiana*
113.	8	*Mastixia arborea*
114.	9	*Neolitsea fischeri*
115.	10	*Nothapodytes nimmoniana*
116.	11	*Parthenocissus neilgherriensis*
117.	12	*Rungia laeta*
118.	13	*Symplocos cochinchinensis* ssp. *laurina*
119.	14	*Symplocos oligandra*
120.	15	*Syzygium gardneri*
121.	16	*Vaccinium neilgherrense*
6. Medium to high altitudes (1800-2400 m)		
122.	1	*Beilshmiedia wightii*
123.	2	*Alsophila nilgirensis*
124.	3	*Hedyotis anamalayana*
125.	4	*Hypericum mysurense*
126.	5	*Impatiens hensloviana*
127.	6	*Litsea coriacea*
128.	7	*Isonandra lanceolata*
129.	8	*Lasianthus venulosus*
130.	9	*Psychotria elongata*
131.	10	*Strobilanthes calycinus*
132.	11	*Strobilanthes micranthus*
133.	12	*Strobilanthes wightianus*
134.	13	*Symplocos pendula*
135.	14	*Tylophora mollissima*
7. Medium to very high altitudes (1800-2600m)		
136.	1	*Eurya japonica*
137.	2	*Ligustrum perrottetii*
138.	3	*Microtropis ramiflora*
139.	4	*Symplocos foliosa*

(C. No. = Cumulative number)

Appendix 28. (contd.)

C. No	No	SPECIES
8. High altitudes only (2000-2400 m)		
140.	1	*Casearia thwaitesii*
141.	2	*Cinnamomum filipedicellatum*
142.	3	*Elaeocarpus recurvatus*
143.	4	*Meliosma simplicifolia* ssp. *pungens*
144.	5	*Osbeckia leschenaultiana*
145.	6	*Plectranthus coleoides*
146.	7	*Myrsine capitellata*
147.	8	*Myrsine thwaitesii*
148.	9	*Smilax wightii*
149.	10	*Solanum virginianum*
150.	11	*Symplocos macrophylla* ssp. *rosea*
151.	12	*Vernonia bourneana*
9. High and very high altitudes (2000-2600 m)		
152.	1	*Arachniodes aristata*
153.	2	*Cinnamomum keralaense*
154.	3	*Cinnamomum macrocarpum*
155.	4	*Cissampelopsis corymbosa*
156.	5	*Crotalaria beddomeana*
157.	6	*Hedyotis corymbosa*
158.	7	*Helichrysum buddleioides*
159.	8	*Ilex denticulata*
160.	9	*Jasminum bignoniaceum*
161.	10	*Leucas lanceaefolia*
162.	11	*Mahonia leschenaultii*
163.	12	*Michelia nilagirica*
164.	13	*Notonia walkeri*
165.	14	*Pilea trinervia*
166.	15	*Piper argyrophyllum*
167.	16	*Piper schmidtii*
168.	17	*Pittosporum neilgherrense*
169.	18	*Polygonum chinense*
170.	19	*Psychotria nilgiriensis* var. *astephana*
171.	20	*Pteridium aquilinum*
172.	21	*Senecio scandens*
173.	22	*Arundinaria floribunda*
174.	23	*Symplocos anamalayana*
175.	24	*Symplocos macrophylla* ssp. *macrophylla*
176.	25	*Vernonia fysonii*
10. Very high altitudes only (> 2400 m)		
177.	1	*Clematis munroiana*
178.	2	*Hedyotis leschenaultiana*
179.	3	*Pittosporum tetraspermum*
180.	4	*Scutellaria wightiana*
181.	5	*Strobilanthes zenkerianus*

Appendix 29. Species encountered in different altitudes* at Mannavan Shola

(*purely based on quadrat data)

No	1600 m	No	1700 m	No	1800 m
1	*Acronychia pedunculata*	1	*Acronychia pedunculata*	1	*Acronychia pedunculata*
2	*Allophylus concanicus*	2	*Aglaia apiocarpa*	2	*Actinodaphne bourdillonii*
3	*Antidesma menasu*	3	*Ardisia rhomboidea*	3	*Aglaia apiocarpa*
4	*Archidendron clypearia*	4	*Atalantia wightii*	4	*Alseodaphne semecarpifolia*
5	*Bischofia javanica*	5	*Bhesa indica*	5	*Apollonias arnottii*
6	*Cassia laevigata*	6	*Bischofia javanica*	6	*Ardisia rhomboidea*
7	*Celtis tetrandra*	7	*Chassalia curviflora* var. *ophioxyloides*	7	*Beilshmiedia wightii*
8	*Chassalia curviflora*	8	*Chionanthus linocieroides*	8	*Bhesa indica*
9	*Cinnamomum wightii*	9	*Chionanthus ramiflorus* var. *peninsularis*	9	*Canthium rheedii*
10	*Clerodendrum serratum*	10	*Cinnamomum keralaense*	10	*Chassalia curviflora*
11	*Clerodendrum viscosum*	11	*Cinnamomum malabatrum*	11	*Chassalia curviflora* var. *ophioxyloides*
12	*Cocculus laurifolius*	12	*Cinnamomum wightii*	12	*Chionanthus linocieroides*
13	*Cyphomandra betacea*	13	*Clerodendrum serratum*	13	*Chionanthus ramiflorus* var. *peninsularis*
14	*Daphniphyllum neilgherrense*	14	*Clerodendrum viscosum*	14	*Cinnamomum malabatrum*
15	*Derris brevipes*	15	*Cocculus laurifolius*	15	*Cinnamomum wightii*
16	*Elaeagnus kologa*	16	*Cryptocarya bourdillonii*	16	*Clerodendrum serratum*
17	*Elaeocarpus glandulosus*	17	*Daphniphyllum neilgherrense*	17	*Clerodendrum viscosum*
18	*Eurya nitida*	18	*Elaeocarpus glandulosus*	18	*Cryptocarya bourdillonii*
19	*Glochidion neilgherrense*	19	*Elaeocarpus tuberculatus*	19	*Derris brevipes*
20	*Gordonia obtusa*	20	*Eurya nitida*	20	*Elaeocarpus munronii*
21	*Hydnocarpus alpina*	21	*Glochidion neilgherrense*	21	*Elaeocarpus tuberculatus*
22	*Ilex malabarica*	22	*Gomphandra coriacea*	22	*Eurya nitida*
23	*Ilex walkeri*	23	*Hedyotis anamalayana*	23	*Glochidion neilgherrense*
24	*Ilex wightiana*	24	*Hydnocarpus alpina*	24	*Gnidia glauca*
25	*Lasianthus acuminatus*	25	*Ilex walkeri*	25	*Gomphandra coriacea*
26	*Litsea glabrata*	26	*Ilex wightiana*	26	*Hydnocarpus alpina*
27	*Litsea oleoides*	27	*Isonandra perrottetiana*	27	*Ilex walkeri*
28	*Litsea wightiana*	28	*Lasianthus acuminatus*	28	*Ilex wightiana*
29	*Maesa indica*	29	*Litsea glabrata*	29	*Isonandra lanceolata*
30	*Meliosma pinnata*	30	*Maesa indica*	30	*Isonandra perrottetiana*
31	*Meliosma simplicifolia*	31	*Mallotus tetracoccus*	31	*Lasianthus acuminatus*
32	*Murraya paniculata*	32	*Mastixia arborea*	32	*Lasianthus coffeoides*
33	*Myrsine wightiana*	33	*Meliosma pinnata*	33	*Lasianthus venulosus*
34	*Neolitsea scrobiculata*	34	*Meliosma simplicifolia*	34	*Litsea oleoides*
35	*Neolitsea zeylanica*	35	*Murraya paniculata*	35	*Litsea wightiana*
36	*Nothopegia colebrookeana*	36	*Myrsine wightiana*	36	*Mastixia arborea*
37	*Pavetta breviflora*	37	*Neolitsea scrobiculata*	37	*Murraya paniculata*
38	*Persea macrantha*	38	*Neolitsea zeylanica*	38	*Myrsine wightiana*
39	*Phoebe wightii*	39	*Nothapodytes nimmoniana*	39	*Neolitsea fischeri*
40	*Piper attenuatum*	40	*Olea paniculata*	40	*Neolitsea zeylanica*
41	*Piper hymenophyllum*	41	*Parthenocissus neilgherriensis*	41	*Nothapodytes nimmoniana*
42	*Piper mullesua*	42	*Persea macrantha*	42	*Olea paniculata*
43	*Piper wightii*	43	*Phoebe wightii*	43	*Parthenocissus neilgherriensis*
44	*Pogostemon pubescens*	44	*Photinia notoniana*	44	*Persea macrantha*
45	*Polygala arillata*	45	*Piper nigrum*	45	*Phoebe wightii*
46	*Prunus ceylanica*	46	*Psychotria glandulosa*	46	*Piper hymenophyllum*

No	1600 m	No	1700 m	No	1800 m
47	*Psychotria glandulosa*	47	*Psychotria nilgiriensis*	47	*Piper mullesua*
48	*Psychotria nilgiriensis*	48	*Rauvolfia densiflora*	48	*Piper nigrum*
49	*Rhododendron arboreum* ssp. *nilagiricum*	49	*Rhamnus wightii*	49	*Piper wightii*
50	*Sageretia hamosa*	50	*Rhododendron arboreum* ssp. *nilagiricum*	50	*Prunus ceylanica*
51	*Sarcococca saligna*	51	*Saprosma foetens*	51	*Psychotria nilgiriensis*
52	*Schefflera racemosa*	52	*Sarcococca saligna*	52	*Saprosma foetens*
53	*Scolopia crenata*	53	*Schefflera racemosa*	53	*Sarcococca saligna*
54	*Strobilanthes cuspidatus*	54	*Scolopia crenata*	54	*Scolopia crenata*
55	*Strobilanthes foliosus*	55	*Strobilanthes asperrimus*	55	*Strobilanthes gracilis*
56	*Strobilanthes gracilis*	56	*Strobilanthes foliosus*	56	*Strobilanthes luridus*
57	*Strobilanthes luridus*	57	*Strobilanthes gracilis*	57	*Strobilanthes micranthus*
58	*Strobilanthes urceolaris*	58	*Strobilanthes urceolaris*	58	*Strobilanthes urceolaris*
59	*Symplocos cochinchinensis*	59	*Symplocos cochinchinensis*	59	*Symplocos cochinchinensis* ssp. *laurina*
60	*Syzygium caryophyllatum*	60	*Symplocos cochinchinensis* ssp. *laurina*	60	*Symplocos oligandra*
61	*Syzygium cumini*	61	*Syzygium caryophyllatum*	61	*Syzygium caryophyllatum*
62	*Syzygium densiflorum*	62	*Syzygium cumini*	62	*Syzygium densiflorum*
63	*Toddalia asiatica*	63	*Ternstroemia japonica*	63	*Syzygium gardneri*
64	*Turpinia nepalensis*	64	*Toddalia asiatica*	64	*Ternstroemia japonica*
65	*Vaccinium leschenaultii*	65	*Trichilia connaroides*	65	*Toddalia asiatica*
66	*Viburnum coriaceum*	66	*Turpinia nepalensis*	66	*Trichilia connaroides*
67	*Viburnum punctatum*	67	*Vaccinium leschenaultii*	67	*Turpinia nepalensis*
68	*Xantolis tomentosa*	68	*Vaccinium neilgherrense*	68	*Zanthoxylum tetraspermum*
69	*Zanthoxylum tetraspermum*	69	*Viburnum punctatum*		
		70	*Zanthoxylum tetraspermum*		

Appendix 29. (contd.)

No	1900 m	No	2000 m	No	2100 m
1	*Actinodaphne bourneae*	1	*Antidesma menasu*	1	*Ardisia rhomboidea*
2	*Ardisia rhomboidea*	2	*Ardisia rhomboidea*	2	*Beilshmiedia wightii*
3	*Beilshmiedia wightii*	3	*Beilshmiedia wightii*	3	*Casearia thwaitesii*
4	*Celtis tetrandra*	4	*Casearia thwaitesii*	4	*Celtis tetrandra*
5	*Chionanthus ramiflorus* var. *peninsularis*	5	*Casearia zeylanica*	5	*Cinnamomum filipedicellatum*
6	*Cinnamomum wightii*	6	*Celtis tetrandra*	6	*Cinnamomum macrocarpum*
7	*Clerodendrum serratum*	7	*Chassalia curviflora* var. *ophioxyloides*	7	*Cinnamomum wightii*
8	*Cocculus laurifolius*	8	*Cinnamomum filipedicellatum*	8	*Connarus wightii*
9	*Connarus wightii*	9	*Cinnamomum travancoricum*	9	*Daphniphyllum neilgherrense*
10	*Debregeasia velutina*	10	*Cinnamomum wightii*	10	*Derris brevipes*
11	*Elaeocarpus glandulosus*	11	*Clerodendrum viscosum*	11	*Elaeagnus kologa*
12	*Eurya japonica*	12	*Cryptocarya bourdillonii*	12	*Elaeocarpus recurvatus*
13	*Excoecaria crenulata*	13	*Derris brevipes*	13	*Eurya nitida*
14	*Ficus amplocarpa*	14	*Elaeagnus kologa*	14	*Glochidion neilgherrense*
15	*Glochidion ellipticum*	15	*Gomphandra coriacea*	15	*Gomphandra coriacea*
16	*Gomphandra coriacea*	16	*Hedyotis anamalayana*	16	*Hedyotis anamalayana*
17	*Ilex wightiana*	17	*Ilex wightiana*	17	*Hedyotis corymbosa*
18	*Isonandra lanceolata*	18	*Isonandra perrottetiana*	18	*Ilex walkeri*
19	*Isonandra perrottetiana*	19	*Lasianthus acuminatus*	19	*Ilex wightiana*
20	*Lasianthus acuminatus*	20	*Lasianthus venulosus*	20	*Isonandra candolleana*

No	1900 m	No	2000 m	No	2100 m
21	*Litsea oleoides*	21	*Litsea coriacea*	21	*Lasianthus acuminatus*
22	*Mastixia arborea*	22	*Litsea glabrata*	22	*Lasianthus venulosus*
23	*Microtropis ramiflora*	23	*Litsea oleoides*	23	*Ligustrum perrottetii*
24	*Myrsine wightiana*	24	*Litsea wightiana*	24	*Litsea oleoides*
25	*Neolitsea fischeri*	25	*Mastixia arborea*	25	*Litsea wightiana*
26	*Neolitsea scrobiculata*	26	*Microtropis ramiflora*	26	*Mastixia arborea*
27	*Neolitsea zeylanica*	27	*Neolitsea fischeri*	27	*Myrsine wightiana*
28	*Nothapodytes nimmoniana*	28	*Neolitsea scrobiculata*	28	*Neolitsea scrobiculata*
29	*Persea macrantha*	29	*Neolitsea zeylanica*	29	*Neolitsea zeylanica*
30	*Phoebe wightii*	30	*Nothapodytes nimmoniana*	30	*Nothapodytes nimmoniana*
31	*Piper mullesua*	31	*Pavetta breviflora*	31	*Parthenocissus neilgherriensis*
32	*Prunus ceylanica*	32	*Phoebe wightii*	32	*Persea macrantha*
33	*Psychotria nilgiriensis*	33	*Piper hymenophyllum*	33	*Phoebe wightii*
34	*Saprosma foetens*	34	*Piper mullesua*	34	*Piper argyrophyllum*
35	*Scolopia crenata*	35	*Piper wightii*	35	*Piper attenuatum*
36	*Strobilanthes gracilis*	36	*Prunus ceylanica*	36	*Piper hymenophyllum*
37	*Strobilanthes luridus*	37	*Psychotria elongata*	37	*Piper mullesua*
38	*Strobilanthes micranthus*	38	*Psychotria nilgiriensis*	38	*Piper schmidtii*
39	*Symplocos foliosa*	39	*Rungia laeta*	39	*Piper wightii*
40	*Symplocos oligandra*	40	*Strobilanthes calycinus*	40	*Polygala arillata*
41	*Symplocos pendula*	41	*Strobilanthes gracilis*	41	*Prunus ceylanica*
42	*Syzygium caryophyllatum*	42	*Strobilanthes luridus*	42	*Psychotria nilgiriensis*
43	*Syzygium cumini*	43	*Strobilanthes micranthus*	43	*Myrsine thwaitesii*
44	*Syzygium densiflorum*	44	*Strobilanthes wightianus*	44	*Rhododendron arboreum* ssp. *nilagiricum*
45	*Syzygium gardneri*	45	*Symplocos foliosa*	45	*Schefflera racemosa*
46	*Ternstroemia japonica*	46	*Symplocos macrophylla* ssp. *rosea*	46	*Senecio scandens*
47	*Toddalia asiatica*	47	*Symplocos oligandra*	47	*Arundinaria floribunda*
48	*Turpinia nepalensis*	48	*Syzygium caryophyllatum*	48	*Strobilanthes gracilis*
		49	*Syzygium gardneri*	49	*Strobilanthes micranthus*
		50	*Turpinia nepalensis*	50	*Strobilanthes wightianus*
				51	*Symplocos anamalayana*
				52	*Symplocos foliosa*
				53	*Symplocos macrophylla* ssp. *macrophylla*
				54	*Symplocos macrophylla* ssp. *rosea*
				55	*Symplocos pendula*
				56	*Syzygium caryophyllatum*
				57	*Syzygium densiflorum*
				58	*Turpinia nepalensis*
				59	*Tylophora mollissima*

Appendix 29. (contd.)

No	2200 m	No	2300 m	No	2400 m
1	*Ageratina adenophora*	1	*Ageratina adenophora*	1	*Ageratina adenophora*
2	*Arachniodes aristata*	2	*Ardisia rhomboidea*	2	*Arachniodes aristata*
3	*Arundinaria floribunda*	3	*Arundinaria floribunda*	3	*Arundinaria floribunda*
4	*Bischofia javanica*	4	*Cinnamomum filipedicellatum*	4	*Cinnamomum filipedicellatum*

Appendix 29. (contd.)

No	2200 m	No	2300 m	No	2400 m
5	*Casearia thwaitesii*	5	*Cinnamomum keralaense*	5	*Cinnamomum keralaense*
6	*Cinnamomum filipedicellatum*	6	*Cinnamomum macrocarpum*	6	*Cinnamomum macrocarpum*
7	*Cinnamomum keralaense*	7	*Cinnamomum wightii*	7	*Cinnamomum wightii*
8	*Cinnamomum macrocarpum*	8	*Cissampelopsis corymbosa*	8	*Cissampelopsis corymbosa*
9	*Cinnamomum wightii*	9	*Clematis munroiana*	9	*Clematis munroiana*
10	*Alsophila nilgirensis*	10	*Crotalaria beddomeana*	10	*Elaeagnus kologa*
11	*Daphniphyllum neilgherrense*	11	*Alsophila nilgirensis*	11	*Elaeocarpus recurvatus*
12	*Derris brevipes*	12	*Daphniphyllum neilgherrense*	12	*Eurya japonica*
13	*Elaeagnus kologa*	13	*Elaeagnus kologa*	13	*Eurya nitida*
14	*Elaeocarpus recurvatus*	14	*Elaeocarpus recurvatus*	14	*Gaultheria fragrantissima*
15	*Eurya nitida*	15	*Euphorbia rothiana*	15	*Hedyotis corymbosa*
16	*Gaultheria fragrantissima*	16	*Eurya japonica*	16	*Hedyotis leschenaultiana*
17	*Hedyotis anamalayana*	17	*Eurya nitida*	17	*Helichrysum buddleioides*
18	*Hypericum mysurense*	18	*Hedyotis anamalayana*	18	*Ilex denticulata*
19	*Ilex denticulata*	19	*Hedyotis corymbosa*	19	*Ilex walkeri*
20	*Ilex walkeri*	20	*Hedyotis leschenaultiana*	20	*Ilex wightiana*
21	*Ilex wightiana*	21	*Helichrysum buddleioides*	21	*Jasminum bignoniaceum*
22	*Impatiens hensloviana*	22	*Ilex denticulata*	22	*Ligustrum perrottetii*
23	*Lasianthus venulosus*	23	*Ilex thwaitesii*	23	*Litsea glabrata*
24	*Leucas lanceaefolia*	24	*Ilex wightiana*	24	*Litsea wightiana*
25	*Ligustrum perrottetii*	25	*Leucas lanceaefolia*	25	*Mahonia leschenaultii*
26	*Litsea glabrata*	26	*Ligustrum perrottetii*	26	*Microtropis ramiflora*
27	*Litsea wightiana*	27	*Litsea glabrata*	27	*Myrsine wightiana*
28	*Mahonia leschenaultii*	28	*Litsea wightiana*	28	*Neolitsea zeylanica*
29	*Meliosma simplicifolia*	29	*Mahonia leschenaultii*	29	*Notonia walkeri*
30	*Meliosma simplicifolia* ssp. *pungens*	30	*Microtropis ramiflora*	30	*Persea macrantha*
31	*Michelia nilagirica*	31	*Myrsine wightiana*	31	*Pilea trinervia*
32	*Microtropis ramiflora*	32	*Neolitsea zeylanica*	32	*Piper argyrophyllum*
33	*Myrsine wightiana*	33	*Notonia walkeri*	33	*Piper attenuatum*
34	*Neolitsea scrobiculata*	34	*Osbeckia leschenaultiana*	34	*Piper schmidtii*
35	*Neolitsea zeylanica*	35	*Pilea trinervia*	35	*Piper wightii*
36	*Nothapodytes nimmoniana*	36	*Piper argyrophyllum*	36	*Pittosporum neelgherrense*
37	*Notonia walkeri*	37	*Piper hymenophyllum*	37	*Pittosporum tetraspermum*
38	*Osbeckia leschenaultiana*	38	*Piper schmidtii*	38	*Plectranthus malabaricus*
39	*Persea macrantha*	39	*Piper wightii*	39	*Polygala arillata*
40	*Pilea trinervia*	40	*Pittosporum neelgherrense*	40	*Polygonum chinense*
41	*Piper argyrophyllum*	41	*Pittosporum tetraspermum*	41	*Polystichum* sp. 1
42	*Piper mullesua*	42	*Polygala arillata*	42	*Psychotria nilgiriensis* var. *astephana*
43	*Piper schmidtii*	43	*Polygonum chinense*	43	*Pteridium aquilinum*
44	*Piper wightii*	44	*Psychotria nilgiriensis* var. *astephana*	44	*Myrsine thwaitesii*
45	*Pittosporum neelgherrense*	45	*Pteridium aquilinum*	45	*Myrsine wightiana*
46	*Plectranthus coleoides*	46	*Myrsine thwaitesii*	46	*Rhododendron arboreum* ssp. *nilagiricum*
47	*Polygonum chinense*	47	*Rhododendron arboreum* ssp. *nilagiricum*	47	*Rubus ellipticus*
48	*Psychotria nilgiriensis* var. *astephana*	48	*Rubus ellipticus*	48	*Rubus fairholmianus*
49	*Pteridium aquilinum*	49	*Rubus fairholmianus*	49	*Rubus niveus*
50	*Myrsine capitellata*	50	*Rubus niveus*	50	*Scutellaria violacea*

Appendix 29. (contd.)

No	2200 m	No	2300 m	No	2400 m
51	*Myrsine thwaitesii*	51	*Sageretia hamosa*	51	*Senecio scandens*
52	*Rhododendron arboreum* ssp. *nilagiricum*	52	*Strobilanthes gracilis*	52	*Strobilanthes zenkerianus*
53	*Rubus ellipticus*	53	*Strobilanthes zenkerianus*	53	*Symplocos anamalayana*
54	*Rubus fairholmianus*	54	*Symplocos anamalayana*	54	*Symplocos foliosa*
55	*Rubus niveus*	55	*Symplocos foliosa*	55	*Symplocos macrophylla* ssp. *macrophylla*
56	*Schefflera racemosa*	56	*Symplocos macrophylla* ssp. *macrophylla*	56	*Symplocos macrophylla* ssp. *rosea*
57	*Sageretia hamosa*	57	*Symplocos macrophylla* ssp. *rosea*	57	*Syzygium densiflorum*
58	*Smilax wightii*	58	*Symplocos oligandra*	58	*Toddalia asiatica*
59	*Solanum virginianum*	59	*Syzygium caryophyllatum*	59	*Turpinia nepalensis*
60	*Strobilanthes gracilis*	60	*Syzygium densiflorum*		
61	*Symplocos cochinchinensis*	61	*Toddalia asiatica*		
62	*Symplocos cochinchinensis* ssp. *laurina*	62	*Turpinia nepalensis*		
63	*Symplocos foliosa*	63	*Vaccinium leschenaultii*		
64	*Symplocos macrophylla* ssp. *macrophylla*	64	*Vaccinium neelgherrense*		
65	*Symplocos macrophylla* ssp. *rosea*	65	*Vernonia bourneana*		
66	*Syzygium caryophyllatum*	66	*Vernonia fysonii*		
67	*Syzygium densiflorum*				
68	*Syzygium gardneri*				
69	*Toddalia asiatica*				
70	*Turpinia nepalensis*				
71	*Vaccinium leschenaultii*				
72	*Vernonia bourneana*				

Appendix 30. Species encountered in different altitudes* at Eravikulam

(* purely based on quadrat data)

No	1800 m	No	2000 m	No	2200 m
1	*Actinodaphne bourdillonii*	1	*Actinodaphne bourneae*	1	*Actinodaphne bourdillonii*
2	*Actinodaphne bourneae*	2	*Ageratina adenophora*	2	*Actinodaphne bourneae*
3	*Aglaia apiocarpa*	3	*Alsophila nilgirensis*	3	*Ageratina adenophora*
4	*Apollonias arnottii*	4	*Apollonias arnottii*	4	*Ardisia rhomboidea*
5	*Ardisia rhomboidea*	5	*Archidendron clypearia*	5	*Arundinaria floribunda*
6	*Bhesa indica*	6	*Ardisia rhomboidea*	6	*Cinnamomum filipedicellatum*
7	*Calamus gamblei*	7	*Arundinaria densifolia*	7	*Cinnamomum wightii*
8	*Canthium dicoccum*	8	*Arundinaria floribunda*	8	*Derris brevipes*
9	*Casearia thwaitesii*	9	*Calamus gamblei*	9	*Elaeagnus kologa*
10	*Casearia zeylanica*	10	*Casearia zeylanica*	10	*Elaeocarpus recurvatus*
11	*Chassalia curviflora*	11	*Chassalia curviflora*	11	*Eugenia calcadensis*
12	*Chionanthus linocieroides*	12	*Cinnamomum keralaense*	12	*Euonymus crenulatus*
13	*Chionanthus ramiflorus* var. *peninsularis*	13	*Cinnamomum wightii*	13	*Eurya nitida*
14	*Cinnamomum wightii*	14	*Daphniphyllum neilgherrense*	14	*Garcinia gummi-gutta* var. *papilla*
15	*Cryptocarya bourdillonii*	15	*Derris brevipes*	15	*Gardneria ovata*
16	*Daphniphyllum neilgherrense*	16	*Elaeagnus kologa*	16	*Gaultheria fragrantissima*
17	*Eugenia bracteata*	17	*Elaeocarpus recurvatus*	17	*Hedyotis anamalayana*
18	*Garcinia gummi-gutta var. papilla*	18	*Euonymus crenulatus*	18	*Ilex denticulata*
19	*Glochidion neilgherrense*	19	*Eurya nitida*	19	*Ilex walkeri*
20	*Gomphandra coriacea*	20	*Gaultheria fragrantissima*	20	*Lasianthus acuminatus*
21	*Ilex walkeri*	21	*Glochidion neilgherrense*	21	*Lasianthus coffeoides*
22	*Isonandra candolleana*	22	*Gomphandra coriacea*	22	*Lasianthus venulosus*
23	*Ixora notoniana*	23	*Hedyotis anamalayana*	23	*Ligustrum perrottetii*
24	*Lasianthus acuminatus*	24	*Hedyotis swertioides*	24	*Litsea glabrata*
25	*Litsea oleoides*	25	*Ilex walkeri*	25	*Litsea oleoides*
26	*Litsea wightiana*	26	*Ilex wightiana*	26	*Litsea wightiana*
27	*Lycianthes laevis*	27	*Isonandra candolleana*	27	*Mahonia leschenaultii*
28	*Maesa indica*	28	*Jasminum bignoniaceum*	28	*Mastixia arborea*
29	*Mastixia arborea*	29	*Lasianthus acuminatus*	29	*Meliosma simplicifolia* ssp. *pungens*
30	*Meliosma simplicifolia*	30	*Ligustrum perrottetii*	30	*Microtropis ramiflora*
31	*Microtropis ramiflora*	31	*Litsea ligustrina*	31	*Moonia heterophylla*
32	*Myrsine wightiana*	32	*Litsea oleoides*	32	*Neolitsea scrobiculata*
33	*Neolitsea scrobiculata*	33	*Mahonia leschenaultii*	33	*Neolitsea zeylanica*
34	*Neolitsea zeylanica*	34	*Mastixia arborea*	34	*Pavetta breviflora*
35	*Nothapodytes nimmoniana*	35	*Medinilla malabarica*	35	*Piper mullesua*
36	*Persea macrantha*	36	*Meliosma simplicifolia* ssp. *pungens*	36	*Pittosporum tetraspermum*
37	*Prunus ceylanica*	37	*Moonia heterophylla*	37	*Prunus ceylanica*
38	*Psychotria nilgiriensis*	38	*Myrsine thwaitesii*	38	*Psychotria nilgiriensis* var. *astephana*
39	*Psychotria nilgiriensis* var. *astephana*	39	*Myrsine wightiana*	39	*Rhododendron arboreum* ssp. *nilagiricum*
40	*Rauvolfia densiflora*	40	*Neolitsea scrobiculata*	40	*Rhodomyrtus tomentosa*
41	*Saprosma foetens*	41	*Neolitsea zeylanica*	41	*Rubus niveus*
42	*Schefflera racemosa*	42	*Nothapodytes nimmoniana*	42	*Schefflera rostrata*
43	*Scolopia crenata*	43	*Pavetta breviflora*	43	*Senecio scandens*
44	*Strobilanthes gracilis*	44	*Persea macrantha*	44	*Strobilanthes calycinus*
45	*Strobilanthes micranthus*	45	*Photinia notoniana*	45	*Strobilanthes gracilis*

No	1800 m	No	2000 m	No	2200 m
46	*Symplocos macrophylla* ssp. *rosea*	46	*Pittosporum tetraspermum*	46	*Strobilanthes micranthus*
47	*Toddalia asiatica*	47	*Pouzolzia bennettiana*	47	*Strobilanthes zenkerianus*
		48	*Protasparagus racemosus*	48	*Symplocos foliosa*
		49	*Psychotria nilgiriensis* var. *astephana*	49	*Symplocos macrophylla* ssp. *macrophylla*
		50	*Rhododendron arboreum* ssp. *nilagiricum*	50	*Syzygium densiflorum*
		51	*Rhodomyrtus tomentosa*	51	*Ternstroemia japonica*
		52	*Rubus fairholmianus*	52	*Turpinia nepalensis*
		53	*Saprosma foetens*	53	*Vaccinium leschenaultii*
		54	*Scolopia crenata*		
		55	*Strobilanthes foliosus*		
		56	*Strobilanthes gracilis*		
		57	*Strobilanthes micranthus*		
		58	*Symplocos macrophylla* ssp. *macrophylla*		
		59	*Symplocos macrophylla* ssp. *rosea*		
		60	*Syzygium densiflorum*		
		61	*Syzygium gardneri*		
		62	*Ternstroemia japonica*		
		63	*Turpinia nepalensis*		
		64	*Vaccinium leschenaultii*		

Appendix 30. (contd.)

No	2400 m	No	2600 m
1	*Actinodaphne bourneae*	1	*Ageratina adenophora*
2	*Ageratina adenophora*	2	*Anaphalis travancorica*
3	*Arachniodes aristata*	3	*Arachniodes aristata*
4	*Casearia thwaitesii*	4	*Arundinaria densifolia*
5	*Cinnamomum keralaense*	5	*Arundinaria walkeriana*
6	*Cinnamomum wightii*	6	*Eurya nitida*
7	*Crotalaria spectabilis*	7	*Gaultheria fragrantissima*
8	*Daphniphyllum neilgherrense*	8	*Hedyotis articularis*
9	*Derris brevipes*	9	*Hedyotis buxifolia*
10	*Elaeagnus kologa*	10	*Hedyotis leschenaultiana*
11	*Elaeocarpus recurvatus*	11	*Ilex denticulata*
12	*Euonymus crenulatus*	12	*Ilex walkeri*
13	*Eurya nitida*	13	*Jasminum bignoniaceum*
14	*Gaultheria fragrantissima*	14	*Kalanchoe grandiflora*
15	*Hedyotis leschenaultiana*	15	*Knoxia* sp. 1
16	*Ilex denticulata*	16	*Leucas lanceaefolia*
17	*Ilex walkeri*	17	*Myrsine thwaitesii*
18	*Jasminum bignoniaceum*	18	*Osbeckia leschenaultiana*
19	*Lasianthus venulosus*	19	*Pittosporum tetraspermum*
20	*Ligustrum perrottetii*	20	*Pogostemon artopurpureus*
21	*Litsea wightiana*	21	*Polygonum chinense*
22	*Mahonia leschenaultii*	22	*Polystichum* sp. 1
23	*Microtropis ramiflora*	23	*Pteridium aquilinum*
24	*Myrsine thwaitesii*	24	*Rhododendron arboreum* ssp. *nilagiricum*
25	*Osbeckia melastomoides*	25	*Rubus fairholmianus*

Appendix 30. (contd.)

No	2400 m	No	2600 m
26	*Pittosporum tetraspermum*	26	*Scutellaria wightiana*
27	*Polystichum* sp. 2	27	*Senecio scandens*
28	*Psychotria nilgiriensis* var. *astephana*		
29	*Rhododendron arboreum* ssp. *nilagiricum*		
30	*Rubus fairholmianus*		

Appendix 31. All Phytosociological attributes and indices of Mannavan Shola and Eravikulam at a glance

No	Altitude (m)	No. of individuals	No. of species	Density (per ha.)	Frequency (per ha.)	Basal Area (m^2/ha.)	Abundance (per ha.)	Margalef's Index	Menhinick's Index	Shannon's Index	Simpson's Index	Pielou's Index	Maturity Index
Location: Mannavan Shola													
1	**1600**	860	**69**	8600	2080	151.3	207.08	**10.06**	**2.35**	**3.36**	0.056	**0.79**	30.15
2	**1700**	857	**70**	8570	2150	108.2	215.1	**10.2**	**2.39**	**3.33**	0.073	**0.78**	30.17
3	**1800**	1251	68	12510	2220	**197.28**	**256.29**	9.39	1.92	2.61	**0.167**	0.62	32.65
4	**1900**	1203	48	12030	1540	150.65	178.97	6.68	1.38	2.17	**0.202**	0.56	32.1
5	**2000**	1242	50	12420	1940	126.06	189.79	6.88	1.42	2.52	0.146	0.64	**38.8**
6	**2100**	1277	59	**12770**	2130	149.17	219.53	8.11	1.65	**3.08**	0.066	**0.76**	36.1
7	**2200**	1053	**72**	10530	**2490**	**211.28**	195.03	**10.20**	**2.22**	**3.02**	0.122	**0.71**	34.58
8	**2300**	**1409**	66	**14090**	**2440**	152.77	**284.18**	8.96	1.76	2.73	0.15	0.65	**36.97**
9	**2400**	**1255**	59	12550	**2460**	111.99	206.73	8.13	1.67	2.94	0.126	0.72	**41.7**
Location: Eravikulam													
1	**1800**	1284	47	25680	2220	159.58	373.64	6.427	1.312	2.62	**0.141**	0.68	47.23
2	**2000**	1021	64	20420	2440	163.18	**469.79**	**9.09**	**1.78**	**3.43**	0.063	0.83	38.13
3	**2200**	1255	53	25100	**2360**	**216.19**	448.17	7.29	1.5	3.04	0.09	0.77	44.53
4	**2400**	1303	44	**26060**	**2360**	204.84	448.56	5.99	1.22	**3.35**	0.05	**0.89**	**53.64**
5	**2600**	944	27	18880	1600	104.47	267.79	3.8	0.88	2.92	0.07	**0.89**	**59.26**

Appendix 32. Mean values of the different ecological indices obtained from the two study sites (based on per hectare values).

I. MANNAVAN SHOLA

No	Altitude	Species	D	F	BA	Ab.	Margalef's I.	Menhinick's I.	Shannon's I.	Simpson's I.	Pielou's I.	M.I.
1	1600 m	69	8600	2080	151.30	207.08	10.06	2.35	3.36	0.06	0.79	30.15
2	1700 m	70	8570	2150	108.20	215.10	10.22	2.39	3.33	0.07	0.78	30.17
Low	MEAN	**69.50**	**8585**	**2115**	**129.75**	**211.09**	**10.14**	**2.37**	**3.35**	**0.06**	**0.79**	**30.16**
3	1800 m	68	12510	2220	197.28	256.29	9.39	1.92	2.61	0.17	0.62	32.65
4	1900 m	48	12030	1540	150.65	178.97	6.63	1.38	2.17	0.20	0.56	32.10
5	2000 m	50	12420	1940	126.06	189.79	6.88	1.42	2.52	0.15	0.64	38.80
Medium	MEAN	**55.30**	**12320**	**1900**	**158**	**208.35**	**7.63**	**1.58**	**2.43**	**0.17**	**0.61**	**34.52**
6	2100 m	59	12770	2130	149.17	219.53	8.11	1.65	3.08	0.07	0.76	36.10
7	2200 m	72	10530	2490	211.28	195.03	10.20	2.22	3.02	0.12	0.71	34.58
8	2300 m	66	14090	2440	152.77	284.18	8.97	1.76	2.73	0.15	0.65	36.97
9	2400 m	59	12550	2460	111.99	206.73	8.13	1.67	2.94	0.13	0.72	41.70
High	MEAN	**64**	**12485**	**2380**	**156.30**	**226.37**	**8.85**	**1.82**	**2.94**	**0.12**	**0.71**	**37.34**
Low - High	MEAN	**62.30**	**11563.33**	**2161.11**	**150.97**	**216.97**	**8.73**	**1.86**	**2.86**	**0.12**	**0.69**	**34.80**

II. ERAVIKULAM NATIONAL PARK

No	Altitude	Species	D	F	BA	Ab.	Margalef's I.	Menhinick's I.	Shannon's I.	Simpson's I.	Pielou's I.	M.I.
1	1800 m	47	25680	2220	159.58	373.64	6.43	1.31	2.62	0.14	0.68	47.23
2	2000 m	64	20420	2440	163.18	469.79	9.09	1.78	3.43	0.06	0.83	38.13
Medium	MEAN	**55.50**	**23050**	**2330**	**161.38**	**421.72**	**7.76**	**1.55**	**3.03**	**0.10**	**0.75**	**42.68**
3	2200 m	53	25100	2360	216.19	448.17	7.29	1.50	3.04	0.09	0.77	44.53
4	2400 m	44	26060	2360	204.84	448.56	6	1.22	3.35	0.05	0.89	53.64
High	MEAN	**48.50**	**25580**	**2360**	**210.52**	**448.37**	**6.64**	**1.36**	**3.20**	**0.07**	**0.83**	**49.08**
5	2600 m	27	18880	1600	104.47	267.79	3.80	0.88	2.92	0.07	0.89	59.26
Very high	MEAN	**27**	**18880**	**1600**	**104.47**	**267.79**	**3.80**	**0.88**	**2.92**	**0.07**	**0.89**	**59.26**
Medium-Very High	MEAN	**47**	**23228**	**2196**	**169.65**	**401.59**	**6.52**	**1.34**	**3.07**	**0.08**	**0.81**	**48.56**

* (**D** = Density / Ha.; **Ab.** = Abundance; **F** = Frequency; **BA** = Basal Area (m^2) / Ha.; **DI** = Distributional index; **IVI** = Importance value Index; **I.** = Index; **M.I.** = Maturity Index)

Appendix 33. Tree species associations met with at different altitudes of shola forests

No	Altitude	Tree species associations
1.	**1600 m**	*Meliosma simplicifolia - Persea macrantha - Turpinia nepalensis - Viburnum punctatum - Phoebe wightii - Bischofia javanica*
2.	**1700 m**	*Meliosma simplicifolia - Symplocos cochinchinensis - Mastixia arborea - Acronychia pedunculata - Elaeocarpus tuberculatus - Syzygium cumini*
3.	**1800 m**	*Hydnocarpus alpina - Beilschmiedia wightii - Mastixia arborea - Isonandra perrottetiana - Chionanthus linocieroides - Elaeocarpus munronii*
4.	**1900 m**	*Beilschmiedia wightii - Mastixia arborea - Gomphandra coriacea - Isonandra perrottetiana - Cinnamomum wightii - Actinodaphne bourdillonii*
5.	**2000 m**	*Beilschmiedia wightii - Litsea wightiana - Syzygium caryophyllatum - Litsea oleoides - Cinnamomum wightii - Neolitsea scrobiculata*
6.	**2100 m**	*Ilex walkeri - Cinnamomum wightii - Turpinia nepalensis - Syzygium densiflorum - Daphniphyllum neilgherrense - Casearia thwaitesii*
7.	**2200 m**	*Turpinia nepalensis - Elaeocarpus recurvatus - Syzygium caryophyllatum - Symplocos foliosa - Ilex walkeri - Rhododendron arboreum* subsp. *nilagiricum*
8.	**2300 m**	*Syzygium caryophyllatum - Elaeocarpus recurvatus - Turpinia nepalensis - Symplocos foliosa - Litsea wightiana - Microtropis ramiflora - Rhododendron arboreum* subsp. *nilagiricum*
9.	**2400 m**	*Microtropis ramiflora - Cinnamomum wightii - Litsea wightiana - Ilex denticulata - Elaeocarpus recurvatus - Symplocos anamalayana - Pittosporum tetraspermum*
10.	**2500 m**	*Rhododendron arboreum* subsp. *nilagiricum - Myrsine thwaitesii - Glochidion neilgherrense - Ilex denticulata - Microtropis ramiflora - Vaccinium leschenaultii*
11.	**2600 m**	*Rhododendron arboreum* subsp. *nilagiricum - Ilex walkeri - Ilex denticulata - Microtropis ramiflora - Pittosporum tetraspermum - Eurya nitida*

Appendix 34. Earlier studies conducted in the sholas and evergreen forests of Kerala region at a glance

No	Study area	Altitude (m)	Plot size /Area	S	N	Girth class considered	D	BA	Ab	Most dominant species & IVI	Workers
1.	**Attappadi** (Medium evergreen)	--	--	32	--	≥ 10 cm gbh	1520	59.63	--	--	**Pascal (1988)**
2.	**Eravikulam**	<1900 m	(10x10)50 5000 m^2	53	942	≥ 10 cm gbh	1884	48	--	1. *Pithecellobium subcoriaceum* IVI: 37.21 2. *Ternstroemia japonica*: 24.47 3. *Ixora notoniana*: 14.06	**Jose *et al.* (1994)**
3.	**Eravikulam**	2000-2350	7000 m^2	49	894	≥ 15 cm gbh	1268	25 (14.2-32.8)	--	--	**Babu (1997)**
4.	**Ranni** (Evergreen forests)	1050-1100	(5 x 5)28 700 m^2	48	451	≥ 1 cm dbh	6438	103.48	81.8	1. *Cullenia excelsa*: 8.42 2. *Psychotria* sp.: 6.77 3. *Tabernaemontana heyneana*: 6.88	**Sudhakara (2001)**
5.	**Mannavan Shola**	1550-1900	(5 x 5)60 1500 m^2	55	2506	≥ 1 cm dbh	16710	372.45	131.3	1. *Syzygium cumini*: 7.97 2. *Viburnum punctatum*: 7.51 3. *Persea macrantha*: 6.96	
6.	**Pambadam Shola**	1750-1950	1500 m^2	44	3084	≥ 1 cm dbh	21894	114.94	110.1	1. *Psychotria nilgiriensis*: 9.34 2. *Actinodaphne bourdillonii*: 8.63	
7.	**Eravikulam**	1900-2400	(33 x 33)6	36	--	≥ 10 cm gbh	--	--	--	1. *Cinnamomum perrottetii* 2. *Cinnamomum sulphuratum* 3. *Microtropis ramiflora*	**Nair & Menon (2001)**
8.	**Silent Valley**	2000-2400	(33 x 33)6	37	--	≥ 10 cm gbh	--	--	--	1. *Ilex wightiana* 2. *Cinnamomum perrottetii* 3. *Syzygium densiflorum*	
9.	**Wayanad** (Brahmagiri)	<1700 m	(10x10)10 1000 m^2	45	380	≥ 10 cm gbh	2533	73.55	--	1. *Cinnamomum perrottetii* 2. *Actinodaphne salicina* 3. *Microtropis stocksii*	**Vidyasagaran & Gopikumar (2001)**

(**S**=No. of species; N=No. of individuals; **D**=Density/Ha.; **BA**=Basal Area/Ha.; **Ab**=Abundance; **IVI** =Importance Value Index)
(Data not available are indicated as blank)

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3. **Kumar, K. K. 1997.** Two new records of ferns for Kerala State, India. *Indian Fern Journal*, 14: 110-112. Patiala, India.

4. **Kumar, K. K. and P. V. Madhusoodanan. 1998.** Rare Pteridophytes from Chinnar Wildlife Sanctuary, Kerala. *Journal of Economic and Taxonomic Botany*, 22 (1): 145-148, Jodhpur, India

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2. **Balasubramaniam, K. and K. K. Kumar. 1999.** The Riddle of the Shola. *Evergreen* (KFRI news letter), 42: 1-5, Kerala Forest Research Institute, Peechi.

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"Forest is a peculiar organism of unlimited kindness and benevolence that makes no demand for its sustenance and extends protection to all beings, offering shade even to axe man who destroys it"

- Gautama Buddha

NBHSC