

**TAXONOMIC AND ETHNOBOTANIC
STUDIES ON THE ANGIOSPERMIC EPIPHYTES
AND PARASITES OF KERALA**

**Thesis submitted to the
UNIVERSITY OF CALICUT
in part-fulfilment of the requirements for the award of the degree of
DOCTOR OF PHILOSOPHY
in
BOTANY**

**by
A.E. SHANAVAS KHAN
DEPARTMENT OF BOTANY
UNIVERSITY OF CALICUT
KERALA, INDIA**

2002

*dedicated to
parents*



Department of Post-Graduate Studies and Research in Botany
UNIVERSITY OF CALICUT

Dr. M. Sivadasan
Professor

Calicut University P.O., 673 635
Kerala, India

2nd Sept., 2002

CERTIFICATE

This is to certify that the thesis entitled, **Taxonomic and Ethnobotanic studies on the Angiospermic Epiphytes and Parasites of Kerala** submitted by Mr. A.E. Shanavas Khan for the degree of **Doctor of Philosophy** in Botany of the **University of Calicut** is a record of *bona fide* research work carried out by him during the period of his study under my supervision, and that the thesis has not previously formed the basis for award of any degree, diploma, associateship, fellowship or other similar titles of recognition.

Mr. A.E. Shanavas Khan has successfully completed the preliminary qualifying examination prescribed by the University of Calicut.

A handwritten signature in black ink, appearing to read 'M. Sivadasan', with a horizontal line underneath.

(M. Sivadasan)

DECLARATION

I hereby declare that the thesis entitled '**Taxonomic and Ethnobotanic Studies on the Angiospermic Epiphytes and Parasites of Kerala**', submitted by me to The University of Calicut in part-fulfillment of the requirements for the degree of Doctor of Philosophy in Botany has not been submitted by me for the award of any other degree or diploma and represents the original work done by me.



SHANAVAS KHAN. A. E.

A

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ACKNOWLEDGEMENT

I am very much beholden to my guide Dr. M. Sivadasan, Professor, Department of Botany, University of Calicut for conceiving, planning and formulating this study.

I express my sincere thanks to Dr. P. Pushpangadan, former Director, Tropical Botanic Garden and Research Institute (TBGRI), Palode, Thiruvananthapuram, presently the Director, National Botanic Research Institute, Lucknow, and Dr. G. M. Nair, Director, TBGRI, for granting me all the facilities required for my study.

I wish to place on record, my indebtedness to Mr. K. P. Pradeep Kumar and Mr. S. Suresh Kumar for the quality line drawings. Mr. C. Suseendran deserves special thanks for the excellent photographic assistance.

To my colleagues, Dr. C. Sathish Kumar, Dr. Mathew Dan, Dr. S. Binu, Mr. Raju Antony, Mr. C. Murali, Mr. M. Shajahan and Mr. K. Ashok Kumar, I shall always remain thankful for all their kind help, always generously given.

I wish to express my sincere gratitude to Mr. M.S. Kiran Raj for his sincere painstaking service rendered during the final consolidation of the thesis.

Mr. E. S. Santhosh Kumar, TBGRI and Mrs. Sheeja Mathew, Winsoft Computers, Palode, typeset the thesis and I am extremely grateful to them.

Dr. P. G. Latha and Dr. N. Mohanan made the proof reading of the thesis for which I extend my sincere thanks.

A. E. SHANAVAS KHAN

INTRODUCTION

Taxonomic and ethnobotanic studies on angiospermic epiphytes and parasites of Kerala are a novel venture to enumerate the taxa coming under these groups and to record their human relationships. Though some of the species of these groups have been studied by earlier workers, a comprehensive study of epiphytes and parasites together with their ethnobotany is a new attempt. Epiphytes and parasites are fascinating groups of plants, which depend on other groups of plants in one way or the other. While aerial parasites depend on other plants for anchorage and nourishments, the epiphytes depend on the higher plants only for anchorage. Some other groups like root parasites depend on other plants for food materials. They grow attached to the roots of host plants and absorb water and minerals from the host. To adapt to their special mode of habitat, both epiphytes and parasites develop their own special morphological features like haustoria, velamen roots and undergo some kind of vegetative reduction.

EPIPHYTES

The term 'epiphyte' was introduced to the literature by Martius (1842). Epiphytes are extreme specialists adapted to climatically and ecologically harsh conditions in the canopy; they represent an important and interesting plant group (Biedinger & Fischer, 1996). According to Tixier (1966) the epiphytes can be divided into macro-epiphytes (vascular epiphytes) and microepiphytes (mosses, liverworts, lichens and algae). Based on their micro-habitat, they are classified as epixylous epiphytes which cover the branches,

limbs and trunks of trees, and epiphyllous epiphytes which grow on the surface of living leaves. The term 'epiphytes' includes 'true epiphytes', 'hemiepiphytes', 'casual epiphytes', and 'semiepiphytic climbers'. True epiphytes or 'holoepiphytes' are those plants that normally spend their life cycle perched on other plants, and receive all mineral nutrients from non-terrestrial sources.

Madison (1977) defined the true epiphytes as those species, which normally germinate on the surface of other living plants and spend their entire life cycle without being connected to the ground. Hemiepiphytes, normally spend part of their life cycle perched on other plants, and thus some mineral nutrients are received from terrestrial sources also. Hemiepiphytes, either begin their life cycle as epiphytes and eventually send roots and shoots to the ground, or begin as terrestrial seedlings, that secondarily become epiphytic, by delinking all connections from the ground. Species in which some individuals are epiphytes and others are terrestrial are called casual epiphytes. Semiepiphytic climbers are vines, that climb by adventitious roots which partially function in water and mineral uptake (Wallace, 1987). In addition to the above categories, there are some plants which are accidental epiphytes. Here, in this study, only true epiphytes are included.

Epiphytes usually grow on tree trunks. Generally they do not harm the host plants, being dependent upon them only for support. Since they do not have a regular supply of water absorbed from the soil, epiphytic plants live under more or less xerophytic conditions and have corresponding adaptations such as thick leathery leaves which are often succulent, reduced leaves, and leafless condition. But the greatest adaptation of the

epiphytic orchids for their aerial existence is the development of a unique tissue called velamen in their roots. As in terrestrial plants, the roots of epiphytes also serve the double purpose of anchorage and absorption. The roots that bind the epiphyte to the host, serve this purpose adhering to the bark of the tree with high degree of tenacity. But a large number of roots hang freely in the air and in these the velamen tissue reaches its maximum development. The velamen root, when it comes in contact with the host tissue, is capable of functioning as an ordinary root, developing root hairs and absorbing whatever food materials the bark tissue may offer along with the excreta of birds and animals, which has been accidentally deposited on the bark. The growing tree will always have fresh supplies of dead bark peeling off from the outside, which is broken down by the mycorrhiza residing inside the epiphytic orchid root and whatever nutrients thus released are made available to the epiphytes. Also, the blue-green algae, which colonise the bark of the host, fix nitrogen which also becomes available to the epiphytes.

Epiphytes are representing 10% of known vascular plants, coming under 7% genera, belonging to 19% families (Kress, 1986). Epiphytism is unevenly developed geographically as well as systematically. While less in aggregate land area, neotropical habitats harbour many more kinds of epiphytes than do paleotropical forests (Benzing, 1983). Madison (1977) in a review of systematic occurrence of vascular epiphytes found that none of the families with epiphytic members is exclusively epiphytes, with an exception of Vittariaceae (Pteridophytes). He concluded that in each family, epiphytism is probably of recent origin.

PARASITES

Parasitic flowering plants penetrate with the help of contact organs, the so-called haustoria, into living host tissue in order to obtain nutrition (Weber, 1982). This definition is essential for separating parasites from other specialized angiosperms; they have developed and established themselves independently in many different families (Kuijt, 1969). According to the location of origin of the haustorium, there are root, shoot and leaf parasitism (Weber, 1980). This may be broadly classified into aerial parasitism and root parasitism. In root parasitism, the haustoria are root initiated and in shoot parasitism the contact organs form the secondary haustoria, laterally on shoot axes or terminally as primary haustoria (Rough, 1937; Kuijt, 1969; Kuijt & Toth, 1985).

Root parasitism is a well-known feature of many species in the families like Scrophulariaceae, Orobanchaceae, Balanophoraceae, etc. The conditions range from achlorotic holoparasites, completely dependent on their host for all nutrients to green hemiparasites, only partially dependent on their host for nutrients. Both holoparasites and hemiparasites are connected to their host by a specialized organ called the haustorium, which forms an anatomical and physiological bridge between the parasite and host (Kuijt, 1969). In 1969, Kuijt reviewed the literature on the parasitic Scrophulariaceae. In all haustoria studied, xylem is continuous between host and the parasite. Phloem is sometimes observed in older haustoria, but no host-parasite connection of sieve tube members has been observed. The haustorial organ is composed of two distinct regions, viz., the upper haustorium, which extends from the parent root to the point of contact with the host, and the endophyte which penetrates and invades the host tissue.

All the members of the family Loranthaceae are parasites and among them majority are aerial parasites, except a few root parasites. They are mostly distributed in the tropical and subtropical regions and occasionally in the temperate regions. On the basis of presence and absence of calyculus, De Candolle (1830 a, b) divided the family Loranthaceae into 2 groups, which are generally recognized as two subfamilies: Loranthoideae and Viscoideae. Recent findings indicate that they should be raised to the rank of independent families and designated as Loranthaceae and Viscaceae respectively (Maheshwari *et al.*, 1957; Barlow, 1964).

Loranthaceous plants obtain their food partially or entirely from the host through haustoria. Sometimes after the decay of the parasites, the swollen ruptured tissues of the host assume a somewhat radiate structure and is termed 'wood-flowers' or 'Holzrosen' (Tubef, 1936) as seen in the case of plants infected by *Macrosolen* (Plate VIII-B). They are known as '*Rosa de Palo*' in Mexico and '*Rosa de Madera*' in Gautemala (Metcalf & Chalk, 1950).

Parasites are integral members of virtually all biotic communities. They interact widely with other members of their community, and not only with other parasites (Holmes, 1973) but also with their host and even other species, which interact with their host.

The seeds of several Loranthaceous members do not require any special stimulant from the substratum and germinate even on dead objects. Two Javanese species germinate even during suspension in air (Van Leeuwen, 1954). Mc Luckie (1923) observed germination on iron wire, wooden gates, trunks of trees, branches or leaves. Usually, when

a bird bites the fruits, the seeds enclosed in the sticky viscin may be extruded suddenly from the pericarp and fall either on the ground or other plants or stick to the bird's beak and feed later by rubbing off its beak against the bark of the host. Alternatively, the seeds are swallowed by the birds and excreted with faeces. The viscin around the seeds play an important role, not only in getting attachment, but also providing moisture for germination.

The various aspects relating to the members of the family Loranthaceae and Viscaceae are studied by eminent workers like Barlow (1964, 1997), Danser (1929, 1933, 1938), Kuijt (1969), Balle (1958), Polhill (1989), Wiens (1973 a,b), Johri and Bhatnagar (1972). A complete enumerative study recording the total parasites of the world including root and aerial parasites are still lacking. Razi (1957) published an annotated list of phanerogamic parasites from India and Pakistan. But his work was mainly based on the herbarium collections of Indian specimens deposited in the herbaria of United States of America. He confessed that US herbaria represent scanty collections of Indian specimens and his work was not a comprehensive one. His list contained 190 species of parasites belonging to 38 genera and 8 families. He considered Loranthaceae and Viscaceae as a single family. Scattered efforts were done by some workers to publish the list of parasites in their respective areas. Ansari *et al.* (1994) studied the parasitic angiosperms of Sheveroy and Kolli Hills. No earlier work on angiospermic parasites was recorded from the present study area and hence the present study.

In many parts of the world, the parasitic plants cause damage to the plants of aesthetic, ornamental, medicinal and economic value. Various control measures have been

adopted. These include physical removal, pruning of the parasites and chemical treatment. Some success has also been obtained in India in eradicating *Dendrophthoe falcata* (Singh, 1962).

ETHNOBOTANY

Traditional communities depend on wild plants for food, medicine, and construction materials, fuel wood, and nearly for all other material cultures. Their interactions with the ambient vegetation for centuries helped them evolve a sound oral knowledge system on the utility of plants, which remained unrecorded until recently, when ethnobotanists started systematically documenting them. Since such oral traditions are based on local plant resources, they are different from region to region as well as from tribe to tribe of the same region.

Ethnobotanical investigations conducted among the traditional communities in different parts of the world have greatly helped the modern world benefit from the traditional knowledge systems. This has been acknowledged, mainly in the fields of developing promising life saving drugs including psychotomimetic drugs of plant origin (Schultes, 1983, 1989, 1993; Mendelsohn & Balick, 1995), gaining knowledge on traditional land and plant utilisation pattern (Phillips & Gentry, 1993; Phillips *et al.*, 1994), evolving strategies for conservation of biological diversities and policies for environment management (Cunningham, 1993) and searching out promising new economic plants and land races (Arora, 1997). Ethnobotanical surveys and biological investigations on plants of tribal claims have become remarkably significant, in the present scenario.

The anthropologists referred to Kerala as a museum of diverse ethnic groups and a variety of traditional systems of medicine. The forests of Western Ghats of Kerala are endowed with a very rich collection of rare medicinal plants, of which many are endemic to the region (Subramanian, 1982). The tribals, living in the region are known to possess great knowledge on the medicinal uses of many of these plants.

Since Kerala is a treasure house of ethnic communities, some ethnobotanical surveys were conducted in this region. But all these studies were conducted on district-wise or community-wise. No efforts have so far been made to record the ethnobotanic information on the epiphytes and parasites of Kerala. Owing to the difficulty in procuring the plants from other higher plants, tribal information on these groups are very scanty. Nobody has so far attempted to record this information. Hence, the present study is a new venture to enumerate the epiphytes and parasites of Kerala and to record the ethnobotanic information of this group of plants, which is of great significance today.

Tribals of Kerala

In accordance with the vast variation of geography and climate, the tiny state of Kerala is inhabited by diverse ethnic groups, from the most civilized society to the most primitive, cave-dwelling society with Stone Age culture. The forests of Ghat areas are inhabited by the tribals of mixed origin. As per 1991 census report, the tribal population in Kerala is 320,967, which represented 1.10% of the total population. They belong to 35 distinct tribal communities (Appendix-V). Photographs of the representatives of some of the tribes viz., Malapandaram, Urali, Mala-arayan, Ulladan, Malavedan, Malakuravan, Kanikkaran and Malavedan showing the general physical features are given in Plate I.

Wayanad has the highest tribal concentration with 35.85% of the total tribal population of the State and 17.11% of the total population of the district. Idukki comes next with 15.66% and 4.66% respectively.

As per a survey conducted by the Forest Department in 1992, 17156 scheduled tribe families belonging to 671 settlements are living in the forest. This shows that nearly 23 percent of the tribal families are living within the forest areas.

From time immemorial, tribals have been living in the forest. The tribals have the monopoly in the collection of Non Wood Forest Products (NWFP), food gathering, hunting and fishing, and supplement their income. They have their own indigenous systems of medicine and still majority of them have firm belief in them. Collection of forest produces and hunting are two traditional means of livelihood for them. Consequent to the nationalization of the forest in 1974, hunting was banned in the State and collection of NWFP was entrusted to private contractors who employed mostly non-tribals for the purpose. Subsequently, Government of India stopped this practice of entrusting collection of NWFP to private contractors. The right to collect NWFP from forest was exclusively assigned to the tribal co-operative societies from 1978, and the NWFP committee allots forest ranges to the tribal co-operative societies for the collection. There is a fairly well organized network of tribal co-operative societies in the State. Around 12% of the tribal families are engaged in the forest produce collection.



Plate I. Some of the tribals of Kerala: A. Malappaandaram; B. Urali; C. Malaaryan; D. Ulladan; E. Malavedan; F. Malakuravan; G. Kanikkaran; H. Malavedan cleaning some herbal drugs

Primitive tribals

Tribal communities with pre-agriculture stage of development, stagnant population and very low literacy are recognized as primitive tribes by Government of India. *Cholanaickens, Kattunaickens, Kadars, Kurumbas and Koragars* are the primitive tribes of Kerala and they constitute nearly 4.8 % of the total tribal population of the State. *Cholanaickens*, the cave-dwellers of the dense forest of Nilambur and Manchery mountain ranges are the most primitive humans known in the sub-continent. They were discovered four decades ago and appear to have barely emerged from the hunting and gathering way of life, possessing the Stone Age type of culture and civilization. Ethnically also they are quite different from all other tribals of Kerala. *Kattunaickens*, another primitive type of tribals of Western Ghats, living in the lower ranges of Nilambur is a semi nomadic tribe. They move in and around the forest and occasionally come down to the plains. *Irular, Adiyan* and *Kuruman*, the three semi-nomadic tribals living in the Attappadi, Mannarkad and Wayanad areas show mixed features of Negroids and *Cholanaickens*. *Paniyan*, another semi-nomadic forest tribe, living in the low ranges of Attappadi, Mannarkad and Wayanad areas form the majority of population of the tribals of Kerala. *Kurichian*, another interesting tribe, living in the dense forest regions of Mananthavadi and Mannarkad observe very rigid rituals and taboos. They claim to be mountain brahmins and practise strict untouchability with other tribals as well as with outsiders.

STUDY AREA

Kerala (Plate II-B), is a small State tucked away in the south-west corner of India (Plate II-A). It represents only 1.18% of the total area of India. Kerala was reorganized in the present form in 1956. It is bordered by the States of Karnataka on the north, Tamil Nadu on the east and south, and washed by Arabian Sea on the west. The coastline is 580 kms along the west; maximum east-west width is 120 km. Administratively, the State is divided into 14 districts, viz., a. Thiruvananthapuram (Capital), b. Kollam, c. Pathanamthitta, d. Alappuzha, e. Kottayam, f. Idukki, g. Ernakulam, h. Thrissur, i. Palakkad, j. Malappuram, k. Kozhikode, l. Wayanad, m. Kannur, and n. Kasaragod.

Physiography

Kerala may be divided into three geographical regions: 1) Highlands, 2) Midlands, and 3) Lowlands. The highland slopes down from the Western Ghats, which rise to an average height of 900 m, with a number of pockets, well over 1800 m in heights. The midlands, lying between the highlands and lowlands are made up of undulating hills and valleys. The lowlands or the coastal areas, is made up of the river deltas, backwaters and the Arabian Sea.

Kerala is a land of rivers and backwaters. Forty four rivers, out of which 41 are west-flowing and 3 are east-flowing, outcross Kerala with their innumerable tributaries and branches. These rivers are comparatively small sized and monsoon-fed, practically turn into rivulets in the summer, especially in the upper areas.

KERALA



Plate II. Maps: A. India; B. Kerala

The backwaters form a special attractive valuable feature of Kerala. They include lakes and ocean inlets, which stretch irregularly along the coast. The biggest lake is the Vembanadu Lake with about 200 sq. km in area, which opens out into the Arabian Sea at Cochin. The Periyar, Pamba, Manimala, Achancovil, Meenachil and Moovattupuzha rivers also draw into this lake. The other important lakes are Veli, Kadinamkulam, Anchuthengu, Edava, Nadayara, Paravoor, Ashtamudi, Kayamkulam, Kodungalloor, and Chetuva. The deltas of the rivers interline the backwaters and provide excellent water transportation in the lowlands of Kerala.

Geographical features

The region, designated as Kerala State lies between 8° 20' and 12° 30' N latitude and 75° 0' and 77° 15' E longitude. On the western side, it fully stretches along the coast of Arabian Sea and the eastern side is guarded by the Sahyadri (Western Ghats). The Western Ghats occupy the western Peninsular India and cover a north-south length of about 1600 kilometres from Tapti Valley in Gujarat to Kanyakumari in Tamil Nadu. This forms a continuous series of hill ranges, except for the Palakkad gap, traversing the States of Gujarat, Maharashtra, Goa, Karnataka, Tamil Nadu and Kerala. The total extent of the Western Ghats is 1.6 lakh square kilometres, of which Kerala accounts for about 22,000 square kilometres, i.e. nearly 60% of the total geographical areas of Kerala.

Varied types of vegetation, including tropical evergreen forests, tropical moist deciduous forests, tropical dry deciduous forests, scrub jungles, montane subtropical forests, montane temperate forests, wet grasslands, etc. occur in the hill ranges of Western Ghats. The forests of Western Ghats are very rich in species diversity.

The Western Ghats, which is one of the nine biogeographical areas of India, harbours 4000 species of flowering plants. It is pertinent to note that, out of the 4000 species of flowering plants in the Western Ghats, 1500 species are endemic to this region. The Southern Western Ghats, known as the floristically rich 'Malabar' area harbouring a genetic resource of several species of cash crops such as pepper, turmeric, cinnamon, etc. also lie in this area. Due to their varied topography and bio-climate, they are very rich in endemic flora.

Geology

The remarkably straight edge of the continental shelf of the western coast of Peninsular India is believed to have formed some 2-5 million years ago. The mountain sides are composed of crystalline metamorphic rocks of Archean age, mainly quartzose gneiss which gets withered or decomposed into a white, yellow or reddish felspartic clayey mass, ultimately becoming laterite. The principal rock types are dark granites and their gneissic variations.

In Kerala, at lower elevations, the laterite shows poor nutrient sand, and paddy is grown here. Laterite at higher altitudes support plantation crops. The soils are generally poor in nitrogen, phosphorus, potassium and organic matter with pH ranging between 4.5-6.0.

The coastline between Kollam and Kannur is low and sandy, with some rocky outcrops. The coastal belt is undulating, with 44 rivers transversing it, from the east to the west, flowing into the many regions and backwaters. The seabed near the shore is

composed of sand up to several meters, with a mixed substratum of sand and mud. The alluvial deposits vary between 400 and 600 m in depth, till the rock base is reached. Laterite on degeneration by water produces large quantities of mud.

Climate

Climate is one of the basic elements in the natural environment. It affects landforms, soils and vegetation. The climate in Kerala is equable and varies from season to season. It is tropical maritime and monsoonal in character, temperature and humidity are high throughout the year. Diurnal and orographic effects are pronounced; synoptic patterns are vastly modified by the interplay of local, convectional and topographic factors.

Temperature

Temperature is the most important factor of climate. The proximity of the area to the sea coupled with tropical location render diurnal and seasonal variations of temperature, comparatively negligible in the coastal belt. However, the range widens in the interior and over the high terrain. The temperature normally ranges from 27°C to 32°C in the plains but drops down to about 21°C in the highlands. Kerala receives maximum sunshine in May-June and minimum in the months of December - January. The mean minimum and maximum temperatures recorded for the period from 1995 to 2000 by the Indian Meteorological stations in Kerala are provided below.

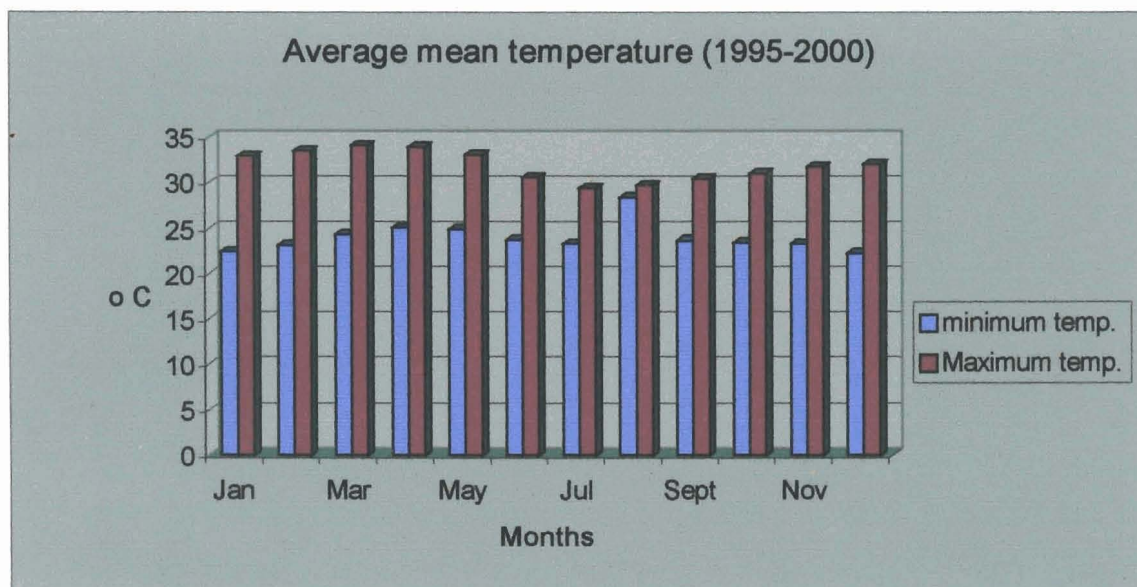


Fig. 1. Monthly distribution of mean Maximum and Minimum temperature

Rainfall

Kerala is a land of monsoon. The first showers of the southwest monsoon in India take place in Kerala. The unique location of the state at the western tip of the Indian subcontinent positions it directly across the path of maritime air, blowing from the Indian Ocean and the Arabian Sea, in the northern hemisphere. The peculiarly north-south positioned Western Ghats intercept these southwest monsoon currents. This moist air thus undergoes a forced ascent on the wind-ward slopes, resulting in copious rain.

The southwest monsoon rains are locally known as *Edavapathy*, since the rains commence in the middle of the month 'Edavam' of Malayalam calendar of which coincides almost with the first of the month of June. This is the prime rainy season in Kerala and it extends to August. There is abatement of rain in August and September, followed by enhancement in October-November. This second rainy period is referred to as

coincides with October. This is mainly due to northeast monsoon. After the withdrawal of southwest monsoon and northeast monsoon it is more or less dry.

Averaged over the entire state, Kerala gets an annual rainfall of about 301 cm, spread over 126 rainy days. The details of distribution of the rain over the year in different period is given in the Table I.

Periods	Amount of rain in cm	Percentage of rainfall	No. of rainy days	Percentage of rainy days
June-Sept.	201	66.8	79	62.7
Oct.- Nov.	50	16.6	23	18.2
Dec.-Feb.	9	3.0	4	3.2
Mar.-May	41	13.6	20	15.9
Annual	301		126	

Table I. Monthly distribution of rain over the year

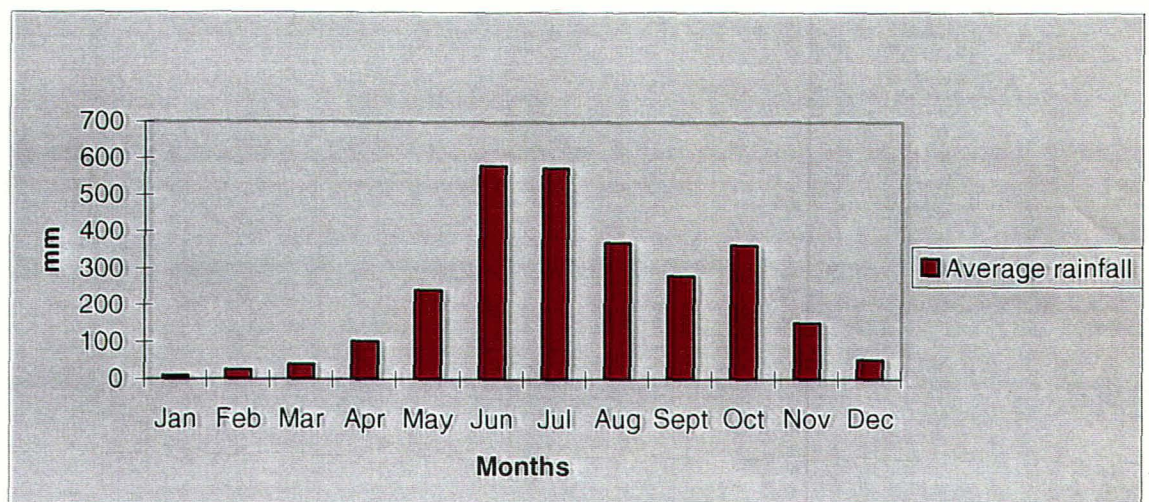


Fig. 2. Average monthly rainfall.

Average monthly rainfall of the last 5 years given in the chart (Fig. 2) gives an idea about the month-wise distribution of rainfall in Kerala.

In the southern half of the State, there are 2 high rain pockets. One is centred on Peerumedu (377 cm) in Idukki district and other around Neriamangalam (383 cm), also in Idukki district. In the northern half, Wythiri (393 cm, Wayanad district) and Kuttiyadi (336 cm, Kozhikode district) are the high rain pockets.

The Palakkad gap region and portion of the Malappuram district, extending to the west from the gap, between the two high rain areas of the south and north, receives only comparatively less rainfall.

Humidity

Kerala, being the land of water, beaches and backwaters, the relative humidity varies between 85% to 95% during June-September, and is about 70% during January.

Vegetation

Most of the familiar types of south Indian forests are represented here along with the forests that are peculiar to the hilltops of Peninsular India. The ranges of latitudes, high rainfall, temperature and altitudes have greatly influenced the vegetation of Kerala. In richness, variety and diversity of vegetation pattern, this tract surpasses any other tract of India. Chandrasekharan (1962 b) classified the southern Western Ghats of Kerala forests, mainly based on Champion's work (1936), into the tropical wet evergreen forests, tropical moist deciduous forests, tropical dry deciduous forests, montane subtropical forests, and montane temperate forests.

1. Tropical wet evergreen forests

This kind of forests occurs in areas where rainfall is well distributed and heavy. The general altitudinal distribution of evergreen forests in Kerala shows that this type is seen even from the elevation of 244 m (880'), but the best development is confined to the middle elevations, along the ghats between 610 m and 1067 m (2000' to 3500'). Annual rainfall in this zone varies from 3175 to 7620 mm. Epiphytic species representation is found to be high in the zone. Epiphytic species like *Aeschynanthus perrottetii*, *Raphidophora pertusa* and almost all parasites like *Cuscuta reflexa*, *Dendrophthoe falcata*, *Helixanthera spp.*, *Scurulla spp.*, *Taxillus spp.*, etc are seen. Besides, the tree trunks in these forests are moss-laden and harbours multitudes of epiphytic orchids, ferns, fern allies, bryophytes and lichens.

2. Tropical dry deciduous forests

The dry deciduous forests are on the eastern part of the ghats, around the hills of linear elevation between 300m to 900m, in several protected areas, which receive moderate rainfall. The canopy is open and the trees leafless, during the summer months. Flowering and fruiting occurs before the first flush of new leaves. Epiphytes and parasites are seen in plenty in this type of forest and they normally flower when the host trees shed leaves.

3. Tropical moist deciduous forests

On the lower side of the ghats, and at the foothills, the moist deciduous type of forest occurs having a brief leaf fall; a non- stratified understorey of shrubs and climbers,

as well as a number of epiphytic orchids. It occurs between 500m and 1200m, depending upon the rainfall. Epiphytic orchids like *Aerides crispum*, *Dendrobium barbatulum*, *Dendrobium nutantoflorum*, *Pholidota imbricata*, and *Rhynchostylis retusa* are seen in this type of forests. This type of forest gradually merges with the evergreen type through semi-evergreen type. Many dry deciduous trees of lower elevation and evergreen trees of higher elevation intrude this zone.

Semi-evergreen forests occur as transitional zones between the evergreen and moist deciduous vegetation. *Aeschynanthus perrottettii* and *Remusatia vivipara* are seen as epiphytes in this type of forest also.

4. Montane subtropical forests

This type of forest is seen in Kerala on the hilltops only. The sites occupied by these forests being on hilltops, are often well exposed and have poor and shallow soil. The rainfall is fairly high but the moisture retention capacity of soil is limited. Due to the above mentioned factors, eventhough this forest contains many evergreen species, the total appearance of these forests with short-boled branchy trees is sometimes that of inferior kind of forests. These occur as patches on the hilltops above 1200 m in areas like Munnar, Agastyamala, etc. Epiphytes are represented by *Bulbophyllum fimbriatum*, *Cymbidium aloifolium*, *Dendrobium barbatulum*, *Hoya wightii*, *Porpax jerdoniana*, etc. Parasites such as *Dendrophthoe trigona*, *Helicanthes elasticus*, *Scurrula cordifolia*, *Taxillus cuneatus*, *Viscum angulatum*, *V.monoicum*, etc. are found here.

5. Montane temperate forests

This type of forests occurs at elevations above 1524 m. Based on altitude, differentiation within this zone can be found as tropical, subtropical and temperate forests. It merges with sub-tropical rain forests between 1372 m and 1524 m. Orchids are fairly well distributed. Richest assemblage of species occurs in the evergreen forests of both tropical and temperate zones. Pure strands of reeds and bamboos were intermittently seen in different elevations in Kerala. The pure reed areas are heavily subjected to biotic interferences, which include human exploitation for paper industry and frequent severe fires. But the rhizome escapes fire and reappears during monsoon.

Grasslands occur in Kerala at both the lower and higher elevations. Those of the lower elevations are mainly formed as a result of clearing for coffee and tea plantations. They are maintained through annual fires and grazing. Grasslands in the higher elevation occur commonly with temperate formation, locally called as Sholas. Root parasites like *Aeginetia pedunculata*, *Striga lutea*, etc. are seen in these grasslands. The shola forests harbour most of the epiphytic orchids and angiospermous parasites.

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Most of the works available on parasites generally refer to the microbial parasites and the rest of the works on angiosperm parasites are mainly on Loranthaceae and its allied families. All the local floras mentioned above provided enumerative accounts of the parasitic members present in the respective study areas.

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Van Tieghem (1896 a, b, c) recognized several genera mostly based on the difference in the structure of inflorescence. He split the known genera of Loranthaceae based on even very slight differences in morphology of the inflorescence and floral parts.

Engler (1897) adopted van Tieghem's system and revised the family. However, he treated a large number of van Tieghem's genera as sections and subsections with the inclusion of the respective species under the genus *Loranthus*. In his classical monograph on Loranthaceae, Danser (1929-1933 a, b) revised the classification, particularly of the sub-family Loranthoideae. He also revised the Loranthaceae of Netherlands Indies (1931), Philippines (1935), Tropical Archipelago (1936), Indo-China and Siam (1938), and India (1941). In 1929, he described 32 genera of Loranthoideae from Asia and Australia, and subsequently in 1933 he recognized 51 genera for the Old World.

Danser's system is now widely accepted, since his concept of generic limits is much broader than that of van Tieghem. Moreover, Danser also distinguished a number of clearly defined natural groups. Balle (1958) also adopted Danser's classification and she has described more than 300 species in 22 genera for African Loranthaceae.

Danser's classification of Loranthaceae is a modification of the system of Engler and Prantl (1897). In contrast to the one tribe recognised by Bentham and Hooker, and two tribes by Engler and Prantl, Danser recognized 3 tribes, viz., Elytrantheae, Nuytseae and Lorantheae, which were equivalent to the families Elytranthaceae, Nuytsiaceae and Loranthaceae of van Tieghem. Danser's system is an improvement over the classification proposed by Engler and Prantl. However, it differs from the latter in one very important respect i.e., erection of a large number of genera. Barlow (1964) suggested that on the basis of structure of ovary, the tribe Nuytsiae should be reduced to a subtribe of the Elytrantheae. According to Mac Bride (1937), there is no justification to distinguish a separate subtribe Psittacanthinae, merely based on the absence of endosperm. Bhatnagar and Chandra (1968) examined the fruits of *Psittacanthus cuneifolius*, and noticed the presence of endosperm, and based on this, Johri and Bhatnagar (1972) argued the placement of the *Psittacanthus* as unnatural. Maheshwari *et al.* (1957) and Barlow (1964) raised the rank of the subfamilies Loranthoideae and Viscoideae to that of families as Loranthaceae and Viscaceae.

Eminent workers like Barlow (1964,1997), Danser (1929,1933 a, b), Kuijt (1963), Balle (1956), Polhill (1989) and Wiens (1973) studied the various aspects relating to the members of the family Loranthaceae and Viscaceae. Johri and Bhatnagar (1972) published a monographic work on the family Loranthaceae. A taxonomic monograph on the genus *Balanophora* was published by Hansen (1972). Bhattacharya and Mukherjee (1978) reported a general account of Indian Cuscutaceae. Despite all these, a comprehensive account on the parasites of the world including root and aerial parasites is still lacking. Razi (1957) published an annotated list of Phanerogamic parasites from India and

Pakistan. But his work was mainly based on the herbarium collections of Indian specimens deposited in the herbaria of United States of America. He confessed that US Herbaria represent scanty collections of Indian specimens and his work was not a comprehensive one. His list contained the names of 190 species of parasites, belonging to 38 genera and 8 families. Scattered works on enumeration of parasites of various localities are available. Ansari *et al.* (1994) studied the parasitic angiosperms of Sheveroy and Kolli Hills. Barlow (1997) revised the Loranthaceae and Viscaceae of Malaysia. Thorne (2000) proposed a new system of classification of the flowering plants and placed the parasitic families like Santalaceae, Loranthaceae, Viscaceae, Balanophoraceae in the order Santalales, and the families Scrophulariaceae and Orobanchaceae in the order Lamiales.

Ethnobotany

Organized study and research in Indian ethnobotany with emphasis on tribal system of medicine and culture are of recent origin and initiated in the middle of this century. **Charaka–Samhita**, a classical ancient Indian medical treatise written by Charaka in Sanskrit, a few thousand years ago, forms the first record to contain the details of an Indian epiphytic orchid and its uses in Ayurvedic medicine. Earlier works like **A Catalogue of Indian Medicinal Plants and Drugs** (Fleming, 1810), **Materia Medica of Hindoostan** (Ainslie, 1813), and **Indigenous drugs of India** (Dey, 1973) dealt mainly with plants and drugs of established Indian systems of medicine. **Bazaar medicines and common medicinal plants of India** (Waring, 1897) is a slightly different contribution and contains many folk remedies.

Since 1960, ethnobotanical studies or research in India have been initiated and intensified at different regional offices of the Botanical Survey of India, the Regional Research Laboratory, Jammu, the Central Drug Research Institute, Lucknow, the Central Institute of Medicinal and Aromatic Plants, Lucknow, the National Botanical Research Institute, Lucknow, the Central Council for Research in Ayurveda and Siddha, New Delhi, and several University centers throughout the country. This awakening resulted in bringing out volumes like **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, 1987b), **Tribal Medicine** (Chauduri *et al.*, 1989), and **Dictionary of Indian Folk Medicine and Ethnobotany** (Jain, 1991).

Ethnobotanical research in India meanwhile got further impetus when the Department of Environment and Forests, Govt. of India launched the multidisciplinary 'All India Co-coordinated Research Project on Ethnobiology (AICRPE)' in 1982 with a view to conduct an exhaustive survey and study of plants and animals used by the various tribal populations in India. This is still an ongoing project under the Ministry. The results, it is expected, when published would constitute the richest source of information on the botanical as well as zoological culture of tribal populations in India. Paul and Hegde (1998) reported the ethnobotanical uses of some orchids, of which most of them are epiphytes. Khasim and Mohan Rao (1999) reported the medicinal uses of 39 orchids from India. Siwakoti and Siwakoti (1999) reported the ethnobotanical uses of plants among the Satar tribes of Nepal. Singh (1999) studied the ethnobotanical uses of plants from the Kullu district in North West district of Himalayas. Chaurasia *et al.* (1999) reported the ethnomedicinal plants and veterinary practices of Ladak. Differential utilization and

ethnobotany of trees in Kitulanghalo forest reserves and surrounding communal lands of eastern Tanzania was studied by Luogh *et al.* (2000).

Since time immemorial, many species of *Loranthus* have been used medicinally by the Brazilians (Le Maout & Decaisne, 1876). The leaves of *Loranthus rotundifolius* Engl. cooked in milk have been used to cure chest diseases. An ointment prepared from the young shoots and leaves of *L. citrocolus* is a remedy of repute for oedematous tumours. Similar cases of usage of *Dendrophthoe falcata*, *Helicanthus elastica*, and *Macrosolen cochinchinensis* are common in India (Johri & Bhatnagar, 1972). *Dendrophthoe falcata* is employed as an antisyphilitic agent (Le Maout & Decaisne, 1876). In Malaysia *Dendrophthoe grandifrons* (King) Dans. is used against ring worm infestation, *D. pentandra* (L.) Miq. in childbirth; *Macrosolen cochinchinensis* in childbirth and headache, and *Scurrula ferruginea* (Jack.) Dans. in childbirth, snakes bite, wound, fever and berberi (Burkill & Haniff, 1930). Experiments conducted on animals showed that the extract of *Phrygianthus flagellaris* (Cham. & Schl.) Eichl. raises blood pressure and facilitate coagulation (Rojo, 1929). Moreover, it has useful veterinary properties (Biloni, 1946,). In Australia and New Zealand, several species of *Loranthus* are eaten by cattle, sheep and camels (Blakely, 1922, 1923, 1924, 1925; Hartigan, 1958; May, 1941; Pescott, 1946).

Ethnobotanical studies in Kerala

Earlier studies carried out by Pisharoti (1935), Gnanambal (1952), Mukherjee (1953) and others on tribals of Kerala State were basically from an anthropological view point and no serious ethnobotanical investigations were carried out in Kerala until recently. Manilal (1981a) studied the ethnobotany of rice of Malabar and reported 26

primitive varieties of rice used by tribals of the area. Many of them claimed to have medicinal value. Ramachandran and Nair (1981) conducted an ethnobotanical study of Cannanore district and mentioned about 93 species of plants used by the different tribals in the district. Nagendra Prasad and Abraham (1984) studied the plants used by the Nayadis of Wayanad of North Kerala. Pushpangadan and Atal (1984) carried out an ethnobotanical investigation of seven primitive tribals living in the densely forested highlands of the Western Ghats in Kerala. They reported tribal uses of 79 plant species. Ethnobotanical and ethnomedical culture of scheduled castes in the State were also studied by Pushpangadan and Atal (1986). Nagendra Prasad *et al.* (1987) studied the medicinal plants used by the Kanikkars of South India. A list of medicinal plants of Kerala was provided by Kumar *et al.* (1987). Detailed ethnobotanical investigations were also carried out on *Trichopus zeylanicus* (Pushpangadan *et al.*, 1988) and *Janakia arayalpathra* (Pushpangadan *et al.* 1990).

Rajasekharan *et al.* (1989) have given an account of the Ethnomedicinal importance of *Aristolochia indica* and *A. tagala* with reference to Kani tribes of Agastyar hills, who use these plants against snakebite. Mathew and Unnithan (1992) reported some plants having anticancer properties used by the tribals of Wayanad, Malappuram and Palakkad districts of Kerala. Balasubramanian and Prasad (1996) published the ethnobotany and conservation of medicinal plants by the Irulas of Nilgiri Biosphere Reserve. Rajasekharan *et al.* (1996) reported the folk medicines of Kerala with special reference to the native traditional folk healing art and its practitioners. Shanavas Khan *et al.* (1997) reported the detoxification techniques of some herbal drugs employed by the traditional practitioners of Kerala.

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Danser's system is now widely accepted, since his concept of generic limits is much broader than that of van Tieghem. Moreover, Danser also distinguished a number of clearly defined natural groups. Balle (1958) also adopted Danser's classification and she has described more than 300 species in 22 genera for African Loranthaceae.

Danser's classification of Loranthaceae is a modification of the system of Engler and Prantl (1897). In contrast to the one tribe recognised by Bentham and Hooker, and two tribes by Engler and Prantl, Danser recognized 3 tribes, viz., Elytrantheae, Nuytseae and Lorantheae, which were equivalent to the families Elytranthaceae, Nuytsiaceae and Loranthaceae of van Tieghem. Danser's system is an improvement over the classification proposed by Engler and Prantl. However, it differs from the latter in one very important respect i.e., erection of a large number of genera. Barlow (1964) suggested that on the basis of structure of ovary, the tribe Nuytsiae should be reduced to a subtribe of the Elytrantheae. According to Mac Bride (1937), there is no justification to distinguish a separate subtribe Psittacanthinae, merely based on the absence of endosperm. Bhatnagar and Chandra (1968) examined the fruits of *Psittacanthus cuneifolius*, and noticed the presence of endosperm, and based on this, Johri and Bhatnagar (1972) argued the placement of the *Psittacanthus* as unnatural. Maheshwari *et al.* (1957) and Barlow (1964) raised the rank of the subfamilies Loranthoideae and Viscoideae to that of families as Loranthaceae and Viscaceae.

Eminent workers like Barlow (1964,1997), Danser (1929,1933 a, b), Kuijt (1963), Balle (1956), Polhill (1989) and Wiens (1973) studied the various aspects relating to the members of the family Loranthaceae and Viscaceae. Johri and Bhatnagar (1972) published a monographic work on the family Loranthaceae. A taxonomic monograph on the genus *Balanophora* was published by Hansen (1972). Bhattacharya and Mukherjee (1978) reported a general account of Indian Cuscutaceae. Despite all these, a comprehensive account on the parasites of the world including root and aerial parasites is still lacking. Razi (1957) published an annotated list of Phanerogamic parasites from India and

Pakistan. But his work was mainly based on the herbarium collections of Indian specimens deposited in the herbaria of United States of America. He confessed that US Herbaria represent scanty collections of Indian specimens and his work was not a comprehensive one. His list contained the names of 190 species of parasites, belonging to 38 genera and 8 families. Scattered works on enumeration of parasites of various localities are available. Ansari *et al.* (1994) studied the parasitic angiosperms of Sheveroy and Kolli Hills. Barlow (1997) revised the Loranthaceae and Viscaceae of Malaysia. Thorne (2000) proposed a new system of classification of the flowering plants and placed the parasitic families like Santalaceae, Loranthaceae, Viscaceae, Balanophoraceae in the order Santalales, and the families Scrophulariaceae and Orobanchaceae in the order Lamiales.

Ethnobotany

Organized study and research in Indian ethnobotany with emphasis on tribal system of medicine and culture are of recent origin and initiated in the middle of this century. **Charaka–Samhita**, a classical ancient Indian medical treatise written by Charaka in Sanskrit, a few thousand years ago, forms the first record to contain the details of an Indian epiphytic orchid and its uses in Ayurvedic medicine. Earlier works like **A Catalogue of Indian Medicinal Plants and Drugs** (Fleming, 1810), **Materia Medica of Hindoostan** (Ainslie, 1813), and **Indigenous drugs of India** (Dey, 1973) dealt mainly with plants and drugs of established Indian systems of medicine. **Bazaar medicines and common medicinal plants of India** (Waring, 1897) is a slightly different contribution and contains many folk remedies.

Since 1960, ethnobotanical studies or research in India have been initiated and intensified at different regional offices of the Botanical Survey of India, the Regional Research Laboratory, Jammu, the Central Drug Research Institute, Lucknow, the Central Institute of Medicinal and Aromatic Plants, Lucknow, the National Botanical Research Institute, Lucknow, the Central Council for Research in Ayurveda and Siddha, New Delhi, and several University centers throughout the country. This awakening resulted in bringing out volumes like **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, 1987b), **Tribal Medicine** (Chauduri *et al.*, 1989), and **Dictionary of Indian Folk Medicine and Ethnobotany** (Jain, 1991).

Ethnobotanical research in India meanwhile got further impetus when the Department of Environment and Forests, Govt. of India launched the multidisciplinary 'All India Co-coordinated Research Project on Ethnobiology (AICRPE)' in 1982 with a view to conduct an exhaustive survey and study of plants and animals used by the various tribal populations in India. This is still an ongoing project under the Ministry. The results, it is expected, when published would constitute the richest source of information on the botanical as well as zoological culture of tribal populations in India. Paul and Hegde (1998) reported the ethnobotanical uses of some orchids, of which most of them are epiphytes. Khasim and Mohan Rao (1999) reported the medicinal uses of 39 orchids from India. Siwakoti and Siwakoti (1999) reported the ethnobotanical uses of plants among the Satar tribes of Nepal. Singh (1999) studied the ethnobotanical uses of plants from the Kullu district in North West district of Himalayas. Chaurasia *et al.* (1999) reported the ethnomedicinal plants and veterinary practices of Ladak. Differential utilization and

ethnobotany of trees in Kitulanhalo forest reserves and surrounding communal lands of eastern Tanzania was studied by Luogh *et al.* (2000).

Since time immemorial, many species of *Loranthus* have been used medicinally by the Brazilians (Le Maout & Decaisne, 1876). The leaves of *Loranthus rotundifolius* Engl. cooked in milk have been used to cure chest diseases. An ointment prepared from the young shoots and leaves of *L. citrocolus* is a remedy of repute for oedematous tumours. Similar cases of usage of *Dendrophthoe falcata*, *Helicanthus elastica*, and *Macrosolen cochinchinensis* are common in India (Johri & Bhatnagar, 1972). *Dendrophthoe falcata* is employed as an antisyphilitic agent (Le Maout & Decaisne, 1876). In Malaysia *Dendrophthoe grandifrons* (King) Dans. is used against ring worm infestation, *D. pentandra* (L.) Miq. in childbirth; *Macrosolen cochinchinensis* in childbirth and headache, and *Scurrula ferruginea* (Jack.) Dans. in childbirth, snakes bite, wound, fever and berberi (Burkill & Haniff, 1930). Experiments conducted on animals showed that the extract of *Phrygianthus flagellaris* (Cham. & Schl.) Eichl. raises blood pressure and facilitate coagulation (Rojo, 1929). Moreover, it has useful veterinary properties (Biloni, 1946,). In Australia and New Zealand, several species of *Loranthus* are eaten by cattle, sheep and camels (Blakely, 1922, 1923, 1924, 1925; Hartigan, 1958; May, 1941; Pescott, 1946).

Ethnobotanical studies in Kerala

Earlier studies carried out by Pisharoti (1935), Gnanambal (1952), Mukherjee (1953) and others on tribals of Kerala State were basically from an anthropological view point and no serious ethnobotanical investigations were carried out in Kerala until recently. Manilal (1981a) studied the ethnobotany of rice of Malabar and reported 26

primitive varieties of rice used by tribals of the area. Many of them claimed to have medicinal value. Ramachandran and Nair (1981) conducted an ethnobotanical study of Cannanore district and mentioned about 93 species of plants used by the different tribals in the district. Nagendra Prasad and Abraham (1984) studied the plants used by the Nayadis of Wayanad of North Kerala. Pushpangadan and Atal (1984) carried out an ethnobotanical investigation of seven primitive tribals living in the densely forested highlands of the Western Ghats in Kerala. They reported tribal uses of 79 plant species. Ethnobotanical and ethnomedical culture of scheduled castes in the State were also studied by Pushpangadan and Atal (1986). Nagendra Prasad *et al.* (1987) studied the medicinal plants used by the Kanikkars of South India. A list of medicinal plants of Kerala was provided by Kumar *et al.* (1987). Detailed ethnobotanical investigations were also carried out on *Trichopus zeylanicus* (Pushpangadan *et al.*, 1988) and *Janakia arayalpathra* (Pushpangadan *et al.* 1990).

Rajasekharan *et al.* (1989) have given an account of the Ethnomedicinal importance of *Aristolochia indica* and *A. tagala* with reference to Kani tribes of Agastyar hills, who use these plants against snakebite. Mathew and Unnithan (1992) reported some plants having anticancer properties used by the tribals of Wayanad, Malappuram and Palakkad districts of Kerala. Balasubramanian and Prasad (1996) published the ethnobotany and conservation of medicinal plants by the Irulas of Nilgiri Biosphere Reserve. Rajasekharan *et al.* (1996) reported the folk medicines of Kerala with special reference to the native traditional folk healing art and its practitioners. Shanavas Khan *et al.* (1997) reported the detoxification techniques of some herbal drugs employed by the traditional practitioners of Kerala.

METHODOLOGY

TAXONOMIC STUDIES

Exhaustive and intensive plant exploration trips were conducted to different parts of Kerala, during the last ten years, covering all seasons. Every locality was visited repeatedly, to collect the specimens, in generative forms. Each of the trips was of 5-7 days duration. The team consisted of more than 3 people carrying food and collection materials. Some taxa were repeatedly collected from other areas, where they were found. This is for ascertaining the ecological variations and distribution pattern of the taxa.

For collection and preservation, the procedures provided by Jain and Rao (1977) and Balgooy (1987) were generally followed. Usually specimens were collected in reproductive form i.e., with flower and fruits. When the epiphytic species were not available in generative form, they were collected in vegetative form and grown in the Tropical Botanic Garden and Research Institute, Palode, Thiruvananthapuram and whenever these plants flowered they were collected and studied.

Epiphytes and parasites are difficult to collect from their host, because usually they are available only on the higher branches of the host trees. In some cases, even the tree-climbers who are employed also find it difficult because of the large girth of host trees or because of the occurrence of specimens on the extreme distal ends of small branches, which were not accessible to them. In order to overcome this difficulty, a special device was developed and used for the collection. Aluminum pipes, each of 6 ft. height having

different diameters ranging from 1.5", 1.25", 1.0", 0.75" and 0.5" were procured. A sharp hook was fixed to one end of the thin pipe with 0.5" diam. Provisions were made in such a way that the pipes can be joined together, using nuts and bolts, and when all are joined it can reach up to 30 ft. height. The sharply pointed hook fixed to the distal end of the pole helped to detach even the firmly attached epiphytes from the host. After the use, these pipes could be separated and inserted one inside the other and could be easily carried to the distant places even in vehicles. This special device helped to collect the epiphytes and parasites from the host at heights of even 35 feet. Parasites were collected along with their host wherever possible and the details of the host plants were recorded in the field books.

Field notes such as date of collection, locality, altitude, habit, habitat, colour and odour of leaves, flowers and fruits, etc., their frequency, and description of host plants were made during collection trips. For preservation in the field, wet method (Fosberg & Sacht, 1965), using 70% methyl alcohol was employed. This method was found very effective, especially as majority of the taxa are with succulent parts. Drying and processing was done following standard herbarium techniques. In addition to the materials for dry preservation, some materials were kept pickled in 70% methyl alcohol for making illustrations and detailed studies. Drawings were made using Stereo-microscope and Camera-lucida. The herbarium sheets prepared during the study were deposited in the TBGRI herbarium (TBGT) and Calicut University Herbarium (CALI).

Materials collected were provisionally identified mainly by using the **Flora of British India** (J. D. Hooker, 1872-1897), **Flora of the Presidency of Madras** (Gamble & Fischer, 1915-1936), **Flora of Hassan District** (Saldanha & Nicolson, 1976), **Flora of**

Tamil Nadu Carnatic (Matthew, 1983) and the **Revised Handbook to the Flora of Ceylon** (Dassanayake & Fosberg, 1980-1991; Dassanayake, Fosberg & Clayton, 1994). All the district floras published so far, available monographs, revisions, and other relevant literature were also referred. The identification of specimens collected were confined by matching with the collections of Central National Herbarium, Kolkata (CAL), Madras Herbarium, Coimbatore (MH) and the Tropical Botanic Garden Herbarium (TBGT). The Kew herbarium, U. K. was also visited and the specimens available there were studied in detail.

Plan of Presentation of Data

The format proposed by Radford *et al.* (1974) was followed for the general presentation of the data. Bentham and Hooker's (1862-1883) system of classification is followed in the treatment of the families, with necessary alterations based on latest revisions of the families. Artificial keys were provided for the families, genera, species and varieties. The keys are strictly dichotomous and bracketed and are relevant only on the taxa included. After the key, the families with epiphytic nature are arranged in alphabetic order. Within the families, genera and species are also arranged alphabetically. And the parasitic families follow this, in the same manner as epiphytes in a separate chapter. As far as possible, both vegetative and generative characters are utilized for the keys. The general descriptions of the families followed by the generic descriptions and species descriptions are given in alphabetic order. If there is more than one genus or species, dichotomous keys are provided. Each species was provided with updated nomenclatural citation including references from the **Flora of British India** (J.D. Hooker, 1872-1897), **Flora of the**

Presidency of Madras (Gamble & Fischer, 1915-1936), **Flora of Calicut** (Manilal & Sivarajan, 1982), **Flora of Cannanore** (Ramachandran & Nair, 1988), **Flora of Silent Valley** (Manilal, 1988), **Flora of Palghat District**, (Vajravelu, 1990), **Flora of Thiruvananthapuram** (Mohanam & Henry, 1994), **Flowering Plants of Thrissur Forest** (Sasidharan & Sivarajan, 1996) and **Flora of Nilambur** (Sivarajan & Mathew, 1997). Besides these floras, relevant monographs, revisions, etc. were also included. For the family Orchidaceae, **Introduction to Orchids** (Abraham & Vatsala, 1981), **Catalogue of Indian Orchids** (Sathish Kumar & Manilal, 1994), **Orchid Monograph** (Ansari *et al.*, 1994), etc. were also cited. Icons of Wight (1839-1853) and Beddome (1868-1874) were cited wherever applicable. **Revised handbook to the Flora of Ceylon** (Dassanayake & Fosberg, 1980-1991; Dassanayake, Fosberg & Clayton, 1994) was also cited to assess the Sri Lankan affinity of the species reported. Where the revised treatment was not available, **Handbook to the Flora of Ceylon** (Trimen, 1893-1900) was referred. Synonyms, relevant to the Peninsular Indian flora were given in italics. For the abbreviations of periodicals, **Botanico Periodicum Huntianum** (BPH) (Lawrence *et al.*, 1968) was followed.

The nomenclatural citations of the species were followed by a precise species description, in the sequence habit, leaves, inflorescence, flowers, calyx, corolla, stamens, pistils, fruits, and seeds. The description is followed by phenology, worldwide distribution, and relevant notes on habitat, ecology, peculiarities on morphology, problems in nomenclature, if any, etc. The reported chromosome number of the species is also provided, wherever available. Occurrence of these species in Kerala and the specimens studied are given in the ascending order of district from south to north. Acronyms of the

herbaria where the materials are deposited is given in parentheses. Wherever the acronyms are not given it meant that the materials are deposited at TBGT. Illustrations and photographs of a few selected species are also provided. A detailed analysis of the data collected on epiphytes, parasites and their ethnobotany are given at the end of the corresponding chapters. A summary of the whole work, covering all the three aspects is given in the last chapter.

Abbreviations used in the treatment

The frequent abbreviations used in the text and their expansions are given below

AESK	: A.E.Shanavas Khan
CAL	: Central National Herbarium, Kolkota
CALI	: Calicut University Herbarium, Calicut
Chrom. No.	: Chromosome Number
Dist.	: District
Distr.	: Distribution
Fig.	: Figure
Fl.	: Flowering
Fr.	: Fruiting
K	: Kew Herbarium, UK
MGM	: Mysore University Herbarium
MH	: Madras Herbarium, Coimbatore
<i>s.n.</i>	: <i>sine numero</i> (without a number)
<i>s. coll.</i>	: without collectors name.
UCT	: University College Herbarium, Trivandrum.

ETHNOBOTANICAL STUDIES

During plant exploration trips, special emphasis was given to record the ethnobotanical uses of epiphytes and parasites of Kerala. Survey was undertaken in a number of tribal pockets, located at the dense forests of Western Ghats in Kerala. The tribal physicians were interviewed to know the plants they used, the plant part used for the preparation of remedies, diseases treated, and regime of drugs. With the help of these tribal people, plant specimens were collected, for proper identification. The persons mostly above the age of 60 have precise information, regarding their old traditions. The information shared by them related to the specimens collected is recorded in the field book. **Ethnobotany - A Method Manual** (Martin, 1995) was followed as the general source of guidelines for the present study. Literature pertaining to the districts, people, tribes, vegetation, forest types and flora was surveyed to gain a preliminary knowledge about the respective aspects. Review of literature was carried out to interpret and analyze the data collected during the study.

Plan of Presentation of Data

Ethnobotanic information collected during the study is provided in a separate chapter. The families are treated in alphabetic sequence. The genera under families and species under genera are also treated in alphabetic sequence. Each species is provided with an updated correct botanical name with author's name, and it is followed by the local name of the plant given in *Italics*. The tribe who use the name and the name of the district to which the tribe belongs to are given in parenthesis after the local name. It is followed by the method of application or administration of the plant as a medicine. The details of

earlier published works, if any available on the use of the species, are also provided along with their references. Folkloric informations, if any available, are collected during the present study on these species, and are also recorded. A detailed analysis of the data collected was given at the end of the ethnobotanical treatment.

TAXONOMIC TREATMENT

Key to the families

1. Plants epiphytic2
1. Plants parasitic10
2. Leaves reticulately nerved; embryo with two cotyledons3
2. Leaves parallelly or reticulately nerved; embryo with one cotyledon.....8
3. Flowers without perianth lobes **Peperomiaceae**
3. Flowers with perianth lobes or petals 4
4. Petals distinct, free from stamens 5
4. Petals connate, fused with stamens 6
5. Ovary superior; flowers zygomorphic **Balsaminaceae**
5. Ovary inferior or perigynous; flowers actinomorphic **Melastomataceae**
6. Pollen grains agglutinated in the pollinia **Asclepiadaceae**
6. Pollen grains not agglutinated in the pollinia 7
7. Stamens didynamous; fruit a capsule **Gesneriaceae**
7. Stamens equal; fruit a berry **Loganiaceae**
8. Perianth absent or minute; inflorescence a spadix **Araceae**
8. Perianth well developed; inflorescence other than spadix9
9. Flowers with a distinct lip or labellum; seeds minute, powdery **Orchidaceae**
9. Flowers without a distinct lip or labellum; seeds conspicuous, not powdery
..... **Commelinaceae**

10. Aerial parasites	11
10. Root parasites	14
11. Plants vines.....	12
11. Plants bushy shrubs.....	13
12. Stamens opening by valves.....	Cassythaceae
12. Stamens not opening by valves.....	Cuscutaceae
13. Flowers unisexual, in triads	Viscaceae
*13. Flowers bisexual, in racemes or spikes.....	Loranthaceae
14. Flowers unisexual.....	Balanophoraceae
14. Flowers bisexual.....	15
15. Plants with well-developed leaves.....	Scrophulariaceae
15. Plants without leaves.....	Orobanchaceae

EPIPHYTES

ARACEAE A. L. Jussieu

Gen. Pl. 23. 1789, *nom. cons.*

Erect herbs or somewhat woody climbers, with aerial stems or subterranean, often starchy tubers or rhizomes. Leaves alternate, rarely solitary ranging from simple to variously compound. Inflorescence a spadix subtended by a large spathe. Spathe persistent or deciduous. Flowers bisexual or unisexual, when unisexual lower flowers pistillate and the upper flowers staminate; sometimes spadix with naked sterile appendix or with sterile flowers. Perianth 0 or 4-6, free or united. Staminate flowers usually with 2-6 stamens per

flower, free. Pistillate flowers usually free, with 1-many locules; each locule with 1-many ovules. Fruit a 1-many seeded berry.

A family of world wide distribution except for Antarctica and Southern South America.

Key to the genera

- 1. Plants climbing, without underground tubers. **Rhaphidophora**
- 1. Plants not climbing, with underground tubers. **Remusatia**

REMUSATIA Schott

in Schott & Endl., Melet. Bot. 18. 1832.

Tuberous herbs, commonly producing coppey, sub erect shoots with scaly bulbils. Leaves peltate; venation reticulate. Inflorescence often produced with leaves or some times before leaves. Spathe with basal tube convolute, green, persistent; limb yellow, orbicular, reflexed. Spadix much shorter than spathe, with female flowers at base, and male flowers above. Male flowers of 2-4 stamens united into a truncate synandrium. Female flowers with ovary unilocular bearing many sub-orthotropous ovules, in 2-4 parietal placentas. Seeds ovoid, with copious endosperm.

Distributed throughout South Asia, Africa, Java and Australia.

Remusatia vivipara (Roxb.) Schott in Schott & Endl., Melet. Bot. 18. 1832; Hook. f., Fl. Brit. India 6: 521. 1893; Fischer in Gamble, Fl. Pres. Madras 1583. 1928;

Ramachandran & Nair, Fl. Cannanore 495.1988; Manilal, Fl. Silent Valley 334. 1988; Vajravelu, Fl. Palghat 535. 1990; Mohanan & Henry, Fl. Thiruvananthapuram 499. 1994; Sasi. & Sivar., Flow. Pl. Thrissur For. 487. 1996; Sivar. & P.Mathew, Fl. Nilambur 759. 1997. *Arum viviparum* Roxb., Fl. Ind. 3: 496. 1832; Wight, Ic. t. 798. 1844.

Epiphytic herbs. Tubers 6 cm across, depressed globose; skin reddish. Bulbiliferous shoots copper-coloured, equalling petioles. Leaves with petiole 30 cm long, terete, sheathing at base, lamina ovate, to 30 x 20 cm, base cordate, peltate, glabrous, often purplish below between veins. Spathe to 15 cm long; tube 3 cm long, persistent; limb 7 x 4 cm, bright yellow, deciduous. Spadix ca. 4 cm long; female portion 1.5 cm long; sterile portion 1.5 cm long and male portion 1 cm long.

Fl. & Fr.: Apr.-May

Distr.: India, Java with reports from Africa and Australia. Throughout Kerala.

Note: In the evergreen and semi-evergreen forests. Seen in wet, shady places, commonly in clefts of trees and rocks.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Attayar, N. Mohanan 7893; Bonaccord, N. Mohanan 7993; Ponmudi, Radhakrishnan 19755; *Ibid.*, M. Mohanan 69221 (MH). **Kollam Dist.:** Cheenikala, AESK 5415 **Pathanamthitta Dist.:** Way to Pamba, Ravi 55 (MH), *Ibid.*, Vivekananthan 48345 (MH); Thannithode, C.N. Mohanan 69306 (MH). **Idukki Dist.:** Kulamavu, C.N. Mohanan 79928 (MH); *Ibid.*, Ramanujam 71911 (MH); Calvary Mount, Pandurangan 78065 (MH); Painavu, Raju 71174 (MH);

Thekkadi, *Vivekananthan* 46697 (MH); Neriambangalam, *Sabastine* 25327 (MH); Kuttikanam, *Vivekananthan* 21393 (MH). **Thrissur Dist.:** Vazhachal, *Pandurangan* 30786; Peechi, *Sasidharan* 4677, 5032 (KFRI); Poringal, *Sasidharan* 5389 (MH). **Palakkad Dist.:** Mukkali Forest, *Vajravelu* 26252 (MH); Below Ayyappan Kovil, *Vajravelu* 48698 (CAL). **Malappuram Dist.:** Thalichola, *Philip Mathew* 28406 (CALI). **Wayanad Dist.:** Thirunelli, *AESK* 2244; Sulthanbathery, *Ellis* 19947 (M.H); Chandanathode, *Ramachandran* 69922 (MH).

RHAPHIDOPHORA Hasskarl

Flora 25(2), Beibl. 1: 11. 1842.

Climbing epiphytic shrubs. Petiole pulvinate, sheathing. Leaves lanceolate-ovate, entire, perforate or pinnatisect. Spathe boat-shaped, yellowish at maturity, deciduous. Flowers bisexual, naked. Stamens 4, with flattened filaments. Pistil with a sub-punctiform stigma. Fruit a berry.

The genus is distributed through Malesia, Africa and Oceania. Only one species is present in Kerala.

Rhaphidophora pertusa (Roxb.) Schott, *Bonplandia* 5:45.1857; Hook.f., *Fl. Brit. India* 6:546.1893; Fischer in Gamble, *Fl. Pres. Madras* 1598.1931; Manilal & Sivar., *Fl. Calicut* 302.1982; Ramachandran & Nair, *Fl. Cannanore* 494.1988; Vajravelu, *Fl. Palghat* 536.1990; Sasi. & Sivar., *Flow. Pl. Thrissur For.* 488.1996; Sivar. &

P.Mathew, Fl. Nilambur 759.1997. *Pothos pertusa* Roxb., Fl. Ind.1: 455.1820; Wight, Ic. t. 781.1844.

Epiphytic or lithophytic climbers. Stems to 3.5 cm thick. Petiole 15-30 cm, sheath quickly withering, 1/3 to equalling the petiole, pulvinate at leaf blade. Blade 20-50 x 15-25 cm, broadly ovate, cuspidate at apex, subcordate at base, entire or irregularly or shallowly lobed, occasionally with large perforations. Peduncle 5-18 cm long. Spathe yellow, 18 cm long, soon withering. Spadix to 10 x 2 cm.

Fl. & Fr.: Dec. – Mar.

Distr.: South India and Sri Lanka. Throughout Kerala.

Note: In wet forests as epiphytes and as lithophytes.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Kallar, *AESK 7506*.

Pathanamthitta Dist.: Thriveni, *B.D.Sharma 42456* (MH). **Idukki Dist.:** Panamkuttu,

Pandurangan 79282 (MH). **Thrissur Dist.:** Poringal, *Sasidharan 3301* (KFRI). **Palakkad**

Dist.: Karapara river, *Vajravelu 48979, 48752* (MH). **Malappuram Dist.:** Nellikuth,

Philip Mathew 33146 (CALI). **Wayanad Dist.:** Chandanathode, *Ellis 26424* (MH).

Kannur Dist.: Nedumpoil, *Ramachandran 68241* (MH).

ASCLEPIADACEAE R. Brown

Asclepideae 12, 19. 1810, *nom. cons.*

Erect, creeping, scrambling, or most frequently twining, woody or herbaceous perennials, with milky latex. Leaves opposite, simple, entire, pinnately veined. Flowers with calyx and corolla, actinomorphic, 5-merous, bisexual. Sepals shortly connate, or almost free, imbricate. Corolla gamopetalous, rotate, the lobes valvate or contorted in buds. Stamens 5, alternating with corolla lobes and inserted at the base of the tube; anthers distinct or connate, adnate to the style apex; pollens united in to a waxy mass. Corona of one or two series, attached to the corolla. Disc absent. Carpels two, superior. Fruit consisting of two distinct, many-seeded mericarp.

More than 250 genera with about 3000 species, mainly in the tropics and in warm temperate regions.

HOYA R. Brown

Mem. Wern. Nat. Hist. Soc. 1: 26. 1811.

Climbing and twining, herbaceous or scarcely woody epiphytes. Leaves fleshy, elliptic, rhomboid, narrowly lanceolate or lanceolate, glabrous. Flowers in sessile clusters or in peduncled, umbel like cymes. Calyx lobes triangular or ovate-oblong, acute. Corolla white or pinkish white, rotate, glabrous within; the lobes as long as or longer than the radius of the united portion. Corona single, consisting of 5 large fleshy, horizontally spreading segments attached to the staminal column. Anthers with connectives produced

into a membranous tip; pollen masses ovate-oblong, solitary in each anther-loculus, ascending, with a narrow pellucid margin, almost as long as pollinium. Mericarps linear, tapering to the apex.

About 80 species, mostly epiphytic and climbing, with rooting stems. Throughout the moist parts of the Eastern Tropics from Nepal, Sri Lanka to South China and Northern Australia.

Key to the species

1. Leaves narrow; flowers very few, in usually 1-3-flowered umbels. 2
1. Leaves ovate to elliptic or orbicular; flowers in many-flowered umbels. 3
2. Leaves linear, gradually dilated from the base to the obcordate tip **H. retusa**
2. Leaves linear, lanceolate, obtuse at tip **H. pauciflora**
3. Leaves orbicular, rounded at tip. **H. kanyakumariana**
3. Leaves elliptic, not rounded at tip. 4
4. Leaves elliptic or elliptic-lanceolate, long acuminate at apex; margins recurved **H. wightii**
4. Leaves elliptic-ovate, obtuse or acute at apex; the margins not recurved **H. ovalifolia**

Hoya kanyakumariana Henry & Swamin., J. Bombay Nat. Hist. Soc. 75: 462.1978.

(Plate III-F)

Epiphytic climbing shrubs. Leaves 1.5-2.5 x 1-1.5 cm, ovate to orbicular, rounded to emarginate at apex, broadly attenuate at base. Flowers many in axillary umbellate

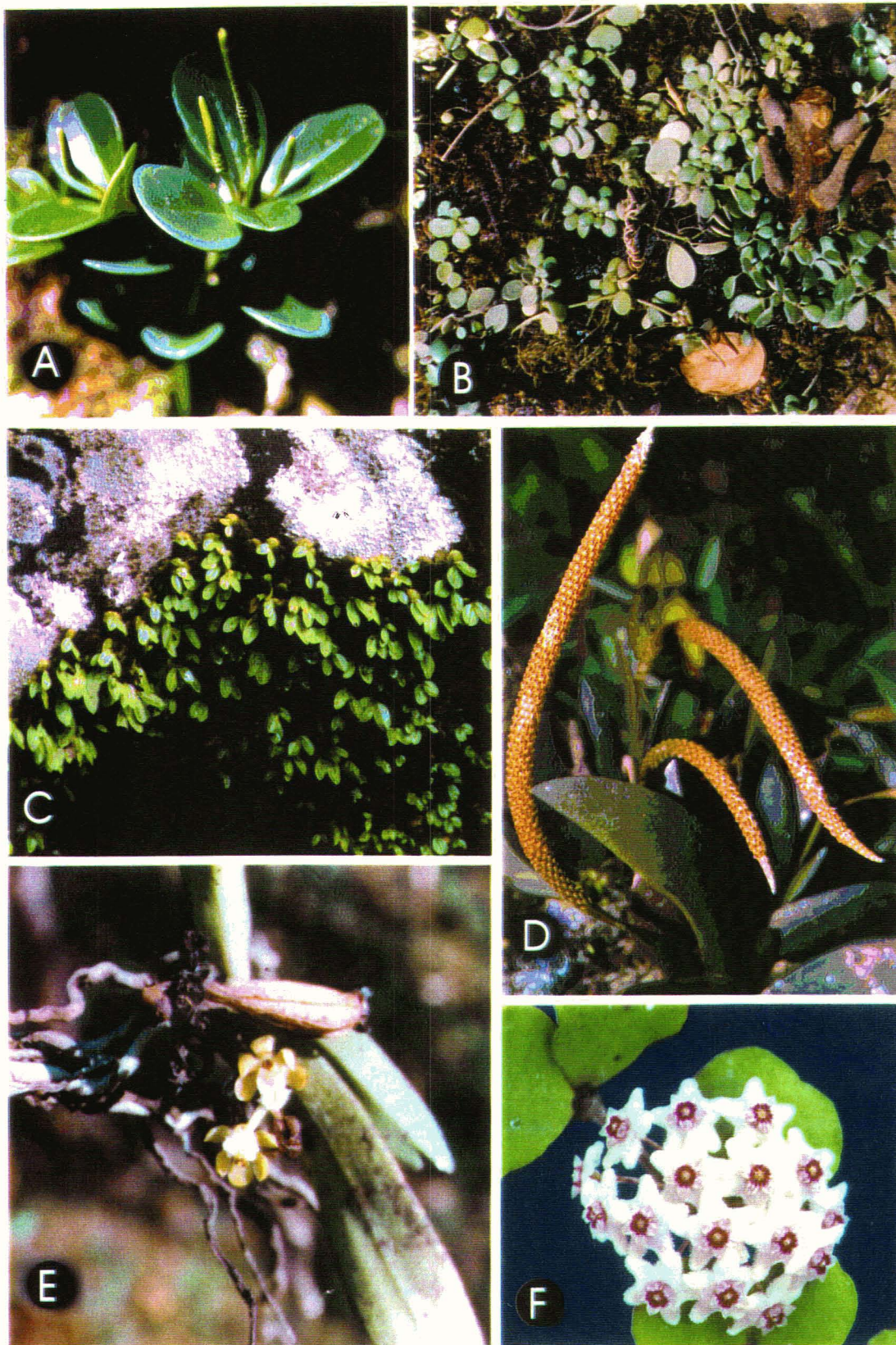


Plate III. A. *Peperomia portulacoides* (Lamk.) Dietr.; B. *Peperomia heyneana* Miq.; C. *Porpax reticulata* Lindl.; D. *Oberonia brunoniana* Wight; E. *Gastrochilus acaulis* (Lindl.) Kuntze; F. *Hoya kanyakumariana* Henry ex Swamin.

cymes. Calyx lobes small. Corolla white, 0.5-0.6 cm across, rotate, hairy on the inner side.

Coronal process white, with a red ring at the centre.

Fl. & Fr.: Jun.-Sept.

Distr.: Kerala and Tamil Nadu. Endemic to Western Ghats.

Note: Rare in evergreen forests and montane vegetation.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Karamanayar, *N. Mohanan 10751*; Athirumala, *N. Mohanan 12445*; *Ibid.*, *AESK 4453*.

Hoya ovalifolia Wight & Arn. ex Wight, *Contr. Bot. India* 37. 1834; Hook.f., *Fl. Brit.*

India 4: 60. 1883; Wight, *Ic. t.* 847. 1848; Gamble, *Fl. Pres. Madras* 2: 849. 1921;

Ramachandran & Nair, *Fl. Cannanore* 285. 1988; Vajravelu, *Fl. Palghat* 29. 1990;

Sasi. & Sivar., *Flow. Pl. Thrissur For.* 293. 1996; Sivar. & P. Mathew, *Fl. Nilambur*

427. 1997.

A slender epiphytic climber. Leaves sub-fascicled, 4-10 x 2-5 cm, elliptic-rhomboid, obtuse or acute at both ends, rarely rounded at the base, frequently short acuminate at apex; petiole 0.4-1 cm long. Flowers numerous in pedunculate cymes; peduncle as long as or longer than leaves. Calyx lobes 1 mm in diameter; lobes glabrous within and not ciliolate. Corona segments pointed and exceeding the tube. Mericarp 12-15 cm long, slender, curved.

Fl. & Fr.: Nov.-Dec.

Distr.: Southern Deccan Peninsula, Sri Lanka. Throughout Kerala.

Note: Seen in evergreen forests as epiphytes.

Occurrence & Specimens studied: **Kollam Dist.:** Achankovil, *Chandrabose* 49131 (MH).

Thrissur Dist.: Peechi, *Sasidharan* 5520 (MH). **Palakkad Dist.:** Karavara Forest,

Bhargavan 65690 (MH). **Malappuram Dist.:** Manchiri, *Philip Mathew* 33761 (CALI).

Wayanad Dist.: Begur, *Ramachandran* 62021 (MH).

Hoya pauciflora Wight, Ic. Pl. Ind. Or. 4(2): 16, t. 1269. 1848; Hook.f., Fl. Brit. India 4:

56. 1883; Gamble, Fl. Pres. Madras 2: 848. 1921; Ramachandran & Nair, Fl.

Cannanore 284. 1988; Manilal, Fl. Silent Valley 179. 1988; Mohanan & Henry, Fl.

Thiruvananthapuram 209. 1994; Sasi. & Sivar., Flow. Pl. Thrissur For. 293. 1996.

(Fig. 3).

A very slender epiphytic climber. Leaves linear-lanceolate, 2-5 x 0.5-1 cm, obtuse or rounded at base, tapering into a rounded apex; margins often recurved; petiole 0.2-0.6 cm long, frequently dotted with red beneath. Flowers 2-3, in sessile or almost sessile, umbel-like cymes, shorter than the leaves. Calyx lobes 1-1.2 mm long, narrowly triangular, glabrous. Corolla 1-1.8 cm in diameter, pentagonal in outline, quite glabrous or the lobes minutely puberulous within towards the margins. Corona segments rounded at the apex. Fruit not seen.

Fl.: Mar.-Nov.

Distr.: Southern Deccan Peninsula and Sri Lanka.

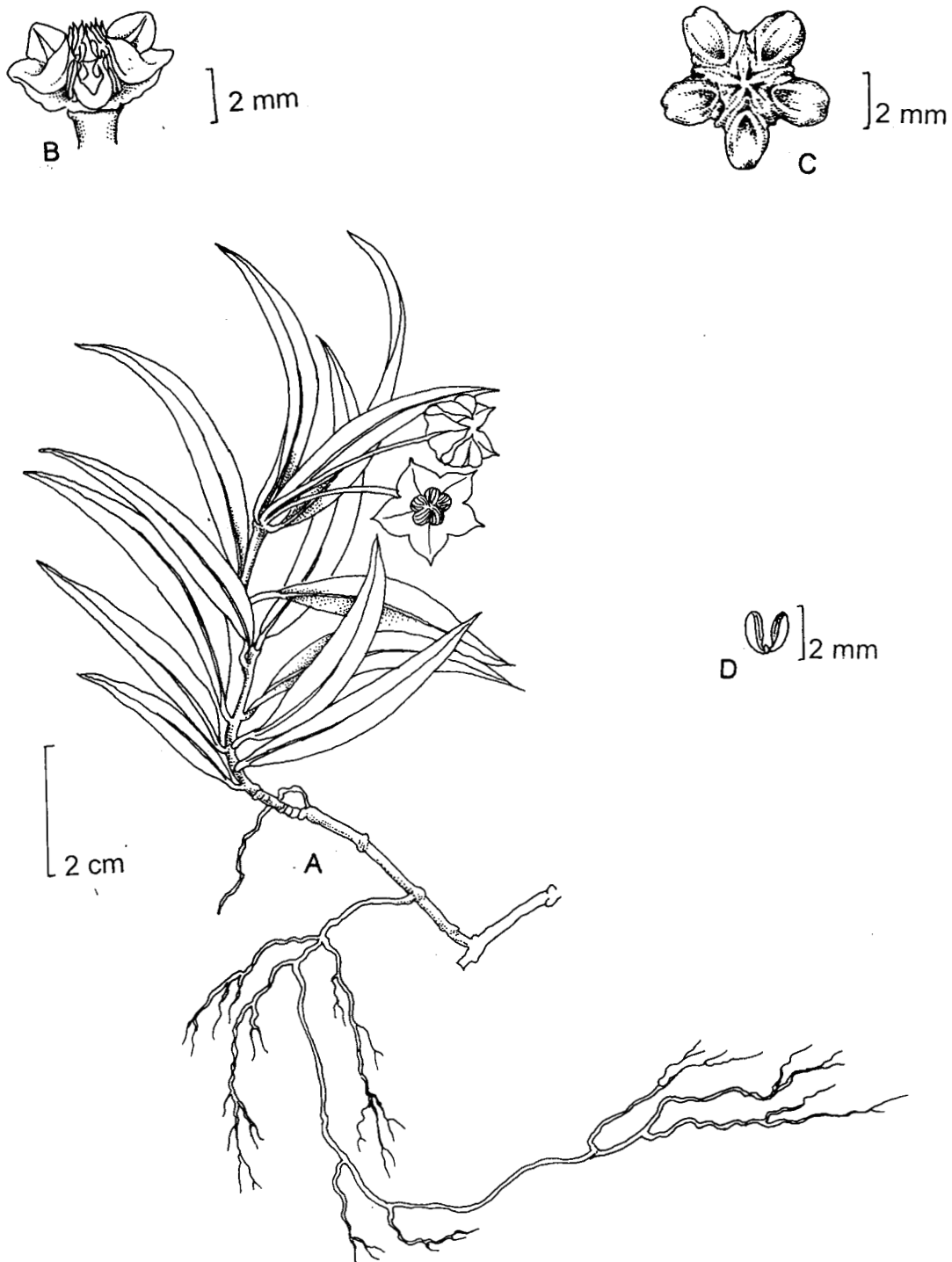


Fig. 3. *Hoya pauciflora* Wight: A. Habit; B. Gynostegium – lateral view; C. Gynostegium – view from top; D. Pollinia.

Note: Seen in dense forests as epiphytes or lithophytes.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Pongalappara, *AESK* 5207; *Ibid.*, *N. Mohanan* 9732; Agasthyamala, *Henry* 16351 (MH). **Idukki Dist.:** Guderale, *AESK* 7463; Pachakanam, *Sharma* 40832 (MH); Mangaladevi Temple, *Vivekananthan* 48628 (MH). **Palakkad Dist.:** Kunthipuzha, *Shaju & Kiran Raj* 44177; Silent Valley, *Bhargavan* 47240 (MH). **Wayanad Dist.:** Tirunelly, *AESK* 11008; *Ibid.*, *Ramachandran* 62707 (MH); Kuruwa Island, *AESK* 22372.

Hoya retusa Dalz. in Hook., *Kew Jour. Bot.* 4: 294.1852; Hook.f., *Fl. Brit. India* 4: 56. 1889; Gamble, *Fl. Pres. Madras* 2: 848. 1921.

Pendulous slender epiphytes. Leaves 3-5 x 0.6-0.8 cm, very narrow, gradually dialating from the base to the obcordate tip, fleshy; midrib very strong. Flowers 1-3-nate; pedicels slender, 1-1.8 cm long. Calyx lobes minute, ovate. Corolla 1.2 cm in diameter, white; lobes broad. Corona horizontal, ovate, shorter than the corolla tube, broad and outwards; spur recurved. Mericarps not seen.

Fl.: Oct.-Nov

Distr.: Concan southwards. Endemic to Southern Western Ghats.

Note: Epiphytic on trees trunks, seen in evergreen forests only.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Randattumukku, *AESK* 14788. **Kollam Dist.:** Cheenikala, *AESK* 15657, 8843; Padimotta, *Abdul Jabbar & Santhoshkumar* 15976. **Pathanamthitta Dist.:** Sabarimala, *Vivekananthan* 45363 (MH)

Hoya wightii Hook.f., Fl. Brit. India 4: 59. 1885; Gamble, Fl. Pres. Madras 849. 1921;
Ramachandran & Nair, Fl. Cannanore 285. 1988; Manilal, Fl. Silent Valley 179. 1988;
Mohanan & Henry, Fl. Thiruvananthapuram 299. 1994.

A stout epiphytic climber. Leaves 7-10 x 3-5 cm, elliptic or elliptic-lanceolate, acute at both ends, recurved at margins, nerves loosely netted. Peduncle 3-4 cm long. Pedicels 2.5 cm long, stout. Sepals glabrous, linear-oblong. Corolla 1.2-1.5 cm across, cream-coloured, glabrous within, puberulous at margins. Corona ascending, short, inflated, obtuse, concave above, inner angle produced into a short erect spur. Mericarps slender.

Fl. & Fr.: Oct.-Nov.

Distr.: Deccan Peninsula. Throughout Kerala.

Note: Epiphytic climbers in evergreen and semi-evergreen forests.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.**: Ponmudi, *AESK* 13783; Pongalappara, *N.Mohanan* 9767. **Pathanamthitta Dist.**: Pamba, *Deb* 80356 (MH). **Idukki Dist.**: Painavu, *Vivekananthan & Raju* 71121 (MH); Pachakanam, *Vivekananthan* 48389 (MH). **Wayanad Dist.**: Thirunelly, *AESK* 17308; Chandanathodu, *Ellis* 25259 (MH); *Ibid.*, *Ramachandran* 62651, 62706 (MH). **Kannur Dist.**: Iritty, *AESK* 15644. **Kasaragod Dist.**: Manpurathukavu, *Sarojini Menon* 17019.

BALSAMINACEAE A. Richard

in Bory, Dict. Class. Hist. Nat. 2: 173. 1822, *nom. cons.*

Annual or perennial herbs, rarely shrubby, terrestrial or epiphytic. Stems succulent, swollen at nodes, rarely woody below, erect and procumbent. Leaves simple, alternate or opposite, verticillate, glabrous or pubescent; margins crenate, dentate or serrate; petiole occasionally with short capitate or fimbriate glands. Flowers bisexual, zygomorphic, often showy and brightly colored, solitary or binate or fascicled in racemes or umbels; bracts rarely toothed. Sepals 3 or 5, free, colored; lateral sepals small, green or coloured; lower sepals resupinate, larger, always coloured, navicular, tapering or abruptly constricted into a nectariferous spur; spur short or long, filiform, straight or curved, swollen at the tip or pointed, rarely bilipped. Petals 3-5, coloured; dorsal petal resupinate, free, often keeled and rarely spurred. Wings entire or 2-3-lobed. Stamens 5, alternating with petals; filaments short and broad, connate or sub-connate into a ring and hood surrounding the ovary and stigma; anther 2-locular. Ovary superior, 5-locular with axile placentation; style 1, very short or absent; stigma 1-5; ovules 5-many. Capsules opening elastically into 5 twisted valves, opening and coiling with explosive dehiscence for seed ejection. Seeds warty or smooth.

Distributed through Tropical Asia and Africa with 2 genera and ca. 900 species. In India it is represented with 2 genera and 203 species, out of which 16 are epiphytes. In Kerala, 8 epiphytic species are reported.

IMPATIENS Linnaeus

Sp. Pl. 937.1753

Annual or perennial, terrestrial or often epiphytic herbs. Leaves simple, spirally arranged. Flowers zygomorphic, resupinate, in axillary racemes or umbels. Sepals 3-5, coloured. Petals 3-5; anterior standard erect; lateral ones entire or 2-3-lobed. Stamens 5; filaments short and broad; anthers cohering. Ovary oblong, 5-celled. Capsule short or long, loculicidally dehiscent.

Genus with about 900 species distributed through wet tropical and subtropical regions of Asia and Africa.

Key to the species

1. Plants scapigerous; leaves radical.2
1. Plants not scapigerous; leaves cauline 4
2. Leaves ovate; cordate and deeply 2-lobed at base; spur long.....**I. denisonii**
2. Leaves sub orbicular, not deeply 2-lobed; spur short..... **3**
3. Leaves oblique at base; lip longer than petals..... **I. sivarajanii**
3. Leaves not oblique at base; lip shorter than petals..... **I. modesta**
4. Wings 3-lobed **I. kulamavuensis**
4. Wings 2-lobed **5**
5. Flowers completely green.....**I. viridiflora**
5. Flowers not completely green **6**

- 6. Wings purple **I. auriculata**
- 6. Wings yellow 7
- 7. Lateral sepals elliptic; capsules ellipsoid..... **I. jerdoniae**
- 7. Lateral sepals linear; capsules gibbous.....**I. parasitica**

Impatiens auriculata Wight, Madras J. Lit. Sci. Ser. 1, 5: 8, t. 3. 1837; Hook. f., Fl. Brit. India 1: 460.1874; Gamble, Fl. Pres. Madras 139.1915; Mohanan & Henry, Fl. Thiruvananthapuram 96.1994; Sasi. & Sivar., Flow. Pl. Thrissur For. 77.1996.

Perennial, succulent, epiphytic herbs. Stems fleshy, swollen, with leaf scars, rarely branched, rooting at lower nodes of stem. Leaves 2-17 x 1-6cm, alternate, broadly ovate, lanceolate or elliptic, obtuse or acute at apex, obscurely crenulate with few granular setae at base; petiole 1-4 cm long. Flowers in axillary few-flowered peduncles, 2.5 cm across. Lateral sepals very large, pendulous, obliquely long or oblong, acute scarlet. Lip bright green, saccate, wrinkled; spur short, hooked. Standard small, dark green hooded. Wings 2-lobed, hooded, purple. Capsule ovate; seeds many.

Fl. & Fr.: Aug.-Oct.

Distr.: Endemic to South India. In Kerala it is seen in Thiruvananthapuram and Thrissur districts.

Note: Mostly seen on tree trunks in hilly areas.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Agasthyamala, *N. Mohanan* 4282; Athirumala, *N. Mohanan* 4295; *Ibid.*, *AESK* 10054; Western slopes of Agasthyar Hills, *Joseph* 44580 (MH). **Thrissur Dist.** Sholayar, *Nambiar* 105 (KFRI).

Impatiens denisonii Bedd., *Madras J. Lit. Sci. Ser.* 3,1: 41. 1864 & *Ic. t.* 151. 1869; Hook. f., *Fl. Brit. India* 1: 444. 1874; Gamble, *Fl. Pres. Madras* 139. 1915; Manilal, *Fl. Silent Valley* 40. 1988.

Scapigerous, epiphytic or lithophytic herbs. Leaves 7-15 x 7.5-10 cm, radical, ovate-cordate, deeply 2-lobed at base, sinuses broad, obtuse or acute at apex, slightly crenate, hairy above, glabrous below; petiole shorter than leaves. Inflorescence 2-4 times as long as leaves. Flowers numerous, 2.5 cm long, pink, racemed towards apex; pedicels 2.5-3.5 cm long. Lateral sepals ovate. Lip broadly ovate with three broad spreading lobes and dense tuft of petaloid hairs above conjunction of lobes, spurred. Wings with a filiform auricle enclosed in long curved spur. Capsules glabrous. Seeds numerous with spiral hairs.

Fl. & Fr.: Jul. – Nov.

Distr.: Endemic to western slopes of Nilgiris. In Kerala it is seen in Palakkad district.

Note: Epiphyte or lithophyte in moist places above 1000 m elevation.

Occurrence & Specimens studied: **Palakkad Dist.:** Silent Valley, *KSP* 10933

(CALI); *Sispara, S.T. Dum s.n.* (Acc. No: 7340 -MH).

Impatiens jerdoniae Wight, Madras J. Lit. Sci. Ser. 1, 5: 8. 1837 & Ic. 4(4): t. 15, 1850; Hook. f. Fl. Brit. India 1: 460. 1874; Gamble, Fl. Pres. Madras 1: 139. 1915; Manilal, Fl. Silent Valley 40. 1988.

Succulent, epiphytic herbs. Stems tumid, glabrous, green or purple. Leaves few, alternate, elliptic, acute, serrate, 5-8 cm long, deep green; nerves few with glandular cilia at base and on the top of stout petiole. Flowers solitary or binate, 3.5-5 cm long; peduncles 2.5-8 cm long, green, stout. Lateral sepals lanceolate, acuminate, green. Lip rounded, overlapping, laterally compressed, scarlet; spur ventricose, wrinkled, saccate, very large. Standard yellow, orbicular, apiculate, narrowly keeled at base. Wings 2-lobed; lobes rounded, overlapping, concealed under lip. Capsule ellipsoid.

Fl & Fr.: Aug.-Dec.

Distr.: Endemic to Western Ghats. In Kerala, reported from Palakkad and Idukki districts.

Note: Epiphytic and lithophytic in evergreen forests.

Occurrence & Specimens studied: **Palakkad Dist.**: South Wallakkad, *T. Sabu 11419* (CALI). **Idukki Dist.**: Lockhart Gap, *K.M. Sebastine 1649* (MH).

Impatiens kulamavuensis Pandurangan & V.J. Nair, Novon 5: 57-58.1995.

Epiphytic, stoloniferous, herbs. Stem short, stout, fleshy, less than 1cm long. Leaves alternate; petiole gland dotted, 2-4 cm long with 2 prominent stipitate glands near the base of the blade; lamina 2-5.5 x 1.5-2.5 cm, ovate-lanceolate, membranous, gland-dotted above, glabrous below, deep green, connate at base, acuminate at apex; margin

entire to obscurely crenate-serrate; lateral veins 4-6 pairs, indistinct. Inflorescence 1-3-flowered racemes; peduncles 2.5-5 cm long; pedicels 3.5-5 cm long. Flowers greenish-yellow. Lateral sepals linear, hairy outside, glabrous inside. Lower sepals saccate, compressed, glabrous. Spurs strongly curved, tip obtuse. Dorsal petals erect, orbicular to ovate, hairy at base. Lateral petals united close to the base, 3-lobed; upper lob smaller in size. Stamens 3-3.5 mm long. Ovary ellipsoid, glabrous; ovules many, 1-seriate; style short; stigma curved, with an obtuse tip, silky pubescent. Capsule ellipsoid 10-12 x 4-5mm, glabrous. Seeds pyriform smooth.

Fl. & Fr.: Oct.-Dec.

Distr.: Endemic to Kerala. Reported from Idukki and Palakkad districts.

Note: On moss-clad tree trunks at altitudes of 600-850 m.

Occurrence & Specimens studied: **Idukki Dist.**: Meenmutty, *Pandurangan* 62585 (MH).

Palakkad Dist.: Silent Valley, *AESK* 5289.

Impatiens modesta Wight, *Madras J. Lit. Sci. Ser.* 1, 5: 13. 1837 & *Ic.* 3(3): 6, t. 968. 1845; Hook. f., *Fl. Brit. India* 1: 442. 1874; Gamble, *Fl. Pres. Madras* 138. 1915; Vajravelu, *Fl. Palghat* 100. 1990.

Epiphytic, perennial herbs, 8-30 cm high; root stock tuberous. Leaves radical, 2.5-14 x 2-9 cm, ovate-cordate or suborbicular, acute, crenate-serrate, sparsely hairy above, glabrous and pale shining glaucous beneath. Inflorescence slender, erect, to 20 cm long. Bracts subulate, lanceolate, thickened at tips. Flowers pinkish or white, to 1 cm across;

pedicels filiform. Upper sepals broad, obovate or sub orbicular; lateral ones narrowly lanceolate or subulate. Lip shorter than petals. Standard short, broader than long, entire. Wings 3-lobed; lobes subequal, obtuse. Spur short, obtuse, straight. Capsule ellipsoid, 4-6 mm long, acute at both ends, glabrous. Seeds minute with spiral hairs.

Chrom. No.: n=8, 9, 16 (Bhaskar, 1976)

Fl. & Fr.: Apr.-Sept.

Distr.: Endemic to Southern Western Ghats. In Kerala it is reported from Palakkad and Thiruvananthapuram districts only.

Note: Succulent epiphytes on moss cushions or lithophytes in damp shady places at an altitudes between 800-2000 m.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.**: Agastyamala, *AESK* 4298; *Ibid.*, William D'Cruz 18427; Pongalappara, N. Mohanan 10059. **Idukki Dist.**: Pindimedu, *Bhargavan* MH); Umayamalai, *Shetty*, 28324 (MH). **Palakkad Dist.**: Naduvattom, *Bhaskar* 376 (MGM); Kunthipuzha, *N.C.Nair* 64278 (MH). **Kozhikode Dist.**: Vellarimala, *Pradeep* 56003 (CALI).

Impatiens parasitica Bedd., Madras J. Lit. Sci. Ser. 2, 20: 66, t. 7. f. 2. 1859 & Ic. t. 140. 1868; Gamble, Fl. Pres. Madras 139. 1915. *I. jerdoniae* Wight var. *parasitica* (Bedd.) Hook. f., Fl. Brit. India 1: 460. 1874.

Succulent, epiphytic, perennial herbs. Stem moniliform, 10-25 cm long, green or purple; internodes swollen. Leaves crowded at the ends of branches, 3-7 x 2-3 cm, elliptic,

acute, serrate with glandular cilia at the base; petiole 2-6 cm long. Peduncle axillary, up to 3.5 cm long, bearing 1-3 flowers. Pedicels to 5 cm long. Lateral sepals linear, green with a foliaceous crest. Lip saccate. Spur 5 mm across the mouth, recurved at tip. Standard dorsally winged, green. Wings yellow, 2-lobed, concealed under lip. Capsule gibbous, glabrous. Seeds numerous, small.

Chrom. No: n=10 (Bhaskar, 1976).

Fl. & Fr.: Jun.-Nov.

Distr.: Endemic to Southern Western Ghats. In Kerala, Idukki and Palakkadu districts.

Note: Epiphytic on tree trunks above 1000 m above MSL.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Agastyamala, *AESK* 25586. **Idukki Dist.:** Umayamalai, *Shetty* 26625 (MH); Meenmutty, *C.N. Mohanan* 79991 (MH); Calvary Mount, *Pandurangan* 79270 (MH); Way to Eravikulam hut, *Bhargavan* 90932 (MH). **Palakkad Dist.:** Way to Silent Valley, *Ansari* 51488 (MH).

Impatiens sivarajanii Muktesh *et* Stephen, *Rheedea* 6(2): 51. 1996.

Epiphytic, scapigerous, perennial tuberous herbs, to 10 cm high. Leaves 1-2, radical, 4.5-5 x 2.4-2.7 cm, subcordate and oblique at base, acute or acuminate at apex, distantly subcrenate, glabrous except the nerves. Inflorescence 1-3-flowered racemes. Scape to 10 cm long, slender. Bracts linear-lanceolate, to 4.9 x 1.9 mm, glabrous. Pedicels to 1.8 cm long, filiform, glabrous. Flowers to 2 x 1.25 cm, creamy white. Lateral sepals ovate-elliptic, to 0.5 x 2.5 mm. Lip widely obovate, acuminate, concave, to 1.2 x 0.75,

glabrous. Spur very short. Dorsal petal widely depressed, obovate, concave, to 0.75 x 1 cm. Lateral petals 3-lobed, to 1.75 x 0.9 cm; basal lobe ovate-oblong, obtuse at apex; middle lobe more or less confluent with distal one. Stamens 5, united; anthers 1 mm long. Ovary ovate-elliptic, to 3 x 1.4 mm; stigma sessile, toothed. Capsule oblong-ovate, 3 x 1 mm, apex beaked, glabrous. Seeds narrowly elliptic, to 0.8x0.3 mm, orange, glabrous except the tips, not banded, tip tufted ciliate.

Fl. & Fr.: Aug.-Oct.

Distr.: Endemic to Silent Valley, Palakkad District.

Note: This new species is allied to *Impatiens agumbeana* Bhaskar & Razi, but differs in having glabrous lamina, creamy white flower, widely obovate lip, very short spur with rounded tip; distal lobe of lateral petals minutely 2-lobuled, basal lobes of lateral petals without dorsal auricle and the seeds orange, glabrous except at both ends, not banded.

Occurrence & Specimen studied: **Palakkad Dist.:** Silent Valley, *Stephen* 7885 (KFRI).

Impatiens viridiflora Wight, Madras J. Lit. Sci. Ser. 1, 5: 9. 1837; Hook. f., Fl. Brit. India 1: 460. 1874; Gamble, Fl. Pres. Madras 139. 1915.

Erect epiphytic herbs, glabrous. Stem fleshy, thick, 2.5 cm across; branches nodose. Leaves congested at ends of branches, 3.5 cm long, elliptic, sometimes ovate, obovate or lanceolate, acute at apex, crenate-serrate; crenatures large, with a few glandular cilia at base; petiole stout. Peduncle axillary, two or rarely one. Flowers completely green, 2.5 cm along the lip. Lateral sepals reflexed or deflexed, linear-oblong, acuminate. Lip

saccate, narrowed into a stout involute spur. Spur wrinkled, green, laterally compressed. Standard orbicular, 2-lobed, strongly keeled on the back. Wings fleshy, 2-lobed; basal lobes concealed under standard; distal lobes oblong, rounded. Capsule glabrous.

Distr.: Endemic to southern Western Ghats.

Fl. & Fr.: Sept. – Oct.

Note: On the tree trunks at altitudes of 1350 m.

Occurrence & Specimen studied: **Thiruvananthapuram Dist.:** Agastyamala, *AESK* 7328.

COMMELINACEAE R. Brown

Prodr. 268. 1810.

Prostrate or erect herbs. Leaves alternate with a strong midrib and many parallel veins, sheathing at the base. Inflorescence various, often cymose, sometimes paniced. Flowers bisexual, 6-partite, 2-seriate. Stamens 6, adnate to the base of the perianth. Ovary superior, 3-celled. Fruit a loculicidal capsule.

A family of herbs occurring in the tropical and subtropical regions with about 38 genera and 500 species.

BELOSYNAPSIS Hasskarl

Flora 54: 259. 1871.

Epiphytic herbs. Leaves both radical and cauline, alternate. Inflorescence few-flowered. Bracts 2. Flowers 3-4; sepals 3, free; petals 3, connate to middle. Capsule 3-celled.

An Indo-Malayan genus with 6 species.

Belosynapsis vivipara (Dalz.) C.E.C. Fisch., ex Sprague & Fischer, Kew Bull. 1928: 254. 1928; Fischer in Gamble, Fl. Pres. Madras 1551. 1931; Manilal, Fl. Silent Valley 324. 1988; Vajravelu, Fl. Palghat 515. 1990; Mohanan & Henry, Fl. Thiruvananthapuram 485. 1994. *Cyanotis vivipara* Dalz., Hooker's J. Bot. Kew Gard. Misc. 3:226. 1851; Hook.f., Fl. Brit. India 6: 388. 1892.

Slender, epiphytic, creeping herbs with rufous hairs all over, 5-20 cm long; primary stem bearing radical leaves; secondary branches slender, radiating from the base of the radical leaves, viviparous, villous. Radical leaves 3-8 x 1-2 cm, linear-lanceolate, acute or acuminate, pilose or with rufous hairs; cauline leaves sessile, 1-2 x 0.2-0.5 cm, ovate or elliptic, acute, pilose. Flowers in axillary or terminal umbels, 2-5 flowers on slender pilose peduncles, bracteate. Sepals 3, 2-3 mm long, pilose, connate below. Petals 3, white, connate below. Stamens 6; filaments bearded. Capsule cylindrical, about 3 mm long, pilose, 3-celled; cells 2-seeded. Seeds cylindrical, obscurely pitted.

Fl. & Fr.: Aug.-Oct.

Distr.: Endemic to Southern Western Ghats.

Note: Vulnerable species due to felling and opening up of forests and habitat loss (Nayar & Sastry, 1987). Epiphytic on densely moss covered tree trunks and braches in cool shady evergreen forests.

Occurrence and Specimens studied: **Thiruvananthapuram Dist.**: Bonaccord, *N. Mohanan* 8131. **Idukki Dist.**: Walara, *AESK* 12827; Neriamangalam, *AESK* 19122; Kulamavu, *C.N. Mohanan* 38590 (MH).

GESNERIACEAE B. C. J. Dumortier

Comment. Bot. 57. 1822, *nom. cons.*

Acaulescent or coalescent herbs, occasionally epiphytic. Leaves usually opposite, sometimes whorled or alternate, simple entire or toothed. Stipules absent. Inflorescence axillary or terminal, usually a simple or compound dichasium. Bracts usually small or absent. Flowers large and showy. Calyx 5-merous, divided to base or tubular and 5-lobed. Corolla 5-merous, gamopetalous, usually with distinct tube, 2-lipped. Stamens usually 2 or 4, inserted on corolla tube; anthers usually connate or connivent in pairs; staminodes often present. Disc annular, cupular, one-sided or represented by 1-5 distinct glands. Ovary superior; style simple; stigma simple or variously lobed. Fruits usually a capsule splitting loculicidally. Seeds numerous, small, sometimes with hair like appendages at either end.

A large family of about 120 genera and 2000 species, widespread in the tropics and subtropics of the New and Old world.

AESCHYNANTHUS Jack

Trans. Linn. Soc. London 14: 42. 1823.

Epiphytic undershrubs. Leaves opposite, fleshy or leathery, entire. Flowers often showy, in fascicles on terminal or axillary peduncles. Bracts usually small, deciduous; bracteoles small. Calyx 5-fid or 5-partite. Corolla tubular-ventricose. Stamens 4, perfect; staminodes present. Disc annular. Ovary superior, stipitate; stigma dilated. Fruit a long linear capsule.

An Indo-Malayan genus of about 100 species.

Aeschynanthus perrottetii A. DC. in DC., Prodr. 9: 261. 1845; Clarke in Hook.f., Fl. Brit. India 4: 339. 1884; Gamble, Fl. Pres. Madras 985. 1924; Manilal, Fl. Silent Valley 199. 1988; Ramachandran & Nair, Fl. Cannanore 325. 1988; Vajravelu, Fl. Palghat 332. 1990; Mohanan & Henry, Fl. Thiruvananthapuram 337. 1994; Sasi. & Sivar., Flow. Pl. Thrissur For. 329. 1996; Sivar. & P. Mathew, Fl. Nilambur 482. 1997. *A. planiculmis* (C. B. Clarke) Gamble, Fl. Pres. Madras 985. 1924. *A. ceylanica* sensu Wight, Ic.t. 1347. 1848, *non* Gaertn., 1846. (Fig. 4)

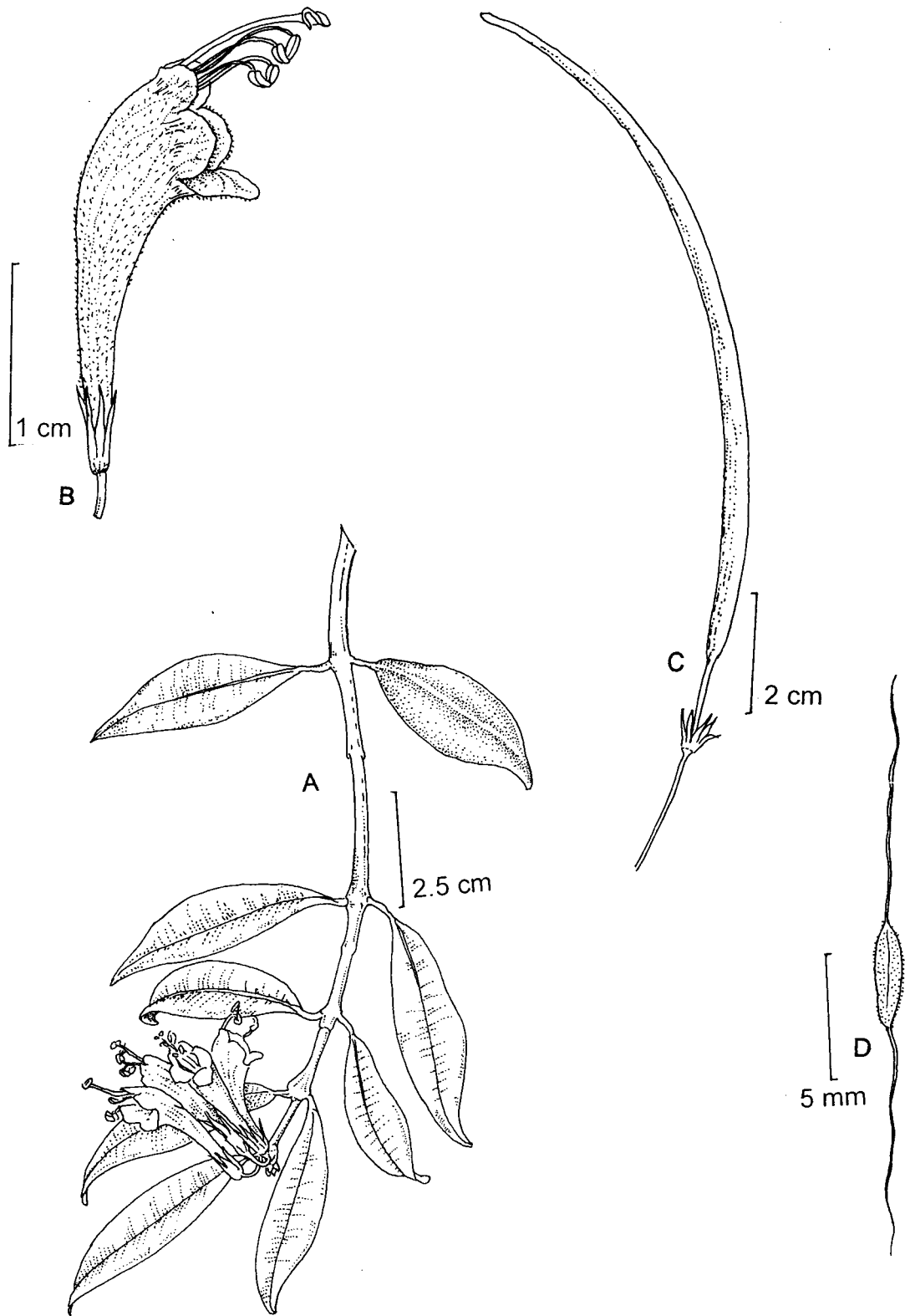


Fig. 4. *Aeschynanthus perrottetti* A. DC.: A. Habit; B. Flower; C. Fruit; D. Seed.

Stems long, slender, cylindrical or sometimes flattened, scandent, often rooting at nodes; bark smooth and shiny, greyish. Leaves 4.5-9 x 1.2-3 cm, oblanceolate to elliptical or narrowly elliptical, base tapering, apex acute to obtusely acuminate, glabrous, thick and fleshy, sometimes coriaceous, pale green above, whitish green below. Petiole short, thick, 2-6 mm long. Inflorescence pseudo-terminal. Flowers 1-2 in axils of terminal leaves. Calyx segments linear-lanceolate, glabrous, to 0.6 cm long. Corolla tube scarlet, 2.5 cm long, 0.4-0.5 cm broad at the throat, glandular-pubescent without, yellowish and glandular pubescent within; lower 3-lobes with purplish-red blotches near the base and scattered stripes in front, glandular pubescent on both surfaces; upper 2-lobes slightly smaller. Filaments violet, glandular-pubescent upper pair 22 mm long; lower pairs 18 mm long; anthers reddish-purple below the filaments, yellowish green above; staminodes glabrous, 8 mm long. Ovary glabrous; style 18 mm long at maturity; stigma purple. Capsule straight or curved, 15 x 0.3 cm, glabrous; base empty and narrower. Seeds with one long hair at each end, brown, rugose.

Fl. & Fr.: Throughout the year.

Distr.: Peninsular India. It is seen throughout Kerala.

Note: Climbing and rooting over rocks surfaces and on trees in moist places or in the stream sides.

Gamble (1924) elevated the status of *Aeschynanthus perrottetii* A. DC. var. *planiculmis* C.B. Clarke to species as *A. planiculmis* in his *Flora of the Presidency of Madras* with a comment "doubtfully distinct". Subramanyam and Henry (1970) treated

this as conspecific to *A. perrottetii*. As a lot of intermediate forms are occurring, the treatment of Subramanyam and Henry is followed here.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Athrumala, *N. Mohanan* 4245, 4204, 7437, 9417, 10243; Pongalapara, *N. Mohanan* 9804; *Ibid.*, *AESK* 5492; Agastyamala, *William D'Cruz* 18422; *Ibid.*, *AESK* 7302; *Ibid.*, *Mathew* 6556; Poonkulam, *M. Mohanan* 66031 (MH); Pandimotta, *AESK* 22285. **Idukki Dist.:** Chokkampetty, *C.N. Mohanan* 73425 (MH); Peermedu, *Narayana Iyer s.n.* (MH); Guderale, Munnar, *AESK* 13066; Idukki, *Sharma* 42439 (MH); *Ibid.*, *Ramanujan* 72410 (MH); Devicolam *AESK* 18232; Adimaly, *AESK* 7532; Neymakkadu, *Santhosh Kumar* 14486; Wagamon, *AESK* 13280. **Ernakulam Dist.:** Pooyamkutty, *AESK* 18359. **Palakkad Dist.:** Silent Valley, *Santhosh Kumar* 15918; *Ibid.*, *AESK* 5290; Poochappara, *AESK* 5270. **Wayanad Dist.:** Wythiri, *AESK* 23304; Chandanathodu, *Ramachandran* 53966 (MH); *Ibid.*, *AESK* 11010; Periya, *AESK* 42192, 42193.

LOGANIACEAE R. Brown ex C. F. P. von Martius

Nov. Gen. Sp. Pl. 2: 133. 1827.

Trees, shrubs, woody climbers or herbs. Leaves usually opposite, rarely ternate, entire, pinnately or more rarely 3-7-veined, stipulate or not; stipules when present usually interpetiolar. Flowers actinomorphic, bisexual, usually arranged in simple or compound, terminal or axillary cymes. Calyx 5, rarely 4-lobed, lobes free or rarely united. Corolla tubular, 5, rarely 4-lobed; lobes valvate or imbricate. Stamens 5 (-4), inserted on corolla

tube, alternating with lobes; anthers 2-celled, usually basifixed. Ovary superior, 2-celled; ovules 1-many in each cell; style simple; stigma capitate or 2-lobed. Fruit baccate, rarely capsular. seeds 1-many.

Family of some 28 genera occurring in the tropics of both Old and New World.

FAGRAEA Thunberg

Kongl. Ventensk. Acad. Nya Handl. 3: 132. 1782.

Trees, shrubs or woody climbers. Leaves opposite, large, coriaceous, petiolate or sessile, appearing exstipulate, but with initially connate or sheathing stipules which split interpetiolarily. Flowers large, in 3-many-flowered terminal, trichotomous cymes. Bracts small; scale linear. Bracteoles similar to bracts but very small. Calyx deeply 5-lobed; lobes fleshy, rounded, imbricate. Corolla 5-lobed; tube long, funnel shaped; lobes rounded. Stamens 5, inserted in corolla tube. Ovary ellipsoid, 2-celled; style filiform; stigma capitate; Ovules many in each cell. Fruit 1-2 celled berry, indehiscent. Seeds many embedded in pulp.

A genus of about 35 species from South India, Sri Lanka, China, Hainan, Formosa, Malesia and Pacific Islands. The genus is represented in Kerala by 1 species.

Fagraea ceilanica Thunb., Kongl. Ventensk. Acad. Nya Handl. 3:132.1782; Hook.f., Fl. Brit. India 4:83.1883; Gamble, Fl. Pres. Madras 865.1923; Manilal & Sivar., Fl. Calicut 172.1982; Manilal, Fl. Silent Valley 180.1988; Ramachandran & Nair, Fl. Cannanore 287.1988; Vajravelu, Fl. Palghat 294.1990; Mohanan & Henry, Fl.

Thiruvananthapuram 102. 1994; Philcox in Dassan. & Clayton, Rev. Handb. Fl. Ceylon 10: 278. 1996; Sasi. & Sivar., Flow. Pl. Thrissur For. 295.1996; Sivar. & P. Mathew, Fl. Nilambur 429.1997. *F. obovata* Wall. in Roxb., Fl. Ind. 2: 33.1824; Hook f., Fl. Brit. India 4: 83.1883; Gamble, Fl. Pres. Madras 865.1923. *F. coromandelina* Wight, Ic. t.1336. 1848. *F. malabarica* Wight, Ic. .t.1317. 1848, *nom. illeg.*

Epiphytic shrubs or small trees, up to 10 m tall. Leaves 10-18 x 4-9.5 cm, obovate to obovate-oblong, apex obtuse, cuneate at base into the petiole, entire, fleshy or coriaceous; glabrous; veins 4-6 pairs, indistinct, frequently prominent beneath. Petiole 0.5-5.5cm long, robust or somewhat slender. Flowers very large, pale yellow to white on short thick pedicels, sweet-scented, arranged in dense to sub-dense, glabrous dichasial cymes. Pedicels 0.5-4 cm long. Calyx 1-1.5 cm long, sericeous; lobes connate to more than half their length, rounded, glabrous. Corolla some what fleshy, narrowly funnel-shaped; tube 6.5-9.5 cm long, glabrous; lobes 2.5-3.5 x 1-1.75 cm, broadly ovate-oblong to oval, obtuse, glabrous. Stamens attached about 1/3 down tube, exerted. Ovary oblong. Style up to 10 cm long, exceeding stamens. Fruit 3-5.5 cm long, ovoid or ellipsoid, slightly or strongly beaked.

Fl. & Fr.: Mar. – Nov.

Distr.: Southern India, Sri Lanka, Myanmar, Thailand and throughout Malesia, China, Hainan, Hong-Kong and Formosa. Throughout Kerala.

Note: Seen as epiphytes in the borders of the evergreen and semi evergreen forests.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Athirumala, *AESK* 26804; *Ibid.*, *N. Mohanan* 9812; Bonaccord, *AESK* 19152; *Ibid.*, *N. Mohanan* 8405; Palode, *Mathew Dan* 5917; *Ibid.*, *N. Mohanan* 159; *Ibid.*, *T. S. Nair* 217. **Kollam Dist.:** Paravur, *C.N. Mohanan* 59683 (MH); Thenmala, *C.N. Mohanan* 63062 (MH). **Pathanamthitta Dist.:** Kattathipara, *AESK* 15625. **Alappuzha Dist.:** Vandanam, *Sarajini Menon* 20617. **Idukki Dist.:** Devicolam, *Ramamurthy* 66343 (MH); *Ibid.*, *Sebastine* 16528 (MH); Perumedu, *Vibekananthan* 21414, 24317 (MH). **Thrissur Dist.:** Athirapalli, *Pandurangan* 30581. **Palakkad Dist.:** Nelliampathy, *AESK* 15775; Mukkali, *Vajravelu* 32170 (MH); Nadugani, *Vajravelu* 43795. **Wayanad Dist.:** Pakshipathalam, *AESK* 17346; Chandanathodu, *Ellis* 27159 (MH). **Kannur Dist.:** Aralam, *Ramachandran* 58661 (MH).

MELASTOMATACEAE A. L. Jussieu

Gen. Pl. 328. 1789, *nom. cons.*

Herbs or shrubs, some times climbing, rarely trees. Leaves opposite or whorled, entire or nearly so, often ribbed from the base; stipules 0. Flowers regular, in spikes, panicles or corymbs, rarely solitary or fascicled, usually bracteate and bracteolate. Disk some times present. Calyx tube free or partly or entirely adherent to ovary; lobes 4-5. Petals as many as calyx lobes, inserted on the margin of the tube, imbricate. Stamens as many or often twice as many as petals. Filaments bent inwards in bud, often alternately shorter and longer; anthers 2-celled, basifixed; dehiscence usually terminal pores. Ovary

4-5, rarely 3 or 6 or 1-celled; ovules usually numerous on axile placentas; style terminal, usually filiform. Fruit usually enclosed in the calyx tube; capsule dehisce by irregular slits. Seeds many.

A Pantropical family with 200 genera and 4500 species, most of which occur in South America. Only one epiphytic genus having two species is found in Kerala.

MEDINILLA Gaudichaud

in Freyc., Voy. Uranie Bot. 484.1830.

Erect or scandent, often epiphytic, branching shrubs. Leaves opposite or whorled, entire, often fleshy, ribbed from the base of the blade. Flowers pink or white, in terminal panicles or axillary cymes, 4-5, rarely 6-merous, some times solitary. Bracts some times coloured, deciduous. Calyx tube usually ovoid; the limb entire or obscurely toothed. Petals usually 4 or 5, ovate-oblong or obovate, acute, fleshy. Stamens twice as many as petals, equal; anthers opening by a terminal pores; connective with 2 tubercles in the front and a spur behind. Ovary inferior, 4-6-celled. Fruit a berry, crowned by the limb of the calyx.

A Paletropical genus of about 400 species, extending from Africa, Madagascar, South and South East Asia to the Pacific.

Key to the species

1. Leaves 3-5-ribbed, elliptic lanceolate; tubercles and spur very small
..... **M. malabarica**
1. Leaves 3-ribbed, orbicular; tubercles and spur prominent **M. beddomei**

Medinilla beddomei C.B. Clarke in Hook. f., Fl. Brit. India 2:548. 1879; Gamble, Fl. Pres. Madras 496. 1919; Manilal, Fl. Silent Valley 108. 1988; Ramachandran & Nair, Fl. Cannanore 185. 1988; Vajravelu, Fl. Palghat 202. 1990; Sasi. & Sivar., Flow. Pl. Thrissur For. 186. 1996. (**Fig. 5**)

An epiphytic fleshy shrub, rooting from the nodes. Branches terete. Leaves 3 x 2.5 cm, sub orbicular, fleshy, 3-nerved; outer nerves obscure and close to the margin. Flowers axillary on solitary peduncles, yellowish white. Stamens with long curved acuminate anthers; spur and tubercles of the connective prominent. Berry crowned by the limb of calyx.

Fl. & Fr.: Mar.-Jun.

Distr.: Southern Western Ghats; endemic.

Note: Epiphytic and lithophytic on moist places in hilly areas.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.**: Pongalappara, *AESK* 2508, 5208, 7363; *Ibid.*, *N.Mohanan* 5515, 9694. **Idukki Dist.**: Painavu, *C.N.Mohanan* 76158 (MH); Neriamangalam, *AESK* 37603. **Thrissur Dist.**: Vazhachal, *Sasidharan* 737 (KFRI); Sholayar, *N.G.Nair* 1744 (KFRI). **Palakkad Dist.**: Valiyaparathodu,

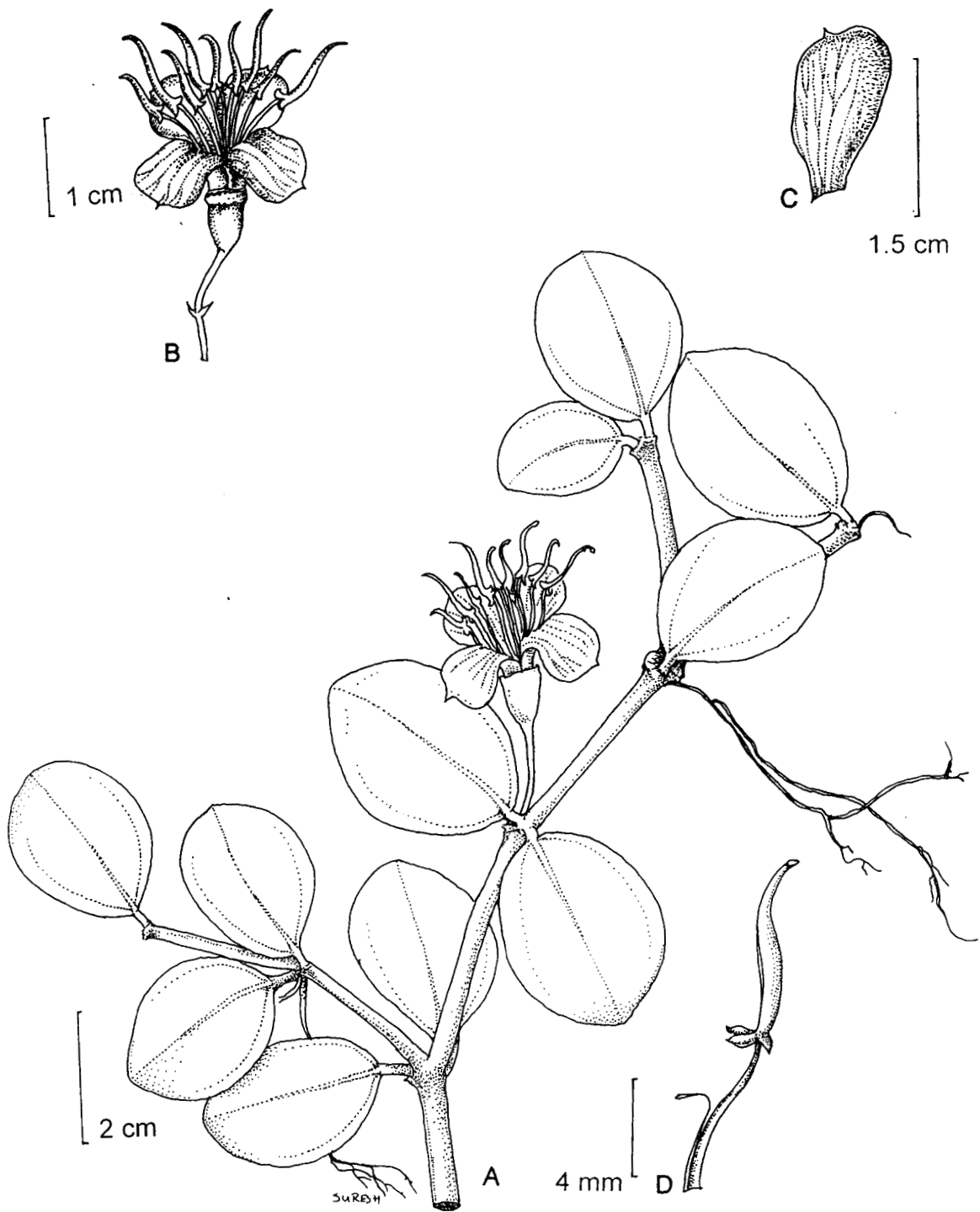


Fig. 5. *Medinilla beddomei* C. B. Clarke: A. Habit; B. Flower; C. Petal; D. Stamen.

V.J.Nair 7311(MH); Aruvanpara, *KSP* 10313 (CALI). **Wayanad Dist.:** Thavinjal, *Ravi* 33766; Chandanathodu, *Ellis* 25212 (MH). **Kannur Dist.:** Thalassery, *AESK* 15645.

Medinilla malabarica Bedd., *lc. t.* 157. 1868; Clarke in Hook.f., *Fl. Brit. India* 2: 548. 1879; Gamble, *Fl. Pres. Madras* 496. 1918; Manilal, *Fl. Silent Valley* 109. 1988.

(Fig. 6)

Erect, epiphytic, branching shrubs; branches striate, somewhat verrucose. Leaves 5-9 cm long, elliptic, narrowed at both ends, 3-5-nerved. Petiole 0.6 cm long. Flowers axillary, 1-3-flowered, large, crimson red, 4-merous. Stamens with long filaments; anthers short with two glandular swellings at the apex of the filaments inside; spur of the connective perceptible behind but very small. Berry crowned by the limb of the calyx.

Fl. & Fr.: Mar.-Jun.

Distr.: Anamalais and Nilgiris

Note: Epiphytic on tree branches. Commonly seen on river banks.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Uthipanji, *AESK* 7322; Attayar, *N. Mohanan* 5528, 8280; Chemungi, *AESK* 16045; *Ibid.*, *Santhosh Kumar* 25409.

Idukki Dist.: Walara, *AESK* 7547; Munnar, *Sarojini Menon* 12213; Devikulam, *Shetty* 28323 (MH); Umayamala, *Shetty* 26477, 33405 (MH). **Palakkad Dist.:** Walakkad, *Sabu* 11421 (CALI).

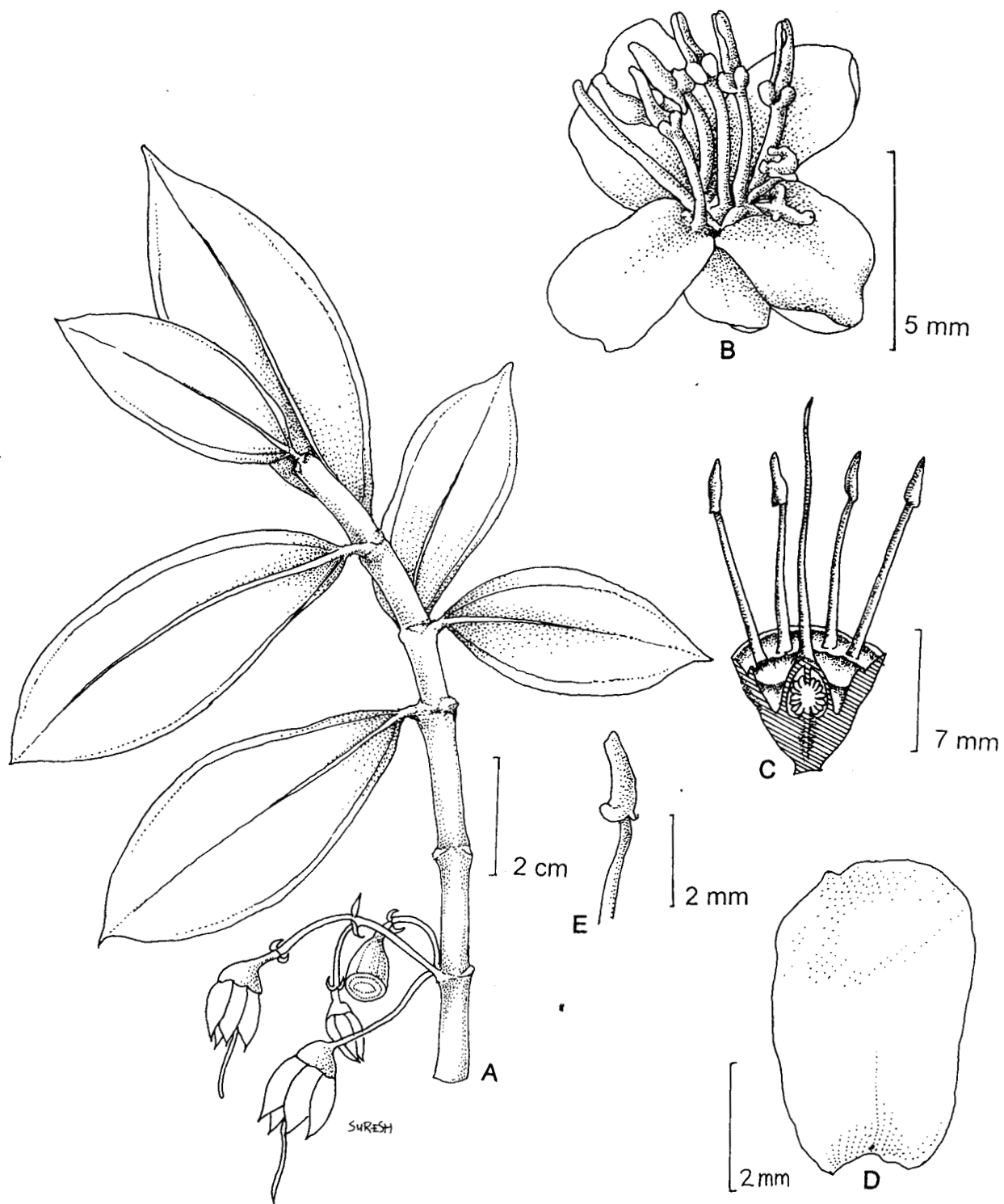


Fig. 6. *Medinilla malabarica* Bedd.: A. Habit; B. Flower; C. L. S. of flower with petal removed; D. Petal; E. Stamen.

ORCHIDACEAE A. L. Jussieu

Gen. Pl. 64. 4.1789, *nom. cons.*

Perennial herbs, or rarely shrubs, or vine-like climbers, terrestrial and often tuberous, epiphytic or saprophytic but never parasitic, occasionally lithophytic. Roots subterranean or aerial, solitary, fascicled or rarely adventitious, fibrous, fleshy, tuberous or corm-like. Stems terete, flattened or angular, more or less elongated but often much reduced into pseudobulbs; pseudobulbs slender and stem like to globose, fusiform or pyriform, naked, bracteate or leafy, bearing one or more leaves subtended by sheaths. Leaves solitary or many, rarely wanting, radical or cauline, alternate or occasionally whorled, simple, coriaceous or fleshy, flat or plicate, acute entire, parallel veined. Inflorescence terminal or lateral, short or long pedunculate, 1-many-flowered, spicate, racemose or paniculate. Flowers minute and inconspicuous or large and showy. Perianth superior, 6-segmented, free or variously united; an outer whorl of 3 sepals and an inner whorl of 2 petals and 1 lip or labellum. Sepals similar or the dorsal smaller, laterals more or less adnate to the inferior ovary of the column-foot. Petals rather similar to sepals. Lip dissimilar and variously modified, slightly or very much into a saccate pouch or elongated spur. Stamen and style confluent in a column opposite the lip. Anther one, sessile on the column, attached near the apex or laterally. Pollen powdery or waxy, compressed into 2 to 8 distinct masses of pollinia. Fruit a dry loculicidal capsule. Seeds numerous, minute, without endosperm.

A very large family of flowering plants comprising over 30,000 species distributed in every part of the globe except the polar regions, with greatest concentration of species in the hilly regions of the tropics, both in the Old and New World.

Key to the genera

- 1. Anther erect in early bud, later becoming operculate; pollinia without stipes. 16
- 1. Anther usually operculate; pollinia with a stipe. 2
- 2. Leaves laterally compressed..... 3
- 2. Leaves not laterally compressed..... 4
- 3. Sepals connate at base; pollinia two..... **Podochilus**
- 3. Sepals free at base, pollinia four **Oberonia**
- 4. Plants without pseudobulbs **Sirhookera**
- 4. Plants with distinct pseudobulbs 5
- 5. Pollinia eight 6
- 5. Pollinia four..... 9
- 6. Sepals jointed into a tube; flowers usually solitary..... **Porpax**
- 6. Sepals not jointed into a tube; inflorescence 1-many flowered 7
- 7. Pollinia jointed by a long caudicle 8
- 7. Pollinia without any long caudicle **Eria**
- 8. Leaves obtuse at tip; inflorescence terminal **Phreatia**
- 8. Leaves bluntly lobed at tip; inflorescence lateral **Thelasis**
- 9. Pollinia jointed by a caudicle 10
- 9. Pollinia without caudicle 11

10. Lip saccate at base	Pholidota
10. Lip not saccate at base	Coelogyne
11. Pseudobulbs uninodal	12
11. Pseudobulbs plurinodal	16
12. Operculum with a long tail like prolongation	Trias
12. Operculum without such tail	13
13. Pseudobulbs with single leaf	14
13. Pseudobulbs with 2-3 leaves	Liparis
14. In fully mature flowers the lateral sepals twisted once to form a convex blade through outer margins.....	Cirrhopetalum
14. In fully mature flowers the lateral sepals not twisted, if twisted more than once.....	15
15. Lateral sepals involute, firmly twisted along both margins, horn or pouch-like.....	Rhytionanthos
15. Lateral sepals free or connate, never horn or pouch like	Bulbophyllum
16. Pseudobulbs continuous; flowers many on a raceme or fascicle	Dendrobium
16. Pseudobulbs at regular intervals on an elongated nodose stem; flowers solitary or in groups of 2 or 3.....	Flickingeria
17. Plants always monopodial	18
17. Plants sympodial	39
18. Pollinia 4, more or less equal globular, free from each other	Taeniophyllum
18. Pollinia 2, cleft or porate, or combined	19
19. Pollen masses completely divided	20
19. Pollen masses not so	32

20. Spur without callii on back walls	21
20. Spur with ornamentation on back walls	Seidenfadeniella
21. Lip with short spur.....	Diplocentrum
21. Lip saccate or without a spur	22
22. Column-foot distinct.....	23
22. Column-foot absent	30
23. Lip adnate to the column and immovable	24
23. Lip movable	25
24. Flowers creamy with red stripes	Acampe
24. Flowers pure white or white with pink.....	Schoenorchis
25. Hypochile concave, not distinctly spurred or saccate	Cottonia
25. Hypochile spurred or saccate	26
26. Leafless during flowering; operculum with a pair of fine threads	Chiloschista
26. Leafy during flowering; operculum without such threads	27
27. Spur with a longitudinal septum	Cleisostoma
27. Spur without septum	28
28. Spur or sac with callii	29
28. Spur or sac without callii	Pteroceras
29. Stem short, stout	Kingidium
29. Stem elongated	Thrixspermum
30. Lip without auricular callii, not spurred	Cottonia
30. Lip with auricular callii, spurred	31

31. Spur-sac hairy	Smithsonia
31. Spur-sac glabrous	Xenikophyton
32. Inflorescence often branched	33
32. Inflorescence not branched.....	34
33. Column-foot present	Aerides
33. Column-foot absent	Pomatocalpa
34. Leaves terete.....	35
34. Leaves not terete	36
35. Spur or sac present	Papilionanthe
35. Spur or sac absent.....	Luisia
36. Stem condensed	37
36. Stem elongated	38
37. Leaves articulated at base; spur conical	Smithsonia
37. Leaves not articulated at base; spur saccate	Gastrochilus
38. Stipes short, broad	Vanda
38. Stipes linear	39
39. Lip emarginate at apex	Rhynchostylis
39. Lip not emarginate at apex	40
40. Side lobes of lip absent; spur long	Robiquetia
40. Side lobes of lip present, erect; spur short	Trichoglottis
41. Inflorescence terminal, often branched	Polystachya
41. Inflorescence lateral, not branched	Cymbidium

ACAMPE Lindley

Fol. Orch. Fasc. 4: 95. 1853.

Epiphytes. Stems thick, stout, covered with leaf sheaths. Roots long, stout, vermiform. Leaves distichous, lorate or ligulate, coriaceous, 2-lobed at tip. Panicle stoutly peduncled, leaf-opposed or supra-axillary, branched; peduncle with cupular sheaths. Flowers comparatively large. Sepals and petals subequal or petals smaller, thick, barred. Lip spurred or saccate; sidelobes small; midlobe ovate, fleshy; column short, stout; foot 0. Pollinia 2, entire or unequally bipartite, waxy.

The genus with 20 species distributed in tropical Africa, India, Sri Lanka, Malaya, Myanmar to South China and the Philippine Islands. There are 5 species in the Peninsular India of which 3 are present in Kerala.

Key to the species

1. Lip spurred; panicles slender, leaf-opposed; midlobe of the lip with a fleshy tooth on each side of the base **A. ochracea**
1. Lip saccate, panicles axillary; midlobe of the lip entire **2**
2. Leaves 15-30 cm long **A. rigida**
2. Leaves 10-17 cm long **A. praemorsa**

Acampe ochracea (Lindl.) Hochr., Bull. New York Bot. Gard. 6: 270. 1910; Jayaw. in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 2: 227. 1981; Abraham & Vatsala, Intr. Orch. 452. 1981. *Saccolabium ochraceum* Lindl., Bot. Reg. 28: Misc. 2. 1842; Hook. f., Fl. Brit. India 6: 62. 1890.

Epiphytes. Stems 30-75 cm long. Roots vermiform, branched. Leaves 14.5-19.3 x 1.8-2.3 cm, lorate, distichous, keeled, thickly coriaceous, with 2 rounded lobes at apex. Flowers 1 cm across, yellow with red transverse striae across the perianth segments and white lip. Panicles as long as or longer than the leaves; branches green and many-flowered. Floral bracts to 1.2 x 2.6 mm, broadly ovate, mucronate, villous inside. Dorsal sepal 5.6-6 x 2.8-3 mm, obovate-oblong or lanceolate-oblong, obtuse or emarginate, 3-veined. Lateral sepals as long as dorsal sepal. Petals to 5.2 x 2 mm, lanceolate-oblong, obtuse or rounded. Lip to 4.4 x 3.8 mm, saccate and hairy to the base inside. Lateral lobes of the lip short, recurved; midlobe ovate, acute or rounded, undulate. Spur to 3.6 mm long, stout and rounded. Column broad with 2 straight arms at the apex. Anther terminal, 2-loculed. Pollinia 2, globose, unequally partite, attached by a long caudicle. Ovary with pedicel 5.6 mm long. Fruit a fusiform, erect, short pedicelled capsule.

Chrom. No.: n = 19 (Vatsala, 1964).

Fl. & Fr.: Nov.-Feb.

Distr.: Eastern Himalayas, Sikkim, Khasia Hills, Assam, Bhutan, Myanmar, Indo-China and Sri Lanka. Very rare in Kerala.

Note: Seen as epiphytes in Teak Plantations.

Occurrence & Specimens studied: **Pathanamthitta Dist.:** Mookkenpetty, *AESK* 13270; Thekkuthodu, *Anil Kumar* 591 (SNCH); Angamoozhy, *Anil Kumar* 528 (SNCH); Pamba, *Vajravelu* 80584 (MH); Thriveni, *Pandurangan* 12741. **Idukki Dist.:** Adimali, *Gangaprasad* 12221. **Ernakulam Dist.:** Pooyamkutty, *Pandurangan* 79245 (MH). **Kannur Dist.:** Aralam, *Ramachandran* 61919 (MH); Kannothe, *Ramachandran* 65245 (MH).

***Acampe praemorsa* (Roxb.) Blatt. & McCann, J. Bombay Nat. Hist. Soc. 35: 495. 1932; Jayaw. in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 2: 231. 1981; Abraham & Vatsala, Intr. Orch. 450. 1981; Manilal & Sivar., Fl. Calicut 284. 1982; Vajravelu, Fl. Palghat 465. 1990; Mohanan & Henry, Fl. Thiruvananthapuram 446. 1994; Sasi. & Sivar., Flow. Pl. Thrissur For. 433. 1996; Sivar. & P. Mathew, Fl. Nilambur 677. 1997. *Epidendrum praemorsum* Roxb., Pl. Corom. 34, t. 43. 1795. *Vanda wightiana* Lindl. ex Wight, Ic. t. 1670. 1851. *Saccolabium praemorsum* (Roxb.) Hook.f., Fl. Brit. India 6: 62. 1890. *Acampe wightiana* (Wight) Lindl., Fol. Orch. 2:95. 1853; Fischer in Gamble, Fl. Pres. Madras 1447. 1928.**

Epiphytes with simple, non-pseudobulbous stem. Stem 60 cm long, thick, ensheathed on the petiolar leaf bases, bearing long stout roots. Leaves 17-20 x 2.2-2.7 cm, lorate, thickly coriaceous, unequally bilobed at apex, lobes rounded. Flowers 1.4 cm across, yellow barred with red, in stout compact racemes arising from opposite the leaves. Peduncle 6-8 cm long, stout with sterile, scaly cupular bracts. Floral bracts 2 x 4 mm, rounded, brown in colour. Sepals and petals thick, fleshy barred, pink or red on the inside

and spotted outside. Dorsal sepal 10 x 5 mm, oblong, obtuse. Lateral sepals 10 x 5 mm, obovate-oblong, obtuse. Lip 8 x 4 mm, fleshy, saccate, lateral lobes small, blunt; middle lobe thick, ovate, white barred with magenta, obtuse and irregularly dentate. Column short, thick. Anthers terminal, 2-loculed; pollinia 2, globose, unequally bipartite, the larger section 0.7 x 0.8 mm, concave, the smaller section 0.6 x 0.4 mm, wedged into the concavity; pollinia attached by a short caudicle to a slender strap and a small gland. Ovary with pedicel 7-9 mm long. Fruit 6 x 1.2 cm, fusiform, sessile capsule

Chrom. No.: n = 19, 2n = 38 (Vatsala, 1964)

Fl. & Fr.: Mar.-Apr.

Distr.: India and Sri Lanka. Throughout in Kerala.

Note: Common on branches of trees in moist deciduous forests

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Bonaccod, *AESK* 5474; *Ibid.*, N. Mohanan 10330; Peringammala, *AESK* 7368; Chathancode, *AESK* 7290; Pulimath, M. Mohanan 54621 (MH). **Kollam Dist.:** Nadayara, C. N. Mohanann 63794 (MH). **Idukki Dist.:** Neriyaalgalam, *Gangaprasad* 12219. **Alappuzha Dist.:** Cherthala, Swaminathan 88224 (MH). **Ernakulam Dist.:** Iringolekavu, *Sarojini Menon* 20606. **Thrissur Dist.:** Peechi, *Ramamurthy* 47626 (MH). **Palakkad Dist.:** Peringothukavu, *Vajravelu* 44817 (MH); Kalpathy, *Gopalan* 47499 (MH); Karivara, *Vajravelu* 49763 (MH); Walayar, *Joseph* 17022 (MH); *Ibid.*, *Vajravelu* 19042 (MH); Dhoni, *Joseph* 17206 (MH). **Malappuram Dist.:** Nilambur, *Philip Mathew* 25796 (CALI). **Kannur Dist.:** Cheruvathur, *Ansari* 70993 (MH).

Acampe rigida (Buch.-Ham. ex J. E. Smith) Hunt, Kew Bull. 24 (1): 98. 1970; Jayaw. in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 2: 229. 1981. *Aerides rigida* Buch.-Ham. ex J.E. Smith in Rees, Cyclop. 39: *Aerides* n. 12. 1819. *Saccolabium longifolium* Hook. f., Fl. Brit. India 6: 62. 1890.

Epiphytes with very stout, non-pseudobulbous stems. Stems 60-90 cm long. Leaves 15-30 x 3.7 cm, lorate, thickly coriaceous, shortly 2-lobed. Flowers 1.8 cm across, yellow, barred with red, in many-flowered stoutly peduncled panicles. Panicles 15-20 cm long, distantly branched, base with cupular sheaths; branches short. Floral bracts small, annular, rounded. Sepals broadly oblong, obtuse. Petals small, obovate-oblong. Lip saccate. Lateral lobes short; midlobe ovate, obtuse, channelled in the middle. Sac short, rounded with a vertical hairy plate projecting in the hollow portion opposite the column. Column short, stout. Foot 0. Anther terminal, 2-loculed; pollinia 2, globose, deeply bipartite.

Fl. & Fr.: May-June.

Distr.: Sikkim Himalayas, Upper Assam, Myanmar, China, and Philippine Islands. Very rare in Kerala. Reported from Palakkad.

Occurrence & Specimens studied: **Palakkad Dist.**: Kanjikode, Puri 36315 (MH).

AERIDES Lourerio

Fl. Cochinch. 2: 525. 1790.

Epiphytes. Stems fairly long with many thick roots. Leaves flat or terete, coriaceous. Flowers few or many in lax or dense-flowered, leaf-opposed racemes or panicles. Sepals and petals similar, spreading, the lateral sepals decurrent on the column-foot; lip hinged to the end of the column-foot, spurred, 3-lobed. Spur usually bent forwards with calli within; column short with a large foot. Pollinia 2, waxy, globose, cleft, on a rather short and broad or narrow stipe.

About 90 species throughout India, Sri Lanka, Malaya, Myanmar, Thailand, Cambodia, China, Java, Sumatra, Borneo, and Philippine Islands. Eight species are there in India out of which 3 are reported from Kerala.

Key to the species

1. Stem below 10 cm tall; flowers pinkish violet..... **A. maculosa**
1. Stem above 10 cm tall; flowers pink or magenta..... **2**
2. Stem 20-30 cm tall; flowers white tinged with pink **A. crispa**
2. Stem 10-20 cm tall; flowers white flushed with pink or deep magenta..... **A. ringens**

Aerides crispa Lindl., Gen. Sp. Orch. 239. 1833; Hook.f., Fl. Brit. India 6: 45. 1890; Fischer in Gamble, Fl. Pres. Madras 1442. 1928; Manilal, Fl. Silent Valley 268. 1988; Sivar. & P. Mathew, Fl. Nilambur 678. 1997. *Aerides lindleyana* Wight, Ic. 1677. 1852 (Plate IV-F).

Stout epiphytic herbs. Stems 20-30 cm tall, with persistent leaf base. Leaves 8-12 x 2.5-3 cm, leathery, rigid, linear-oblong, base articulated, bluntly 2-lobed at apex. Inflorescence axillary, branched or unbranched racemes, 20-30 cm long, with 10-12 pinkish white flowers. Bracts small. Sepals 12 x 8 mm, pink, ovate-obtuse. Petals pink with white stripes. Lip 3 cm long, hinged to the foot of the column, 3-lobed; sidelobes larger than midlobe; midlobe triangular, crenulate, deep pink with finely crenulate margin and two calli on the disc. Spur curved, 1 cm long. Column short.

Chrom. No.: $n = 19$ (Chardard, 1963).

Fl. & Fr.: May-June.

Distr.: Endemic to Western Ghats.

Note: Semi evergreen and evergreen forests.

Occurrence & Specimens studied: **Idukki Dist.**: Kundaley, AESK 7582. **Palakkad Dist.**: Aruvanpara, Sathish Kumar 10589 (CALI). **Malapuram Dist.**: Nadugani, Philip Mathew 33277. **Kannur Dist.**: Panathur, Ansari 67910 (MH).



Plate IV. A. *Luisia birchea* (A. Rich.) Bl.; B. *Luisia evangelinae* Blatt. et McCann; C. *Luisia zeylanica* Lindl.; E. *Dendrobium jerdonianum* Wight; F. *Aerides crispa* Lindl.

Aerides maculosa Lindl., Bot. Reg. t. 58. 1845; Hook.f., Fl. Brit. India 6: 45. 1890; Fischer in Gamble, Fl. Pres. Madras 1442. 1928; Abraham & Vatsala, Intr. Orch. 444. 1981; Manilal, Fl. Silent Valley 268. 1988; Vajravelu, Fl. Palghat 466. 1990. *Saccolobium speciosum* Wight, Ic. t. 1674-75. 1851.

Stout, epiphytic, woody herbs. Stems 5-6 cm long. Leaves 12-15 x 1-5 cm, dark green, spotted with purple, linear-oblong, channelled, coriaceous. Inflorescence paniced racemes, longer than the leaves. Flowers 2 cm across, deep pink, fragrant. Sepals 1 x 1 cm, obovate, mottled. Petals 1 x 0.5 cm, narrow. Lip large, 3-lobed quadrate-oblong; sidelobes small, rounded; midlobe retuse; margin crenulate. Spur strongly inflexed.

Chrom. No. 2n = 38 (Jones, 1967)

Fl. & Fr.: June-July.

Distr.: Endemic to South India.

Note: Semi ever-green forest in lower elevations.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.**: Ponmudi, Aesk 7258; Agastyamala, Aesk 7333. **Idukki Dist.**: Near Idukki Reservoir, Pandurangan 79228 (MH). **Palakkad Dist.**: Sispara, Sathish Kumar 11209 (CALI); Attapady, Vajravelu 32198 (MH); Walayar, Joseph 17896 (MH).

Aerides ringens (Lindl.) Fischer, Kew Bull. 1928: 284. 1928 & in Gamble, Fl. Pres. Madras 1442. 1928; Jayaw. In Dassan. & Fosb., Rev. Handb. Fl. Ceylon 2: 205. 1981; Abraham & Vatsala, Intr. Orch. 446. 1981; Ramachandran & Nair, Fl.

Cannanore 447. 1988; Manilal, Fl. Silent Valley 269. 1988; Mohanan & Henry, Fl. Thiruvananthapuram 446. 1994; Sasi. & Sivar., Flow. Pl. Thrissur For. 433. 1996; Sivar. & P. Mathew, Fl. Nilambur 679. 1997. *Saccolabium ringes* Lindl., Gen. Sp. Orch. 221. 1833; Wight, Ic. t. 917. 1845; *Aerides radicosum* A. Rich., Ann. Sci. Nat. Bot. 11. 15: 65. 1841; *Saccolabium rubrum* Wight, Ic. 1674. 1852. *Aerides lineare* Hook. f., Fl. Brit. India 6: 47. 1890.

Epiphytic with a short, stout stem. Roots vermiform, branched. Leaves 17-18 x 1.4 cm; loriform and twisted, coriaceous, keeled, unequally 2-lobed at apex, base closely imbricating. Flowers 20 x 7.5 mm, whitish-pink, in long, spreading racemes. Peduncle 12 cm long, erect; pedicel decurved. Floral bracts 5 x 6 mm, triangular, acute, margin at apex irregularly serrate. Sepals and petals adnate to the long foot of the column by their bases. Dorsal sepal 7 x 3 mm, oblong or oval, subacute; 5-veined. Lateral sepals as long as but broader than dorsal sepals, broadly ovate or orbicular. Petals 6 x 4.8 mm, obovate, subacute, 3-veined. Lip as long as the sepals, sessile on the foot of the column, 3-lobed. Lateral lobes small, rounded, broadening at the mouth of a large subclavate spur; midlobe oblong-ovate, flat, rounded. Column 4.8 mm high. Foot with a long, broad, deep channel leading into the sac with fleshy sides; Rostellum shortly beaked. Anther terminal, 2-loculed. Pollinia 2, globose. Ovary with pedicel 1.3 cm long.

Chrom. No.: $n = 19$ (Vatsala, 1964).

Fl. & Fr.: Jun.-Nov..

Distr.: South India and Sri Lanka. Throughout in Kerala.

Note: Epiphytic on tree branches in the deciduous forests at low elevations. Much variations are noted in this species in the habit and flower colour. Abraham and Vatsala (1981) identified 3 varieties under this species.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Palode, *AESK 7450*; Chembikunnu, *AESK 5441*; Chathancode, *AESK 7229*; Pongalappara, *AESK 5209*; Bonaccord, *AESK 2636*. **Pathanamthitta Dist.:** Ranni, *C. N. Mohanan 65097 (MH)*; Pamba, *Deb 30453 (MH)*. **Idukki Dist.:** Kuttikanum, *Vivekananthan 21404 (MH)*; Umaiyamala, *Shetty 27301 (MH)*; Thekkady, *Fischer 3756 (CAL)*. **Thrissur Dist.:** Chalakudy, *Ramamurthy 48528 (MH)*. **Palakkad Dist.:** Sispara, *Sathish Kumar 11209 (CALI)*; Sithargundi, *AESK 15770*; Thuthumpara, *AESK 15771*. **Malppuram Dist.:** Kanjirakadavu, *Philip Mathew 25797 (CALI)*; Vadapuram, *Philip Mathew 33290 (CALI)*.

BULBOPHYLLUM Thouars

Orch. Illes. Fr. Tt. 92-97. 1882.

Epiphytes with creeping rootstock and globose or subglobose ovoid or ovoid-oblong pseudobulbs. Leaves one on each pseudobulb, coriaceous, oblong, oval or lanceolate, petiolate. Flowers very small or large, 1-many in spicate, shortly racemed or umbelled, 2-8-flowered scapes, arising at the base of the pseudobulbs. Sepals subequal or the dorsal about half as long as lateral sepals, 5-veined. Lateral sepals adnate to the foot of the column forming a short mentum. Petals much smaller, ovate or lanceolate. Lip tongue-shaped hinged to the end of the column foot, coriaceous or fleshy, strongly

recurved. Column short, its base produced into a long upcurved foot, winged or toothed at the top. Anther terminal, 2-chambered; pollinia 4, collateral, cohering in pairs, ovoid or oblong; the two inner pollinia smaller.

About 1000 species distributed in tropical America and Africa, India, Sri Lanka and New Zealand. In India the genus is represented by 97 species, out of which 35 are endemic (Sathish Kumar & Manilal, 1994).

Key to the species

1. Plants with well developed pseudobulbs..... 2
1. Plants without pseudobulbs..... **B. xylophyllum**
2. Inflorescence racemose 3
2. Inflorescence umbellate or sub-umbellate..... 6
3. Lip fringed with long acicular hairs **B. tremulum**
3. Lip without hairs 4
4. Inflorescence longer than leaves **B. fusco-purpureum**
4. Inflorescence shorter than leaves..... 5
5. Basal portion of the lateral sepals free, tip cohering **B. careyanum**
5. Basal portion united with the column-foot, tip free **B. sterile**
6. Inflorescence 1-2-flowered **B. aureum**
6. Inflorescence many-flowered 7

- 7. Leaves 2-per pseudobulb; leafless when flowering; dorsal sepals and petals fimbriate on the margins **B. fimbriatum**
- 7. Leaf 1-per pseudobulb; leafy when flowering; dorsal sepals and petals without fimbriate **8**
- 8. Petals with a short setae on the margin **B. acutiflorum**
- 8. Petals without setae **9**
- 9. Lateral sepals not connecting at their base **10**
- 9. Lateral sepals connecting along the margins, including the base..... **11**
- 10. Lateral sepals linear-lanceolate, densely papillose towards the base.....
..... **B. elegantulum**
- 10. Lateral sepals long-subulate, not densely papillose towards the base.....
..... **B. keralensis**
- 11. Lip up to 1.5 mm long, recurved with a longitudinal furrow..... **B. silentvalliensis**
- 11. Lip up to 1.8 mm long, recurved without a longitudinal furrow..... **B. josephii**

Bulbophyllum acutiflorum A. Reichb., Ann. Sci. Nat. 2, 15: 18, t. 7. 1841.

Cirrhopetalum acutiflorum (A. Reichb.) Hook. f., Fl. Brit. India 5: 779. 1890;

Fischer in Gamble, Fl. Pres. Madras 1421. 1928.

Pseudobulbous epiphytic herbs. Pseudobulbs 2-2.5 cm long, globosely ovoid. Leaves 2.5-4 cm long, oblong, obtuse or emarginated. Scape slender, as long as the leaves, 6-8-flowered. Bracts 0.6 cm long, lanceolate. Pedicels longer, slender. Flowers greenish white or creamy. Lateral sepals 1.2 cm long, linear-lanceolate, acuminate, 7-

nerved. Dorsal sepals small, falcately ovate-lanceolate, acuminate, 5-nerved. Petals broadly oblong, 3-nerved, tip rounded. Lip with uncinately recurved basal lobes. Columnar teeth minute.

Fl. & Fr.: May-Jun.

Distr.: Nilgiri Hills, Karnataka, Tamil Nadu, Kerala.

Occurrence & Specimen studied: “**Travancore**”, Periacanal, Barnes 1690 (K).

Bulbophyllum aureum (Hook. f.) Smith, Bull. Bot. Buitz. (Z.S) 8: 22. 1912; Abraham & Vatsala, Intr. Orch. 338. 1981; Manilal, Fl. Silent Valley 270. 1988; Sasi. & Sivar., Flow. Pl. Thrissur. For. 435. 1996. *Cirrhopetalum aureum* Hook. f., Fl. Brit. India 5: 777. 1890; Fischer in Gamble, Fl. Pres. Madras 1420. 1928. **(Plate V-F)**

Epiphytic or lithophytic pseudobulbous herbs. Pseudobulbs 1.5 cm long, ovoid or globose, wrinkled. Leaves 2.5-3 cm long, linear-oblong, thick and coriaceous. Scape 4-6 cm, slender with 2 flowers. Flowers golden yellow, 2.5 cm long, 1 cm across; pedicel slender, long. Lateral sepals oblong, to 2.5 cm long, twisted at apex. Dorsal sepal ovate-acute, 8 x 5 mm. Petals oblong spathulate, 0.7 cm long. Lip 0.5 cm long, auricled at base. Column winged.

Fl. & Fr.: Nov.-Dec.

Note: In evergreen forests above 600 m.



Plate V. A. *Dendrobium aqueum* Lindl.; B. *Bulbophyllum fimbriatum* (Lindl.) Reichb. f.; C. *Bulbophyllum sterile* (Lamk.) Suresh; D. *Pholidota imbricata* W.J. Hook.; E. *Smithsonia maculata* (Dalz.) Saldanha; F. *Bulbophyllum aureum* (Hook. f.) Smith.

Distr.: Endemic to Southern Western Ghats. In Kerala it is reported from Thrissur, Palakkad, Wayanad and Thiruvananthapuram Districts.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.**: Agastyamala, *AESK* 5436. **Idukki Dist.**: Adimaly, *AESK* 7336. **Thrissur Dist.**: Sholayar, *Sasidharan* 5534 (KFRI). **Palakkad Dist.**: Silent Valley, *Sathish Kumar* 10780 (CALI). **Wayanad Dist.**: Chandanathodu, *AESK* 23311.

Bulbophyllum careyanum (Hook.) Spreng., *Syst.* 3: 732. 1826. Hook. f., *Fl. Brit. India* 5: 760. 1890. *Anisopetalum careyanum* Hook., *Exot. Fl.* 2: pl.149. 1825. (**Fig. 7**)

Rhizomatous, pseudobulbous epiphytes. Pseudobulbs 3.8 x 3.2 cm, erect, ovoid, ribbed. Leaves 12-25 x 2-4 cm, oblong, tapering to both ends, subsessile, apex sub-acute, notched. Scape about the length of pseudobulb, stout, brown, clothed with many lanceolate bracts. Racemes 5-8 cm long, densely flowered. Floral bracts lanceolate, longer than the ovary. Flowers 0.6-0.7 cm, imbricate, dark brown, shining. Lateral sepals oblong-ovate, acute, cohering by their tip but free at the base. Dorsal sepals small, oblong, acute, quite free from the laterals. Petals smaller than sepals, fleshy, narrowly triangular, caudate-acuminate at apex and with a few projecting bristles like teeth on the edges. Lip longer than the petals, oblong, with a broad base and two short falcate side lobes or auricles obscurely erose at the apices. Column stout, with two short, broad apical teeth and a short curved foot. Pollinia obovoid.

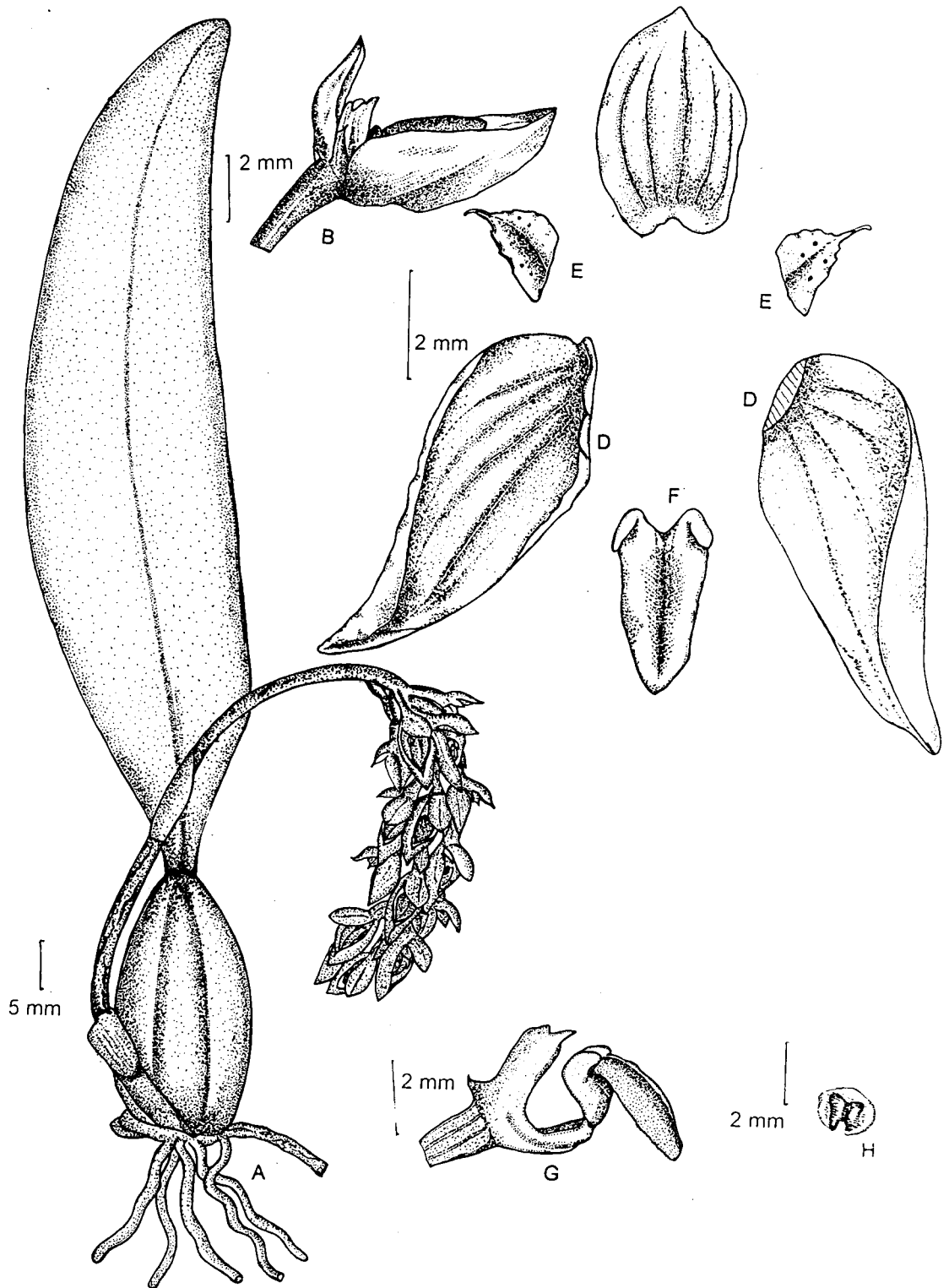


Fig. 7. *Bulbophyllum careyanum* (Hook.) Spreng.: A. Habit; B. Flower; C. Dorsal sepal; D. Lateral sepals; E. Petals; F. Lip; G. Column with lip; H. Operculum.

Fl.: Nov.

NB 2965

TH

580

SHA/T

Distr.: Western Himalayas and China.

Notes: This species so far known only from Western Himalayas and China. Hence, the present collection from Kerala forms a new distributional record for South India.

Occurrence & Specimens studied: **Ernakulam Dist.:** Pooyamkutty, AESK 15709. **Idukki**

Dist.: Walara, AESK 42128; Vazhathoppu, AESK 25444.

Bulbophyllum elegantulum (Rolfe) J.J. Sm., Bull. Jard. Bot. Buitenz. 3,8: 23. 1912.

Cirrhopetalum elegantulum Rolfe, Gard. Chron. ser. 3, 3: 552. 1891; Fischer in Gamble, Fl. Pres. Madras 1421. 1928. (Fig. 8).

Epiphytic herbs with creeping stem and pseudobulbs at intervals. Pseudobulbs 10-15 mm long, 3-9 mm broad, ovoid, corrugated. Leaves 3.5-9 x 0.7-1.1 cm, linear-oblong, sessile, narrow at base, obtuse or emarginated. Inflorescence an umbel. Scape 3.7-6 cm long, slender, produced from the base of the pseudobulbs. Flowers up to 6 in an umbel, pale yellow, with maroon stripes. Bracts 3.5 x 10 mm, lanceolate, acute. Lateral sepals 10-13 mm long, 3-4 mm broad, linear-lanceolate, oblique at base, acute at tip, cohering along the margins, free below except towards the gibbous base, densely papillose towards base on outer surface, 5-nerved. Dorsal sepals 5.5-7 x 2-3.2 mm, oblong-ovate, obtuse, 5-nerved. Lateral petals 3.5-4 x 2 mm, oblong, obtuse, 3-nerved. Lip 2 x 1 mm, attached to the foot of the column, flat incurved. Ovary with pedicel 6.5 mm long.



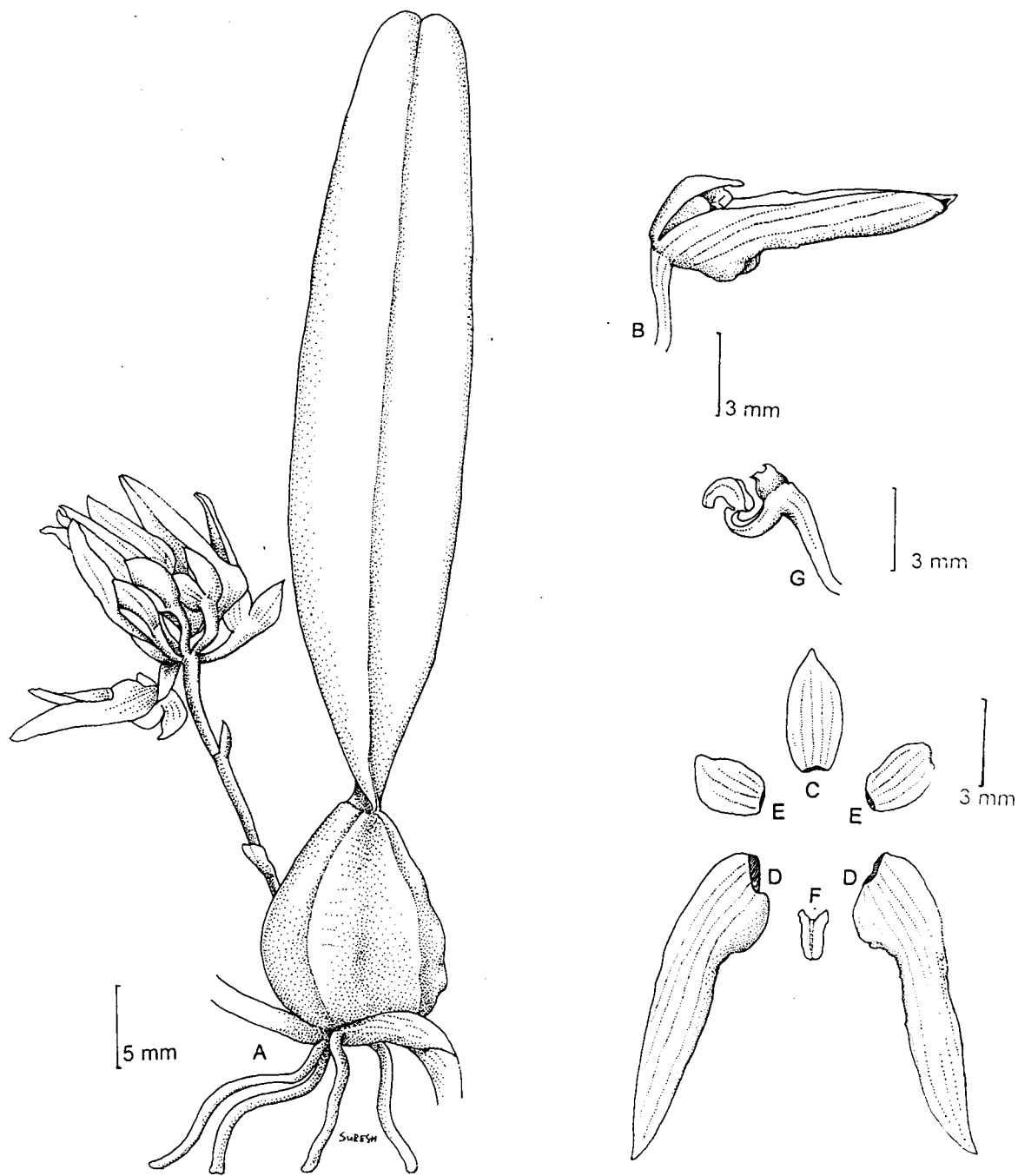


Fig. 8. *Bulbophyllum elegantulum* (Rolfe) J. J. Sm.: A. Habit; B. Flower – side view; C. Dorsal sepal; D. Lateral sepals; F. Petals; G. Lip; H. Column with lip.

Fl. & Fr.: Aug.

Distr.: Peninsular India. In Kerala it is reported from Wayanad.

Note: Epiphytic on Shola forests.

Occurrence & Specimens studied : **Wayanad Dist.**: Pakshipathalam, *Sathish Kumar* 1601; *Ibid.*, AESK 17344.

Bulbophyllum fimbriatum (Lindl.) Reichb. f., Walp. Ann. 6: 260. 1861; Abraham & Vatsala, Intr. Orch. 336. 1981. *Cirrhopetalum fimbriatum* Lindl., Bot. Reg. Misc. 72. 1839; Wight, Ic. t. 1655. 1851; Hook.f., Fl. Brit. India 5: 774. 1888; Fischer in Gamble, Fl. Pres. Madras 3: 1420. 1928; Ramachandran & Nair, Fl. Cannanore 449. 1998. **(Plate V-B)**

Epiphytic, pseudobulbous herbs. Rhizome slender. Pseudobulbs 1 cm tall, 1.5 cm across, lemon yellow in colour, four-angled, shiny, crowded on the rhizome. Leaves membranous, 3-4 cm long, oblong-lanceolate, acute, falling before flowering. Scape 10-12 cm long, slender, producing 8-12 flowers. Flowers 2 cm long, lemon yellow; lateral sepals linear-acute, flat coherent, 5-nerved, longer than the dorsal sepal; dorsal sepal triangular-ovate, long red-ciliate. Petals same as dorsal sepal. Lip deep purplish with a yellow center, 0.5 cm long, fleshy columnar arms long, horizontal.

Fl. & Fr.: Feb.-Mar.

Distr.: Endemic to South India. Reported from Kannur and Wayanad districts of Kerala.

Note: Epiphytic on the exposed tree trunks. Semi evergreen forests.

Occurrence & Specimens studied: **Idukki Dist.:** Peerumedu, AESK 15674; *Ibid.*, William D'cruz 12295; Pambanar, AESK 42113. **Wayanad Dist.:** Thirunelly, AESK 44230.

Bulbophyllum fusco-purpureum Wight, Ic. 5 (1): 6, t. 1651. 1852; Hook.f., Fl. Brit.

India 5: 760. 1890; Fischer in Gamble, Fl. Pres. Madras 1418. 1928; Abraham & Vatsala, Intr. Orch. 334. 1981.

Creeping slender herbs with pseudobulbs at intervals. Pseudobulbs ovoid-conical, 3 x 2 cm. Leaves 5-19 x 1.9-4 cm, oblong, narrowed into a short petiole, obtuse-emarginate. Scape 12-15 cm long, arising from the apex of the flesh of shoots, more or less drooping. Flowers few, large, dark purplish. Bracts 16 x 7 mm, ovate, acute, concave. Lateral sepal 16 x 7 mm, obliquely lanceolate, acute, keeled. Dorsal sepal 14 x 6 mm, oblong, concave, acute, shortly, acuminate. Lateral petals 9 x 3 mm, triangular-ovate, long awned at tip. Lip 13 x 8 mm, oblong, thick; side lobes minute, tooth like; midlobe, thick, 2-ridged, reflexed, mucronate at tip. Ovary with pedicel 4 mm long.

Fl.: Feb.-Mar.

Distr.: Endemic to South India.

Note: Epiphytic on tree trunks near stream sides. This is the largest *Bulbophyllum* in South India.

Occurrence & Specimens studied: **Idukki Dist.:** Guderale, AESK 43128; *Ibid.*, Gangaprasad 12258.

Bulbophyllum josephi Muktesh & Stephen, J. Bombay Nat. Hist. Soc. 98(1): 89. 2001.

Epiphytic, pseudobulbous, creeping herbs; pseudobulbs 1-1.3 x 0.6-1 cm, ovoid. Leaves solitary at the tip of the pseudobulb; lamina 3.7-4.1 x 0.8-1.2 cm, elliptic, emarginate, grooved along midrib, coriaceous. Inflorescence umbel or sub-umbel, peduncle up to 5 cm with 1 or 2 sterile bracts; floral bracts minute, 3 mm long, ovate, acuminate; flowers yellow with violet specks, 10 x 3.5 cm, pedicel up to 6 mm long; sepals dissimilar; dorsal sepal 4.5 mm long, 1.5 mm broad; ovate-lanceolate, acuminate, induplicate, scattered papillate at the base, 5-veined; lateral sepals 9.5-10 x 3 mm, oblong-lanceolate, acute, papillate; connate at upper edges; 5-veined; petals 3 x 1.6 mm, oblong-ovate, slightly falcate, apex apiculate, 3-veined, speckled with violet; lip tongue-shaped, 2.8 mm long, recurved, attached to the column-foot; column 1.5 x 1.5 mm, orbicular ovate. Stelidia 0.7 mm long, anther terminal; pollinia 0.3 x 0.1 mm; operculum ovate orbicular; 0.5 x 0.4 mm.

Fl. & Fr.: Aug.-Sept.

Distr.: So far known only from Kerala.

Note: Epiphytic on tree trunks in evergreen forests at 900-1000 m.

Occurrence & Specimen studied: **Palakkad Dist.:** Silent Valley, Punnamala, Stephen 7521 (KFRI).

Bulbophyllum keralensis Muktesh & Stephen, J. Bombay Nat. Hist. Soc. 98(1): 87.
2001.

Epiphytic, pseudobulbous, creeping herbs; pseudobulbs 1.2-2 x 0.5-0.7 cm, ovoid, angled. Leaves petiolate, solitary, at the top of pseudobulb; lamina 1.8-6 x 0.8-2 cm, elliptic, emarginate, grooved along midrib, coriaceous. Inflorescence umbel or sub-umbel, peduncle 10-12 cm, with 3 linear sterile bracts; floral bracts 4-6 x 1-1.2 mm, ovate, acuminate; flowers 4-7, golden yellow with purple tinge, 28-32 x 5-7 mm, sepals dissimilar, dorsal sepals 7-9 mm long, 3.2-3.4 mm at the broadest point, ovate-lanceolate, acuminate, induplicate, papillate at the base, 5-veined; lateral sepals 27-30 x 2.3-2.6 mm, parallel, linear-ovate, subulate, 5-veined, free, induplicate, papillate; petals 4-6 x 2-3 mm, elliptic, slightly falcate, 3-veined, cuspidate, entire, slightly papillate; lip 4.6 x 1.2 mm, recurved, tongue-shaped, obtuse, pouched, attached to the column-foot; column 2.8 x 2 mm, broadly ovate. Stelidia minute, 0.2 mm long, anther terminal; pollinia 4 in pairs, 0.4 x 0.25 mm, oval shaped; operculum 1 x 0.75 mm, broadly obovate.

Fl. & Fr.: Aug.-Sept.

Distr.: So far known only from Kerala-Silent Valley National Park (Palakkad Dist.) and Wayanad.

Occurrence & Specimens studied: **Palakkad Dist.:** Silent Valley, Sispara, *Stephen* 7857 (KFRI). **Wayanad Dist.:** Pakshipadalam, 1,200 m, *Stephen & Michael* 8140 (KFRI.)

Bulbophyllum silent-valliensis Sharma *et* Srivastava, J. Jap. Bot. 68: 209-210. 1993;
Sath. Kumar & Manilal, Cat. Ind.Orchids 66. 1994.

Epiphytic herbs with creeping rhizome and pseudobulbs. Pseudobulbs 2-2.5 cm across, ovoid. Leaves 1.5-2.2 x 0.7-1 cm, linear-oblong, obtuse, notched at the tip, sessile or sub sessile. Scape exceeding the leaves, slender, 3.5-4.5 cm long, with 2-3 tubular sheaths. Flowers 2-3, yellow; bracts 1.5 mm long, lanceolate, acuminate, membranous. Ovary with pedicel ca. 4.5 m long. Dorsal sepal 3.7 x 1.5 mm, ovate, entire, 5-nerved. Lateral sepals 7.2 x 1.2 mm, connate at the margin along their whole length, except towards gibbous base, 5-nerved, glabrous on other surface. Lateral petals 2.6 x 1.7 mm, broad, ovate, obtuse at apex, entire, 5-nerved, lip 1.5 mm long, attached to the foot of the column, curved with deep longitudinal furrows. Column 1 mm long, foot of the column turning upwards at one end. Column with short vertical acute stelidia.

Fl.: Mar.-Apr.

Distr.: Endemic to Kerala. So far reported from Silent Valley, Palakkad District only.

Note: This species could not be collected during the study. Description given is taken from the original publication.

Bulbophyllum sterile (Lam.) Suresh in Nicolson *et al.*, Interpr. Rheede's Hort. Malab. 298. 1988. *Epidendrum sterile* Lam., Encycl. Meth. Bot. 1: 189. 1783. *Bulbophyllum neilgherrense* Wight, Ic. 5(1): 6. t. 1650. 1852; Hook.f., Fl. Brit. India 5: 761. 1890; Fischer in Gamble, Fl. Pres. Madras 3: 1418. 1928; Abraham & Vatsala, Intr. Orch.

334. 1981; Manilal & Sivar., Fl. Calicut 284. 1982; Ramachandran & Nair, Fl. Cannanore 447. 1988; Manilal, Fl. Silent Valley 271. 1988; Vajravelu, Fl. Palghat 468. 1990; Sasi. & Sivar., Flow. Pl. Thrissur For. 435. 1996; Sivar. & P. Mathew, Fl. Nilambur 680. 1997. (**Plate V-C**)

Creeping epiphytes with pseudobulbs. Pseudobulbs conical-ovoid, 1.5-1.5 cm long, 1-3 cm broad, smooth, 4-angled. Leaves with lamina tapering at base into a short petiole, 10-15 cm long, 2-3 cm broad, oblong-elliptic, obtuse-emarginate. Inflorescence racemose, 5-8.5 cm long, more or less drooping, arising from the base of the pseudobulb. Flowers many, dull yellow. Bracts small, 3 x 1.2 mm, oblong-lanceolate, shortly acute-acuminate, membranous. Dorsal sepal 4 x 2.5 mm, ovate, concave, obtuse, with or without a mucro at tip. Lateral sepals 6-6.5 x 3 mm, much larger than dorsal sepal, acute, attached to the foot of the column along the sides and united along the lower margins to form a cymbiform structure. Lateral petals 2.5 x 1.2 mm, ovate-triangular, awned. Lip 3 mm long, tongue-shaped, geniculate about the middle; side lobes narrow, acute; midlobe ovate-lanceolate, grooved dorsally. Column produced above into 2 teeth.

Chrom. No.: n=19 (Vatsala, 1964).

Fl. & Fr.: Jan.-Feb.

Distr.: Endemic to South India. Throughout Kerala.

Note: Seen in plains as well as higher elevations up to 900 m. This species shows a lot of variations in the size and flower colour.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Palode, *AESK* 5434; Bonaccord, *AESK* 7202. **Kollam Dist.:** Aryankavu, *C.N. Mohanan* 59528 (MH). **Pathanmthitta Dist.:** Mookkenpetty, *AESK* 13026. **Idukki Dist.:** Adimaly, *AESK* 12803; Walara, *AESK* 12804; Vallakadavu, *B.D.Sharma* 43802 (MH). **Palakkad Dist.:** Karivara, *Bhargavan* 55692 (MH); *Ibid.*, *Vajravelu* 33296 (MH); Pottickal forest, *Vajravelu* 44875 (MH). **Malappuram Dist.:** Nilambur, *AESK* 5435. **Kannur Dist.:** Kakkangad, *Ramachandran* 61950 (MH); Chembukavu, *V. J. Nair* 59331 (MH); Panathur, *V. J. Nair* 59952; *Ibid.*, *Ramachandran* 59274 (MH); *Ibid.*, *Ansari* 70044 (MH).

Bulbophyllum tremulum Wight, *Ic. 5(1): 20, t. 1749. 1852; Hook.f., Fl. Brit. India 5: 763. 1890; Fischer in Gamble, Fl. Pres. Madras 3: 1418. 1928; Abraham & Vatsala, Intr. Orch. 331. 1981; Ramachandran & Nair, Fl. Cannanore 448. 1988; Manilal, Fl. Silent Valley 271. 1988; Vajravelu, Fl. Palghat 469. 1990; Mohanan & Henry, Fl. Thiruvananthapuram 450. 1994; Sasi.& Sivar., Flow. Pl. Thrissur For. 436. 1996.*

Creeping herbs with slender rhizome. Pseudobulbs at intervals, 0.7-1.5 cm long, 0.8-1.7 cm across, ovoid-conical. Leaves sessile, 3-4 x 0.75-1 cm, oblong-lanceolate, obtuse at apex. Inflorescence racemes, much longer than the leaves, lax-flowered; scape erect, slender, terete with a few sterile bracts. Flowers large, yellowish with purple marks and purple lip. Bracts minute, 2 x 1.2 mm, erect, ovate, acute, persistent. Ovary with pedicel 8 mm long. Sepals longer than the ovary and reflexed over it, narrowly lanceolate, acute, 3-veined, sparsely villous on the adaxial side and along the margin. Dorsal sepal 12 x 2 mm. Lateral sepals 12 x 3.5 mm. Lateral sepals 3 x 1 mm, lanceolate,

acute, projecting forward on either side of the column, fringed with hairs. Lip ligulate, sagittate at base, 8 x 2 mm, with acicular hairs on the lower surface, tremulous, loosely attached to the foot of the column by a short, narrow stipe. Fruits ellipsoid with accrescent perianth.

Chrom. No.: n = 19 (Vatsala, 1964).

Fl. & Fr.: Nov.-Dec.

Distr.: Endemic to South India. Throughout Kerala.

Note: Moist shady places.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.**: Ponmudi, *AESK* 5449, 7237, 7254; Bonaccord, *AESK* 23337; Agastyamala, *AESK* 5438; Uthipanchi, *AESK* 7504; Athrumala, *AESK* 7331. **Idukki Dist.**: Walara, *AESK* 42129; Vallakadavu, *AESK* 37699. **Palakkad Dist.**: Nelliampathy, *Vajravelu* 60414 (CAL).

Bulbophyllum xylophyllum Par. & Reichb. f., *Trans. Linn. Soc.* 30: 151. 1874; Hook. f., *Fl. Brit. India* 5: 766. 1890. *Bulbophyllum gracilipes* King & Pantl., *J. Asiat. Soc. Bengal* 65: 119. 1896. *B. agastyamalayanum* Gopalan & Henry, *J. Bombay. Nat. Hist. Soc.* 90 (1): 78. 1993.

Herbs, epiphytic; rhizome woody, cream-coloured, with fibrous scales at nodes; internodes c. 5 mm long; roots slender, fibrous; pseudobulbs minute, very difficult to distinguish, up to 2 mm, green, naked, oblique, flat. Leaves 2.3-9.5 x 1.0-2.2 cm, solitary. 1.5 cm apart, thick, fleshy, elliptic, connate at base, obtuse at apex, faintly 1-nerved;

petals up to 2 mm long; fleshy grooved adaxially. Flowers pink, 6-12 in umbels, up to 6 cm long, filiform, arising on rhizome is between leaves; bracts 1-2 x 1 mm, equal to or slightly longer than ovary, truncate-lanceolate, acuminate; margin setaceous or papillate. Dorsal sepal 2.5-3 x 1.5 mm oblong, elliptic, concave, base thick; margin entire and incurved, obtuse at apex, lobes 3-nerved; lateral sepals 2.5-3 x 1-2 mm obliquely falcate; base oblique, attached to foot of column, margin entire, apex obtuse, 3-nerved. Petals narrow, 2-2.5 x 1 mm, obliquely elliptic; base thick; margin entire acute of apex, 1-veined, nerves raised dorsally. Lip 2 x 2 mm, yellow, ovate, convex, thick, deflexed, deeply grooved, attached to mentum, 3-lobed; lateral lobes two, very small or minute, erect; midlobe ovate, rounded, thick, fleshy, deflexed, obtuse at apex, grooved from the base to middle. Column short, up to 1 mm long; stolidium up to 1 mm long, falcate. Pollinia two, yellow, small, obovate. Ovary 1-2 mm, glabrous. Fruit globose 8-10 x 5.7 mm, 6-ribbed.

Fl. & Fr.: Nov.-Jan.

Distr.: Eastern Himalaya, North-East India and South India.

Note: Gopalan and Henry (1993) published a new species of *Bulbophyllum* viz., *B. agastyamalayanum* based on collections from Poonkulam in Kanyakumari district. Later Sasidharan *et al.* (1997) found that this species is conspecific to *B. xylophyllum*.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Chemunji, Santhosh Kumar 17398. **Idukki Dist.:** Pachakanam, AESK 42109.

CHILOSCHISTA Lindley

Bot. Reg. 18: ad. t. 1522. 1832.

Epiphytes. Stems reduced. Roots long, flattened, spreading and compressed. Leaves absent at the time of flowering, otherwise 2 or more, linear-lanceolate, channelled. Peduncles erect, pubescent; racemes short, decurved. Petals larger than sepals. Base of the sepals adnate to the long column. Lip sessile, bipartite, crested to the middle articulating with the root of the column, base saccate or conical. Column small-erect, semi-terete or cylindrical. Pollinia 2, gland minute. Fruit sessile, terete, sausage-shaped.

About 13 species distributed in India, Sri Lanka, Java, China and Australia. Four species in India out of which 2 are reported from South India.

Key to the species

1. Inflorescence up to 2 cm; flowers green **C. pusilla**
1. Inflorescence up to 4 cm; flowers creamy yellow **C. lunifera**

Chiloschista lunifera (Reichb. f.) J.J. Sm. ex Holtt., Kew Bull. 14: 273. 1960.

Thrixspermum luniferum Reichb.f., Gard. Chron. 786. 1868. *Sarcochilus luniferus* (Reich. f.) Benth. ex Hook. f. in Curtis, Bot. Mag. 115: 7044. 1899 & Fl. Brit. India 6: 37. 1890. *Chiloschista glandulosa* Blatt. & McCann, J. Bombay Nat. Hist. Soc. 35: 488. 1932.

Small epiphytic herbs. Roots thick, green, 12 cm long, flattened. Stem 0. Leaves appear after flowering. Scape 2-4 cm long, racemose, scape and raceme portion white hirsute. Floral bracts 1.5 x 1.8 mm, ovate, thickly gland dotted, 1-veined obtuse. Ovary with pedicel 6 mm long. Flowers creamy-yellow with a few brown spots. Dorsal sepal 5 x 3 mm, broadly, oblong, 5-veined, gland-dotted. Lateral sepals 3 x 2 mm, broadly oblong, 5-veined, gland-dotted, petals 4 x 1.5 mm, oblong, 5-veined. Lip 2-3 mm long, 3-lobed; sidelobes twice as long as midlobe, oblong, obtuse; midlobe, smaller, short, rounded, emarginate or 2-lobulate; lobules with thick white wool. Column 1 mm long, purple blotched. Operculum broad, obcordate. Pollinia 4 in 2 unequal pairs. Fruits 1 cm long, oblong, capsule.

Fl. & Fr.: Feb.-May

Distr.: Endemic to South West India and Himalaya.

Note: Abraham and Vatsala (1981) confused this species with *C. pusilla* which has uniform green flowers. These two are very distinct species and are reported from Kerala.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Pombudi, Sathish Kumar 3706. **Idukki Dist.:** Chekuthanmala, Kurien 1969 (MH).

Chiloschista pusilla (Retz.) Schl. in Feddes Rep. Beih. 4: 275. 1919; Fischer in Gamble, Fl. Pres. Madras 1441. 1928; Jayaw. in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 2: 188. 1981; Abraham & Vatsala, Intr. Orch. 495. 1981; Mohanan & Henry, Fl. Thiruvananthapuram 451. 1994. *Epidendrum pusillum* Retz., Obs. Bot. 6: 49.

1791. *Chiloschista usneoides* Wight, Ic. 1741. 1851, non Lindl., 1832. *Sarcochilus wightii* Hook. f., Fl. Brit. India 6: 37. 1890.

Small epiphytes, almost stemless and leafless when flowering, with many vermiform, compressed, long, stout roots, adpressed to the bark of the host plant. Leaves 1-3 when in fruit only, 1.3 x 0.6 cm, linear-lanceolate, acute-acuminate, narrowing at the base to a very short petiole. Flowers 7.5 mm across, greenish yellow, in 2-4-flowered, decurved, spikes or racemes. Racemes 3.5 cm high; peduncle 1-2.2 cm long, reddish, pubescent, continuing into a zig-zag, pubescent rachis with 2-3 tubular sterile bracts. Floral bracts 1.8-2.6 x 1.8-2.2 mm, ovate, membranous, acute, 1-veined, pubescent. Sepals and petals 3-veined with tomentose bases. Dorsal sepal 5.7 x 3 mm, oblong, rounded. Lateral sepals 4.8 x 2.4 mm, oblong-oval, obtuse, attached to the foot of the column. Petals 4 x 21.4 mm, oblong, rounded, attached to the column. Lip 3 x 8 mm, transversely oblong, 2-winged, 5-veined. Lateral lobes vertical; midlobe obscure, depressed and the apex bluntly dividing into two base, base shortly saccate, pubescent. Disc pubescent with a thick, glandular 'V'-shaped callus. Column 1 mm high truncate, base continuous into the foot. Anther terminal, 2-loculed. Pollinia 2, 0.3 mm across, globose, sulcate. Ovary with pedicel 2.5 mm long, pubescent. Fruit a capsule.

Fl. & Fr.: Oct.-Dec.

Distr.: South India, Sri Lanka.

Note: Epiphytic on trees in the semi-evergreen and evergreen forests.

Occurrence & Specimens studied: Thiruvananthapuram Dist.: Ponmudi, AESK 5451, 5452; Ibid., Vatsala 89291 (MH); Bonaccord, N. Mohanan 8151. Idukki Dist.: Vallakadavu, AESK 42110.

CIRRHOPETALUM Lindley

Bot. Reg. 10: subt. 852. 1824, *nom cons.*

Rhizomatous epiphytes. Pseudobulbs often angular, one-leaved. Inflorescence erect to arcuately bent, rather slender, terminated by pseudo-umbels, with flowers spread out in a semicircular pattern. Dorsal sepals free, concave to cucullate. Lateral sepals erect or recurved, adnate basally to column-foot, then abruptly twisted once so as to form a concave blade, united through con-jointed outer margins, either forming a circular candy around the lip or a funnel like passage, much larger than the dorsal sepal, mostly hirsute.

Note: Lindley (1824) described the genus *Cirrhopetalum* based on an African species known under the name *Bulbophyllum longiflorum* Thou. Eminent botanists like Meisner (1842), Endlicher (1837), Bentham and Hooker (1830), Hook. f. (1890), Pfitzer (1888) and Schlechter (1914) recognised *Cirrhopetalum* as a good genus. Reichenbach.f. in 1861 raised the difficulty in maintaining *Cirrhopetalum* as distinct from *Bulbophyllum* and he reduced it into a section of *Bulbophyllum*. In 1912 J.J. Smith transferred all the species of *Cirrhopetalum* to *Bulbophyllum*. Garay *et al.* (1994) provided a new generic circumscription to the genus *Cirrhopetalum* Lindl. and transferred a good number of species into it. He segregated the taxa with lateral sepals erect or recurved, adnate basally

to column-foot, then abruptly twisted once so as to form a convex blade, united through conjoined margins either forming a circular cavity around the lip or a passage which help in pollination, and treated them as belonging to *Cirrhopetalum*. In the study area there are two species belonging to this genus.

Key to the species

1. Leaves 4-7.5 cm long; flowers 3-6; lateral sepals puberulous near the base
 **C. gamblei**
1. Leaves 7.5-11.5 cm long; flowers 6-8; lateral sepals glabrous throughout
 **C. neelgherrense**

Cirrhopetalum gamblei Hook. f., Fl. Brit. India 5: 778. 1890; Fischer in Gamble, Fl. Pres. Madras 1420. 1928. *Bulbophyllum gamblei* auct., non Hook. f. 1890: J.J. Sm., Bull. Jard. Bot. Buitenz. 2, 8: 24. 1912, non Hook. f., 1890. *Bulbophyllum fischeri* Seidenf., Dansk Bot. Ark. 29: 202. 1973; Abraham & Vatsala, Intr. Orch. 341. 1981; Manilal, Fl. Silent Valley 271. 1982; Vajravelu, Fl. Palghat 468. 1990; Mohanan & Henry, Fl. Thiruvananthapuram 449. 1994; Sasi. & Sivar., Flow. Pl. Thrissur For. 435. 1996.

Epiphytic as well as lithophytic, pseudobulbous herbs. Pseudobulbs 1.25 cm long, greenish brown, ovoid, crinkled. Leaves 4 x 1.25 cm, linear-oblong, greenish brown, notched at apex. Scape slender, sheathed, longer than leaves, 7 cm long, with an 4-8-flowered umbel. Flowers cream coloured, evenly mottled with purple so that appear as

dull maroon. Pedicel 4 mm long. Dorsal sepal 3.5 mm long, 3-nerved, yellow with purplish-red mottling. Lateral sepals 1.4 cm long, 3-4-nerved. Petals 2.5 mm long, 3-nerved, obtuse at tip. Lip fleshy, curved, dark purple. Column 1.5 mm long. Pollinia 2.

Fl.: Oct.-Nov.

Distr.: Endemic to South India.

Note: Epiphyte or lithophyte on open areas in the higher elevations.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.**: Ponmudi, *AESK 7244*; Pongalappara, *N. Mohanan 10074*. **Kollam Dist.**: Pandimotta, *AESK 25551*. **Pathanamthitta Dist.**: Pamba, *Pandurangan 67779* (MH). **Idukki Dist.**: Deviculam, *Rathakrishnan 16242* (MH); Lockhart Gap, *Sebastine 16508* (MH); Umaiyamala, *Shetty 27324* (MH); Vandamedu, *Vivekananthan 50570* (MH, CAL). **Thrissur Dist.**: Karimala, *Sasidharan 5749* (KFRI). **Palakkad Dist.**: Valiyaparathodu, *Sathish Kumar 10566* (CALI); Ayyappankovil, *Vajravelu 49716* (CAL). **Wayanad Dist.**: Pakshipathalam, *AESK 15655*.

Cirrhopetalum nilgherrense Wight, *Ic. t. 1654. 1852; Hook.f., Fl. Brit. India 5: 778. 1888; Fischer in Gamble, Fl. Pres. Madras 1420. 1928. *Bulbophyllum kaitense* Reichb. f. in Walp, Ann. 6: 262. 1861. Abraham & Vatsala, *Intr. Orch. 338. 1981.**

Rhizomatous, epiphytic herbs with pseudobulbs. Pseudobulbs ovoid, 2-2.5 cm long. Leaves 6-12 x 1.25-2 cm, linear-oblong, obtuse, emarginate, 3-nerved. Scape slender, shorter than leaves, 5-10 cm long. Umbels 6-8-flowered. Flowers greenish-

yellow tinged with pink, marked with dark lines, turning rusty-red on aging. Dorsal sepal ovate acute, 1/3 as long as the lateral, 5-nerved. Lateral sepals 2-2.5 cm long, linear-lanceolate, acuminate, 5-nerved, coherent. Laterals broadly oblong, obtuse, shorter than the dorsal sepal, thickly 3-nerved. Lip short, cordate, ovate, recurved, hairy on the back. Column pubescent within; process of the column, short, erect, red.

Distr.: Endemic to South India. Kerala-Idukki District.

Fl.: Aug.-Sept.

Note: Epiphytic on heavy shaded tree trunks in higher elevations.

Occurrence & Specimens studied : **Idukki Dist.:** Guderale, *AESK* 7453; *Ibid.*, *Gangaprasad*, 12257; Kundalay, *AESK* 7583.

CLEISOSTOMA Blume

Bijdr. 6: t. 3, f. 27; 8: 362. 1825

Epiphytes. Stem short or long, erect or hanging, non-pseudobulbous. Leaves flat or terete, articulate on a short sheath. Inflorescences racemose or paniced, erect or pendulous, leaf-opposed, many-flowered. Flowers small; sepals and petals similar, usually spreading. Lip 3-lobed, spurred, joined to the foot of the column. Spur conical or cylindric, often longitudinally septate. Column short with a short foot. Pollinia 4, united into 2 round bodies; strap very slender, gland small.

Genus with about 168 species distributed over tropical Africa, India, Sri Lanka, Myanmar, Thailand to China and southwards to Java, Sumatra, Borneo, New Guinea, and Philippine Islands.

In India there are 19 species, and only one species is reported from Kerala.

Cleisostoma tenuifolium (L.) Garay, Bot. Mus. Leafl. 23(4): 175. 1972; Sivar. & P. Mathew, Fl. Nilambur 681. 1996. *Epidendrum tenuifolium* L., Sp. Pl. 2: 953. 1753. *Sarcanthus peninsularis* Dalz., Hook. f., Fl. Brit. India 6: 67. 1890; Fischer in Gamble, Fl. Pres. Madras 1447. 1928; Jayaw. in Dassan. & Fosb., Rev. Handb., Fl. Ceylon 2: 273. 1981. *S. pauciflorus* Wight, Ic. 1747. 1851; Abraham & Vatsala, Intr. Orch. 471. 1981.

Hanging epiphytes, non pseudobulbous, stem 10-30 cm long, flexuosus, slightly flattened. Roots vandaceous in the lower part of the stem, arising from the internodes and emerging through the leaf sheaths. Leaves 8-17 x 0.5-0.8 cm, lineal-lanceolate, falcately recurved, dark-green above, and ash-green below, acuminate, keeled, coriaceous; bases sheathing the internodes. Flowers small, 7 mm across, brownish-yellow with a white lip and pink wings, in stout, few-flowered, leaf-opposed racemes. Peduncle 6-10 mm long. Floral bracts 1 x 1.6 mm, minute obtuse. Dorsal sepal 4.8 x 2.7 mm, ovate-oblong, obtuse, concave, 5-veined. Lateral sepals 3.8 x 2.2 mm, obliquely obovate-oblong, obtuse, 3-veined. Petals 3.7 x 2.2 mm; obovate-oblong, rounded, 3-veined. Lip together with the spur 4.6 mm long, 3-lobed. Lateral lobes very short, erect, subacute; midlobes

small; margin incurved. Spur as long as the midlobe, conical, septate to near the mouth. Callus 2-lobed, column 1.4 x 1.8 mm broad, extending to a very short foot. Anther terminal, 2-loculed; pollinia 4. Ovary with pedicel 4.6 mm long. Fruit a deflexed, fusiform capsule, 2 cm long.

Fl. & Fr.: Jun.-Dec.

Distr.: South India, Sri Lanka

Note: In semi-evergreen, and moist deciduous forest.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.**: Palode, *AESK* 13209; *Ibid.*, *Sathish Kumar* 508, 1105; *Umaiya* *AESK* 7373. **Kollam Dist.**: Ranni, *C. N. Mohanan* 63469 (MH); *Perunthenaruvi*, *Chandrabose* 49189 (CAL, MH). **Idukki Dist.**: *Neriamangalam*, *AESK* 18398; *Ibid.*, *Sebastine* 25100 (MH); *Pamba Valley*, *Sharma* 43949 (MH); *Adimaly*, *AESK* 22384. **Pathanamthita Dist.**: *Attathodu*, *AESK* 7242; *Kattathipara*, *AESK* 15629; *Thriveni*, *Sharma* 42478 (MH). **Thrissur Dist.**: *Kannankuzhi*, *Ramamurthy* 48471 (MH). **Wayanad Dist.**: 'Tambracherry', *Barber* 7408 (MH); *Santhigiri* *AESK* 42190. **Kannur Dist.**: *Payyannur*, *Ansari* 70943 (MH); *Panathur*, *V. J. Nair* 59956. "Travancore": *Calder & Ramaswamy* 369 (MH).

COELOGYNE Lindley

Collect. Sub.t. 33. 1822.

Epiphytes or lithophytes with creeping rootstocks, bearing 1 or few-flowered pseudobulbs. Leaves usually 2, coriaceous or membranous and plaited. Flowers few or

many in racemes arising from the base or top of the pseudobulb. Bracts large; sepals subequal, strongly concave; petals narrower than sepals. Lip sessile on the base of the column, 3-lobed. Column long, slender, margined or winged. Foot 0. Anthers 2-chambered. Pollinia 4, pyriform.

More than 150 species extending from India, Sri Lanka to South China and throughout Malaysia. In India the genus is represented by 38 species, most of them are in Himalayas. In Kerala it is represented by 5 species.

Key to the species

1. Flowers all opening at one time. 2
1. Flowers open one by one. 4
2. Lip 2-lamellate..... **C. mossiae**
2. Lip 3-lamellate 3
3. Inflorescence arising from between two well developed leaves
..... **C. odoratissima**
3. Inflorescence arising from new shoots with imbricating scales at base
..... **C. breviscapa**
4. Pseudobulbs corrugate; midlobe of lip triangular-lanceolate acute **C. nervosa**
4. Pseudobulbs not corrugate; midlobe of lip ovate-oblong, or suborbicular rounded
..... **C. glandulosa**

Coelogyne breviscapa Lindl., Fol. Orch. Coelogyne 4. 1854; Hook. f., Fl. Brit. India 5: 833. 1890; Fischer in Gamble, Fl. Pres. Madras 1430. 1928; Jayaw. in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 2: 114. 1981; Abraham & Vatsala, Intr. Orch. 277. 1981; Manilal, Fl. Silent Valley 273. 1988; Vajravelu, Fl. Palghat 470. 1990; Sasi. & Sivar., Flow. Pl. Thrissur For. 436. 1996.

Epiphytes with very stout rootstock, covered with dark brown scales. Pseudobulbs 4-6 cm long, narrowly ovoid. Leaves 7.5-16.5 cm long, 1 or 2, linear-oblong, subacute, coriaceous, keeled. Flowers white with yellow tinged tip, 2-2.5 cm across, in 4-8-flowered racemes arising from the base of the terminal pseudobulb. Peduncles 7.5-10 cm long, slender. Pedicel slender, spreading, or decurved. Bracts 1.7-3 m long, oblong-lanceolate, acute, brown. Dorsal sepal oblong-lanceolate, acute, lateral sepals ovate-oblong. Petals linear-oblong. Lip sessile on the base of the column, erect, as long as sepals, 3-lobed; lateral lobes short, embracing the column; midlobe orbicular-ovate, retuse or apiculate. Disc with two thick ridges. Column long, slender, winged, crenate at the top; foot 0. Anther terminal, 2-loculed; pollinia 4, pyriform. Ovary with pedicel 1.2-1.7 cm long. Fruit a narrowly fusiform, acute-angled capsule.

Fls. & Fr.: Mar.-Apr.

Distr.: Southern Western Ghats and Sri Lanka

Note: Very characteristic species with white flowers and 3-crenate, apically yellowish keels on the disc. In Silent Valley, Munnar and Wayanad this species occurs in large numbers on the whole trunk of the host trees in riverine vegetation.

Occurrence & Specimens studied: **Idukki Dist.:** Pambanar, *AESK 42114*; Kuttikanum, *Vivekananthan 21401* (MH); Edapalayam, *Sharma 41679* (MH); Munnar, *Sathish Kumar 3681*; Meenmutty, *C. N. Mohanan 73284* (MH). **Palakkad Dist.:** Silent Valley, *Vajravelu 26164* (MH); *Ibid.*, *V. J. Nair 67252* (CAL). Thathengalam, *Vajravelu 49792* (MH). **Wayanad Dist.:** North Wayanad, *AESK 15717*; Periya, *AESK 42189*.

Coelogyne glandulosa Lindl., *Fol. Orch. Coelogyne* 6. 1854; Hooker f., *Brit. India* 5: 835. 1890; Fischer in Gamble, *Fl. Pres. Madras* 1430. 1928; Abraham & Vatsala, *Intr. Orch.* 275. 1981; *C. nervosa* Wight, *lc.* 5(1): 5 t. 1638. 1851, *non* A. Rich., 1841.

Epiphytic or lithophytic herbs. Pseudobulbs 3-8 x 1.2-3 cm ovoid, sulcate, curved, crowded or distantly arranged. Leaves 2, each 9-20 x 2.3-4.6 cm; oblong to lanceolate, acute or subacute, with stout, channelled petiole. Scape 13-25 cm long, racemose, 2-8-flowered. Floral bracts 3.5-4 cm long, ovate-lanceolate, cymbiform, coriaceous subacuminate. Flowers white, fragrant. Dorsal sepal 2.2-3 x 0.9-1.3 cm, elliptic oblong, rounded. Lateral sepals equalling dorsal sepal, ovate, oblong, acute. Petals 2.2-2.8 x 1-1.4 cm, elliptic, acute. Lip 1.8-2.2 x 1-1.3 cm, white tinged with yellow or orange in the center, 3-lobed; side lobes, oblong, obtuse; midlobe elliptic or suborbicular, rounded. Disc with 3 entire keels, often glandular towards apex. Column 1.4-1.6 x 0.3-0.4 cm, broadly winged. Pollinia ellipsoid. Fruit 6-angled.

Fl. & Fr.: Feb.-May.

Distr.: Endemic to Kerala and Tamil Nadu.

Note: Epiphytic on trees in higher elevations (between 1800 and 2350 m).

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Agastyarmala, *Barber* 2896 (MH); Pongalappara, *Gangaprasad* 15146. **Idukki Dist.:** Anamudi slopes, *Shetty* 27361 (MH); Western Slopes of Eravikulam, *Bharghavan* 87340 (MH). **Palakkad Dist.:** Silent Valley, *Sathish Kumar* 10512 (CALI).

Coelogyne mossiae Rolfe, *Kew Bull.* 1894: 156. 1894; Fischer in Gamble, *Fl. Pres. Madras* 1430. 1928; Abraham & Vatsala, *Intr. Orch.* 285. 1981; Manilal, *Fl. Silent Valley* 273. 1988.

Epiphytes or lithophytes. Pseudobulbs 6-8 x 2-2.5 cm, conical, wrinkled, covered by sheathing scales and loose fibres at the base. Leaves 2-per pseudobulb, 27.8-36.5 x 2.9-4.1 cm, oblong-elliptic, obtuse, narrowed towards the base. Inflorescence racemes lateral to the pseudobulb, 24-27 cm long. Scape covered by imbricating scales towards the base. Flowers 6-8, fragrant. Bracts large, 2.5-4.8 x 1-2.1 cm, cymbiform, scarious, persistent. Ovary with pedicel 1.7-2.4 cm. Sepals and petals spreading, many-nerved. Dorsal sepal 2.3-3.1 x 0.8-1.1 cm, ovate-oblong, obtuse; Lateral sepals 2.3-3.2 x 0.8-1 cm, narrowly oblong, obtuse, median nerve keeled externally. Lateral petals 2.1-2.9 x 0.9-1.1 cm, elliptic, obtuse, subequal with the sepals. Lip 1.8-2 x 1.2-1.4 cm long, shorter than other parts, tri-lobed with two erect, entire lamella on either side of the median nerve; side lobes 1.2-1.5 x 0.4-0.5 cm, erect, oblong, obtuse, embracing the column; midlobe 0.6-1.2 x 0.6-0.7 cm, sub-elliptic with a short or long narrow base. Column 1.6 cm long, winged, more or less acute.

Fl. & Fr.: Jan.-Feb.

Distr.: Endemic to Kerala and Tamil Nadu.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.**: Agastyamala, Gangaprasad 18463, *Ibid.*, AESK 7343; Pongalappara, N. Mohanan 10053. **Kollam Dist.**: Pandimotta, AESK 18292. **Idukki Dist.**: Rajamala, Shetty 31780 (MH); *Ibid.*, Gangaprasad 15107; Anamudi slopes, Shetty 27361 (MH). **Wayanad Dist.**: Wayanad, Sathish Kumar 3698. “**Travancore**” Calder & Ramaswamy 975 (MH).

Coelogyne nervosa Rich., Ann. Sci. Nat. Ser. 2, 15: 16. 1841; Fischer in Gamble, Fl. Pres. Madras 1430. 1928; Abraham & Vatsala, Intr. Orch. 285. 1981; Ramachandran & Nair, Fl. Cannanore 449. 1988; Manilal, Fl. Silent Valley 273. 1988; Mohanan & Henry, Fl. Thiruvananthapuram 436. 1994; Sasi. & Sivar., Flow. Pl. Thrissur. For. 436. 1996; *C. corrugata* Wight, Ic. 5 (1): 5, t. 1639. 1852; Hook.f., Fl. Brit. India 5: 835. 1890.

Creeping epiphytes, rarely lithophytes. Pseudobulbs 3-6 x 2-3 cm, broadly oblong-ovoid, serially arranged, 2-leaved, old bulbs covered by dried scales and fibres, rugose. Fresh shoots arise from the sides of the old bulbs, covered by large, erect, imbricating, sheathing bracts and bear 2 leaves at apex and an inflorescence in between them. Leaves 5-27 x 1.6-4.5 cm, elliptic, acute, narrowed in to a keeled petiole, punctate. Inflorescence a suberect raceme, 10-23 cm long; scape terete, naked. Flowers large, white. Bracts 2-2.5 x 0.8-1 cm, lanceolate, scarious, deciduous. Ovary with pedicel 1.8 cm long. Dorsal sepal 27 x 8.5 mm, elliptic-oblong, acute, many-nerved, median nerve

prominent. Lateral sepals as long as the dorsal, 8 mm broad, elliptic, oblique at base, acute, many-nerved; median nerve prominent, ending in a subterminal cusp on the dorsal side. Lateral petals *ca.* 26 x 9.5 mm, elliptic, acute 3-nerved; median nerve prominent. Lip 23 x 15 mm; the side lobes, trilobed, with 3 longitudinal, erect, crisped lamellae, oblong, obtuse, embracing the column, yellowish within; midlobe lanceolate, margin obscurely crenulate. Column 1.7 cm long, erect, winged on either side, hooded at apex. Fruits 5.5 cm long with pedicel, ellipsoid.

Fl. & Fr.: Throughout the year.

Distr.: Endemic to Southern Western Ghats.

Note: Fairly common in grasslands and evergreen Shola forests.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.**: Agastyamala, *AESK* 7307; *Ibid.*, *N. Mohanan* 4290, 9517; Agastyarkudam, *M. Mohanan* 66052; Western slopes of Agastyamala, *Joseph* 44612; Athirumala, *AESK* 13252. **Kollam Dist.**: Pandimotta, 15693, 15788, 15793. **Idukki Dist.**: Munnar, *AESK* 42124; Painavu, *Raju* 71139 (MH, CAL); Meenmutty, *C. N. Mohanan* 76144; Devikulam, *Radhakrishnan* 16241 (MH). **Kottayam Dist.**: Wagamon, *AESK* 13281. **Wayanad Dist.**: Brahmagiri, *Ramachandran* 62051 (MH).

Coelogyne odoratissima Lindl., *Gen. Sp. Orch.* 41. 1830; Wight, *lc. t.* 1640. 1851; Hook.f., *Fl. Brit. India* 5: 834. 1890; Fischer in Gamble, *Fl. Pres. Madras* 1430. 1928; Abraham & Vatsala, *Intr. Orch.* 277. 1981; Jayaw. in Dassan. & Fosb., *Rev. Handb.*

Fl. Ceylon 2: 116. 1981; Manilal, Fl. Silent Valley 273. 1988; Sivar. & P. Mathew, Fl. Nilambur 682. 1997.

Epiphytes with pseudobulbs and long slender roots. Pseudobulbs 1.7 x 1.4 cm, crowded, subglobose, wrinkled when old, green, covered with hyaline sheaths. Leaves usually 2, small at the time of flowering, larger and long at fruiting, linear-lanceolate, acute, coriaceous, recurved beneath. Scape with 2-4 flowers. Flower 3-5 cm across, white, fragrant; peduncle 4.5 cm long with a single, brown, membranous, sterile bract at the middle. Bract 1.3-1.6 x 1.2 cm, orbicular-ovate, acute, persistent. Dorsal sepal 2.3 x 1 cm, oblong-lanceolate, subacute. Lateral sepals oblong-ovate, 2.3 x 0.75 cm, 5-veined. Petals linear, 2.2 x 0.3 cm, acute, 3-veined. Lip 3-lobed, 9-veined; lateral lobes oblong, obtuse, erect; midlobe orbicular, apiculate with 3-crisped ridges. Column 1.4 x 0.3 cm broad, winged, bending over the apex. Anther terminal, 2-loculed. Ovary with pedicel 9 mm long. Fruit a capsule, 6-ribbed, pendulous at the end of a thick peduncle.

Fl. & Fr.: Mar.-May.

Distr.: South India, Sri Lanka.

Note: Rare in Shola forest along upper Ghats.

Occurrence & Specimens studied: **Palakkad Dist.:** Sispara, Sathish Kumar 11201 (CALI). **Malappuram Dist.:** Kunda Hills, Philip Mathew 34018 (CALI).

COTTONIA Wight

Ic. Pl. Ind. Or. 5: 21, t. 1755. 1852.

Epiphytes. Stem terete. Leaves linear, 2-lobed at apex. Flowers in racemes; peduncle very long. Sepals subequal, spreading. Petals narrower than the sepals. Lip sessile, auricled at base; side lobes indistinct; midlobe, rounded, retuse; base with a hairy callus, villous along margins. Column short, foot 0. Pollinia 2 cm, equally 2-partite.

One species in India and Sri Lanka.

Cottonia peduncularis (Lindl.) Reichb .f., Cat. Orch. Schiller 52. 1857; Abraham & Vatsala, Intr. Orch. 456. 1981; Jayaw. in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 2: 261. 1981; Ramachandran & Nair, Fl. Cannanore 450. 1988. Manilal, Fl. Silent Valley 274. 1988; Vajravelu, Fl. Palghat 471. 1990; Sasi. & Sivar., Flow. Pl. Thrissur For. 437. 1996; Sivar. & P. Mathew, Fl. Nilambur 683. 1997. *Vanda peduncularis* Lindl., Gen. Sp. Orch. 216. 1833. *Cottonia macrostachya* Wight, Ic. t. 1755. 1851; Hook f., Fl. Brit. India 6: 26. 1890; Fischer in Gamble, Fl. Pres. Madras 1439. 1928.

Non pseudobulbous epiphytes. Stem 10-40 cm long, stout, leafy. Roots stout, vermiform. Leaves 12-24 x 1.5-2.3 cm, lorate, coriaceous, jointed at petiolar sheaths, recurved, apex truncately 2-lobed, one lobe little longer than the other, with a spiny sinus in between the lobes. Flowers 2.4 x 1.5 cm, greenish brown. Peduncle very long, 30-90 cm, green, red-mottled; flowers borne terminally. Floral bracts 1.2 x 2.4 mm, ovate or

semi-lunar. Dorsal sepal 9-9.5 x 4 mm, obovate-oblong, obtuse or rounded 7-veined. Lateral sepals 8 x 4.5 mm. Petals 8-9 x 3 mm, linear-oblong, obliquely truncate, 3-veined. Lip 1.2 x 1 cm, broad, thick, sub-panduriform, villous, adnate to the base of the column, 2-auricled at the base. Lateral lobes conspicuously fringed with greenish yellow colour; midlobe trifid; lateral lobes large and rounded, midlobe small. Column 4-6 x 4 mm, 3-toothed. Anther terminal 2-loculed. Pollinia 2. Ovary with pedicel 2 cm long. Fruit a fusiform, ridged, twisted capsule.

Chrom. No.: $2n = 38$ (Vatsala, 1964).

Fl. & Fr.: Mar.-Jul.

Distr.: South India and Sri Lanka. Throughout Kerala.

Note: Mostly seen in semi-evergreen, and evergreen forests.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Palode, *AESK 15751*; Kurisadi, *AESK 7209*; Venkolla, *AESK 7508*. **Kollam Dist.:** Thenmala, *Sathish Kumar 711*. **Pathanamthitta Dist.:** Pamba, *Anil Kumar 1690* (CAL). **Idukki Dist.:** Pachakanam, *Sharma 42486* (MH). **Thrissur Dist.:** Chalakudy, *Ramamurthy 49355* (MH); Karimala Hills, *Sasidharan 5660* (KFRI). **Palakkad Dist.:** Mandanpatty forest, *Sathish Kumar 11214* (CALI); *Ibid.*, *N. C. Nair 56761*(MH); Mukkali, *Vajravelu 32157* (MH). **Kannur Dist.:** Aralam, *Ramachandran 61625* (MH); Wayanad Dist.: Santhigiri, *AESK 42191*. “**Travancore**” *Calder & Ramaswamy 1494* (MH).

CYMBIDIUM Swartz

Nova Acta Regiae Soc. Sci. Upsal. 6: 70. 1799.

Terrestrial or epiphytic herbs with pseudobulbs covered by scaly sheaths. Leaves linear-lanceolate, thickly coriaceous. Flowers in few to many-flowered racemes from the base of the pseudobulbs, erect or pendulous. Sepals and petals subequal, spreading. Lip sessile, 3-lobed; side lobes small, incuving embracing the column; midlobe rounded. Column elongated, winged. Foot 0. Pollinia 2, sessile.

About 50 species distributed from Madagascar, through India, Sri Lanka, Japan, Malaysia and Australia. In India, it is represented by 23 species, most of them are from Himalayas. In South India there are 3 species out of which 2 are epiphytic. Both the epiphytic species are present in Kerala.

Key to the species

1. Inflorescence sharply pendulous, larger than the leaves; lip with purple stripes on the midlobe, side lobes acute **C. bicolor**
1. Inflorescence not sharply pendulous, as long as leaves; lip with irregular purple blotches, side lobes obtuse **C. aloifolium**

Cymbidium aloifolium (L.) Sw., Nov. Act. Soc. Upsal. 6: 73. 1799; Wight, Ic. t. 1687, 1688. 1851; Hook.f., Fl. Brit. India 6: 8. 1890; Fischer in Gamble, Fl. Pres. Madras 1436. 1928; Abraham & Vatsala, Intr. Orch. 305. 1981; Jayaw. in Dassan. & Fosb.,

Rev. Handb. Fl. Ceylon 2: 183. 1981; Ramachandran & Nair, Fl. Cannanore 450. 1988; Vajravelu, Fl. Palghat 471. 1990; Mohanan & Henry, Fl. Thiruvananthapuram 452. 1994; Sasi. & Sivar., Flow. Pl. Thrissur For. 437. 1996; Sivar. & P. Mathew, Fl. Nilambur 683. 1997. *Epidendrum aloifolium* L., Sp. Pl. 953. 1753.

Tufted epiphytes with short, fleshy stems, clothed in membranous sheaths. Roots vermiform, aerial roots standing out as thin needles. Leaves 2 or 3, loriform, 20-48 x 1.8-2.4 cm, coriaceous, tip unequally and obtusely 2-lobed. Flowers cream-colored, in lax, many-flowered, pendulous racemes. Racemes 28 cm long; peduncle up to 14 cm long, clothed with imbricating, acute sheaths at the base. Bracts 2.5 x 3 mm, broadly ovate, fleshy, 3-veined. Dorsal sepal 2-2.2 x 0.5-0.6 cm, linear-oblong, suddenly acuminate or apiculate. Lateral sepals linear-oblong, falcate, obtuse, 7-9-veined; petals same size as lateral sepals, lanceolate, erect, subacute or apiculate, 3-veined. Lip 1.5 x 1.5 cm, sessile on the base of the column and embracing by its lateral lobes; midlobe broadly oblong, rounded, revolute, finely hairy or papillate on the inner surface. Column 11 x 3 mm, incurved. Anther terminal, 2-loculed. Ovary with pedicel 1.8-2.7 cm long. Fruit 5-6 cm long, pyriform capsule.

Fl. & Fr. : Mar.-Nov.

Distr.: India, Sri Lanka, China, Myanmar, Burneo. Throughout Kerala.

Note: Seen as epiphytes on trees near the forest fringes and road sides.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.**: Palode, AESK 7370; *Ibid.*, Sathish Kumar 580; Braemore, AESK 7379; Bonaccord, Sathish Kumar 598;

Kaviar, *N. Mohanan* 54712; Neyyar Dam, *Joseph* 44187 (MH). **Kollam Dist.:** Kodumon, *C. N. Mohanan* 60337 (MH). **Pathanamthita Dist.:** Pathanapuram, *Calder & Ramaswamy* 1506 (CAL). **Idukki Dist.:** Thekkady, *Vivekananthan* 45661 (MH); *Ibid.*, *Sharma* 42089 (MH). **Palakkad Dist.:** Mukkali, *Vajravelu* 32186 (MH); Attappadi, *Vajravelu* 27732 (MH). **Kannur Dist.:** Kannothe, *Ramachandran* 61606 (MH); Thaliparamba, *Barber* 8750. **Kasaragod Dist.:** Mulleria, *V. J. Nair* 71068 (MH).

Cymbidium bicolor Lindl., Gen. Sp. Orch. 164. 1833. *C. aloifolium auct., non* (L.) Sw., 1799: Jayaw. in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 2: 183. 1981; Abraham & Vatsala, Intr. Orch. 305. 1981.

Pseudobulbous epiphytic herbs. Pseudobulbs 6-9 cm long, ovoid, ensheathed. Leaves 40-100 x 1.5-4.5 cm, 4-6 per pseudobulbs, broadly linear, thick, obliquely obtuse at apex. Inflorescence about 90 cm long, pendulous lateral racemes with 15-40 flowers. Flowers 3-4 cm across, pale yellow to cream with maroon-brown stripes in the median region and midlobe of lip. Dorsal sepal 17-24 x 5-8 mm, narrowly oblong to narrowly ligulate, obtuse. Petals 18-23 x 5-8 mm, narrowly elliptic, obtuse to acute. Lip 15-20 x 10-12 mm, saccate at base, minutely papillose to pubescent, 3-lobed; sidelobes erect enclosing the column, acute to acuminate; midlobe ovate with purple stripes acute or acuminate. Disc with a deep sac bordered by strongly stigmoid ridges. Column 10-12 mm long, violet, arching, with a very short foot. Pollinia 2, triangular, deeply cleft with a triangular viscidium.

Fl. & Fr.: Mar.-Apr.

Distr.: India, Java. In Kerala it is restricted in distribution and collected from Wayanad district only.

Occurrence & Specimens studied: **Wayanad Dist.:** North Wayanad, *Sathish Kumar 4661.*

Note: Abraham and Vatsala (1981) recorded the presence of this species in Wayanad, Kerala but wrongly identified as *C. aloifolium* (L.) Sw., which has distribution throughout Kerala.

DENDROBIUM Swartz

Nova Acta Regiae Soc. Sci. Upsal. 6: 82. 1799.

Epiphytes; stem elongated, cylindric or pseudobulbous. Leaves alternate on elongated shoots or terminal in pseudobulbs, often deciduous during flowering. Flowers solitary or in fascicles or racemes. Sepals unequal, laterals adnate to the column, forming a mentum. Petals similar to sepals. Lip sessile or clawed, adnate to the foot of the column; side lobes when present embrace the column; midlobe concave or saccate, sometimes lamellate. Column short, angled or toothed at apex; foot often elongate. Pollinia 4, without caudicles.

Over 1000 species distributed from India, Sri Lanka, China, Japan, Malaysia, Australia and New Zealand. In India there are 102 species, out of which 18 are reported from Kerala. A total of 22 species are endemic to India.

Key to the species

- 1. Stem short, reduced to single pseudobulb. 2
- 1. Stem long, plurinodal. 5
- 2. Plants leafy during flowering 3
- 2. Plants not leafy during flowering 4
- 3. Lip with a series of papillae or fringes along the margins **D. nanum**
- 3. Lip without papillae or fringes **D. anamalayanum**
- 4. Raceme dense-flowered; tip of the lip triangular, acute **D. peguanum**
- 4. Raceme lax-flowered; tip of lip orbicular or truncate **D. microbulbon**
- 5. Flowers on leafy nodes 6
- 5. Flowers on leafless nodes 12
- 6. Flowering portion with short black hairs 7
- 6. Flowering portion without short black hairs 8
- 7. Flowers white suffused with pale violet inside lip; mentum as long as sepals; base of operculum entire **D. nutantiflorum**
- 7. Flowers golden yellow throughout; mentum very short; base of operculum toothed **D. jerdonianum**
- 8. Flowers fascicled on leaf-opposed tubercles 9
- 8. Flowers racemose 10
- 9. Leaves linear, grass-like, 4 mm broad **D. haemoglossum**
- 9. Leaves oblong, oblong-elliptic, 20-50 mm broad **D. aquem**
- 10. Stems cylindric **D. wightii**
- 10. Stems flattened, compressed 11

11. Lip panduriform, 9 mm long; column with 2 erect stelia..... **D. panduratum**
11. Lip obovate, 14 mm long; column without any stelia..... **D. heyneanum**
12. Flowers subactinomorphic; lip not distinct **D. lawianum**
12. Flowers zygomorphic; lip distinct..... **13**
13. Flowers fascicled on short tubercles at nodes **14**
13. Flowers racemose..... **16**
14. Stems clavately swelling distally; operculum short hairy **D. heterocarpum**
14. Stem not clavate, uniformly cylindric; operculum not hairy..... **15**
15. Lip-margin minutely fimbriate, ciliate; petals lanceolate acute.....
..... **D. macrostachyum**
15. Lip-margin not fimbriate, not ciliate, but slightly crimped; petals obovate-obtuse
..... **D. crepidatum**
16. Stems much branched; flowers small, 7 mm across; lip unlobed **D. herbaceum**
16. Stems unbranched; flowers medium sized, 1-2.5 mm across, lip 3-lobed **17**
17. Midlobe of the lip oblong, obtuse-acute..... **D. barbatulum**
17. Midlobe of the lip quadrate-oblong, truncate. **D. ovatum**

Dendrobium anamalayanum Chandrab., V. Chandras. & Nair, J. Bombay. Nat. Hist.

Soc. 78 : 575. 1981; Sath. Kumar & Manilal, Cat. Ind. Orchids 70. 1994. (Fig. 9).

Epiphytic herbs. Pseudobulbs 2-3 cm long, ovoid, leafy when in flower. Leaves 2-7.5 x 0.6-2 cm, elliptic-oblong, sheathing at base, acute. Inflorescence a terminal raceme, up to 12 cm long, 5-many-flowered. Flowers white, suffused with pink, not opening fully,

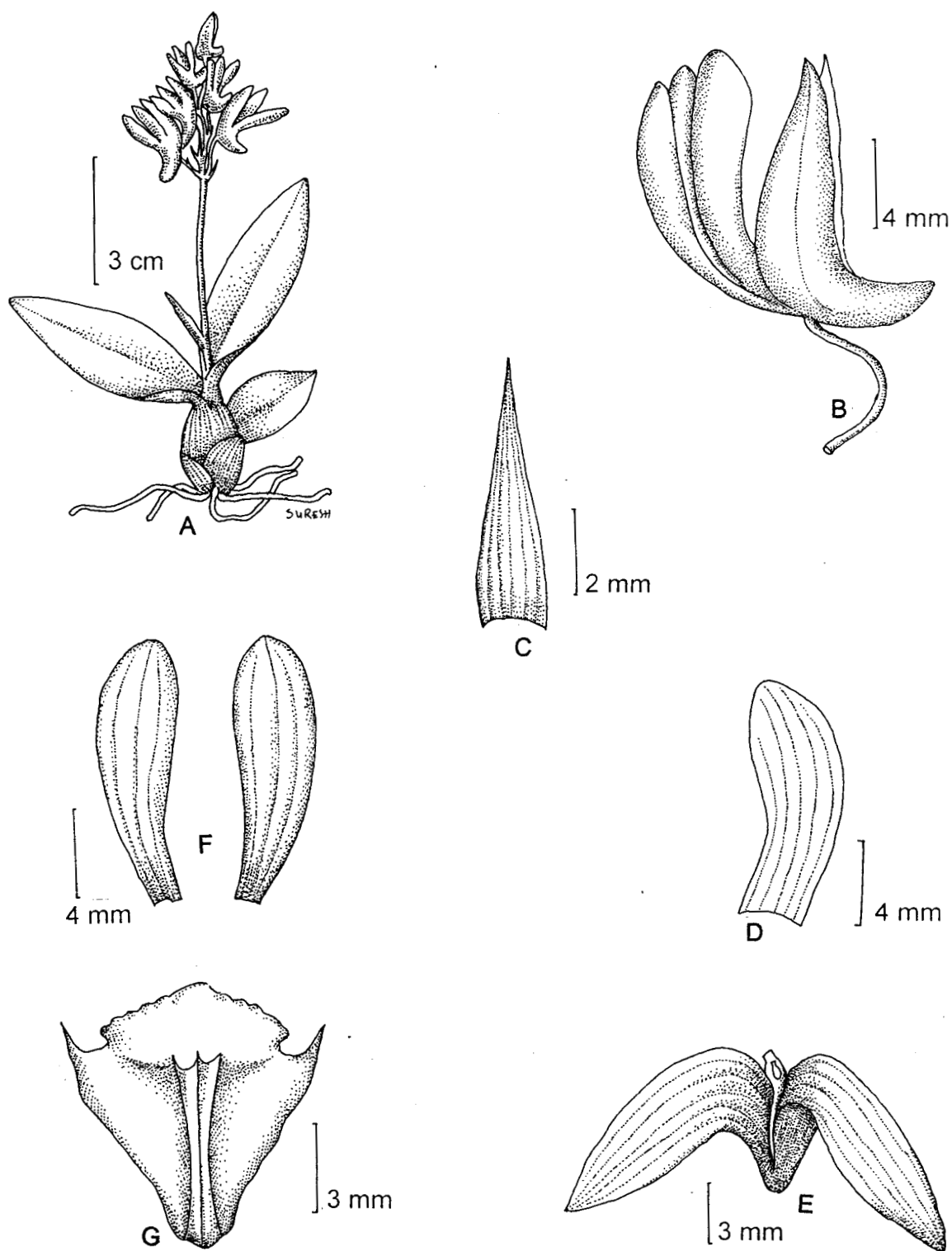


Fig. 9. *Dendrobium anamalayanum* Chandr. et al.: A. Habit; B. Flower; C. Bract; D. Dorsal sepal; E. Lateral sepals with column; F. Lateral petals; G. Lip.

16 mm across. Bracts 7 x 1.5 mm, lanceolate, 5-veined, acuminate. Dorsal sepal 11 x 4 mm, oblong-obovate, 5-veined, obtuse. Lateral sepals 11 x 4 mm, falcately oblong-lanceolate, joining with the sides of foot forming a mentum, 5-veined, subacute. Petals 12 x 4 mm, oblanceolate, 3-veined, obtuse. Lip 9 x 9 mm, broadly ovate, 3-lobed; side lobes with purple spots, tooth like; midlobe 6 mm broad, rhomboid-ovate, with 2 violet spots. Disc white with a median callus, 3-toothed at apex. Column white, short, column foot 5 mm long, basally forming a small sac having deep violet hairs. Operculum 1 x 1.5 mm, 2-celled, shortly glandular. Pollinia 1 mm long, oblong, compressed. Fruits 1 mm long, oblong, compressed. Fruits ellipsoid or globose capsule.

Distr. : Endemic to Kerala and Tamil Nadu.

Fl. & Fr.: Jan.-Feb.

Occurrence & Specimens studied: **Idukki Dist.**: Rajamala, *Sathish Kumar* 1407; Eravikulam, *Sathish Kumar* 4667; Devikulam, *Sathish Kumar* 4675; Umaiyamala, *Shetty* 27302 (MH); Rajamala, *Shetty* 31796 (MH); Guderale, *William D'Cruz* 12355; Walara, *AESK* 19114; Munnar, *AESK* 42140; Adimaly, *AESK* 13024. "**Travancore**", *Jacob* 20158 (MH).

Dendrobium aquem Lindl., Bot. Reg. 6 : t. 59. 1843; Hook.f., Fl. Brit. India 5: 739. 1890; Fischer in Gamble, Fl. Pres. Madras 1417. 1928; Abraham & Vatsala, Intr. Orch. 349. 1981; Manilal, Fl. Silent Valley 276. 1988; Vajravelu, Fl. Palghat 473. 1990. *D. album* Wight, Ic. t. 1645. 1851. **(Plate V-A)**

Stout, pendulous, epiphytic herbs with clavate stems. Stems 15-45 cm long, Leaves 7-14 x 2-5 cm, ovate-lanceolate, acute. Inflorescence axillary, cymose fascicles. Bracts very small, oblong, oblong-ovate, acute. Flowers large, white, 2-3. Dorsal sepal 2.4 x 1.2 cm, broadly ovate, 3-veined, acute. Lateral sepals 2.4 x 1.2 cm, ovate-triangular, 3-veined, apiculate, connate with column foot, forming a mentum. Petals 2.3 x 1.2 cm, obovate, white, 3-veined, spreading, Apiculate. Lip 2.2 x 2 cm, whitish green, sub-rhomboid, deflexed near margin, 3-lobed; sidelobes 6-7 mm broad, obovate, oblong; midlobe 10 x 10 m, oblong-concave, erose, pubescent, acute. Disc yellow, puberulous. Column 4-5 mm, greenish white. Ovary with pedicel 2.5 cm. Fruit oblong-pyriform, 6-ridged capsule.

Distr.: Endemic to South India.

Fl. & Fr.: Sept.-Apr.

Note: In the evergreen forests but on exposed tree trunks.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.**: TBGRI, *AESK 1568* (Cultivated). **Kollam Dist.**: Pandimotta, *AESK 15690*. **Idukki Dist.**: Varayattumudi, *AESK 42169*; Pachakanam, *Sharma 43492* (MH). **Palakkad Dist.**: Silent Valley, *Sathish Kumar 10558* (CALI); Kunthipuzha Dam site, *Vajravelu 46864* (MH); Varadimala, *Bharghavan 56917* (MH).

Dendrobium barbatulum Lindl., Gen. Sp. Orch. 84. 1830; Hook.f., Fl. Brit. India 5: 719. 1890; Fischer in Gamble, Fl. Pres. Madras 1412. 1928; Manilal, Fl. Silent Valley 276. 1988; Vajravelu, Fl. Palghat 473. 1990; Sivar. & P. Mathew, Fl. Nilambur 684. 1997.

Caespitose herbs with plurinodal stems, leafless when flowering. Stems 9-17 cm long, slender. Leaves distichous, lanceolate-ovate. Inflorescence 4-9 cm long, terminal or lateral, many-flowered. Flowers creamy white with pinkish yellow blotches on the tip. Bracts 2-3 x 1-1.5 mm, ovate-lanceolate, acute, scarious. Dorsal sepal 9-2.5 mm, oblong, acute at tip, 4-nerved. Lateral sepals 10 x 5 mm, obliquely oblong-lanceolate, acute at tip, 5-nerved. Mentum conical, acute. Lateral petals 9.5 x 5 mm, obovate-lanceolate, acute, 3-nerved. Lip 11.5 x 6mm, trilobed, beard on the upper surface about the middle and sparsely hairy towards the base; midlobe much longer than the side lobes, oblong, obtuse-acute. Ovary with pedicel 1.1-1.3 cm long. Fruits 2 cm long ellipsoidal capsule.

Distr.: South West India (Endemic).

Fl. & Fr.: Jan.-Apr.

Note: Eventhough an epiphyte, it is seen as lithophyte on exposed rocks.

Occurrence & Specimens studied: **Idukki Dist.**: Cheruthoni, Raju 71263 (MH); Pallivasal, AESK 3760. **Palakkad Dist.**: Poochappara, Sathish Kumar 10151 (CALI); Aruvanpara, Sathish Kumar 710; Nelliampahy, Vajravelu 60418 (MH); Valiyaparathodu, N. C. Nair 65495 (MH); Silent Valley, AESK 13060; Mukkali, E.Vajravelu 60636 (MH). **Malappuram Dist.**: Thalikota, Philip Mathew 33094 (CALI). “**Travancore**”, Bourdillon 60 (MH).

Dendrobium crepidatum Lindl. in Paxton, Fl. Gard. 1: 63, f. 45. 1850-51; Hook.f., Fl. Brit. India 5: 740. 1890; Abraham & Vatsala, Intr. Orch. 349. 1981; Ramachandran & Nair, Fl. Cannanore 451. 1988.

Pendulous herbs. Stems shining where there is no covering sheath, 10-20 cm long. Leaves membranous 10 x 1 cm, lanceolate, acuminate. Flowers white, suffused with pink on outer margin, 1-3-nate on short pendulous leafless stems. Bract small, lateral sepals 15 x 7 mm, oblong, 5-veined, obtuse, fused with the column forming a short mentum. Petals 15 x 7 mm, broadly oblong, 5-veined, narrowed at base, obtuse at apex. Lip 17 x 7 mm, oblong-orbicular, narrowly clawed at base, white, yellowish in middle, margins wavy. Disc with a basal pit and ridge across the claw. Column 3-4 mm long. Foot 4 mm long, violet. Ovary with pedicel 2.3-3 cm long. Fruit a fusiform capsule.

Chrom. No.: $2n = 38$ (Jones, 1963).

Distr.: India, Nepal, Bhutan, Myanmar, Thailand, Vietnam and China.

Fl. & Fr.: Mar.-Aug.

Occurrence & Specimens studied: **Wayanad Dist.**: Periya, Sathish Kumar 4656; Chandanathodu, Ramachandran 63913 (MH).

Dendrobium haemoglossum Thw., Enum. Pl. Zeyl. 429. 1864; Hook.f., Fl. Brit. India 5: 727. 1890; Fischer in Gamble, Fl. Pres. Madras 1416. 1928; Abraham & Vatsala, Intr. Orch. 365. 1981; Manilal, Fl. Silent Valley 276. 1988; Ramachandran & Nair, Fl. Cannanore 451. 1988; Sivar. & P. Mathew, Fl. Nilambur 685. 1997. *D. bambusaefolium* Par. et Reichb.f., Trans. Linn. Soc. London 30: 149. 1874; Jayaw. in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 2 : 88. 1981.

Epiphyte with slender, pendulous stems of *ca.* 30-45 cm long, and woody, nodose rootstock. Roots long, vermiform. Stems hard, naked, leafy above, base sometimes swollen and obpyriform; internodes 2-3 cm long. Leaves distichous, sessile, 11-16 x 0.9 cm, linear, rigidly papery, striate, obtuse, slightly incurved. Flowers yellow with dark red tinged tip, in 2-4-flowered, leaf-opposed tubercles which burst through the sheath below the mouth. Bracts cupular at the base of the pedicel; sepals about 0.6 cm long, connivent with recurved tips. Dorsal sepal oblong, acute. Lateral sepals ovate-oblong, apiculate. Petals as long as the sepals, oblong; lip tongue-shaped, entire, acute, glabrous, undulate, adnate to the foot of the column. Mentum short, rounded at the tip and incurved. Column short, produced into a foot at the base. Anther terminal, 2-loculed; Pollinia 4, oblong, waxy, collateral in parts. Ovary with pedicel 1.7 cm long. Fruit an oblong capsule, 2 cm long, narrowed at both ends.

Distr.: South India and Sri Lanka.

Fl. & Fr.: Periodical.

Note: Growing in huge bunches on tree trunks in heavy shaded forests.

Occurrence & Specimens studied: **Idukki Dist.:** Anjuril, Thekkadi, *Sharma 43299* (MH); Pachakkanam, *AESK 42104*. **Kottayam Dist.:** Mundakkayam, *AESK 15748*. **Palakkad Dist.:** Walakkad, *Sathish Kumar 10771* (CALI). **Malappuram Dist.:** Koomanpara, *Philip Mathew 33819* (CALI); Thalichola, *Philip Mathew 28402* (CALI). **Wayanad Dist.:** Wayanad, *s. coll., s.n.* (Acc. No. 5023-MH); Sultan's Battery, *Ellis 19939* (MH). **Kannur Dist.:** Panoth, *Ramachandran 66877* (MH). **Kasargod Dist.:** Poovadukka, *AESK 15648*.

Dendrobium herbaceum Lindl., Bot. Misc. 69. 1840; Hook.f., Fl. Brit. India 5: 719. 1890; Fischer in Gamble, Fl. Pres. Madras 1416.1928; Abraham & Vatsala, Intr. Orch. 1981; Manilal, Fl. Silent Valley 276. 1988; Ramachandran & Nair, Fl. Cannanore 452. 1988; Vajravelu, Fl. Palghat 474. 1990; Mohanan & Henry, Fl. Thiruvananthapuram 453. 1994; Sasi. & Sivar., Fl. Pl. Thrissur For. 438. 1996;

Erect, bunchy, epiphytic, herbs. Stems caespitose, yellowish, or purplish brown, shining, much branched, ridged, up to 45 cm long, leafless during flowering. Leaves 1.5-3.5 x 0.2-0.5 cm; linear-lanceolate, acute. Inflorescence condensed racemes, lateral at nodes, 2-4-flowered. Flowers creamy white-yellowish, long pedicellate. Bracts 2-2.5 x 1-1.6 mm, hyaline. Dorsal sepal 5.5 x 2.2 mm, oblong-obtuse, 3-nerved. Lateral sepals 6.5 x 3.5 mm, narrowly lanceolate, obtuse, 5-nerved. Lateral petals 5 x 1.8 mm, spatulate, obtuse at lip, 3-nerved. Lip 5 x 2 mm, attached to the foot of the column, reflexed at base, sub entire, oblong, with a shallow constriction about the middle, pale yellow, obtuse at tip, 5-nerved, sparsely gland-dotted. Ovary with pedicel 1.2 cm long. Fruit a capsule, 3 cm long, ellipsoid, tapering at base, with 6 ribs.

Distr.: Endemic to South and North East India. Throughout in Kerala.

Fl. & Fr.: Dec.-Jan.

Note: Seen as epiphytic in moist deciduous forests.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.**: Ponmudi, *Sathish Kumar* 1933; *Ibid.*, *AESK* 5448, 7239; *Ibid.*, *Santhosh Kumar* 15971; Pongalappara, *Sathish Kumar* 1338; Agasthyargudam, *M. Mohanan* 66054 (MH); Athrumala, *N. Mohanan* 4417,

9270; 10448; Chemunji, *Gangaprasad* 15132; *Ibid.*, *N. Mohanan* 10315. **Kollam Dist.:** Pandimotta, *AESK* 15691, 18287. **Idukki Dist.:** Lockhart Gap, *Sebastine* 18417 (MH); Kuttikanam, *Vivekananthan* 23004 (MH); Vallakadavu, *Sharma* 43816 (MH); *Ibid.*, *AESK* 37686; Way to Vallakadavu, *N. C. Nair* 70222 (MH); Pachakkanam, *AESK* 37695; Varayattumudy, *AESK* 42167. **Kottayam Dist.:** Wagamon, *AESK* 7342, 12801. **Ernakulam Dist.:** Edamalayar, *AESK* 15723. **Thrissur Dist.:** Vazhachal, *Sasidharan* 5294 (KFRI). **Palakkad Dist.:** Dam site, *Sathish Kumar* 10273; Nelliampathy, *Vajravelu* 60413 (MH). **Wayanad Dist.:** Pakshipathalam, *Sathish Kumar* 1610; Brahmagiri, *AESK* 42178. **Kannur Dist.:** Thrissilleri, *Ramachandran* 62264 (CAL, MH).

Dendrobium heterocarpum Wall. ex Lindl., *Gen. Sp. Orch.* 78. 1830; Hook.f., *Fl. Brit. India* 5 : 737. 1890; Fischer in Gamble, *Fl. Pres. Madras* 1416. 1928; Abraham & Vatsala, *Intr. Orch.* 361. 1981; Jayaw. in Dassan. & Fosb., *Rev. Handb. Fl. Ceylon* 2: 84. 1981; Manilal, *Fl. Silent Valley* 276. 1988; Vajravelu, *Fl. Palghat* 473. 1990; Mohanan & Henry, *Fl. Thiruvananthapuram* 452. 1994. *Dendrobium aureum* Lindl., *Gen. Sp. Orch.* 77. 1830; Wight, *lc. t.* 1646. 1851.

Epiphytic, subclavate, herbs. Stems 10-30 cm long, constricted at nodes, yellowish-green, leafless when flowering. Leaves 7-10 x 1-2.2 cm, oblong-lanceolate, flat, coriaceous, unequally notched at apex; bases sheathing the internodes. Flowers yellowish-white, 1-3-nate on axillary racemes, 4-7 cm across. Bracts 0.6 x 0.6 cm, oblong, rounded or emarginate. Dorsal sepal 2.8 x 0.9 cm, linear-oblong, rounded or truncate, 7-veined. Lateral sepals 2.5 x 1.2 cm, obliquely oblong-ovate, rounded, attached to the column.

Petals 3 x 1.5 cm, ovate, apiculate, undulate, 5-veined. Lip 2.9 x 2.5 cm, ovate, 3-lobed; lateral lobes vertical, rounded; midlobe recurved, pubescent and ridged. Column 5 mm high, conical, produced into a foot; apex of the column 3-lobed. Anther terminal, 2-loculed. Pollinia 4. Ovary with a pedicel 2.3-2.9 cm long. Fruit a smoothly ridged, fusiform or conical capsule, narrowly tapering to the pedicel.

Distr.: India, Sri Lanka, Myanmar, Thailand, Malaysia, Philippines and Indonesia.

Chrom.No: 2n = 38 (Kosaki, 1958).

Fl. & Fr.: Jan.-Mar.

Note: Epiphytic in evergreen forests.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Ponmudi, *Sathish Kumar* 552; Athirmala, *Sathish Kumar* 1356. **Kollam Dist.:** Pandimotta, *AESK* 15718. **Idukki Dist.:** Munnar, *SathishKumar* 575,1952; Devikulam, *AESK* 29732. **Kottayam Dist.:** Wagamon, *AESK* 7335, 12802, 13292. **Palakkad Dist.:** Poochappara, *Sathish Kumar* 11542 (CALI); Karasuryamala, *Vajravelu* 66196 (MH). **Wayanad Dist.:** Pakshipathalam, *Sathish Kumar* 1604; Manantoddy, *s. coll., s.n.* (Acc. No. 50231- MH); Thavinjal, *AESK* 44210.

Dendrobium heyneanum Lindl., Gen. Sp. Orch. 78. 1830; Hook.f., Fl. Brit. India 5: 718. 1890; Fischer in Gamble, Fl. Pres. Madras 1415. 1928; Abraham & Vatsala, Intr. Orch. 350. 1981; Ramachandran & Nair, Fl. Cannanore 452. 1988; Manilal, Fl. Silent Valley 277. 1988; Vajravelu, Fl. Palghat 474. 1990; Mohanan & Henry, Fl. Thiruvananthapuram 453. 1994; Sasi. & Sivar., Flow. Pl. Thrissur For. 438. 1996.

Epiphytic herbs to 20 cm high including the inflorescence. Stem 5-11 cm long, plurinodal, laterally compressed, green, covered with transparent scales. Leaves distichous, 1.3-5 x 0.7-0.8 cm, linear-oblong, acute, slightly falcate at tip, thinly coriaceous and spreading. Petiole sheathing. Inflorescence lateral from the nodes, slender, 4-5-flowered, 3.5-5 cm long. Pedicel slender, 6-7 mm long. Flowers not fully opening, with a prominent mentum, 1.4 cm across. Bracts 2.5 x 1 mm, ovate, acute, 5-veined. Dorsal sepal 8 x 3.5 mm, oblong, obtuse, 5-veined. Lateral sepals united with the column forming a mentum. Petals 9 x 3.5 mm, clavate, obtuse, 3-veined. Lip 3-lobed; lateral lobes small, acute; midlobe crenulate, broadly ovate. Disc 5-veined, the outer veins branching. Mentum stout, spur like, slightly curved, two-lobed at the tip. Column short, produced into a foot. Anther terminal, 2-loculed. Pollinia 4, smooth. Ovary with pedicel 8 mm long. Fruits 1.2 cm long, ovoid capsule.

Distr. : Endemic to Tamil Nadu, Karnataka and Kerala. Throughout Kerala.

Fl. & Fr.: May-Dec.

Note: Seen as epiphytes in most places.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.**: Agasthyamala, *Sathish Kumar 703*; Pongalappara, *Sathish Kumar 1326*; Erattumukku, *AESK 15603*; Chemunji, *AESK 22381*; Athirumala, *N. Mohanan 8251, 9641, 9676*. **Kollam Dist.**: Pandimotta, *AESK 15754, 22390*. **Idukki Dist.**: Munnar, *Sathish Kumar 3554*; Vandanmedu, *Vivekananthan 50431 (MH)*; Adimaly, *AESK 13054*. **Palakkad Dist.**: Silent Valley, *Sathish Kumar 10149 (CALI)*; *Ibid.*, *Vajravelu 26108 (MH)*; Kummathanthodu, *N. C.*

Nair 64396 (MH). **Wayanad Dist.:** Thirunelly, *Ramachandran 62295* (MH); Chandanathodu, *Ellis 29441* (MH).

Dendrobium jerdonianum Wight, Ic. 5(1) 6. in part, non. t. 1644.1851; Hook.f., Fl. Brit. India 5:734. 1888, *excl.* Wight. Ic., t. 7741. 1900. *D. villosulum* Lindl., Paxt. Fl., Gard. 2: 82., Ic. xylog. n. 175. 1952, *non* Wallich, 1830. (**Plate IV-E**).

Stout epiphytic herbs. Stems 25-30 cm long, plurinodal, terete, grooved, clothed with sheaths having hispid brown hairs. Leaves 5-6 x 1-1.5 cm, linear-oblong, coriaceous, yellow with green, 2-cleft at apex. Flowers large on short tubercles from the upper most leaf axil, golden to orange yellow. Bracts, minute, obtuse, green. Sepals and petals similar. Mentum about 6 mm long. Lip shorter than sepals, erect, incurved, 3-lobed; sidelobes short, narrow, notched or 2-lobed. Epichile narrowly tongue-shaped, margin deeply crenate, almost, lobulate, obtuse. Disc with 3 acute keels, median one crenate on the epichile. Ovary with pedicel 3.8 cm long.

Distr.: Endemic to Kerala and Karnataka.

Fl. & Fr.: Jan.-Apr.

Occurrence & Specimens studied: **Wayanad Dist.:** Pakshipathalam, *Sathish Kumar 1609*; *Ibid.*, *Balakrishnan 3554* (CALI).

Note: Many workers merged this species with *D. nutantiflorum* Howkes & Heller. This beautiful species with large golden yellow flowers is quite distinct from the former. Hence, here it is treated as separate species as proposed by Wight (1851).

Dendrobium lawianum Lindl., J. Linn. Soc. Bot. 3 : 10. 1859; Muktesh Kumar & Sasi., Curr. Sci 55 : 187. 1986; Ramachandran & Nair, Fl. Cannanore 452. 1988; Sasi. & Sivar., Flow. Pl. Thrissur For. 438. 1996. *Dendochilum roseum* Dalz. in Hooker's J. Bot. Kew. Gard. Misc. 4: 291. 1852, *non D. roseum* Sw., 1805.

Pendulous epiphytic herbs. Stem clavate, narrowed towards base, yellowish-green. Leaves 10 x 1.5 cm, distichous, sessile, lanceolate or oblong-lanceolate. Flowers 3 cm across, solitary or in pairs. Sepals and petals similar, 1.5 x 0.7 cm, oblong, obtuse, white with pink tinge at apex. Lip similar to petals, but broader, entire. Column stout, 2.5 mm long with 2-calli at base. Foot and mentum absent. There is a deep cavity behind the column which serves as nectary.

Distr.: Peninsular India.

Fl. & Fr.: Feb.-Mar.

Note: This species closely resembles *Dendrobium crepidatum* Lindl. in its external morphology. But it differs from the latter in possessing actinomorphic flowers, and equal perianth parts. Absence of foot is a unique character of this species.

Occurrence & Specimens studied: **Thrissur Dist.**: Poringal, *Sasidharan* 3486 (KFRI).

Wayanad Dist.: Chandanathodu, *Ramamchnadran* 62623 (CAL); Periya, *Ramachandran* 66879 (CAL).

Dendrobium macrostachyum Lindl., Gen. Sp. Orch. 78. 1830; Wight, Ic. t. 1647. 1851; Hook.f., Fl. Brit. India 5: 735. 1890; Fischer in Gamble, Fl. Pres. Madras 1416. 1928;

Abraham & Vatsala, *Intr. Orch.* 355. 1981; Jayaw. in Dassan. & Fosb., *Rev. Handb. Fl. Ceylon* 2 : 9. 1981; Manilal & Sivar., *Fl. Calicut* 285. 1982; Manilal, *Fl. Silent Valley* 277. 1988; Ramachandran & Nair, *Fl. Cannanore* 452. 1988; Mohanan & Henry, *Fl. Thiruvananthapuram* 453. 1994; Sasi. & Sivar., *Flow. Pl. Thrissur For.* 439. 1996.

Pendulous epiphytes. Stems 30-70 cm long, terete, drooping, pale purple with dull white streaks. Leaves 8 x 2.5 cm, distichous, oblong or ovate lanceolate, acute. Flowers greenish yellow, 2.5 cm across, produced on 2-4-flowered short peduncles from the nodes of the stem. Bracts 2.6 x 1.8 mm, oblong-ovate, acute, 3-veined. Dorsal sepal 1.3 x 0.4 cm, acute. Lateral sepals 1.5 x 0.5 cm, obliquely oblong-lanceolate, acute. Petals 1.4 x 0.5 cm, lanceolate, acute, 3-veined. Lip 1.7 x 1.2 cm; lateral lobes small, rounded, embracing column; midlobe quadrately ovate, apiculate, recurved, crenulate, ciliate. Column 4 mm high. Anther terminal, 2-loculed; pollinia 4. Ovary with pedicel 1.3-1.7 cm long. Fruit a fusiform capsule, 3 x 0.7 cm.

Chrom. No.: n = 19 (Vatsala, 1964).

Fl. & Fr.: Mar.-Oct.

Distr.: Sri Lanka, South India.

Note: A quite common species seen in moist deciduous and semi-evergreen forests of lower elevation.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Palode, Sathish Kumar 530; Attayar, Sathish Kumar 1307; *Ibid.*, N. Mohanan 8279; Bonaccord, Sathish Kumar 707; Veli, M. Mohanan 56932 (MH); Palode, Aesk 7481; Peringamala, Aesk 7367;

Agastyamala, *AESK* 7232. **Kollam Dist.:** Thenmala, C. N. Mohanan 63065 (MH); Kalthuruthi, *AESK* 7359. **Pathanamthitta Dist.:** Pamba Valley, *Sharma* 43950 (MH). **Idukki Dist.:** Pamba Valley, *Sharma* 43950 (MH); Anjavili-Thekkadi, *Sharma* 42408 (MH); Thekkadi, *Vivekananthan* 24361 (MH); Neriamangalam, *AESK* 7538. **Thrissur Dist.:** Wadakkanchery, Ramamurthy 48437 (MH); Vazhachal, *Pandurangan* 30546. **Palakkad Dist.:** Valiyaparathodu, *Sathish Kumar* 10560 (CALI); Siruvani Slopes, *Vajravelu* 46747 (CAL, MH); Anamooly, N. C. Nair 64616 (MH). **Kozhikkode Dist.:** Chedalethu, *Ellis* 24054 (MH). **Wayanad Dist.:** Mananthody, *Ramachandran* 62757 (MH). **Kannur Dist.:** Panathore, *Ansari* 67914 (CAL, MH). “**Travancore**”, Mekarai, *Calder & Ramaswamy* 626, 1507 (CAL); *Ibid.*, Rama Rao 1356 (CAL).

Dendrobium microbulbon A. Rich., *Ann. Sci. Nat. Bot. Ser.* 2. 15 : 19, t. 8. 1841; Hook.f., *Fl. Brit. India* 5 : 716. 1890; Fischer in Gamble, *Fl. Pres. Madras* 1415. 1928; Abraham & Vatsala, *Intr. Orch.* 358. 1981. *D. humile* Wight, *lc.* 1643. 1851.

Epiphytic herbs. Pseudobulbs 1-2 x 1 cm, globose-oblong, 3-4-leaved. Leaves 2.5-6.5 x 0.5-1.5 cm, linear-lanceolate to oblong-lanceolate, sheathing at base, acute. Inflorescence 12 cm long terminal raceme, laxly flowered. Bracts 5- 6 x 1.5-2 mm, broadly lanceolate, 1-veined, acute. Flowers white, scented. Dorsal sepal 4-6 x 2 mm, linear-lanceolate, 3-veined, obtuse. lateral sepals 9 x 5 mm, broadly lanceolate, 4-veined, obtuse. Petals 9.5 x 2.5 mm, spatulate or oblanceolate, 3-veined, subacute or obtuse; Lip 10 x 5 mm, obovate; lower claw jointed with the column, 3-lobed, side lobes 6 mm long, narrow, erect; midlobe transversely oblong-orbicular, irregularly denticulate on margins,

truncate or slightly retuse at apex. Disc pale green, with 2-lobed callus. Column 2 mm long, green, produced below into a 6 mm long, purple, grooved foot. Fruits 10 mm long, ovoid capsules.

Distr.: Endemic to South India.

Fl. & Fr.: Mar.-Jul.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Agastyarmalai, *Barber 2915* (MH). **Idukki Dist.:** Guderale, *AESK 7485*.

Dendrobium nanum Hook.f., *Ic. Pl. t. 19. 1853, Fl. Brit. India 5: 717. 1890; Fischer in Gamble, Fl. Pres. Madras 1415. 1928; Manilal, Fl. Silent Valley 277. 1988; Ramachandran & Nair, Fl. Cannanore 453. 1988; Vajravelu, Fl. Palghat 474. 1990.*

Dwarf epiphyte, with pseudobulbous stem and tufts of filiform roots arising from their bases. Pseudobulbs several, crowded together on a slender root stalk, ovoid-elliptic, tapering to either end, 0.9 x 0.7 cm; previous season's pseudobulbs larger and taller, covered with remnants of scaly leaves, peeling off with age, 1.5 x 1 cm, slightly flattened, tapering to each end, apex carrying dry remains of the peduncle, 2-leaved at flowering. Leaves sessile, linear, slightly twisted at the base, 3.5-6.5 x 0.3-0.4 cm, obtuse-acute, thin, usually 7-veined, midrib larger and prominent beneath. Flowers in terminal 10-flowered racemes, 7.5 cm long, white, peduncle short; floral bracts 2.5-2.7 x 1.25 mm, ovate, acuminate, acute, Dorsal sepal 4 x 2 mm, oblong-lanceolate, obtuse, 3-veined. Lateral sepals 4.4 x 4.25 mm, falcately ovate-lanceolate, bases fusing along their inner edges to

the back of the foot and projecting forward, 3-veined with a strong mid vein. Petals 4.5 x 1.5 mm, linear-oblong, obtuse, 3-veined; Lip 5.25 x 4.25 mm, apple green, long-clawed, limb suborbicular, serrulate, side lobes small, midlobe rounded, with a series of papillae or fringes, both at and along the margins. Disc with a broad depressed fleshy truncate ridge, terminating in a 2-toothed callus. Column 2 mm high, 3-lobed, mid one falcate, inward at the top, base continued into a foot, 4 mm long, inner edges of lateral sepals fusing with it. Anther terminal, 2-loculed, 1 mm across, Pollinia 4, waxy, cohering in two pairs to small gland, each pollinium oblong or club shaped, 0.5 mm long. Ovary with pedicel 4.5 mm long.

Distr.: Endemic to India; throughout Kerala.

Fl. & Fr.: Jul.-Aug.

Occurrence & Specimens studied: **Pathanamthitta Dist.**: Pamba, *Deb 30341* (MH). **Idukki Dist.**: Anamalai, *Joseph 10096* (CAL). **Palakkad Dist.**: Silent Valley, *Sathish Kumar 10771* (CALI); *Ibid.*, *AESK 19114* Ayyappan Koil, *Vajravelu 49712* (MH); Aruvanpara, *Sathish Kumar 10711* (CALI). **Wayanad Dist.**: Chandanathodu, *Ramachandran 58297* (MH); *Ibid.*, *Ellis 26374* (MH).

Dendrobium nutantiflorum Hawkes & Heller, *Lloydia* 20 (2): 122. 1957. *D. nutans* Lindl., *Gen. Sp. Orch.* 90. 1830, *non* Presl, 1827; Hook.f., *Fl. Brit. India* 5:735.1888; Fischer in Gamble, *Fl. Pres. Madras* 1416. 1928; Abraham & Vatsala, *Intr. Orch.* 363. 1981; Jayaw. in Dassan. & Fosb., *Rev. Handb. Fl. Ceylon* 2: 82. 1981; Manilal, *Fl. Silent Valley* 278.1988; Mohanan & Henry, *Fl. Thiruvananthapuram* 453.1994.

Slender epiphytes. Stems 10-20 cm long, swollen towards the middle, slender towards the base, grooved. Leaves 2-4 x 0.5-0.8 cm broad, narrowly lanceolate, distichous, alternate, confined to the apical portion of the stem, dark green. Flowers greenish white, 2 cm across, in short leaf-opposed, 2-4-flowered racemes. Peduncle very short. Bracts 2.2 x 2 mm, triangular-ovate, acute, 1-veined. Lateral sepals obliquely oblong, 16 x 5 mm, obtuse, 5-veined, adnate to the foot of the column. Petals 14 x 4 mm, oblong-lanceolate, acute, crenulate. Lip 20 x 6 mm, obovate-lanceolate; lateral lobes small, obtuse, crenulate; midlobe ovate, undulate, subacute with 3-prominent ridges on the disc. Mentum 5 mm long. Column 4 mm high, truncate, continued into a foot. Anther 2-loculed. Pollinia 4. Ovary with pedicel 2.3 cm long. Fruit a fusiform smooth capsule.

Distr.: South India and Sri Lanka

Fl. & Fr.: May-Nov.

Note: Seen in areas with elevation between 900-1500 m.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.**: Ponmudi, *Sathish Kumar* 1690; *Ibid.*, *AESK* 7249, 7516; Lower sanatorium, *M. Mohanan* 52519 (MH); Chemunji, s. col. 959 (CAL); *Ibid.*, *N. Mohanan* 11736. **Kollam Dist.**: Pandimotta, *AESK* 15721. **Idukki Dist.**: Rajamalai, *Sathish Kumar* 4671; *Ibid.*, *AESK* 42118; *Ibid.*, *Gangaprasad* 15115. **Palakkad Dist.**: Silent Valley, North Walakkad, *Sathish Kumar* 11543 (CALI).

Dendrobium ovatum (L.) Kranz in Engl., *Pflanzenr.* 45: 71. 1910; Fischer in Gamble, *Fl. Pres. Madras* 1416. 1928; Abraham & Vatsala, *Intr. Orch.* 353. 1981; Vajravelu, *Fl. Palghat* 474. 1990; Sasi. & Sivar., *Flow. Pl. Thrissur For.* 439. 1996. Sivar. & P.

Mathew, Fl. Nilambur 685. 1997. *Epidendrum ovatum* L., Sp. Pl. 2: 952. 1753. *Cymbidium ovatum* Willd., Sp. Pl. 4: 101. 1805. *Dendrobium chlorops* Lindl., Bot. Reg. Misc. 44.1844; Hook f., Fl. Brit. India 5: 719. 1890. *D. barbatulum* Wt., Ic. t. 910.1845, *non* Lindl., 1830.

Tufted epiphytes. Stems elongated, up to 30 cm long, terete, pale muddy-brown, longitudinally ribbed, leafless during flowering. Leaves 6-7 x 2-2.5 cm, membranous, oblong-lanceolate. Racemes terminal, few-flowered, 5-10 cm long. Flowers creamy white, 1.5 cm across. Sepals 1 x 0.4 cm, ovate-oblong. Petals 1 x 0.8 cm, obovate, mucronate at apex. Lip shortly clawed, 3-lobed; lateral lobes erect embracing over the column; midlobe quadrate-oblong, truncate, pubescent, with greenish hairs. Column 10 m long, with a long foot. Fruits 1.8 cm long, oblong-ovoid.

Distr.: South -West India; throughout in Kerala

Fl. & Fr.: Dec.-Jun.

Note: Epiphytic on tree trunks exposed to sunlight; from the lower elevations up to 900 m.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.**: Ponnudi, Sathish Kumar 556; Athirumala, Sathish Kumar 1316; *Ibid.*, N. Mohanan 8979; Bonaccord, N. Mohanan 1185, 11285; Uthipanchi, N. Mohanan 9604. **Kollam Dist.**: Plapally, C. N. Mohanan 61200 (MH); Konni, Bourdillon 474 (MH); Thekuthodu, C. N. Mohanan 54984 (MH); Cheenikala, AESK 44224. **Pathanamthitta Dist.**: Chalakayam, C. N. Mohanan 59637 (MH); Thekkuthodu, C. N. Mohanan 54984 (CAL); Kottampara, AESK 15613. **Idukki Dist.**: Walara, Ramamurthy 72988 (CAL, MH); *Ibid* AESK 15022, 42125; Peerumedu,

AESK 25493; Cheruthoni, *Raju 71263 (CAL)*; Vallakadavu, *AESK 37687*. **Kottayam Dist.:** Erattupettah, *AESK 13289*. **Ernakulam Dist.:** Iringole Kavu, *Sarajini Menon 20604*. **Thrissur Dist.:** Chikkali, *Ramamurthy 72901 (MH)*; On the way to Poringalkuthu, *Sebastine 26699 (MH)*. **Palakkad Dist.:** Mukkali, *Vajravelu 33350 (MH)*. **Wayanad Dist.:** Thirunelli, *Sathish Kumar 3677*; Ananthodu, *Barber 2514 (MH)*; Begur, *Raju 62682*; Boy's Town, *AESK 44224*. **Kannur Dist.:** Payyannur, *Ansari 69962 (MH)*.

Dendrobium panduratum Lindl., J. Linn. Soc. Bot. 3 : 19. 1859; Hook.f., Fl. Brit. India 5: 717. 1890; Jayaw. in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 2 : 76. 1981; Manilal, Fl. Silent Valley 278. 1988.

Epiphytic or lithophytic herbs. Stems 5-10 cm long, ovoid-subglobose, plurinodal, superposed. Leaves distichous from the upper nodes, sessile, 2.5-3.8 cm long, linear oblong or lanceolate, spreading, acute. Racemes 2.5-7.5 cm long, terminal, 2-6-flowered. Flowers 1.2 cm long, white tinge with pink. Bracts minute, ovate. Dorsal sepal oblong-lanceolate, acuminate, 3-veined. Lateral sepals falcately ovate, lanceolate, acuminate, 5-veined. Petals oblanceolate, acute, 3-veined. Lip panduriform; lateral lobes small, acute; midlobe broadly ovate-orbicular, crenulate, 3-veined. Disc 5-veined. Mentum stout, spur-like, straight or slightly incurved, 2-lobed at the tip. Column short, produced into a foot. Anther terminal, 2-loculed; Pollinia 4. Ovary with pedicel 3 mm long.

Distr.: Kerala and Sri Lanka.

Fl. & Fr.: Mar.-Jul.

Occurrence & Specimen studied: Palakkad Dist.: Silent Valley, Chembotti, Sathish Kumar 10576 (CALI).

Dendrobium peguanum Lindl., J. Linn. Soc. 3 : 19. 1859. *D. pygmaeum* Lindl., Gen. Sp. Orch. 85. 1830. Bot. Mag. 30: misc. 62. 1844, non J.E. Smith; Hook.f., Fl. Brit. India 5 : 717. 1890.

Small epiphytic herbs. Pseudobulbs 1-6 cm long, ovoid-conical to oblong-ovoid, yellowish green. Leaves 2.5-5 x 0.6-2 cm, elliptic oblong, subacute or obtuse. Inflorescence up to 7 cm long, terminal racemes, with a few sheathing bracts, 1-many-flowered. Bracts 5 mm long, narrowly linear-lanceolate, 1-veined, acuminate. Flowers white, scented. Sepals 8 x 2.5 mm, oblong, 3-5-veined, acute. Petals 8 mm long, spatulate, gland-dotted, 3-veined, acute. Lip 8 mm long, narrowed into a long tail below, joining with the foot; 3-lobed; side lobes 5 x 1.5 mm, broadly triangular, obtuse with raised veins; midlobe 2-2.5 x 2 mm, orbicular to triangular, margins crenulate, acute. Disc with a distinctly emarginate callus. Column 3 x 2 mm, narrowly oblong with a column foot; mentum present. Pollinia golden brown, 1 mm long. Fruits 7 x 4-5 mm, ribbed capsules.

Distr.: India, Thailand, Nepal and Myanmar.

Fl. & Fr.: Sept.-Feb.

Occurrence & Specimen studied: Wayanad Dist.: Thirunelly, Balakrishnan 42654 (MH).

Note : Remarkable species for its long falcate, spathulate petals and characteristic lip. Seen between 900-1000 m elevations.

Dendrobium wightii Hawkes & Heller, *Orquidea* 24: 16. 1962; Abraham & Vatsala, *Intr. Orch.* 351. 1981; Ramachandran & Nair, *Fl. Cannanore* 453. 1988; Mohanan & Henry, *Fl. Thiruvananthapuram* 453. 1994. *D. graminifolium* Wight, *l.c.t.* 1649. 1851, non Willd., 1805; Hook.f., *Fl. Brit. India* 5: 718. 1888; Fischer in Gamble, *Fl. Pres. Madras* 1415. 1928.

Tufted epiphytes or lithophytes, with non pseudobulbous erect stems, up to 16 cm long. Leaves distichous, sessile, clasping the stem, 1-8 x 0.3-0.8 cm, linear-lanceolate, acuminate, thinly coriaceous and spreading. Flowers 2 cm across, rose in colour, in terminal, erect, laxly 2-8-flowered racemes. Racemes up to 6 cm long. Bracts 3 mm, ovate. Dorsal sepal 1 x 0.25 cm, oblong-lanceolate, acuminate, deep rose in colour, 3-veined. Lateral sepals 1.4 x 0.3 cm, falcately ovate, lanceolate, acuminate, 5-veined, united with mentum. Petals linear, acute-acuminate, 1-veined, small papillate projections on the entire margin. Lip with small, short, spreading side lobes; midlobe 1.3 x 0.7 cm, oblong, flat crenate, with a papillose conical callus. Mentum stout, spur like, straight. Column very short. Anther terminal, 2-loculed. Pollinia 4, waxy. Ovary with pedicel 1 cm long. Fruits 7 mm long.

Distr.: Endemic to Kerala and Tamil Nadu.

Fl. & Fr.: Jun.-Sept.

Note: Though it is reported as an epiphyte, in Kerala it is seen growing on drippy rocks in the high elevations. Flowers rose or light pink, and star-shaped. Stems are uniformly pink to purple in colour.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Bonaccord, *AESK* 22389; Ponmudi, *Sathish Kumar* 595, 704; *Ibid.*, *AESK* 15662, 22389, 29706; Dharbakulam, *N. C. Nair* 51097 (MH); *M. Mohanan* 69233 (MH); Attayar, *Sathish Kumar* 1304; Way to Agasthyargudam, *M. Mohanan* 59318 (MH); Forests near Bonaccord, *Joseph* 44499 (MH); Agastyamala, *AESK* 7295, 13223; Uthipanchi, *AESK* 5218. **Kollam Dist.:** Palaruvi, *N. C. Nair* 50937 (CAL). **Idukki Dist.:** Kulamavu, *C. N. Mohanan* 79921 (MH). **Kannur Dist.:** Chandanathodu, *Ramachandran* 65310 (MH).

DIPLOCENTRUM Lindley

Bot. Reg. 18: Sub. t. 1522. 1832.

Epiphytes. Stem short, sheathed. Leaves distichous, linear, sub-terete, fleshy. Flowers on lateral, elongated, sub-spicate, racemose panicles. Sepals and petals subequal, free; the lateral sepals slightly larger. Lip sessile, spreading, entire, basally 2-spurred. Column short, 2-auricled. Foot 0. Pollinia 2, globose, 2-partite.

Distributed in India and Sri Lanka. Two species are found in India and both are present in Kerala.

Key to the species

1. Leaves 10-15 cm long, narrow; inflorescence much branched **D. recurvum**
1. Leaves short, *ca.* 6 cm long, broad; inflorescence less branched **D. congestum**

Diplozentrum congestum Wight, Ic. t. 1682. 1851; Hook. f., Fl. Brit. India 6: 78. 1890; Fischer in Gamble, Fl. Pres. Madras 1449, 1928.

Short epiphytic herbs. Leaves 8 x 0.7 cm, unequally and obtusely 2-lobed at apex. Racemes 15 cm long, sparsely branched, pendulous. Flowers 6 mm across. Sepals and petals dull yellow, 3-4 mm long. Lip white with purple dots. Spurs 1.5 mm long, slightly divergent.

Fl. & Fr.: Apr.-May.

Distr.: Endemic to Western Ghats.

Note: A very rare plant seen in deciduous and evergreen forests.

Occurrence & Specimen studied: **Thrissur Dist.:** Vellanimala, *Sasidharan 5064* (KFRI).

Diplozentrum recurvum Lindl., Bot. Reg. 18: sub. t. 1522. 1832; Hook. f., Fl. Brit. India 6: 78. 1890; Wight, Ic. t. 1680. 1851; Fischer in Gamble, Fl. Pres. Madras 1449. 1928; Abraham & Vatsala, Intr. Orch. 469. 1981; Jayaw. in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 2: 225. 1981.

Epiphytic herbs with very long, flattened roots. Stem short, 5-15 cm long. Leaves 10-15 x 0.6-0.8 cm, linear, recurved, keeled, unequally and obtusely bifid at the apex. Panicles branched, long spreading, decurved, many-flowered. Flowers 4-6 mm across, pink. Bracts minute, acute, deciduous. Dorsal sepals oblong, obtuse. Lateral sepals larger, falcately and broadly oblong. Petals similar to the dorsal sepal, 1-veined. Lip ovate-oblong, longer than petals, entire, 2-spurred; lateral lobes obscure. Disc fleshy with a median ridge. Spur collateral, short, conical, acute, incurved. Column very stout, clavate. Auricles incurved. Foot 0. Anther terminal; pollinia 2. Fruit a clavate, strongly ribbed capsule.

Chrom. No.: 2n = 38 (Vatsala, 1964).

Fl. & Fr.: May-Oct.

Distr.: South India, Sri Lanka

Note: Found at elevations between 1000-1600m.

Occurrence & Specimens studied: **Idukki Dist.:** Devikulam, *Sathish Kumar 4674*; Bodimettu, *Sathish Kumar s.n.*; *Ibid.*, *Radhakrishnan 16236* (MH). Chinnakanal near Devikulam, *Sebastine 18349* (MH). Panniar Valley, *s. coll. 1381* (CAL). **Wayanad Dist.:** Mananthavady, *s. coll., s.n.* (Acc. No. 51078 - MH).

ERIA Lindley

Bot. Reg. 11: t. 904. 1825, *nom. cons.*

Epiphytes. Pseudobulbs ovoid, elongated or discoid. Leaves 2-to many at the apex of pseudobulbs. Flowers solitary or many in lateral or terminal racemes. Dorsal sepal and

petals similar, free. Lateral sepals connate with the foot forming a short mentum. Lip sessile on the top of the foot, entire or 3-lobed. Column free with elongated foot. Pollinia 8, in two groups.

About 900 species distributed in India, Sri Lanka, Burma, Malaya, Thailand, Cambodia, China, Japan, Java, Sumatra, Borneo, Celebes, New Guinea, Philippine Islands, Australia and New Zealand. In India the genus is represented by 53 species out of which 21 are endemic (Sathish Kumar & Manilal, 1994). Twelve species are recorded from Kerala.

Key to the species

1. Leafless when in flower **E. exilis**
1. Leafy when in flower 2
2. Stems reduced to small, discoid, button-like or globular pseudobulbs 3
2. Stems elongated, plurinodal pseudobulbs 9
3. Flowers solitary; lip 3-lobed **E. reticosa**
3. Flowers 2-many ; lip unlobed 4
4. Inflorescence 2-flowered 5
4. Inflorescence 4-12-flowered 6
5. Leaves ovate; lip retuse at apex **E. muscicola** var. **brevilinguis**
5. Leaves oblanceolate-oblong; lip obtuse at apex **E. nana**
6. Flowers secund or sub-secund 7
6. Flowers not secund, but flexuous 8

7. Lip sub-orbicular; ovary with pedicel brown pubescent **E. albiflora**
7. Lip ovate-lanceolate; ovary with pedicel glabrous **E. dalzellii**
8. Lip obtuse at apex with short hairs underneath towards distal half..... **E. tiagii**
8. Lip acute at apex, glabrous underneath..... **E. microchilos**
9. Stems narrowed at base, clavate upwards with 2 leaves; inflorescence terminal, 1-2-flowered **10**
9. Stems uniformly thick with 3-5 leaves; inflorescence axillary, many-flowered **11**
10. Disc of lip with a single ridge; underneath with 2-brown markings.....
..... **E. pseudoclavicaulis**
10. Disc or lip with 2 ridges; underneath without brown markings **E. pauciflora**
11. Sepals hairy outside; lip 3-veined **E. polystachya**
11. Sepals glabrous; lip 5-veined **E. mysorensis**

Eria albiflora Rolfe, Kew Bull. 1893: 170. 1893; Fischer in Gamble, Fl. Pres. Madras 1425. 1928; Vajravelu, Fl. Palghat 477. 1990.

Epiphytic herbs. Pseudobulbs aggregate, globose-ovoid, 4-12 mm across. Roots long, slender. Leaves 2-6 x 0.7-1.3 cm, elliptic-lanceolate, abruptly narrowed into a short sheathing base, acute at tip. Racemes 5-10 cm long, terminal. Flowers white, many, lax, scattered, distinctly pedicellate. Bracts 3 x 1.5 mm, cymbiform, persistent, longer than the pedicel. Perianths sparsely gland-dotted. Dorsal sepal 3.5-4 x 1-1.5 cm, oblong-lanceolate, obtuse, 3-nerved. Lateral sepals 4 x 2 mm, obliquely lanceolate-ovate, obtuse, 3-nerved. Lateral petals 2.5-3.5 x 1 mm, ligulate-ovate, obtuse, 3-nerved. Lip 2.5 x 1.2 mm, sub-

orbicular, conduplicate, beaked at the tip, attached to the foot of the column, sparsely gland-dotted. Ovary with pedicel 5-6 mm, brown pubescent.

Fl. & Fr.: Jul. -Aug.

Distr.: Endemic to South India (Kerala, Tamil Nadu and Karnataka).

Occurrence & Specimens studied: **Palakkad Dist.**: Silent Valley, *Vajravelu* 27550 (CAL, MH). **Wayanad Dist.**: Wayanad, *Proudlock* 594 (CAL).

Eria dalzellii (Hook. ex Dalz.) Lindl., J. Linn. Soc. Bot. 3: 47. 1858 (excl. description); Hook. f., Fl. Brit. India 5: 789. 1890; Fischer in Gamble, Fl. Pres. Madras 1425. 1928; Manilal, Fl. Silent Valley 279. 1988; Ramachandran & Nair, Fl. Cannanore 454. 1988; Vajravelu, Fl. Palghat 477. 1990. *Dendrobium dalzellii* Hook. ex Dalz., Hooker's J. Bot. Kew Gard. Misc. 4: 292. 1852. *D. filiforme* Wight, Ic. 1642. 1851, in part.

Epiphytic or lithophytic herbs. Pseudobulbs discoid, 8-10 mm across, clustered; fresh shoots lateral. Leaves 1-6.5 x 0.5-1 cm, linear oblong or obovate, 2, narrowed into a sheathing base, mucronate at tip. Racemes 3-9 cm long, erect. Peduncles 3 cm long, usually slightly curved. Flowers pale cream yellow, faintly scented. Bracts 3-6 x 5-1 mm, lanceolate, acuminate, erect, curved at apex. Sepals and petals 6 x 1.5-3 cm, triangular ovate to lanceolate, acute; margin entire, hyaline. Mentum 5 mm long, rounded, pale orange-yellow. Lateral petals slightly narrower than sepals and rounded at base. Lip 3-4 x 1.5 mm, ovate-lanceolate, falcate, concave in base half, straight upwards, minutely

papillate, panduriform, margins incurved on the middle. Disc with 2 median yellow ridges. Column 1 mm long with 2 mm long foot. Ovary with pedicel 2 mm long. Fruit 5 mm long, ellipsoid capsule.

Fl. & Fr.: Jul-Nov.

Distr.: Endemic to South India.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.**: Ponmudi, *AESK 5462* ; *Ibid.*, *N. C. Nair 49853* (CAL). **Idukki Dist.**: Painavu, *Vivekananthan 50467* (CAL); **Palakkad Dist.**: Aruvanpara, Silent Valley, *Sathish Kumar 10716* (CALI); Silent Valley, *Ansari 51493* (MH); Way to hanging bridge, *N. C. Nair 64304* (VAL); Below Kunthipuzha, *Vajravelu 48868* (CAL). **Wayanad Dist.**: Bhrahmagiri, *Ramachandran 68218* (MH). “**Malabar**”: *Stocks, Lawson s.n.* (CAL, *Acc. No. 50292* - MH).

Eria exilis Hook. f., *Fl. Brit. India* 5: 788. 1890; Fischer in Gamble, *Fl. Pres. Madras* 1425. 1928. *Porpax chandrasekharanii* Bhargavan & Mohanan *Curr. Sci.* 51 (20): 90. 1982; Manilal, *Fl. Silent Valley* 301. 1988; Vajravelu, *Fl. Palghat* 491. 1990. *Eria chandrasekharanii* (Bhargavan & Mohanan) Sathish Kumar & Manilal, *Taxon* 35: 720. 1986.

Small epiphytic herbs. Pseudobulbs 5 mm across, depressed, crowded, finely reticulate. Leaf shoots develop laterally. Leaves deciduous before flowering. Scape 2 cm long, capillary with imbricating, membranous bract-like sheaths. Bract 1 mm, ovate, apiculate. Flowers 3-6, subsessile, dull-white. Sepals 2 mm long, united almost near the

saccate base, glabrous, apex sub-acute, slightly mucronate. Petals shorter than sepals, 1 mm long, ovate-elliptic, acute-acuminate. Lip 1 mm long, falcate, attached to the incurved foot of the column by a very short claw, truncate to obtusely acute at apex. Column short, produced below into a long foot. Stelidia hook-like. Operculum 2-celled, yellow. Pollinia 8. Fruits 5 mm long, broadly ovoid capsule.

Fl. & Fr.: Jan. -May

Distr.: Endemic to South India.

Note: This is the smallest orchid in Kerala both in plant and flower size.

Occurrence & Specimens studied: **Palakkad Dist.:** Silent Valley, Valiyaparathodu, Sathish Kumar 10782 (CALI); Valiyaparathodu, Bhargavan 65795 (CAL, MH).

Wayanad Dist.: Wythiri, Sivadasan s.n. (CALI).

Eria microchilos (Dalz.) Lindl., J. Linn. Soc. 3: 47. 1858. *Dendrobium microchilos* Dalz., Hooker's J. Bot. 3: 345. 1851.

Epiphytic herbs. Pseudobulbs 4-10 mm across, discoid, aggregated. Leaves 1.5-8 x 0.2-0.6 cm, oblong lanceolate to narrowly linear-lanceolate. Racemes 2.5-8 cm long, terminal. Bracts 3 mm long, lanceolate, acute. Flowers yellowish white. Sepals 8 x 1.5 mm, lanceolate, 3-veined, acuminate. Lateral sepals joining with the column-foot to form the mentum. Petals 7 x 1.5 mm, lanceolate, 3-veined, acuminate. Lip 4 mm long, narrowly oblong, lanceolate; basal portion with ridges, crenulate and acute apex. Column-foot 1.5 mm, curved. Fruits 3 mm long, globose capsules.

Fl. & Fr.: Aug. -Nov.

Distr.: Endemic to South West India.

Note: It is almost similar to *E. tiagii* but the lip is smooth.

Occurrence & Specimens studied: **Pathanamthitta Dist.:** Sabarimala, *Sharma 42021* (MH). **Idukki Dist.:** Painavu-Kulamavu Road, *Raju 71225* (MH); Painavu *Vivekananthan 50467* (MH). **Kannur Dist.:** Kuthuparambu, *s. coll. 9262* (MH).

Eria muscicola (Lindl.) Lindl. var. ***brevilinguis*** Joseph & Chandrasekharan Bull. Bot. Surv. India 15(3-4): 267. 1973. *Dendrobium muscicola* Lindl. in Wall., Cat. 2017. 1829.

Tiny bulbous epiphytic herbs. Pseudobulbs 3-9 x 2-6 mm, compressed, ovoid-oblong. Leaves 5-15 x 3-8 mm, ovate, sheathing at base, cuspidate at apex. Inflorescence up to 3 cm, 1-2-flowered. Bracts 5 x 2.5 mm, lanceolate, acuminate. Flowers creamy white, secund. Dorsal sepal 7.5-12 x 1.5-2 mm, narrowly lanceolate, 3-nerved, acuminate. Lateral sepals 7.5-11 x 2.5-3.5 mm, falcately lanceolate, joining with the foot forming mentum. Petals 6-9 x 1.5-2 mm, lanceolate, 3-veined, acuminate. Lip 4 x 2 mm, obovate, finely puberulous on abaxial surface, crumpled along margin, retuse at apex. Disc with a median oblong callus at base. Column short, 3 mm long. Pollinia 8, pyriform.

Fl. & Fr.: Sept. -Oct.

Distr.: Endemic to Kerala.

Note: Seen as epiphytes on tree branches at higher elevations (1700-1900 m).

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Pongalappara, *AESK* 4455; *Ibid.*, Sathish Kumar 1347; Western slopes of Agastyamala, *Joseph* 44630 (CAL, MH); Agastyamala, *AESK* 7431; *Ibid.*, N. Mohanan 4286, 8496.

Eria mysorensis Lindl., J. Linn. Soc. Bot. 3: 54. 1858; Abraham & Vatsala, *Intr. Orch.* 380. 1981; Manilal, *Fl. Silent Valley* 279. 1988; Sasi. & Sivar., *Flow. Pl. Thrissur For.* 440. 1996. *Eria pubescens* Wight, *lc. t.* 1634. 1851, non Lindley, 1825; Hook. f., *Fl. Brit. India* 5: 793. 1890; Fischer in Gamble, *Fl. Pres. Madras* 1425. 1928.

Epiphytic herbs. Pseudobulbs 3 x 1.2 cm, ovoid, compressed, reddish brown, clothed with sheathing scales, 3-nodded, leafy when in flower. Leaves 15 x 3 cm, oblong lanceolate, mucronate. Racemes 8-14 cm long, axillary, drooping. Flowers straw coloured, fragrant. Bract 9-13 x 2-3 mm, broadly ovate lanceolate. Dorsal sepal 9 x 2 mm, lanceolate, acute. Lateral sepals 9 x 3 mm, ovate lanceolate, acute. Petals 7.5 x 3 mm, ovate lanceolate. Lip 7.5 x 3 mm, subcordate at base, sub pandurate, acute, orange yellow with purple at base. Disc with 2 thickened ridges. Column 4 mm long, straight with a foot, 3 mm long. Ovary with pedicel 1 cm long.

Fl. & Fr.: Aug. -Oct.

Distr.: Endemic to South West India.

Note: A fairly common species found throughout Kerala in higher elevations. It is related to *Eria polystachya* A. Rich., but differs in having an oblong, sub-pandurate lip with disc having 5-7 thickened rugose nerves.

Occurrence & Specimens studied: Thiruvananthapuram Dist.: Athirumala, *AESK* 1211, 7345, 13248; *Ibid.*, *Sathish Kumar* 1934; Pongalappara, *Sathish Kumar* 1334; Agastyamala, *Joseph* 44572; Ponmudi, *AESK* 7242, 29707; Chemunji, *AESK* 21421. **Idukki Dist.:** Walara, *AESK* 42136; Devikulam, *Sathish Kumar* 1934; Vandenmedu, *Vivekananthan* 50524 (CAL); Devikulam, *Meebold* 13965 (CAL). **Palakkad Dist.:** Nelliampathy, *AESK* 15784; Aruvanpara, *Sathish Kumar* 10591 (MH).

Eria nana A. Rich., *Ann. Sci. Nat. Bot.* 15 (2): 19. 1841; Hook. f., *Fl. Brit. India* 5: 789. 1890; Fischer in Gamble, *Fl. Pres. Madras* 1425. 1928; Abraham & Vatsala, *Intr. Orch.* 377. 1981. *Dendrobium filiforme* Wight, *lc.* 1642. 1851, p.p. *Eria muscicola* (Lindl.) Lindl., var. *ponmudiana* Mohanan & Henry, *J. Econ. Tax. Bot.* 8 (2): 425. 1986 & *Fl. Thiruvananthapuram* 455. 1994.

Epiphytic or lithophytic herbs. Pseudobulbs 5-10 mm across, compressed, flat, with reticulate network. Leaves 7-5 x 2-3 mm, 2 or 3 per bulb, oblanceolate-oblong, sheathing at base, minutely ciliate on margins, acute with a mucro. Racemes 3-8 cm, 2-flowered, terminal. Bracts 2.5 x 1.5 mm, ovate, cymbiform, acuminate. Flowers creamy white, secund. Dorsal sepal 5-6 x 1.5-1.6 mm, narrowly lanceolate, gland-dotted 3-veined, short ciliate on margin, acuminate. Lateral sepals 5-6 x 1.5-3.2 mm, falcately lanceolate, 3-veined, attached to the column-foot, ciliate on margin. Petals 5-6 x 1 mm, oblong gland-dotted, 3-veined, ciliate on margin. Lip 3-4.2 x 1-1.2 mm, oblong, glandular hairy beneath, gland-dotted, 3-veined. Disc with 2-linear calli at base, rounded or retuse at apex. Column 1 mm long with 2.5 mm long, curved foot. Pollinia 8.

Fl. & Fr.: Aug. -Sept.

Distr.: Endemic to South India.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.**: Chemunji, *AESK* 13215; Agastyamala, *AESK* 13237; *Ibid.*, Gangaprasad 18443; *Ibid.*, Henry 68803 (MH); Ponmudi, *Sathish Kumar* 536; Upper Sanatorium, *Sathish Kumar* 36973; Mohanan 69213 (CAL); Dharmakulam, Ponmudi, *N. C. Nair* 49853 (CAL, MH); Pongalappara, *N. Mohanan* 10073. **Idukki Dist.**: Umaiymala, *Shetty* 26485 (MH); Devikolam, *s. coll.* 13530 (CAL). Anamala Hills, *Barber* 4029 (MH)

Eria pauciflora Wight, *lc. t.* 1636. 1851; Hook. f., *Fl. Brit. India* 5: 799. 1890; Fischer in Gamble, *Fl. Pres. Madras* 1425. 1928; Abraham & Vatsala, *Intr. Orch.* 377. 1981; Manilal, *Fl. Silent Valley* 280. 1988.

Epiphytic herbs. Stems 3.5-15 cm long, clavate with long slender stalk; apical node swollen, bearing 2 leaves. Leaves 4-7.6 x 1-1.4 cm, oblong, narrow, articulate at base, obtuse. Inflorescence 1-3-flowered, terminal. Bracts 5 x 2 mm, ovate-lanceolate, acute. Flowers white, long-pedicelled. Dorsal sepal 8 x 3 mm, lanceolate, 5-veined, gland-dotted, obtuse. Lateral sepals 9 x 6 mm, obliquely lanceolate, broad at base, 5-veined, gland-dotted, fused with column forming mentum. Petals 8.5 x 2.5 mm, oblong-lanceolate, 5-veined, gland-dotted, obtuse. Lip 8 mm long, cuneately oblong, truncate, obscurely 3-lobed. Disc with 2 calli at base, yellow in the center. Column short. Ovary with pedicel 1.2-1.4 cm long.

Fl. & Fr.: May-Jun.

Distr.: Endemic to Kerala and Tamil Nadu.

Note: Seen as epiphytes on tree trunks near the streams at higher elevations.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Agastyamala, AESK 13228. **Idukki Dist.:** Guderale, AESK 7581; *Ibid.*, Gangaprasad 12260; Devikulam, AESK 42146; *Ibid.*, Sathish Kumar 4681; Umaiyyamala, Shetty 26476 (MH); Santhanpara, AESK 29739; Vandenmedu, William D'cruz 15116 **Palakkad Dist.:** Silent Valley, Sathish Kumar 3534; Aruvanpara, Sathish Kumar 10591 (CALI).

Eria polystachya A. Rich., Ann. Sci. Nat. (2) 11: 20, t. 9. 1841; Wight, Ic. t. 1635. 1852; Hook. f., Fl. Brit. India 5: 792. 1888; Fischer in Gamble, Fl. Pres. Madras 1425. 1928; Abraham & Vatsala, Intr. Orch. 382. 1981; Mohanan & Henry, Fl. Thiruvananthapuram 465. 1994.

Tufted epiphytes with erect, pseudobulbous stems on a crowded root stock. Pseudobulbs, 3.5-6 x 1.2-1.8 cm, elongate, cylindric, consisting of 3-5 scaly sheaths; internodes short, covered with brown papery sheath. Leaves 3-6, forming a cluster at the top of the pseudobulb, 3-9 x 1.3-2 cm, oblanceolate-elliptic with a prominent mid-vein and 8 parallel veins. Flowers 0.3 cm across, creamy yellow, in many-flowered, arching, simple racemes. Racemes up to 6 cm long, arising from the pseudobulb. Pedicel about 5 mm long. Floral bract 5.5 x 2.5 mm, elliptic, acute, 3-veined. Dorsal sepal 6.5 x 1.75 mm, linear, obtuse, 3-veined. Lateral sepals 6 x 2 mm, falcately and obliquely oblong, obtuse or sub-acute, 3-veined, adnate to the foot of the column and along with it forming a saccate mentum, pilose. Petals 5.5 x 2 mm oblanceolate, obtuse, 3-veined. Lip 3.25 x 1.5 mm,

oblong, slightly constricted in the middle and with two calli on the disc with reddish tinge, acute or obtuse, 3-veined; epichile bright yellow. Column 1 mm high. Anther terminal, 4-loculed; pollinia 8, in two groups of 4, disc-shaped, obovate. Ovary with pedicel 6 mm long.

Fl. & Fr.: Jun. -Oct.

Distr.: Endemic to South India.

Occurrence & Specimens studied: **Idukki Dist.:** Munnar, *Sathish Kumar 567*; Kuttikanum, *Vivekananthan 21394 (MH)*; *Ibid.*, *AESK 21421*; Anamalai, *Chandrabose 57795 (CAL)*; Vandenmedu, *Vivekananthan 50524 (CAL)*.

Eria pseudoclavicaulis Blatt., J. Bombay Nat. Hist. Soc. 32: 519. 1928; Fischer in Gamble, Fl. Pres. Madras 1426. 1928; Abraham & Vatsala, Intr. Orch. 380. 1981.

Tufted epiphytic herbs. Stems 20 cm long, apical node usually swollen, oblique. Leaves 17 x 4.5 cm, oblong-lanceolate, 2-3 on the apex of the terminal node. Inflorescence terminal, single flowered. Peduncle up to 2 cm with 2 brownish green foliaceous bracts. Bracts ovate-oblong, sub-amplexicaul, cucullate, acute. Flowers white with pink-tinged lip. Dorsal sepal 15-8 x 6-7 mm, elliptic-oblong, obtuse. Lateral sepals 15-21 x 9 mm, very broad at base, ovate, joining to the foot forming a mentum, acute. Petals 15-20 x 5-6 mm, falcately oblong, sub-obtuse. Mentum 8 mm long. Lip 1 cm, white, 3-lobed; margin pale pink, broadly ovate; side lobes sub-oblong; margin wavy, bent inwards; midlobe

triangular, margin crisped, white puberulous. Disc white, hairy below. Callus 2-toothed. Column 7 mm long. Ovary with pedicel brown tomentose.

Fl. & Fr.: Jun. -Jul.

Distr.: Endemic to Kerala, Tamil Nadu.

Note: Forming large tufts on the forkings of the tree branches in dense shady places.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Agastyamala, *Sathish Kumar* 3559, 3564; *Ibid.*, *AESK* 7334. **Idukki Dist.:** Guderale, *AESK* 7334; Neriyaamangalam, *Gangaprasad* 12248; Munnar, *Gangaprasad* 12363; Kanthallur, *Sathish Kumar* 4690.

***Eria reticosa* Wight**, *Ic. t.* 1637. 1851; Hook. f., *Fl. Brit. India* 5: 787. 1890; Abraham & Vatsala, *Intr. Orch.* 373. 1981; Manilal, *Fl. Silent Valley* 280. 1988; Vajravelu, *Fl. Palghat* 477. 1990; Mohanan & Henry, *Fl. Thiruvananthapuram* 456. 1994; Sasi. & Sivar., *Flow. Pl. Thrissur For.* 440. 1996. *Eria bracteata auct., non* Lindl. 1859; . Fischer in Gamble, *Fl. Pres. Madras* 1425. 1928.

Dwarf epiphytes. Pseudobulbs 10 mm across, discoid, green, with reticulate sheath of fibres. Roots filiform. Leaves 2.2-2.7 x 0.8-0.9 cm, 2 per pseudobulb, elliptic-ob lanceolate, acute or apiculate, minutely ciliate at margin, 15-17 veined, pale green. Flowers 2 cm across, solitary, white, pedicelled. Pedicel 1.9 cm long, slender. Floral bract 6 mm broad, large, cucullate, apiculate, margin minutely ciliate, 5-veined. Dorsal sepal 12 x 5.5 mm, oblong-lanceolate, rounded, to apiculate, 5-nerved, the lateral veins branching. Lateral sepal 14 x 11 mm, falcate, acute, adnate, to the curved foot, 5 nerved, the lateral

veins branching. Petals 12 x 5 mm, elliptic-ob lanceolate, obtuse, 3-veined, the lateral veins branching. Lip 14 x 8 mm, oblong, entire, 3-lobed, 3-veined, the inner pair of the lateral veins carrying a pair of crenulated ridges ventrally along the disc to the mid lobe. Lateral lobes small.; mid-lobe oblong. Column 3 mm long. Anthers terminal; pollinia 8, in 4 pairs, triangular. Ovary 3 mm long.

Chrom. No.: $2n = 40$ (Vatsala, 1964).

Fl. & Fr.: Aug. -Sept.

Distr.: Endemic to South India.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Ponnudi, *Sathish Kumar* 537, 807; *Ibid.*, *M. Mohanan* 69216 (CAL, MH). **Idukki Dist.:** Guderale, *AESK* 21428; Rajamala, *Sathish Kumar* 4609; Lockhart Gap, *Sebastine* 16505 (MH); Mangala Devi, *Vivekananthan* 48637 (CAL, MH). **Palakkad Dist.:** Silent Valley, Aruvanpara, *Sathish Kumar* 10577 (CALI), Sispara, *Sathish Kumar* 11243 (CALI); Panthenthodu, *Vajravelu* 32139 (MH).

Eria tiagii Manilal, *Sathish Kumar & Wood, J. Econ. Tax. Bot.* 5 (2): 483-486. 1984;

Manilal, *Fl. Silent Valley* 280. 1988.

Small epiphytic, pseudobulbous herbs. Pseudobulbs compressed, sheathed. Leaves 2-4 x 1-0.4 cm, sessile, oblanceolate, 2-3 per pseudobulb, apiculate; mid-vein prominent beneath. Inflorescence terminal, flexuous. Scape 3.5 cm long. Bracts small ovate lanceolate, smaller than pedicels. Flowers white. Dorsal sepal linear-lanceolate,

acuminate, 3-veined. Lateral sepals connate with foot of the column forming a saccate mentum. Petals linear-acuminate, 3-veined. Lip clawed at base, shorter than sepals. Disc with 2, slightly linear calli, margin of the basal portion entire, distal crenulate. Pollinia 8.

Fl. & Fr.: Sept. -Nov.

Distr.: Endemic to Kerala.

Occurrence & Specimens studied: **Palakkad Dist.:** Silent Valley, *Sathish Kumar 10736* (CALI); Kunthipuzha, *Vajravelu 48868* (MH); Silent Valley, way to hanging Bridge, *N. C. Nair 64304* (MH); Kannanthodu, *Gangaprasad 15188*.

FLICKINGERIA A. D. Hawkes

Orchid Weekly 2: 451. 1961.

Epiphytes. Rhizome annulate, creeping. Pseudobulbs uninodal, narrowly fusiform. Leaves sessile, terminal to pseudobulbs. Flowers solitary or in groups of 2 or 3. Sepals similar. Lateral sepals adnate to the column forming a mentum. Petals narrower and little shorter than the sepals. Lip narrowed at base, 3-lobed. Pollinia 4.

About 65-70 species distributed from India, Sri Lanka, Malaysia, Java, Sumatra, Borneo, Celebes, New Guinea to Philippine Islands. Seven species are present in India out of which 2 are endemic. Only one species is seen in Kerala.

Flickingeria nodosa (Dalz.) Seidenf., Dansk. Bot. Ark. 34(1): 41. 1980; Manilal, Fl.

Silent Valley 283. 1988; Sasi. & Sivar., Flow. Pl. Thrissur For. 442. 1996.

Dendrobium nodosum Dalz., Hooker's J. Bot. Kew Gard. Misc. 4: 292. 1852. *D. macraei* auct., non Lindl., 1830; Hook. f., Fl. Brit. India 5: 714. 1890. *Desmostrichum fimbriatum* auct., non Bl., 1825; Fischer in Gamble, Fl. Pres. Madras 1412. 1928. *Ephemarantha macraei* auct., p. p., non (Lindl.) Hunt & Summerh., 1961; Abraham & Vatsala, Intr. Orch. 370. 1981. (Fig. 10)

Epiphytic creeping herbs. Stem profusely branching. Branches 20-27 cm long, pendulous, plurinodal, shining, yellowish brown, bearing pseudobulbs at intervals. Pseudobulbs 2-5 x 0.5-1.5 cm, uninodal, oblong, fusiform, shining. Leaves 7-10 x 1.3-2 cm, solitary at the tip of the pseudobulb. Flowers solitary at the base of the leaf, scented, creamy white with maroon dots. Pedicel sheathed by scarious bracts. Bracts shorter than pedicel. Dorsal sepal 7 x 3 mm, oblong, obtuse, 5-nerved, gland-dotted. Lateral sepals 9 x 6 mm, oblique at base, oblong, obtuse 5-nerved, attached to the sides of the foot forming mentum. Lateral petals 7 x 2 mm, lanceolate, 3-nerved, sparsely gland-dotted, acute. Lip attached to the tip of the foot, reflexed, conduplicate 3-lobed; midlobe 4 mm long, contracted at the base and erose at the margins, two-winged towards the tip, base of the lip red-spotted, tip white-cream. Column 1.5 mm long, oblong, irregularly serrulate on apex, yellowish-white with a foot. Fruits globose capsules.

Fl. & Fr.: Sept. -Oct.

Distr.: India, Myanmar, Sri Lanka.

Note: Common in semi-evergreen and moist deciduous forests.

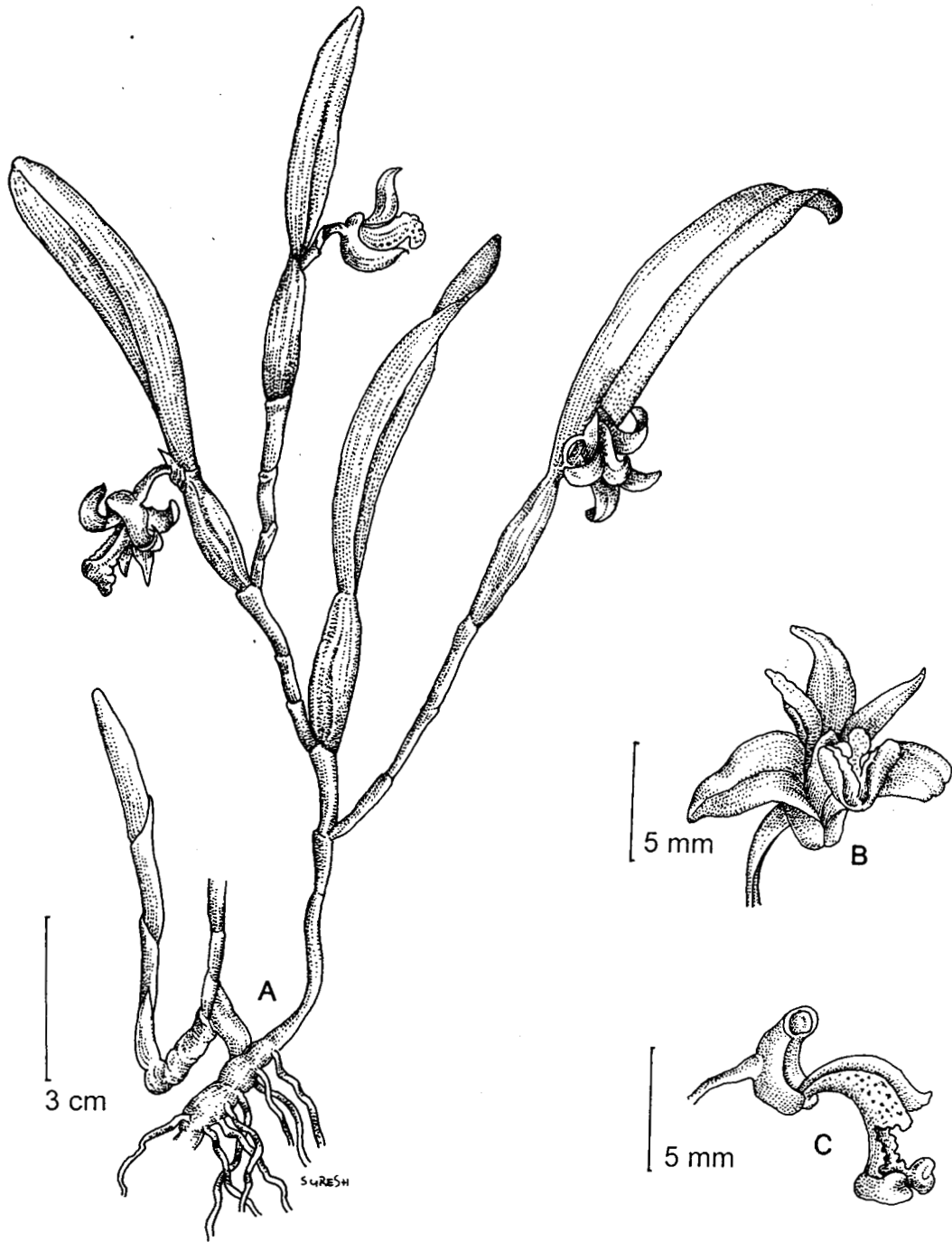


Fig. 10. *Flickingeria nodosa* (Dalz.) Seidenf.: A. Habit; B. Flower; C. Column with lip.

Occurrence & Specimens studied : **Thiruvananthapuram Dist.:** Palode, *AESK 7378*; Bonaccord, way to Agastyamala, *Sathish Kumar 3696*. **Kollam Dist.:** Chankili, *AESK 7403*. **Pathanamthitta Dist.:** Mookkenpetty, *AESK 13056*; Pamba, *Deb 30376 (MH)*. **Idukki Dist.:** Neriamangalam, *Gangaprasad 12222*. **Palakkad Dist.:** Silent Valley, *Sathish Kumar 10575 (CALI)*; Dam site, *Sathish Kumar 4697*; *Ibid.*, *Vajravelu 32129 (MH)*; Valiyaparathodu, *Gangaprasad 12329*; Anakkatty, *Puri 15605 (CAL)*. **Wayanad Dist.:** Thirunelly, *AESK 4648*.

GASTROCHILUS D. Don

Prod. Fl. Nepal. 32. 1825.

Epiphytes; stem short. Leaves unequally notched at apex. Flowers in few-flowered racemes. Sepals and petals sub-similar, free. Lip 3-lobed; side lobes small, erect; midlobes saccate; mouth some times hairy or fimbriate; sac without cells or septa. Pollinia 2, globose; caudicle narrow.

About 40-45 species distributed in India, Sri Lanka and Malaysia. In India there are 15 species with 4 endemics. Kerala is having 2 species.

Key to the species

1. Sac of lip with a conical callus..... **G. acaulis**
 1. Sac of lip naked..... **G. flabelliformis**

Gastrochilus acaulis (Lindl.) Kuntze, Rev. Gen. Pl. 2: 661. 1891; Jayaw. in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 2: 242. 1981. *Cleisostoma acaulis* Lindl., Gen. Sp. Orch. 227. 1833. *Saccolabium acaule* (Lindl.) Hook. f., Fl. Brit. India 6: 61. 1890. *Vanda pulchella* Wight, Ic. 1671. 1851. *Saccolabium nilagiricum* Hook. f., Fl. Brit. India 6: 60. 1890. *Gastrochilus nilagiricus* (Hook. f.) Kuntze, Rev. Gen. Pl. 2: 661. 1891; Manilal Fl. Silent Valley 284. 1988. *Vajravelu*, Fl. Palghat 479. 1990; Mohanan & Henry, Fl. Thiruvananthapuram 458. 1094. *Gastrochilus pulchellus* (Wight) Schltr., Feddes Rep. 12: 215. 1913, non Ridley. *Saccolabium pulchellum* (Wight) Fischer in Gamble, Fl. Pres. Madras 1445. 1928. *Gastrochilus indicus* Garay, Bot. Mus. Leaflet. Harv. Univ. 23(4): 180. 1972. **(Fig. 11; Plate III-E).**

Small epiphytic herbs; stem up to cm. Leaves 5-8 x 0.75-1 cm, distichous, 2-4, linear-oblong, subfalcate, unequally and obtusely 2-lobed at the apex. Inflorescence up to 4 cm long, axillary, corymbose cymes. Bracts 3 x 2 mm, ovate, brown, obtuse. Flowers pale green with yellowish brown spots. Dorsal sepal 6.5 x 3 mm, obovate-cuneate, 3-veined, inwardly curved. Lateral sepals 6 x 3 mm, obovate, obtuse. Petals 6 x 3 mm, resemble sepals. Lip 5-6 mm, white; base saccate, 3-lobed; side lobes short, represented by the saccate structure; midlobe roughly triangular, margin fimbriate or irregularly toothed, mid portion yellow with brown spots. Column 1.5 mm long, bifid or truncate at apex. Rostellum bifid. Pollinia 2. Ovary with pedicel 1 cm long. Fruit 1 cm long, globose capsule.

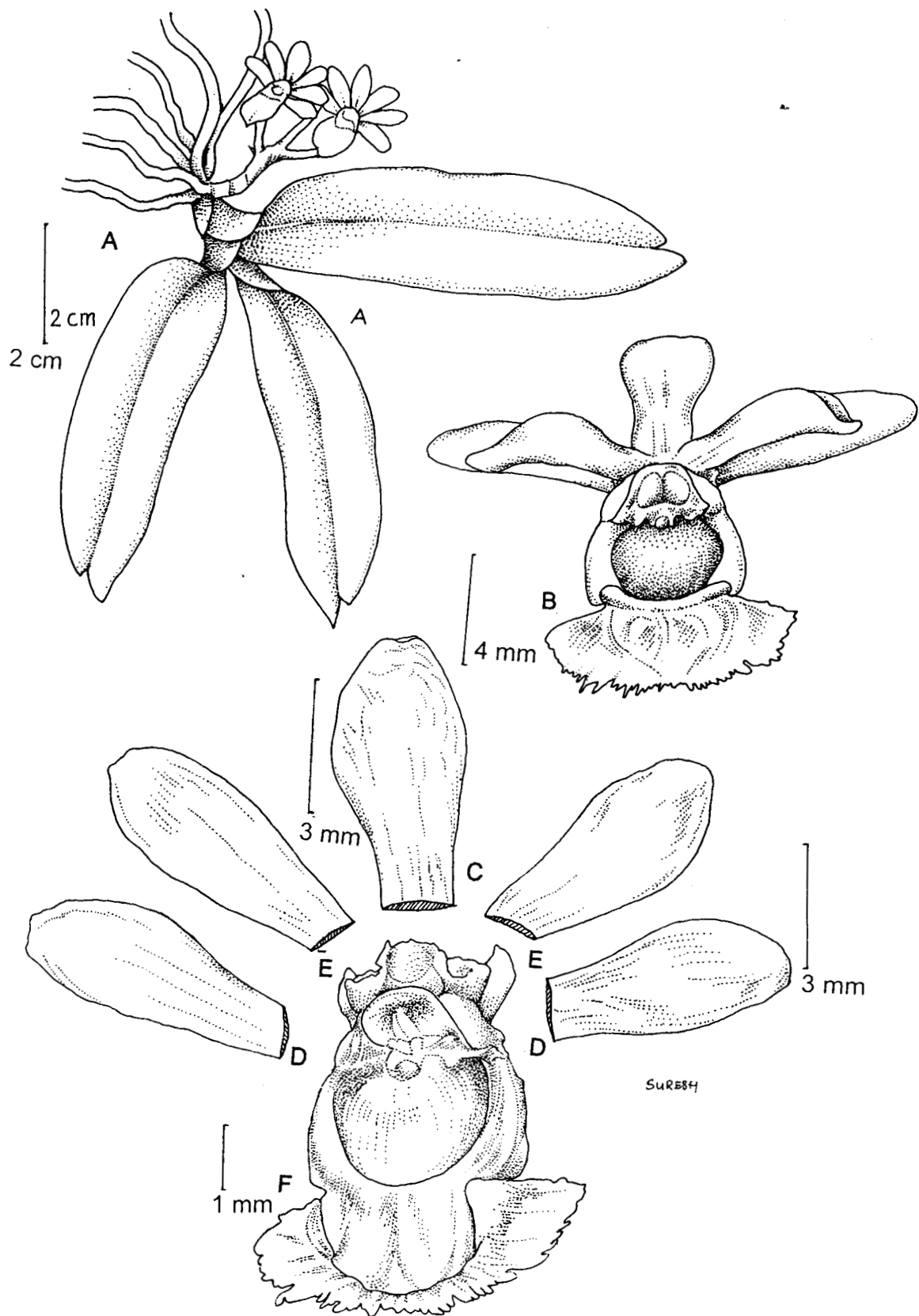


Fig. 11. *Gastrochilus acaulis* (Lindl.) Kuntze: A. Habit; B. Flower – front-view; C. Dorsal sepal; D. Lateral sepals; E. Lateral petals; F. Lip.

Fl. & Fr.: Dec. -May.

Distr.: South India, Sri Lanka.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Ponmudi, *AESK* 7250, *Ibid.*, *Sathish Kumar* 550; Athirumala, *AESK* 7298. *Sathish Kumar* 1306; Pongalappara, *Sathish Kumar* 1333; Agastyamala, *AESK* 5437; Agastyarkudam, *M. Mohanan* 66056 (MH). **Palakkad Dist.:** Aruvanpara, *Sathish Kumar* 10555 (CALI); Ayyappanpara, *Vajravelu* 49713 (CAL, MH). **Kannur Dist.:** Kannothe, *Ramachandran* 65226, 66975 (MH); Parappa, *V. J. Nair* 59834 (CAL, MH); Nedumboil, *Ramachandran* 54083 (MH); *Ibid.*, *AESK* 5516. **Wayanad Dist.:** Thirunelly, *Sathish Kumar* 3675; Chandanathodu, *AESK* 22392.

Note: *Sathish Kumar* (1990) merged *Gastrochilus pulchellus* (Wt) Schl. with *G. acaulis* (Lindl.) Kuntze after comparing both the species. I agree with his treatment and it is followed here.

Gastrochilus flabelliformis (Blatt. & McCann) Saldanha, Fl. Hassan Dist. 830. 1976.

Abraham & Vatsala, *Intr. Orch.* 469. 1981. *Saccolabium flabelliformis* Blatt. & McCann, *Rev. Fl. Pres. Bombay* 16: 722. 1932; *Gastrochilus bigibbus* (Reichb. f. ex Hook. f.) Kuntze, *Rev. Gen. Pl.* 2: 661. 1891; Sasi. & Sivar., *Flow. Pl. Thrissur For.* 441. 1996.

Small epiphytic herbs. Stem short, stout. Leaves 12 x 2.5 cm, distichous, oblong, coriaceous, unequally 2-lobed at apex. Racemes 3 cm long, axillary. Flowers pale yellow, 1.5 cm across. Bracts ovate, acute. Sepals and petals yellow with violet spots, narrowed at

base. Dorsal sepal 6.5 x 3.2 mm, obovate, 3-veined, gland-dotted, obtuse. Lateral sepals 7 x 2.8 mm, spathulate, gland-dotted, obtuse. Petals obtuse at apex. Lip 6.5 x 8 mm, deeply saccate, 4 mm broad at opening; midlobe white with yellow center, finely red-dotted, irregularly toothed on margin. Sac white with a few spots inside, naked. Column 4 mm long. Rostellum bifid.

Fl. & Fr.: Sep. -Dec.

Distr.: Myanmar, Thailand, Sikkim, N. E. India, Kerala.

Note: Seen from the lower elevations to 700m.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.**: Pandimotta, *AESK 18289*. **Kollam Dist.**: Kallar river Bed, Konni, *Chandrabose 49040 (CAL)*. **Thrissur Dist.**: Ambalappara, *Sasidharan 2959 (KFRI)*. **Palakkad Dist.**: Manthampotty, *Sathish Kumar 12296 (CALI)*; Mukkali, *Vajravelu 44838*. **Malappuram Dist.**: Nilambur, *Philip Mathew 34254 (CALI)*; Aryad, *Sasidharan 3361 (KFRI)*. **Wayanad Dist.**: Santhigiri, *AESK 42186*.

KINGIDIUM P. F. Hunt

Kew Bull. 24: 97. 1970.

Epiphytes with short stem. Leaves crowded. Flowers on lateral short racemes. Sepals subequal, spreading. Petals similar to sepals. Lip adnate to the column-foot, 3-lobed; side lobes small; midlobe obovate, with 2-awned plate. Column-foot narrowly winged, foot rather long. Pollinia 2, globose, 2-partite; caudicle with large gland.

The genus with 7 species distributed in India, China, Sri Lanka and Thailand. Five species present in India; three are endemic. Three species are reported from Kerala.

Key to the species

1. Midlobe of the lip emarginate to bilobulate..... **K. deliciosum**
1. Midlobe of the lip not emarginated; not bilobulate..... **2**
2. Petals 3-veined; rostellum 2-fid..... **K. mysorensis**
2. Petals 5-veined; rostellum 3-fid **K. niveum**

Kingidium deliciosum (Reichb. f.) Sweet, Amer. Orch. Soc. Bull. 39: 1095. 1970; Jayaw. in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 2: 207. 1981; Ramachandran & Nair, Fl. Cannanore 460. 1988; Sasi. & Sivar., Flow., Pl. Thrissur For. 460. 1996. *Phalaenopsis deliciosa* Reichb. f., Bot. Zeit. 20: 214. 1862. *Doritis wightii* Benth., Gen. Pl. 3: 574. 1883; Hook. f., Fl. Brit. India 6: 32. 1890. *Kingiella decumbens* (Griff.) Rolfe, Orch. Rev. 25: 197. 1917; Fischer in Gamble, Fl. Pres. Madras 1439. 1928. *Phalaenopsis decumbens* sensu Abraham & Vatsala, Intr. Orch. 464. 1981, *non* (Griff.) Holtum ex Hunt, 1971. **(Fig. 12; Plate VI-A).**

Short stemmed epiphytic herbs. Leaves 12-17 x 2.5-7 cm, distichous, 3 or 4, sessile, oblong-lanceolate; base jointed on short sheaths, obtuse or cuspidate, margin undulate. Panicles 15-25 cm long, branched. Flowers 1.2 cm across, pink. Bracts 1.2 x 1.7 cm, ovate-acute, ridged on the dorsal surface. Dorsal sepal 9 x 4 mm, linear-oblong,

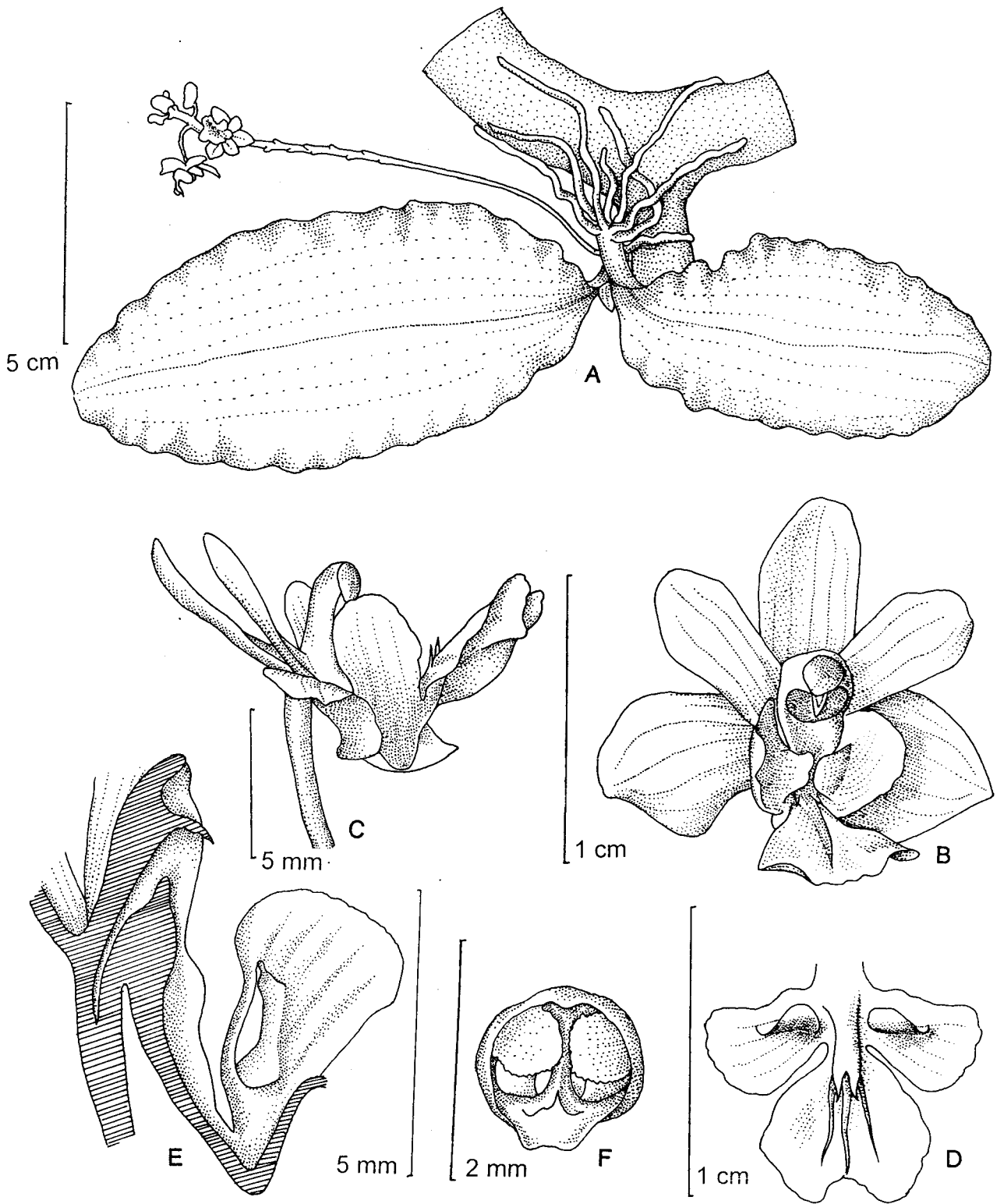


Fig. 12. *Kingidium deliciosum* (Riechb. f.) Sweet: A. Habit; B. Flower – front- view; C. Flower – side view; D. Lip; E. L. S. of lip; F. Operculum.



Plate VI. A. *Kingidium deliciosum* (Reichb. f.) Sweet. - Inset - single flower; B. *Vanda tessellata* (Roxb.) Hook. et G. Don - Inset - single flower; C. *Rhynchosstylis retusa* (L.) Bl.; D. *Papilionanthe cylindrica* (Lindl.) Seidenf.; E. *Vanda spathulata* (L.) Spreng. - Inset - single flower.

obtuse, 5-veined. Lateral sepals 8 x 5 mm, obliquely ovate, 5-veined, attached to the column-foot forming a mentum, petals 7 x 3.8 mm, oblong 3-veined. Petals 6 x 4 mm, oblong, rounded, 3-veined. Lip 7 x 10 mm, 3-lobed; side lobes obovate, rounded with a thick inner callus which joins with the 2-lobed callus on the disc; midlobe obcordate, 2-lobulate; lobules broadly elliptic. Column 3 mm long with a short foot. Rostellum 3-lobed; central lobe shorter than the longer lateral pair. Pollinia 2, globular. Ovary with pedicel 1.2 cm long. Fruit 4 cm long, oblong, angled capsule.

Fl. & Fr.: Jul. -Sept

Distr.: India, Sri Lanka, South-East Asian Islands.

Note: Mostly in evergreen forests, near river sides.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.**: Athirumala, Sathish Kumar s.n. **Kollam Dist.**: Aryankavu, Venkoba Rao 2895 (MH). **Pathanamthitta Dist.**: Erumeli, William D'cruz 12364. **Thrissur Dist.**: Sholayar, N. G. Nair & Sasidharan 1911 (KFRI). **Palakkad Dist.**: Silent Valley, AESK 7489. **Kannur Dist.**: Kannothe, Ramachandran 68215 (MH).

Kingidium mysorens (Saldanha) Sathish Kumar in Sathish & Manilal, Cat. Ind. Orch.

95. 1994. *Phalaenopsis mysorens* Saldanha, Ind. For. 100: 571. 1974; Abraham & Vatsala, Intr. Orch. 464. 1981; Manilal, Fl. Silent Valley 300. 1988.

Epiphytic herbs; stems very short. Leaves 8-10 x 3-4.5 cm, elliptic-obovate, narrowed at base, articulated, unequally 2-lobed at apex. Racemes 7-8 cm, axillary, lateral,

few-flowered. Bracts 1 mm long, subulate. Flowers white, 4-8. Dorsal sepal 7 x 4 mm, oblong-obovate, gland-dotted, 5-veined, rounded at apex. Lateral sepals 6 x 5 mm, obliquely obovate, gland-dotted, 5-veined, attached to the column-foot forming mentum. Petals 6 x 3 mm, oblong-obovate, gland-dotted, 3-veined, rounded. Lip 3-lobed; side lobes parallel to the column, oblong, erose, oblique and incurved with a callus; midlobe triangular, reniform with a concave depression. Antennae 2, flanked by 2 very short teeth. Column short with a flattened foot. Rostellum 2-fid. Pollinia 4. Fruits 4 cm long, narrowly elliptic capsule.

Fl. & Fr.: Feb. -May.

Distr.: Endemic to Karnataka and Kerala.

Occurrence and Specimens studied: **Kollam Dist.:** Cheenikala, *AESK 18291*; **Thrissur**

Dist.: Andalappara, Peechi, *Sasidharan 4800* (KFRI).

Kingidium niveum Sathish in Sathish & Manilal, *Cat. Ind. Orch.* 53. 1994; Sasi. & Sivar., *Flow. Pl. Thrissur For.* 445. 1996.

Epiphytic herbs. Stems short. Leaves 3-9 x 1.6-2.6 cm, oblong, elliptic, fleshy, coriaceous, base narrowed into a short petiole, acute at apex. Inflorescence 1-3 cm long, lateral raceme, purplish violet. Bracts 1 x 1 mm, cupular, entire, acute. Flowers 1-4, to 1. 1 cm across, white. Dorsal sepal 6 x 3 mm, obovate, 5-veined, obtuse. Lateral sepals 5 x 4 mm broadly ovate, slightly falcate, 5-6-veined, sub-acute. Petals 5 x 3 mm, obovate, slightly falcate, 5-veined, obtuse. Lip 3-lobed; side lobes 3 x 1.5 mm, erect, deep yellow,

slightly toothed on margin, lamellate. Lamella single, thick, fleshy, yellow and sub-entire; midlobe 3.7 x 7 mm, triangular; base thick, fleshy with a linear callus, warted within; margin sub-entire or toothed. Disc with 2 pairs of unequal antennae. Column 2 mm long, slightly winged with 3 mm long foot. Operculum 2-celled. Pollinia 4 in 2 unequal pairs. Rostellum unequally 3-fid. Fruits 2 cm long, oblong capsules.

Distr.: Known from Kerala only.

Fl. & Fr.: Mar. -Jun.

Note: Growing on the main trunks of trees in the evergreen forests.

Occurrence and Specimens studied: **Kollam Dist.:** Pandimotta, *AESK 15647, 13063.*

Thrissur Dist.: Sholayar, *Sasidharan 5431 (KFRI). **Palakkad Dist.:** Walghat, *Sathish Kumar 12364 (CALI);* Pothumala, Nelliampathy, *Sasidharan 3086 (KFRI). **Wayanad Dist.:** Thirunelly, *AESK 17358.***

LIPARIS L. C.M. Richard

Mem. Mus. Hist. Nat. 4: 43, 52, 60. 1818, *nom. cons.*

Epiphytic or terrestrial herbs. Stem sometimes pseudobulbs, short or elongated. Leaves 1-2 in epiphytic forms or 3-5 in terrestrial forms, plicate or flat. Scape terminal, racemose or spicate. Flowers small, few to many. Sepals free. Petals similar to sepals or much narrower, erect or reflexed. Lip sessile, entire, 2-fid or 3-lobed. Spur 0. Column elongated, curved, often winged. Foot 0. Pollinia ovoid, waxy, 4 united in pairs.

About 250-400 species distributed throughout the world. A total of 45 species including 17 endemics are present in India. Three epiphytic species are reported from Kerala.

Key to the species

1. Pseudobulbs elongated, over 5 cm long **L. viridiflora**
1. Pseudobulbs short, less 3 cm long 2
2. Leaves elliptic, under 7 cm long; pseudobulbs compressed, under 2 cm long
..... **L. elliptica**
2. Leaves oblanceolate, under 5 cm long; pseudobulbs flat, under 1 cm long
..... **L. caespitosa**

Liparis caespitosa (Thouars) Lindl., Bot. Reg. 11: sub. t. 882. 1825; Jayaw. in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 2: 66. 1981. *Malaxis caespitosa* Thouars, Orch. Isles Austr. D' Afr. Pl. 90. 1822. *Liparis obscura* Hook. f., in Hook., Ic. Pl. 19: pl. 1886. 1889. *L. caespitosa* Ridley, J. Linn. Soc. Bot. 22: 290. 1887, *non* Lindl., 1825.

Tufted epiphyte with short, ovoid, flattened, pseudobulbous stems, crowding together; pseudobulbous 0.5-1 cm long and as broad, 0.6 cm thick and smooth; young pseudobulb enclosed in four scaly sheaths, foliage leaves borne at the summit and articulating with it. Leaves 1 or 2, coriaceous, costate, 1.5 x 0.7-1.3 cm, oblanceolate or ovate, acute mucronate; base contiguous with a short sheathing petiole. Flowers small, greenish-yellow, 5 mm across, in pedunculate, terminal racemes; peduncle 1-2.5 cm long,

flat, green; flower bearing portion 1-2.3 cm long; floral bracts 7 x 1.2 mm linear, acuminate or aristate, stiff, straight, 1-veined; dorsal sepal 2.4 x 0.8 mm, lanceolate, recurved, obtuse, 1-veined; lateral sepals 2.4 x 1.1 mm, obliquely oblong, recurved behind the lip, obtuse or rounded, 1-veined; petals 2.2 x 0.3 mm, narrowly linear, deflexed and recurved, 1-veined; lip oblong ovate or sub-quadrangle, 2.2 x 1.7 mm, recurved from about the middle, acute or sub-acute, base slightly auriculate but lobes obscure; column 1.3 m high, 0.4 mm broad, bending slightly about the middle with a deep hollow stigma. Anther terminal, 2-loculed, 0.4 mm long and as broad ; pollinia 4 in two pairs, each pollinium 0.3 x 0.18 mm. Ovary with pedicel 3 mm long. Fruit a small globular or oblong capsule, 3 mm long and as broad, ridged, with the remains of the rostrum at the summit.

Fl. & Fr.: Jan. -Mar.

Distr.: India, Sri Lanka.

Occurrence & Specimen studied: **Pathanamthitta Dist.:** Plapally, *William D'cruz 11289.*

Liparis elliptica Wight., Ic. t. 1735. 1851; Abraham & Vatsala, *Intr. Orch.* 412. 1981; Ramachandran & Nair, *Fl. Cannanore* 456. 1988; Sasi. & Sivar., *Flow. Pl. Thrissur For.* 446. 1996. *L. viridiflora auct., non* Lindl., 1830: Hook. f., *Fl. Brit. India* 5: 704. 1890; Fischer in Gamble, *Fl. Pres. Madras* 1411. 1928.

Small, pseudobulbous epiphytes; pseudobulbs 2 x 1.15 cm, ellipsoid, compressed. Leaves 7 x 15 cm, 2 per pseudobulb, narrowly elliptic or elliptic-oblong. Inflorescence 8 cm long, terminal, racemes. Scape flattened, narrowly winged. Flowers creamy-green, 0.5 cm across. Bracts 4 x 1 mm, lanceolate-subulate, acuminate. Dorsal sepal 3.5 x 1.2 mm,

lanceolate, 1-veined. Petals 3 x 0.75 mm, linear. Lip 2 x 2 mm, obovate-orbicular, obscurely 3-lobed; midlobe ovate triangular. Column short, incurved, without stelia. Fruits small, oblong.

Fl. & Fr.: Oct. -Dec.

Distr.: India, Sri Lanka, Nepal, Thailand, Thaiwan and Java.

Note: Seen only in higher elevations (above 900-1300 m); completely under shade.

Occurrence and Specimens studied: **Thiruvananthapuram Dist.**: Athirumala, AESK 7293; *Ibid.*, Sathish Kumar 1355, *Ibid.*, N. Mohanan 4449, 8963; Agastyamala, N. Mohanan 5107, 11256. **Wayanad Dist.**: Pakshipathalam, Sathish Kumar 1607.

Liparis viridiflora (Bl.) Lindl., Gen. Sp. Orch. 31. 1830; Abraham & Vatsala, Intr. Orch. 410. 1981; Jayaw. in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 2: 68. 1981; Manilal, Fl. Silent Valley 291. 1988; Ramachandran & Nair, Fl. Cannanore 456. 1988; Vajravelu, Fl. Palghat 483. 1990; 1990; Mohanan & Henry, Fl. Thiruvananthapuram 461. 1994; Sasi. & Sivar., Flow. Pl. Thrissur 446. 1996; Sivar., & P. Mathew, Fl. Nilambur 689. 1997. *Malaxis viridiflora* Bl., Bijdr. 392. 1825. *Liparis longipes* Lindl. in. Wall., Pl. As. Rar. t. 35. 1830; Wight, Ic. t. 906, 1845; Hook. f., Fl. Brit. India 5: 703. 1890; Fischer in Gamble, Fl. Pres. Madras 1411. 1928 (**Fig. 13**).

Epiphytic or lithophytic, pseudobulbous herbs. Pseudobulbs 7 x 1.5 cm, narrowly ovoid, elongated, green, smooth, serially arranged on a creeping stem. Leaves 20 x 2.5 cm, usually 2, narrowly oblong or obovate-oblong. Inflorescence 10-25 cm long, terminal

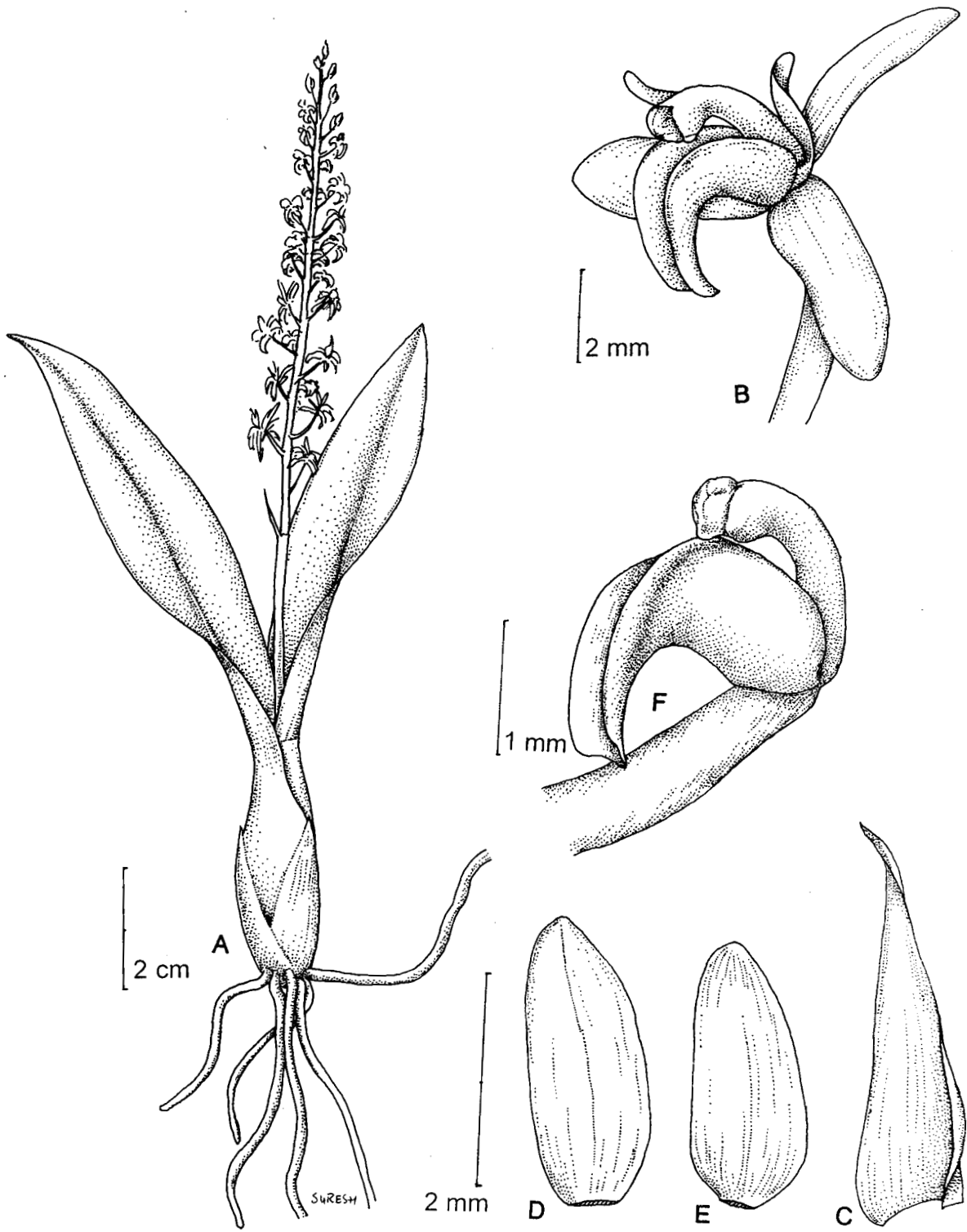


Fig. 13. *Liparis viridiflora* (Bl.) Lindl.: A. Habit; B. Flower – side view; C. Bract; D. Lateral petal; E. Dorsal sepal; F. Column with lip.

racemes. Bracts 4 x 0.7 mm, lanceolate, acuminate. Flowers many, densely arranged, pale green. Dorsal sepal 3 x 1 mm, lanceolate, obtuse. Lateral sepals 2.7 x 1 mm, lanceolate, 1-veined, obtuse. Petals 2.5 x 0.2 mm, linear, 1-veined, obtuse. Lip 2.5 x 1.5 mm broadly ovate, thick recurved, acute. Column 2 mm long, incurved at apex with rounded stielidia. Fruits globular, stalked, yellow capsules.

Fl. & Fr.: Aug. -May

Distr.: India, Sri Lanka, Malesian Islands.

Note: Grows profusely in large clumps on moist rocks and trees trunks.

Occurrence and Specimens studied: **Thiruvananthapuram Dist.:** Uthipanchi, AESK 7324, 13264; Attayar, N. Mohanan 7901; Ponmudi, Sathish Kumar 539; North of Ponmudi, N. Mohanan 52540 (MH). **Kollam Dist.:** Chankili, AESK 7401. **Idukki Dist.:** Munnar, AESK 13267; Pachakanam, AESK 42103; *Ibid.*, Vivekananthan 48391(MH); Peermadu, Vivekananthan 23971 (MH). **Thrissur Dist.:** Kannamkuzhi, N. C. Nair 49899 (MH). **Palakkad Dist.:** Silent Valley, Sathish Kumar 10777 (CALI); Mukkali, Ansari 51205 (MH); Silent Valley, way to hanging bridge, N. C. Nair 60437 (MH); Silent Valley, Vajravelu 26127 (MH). **Kannur Dist.:** Ambayathodu, Ramachandran 59159 (MH); Nedumpoil, Ramachandran. 64071 (MH); **Wayanad Dist.:** Thirunelly, AESK 44209; Chandanathodu, Ellis 26398 (MH). **Kasaragodu Dist.:** Konnakkadu, Ansari 74390 (MH). "Travancore", Nellikal Estate, Jackson 94363 (MH).

LUISIA Gaudichaud

in Freycinet, Voyage Monde, Uranie Physicienne Bot. 426, t. 37. 1827.

Epiphytes with elongated, terete, stems. Leaves terete, fleshy. Flowers in extra axillary, few to many-flowered spikes, resupinate. Sepals subequal; dorsal smaller, lateral, apically keeled. Petals equal or larger than lateral sepals. Lip sessile towards the base of column, sub-entire; base flat or concave, apically decurved, broad, ridged. Column straight, short, Foot. 0. Pollinia 2, globose; caudicle flat.

About 40 species distributed through out India, Sri Lanka, Malaya, Myanmar, Thailand, China, Formosa, Japan, Java, Borneo, Celebes, New Guinea to Philippine Islands. India has got 17 species out of which 7 are endemic. In Kerala there are 5 species.

Key to the species

1. Petals as long as sepals; lip with unlobed epichile..... **L. zeylanica**
1. Petals longer than sepals; lip with 2-lobed epichile2
2. Dorsal sepal sub concave, obovate-elliptic, narrowed at base **L. macrantha**
2. Dorsal sepal linear-oblong; not narrowed at base3
3. Lip uniformly wide, deep violet purple through out..... **L. abrahamii**
3. Lip not uniformly wide; white or creamy with violet or purple dots.....4
4. Leaf apex narrowed into a tail, lip with 3 keels **L. evangelinae**
4. Leaf apex not narrowed into a tail, lip with single keel **L. birchea**

Luisia abrahamii Vatsala in Abraham & Vatsala, *Intr. Orch.* 489. 1981.

Pendulous epiphytes. Stem 10-5 cm long, covered with persistent leaf base, green. Leaves 15-20 x 0.3 cm, 4-8 per shoot, terete, glaucous with a shallow groove on the ventral side, acute. Racemes 2 cm long, leaf-opposed, 4-6-flowered. Flowers 1.5 cm across, pale green flushed with pale purple. Dorsal sepal 1.5 x 0.4 cm, linear-oblong, boat-shaped, slightly incurved, sub-acute. Petals same as sepals, incurved, linear-oblong, obtuse. Lip 2 x 0.6 cm, uniformly wide, blackish purple, 3-lobed; side lobes 0.2 x 0.2 cm, auricular; midlobe bilobed at the apex, lobes parallel, not diverging, each 0.3 cm long, slightly convex and sub-acute. Disc faintly 3-ridged. Column purple, 0.4 cm long. Operculum white. Pollinia 2, bright yellow. Ovary with pedicel 1 cm long. Fruit 1-2 cm long, fusiform capsules.

Fl. & Fr.: Oct. -May.

Distr.: Endemic to Kerala.

Occurrence & Specimens studied: **Kollam Dist.**: Cheenikala, *AESK* 15712; Kulathupuzha, *AESK* 5202, Rosemala, *AESK* 25401; Pandimotta, *AESK* 15663; Palaruvi, Thenmala, *Sathish Kumar* 707; Palaruvi, *Sathish Kumar* 4699. **Pathanamthitta Dist.**: Kottampara, *AESK* 25442.

Luisia birchea (A. Rich.) Bl., *Mus. Bot. Ludg. Bot.* 1: 64. 1849; Abraham & Vatsala, *Intr. Orch.* 481. 1981. 1994; Sasi. & Sivar., *Flow. Pl. Thrissur For.* 447. 1996; Sivar., & P. Mathew, *Fl. Nilambur* 690. 1997. *Birchea teretifolia* A. Rich., *Ann. Sci. Nat.*

Bot. (2) 15: 67. 1841. *Luisia tenuifolia* auct., non (L.) Bl., 1848: Hook. f., Fl. Brit. India 6: 24. 1890; Fischer in Gamble, Fl. Pres. Madras 1438. 1928. *Cymbidium tenuifolium* auct., non (Linn.) Willd., 1805: Wight, Ic. 911. 1844-45. **(Plate IV -A)**.

Epiphytic slender herbs. Stem up to 15 cm long, terete, sheathed. Leaves 6-20 x 0.4 cm, terete, alternate, grooved on one side, cuspidate at apex. Racemes short, extra axillary. Flowers pale green with dark purple patch on the lip. Bracts 1.5 mm, broadly ovate-oblong. Dorsal sepal 8 x 3.5 mm, ovate-lanceolate, concave. Lateral sepals 10 x 3.5 mm, obliquely lanceolate, acute, keeled towards the apex. Petals 12-18 x 5.5 mm, narrowly lanceolate, 7-veined, obtuse. Lip 20 x 13 mm creamy with purple-violet, erect, fleshy, base of the lip with 2 triangular lobes; apex with a quadrate depression. Epichile purple with a single erect keel; margin uneven, prolonged into 2-lobules. Column short. Operculum large, white. Fruits 5 cm long, fusiform capsules.

Fl. & Fr.: May-Oct.

Distr.: South India, Sri Lanka.

Note: A beautiful flowered *Luisia*, rare in Kerala. Deep purple lip with triangular side lobes and epichile with a single smooth, median callus are remarkable features of the species.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.**: Agastyamala, Aesk 5445. **Kollam Dist.**: Rosemala, Aesk 25402. **Idukki Dist.**: Adimaly, Aesk 12805; Munnar, Sathish Kumar 3697; Thadiyampadu Raju 71245 (MH); Okkari, Thekkady,

Sharma 42098 (MH). **Thrissur Dist.:** Peechi, *Sasidharan s.n.* (KFRI). **Kasaragod Dist.:** Cheruvathur, *V.J. Nair 73829* (MH).

Luisia evangelinae Blatt. & McCann, Rev. Fl. Pres. Bombay 16: 493. 1932; Abraham & Vatsala, Intr. Orch. 483. 1981; Sasi. & Sivar., Flow. Pl. Thrissur For. 447. 1996. *L. tenuifolia* Bl. var. *evangelinae* (Blatt. & McCann) Sant. & Kapadia, Orch. Bombay 214. 1966. **(Plate IV-B).**

Slender, pendent, epiphytic herbs. Stem up to 20 cm long, terete, sheathed, brownish with red blotches. Leaves 15 x 0.2 cm, terete with a joined, angled tail at apex. Racemes extra-axillary, short-peduncled. Bracts minute, brown. Flowers 3 cm across, white or creamy with violet-purple. Dorsal sepal 8-10 x 3-4 mm, linear oblong, slightly keeled on back, obtuse. Lateral sepals 8-12 x 3-5 mm, boat-shaped, keeled on back, slightly falcate, obtuse. Petals 20 x 2 mm, linear, creamy-white with purple blotches. Lip 22 x 10 mm, panduriform, base with 2 small rounded lobes, each with a deep brown mark. Hypochile with deep brown spot at base and 3 linear calli in the middle. Median callus deep brown. Epichile ending in 2 divergent, oblong-orbicular lobes with a mucro in between. Column 5 mm, semi terete. Operculum quadrately oblong, yellowish-white purple tinge. Pollinia 2, ovoid. Ovary with pedicel 1.5-2 cm long. Fruits 3 cm long, fusiform capsule.

Fl. & Fr.: Mar. -Apr.

Distr.: Endemic to Maharashtra, Karnataka, Kerala.

Note: *L. evangelinae* is a very distinct species easily distinguishable from *L. birchea*. Both species occur Kerala. Following the treatments of Blatter and McCann (1932) and Abraham & Vatsala (1981) I treat these species as distinct.

Occurrence and Specimen studied: **Thiruvananthapuram Dist.:** Near Athirumala, *Sathish Kumar 1308*; Agastyamala, *Gangaprasad 15126*. **Kollam Dist.:** Pndimotta, *AESK 13061*. **Idukki Dist.:** Walara, *AESK 7475, 42121*. **Ernakulam Dist.:** Pooyamkutty, *15750*. **Palakkad Dist.:** Aruvanpara, *Sathish Kumar 4657*.

Luisia macrantha Blatt. & McCann, J. Bombay Nat. Hist. Soc. 35: 492. 1932; Sath. Kumar & Manilal, Cat. Ind. Orchids 79. 1994.

Large epiphytic herbs. Stems up to 50 cm long, stout, dark brown. Leaves 10-20 x 0.3 cm, terete, dark green, bluntly rounded at apex. Racemes, extra axillary, 1-flowered. Bracts ovate, acute. Flowers creamy-green with purplish violet streaks at base. Dorsal sepal 20 x 10 mm, obovate-elliptic, sub-concave, narrowly beaked at base, apple-green with purple spots on the outer side at middle, apiculate. Lateral sepals 20 x 10 mm, oblong-elliptic, boat-shaped, strongly keeled below, mucronate. Petals 30 x 3 mm, strap-shaped, thin, falcate obtuse. Lip 28 x 8 mm, broadly oblong and slightly dialated below the middle; hypochile with 2-rounded lobes; epichile oblong, raised upwards ending in rhomboid-orbicular folded structures with a mucro between, purplish-violet. Disc with 3 narrow keels. Column 5 mm long, white. Operculum squarish. Pollinia 2. Fruits 4 cm long, spindle-shaped.

Fl. & Fr.: Nov. -Mar.

Distr.: Endemic to Kerala, Karnataka.

Note: This is the largest species of *Luisia* in Kerala. I have collected this species from teak plantations at Idukki and Peria, Wayanad.

Occurrence & Specimens studied: **Pathanamthitta Dist.:** Mookanpetty, AESK 13274.

Idukki Dist.: Walara, AESK 19118, 7472, 13076; Adimaly, Gangaprasad 12226; *Ibid.*, William D'cruz 12274. **Wayanad Dist.:** Peria, Sathish Kumar 1615; Thavinjal, AESK 44211.

***Luisia zeylanica* Lindl.,** Folia Orch. *Luisia* 3. 1853; Abraham & Vatsala, Intr. Orch. 486.

1981; Manilal, Fl. Silent Valley 292. 1988; Ramachandran & Nair, Fl. Cannanore 456. 1988; Sasi. & Sivar., Flow. Pl. Thrissur For. 447. 1996; Sivar., & P. Mathew, Fl. Nilambur 690. 1997. *Luisia teretifolia* auct., non Gaud., 1826: Hook. f., Fl. Brit. India 6: 22. 1890; Fischer in Gamble, Fl. Pres. Madras 1438. 1928; Jayaw. in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 2: 210. 1981; Manilal & Sivar., Fl. Calicut 284. 1982.

(Plate IV-C).

Erect, tufted herbs. Stem up to 15 cm long, terete. Leaves 10 x 0.25 cm, terete, green with purple spots. Racemes 3-7 mm long, extra axillary, 2-4-flowered. Flowers 5-6 mm long, yellowish green. Bracts 2 x 1.5 mm, oblong, obtuse. Sepals and petals greenish-yellow with purple tinge. Dorsal sepal 3-4 x 2 mm, ovate, boat-shaped, concave, 5-veined, obtuse. Lateral sepals 3 x 2 mm, ovate, boat-shaped, concave, obtuse. Petals 5.5 x 2 mm, oblong, obtuse. Lip 6 x 2 mm; hypochile quadrate, green, margined with purple; epichile

rhomboid or sub-reniform, obtuse, purplish red. Column 2 mm long, purplish violet. Operculum 1 x 1 mm, yellowish, with 2 erose-margined flaps inside. Pollinia 2, broadly globular. Ovary with pedicel 5 mm long. Fruits 2-3.5 cm, fusiform capsules.

Fl. & Fr.: Mar. -Aug.

Distr.: India, Nepal, Sri Lanka.

Note: This is the common species seen in lower elevations, mostly in the moist deciduous forests, road sides, teak plantations, etc.

Occurrence & Specimens studied. **Thiruvananthapuram Dist.:** Palode, *AESK* 15652; *Ibid.*, *Sathish Kumar s.n.*; Athirumala, *AESK* 13245. Attayar, *Sathish Kumar* 1315; Bonaccord, *M. Mohanan* 11403. **Kollam Dist.:** Pandimotta, *AESK* 13062; Chandanathopu, *Sathish Kumar* 532; Ranni, K. Kurien 3708; *Ibid.*, *C. N. Mohanan* 65079 (MH); Kudumon, *C. N. Mohanan* 65081 (MH); Konni, *Rama Rao* 1425 (CAL). **Idukki Dist.:** Walara, *AESK* 7470, 42127. Peermade, *Meebold* 675 (CAL); Adimaly, *Gangaprasad* 12218. **Thrissur Dist.:** Parambikulam, *Sebastine* 14612 (MH). **Palakkad Dist.:** Aruvanpara, *Sathish Kumar* 10567 (CALI); Silent Valley, *Sathish Kumar* 3712; Karapara River, *Vajravelu* 46135 (MH). **Wayanad Dist.:** Kuruva Island, *AESK* 22362; Begur R.F., *Ramachandran* 62745 (MH). **Kasaragod Dist.:** Cheruvathur, *V. J. Nair* 73829 (MH).

OBERONIA Lindley

Gen. Sp. Orch. Pl. 15. 1830.

Erect or pendulous epiphytes. Leaves distichous, laterally compressed, fleshy, base articulated or not. Inflorescence terminal; flowers small, pedicelled or sessile ; bracteate. Sepals equal or subequal, sometimes gland-dotted, spreading or reflexed. Petals similar to sepals. Lip 2-3-lobed, or entire, sometimes with saccate or cushion like disc towards base; side lobes entire, spreading or erect or curved upwards, entire or dissected; midlobe entire, 2-lobed or laciniate. Column minute, winged or not. Pollinia 4, waxy, caudicle 0.

About 350 species distributed from East Africa, India, Sri Lanka, Myanmar, Malaya, and China. From India 53 species have been recorded; 22 are endemic. Twenty seven species are reported from Kerala.

Key to the species

1. Leaves jointed **2**
1. Leaves not jointed **20**
2. Lip hairy **3**
2. Lip glabrous **4**
3. Lip reniform; side lobes broad, ear-like; lobules of midlobe small, orbicular, entire with a broad sinus in between **O. chandrasekharanii**
3. Lip obcordate; side lobes narrow; lobules of midlobe large, rounded, crenate with an acute sinus **O. ferruginea**

4. Petals toothed	5
4. Petals entire	7
5. Small plants; leaves up to 10 cm long; lip with 2 large projecting blister like processes at base of midlobe	O. ensiformis
5. Large plants; leaves up to 15 cm long, lip without any projecting blister like process .	6
6. Inflorescence laxly-flowered.....	O. gammei
6. Inflorescence densely-flowered	O. mucronata
7. Sidelobes not well developed, represented by small rounded lobules	8
7. Side lobes well developed.....	9
8. Lobules of midlobe overlapping; petals oblong, obtuse	O. verticillata
8. Lobules of midlobe not overlapping; petals broadly oblong-ovate, sub-acute	
9. Midlobe of lip 3-lobulate	O. platycaulon
9. Midlobe of lip 2-lobulate	10
10. Lobules of lip orbicular.....	11
10. Lobules of lip not orbicular.....	12
11. Lobules of the midlobe with a globose sinus in between, entire	O. wynaadensis
11. Lobules of midlobe with a small round protuberance.....	O. nayarii
12. Lobules of lip ligulate	O. falconeri
12. Lobules of lip not ligulate	13
13. Midlobe with diverging lobules, erose and truncate at apex.....	O. wightiana
13. Midlobe with broad lobules, not erose and truncate	14
14. Petals linear-oblong, obtuse, truncate at apex.....	O. agastyamalayana
14. Petals not linear-oblong, acute at apex.....	15

15. Flowers loosely imbricate	16
15. Flowers densely imbricate	19
16. Sepals oblong; a shallow sinus with a mucro in between lobules of midlobe	
16. Sepals ovate or broadly ovate; no mucro in the sinus	17
17. Bracts entire	O. arnottiana
17. Bracts serrate	18
18. Side lobes of lip oblong; midlobe quadrangular, truncate or with shallow sinus	
18. Side lobes of lip oblong; midlobe 2-lobulate; lobules suborbicular; sinus rounded	
19. Lip with a thick semicircular disc at base	O. santapau
19. Lip with a triangular disc at base	O. brunoniana
20. Floral bracts much longer than the flowers; midlobe irregular truncate	
.....	O. longibracteata
20. Floral bracts not much longer than flowers; midlobe not truncate	21
21. Side lobes of the lip clasping the column	22
21. Side lobes of the lip not clasping the column	23
22. Side lobes of the lip oblong, folded upwards; midlobe 2-lobuled	O. josephii
22. Side lobes of the lip not oblong, nor folded; midlobe 3-lobuled or quadrate	24
23. Side lobes of the lip extended beyond column as horns; midlobe quadrate	
23. Side lobes of lip surrounding the column and meeting above and extends beyond as a single unit; midlobe obscurely 3-lobulate	O. tenuis
24. Lip antrorse, not lobed	O. proudlockii
24. Lip not antrorse, 3-lobed	25

25. Lobules of the midlobe dentate..... **O. brachyphylla**

25. Lobules of the midlobe entire or sub-serrate..... **O. recurva**

Oberonia agastyamalayana Sathish in Sathish & Manilal, Cat. Ind. Orch. 57. 1994. *O. longifolia* Muktesh & Stephen, J. Orch. Soc. India 12 (1-2): 29. 1988.

Tufted pendulous epiphytes. Leaves 3.5-4.1 x 0.5-1.6 cm, linear ensiform, acute. Scape adnate to the upper leaf, 15 cm long, 0.3-0.7 cm broad, flattened. Inflorescence 15-33 cm, tapering into a sterile tail. Flowers in distinct verticels 3-4 mm apart with 4-6 flowers. Bracts 2-3.2 x 1.5-1.7 mm, ovate, erose on margin, acute. Sepals and petals deflexed. Sepals 2.5 x 1.5 mm, ovate-oblong, 1-veined, obtuse. Petals 2.5 x 1 mm, linear-oblong, 1-veined, obtuse, truncate at apex. Lip quadrate, 3-lobed, 3-veined; side lobes 3 x 5 mm, growing behind the column and covering it; midlobe 2-lobulate; lobules orbicular with a sinus in between. Disc ovate, concave. Column 0.25 mm, ovate-oblong. Ovary with pedicel 3-3.5 mm. Pollinia ovoid.

Fl. & Fr.: Aug. -Nov.

Distr.: Kerala; endemic.

Note: On tree trunks in densely shaded evergreen shola forests at an elevations between 1700-1800 m. Muktesh Kumar and Stephen Sequiera (1998) published a species *viz.*, *O. longifolia* based on a collection from Silent Valley. On study of the protologues of the species it was found that it represented only a form of bigger size. So *O. longifolia* Muktesh & Stephen is merged with *O. agastyamalayana* Sathish.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Agastyamala, Sathish Kumar 1398; *Ibid.*, Gangaprasad 15136. **Palakkad Dist.:** Sispara, Stephen 7856 (KFRI).

Oberonia anamalayana Joseph, J. Ind. Bot. Soc. 42: 222. 1963; Abraham & Vatsala, *Intr. Orch.* 425. 1981; Manilal, *Fl. Silent Valley* 294. 1998.

Erect or pendulous epiphytes. Leaves 21 x 4 cm, oblong, acute, tan-brown, jointed at base. Scape 7 cm long, flattened, adnate to the uppermost leaf. Spike 40 cm long, 1 cm broad. Flowers in verticels, 5.25 x 2 mm, pedicelled, greenish-yellow brown. Bracts 2.75 x 1.25 mm, oblong, acute, irregularly denticulate along margins, gland-dotted. Dorsal sepal 2.25 x 0.75 mm, oblong, obtuse. Petals 2.25 x 0.25 mm, linear, obtuse, entire and decurved along margins. Lip 2.75 x 2.25 mm, ovate, 3-lobed; lateral lobes narrow and longitudinally elongated around the disc, crenate, spreading; midlobe 2-lobuled, lobules orbicular, shallowly crenate, diverging; sinus shallow with a rounded protuberance. Disc ovate-lanceolate, cushion-like. Column 1 mm long, cylindrical. Ovary with pedicel 3 mm long.

Fl. & Fr.: Dec. -Mar.

Distr.: Endemic to Kerala and Tamil Nadu.

Note: A very distinct species characteristic for its dirty-brown colour, loosely imbricated flowers in a long inflorescence and erect, conical lip.

Occurrence & Specimens studied: **Idukki Dist.:** Munnar, Bison Valley, Sathish Kumar 566; Thadiyanpadu, Raju 71244 (MH); Nellipara, N. C. Nair 70113 (MH); Pachakanam,

Sharma 42487 (MH); Vallakadavu, *AESK 15108*. **Kottayam Dist.**: Rubber plantation, *Abraham 3555*. “**Travancore**”, *Bourdillon 78* (MH).

Oberonia arnottiana Wight, *Ic. 5*(1), 3, t. 1628. 1851; Ansari & Balakr., *Orch. Monogr.* 4: 23. 1990. *O. wightiana* Lindl., *Bot. Reg.* 25: 14, Misc. 9.1839, var. *arnottiana* (Wight) Ansari *et al.*, *J. Econ. Tax. Bot.* 3: 118. 1982. *O. wightiana* Lindl. var. *nilgirensis* Ansari *et al.*, *J. Econ. Tax. Bot.* 3: 118. 1982.

Erect or pendulous epiphytes. Leaves 9 x 1 cm, oblanceolate or elliptic, falcate, articulate at base, acute. Scape 4.5 cm long, terete. Spike up to 15 cm long, pendulous. Flowers 2.5-3.4 x 1.5-2 mm, pale or brownish-yellow. Bracts 1.75 x 0.75, ovate, acuminate, sub-entire, sparsely gland-dotted. Sepals and petals dissimilar, reflexed. Sepals 1 x 0.75 mm, ovate, acute, entire. Petals 1 x 0.25 mm, linear, obtuse, entire. Lip 2 x 1.75 mm, 3-lobed; side lobes longitudinally elongated, oblong around the disc, entire, folded upwards but not interlocking by their tips; midlobe 2-lobuled with a conical protuberance in between; lobules oblong or ligulate, entire, acute or truncate and variously toothed at apex. Disc ovate indistinct; column 0.27 mm long. Ovary with pedicel 1.5 mm long.

Fl. & Fr.: Sept. -Nov.

Distr.: India and Sri Lanka.

Occurrence & Specimens studied: **Idukki Dist.**: Anamudi, *Shetty 33426* (MH); Umaiyyamala, *Shetty 26468* (MH).

Oberonia bicornis Lindl., Gen. Sp. Orch. 16. 1830; Manilal, Fl. Silent Valley 294. 1988;
Ansari & Balakr., Orch. Monogr. 4: 31. 1990.

Small epiphytic herbs. Leaves 1-2.7 x 0.2-0.5 cm, fleshy, not articulated, slightly falcate, acute or obtuse at apex. Inflorescence to 6.2 cm long, subtended by a long bract. Bract 3 x 6.5 mm, linear-lanceolate, exceeding the flowers, brownish yellow, gland-dotted. Flowers pedicellate, brownish-red or orange-red, closely imbricated. Sepals and petals gland-dotted; dorsal sepal 2 x 1 mm, ovate-acuminate, erect and orange red; lateral orbicular, deflexed, covering the ovary. Petals smaller than sepals, elliptic, obtuse. Lip inferior, 3-lobed, deep red, gland-dotted; side lobes bend backwards and clasp the column as horns; midlobe quadrate, folded upwards with the laterals. Column short. Pollinia 4. Ovary with pedicel 2 mm long.

Fl. & Fr.: Sep. -Oct.

Distr.: India and Bangladesh.

Occurrence & Specimens studied: **Palakkad Dist.**: Aruvanpara, *Sathish Kumar 10758* (CALI). **Wayanad Dist.**: Thirunelly, *AESK 44208*; Brahmagiri, *Rao 95413* (CALI).

Oberonia brachyphylla Blatt. & McCann, J. Bombay Nat. Hist. Soc. 35: 257. 1931;
Abraham & Vatsala, Intr. Orch. 416. 1981; Manilal, Fl. Silent Valley 296. 1988;
Vajravelu, Fl. Palghat 486. 1990.

Small, delicate, epiphytic herbs. Leaves 0.5-4 x 0.3-1.5 cm, ovate-oblong, lanceolate, fleshy, acute. Inflorescence 0.8-7 cm long, much longer than leaves. Floral bracts ovate-lanceolate, gland-dotted, erose on margin, acute. Flowers orange-yellow, some what whorled. Dorsal sepal 0.75-0.5 mm, ovate-oblong, acute. Lateral sepals 0.75 x 0.5 mm, obliquely ovate, sub-acuminate. Petals equaling sepals, oblong-obovate, base narrowed, irregularly dentate on margins, obtuse. Lip 1-1.25 mm, gland-dotted, 3-veined, orange yellow, 3-lobed; side lobes semi lunar, irregularly dentate on margin; midlobe 2-lobulate with a quadrate sinus in between lobules irregularly denticulate on margin. Column short, thick. Fruit 5 mm long, ovoid or globose capsule.

Distr.: South West India.

Fl. & Fr.: Mar. -Jun.

Occurrence & Specimen studied: **Thiruvananthapuram Dist.:** Ponmudi, *Vatsala s.n.* (UCT). **Idukki Dist.:** Sabarimala, *Sharma 43932* (MH). **Palakkad Dist.:** Aruvanpara, *Sathish Kumar 10556* (CALI); Blind Bridge, Mukkali, *Vajravelu 49781* (MH).

Oberonia brunoniana Wight, Ic. t. 1622. 1851., Hook. f., Fl. Brit. India 5: 681. 1888; Fischer in Gamble, Fl. Pres. Madras 422. 1981; Manilal, Fl. Silent Valley 296. 1988; Ramachandran & Nair, Fl. Cannanore 457. 1988; Vajravelu, Fl. Palghat 486. 1990; Ansari & Balakr., Orch. Monogr. 4: 15. 1990; Mohanan & Henry, Fl. Thiruvananthapuram 464. 1994; Sasi. & Sivar., Flow. Pl. Thrissur For. 449. 1996.
(Plate III-D).

Erect or pendulous epiphytic herbs. Leaves 25 x 2 cm, oblong-ensiform, base articulate, acute. Spike 15 cm long, flattened at base. Flowers yellow, pedicellate. Bracts equal or longer than ovary. Sepals and petals reflexed. Sepals 2 x 1.2 mm, dorsal oblong, obtuse. Lateral sepals obliquely ovate, sub-acute, sparsely gland-dotted. Petals 2 x 7 mm, lanceolate, sub-entire. Lip 2.25 mm across, 3-lobed, gland-dotted; side lobes oblong, sub-entire, not produced above the column; midlobe 2-lobulate, lobules diverging; sinus broad. Disc concave. Column about 0.5 mm long, stigmatic area elliptic. Fruits 5 mm long, ellipsoidal capsules.

Fl. & Fr.: Dec. -Jan.

Distr.: Endemic to Southern Western Ghats.

Note: Common in evergreen and semi evergreen forests.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Ponmudi, *N. C. Nair* 49896 (MH); Western slopes of Agastyamala, *Joseph* 44615 (MH); Chermunji, *Mohanan* 61749, 61820 (MH). **Thrissur Dist.:** Parambikulam, *Meebold* 61/12462 (CALI); Peechi, *Sasidharan* 3879 (KFRI). **Palakkad Dist.:** Silent Valley Dam Site, *Sathish Kumar* 10215 (CALI); *Ibid.*, *Sathish Kumar* 3535 (TBGT); Varadimala, *Bharghavan* 56901 (MH).

Oberonia chandrasekharanii Nair, Ramachandran & Ansari, *Blumea* 28: 361. 1983; Manilal, *Fl. Silent Valley* 296. 1988; Ramachandran & Nair, *Fl. Cannanore* 458. 1988; Ansari & Balakr., *Orch. Monogr.* 4: 12. 1990; Sasi. & Sivar., *Flow. Pl. Thrissur For.* 450. 1996.

Pendulous epiphytes. Leaves 15 x 0.5-1.5 cm, ensiform, articulate, acute, scape 9 cm long, 0.3-0.6 cm broad, flattened. Spike 18 cm long. Flowers pedicelled, pale greenish-yellow, in verticels of 3-6. Bracts 2 x 1.25 mm, lanceolate, acuminate, fringed along margin, gland-dotted. Sepals and petals deflexed, gland-dotted. Sepals 1.25 x 1 mm, ovate-oblong, obtuse. Petals 1.25 x 0.5 mm, linear, truncate and toothed at apex. Lip 1.5 x 2 mm, reniform in outline, 3-lobed, pubescent, gland-dotted; lateral lobes auriform, longer than the broad, folded upwards around the column; midlobe 0.5 x 0.75 mm, 2-lobuled with a broad sinus in between. Disc ovate, concave; nerves not clear. Column 0.5 mm, oblong. Ovary with pedicel 2 mm long. Pollinia ovoid.

Fl. & Fr.: Aug. -Nov.

Distr.: Endemic to Kerala, Tamil Nadu and Karnataka.

Note: It is allied to *O. sebestiana* Shetty & Vivek., an endemic species of Kerala, but differs from it mainly by the reniform, pubescent lip with an ovate disc, the ear-shaped lateral lobes, and the orbicular lobules of midlobe.

Occurrence & Specimens studied: **Pathanamthitta Dist.**: Maniyar, Anil Kumar 483 (CAL). **Kottayam Dist.**: *Ibid.*, Vivekananthan 21417 (MH). **Idukki Dist.**: Peermedu, Vivekanandan 21417 (MH). **Palakkad Dist.**: Palakkad, Vajravelu 46154 (MH); Silent Valley, Sathish Kumar 10757 (CALI). **Wayanad Dist.**: Tolpetty, Ramachandran 54137 (MH). **Kannur Dist.**: Chandanathodu, Ramachandran 66948 (CAL, MH).

Oberonia ensiformis (Smith) Lindl., *Fol. Orch. Oberonia* 21. 1859; Hook. f., *Fl. Brit.*

India 5: 676. 1888; Fischer in Gamble, *Fl. Pres. Madras* 1406. 1928; Abraham &

Vatsala, *Intr. Orch.* 419. 1981; Vajravelu, *Fl. Palghat* 486. 1990; Mohanan & Henry, *Fl. Thiruvananthapuram* 464. 1994; Sivar., & P. Mathew, *Fl. Nilambur* 694. 1997. *Malaxis ensiformis* Smith in Rees, *Cyclop.* 22: 14. 1812.

Pendulous epiphytes. Leaves 4.5 x 1.8 cm, ensiform, articulate at base, acute or acuminate. Scape 10 cm long, terete. Spike up to 15 cm long, 0.5 cm across. Flowers 3 x 1.5 mm, pedicellate, pale or brownish yellow in verticels. Bracts longer than the pedicel and ovary, ovate, acute, irregularly dentate on margin, reflexed at apex, gland-dotted. Sepals and petals dissimilar, reflexed. Dorsal sepal 1.25 x 0.75 mm, ovate, acute. Lateral sepals 1 x 1.25 mm, broadly and obliquely ovate, acute. Petals 1.25 x 0.75 mm, ovate-lanceolate, obtuse, irregularly dentate along margins, papillose. Lip antrorse, quadrate in outline, with two minute calli at base, 3-lobed; side lobes rounded or cuneate, wing-like and spreading in flower; midlobe ob-reniform, 2-lobuled; lobules rounded, converging; sinus broad. Disc with two calli. Column 0.4 mm long, subglobose. Clinandrium dorsal, winged. Operculum ovate-orbicular, acute at apex. Pollinia obovoid-oblong. Ovary with pedicel 1.75 mm long, glabrous.

Fl. & Fr.: Dec. -Mar.

Distr.: India, Myanmar, Thailand, China and Indochina.

Occurrence & Specimens studied: **Idukki** **Dist.**: Rajamala, William D'Cruz 12298.

Palakkad Dist.: Mukkali, Vajravelu 67798 (MH). **Malappuram Dist.**: Koonampara, Philip Mathew 33818 (CALI); *Ibid.*, Sebastine 15668 (MH).

Oberonia falconeri Hook. f., Fl. Brit. India 5: 678. 1890; Fischer in Gamble, Fl. Pres. Madras 1406. 1928; Ansari & Balakr., Orch. Monogr. 4: 29. 1990; Sivar., & Philip Mathew, Fl. Nilambur 694. 1997.

Erect epiphytes. Leaves 8 x 1.3 cm, oblong-lanceolate, acute. Scape indistinct. Spike up to 15 cm long. Flowers pedicelled, 1.25 cm across, greenish-orange yellow or rusty brown, scattered on the rachis. Bracts 3 x 1 mm, lanceolate, acuminate, lacerate along margin. Sepals sub-similar, 1 x 0.5 mm, ovate or obliquely ovate, acute, entire. Petals 1 x 0.25 mm, oblong or linear, sub-acute. Lip 1.5 x 0.75 cm, quadrate, 3-lobed; side lobes rounded, auricular, spreading; midlobe 2-lobular; lobules ovate-regulate, acute, entire, parallel to each other; sinus deep with a triangular protuberance. Disc oblong-ovate, cushion-like. Ovary with pedicel 1.25 mm. Column 0.3 mm. Rostellum not prominent.

Fl. & Fr.: Aug. -Sep.

Distr.: India, Malaya, Thailand, Vietnam. In Kerala, it is reported from Malappuram Dist. only.

Occurrence & Specimens studied: **Idukki Dist.**: Udumbancholai, Meebold 132263 (CAL).

Malappuram Dist.: Anamari, Philip Mathew 34148 (CALI)

Oberonia ferruginea Parish ex Hook. f., Fl. Brit. India 5: 679. 1888. *O. ensiformis* auct., non (J. E. Smith) Lindl., 1859: Abraham & Vatsala, Intr. Orch. 419. 1981.

Epiphytic herbs. Leaves 15-25 x 1-1.5 cm, narrowly ensiform, falcate, thick, acuminate. Scape, short, stout, naked. Spike 9-10 cm, shorter than the leaves. Flowers

orange yellow, 2 mm across. Floral bracts hyaline, membranous, broadly ovate, sheathing the flowers, sub-acute. Dorsal sepal 1.2 x 1 mm, ovate, acute. Lateral sepals 1.1 x 1.1 mm, ovate, acute. Petals 1.2 x 0.6 mm, linear-oblong, fimbriate on margin, acuminate. Lip 1.8 x 2 mm, hairy or short fimbriate, 3-lobed; side lobes short, narrow, ascending, acute or obtuse; midlobe obcordate, 2-lobulate; lobules rounded, crenate with an acute sinus in between. Fruits globose capsules.

Fl. & Fr.: Aug. -Oct.

Distr.: India, Myanmar.

Note: This species related to *O. ensiformis* (Smith) Lindl., but different in having an entirely different hairy lip without any callus. *O. ensiformis* has a pair of callus at the base of midlobe.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Ponmudi, *Sathish Kumar s.n.* **Idukki Dist.:** Mallakudy, *Sharma 43857* (MH). **Thrissur Dist.:** Parambikulam, *Sebastine 15668* (MH). **Palakkad Dist.:** Mukkali, *Vajravelu 27587* (MH). **Wayanad Dist.:** Sultan's Battery, *Ellis 18657* (MH).

Oberonia gammiei King & Pantl., *J. Asiat. Soc. Bengal* 2, 66: 578. 1897; Sivar., & P. Mathew, *Fl. Nilambur* 695. 1997.

Epiphytic herbs. Leaves 3.5-15 x 0.8-2 cm, oblong, subfalcate, obtuse or acuminate. Inflorescence including a long narrow flattened scape up to 35 cm long, laxly flowered. Flowers creamy-yellow, distinctly pedicelled. Bracts 1.5 x 0.8 mm, ovate,

irregularly erose on margins, lobed at apex. Dorsal sepals 0.8 x 0.6 mm, ovate, 1-veined, gland-dotted, obtuse. Lateral sepals 0.8 x 0.6 mm, ovate, gland-dotted, obtuse. Petals 0.8 x 0.5 mm, oblong-elliptic, erose to toothed on margins, obtuse. Lip 1.8 x 1.8, 3-veined, gland-dotted, 3-lobed; side lobes erose or dentate on margins; midlobe 2-lobulate; lobules erose or even on margin, with a deep sinus in between. Column short.

Fl.: Oct. -Nov.

Distr.: India, Myanmar, Thailand, and Vietnam.

Note: Ansari and Balakrishnan (1990), in their revision of the genus merged *O. gammiei* with *O. denticulata* Wight. But the very long inflorescence with loosely arranged flowers make it distinct from the latter, and hence treated here as a distinct species.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.**: Ponmudi. *Sathish Kumar s.n.* (TBGT). **Malappuram Dist.**: Nilambur, *Philip Mathew 33615* (CALI)

Oberonia josephii Saldanha, Ind. For. 100: 568. 1974; Saldanha & Nicolson, Fl. Hassan Dist.: 840. 1976. Ansari & Balakr., Orch. Monogr. 4: 14. 1990; Kumar & Sequiera, *Rheedea* 9(2): 173. 1999.

Pendulous epiphytic herbs. Leaves 10-16 x 0.6-1.4 cm, ensiform flattened, acute; scape up to 10 cm long, slightly winged. Inflorescence many-flowered with a sterile portion at the apex. Floral bracts 4.5 x 2 mm, ovate, fimbriate. Flowers 6-6.5 x 3.5-4 mm, in distinct verticels, orange coloured. Sepals and petals deflexed; sepals dissimilar. Dorsal sepal 2-2.2 x 0.7-0.8 mm ovate, induplicate. Lateral sepals similar to the dorsal. Petals 2-

2.2 x 0.3 mm, lanceolate; base slightly sterile, acute, crossing each other. Lip 4.5 x 3.5 mm, 3-lobed, sparsely gland-dotted; lateral lobes oblong, elongate, folded upwards and encircling the column; midlobe 2-lobed; lobules orbicular, crenulate, serrulate; disk ovate, saccate. Pollinia 4, 0.3-0.4 mm long.

Fl. & Fr.: Jan. -Feb.

Distr.: Karnataka, Kerala

Note: Epiphytic on branches of isolated trees in the evergreen forests between 1000-1100 m elevation.

Occurrence & Specimens studied: **Wayanad Dist.**: Vengavalumala, Thirunelly, *Stephen & Micheal 008115* (KFRI).

Oberonia longibracteata Lindl., Gen. Sp. Orch. 15. 1830; Hook. f., Fl. Brit. India 5: 678.

1890; Jayaw. in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 2: 16. 1981.

Epiphytic herbs. Leaves 9 x 0.8 cm, linear-oblong, ensiform, not articulated, acuminate. Scape 11 cm, adnate to the uppermost leaf, flattened. Spike 8.5 cm long, arcuate. Flowers pedicelled, 2.5 x 2 mm, yellowish brown, scattered on the rachis. Bracts 4.5 x 1 mm, linear-lanceolate, acuminate, sub-entire. Sepals and petals subsimilar, entire, spreading. Sepals 1 x 0.75 mm, ovate-lanceolate, acute and inflexed. Lateral sepals ovate, acute. Petals 0.75 x 0.5 mm, oblong, acute, sub-entire. Lip quadrate in outline, 3-lobed, 0.75 x 0.75 mm, gland-dotted; sidelobes oblong, cuneate, wing-like, truncate at apex, sub-entire; midlobe suborbicular, obscurely 2-lobed at apex with a shallow sinus in between.

Disc ovate, saccate. Column 0.3 mm, globose. Clinandrium apical, orbicular. Operculum 0.23 mm, ovate-orbicular, acute at apex. Rostellum triangular, acuminate. Pollinia obovoid.

Fl. & Fr.: Nov. -Jan.

Distr.: Kerala, Sri Lanka, Vietnam.

Occurrence & Specimens studied: **Idukki Dist.:** Sivagiri hills near Elatheri, C. N. Mohanan 72814 (MH, TBGT).

Oberonia mucronata (D. Don) Ormerod & Siedenf, *Contr. Orch. Fl. Thailand* 8: 20. 1997. *Stelis mucronata* D. Don, *Prod. Fl. Nepal* 32. 1825. *Cymbidium iridifolia* Roxb., (*Hort. Beng.* 83. 1814, *nom. nud.*) *Fl. Ind.* 3: 458. 1832. *Oberonia iridifolia* Lindl., *Gen. Sp. Orch.* 15. 1830; Hook. f., *Fl. Brit. India* 5: 675. 1888; Fischer in Gamble, *Fl. Pres. Madras* 1406. 1928, var. *denticulata* (Wight) Hook. f., *Fl. Brit. India* 5:675.1888; Abraham & Vatsala, *Intr. Orch.* 416. 1981. *O. denticulata* Wight, *Ic.* 1625. 1825; Vajravelu, *Fl. Palghat* 487. 1990; Sasi. & Sivar., *Flow. Pl. Thrissur For.* 450. 1996; Sivar., & P. Mathew, *Fl. Nilambur* 694. 1997 (**Fig. 14**).

Large epiphytic herbs. Leaves 5-30 x 0.5-1.5 cm, broadly ensiform, straight or falcate, acuminate. Spike up to 20 cm, slender. Floral bracts ovate-oblong, recurved, erose. Flowers brownish-yellow. Sepals 1 x 0.8 mm, subequal, broadly ovate-obtuse. Petals 1 x 0.5 mm, ovate, margin erose. Lip 1.8 x 2 mm, yellowish brown, 3-lobed; side lobes

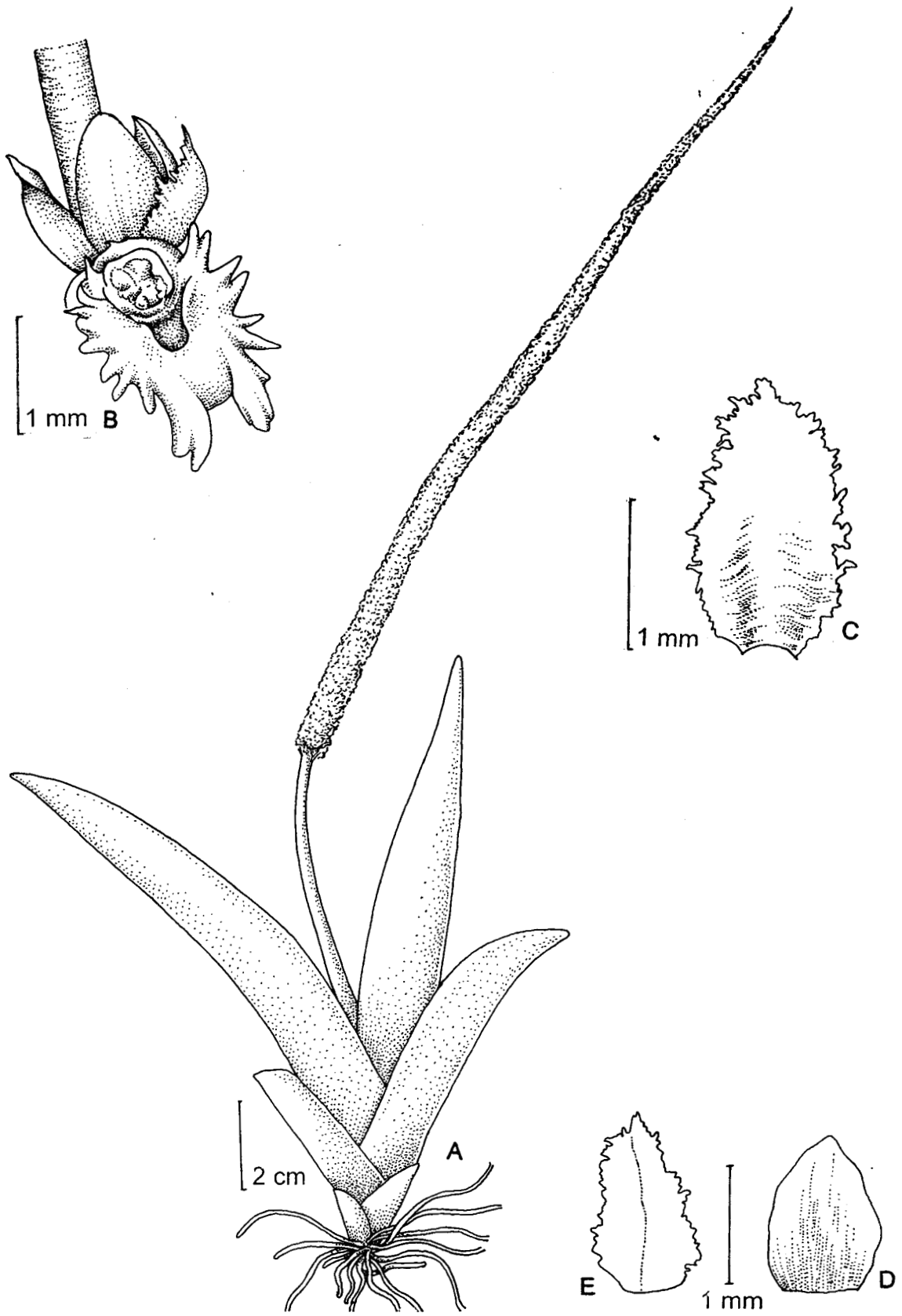


Fig. 14. *Oberonia mucronata* (D. Don) Ormerod et Seidenf.: A. Habit; B. Flower; C. Bract; D. Sepal; E. Petal.

irregularly lobed; midlobe 2-lobulate; lobules unevenly lobed with a deep sinus in between. Column very short. Fruits globose capsules.

Fl. & Fr.: Oct. -Dec.

Distr.: Throughout Indomalaysia.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.**: Palode, *Sathish Kumar 531*. **Kollam Dist.**: Athikayam, *Sathish Kumar 538*; Kulathupuzha, *Mohanan 6116* (MH); *Ibid.*, *AESK 5203*. **Pathanamthitta Dist.**: Kottampara, *AESK 25441*. **Idukki Dist.**: Pamba to Vandiperiyar, *Deb 30438* (MH); Pulimala, *Pandurangan 66494* (CAL). **Kannur Dist.**: Thaliparamba, *s. coll., s.n.* (Acc. No. *11848* - MH); Parappa, *Ansari 64869* (MH). **Kasaragod Dist.**: Parappa, *Ansari 64689* (CAL). “**Travancore**”: Karippanthodu, *Calder & Ramaswamy 319* (CAL).

Oberonia nayarii Ansari & Balakr., *Orch. Monogr.* 4: 17. 1990; Sath. Kumar & Manilal, *Cat. Ind. Orchids* 81. 1994.

Epiphytic herbs. Leaves 5.5 x 0.9 cm, oblong-ensiform, articulate at base, sub-acute, dirty-green. Scape 3 cm long, minutely 2-winged. Spike 7 cm long, erect. Flowers pedicelled, greenish-yellow to brownish-yellow. Bracts 1 x 0.75 mm, ovate, acute, entire or shallowly serrate, sparsely gland-dotted. Sepals and petals dissimilar, reflexed. Dorsal sepal 1 x 0.75 mm, oblong, obtuse, entire. Lateral sepals ovate, acute, entire and induplicate along margins, minutely keeled on balk. Petals 1.25 x 0.25 mm, oblanceolate, acute, entire or subserrate along margins. Lip 1-1.5 x 1-2 mm, semi-orbicular, 3-lobed,

gland-dotted, glabrous; side lobes oblong-cuneate, ear-like, shallowly crenate, spreading in flower, not encircling the column; midlobe 2-lobuled; lobules orbicular, shallowly crenate, diverging; sinus broad, generally with a round protuberance. Disc ovate, indistinct. Ovary with pedicel 1.25 mm long. Rostellum semi-orbicular, obtuse.

Fl. & Fr.: Dec. -July

Distr.: Western Ghats.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.**: *M. Mohanan* 52522, 66057 (MH).

Oberonia platycaulon Wight, Ic. t. 1623. 1852; Hook. f., Fl. Brit. India 5: 682. 1888; Fischer in Gamble, Fl. Pres. Madras 1407. 1928; Abraham & Vatsala, Intr. Orch. 425. 1981; Ansari & Balakr., Orch. Monogr. 4: 13. 1990; Mohanan & Henry, Fl. Thiruvananthapuram 465. 1994. *O. bisaccata* Manilal & Kumar, Kew Bull. 39 (1): 121. 1984; Manilal, Fl. Silent Valley 294. 1988 (**Fig. 15**).

Epiphytic herbs. Leaves up to 19 cm long, 1.5 cm broad, narrowly ensiform, straight, acute. Scape 11 x 0.9 cm, flattened, adnate to the uppermost leaf. Spike up to 9.5 cm long, deflexed from base or decurved. Flowers pedicelled, 4 x 1 mm, pale or orange yellow. Bracts 2.25 x 1.25 mm, ovate-lanceolate, acute, irregularly denticulate along margins, gland-dotted. Sepals and petals dissimilar, reflexed. Dorsal sepal 1.5 x 0.75 mm, oblong or ovate, obtuse. Lateral sepals 1.5 x 1 mm, ovate, acute. Petals 1.5 x 0.25 mm, linear, obtuse or truncate, entire. Lip 2 x 2.75 mm, sub-orbicular, 3-lobed; side lobes

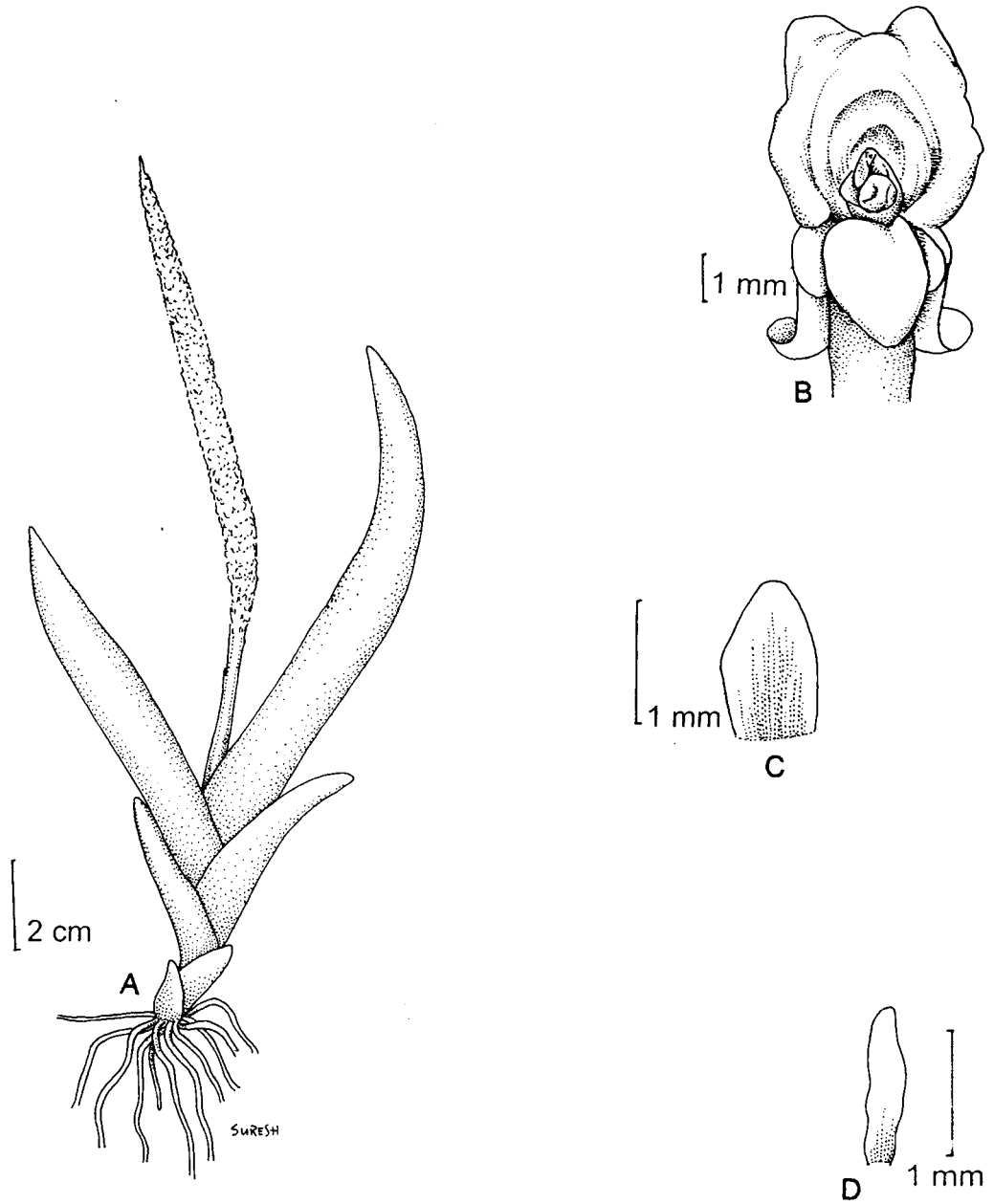


Fig. 15. *Oberonia ptycaulon* Wight: A. Habit; B. Flower; C. Dorsal sepal; D. Lateral petal.

oblong-cuneate, ear-like, entire, encircling the column; midlobe ovate or rectangular in outline, 2-lobuled, with a distinct lobule like protuberance at the sinus; lobules rounded. Disc ovate, 2-saccate towards the proximal end. Ovary with pedicel 2.25 mm long. Column 0.25 mm long. Clinandrium dorsal, quadrate, minutely winged. Operculum 0.48 mm long, suborbicular. Rostellum rounded with an apiculum.

Fl. & Fr.: Aug. -Nov.

Distr.: Endemic to southern parts of Western Ghats.

Note: Manilal and Sathish Kumar (1984) while establishing their species *O. bisaccata* compared the species with *O. brunoniana* and *O. sebastiana* and considered their species to differ from both in having 2 basal pouches on the 3-fid lip, and basally deflexed spike. They overlooked the species *O. platycaulon*. Following Ansari and Balakrishnan (1990) I treat *O. bisaccata* as conspecific with *O. platycaulon* Wight.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.**: Athrumala, Aesk 7294; *Ibid.*, N. Mohanan 4292; Palode, Aesk 7434; Ponmudi, Aesk 5462. **Idukki Dist.**: Vatsala s.n. (KUBOT); *Ibid.*, Vivekananthan 48352 (MH). **Palakkad Dist.**: Palakkad, Ansari 51492 (MH).

Oberonia proudlockii King & Pantl., J. Asiat. Soc. Bengal 66: 580. 1896: Fischer in Gamble, Fl. Pres. Madras 1406. 1928. Abraham & Vatsala, Intr. Orch. 422. 1981; Manilal, Fl. Silent Valley 297. 1998; Ansari & Balakr. Orch. Monogr. 4: 34. 1990 ; Mohanan & Henry, Fl. Thiruvananthapuram 465. 1994.

Erect epiphytes. Leaves 2.5 x 1 cm, ovate, oblong, acute. Scape up to 2 cm long. Spike 7 cm long. Flowers 1 x 0.75 mm, pale or greenish yellow, adpressed to the rachis. Bracts 0.75 x 0.75 mm, suborbicular, lacerate along margins. Dorsal sepal 0.75 x 0.5 mm, ovate, acute, reflexed. Lateral sepals obliquely ovate, acuminate, not reflexed. Petals 0.57 x 0.25 mm, linear or oblong, acute, sub-entire, erect in flower. Lip 0.75 x 0.75 mm, suborbicular, not lobed, two triangular protuberance at apex, irregularly denticulate along margins, gland-dotted. Disc obovate, cushion like. Column 0.15 mm long; clinandrium dorsal, wider than the column-stalk, surrounded by spreading wings, not saccate. Rostellum tooth-like.

Fl. & Fr.: Jan. -Mar.

Distr.: India

Occurrence & Specimens studied: **Thiruvananthapuram Dist.**: Ponmudi Aesk 7005.

Palakkad Dist.: Poochpara, Sathish Kumar 10781 (CALI).

Oberonia recurva Lindl., Bot. Reg. 25: 14, Misc. 8. 1839; Hook. f., Fl. Brit. India 5: 680. 1888; Fischer in Gamble, Fl. Pres. Madras 1406. 1928; Jayaw. in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 2: 24. 1981; Ansari & Balakr., Orch. Monogr. 4: 28. 1990; Sasi. & Sivar., Flow. Pl. Thrissur For. 450. 1996 (**Fig. 16**).

Small epiphytic herbs. Leaves 3 X 0.6 cm, linear-ensiform, acute or acuminate. Scape small, up to 1 cm long. Spikes 7.5 cm. Flowers in verticels, 1-2 x 0.5-1 mm, orange-yellow. Bracts 1 x 0.5 mm, oblong, sub-entire acuminate. Sepals and petals dissimilar,

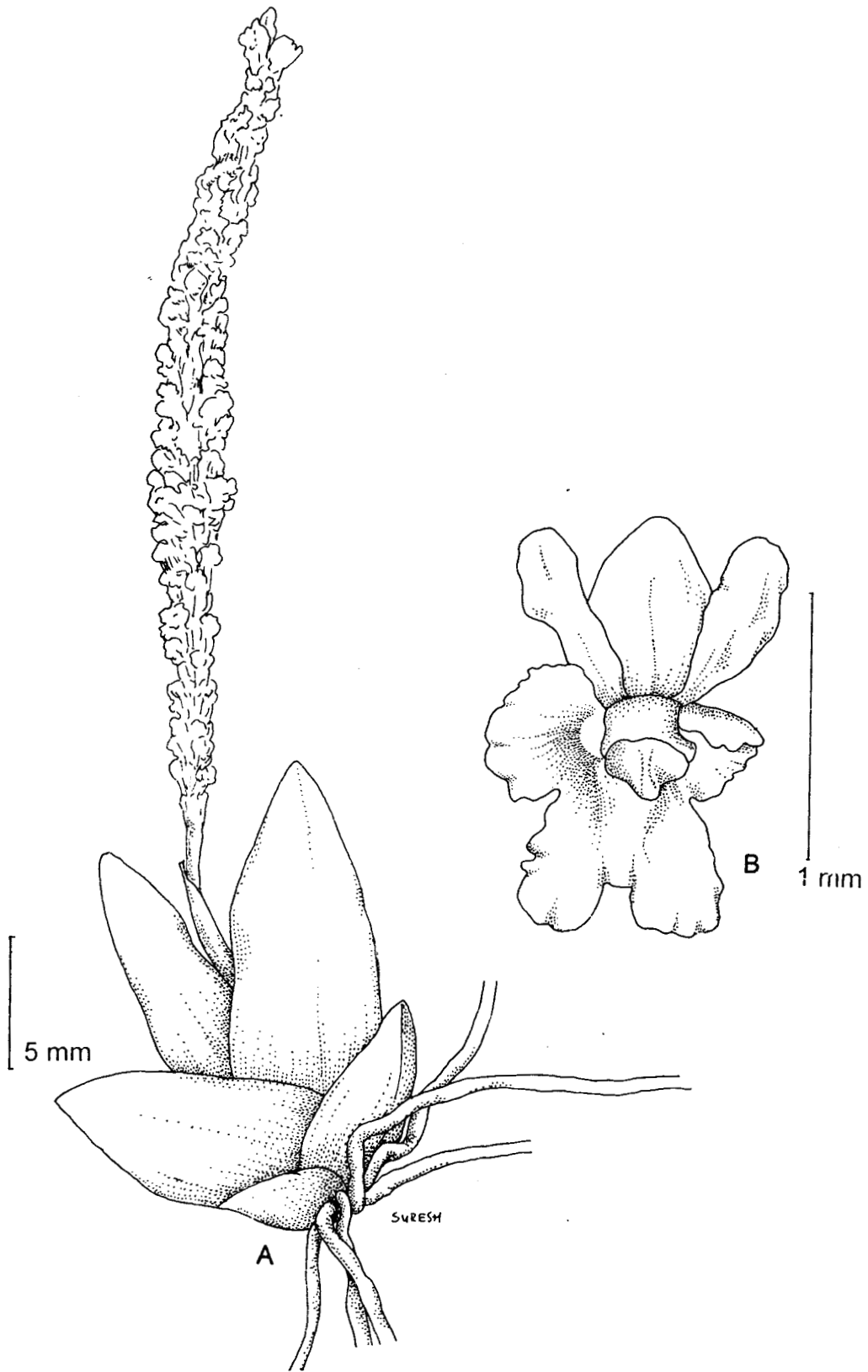


Fig. 16. *Oberonia recurva* Lindl.: A. Habit; B. Flower.

spreading, gland-dotted. Dorsal sepal 0.7 x 0.5 mm, oblong or ovate, obtuse or acute, entire. Lateral sepals ovate-oblong, acuminate. Petals 0.75 x 0.5 mm, oblong-ovate or oblanceolate, acute or rounded. Lip quadrate, 3-lobed, 1 x 0.75 mm, gland-dotted; side lobes cuneate and ear-like, white spreading, curved upwards, parallel to column, but not encircling, sub-entire; midlobe oblong or wedge-shaped, 2-lobuled; lobules oblong-ovate, obtuse or acute, irregularly lobed, diverging or parallel, sinus narrow, without any protuberance. Disc obovate-concave. Column 0.3 mm long; operculum 0.2 x 0.3 mm, laterally elongated. Rostellum triangular-linear, acute at apex. Ovary with pedicels 0.75-1.25 mm long.

Fl. & Fr.: Mar. -Apr.

Distr.: India, Bhutan, Sri Lanka.

Note: This species is growing well along with way sides from Bonaccord to Agasthyamala.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Agasthyamala, *AESK* 7286; Bonaccord, *Rama Rao* 826.

Oberonia santapau Kapad., *J. Bombay Nat. Hist. Soc.* 57: 265. 1960; Abraham & Vatsala, *Intr. Orch.* 429. 1981; Manilal, *Fl. Silent Valley* 297. 1985; Vajravelu, *Fl. Palghat* 487. 1990; Ansari & Balakr., *Orch. Monogr.* 4: 18. 1990; Mohanan & Henry, *Fl. Thiruvananthapuram* 465. 1994; Sasi. & Sivar., *Flow. Pl. Thrissur For.* 450. 1996; Sivar., & Philip Mathew, *Fl. Nilambur* 695. 1997. *O. lindleyana*, *Wight, Ic.* 5(1): 3, t.

1624. 1851, non Brong. ex Duperr., 1834; Hook. f., Fl. Brit. India 5: 681. 1888; Fischer in Gamble, Fl. Pres. Madras 1406. 1928.

Large epiphytic herbs. Leaves up to 17 x 2.5 cm, oblong, obtuse or acute, dirty brown. Scape 8 cm long, flattened. Spike 19 cm long, fleshy, decurved. Flowers 3 x 1.5 mm, pedicelled, reddish brown or straw-coloured. Bracts 2.25 long, longer than ovary and pedicel, lanceolate, acute, irregularly denticulate on margins. Sepals and petals dissimilar, gland-dotted, reflexed. Dorsal sepal 1.25 x 0.75, oblong, obtuse; lateral sepal oblong-ovate, obtuse. Petals 1.25 x 0.25 mm, linear, truncate or obtuse, reflexed. Lip 2.25 x 2.25 mm, gland-dotted; side lobes narrow, longitudinally elongated around the disc, shallowly crenate, not encircling the column; midlobe 2-lobuled; lobules oblong, shallowly crenate, rounded at apex, converging but not overlapping; sides broad with a conical protuberance. Disc ovate with crescent-shaped, cushion like band at the distal end. Ovary and pedicel 1.5 mm long. Column short. Anther 2-celled.

Fl. & Fr.: Nov. -Dec.

Distr.: Endemic to Kerala, Karnataka and Tamil Nadu.

Note: Common in evergreen and shola forests.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.**: Ponmudi, *AESK* 13268; *Ibid.*, *Sathish Kumar s.n.*; Athirumala, *AESK* 7297; *Ibid.*, *N. Mohanan* 9274; Agastyamala, *AESK* 13231; Uthipanchi, *AESK* 7321. **Idukki Dist.**: Kuttikanam, Peerumadu, *Vivekanandan* 22936 (MH); Old Devikulam, *Sebastine* 18475 (MH). **Thrissur Dist.**: Karimala, *Sasidharan* 5778 (MH). **Palakkad Dist.**: Parambikulam, *Sebastine* 15033

(MH); Silent Valley, *Sathish Kumar 10766* (MH); *Ibid.*, *Vajravelu 33226* (MH); Varadimala, *Bhargavan* (MH); Pothumala, Nelliampathy, *N. C. Nair 69635* (MH). **Wayanad Dist.:** Sulthan's Bathery, *Ellis 18564* (MH). **Kannur Dist.:** Chandanathodu, *Ramachandran 54139, 61306, 22936* (MH).

Oberonia sebastiana Shetty & Vivek., *Bull. Bot. Sur. India* 17(1-4): 157-159. 1975; Sath. Kumar & Manilal, *Cat. Ind. Orchids* 81. 1994.

Caespitose, pendulous epiphytic herbs. Leaves about 6 long, distichous, succulent, pale green or yellowish green, laterally compressed, ensiform, acute, acuminate. Inflorescence 17-38 cm long, slightly arcuate, laxly many-flowered; rachis flattened; scape 4.9-10.7 cm long, adnate to the upper leaf. Flowers 2.6 mm long, yellowish, sub-verticillate. Bracts little longer than and closely enveloping the ovary, ovate, irregularly erose, acute or acuminate, sparsely gland-dotted. Sepals subequal, reflexed, broadly ovate, entire, acute. Petals 1-1.2 mm long, 0.3-0.4 mm broad, reflexed, oblong, sub-entire, rounded at apex, without nerves and gland dots; lebellum erect, 3-lobed, broader than long, hyaline, sparsely gland-dotted, 3-nerved; lateral lobes much longer than mid lobe, encircling the column; midlobe 2-lobulate; lobules equal, often with a few notches at the tip. Ovary with a pedicel 1.5 mm long. Capsules 5-6.3 mm long, 2-2.8 mm broad, oblong, shortly-stalked, 6-ribbed, crowned by the accrescent perianth.

Fl. & Fr.: Nov. -Dec.

Distr.: Known only from Anamudi Hills (Idukki District).

Note: Epiphytic on tree trunks at higher elevations.

Occurrence & Specimens studied: **Idukki Dist.:** Umaiymalai, Shetty & Vivekananthan 26480 (MH); Rajamalai, Shetty & Vivekananthan 33404 (MH); Devikulam, Sebastian 17517; Munnar, Radhakrishnan 12238 (MH).

Oberonia seidenfadeniana Joseph & Vajravelu, Bull. Bot. Sur. India 13: 344. 1971.
Ansari & Balakr., Orch. Monogr. 4: 14. 1990; Mohanan & Henry, Fl. Thiruvananthapuram. 465. 1994.

Epiphytic herbs. Leaves 10 x 1.3 cm, ensiform, acute. Scape up to 10 cm, flattened. Spike up to 11 cm with a sterile tip, slightly arcuate. Flowers 2.5 x 1.75 mm, in close verticels, pedicelled, greenish or golden yellow. Bracts 2 x 1.5 mm, ovate-lanceolate, acuminate, irregularly denticulate along margins, gland-dotted. Dorsal sepal 1.25 x 0.75 mm, oblong, obtuse and mucronate at apex, entire. Lateral sepals 1.25 x 1 mm, obliquely ovate, sub-acute, minutely keeled on back at apex. Petals 1.25 x 0.5 mm, oblong, obtuse, sub-entire. Lip semi-orbicular, 3-lobed, 1.5 x 2.25 mm, sparsely gland-dotted; side lobes much broader than mid lobe., oblong or obliquely cuneate., ear like, sub-entire, encircling the column and interlocking at their tips; midlobe quadrangular, minutely 2-lobuled; lobules separated by a very shallow sinus. Disc ovate, saccate towards the proximal end. Ovary with pedicel 1.25 mm long. Column 0.36 mm long. Clinandrium apical, orbicular, widened and winged around giving a bowl-like appearance. Rostellum not developed.

Fl. & Fr.: Mar. -Sept.

Distr.: Endemic to Southern Western Ghats.

Occurrence & Specimen studied: **Thiruvananthapuram Dist.:** Chemunji, M. Mohandn
61749 (MH).

Oberonia tenuis Lindl., *Fol. Orch.* Oberonia 3. 1859; Hook. f., *Fl. Brit. India* 5: 682.
1888; Jayaw. in Dassan. & Fosb., *Rev. Handb. Fl. Ceylon* 2: 36. 1981; Manilal, *Fl.*
Silent Valley 298. 1988 (**Fig. 17**).

Small epiphytes. Leaves 0.3-7 x 0.2-0.9 cm, succulent, brown or pale green, linear-lanceolate, falcate, acuminate or with a short bristle at apex. Inflorescence adnate to the uppermost leaf, and subtended by a fleshy, linear, pale yellow, hair-tipped bract. Floral Bracts 2-4 mm, filiform, yellow, gland-dotted. Flowers 3 mm long shortly pedicellate, pale-yellow or brownish-yellow, loosely imbricated on a raceme. Dorsal sepal 1 x 0.5 mm, pale-brown, ovate-acuminate, gland-dotted, slightly longer than laterals. Lateral sepals 1 mm long, orbicular, concave, gland-dotted, acute. Petals similar to sepals but narrower, subfalcate, obtuse at apex. Lip 3-lobed, inferior, side lobes linear or filiform, erect, surrounding the column and meeting above, acute at apex; midlobe obscurely 3-lobulate; lateral lobules semi-lunar, erect and folded upwards. Column short. Anther 2-celled. Pollinia 4. Ovary 1 mm long. Capsules less than 4 mm, distinctly stalked.

Fl. & Fr.: Sept. -Oct.

Distr.: India and Sri Lanka.

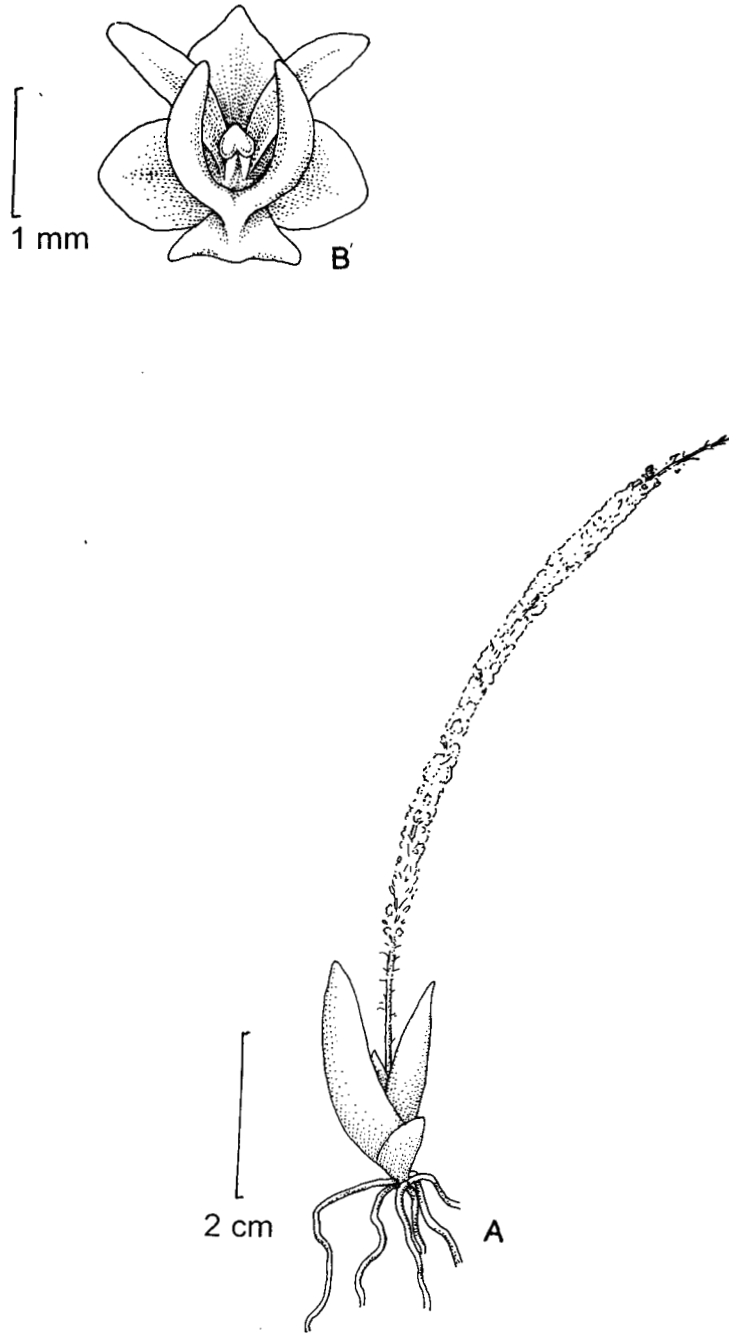


Fig. 17. *Oberonia tenuis* Lindl.: A. Habit; B. Flower.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Palode, *AESK* ; *Ibid.*, *Sathish Kumar* 509. **Palakkad Dist.:** Aruvanpara, *Sathish Kumar* 10762 (CALI). **Wayanad Dist.:** Peria, *Sathish Kumar* 3704.

Note: Closely resembles *O. bicornis*, but differs from the latter by the leaf-adnate inflorescence, leaf-tip pointed, and the obscurely trilobed middle lobe of the lip.

Oberonia thwaitesii Hook. f., *Fl. Brit. India* 5: 678. 1988; Jayaw. in Dassan. & Fosb., *Rev. Handb. Fl. Ceylon*. 2: 23. 1981; Manilal & Kumar, *Curr. Sci.* 33: 1106, 1984; Ansari & Balakr., *Orch. Monogr.* 4: 27. 1990; Sasi. & Sivar., *Fl. Pl. Thrissur For.* 450. 1996.

Pendulous epiphytes. Leaves 10 x 1 cm, narrowly oblong-ensiform, acute, jointed at base. Spike up to 21 cm long, adnate to the upper most leaf, subtended by 2 bracts. Flowers 1.7 x 0.7 mm, yellow, in verticels, 4 mm apart. Bracts 2.2 x 1 mm, longer than ovary, lanceolate, irregularly denticulate along the margin. Sepals and petals deflexed. Dorsal sepal 0.9 x 0.6 mm ovate, 1-veined, apiculate. Lateral sepals 1 x 0.7 mm, ovate, apiculate. Petal 0.8 x 0.5 mm, ovate, gland-dotted, 1-veined, acute. Lip 1.5 x 1.4 mm, cuneiform-obcordate, gland-dotted, 3-veined, 3-lobed; side lobes rounded, auricular; midlobe longer and broader, 2-lobulate; lobules oblong, crenate, distantly toothed along margin. Sinus narrow. Column very short. Anther terminal. Pollinia 2 pairs. Fruits 3 x 1.5 mm, sub-globose, shortly-stalked, ridged capsules.

Fl. & Fr.: May-July

Distr.: Kerala and Sri Lanka

Occurrence & Specimens studied: **Kollam Dist.:** Thenmala, Sivadasan CU 15255 (K).

Thrissur Dist.: Peechi, Sasidharan 3971 (KFRI); Elanad, Sasidharan 5080 (KFRI).

Oberonia verticillata Wight, Ic. 5(1): 3, t. 1626. 1851; Hook. f., Fl. Brit. India 5: 677.

1888; Fischer in Gamble, Fl. Pres. Madras 1406. 1928; Abraham & Vatsala, Intr. Orch.

419. 1981; Ramachandran & Nair, Fl. Cannanore 458. 1988; Ansari & Balakr., Orch.

Monogr. 4: 28. 1990; Mohanan & Henry, Fl. Thiruvananthapuram 466. 1994. (Fig. 18).

Pendulous epiphytes. Leaves up to 20 x 1.5 cm, oblong, ensiform, fleshy, acuminate. Scape 3 cm long, terete. Spike 27 cm long, pendulous. Flowers in verticels, 4 x 2 mm, yellow; bracts 2.5 x 0.75 mm, ovate-lanceolate, acuminate, irregularly dentate along margins, gland-dotted. Sepals and petals dissimilar, glabrous, deflexed. Dorsal sepals 1.25 x 0.75 mm, oblong-ovate, obtuse. Lateral sepals 1 x 0.25 mm, obliquely ovate, acute or sub-acuminate. Petals 1.6 x 0.5 mm, oblong, 1-veined, obtuse. Lip 2 x 1.25 mm, cuneate-obovate, deeply 2-lobulate; lobules broad, overlapping, rounded, dentate or erose, with a narrow sinus in between. Column short. Anther yellow. Ovary with pedicel 2 mm long. Fruits 6 mm long, oblong capsules.

Fl. & Fr.: Mar. -Oct.

Distr.: Endemic to South India

Note: A very distinct species distributed in a very wide range of altitudes.

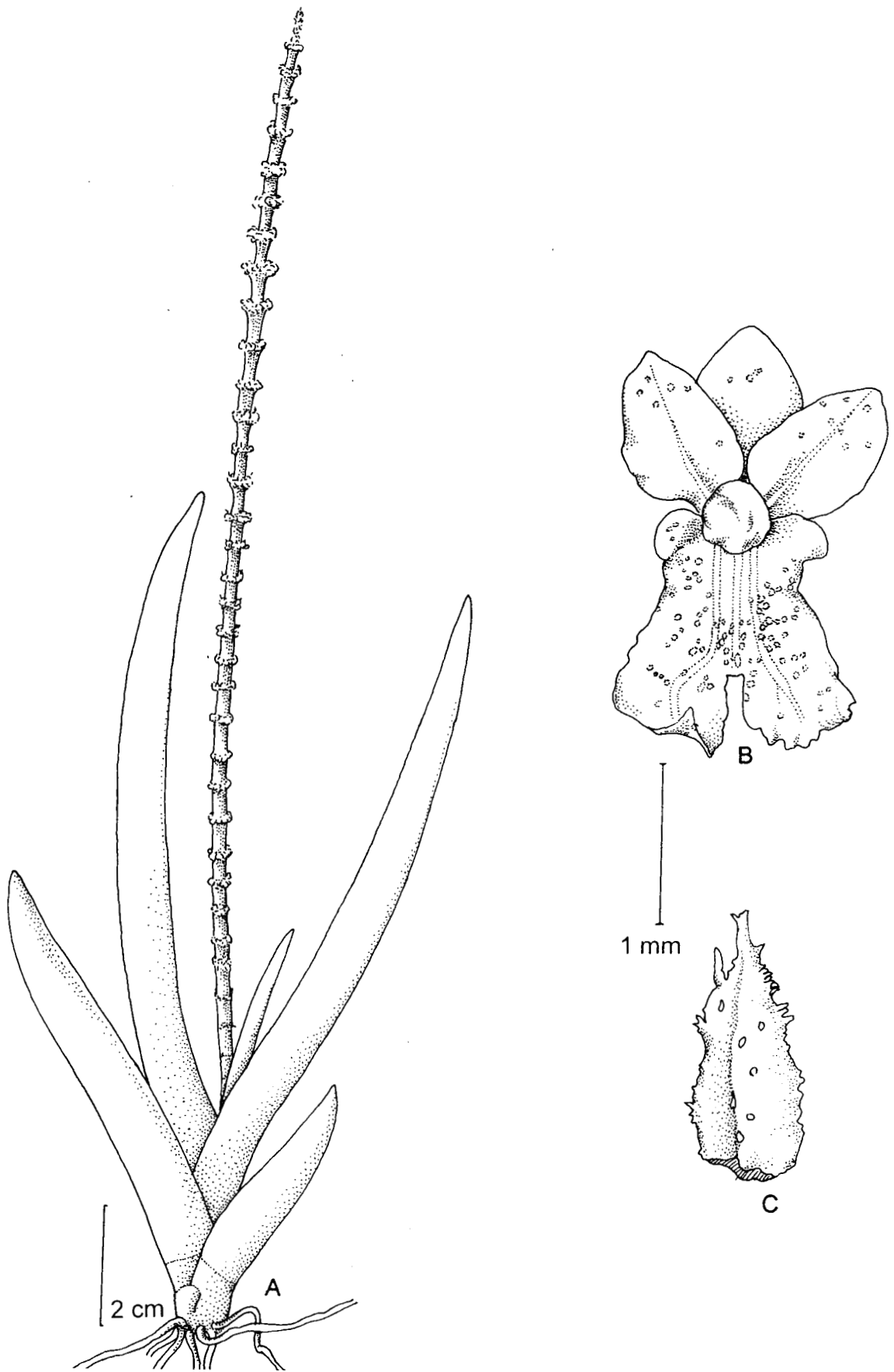


Fig. 18. *Oberonia verticillata* Wight: A. Habit; B. Flower; C. Bract.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Palode, *Sathish Kumar* 533, 583; *Ibid.*, *T. S. Nair* 416; Pongalappara, *Sathish Kumar* 4649; Kurusumala, *M. Mohanan* 632220 (CAL, MH); Kottur Reserve forests, *M. Mohanan* 54623 (MH).
Kollam Dist.: Piravanthur, *C. N. Mohanan* (MH). **Idukki Dist.:** Kanthellur, *Sathish Kumar* 4639. **Thrissur Dist.:** Parambikulam *Meebold* 26/14220 (CAL).

Oberonia wayanadensis Sivad. & Balakr., *Nordic J. Bot.* 9(4): 395. 1989; *O. pakshipadalensis* Muktesh & Stephen, *J. Orch. Soc. India* 12(1-2): 19-33. 1998.

Pendulous epiphytes. Leaves 1-17 x 0.5-1.6 cm, ensiform, articulated at base; basal ones smaller. Scape 12-15 x 0.3-0.7 mm, compressed, adnate to the upper leaf. Inflorescence 25-33 cm long; floral axis rounded to sub-tetragonal, 2 mm diam., tapering into a sterile tail. Flowers pedicellate in distant whorls, each one 3 mm apart and 4 in a whorl. Bracts 2-2.5 x 1.15-1.5 mm, ovate, oblong, erose on margin, acute. Pedicels 1.5 mm long. Ovary 1.5-1.75 mm long. Sepals and petals deflexed. Dorsal sepal 2.3-2.5 x 1.4-1.6 mm, ovate, oblong, obtuse, 1-nerved. Lateral sepals 2.2-2.3 x 1.5-1.75 mm, broadly ovate, 1-nerved. Petals 2.5 x 0.5 mm, linear oblong, acute, 1-nerved. Lip quadrate, 3-lobed, 3-nerved; side lobes entire, encircle and overlap behind the column; midlobe 2-lobulate, 1.25-1.75 x 3.5-4 mm; lobules orbicular with a quadrate sinus between. Disc ovate, concave, glabrous. Column 0.25-1.0 x 0.5-0.7 mm, ovate oblong. Pollinia 2, ovoid.

Fl. & Fr.: Sep. -Oct.

Distr.: Endemic to Kerala.

Note: Seen as epiphytes on trees in evergreen forests.

Occurrence & Specimen studied: **Wayanad Dist.:** Chembra Perk near Meppadi, Balakrishnan 40643 (CALI).

Note: Muktesh Kumar and Stephen Sequiera (1999) described a new species, *O. pakshipadalensis* based on a collection from Wayanad district. This species is very much allied to *O. wayanadensis* Sivad. & Balakr. except for the very sparse erose nature of the lip. The type locality of the both taxa are in Wayanad district and at same elevation. Therefore, I treat the former as conspecific with *O. wayanadensis* Sivad. & Balakr.

Oberonia wightiana Lindl., Bot. Reg. 25: 9. 1839; Wight, Ic. t. 1627. 1851; Hook. f., Fl. Brit. India 5: 683. 1888; Fischer in Gamble, Fl. Pres. Madras 1407. 1928; Jayaw. in Dassan. & Fosb., Rev. Hand. Fl. Ceylon 2: 19. 1981; Manilal, Fl. Silent Valley 298. 1988; Ansari & Balakr., Orch. Monogr. 4: 24. 1990; Mohanan & Henry, Fl. Thiruvananthapuram 466. 1994.

Pendulous epiphytes. Leaves up to 15 x 1 cm, oblong-ensiform, acute. Spikes 5-15 cm long, slightly curved. Bracts 1.5 x 0.25 mm, ovate-lanceolate, acuminate or sub-acute, entire or dentate along margin. Flowers yellow in lax, sub-verticels. Dorsal sepal 1 x 0.5 mm, oblong, obtuse, entire. Lateral sepals ovate-oblong, sub-acute. Petals 1 x 0.25 mm, linear, obtuse, entire. Lip 1.5 x 2 mm, ovate-oblong or quadrate, 3-lobed; side lobes 1-2 mm across; midlobe, oblong-ligulate, wing like on spreading, rounded at tips, entire, folded upwards round the column and locking by their tip; midlobe 2-lobed; lobules

rugulate, entire, oblique and variously toothed at apex, diverging. Disc ovate, not distinct. Ovary with pedicel 2 mm long. Column 0.5 mm. Fruits 5 x 3 mm, obovoid capsules.

Fl. & Fr.: Nov. -Mar.

Distr.: India and Sri Lanka.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Ponmudi, on the way to Upper Sanatorium, *M. Mohanan 525222 (CALI); Ibid., Joseph 446154 (MH). **Idukki Dist.:** Devikulam, *Shetty 33426 ((MH); 26468 (MH). **Palakkad Dist.:** Silent Valley, Sispara, *Sathish Kumar 10793 (CALI).***

Note: This is a highly variable taxon. Variations are seen within in the populations also. However, Ansari *et al.* (1982) recognized 3 varieties under this species.

PAPILIONANTHE Schlechter

Orchis 9: 78. 1915.

Epiphytes with terete leaves and long, flexuous roots. Inflorescence axillary, 1-few-flowered. Flowers large, showy. Petals attached by a very broad base to the foot of the column. Column short, stout. Lip 3-lobed; lateral lobes parallel or enfolding the column. Pollinia 2, sulcate on broadly triangular to sub-quadrangle stipes. Rostellum elongate.

Ten species are distributed in India, Sri Lanka and Indonesia. Five species are present in India, and only one species is reported from Kerala.

Papilionanthe cylindrica (Lindl.) Seidenf., *Descript. Epidend.* J. G. Koenig, 1791: 33.
1995. *Aerides cylindrica* Lindl., *Gen. Sp. Orch.* 240. 1833, excl. syn.; Wight, *Ic. t.*
1744. 1852; Hook. f., *Fl. Brit. India* 6: 44. 1890 (excl. syn. *Epidendrum subulatum*);
Fischer in Gamble, *Fl. Pres. Madras* 1442. 1928; Abraham & Vatsala, *Intr. Orch.* 444.
1981. *Ependendrum subulatum* Koenig in Retz., *Obs. Bot.* 6: 51 1791. *Papilionanthe*
subulata auct., non (Koenig) Garay, 1974: Jayaw. in Dassan. & Fosb., *Rev. Handb. Fl.*
Ceylon 2: 202. 1981; Manilal, *Fl. Silent Valley* 299. 1988; Vajravelu, *Fl. Palghat* 488.
1990 (**Plate VI-D & Plate VII-D**).

Terete epiphytes. Stems 30 cm or more with long flexuous roots. Leaves 9-11 x 0.3 cm, obliquely truncate acute; petiolar sheaths annular. Flowers 3 cm across, creamy white, fragrant, solitary or in twos. Peduncle 3-3.5 cm long, green, cylindrical, spotted. Bracts 3-4 x 4 mm, triangular, emarginate. Dorsal sepal 12 x 8 mm, oblong, 7-veined. Lateral sepals 13 x 8 mm, obliquely oblong-lanceolate, sub-acute or rounded, adnate to the foot of the column. Petals 1.6 x 1 cm, oval, obtuse or rounded, also attached to the foot. Lip 1.5 cm long, sessile on the foot; infundibuliform, 3-lobed. Lateral lobes oblong, obtuse, erect, conspicuously marked on the inside by a number of purple, parallel lines; midlobe tongue shaped, recurved, obtuse, yellow in the center, tipped dark purple. Disc ridged. Column stout, 5 mm high, incurved. Rostellum obtuse. Anther terminal, 2-loculed. Pollinia 2, globose. Ovary with pedicel 2.5 cm long. Fruit 7 cm long, narrowly winged capsule.

Fl. & Fr.: Feb. -Apr.

Distr.: Karnataka, Tamil Nadu, Kerala and Sri Lanka.



Plate VII. Various kinds of epiphytes: A. Extreme xerophilous epiphytes - *Vanda spathulata* (L.) Spreng.; B. Sun epiphyte - *Vanda testacea* (Lindl.) Reichb. f.; C. Epiphyte on the main trunk of the host tree - *Vanda tessellata* (Roxb.) Hook. ex G. Don; D. *Papilionanthe cylindrica* (Lindl.) Seidenf. and *Medinilla beddomei* Clarke on *Euphorbia santapau* Henry.

Note: Seen at elevations between 900 and 2000 m. Mostly prefers open tree trunks for getting more sunlight.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Athirumala, AESK 7300; Agastyamala, N. Mohanan 9518; *Ibid.*, William D'cruz 15192; Pongalappara, AESK 9485. **Kollam Dist.:** Chankili, AESK 7407. **Idukki Dist.:** Munnar, AESK 7455; *Ibid.*, Sathish Kumar 564; Guderale, Gangaprasad 12259. **Palakkad Dist.:** Valiyaparathode, Sathish Kumar 10189; Kaikatty, Vajravelu 46108 (MH); Karasuryamala, Vajravelu 46198, 49718, 60510 (MH). **Wayanad Dist.:** Pakshipathalam, Sathish Kumar 1602.

PHOLIDOTA Lindley ex W.J. Hooker

Exot. Fl. 2: 138. 1825.

Epiphytes with uninodal pseudobulbs. Leaves 1 or 2, plaited. Scape terminal from the pseudobulb, racemose, many-flowered, drooping. Bracts distichous, imbricating. Sepals concave. Petals narrow-linear, free. Lip sessile, saccate at base, 3-lobed. Column very short, broadly winged. Foot 0. Pollinia 4, waxy in pairs, shortly attached to a viscous membrane.

About 28 species are distributed in India, China, Sri Lanka, Australia. In India there are 7 species. Only one species is recorded from Kerala.

Pholidota imbricata W. J. Hook., Exot. Fl. 2: 138. 1825; Wight, Ic. t. 907. 1844-45;

Fischer in Gamble, Fl. Pres. Madras 1431. 1928; Sivar., & P. Mathew, Fl. Nilambur

696. 1997. *P. pallida auct., non* Lindl., 1835: Abraham & Vatsala, *Intr. Orch.* 288. 1981; Jayaw. in Dassan. & Fosb., *Rev. Handb. Fl. Ceylon* 2: 120. 1981; Manilal, *Fl. Silent Valley* 301. 1988; Ramachandran & Nair, *Fl. Cannanore.* 460. 1988; *Vajravelu*, *Fl. Palghat* 490. 1990; Sasi. & Sivar., *Flow. Pl. Thrissur For.* 452. 1996. **(Plate V-D)**.

Epiphytic herbs. Pseudobulbs 5 x 2.5 cm, oblong-conical, with large sheathing bracts. Leaf single, 12-40 x 2.5-6.5 cm, oblanceolate-acuminate, narrowed into a short petiole, acute at apex. Racemes 25-55 cm long, pendulous, terminal, with imbricating bracts. Bracts 8 x 7 mm, broadly ovate, concave, persistent, pinkish-brown, obtuse. Flower 7 x 5 mm, dull white. Dorsal sepal 5 x 4 mm, broadly ovate, 3-veined, obtuse. Lateral sepals 6 x 3 mm, broadly sickle-shaped cymbiform, keeled on the midvein beneath, 3-veined, obtuse. Petals 6 x 2 mm, linear or narrowly linear-oblong subfalcate, 1-veined, acute. Lip 7 mm long, deeply saccate, 3-lobed; side lobes 4 x 3 mm, broadly oblong, erect obtuse; midlobe 3 x 4 mm, 2-lobulate with a broad median sinus; lobules sub-obliquely truncate, auricular, sub-acute. Column 3.5 x 3 mm, broadly winged. Rostellum truncate. Operculum golden brown. Pollinia 4, in 2 pairs. Stigmatic area funnel shaped. Fruits 2 cm long, ellipsoid, pale brown shiny capsules.

Fl. & Fr.: Through out the year.

Distr.: India through Indonesia to Guinea.

Note: This is a very hardy species occurring in a wide range of altitudes in Kerala. This has been wrongly identified as *P. pallida* Lindl. by a number of workers. *P. pallida* Lindl. occurs in North West Himalaya, eastwards to China, Indo-China, Thailand and Myanmar.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Kallar, *Calder & Ramaswamy 203* (CAL); Palode, *Sathish Kumar s.n.* **Kollam Dist.:** Nadayara, *C. N. Mohanan 68394* (MH), Thannithodu, *C. N. Mohanan 54997* (MH). **Pathanamthitta Dist.:** Mookanpetty, *AESK 13277*; Placherry, *C. N. Mohanan 68394* (MH); Kakki Hills, *Kiran Raj 38524*. **Idukki Dist.:** Vandenmedu, *Vivekananthan 50517* (MH); Thekkady, *Vivekananthan 48615* (MH); Anjuril, *Thekkady, Sharma 42400* (MH); Neriamangalam, *Sebastine 25324* (MH); Peermadu, *Vivekananthan 21418* (MH); Santhan Parai, *Sebastine 18363* (MH), *Ibid.*, *William D'cruz 12276*. **Ernakulam Dist.:** Cochin Cavaley, *A. Meebold 12720* (MH); Bhuthathankettu, *Shetty 33488* (MH). **Thrissur Dist.:** Kannamkuzhi, *Ramamurthy 48477* (MH). **Palakkad Dist.:** Anavai, *AESK 25470*; Silent Valley, *Sathish Kumar 10143* (CALI); Mukkali, *Vajravelu 27834* (MH). **Wayanad Dist.:** Periya, *AESK 42195*; Sulthan's Battery, *Ellis 18622* (MH); Begur, *Fischer 4514* (CAL). **Kannur Dist.:** Karimbam, *Ansari 67849* (MH); Chandanathodu, *Ramachandran 63934* (CAL, MH); Panathur, *V. J. Nair 59949* (MH); Thaliparamba, *Barber 8751*. “**Malabar**”, *Wight 2665* (CAL).

PHREATIA Lindley

Gen. Sp. Orchid. Pl. 63. 1830

Epiphytes with 2-or 3-leaved pseudobulbous. Leaves distichous, narrow, jointed on their equitant sheaths; peduncle terminal. Flowers minute in spiciform racemes, rather one-sided; lateral sepals adnate to the foot of the column; column-foot well developed

with a distinct saccate mentum. Petals shorter than sepals; lip inserted on the foot of the column, very small; column short, terminal, 2-chambered. Pollinia 8, microscopic, globose united by a narrow caudicle to a gland on the rostellum.

About 250 species in India, Sri Lanka, Malaya and Formosa extending southwards to Java, Sumatra, Borneo, Celebes, New Guinea, Fiji, and the Philippine Islands.

Phreatia elegans Lindl., Gen. et Sp. Orch. 63. 1830; Trimen, Handb. Fl. Ceylon 4: 207. 1898; Abraham & Vatsala, Intr. Orch. 497. 1981; Jayaw. in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 2: 287. 1981.

Epiphytes with very short, densely tufted, sub-pseudobulbous stems and stout fascicled root fibres. Leaves distichous, equitant, 5-10 cm long, sessile on their thin sheaths, linear, coriaceous, obtuse, narrowed at base, 1-veined. Flowers white, minute, in terminal, spiciform, many-flowered racemes, 5-7.5 cm long; peduncle longer than the leaf, erect; pedicel very short. Floral bracts ovate-oblong or obovate-oblong, acuminate, 1-veined, closely sheathing the curved ovary. Sepals 1.2-2 mm long, broadly triangular, acute, 1-veined; dorsal smaller; laterals gibbous at the saccate base and adnate to the foot of the column. Petals shorter than the lateral sepals, broadly ovate or ovate; mentum rounded. Lip very small, nearly orbicular, clawed, inserted on the foot of the column, obscurely 3-nerved; column very short truncate, with a minute rostellum, base produced into a foot. Anther terminal, membranous, 2-loculed; pollinia 8, very minute, globose pyriform, cohering.

Fl. & Fr.: Jan. -Aug.

Distr.: Sikkim, Himalayas, Kerala, Sri Lanka.

Occurrence & Specimen studied: **Idukki Dist.**: Near Mangaladevi, *Sathish Kumar* 44268.

PODOCHILUS Blume

Bijdr. 7: 295. 1825.

Epiphytes with slender stem and distichous, compressed leaves. Flowers small in terminal or leaf-opposed racemes. Petals smaller than sepals. Lateral sepals adnate to the column forming a mentum. Lip jointed on the apex of the foot of the column. Column short. Rostellum broad, erect, bifid. Anther at the back of the column; pollinia 4, pyriform, waxy, pendulous, in pairs.

It is an Indo-Malaysian genus with about 60 species, mostly found in Indonesia extending to India, Sri Lanka and New Guinea. India is reported to have 4 species. Only one species is present in Kerala.

Podochilus malabaricus Wight, Ic. 5(1): 20, t. 1748. 1851; Hook. f., Fl. Brit. India 6: 80. 1888; Jayaw. in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 2: 278. 1981; Ramachandran & Nair, Fl. Cannanore 461. 1988; Mohanan & Henry, Fl. Thiruvananthapuram 469. 1994; *P. falcatus* auct., non Lindl., 1833: Fischer in Gamble, Fl. Pres. Madras 1450. 1928; Abraham & Vatsala, Intr. Orch. 390. 1981.

Tufted leafy epiphytes with slender, non-pseudobulbous stem. Stem 10-14 cm long and spreading with fibrous roots. Leaves 1. 1-1.3 x 0.4 cm, subulate, erect, distichous, equitant, laterally compressed, coriaceous, acute, not joined on sheaths; upper leaves smaller. Racemes 4 cm long, recurved, lax-flowered. Flowers 3.5-4 mm across, white, with a purplish patch on sepals and petals. Floral bracts 2.25 x 1.25 mm, ovate, acuminate, acute, 1-veined. Dorsal sepal 3.5 x 2 mm, ovate-lanceolate, acute or sub-acute, 1-veined. Lateral sepals 4.5 x 1.5 mm, lanceolate-ovate, acute or sub-acute, 1-veined, adhering to the recurved foot of the column forming a spur-like mentum. Petals 3 x 1 mm, obovate, obtuse, 1-veined. Lip 3.5 x 0.75 mm oblong-oblancheolate, with purplish blotches at tip, obtuse, 3-veined; lateral lobes obscure. Column 1.5 mm high. Rostellum bifid. Anther dorsal, 2-loculed; pollinia 4, club-shaped, waxy, in two pairs, attached to a small gland lodged in the fork of the rostellum by a very short strap, each pair enclosed in a calyptriform membrane. Ovary with pedicel 2.2 mm long.

Fl. & Fr.: Aug. -Nov.

Distr.: Kerala and Sri Lanka.

Occurrence & Specimens studied: **Pathanamthitta Dist.:** Thriveni, *Sharma 42476* (MH); Sabarimala, *Sivadasan 16053* (CALI). **Idukki Dist.:** Walara, *AESK 12808*; *Ibid.*, *Gangaprasad 12225*; Adimali, *William D'cruz 12354*. **Ernakulam Dist.:** Cochin cavaley, *Meebold 12293* (CAL). **Wayanad Dist.:** Chandanathodu, *AESK 23312*; Davala, *Barber 2034* (MH).

POLYSTACHYA W.J. Hooker

Exot. Fl. 2: t. 103. May 1824, *nom. cons.*

Epiphytes with 2-3-noded pseudobulbs. Leaves distichous. Flowers in terminal, simple or branched racemes. Scape sheathing at base. Sepals sub-equal. Dorsal free. Laterals connate with the column-foot forming a wide mentum. Petals linear, shorter than sepals. Lip sessile, 3-lobed, sidelobes erect. Column short, fleshy; foot long. Pollinia 2, globose with a short broad caudicle

The genus is Pantropical in distribution with about 200 species. Only the type species occurs in Asia.

Polystachya concreta (Jacq.) Garay & Sweet, *Revista Soc. Colomb. Orquideol.* 9(3): 206. 1974; Jayaw. in Dassan. & Fosb., *Rev. Handb. Fl. Ceylon* 2: 271. 1981; Manilal, *Fl. Silent Valley* 301. 1988; Mohanan & Henry, *Fl. Thiruvananthapuram* 469. 1994; Sasi. & Sivar., *Flow. Pl. Thrissur For.* 453. 1996; *Epidendrum concretum* Jacq., *Enum. Pl. Carib.* 30. 1760. *Polystachya purpurea* Wight, *lc. t.* 1679. 1851; Hook.f., *Fl. Brit. India* 6: 21. 1890; Fischer in Gamble, *Fl. Pres. Madras* 1438. 1928; *P. wightii* Reichb. f. in Walp., *Ann.* 6: 640. 1861; Fischer in Gamble, *Fl. Pres. Madras* 1437. 1928. *P. flavescens* (Bl.) J.J. Smith, *Fl. Buitenz.* 6: 284. 1905; Abraham & Vatsala, *Intr. Orch.* 392. 1981; Ramachandran & Nair, *Fl. Cannanore* 461. 1988; Vajravelu, *Fl. Palghat* 490. 1990.

Epiphytic herbs. Pseudobulbs 10-20 mm, ovoid, 2-3-noded, sheathed at base, with thick, fibrous roots below. Leaves 10-20 x 1-3 cm, linear-oblong or oblanceolate, 4-6, alternate distichous, green or with violet pink tinge underneath, emarginate. Inflorescence 8-20 cm long, simple or branched raceme. Floral bracts 5 x 3 mm, ovate, acuminate, 2-4-veined, persistent. Flowers greenish yellow, non resupinate. Dorsal sepal 4 x 2 mm, oblong-ovate, acuminate, 3-veined. Lateral sepals 5 x 4 mm, triangular-ovate, recurved at apex, attached to the foot of the column. Petals 3 x 0.7 mm, linear-oblanceolate, 1-veined, apiculate. Lip 4 x 4 mm, cuneate-obovate, jointed to the foot of the column, 3-veined; sidelobes falcate, sub-acute; midlobe broadly oblong, rounded, fimbriate. Disc scurfy. Column 1.9 mm high. Anther 2-loculed. Pollinia 4 in 2 pairs. Ovary with pedicel 6 mm long. Fruit a small, fusiform capsule.

Fl. & Fr.: Feb.-Dec.

Distr.: Pantropical.

Note: Owing to its wide distribution many local variants have been named independently by different workers. Garay and Sweet (1974) listed 54 such synonyms. In Kerala, this species is available in two forms: one with green leaves and much branched inflorescence, and the other with purple-tinged leaves and simple inflorescence. Apart from the difference in size and colour there is hardly any difference in floral details.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.**: Bonaccord, *AESK* 7265; *Ibid.*, N. Mohanan 8483; Palode, *AESK* 7430; *Ibid.*, Sathish Kumar 342; Kottur forest, J. Joseph 41994 (MH); Pongalappara, *AESK* 13247. **Kollam Dist.**: Thenmala, *Mukuntha Kumar* 362. **Idukki Dist.**: Narakkanam, *Vivekananthan* 48395 (CAL, MH); Thenkachi,

Sharma 40877 (MH); *Vandiperiyar, Vivekananthan 21337* (MH); *Painavu, Vivekananthan & Raju 71101* (MH); *Adimali, AESK 12806*; *Walara, AESK 19116, 42134*. **Palakkad Dist.:** *Padagiri, AESK 15772*; *Silent Valley, Sathish Kumar 10132* (CALI); *Attapadi, Vajravelu 27576* (MH); *Karivara forest, Vajravelu 44859* (MH). **Kannur Dist.:** *Chandanathodu, Ramachandran 63942* (MH). **Wayanad Dist.:** *Brahmagiri-Thirunelli, Ramachandran 68237* (MH); *Brahmagiri, Ramachandran 58749* (CAL, MH).

POMATOCALPA Breda

Gen. Sp. Orch. Asclep. Fasc. 3: t. 15. 1829.

Epiphytes with short or long stems. Leaves oblong or narrow. Inflorescence short or long, erect or decurved, often branched, many-flowered. Flowers small with lip pointing towards the apex of inflorescence. Sepals and petals almost equal. Lip bucket-shaped, 3-lobed, with a rounded saccate spur; lateral lobes small, broadly triangular; midlobe fleshy, straight or curved downwards. Column short, footless, lip immovably attached. Rostellum bifid or hammer-shaped. Anther shortly-beaked. Pollinia 2.

The genus with 35-40 species is distributed throughout Indo-Malaysia. Six species occur in India and two are endemic. Only one species is reported from Kerala.

Pomatocalpa spicata Breda, Gen. et Sp. Orch. Kuhl. & Hasselt. 15. 1827. *Cleisostoma manii* sensu Fischer in Gamble, Fl. Pres. Madras 1448. 1928, non Reichb.f., 1856.

Epiphytic herbs. Stems 2-3 cm long. Leaves 7.5-19 x 1.3-2.5 cm, linear-oblong, articulating and sheathing at base, unequally, bluntly 2-lobed at apex. Inflorescence 3-6 cm long, axillary raceme. Floral bracts minute, lanceolate, acuminate. Flowers yellow or white tinged with red. Sepals and petals obovate, obtuse. Lip with a deeply saccate spur, slightly inflated at the apex, with a callus plate on the back wall; sidelobes small, truncate, obtuse; midlobe orbicular-ovate, column short. Pollinia 4, in 2 unequal pairs.

Fl. & Fr.: Mar.-Apr.

Distr.: India, extending to Thailand, Myanmar and Malaysia.

Occurrence & Specimens studied: **Kollam Dist.:** Cheenikala, *Sathish Kumar 1427*; Pandimotta, *AESK 13077*. **Palakkad Dist.:** Walayar, *Sasidharan 759* (KFRI).

PORPAX Lindley

Edward's Bot. Reg. 31 (Misc.): 62. 1845.

Epiphytes or lithophytes with flattened disc-like pseudobulbs covered by a reticulate sheath. Leaves 2, sub-orbicular, deciduous. Flowers 1 or 2, sub-sessile, terminal or lateral. Sepals connate and tubular. Petals free, included within calyx tube. Lip 3-lobed, fleshy, articulated with the column-foot. Pollinia 8, connate in 4's.

The genus with 11 species is distributed in India, Myanmar, Sri Lanka, Malaya and Thailand. Six species including 2 endemics are present in India. Kerala has got 2 species.

Key to the species

1. Flowers solitary; sepaline tube 3-lipped; leafless when in flower **P. reticulata**
1. Flowers 2 or more; sepaline tube 2-lipped; leafy when in flower **P. jerdoniana**

Porpax jerdoniana (Wight) Rolfe, Orch. Rev. 16: 18. 1908; Fischer in Gamble, Fl. Pres. Madras 1422. 1928; Abraham & Vatsala, Intr. Orch. 387. 1981; Manilal, Fl. Silent Valley 302. 1988; Vajravelu Fl. Palghat 491. 1990; Mohanan & Henry, Fl. Thiruvananthapuram 469.1994; Sasi. & Sivar., Fl. Pl. Thrissur For. 453.1996; Sivar. & P. Mathew, Fl. Nilambur 697.1997. *Lichenora jerdoniana* Wight, Ic. t. 1748. 1851. *Eria lichenora* Lindl., Proc. J. Linn. Soc. Bot. 3: 46. 1859; Hook. f., Fl. Brit. India 5: 787. 1890.

Epiphytic or lithophytic herbs. Pseudobulbs 10 x 3-6 mm, discoid with a reticulate network. Leaves 1-2 x 2 cm, oblong-orbicular, lamina beautifully tessellated, sheathing at base, retuse or mucronulate, ciliolate. Floral bracts 3 x 5 mm, oblong, orbicular, sparsely gland-dotted. Flowers 2-3, terminal, hairy outside, deep orange-red, 2-lipped. Dorsal sepal 7 x 5 mm, obovate-oblong to orbicular, obtuse, forming the upper lip. Lateral sepals 9 x 5 mm, fused to form the lower lip, connate with the column-foot forming a sac at base. Petals 6 x 2 mm, linear oblong, 3-veined, minute papillose, obtuse. Lip 3 mm long, slightly arcuate, mobile, yellowish-orange. Column shortly curved with foot. Operculum broadly orbicular. Pollinia 8, pyriform.

Fl. & Fr.: Apr.-Jul.

Distr.: India, Sri Lanka and Thailand.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Ponmudi, *Sathish Kumar* 3692. **Idukki Dist.:** Walara, *AESK* 12826, 19115, 19117; Neriamangalam near Walara forests, *Sebastine* 25329 (MH); Meenmutty, *C. N. Mohanan* 79910 (MH); Kulamavu, *C.N. Mohanan* 80155(MH). **Palakkad Dist.:** Koomenkundu, *Sathish Kusmar* 10745 (CALI); Mukkali, *Vajravelu* 27832, 32157 (MH); *Ibid.*, *Ansari* 51452 (MH). **Kannur Dist.:** Poolakutti, *Sathish Kumar* 36912 (CALI). **Kasaragod Dist.:** Kasaragod, *AESK* 39216.

Porpax reticulata Lindl., Bot. Reg. Misc. 31. 1845; Fischer in Gamble, Fl. Pres. Madras 1422. 1928; Abraham & Vatsala, Intr. Orch. 385. 1981; Manilal, Fl. Silent Valley 302. 1988; Vajravelu, Fl. Palghat 492. 1990. *Aggeianthus marchantioides* Wight, Ic. 1737. 1852. *Eria reticulata* Benth., Gen. Pl. 3: 509. 1883; Hook. f., Fl. Brit. India 5: 786. 1890. (Plate III-C).

Epiphytic or lithophytic herbs. Pseudobulbs 1-2 cm across, discoid, compressed with a sheath of network. Leaves 3-4 x 0.6-1 cm, oblanceolate-spathulate, sessile, 2, obtuse, absent during flowering. Bracts 6 x 7 mm, sub-orbicular, irregularly denticulate, retuse. Flower solitary, brownish red, tubular. Sepals united into a long tube, deep reddish brown, saccate at base, 3-lobed at apex. Petals 4.7 x 1.5 mm, oblanceolate-spathulate, sub-falcate, densely papillose, erose on margin, rounded at apex with a mucro. Lip 3 x 2 mm, panduriform, shortly clawed and saccate at base with a prominent tooth, erose on margin, obtuse at apex. Column 2 mm long, with a short curved foot. Fruits 1 cm long, obovoid capsules.

Fl. & Fr.: Feb.-Jul.

Distr.: South India and Laos.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.**: Ponmudi, Aesk 7235; Attayar, Gangaprasad 15171; Athirumala, N.Mohanan 9616. **Idukki Dist.**: Meenmutty, C.N. Mohanan 79910; Kulamavu, Sathish Kumar 80155. **Palakkad Dist.**: Aruvanpara, Sathish Kumar 10417 (CALI); Way to Silent Valley, Vajravelu 62993 (CAL); Kunthipuzha, V.J. Nair 67269 (CAL, MH); Dhoni, C.E.C. Fischer 1807 (CAL). “**Travancore**”: lamalay, *s.coll.*, *s.n.* (Acc. No. 50282 - MH).

PTEROCERAS Van Hasselt ex Hasskarl

Flora 25: 2, Beibl. 6. 1842.

Short epiphytes, with long flexuous roots. Leaves few to many, sessile, falcate-oblong, or ovate. Inflorescence axillary, from the base of the stem. Sepals and petals almost equal. Lateral sepals adnate to the column-foot. Lip long-clawed, jointed to the foot of the column, spurred, the spur continuing in line with the column-foot or at right angles, 3-lobed; 2 lobes on each side of the mouth of the sac and a marginal, caruncled callus between them but not inside the spur. Column short, always with a well developed foot. Pollinia 2, cleft, pyriform; stipes present. Fruit angular.

The genus is having 19 species distributed through India, Malaysia, Thailand, Sumatra, Borneo to the Philippine Islands. Four species are found in India. Only one species is reported from Kerala.

Pteroceras leopardinum (Par. & Reichb. f.) Seidenf. & Smith, Orch. Thailand 4(1): 535. 1963. *Thrixspermum leopardinum* Par. & Reichb.f, Trans. Linn.Soc. 30: 145. 1874. *Sarcochilus leopardinus* (Par. & Reichb.f.) Hook.f., Fl. Brit. India 6: 38. 1890. *Proteroceras holttumii* Joseph & Vajravelu, J. Ind. Bot. Soc. 53: 189. 1974. (**Fig. 19**).

Dwarf epiphytes. Leaves 2-10 x 1-2.2 cm, distichous, equitant, ovate-oblong or elliptic, cleft at apex. Inflorescence a lax-flowered spike, from the base of the stem. Flowers bifarious. Floral bracts small, broadly ovate, obtuse, membranous. Dorsal sepal ovate-oblong, concave, 5-nerved. Lateral sepals 6-7.5 x 4-5.5 mm, ovate 5-nerved attached to the side of the column-foot at about two-third. Lateral petals much narrower than the sepals, entire, ligulate, 1-nerved. Lip 7 mm long, incurved, 3-lobed, immovably attached to the tip of the foot; sidelobes 4-6 x 1-1.5 mm, erect sub-orbicular; midlobe 4 x 2.5 mm, triangular, thick, with uneven adaxial surface and with or without calli, one on each side of the base. Spur infundibular, inflexed, dorsi-ventrally compressed, naked inside, blunt at the tip. Column short, erect. Foot long, projecting downwards, but inflexed at the distal end. Pollinia 4, in 2 pairs, pyriform; viscidium small, triangular; stipe short, elastic. Fruit sessile, triquetrous, narrowing towards the tip, narrowly winged at margin.

Fl. & Fr.: Apr.-May

Distr.: Kerala and Tamil Nadu.

Occurrence & Specimen studied: **Thiruvananthapuram Dist.**: Agastyamala, Sathish Kumar **Kollam Dist.**: Pandimotta, Aesk 7438.

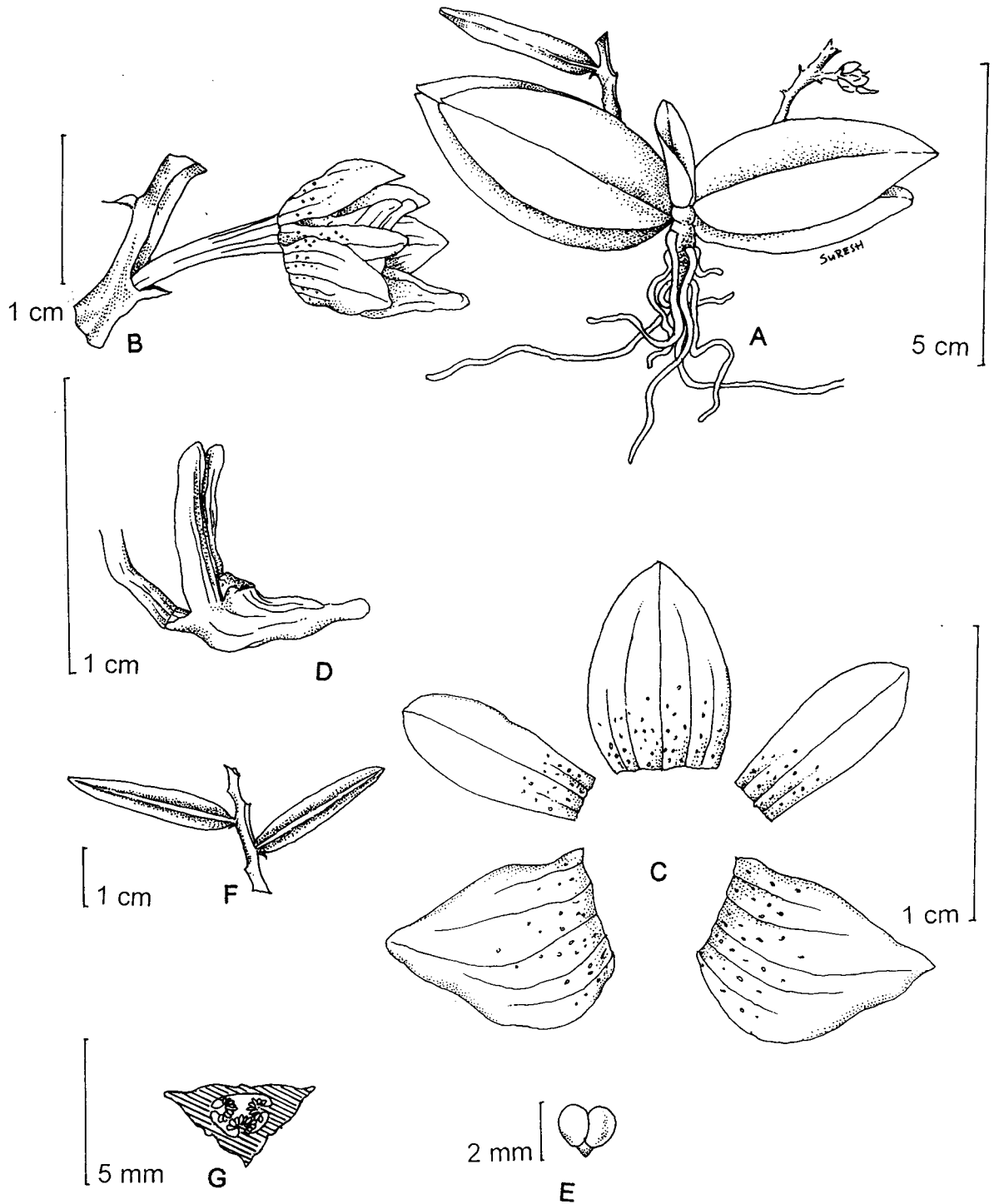


Fig. 19. *Pteroceras leopardinum* (Par. et Reichb. f.) Seidenf. et Sm.: A. Habit; B. Flower – side view; C. Sepals and lateral petals; D. Lip with foot; E. Pollinia; F. Capsule; G. C. S. of Capsule.

RHYNCHOSTYLIS Blume

Bijdr. 6: t. 49; 8: 285. 1825.

Stout epiphytes. Stem woody. Leaves lorate, apex 2-lobed, base jointed. Flowers in dense, lateral, pendulous racemes. Sepals and petals similar, free, spreading. Lateral sepals decurrent on column-foot. Lip adnate to the column-foot, entire, spurred; spur compressed. Column short, with a very short foot. Pollinia 2, globose; caudicle long, slender.

Indo-Malesian genus with 4 species. India has two species and one is represented in Kerala.

Rhynchostylis retusa (L.) Bl., Bijdr. 286, pl. 49. 1825; Hook. f., Fl. Brit. India 6: 32. 1890; Fischer in Gamble, Fl. Pres. Madras 1440. 1928; Abraham & Vatsala, Intr. Orch. 454. 1981; Jayaw. in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 2: 199. 1981; Manilal & Sivar., Fl. Calicut 285. 1982; Ramachandran & Nair, Fl. Cannanore 462. 1988; Vajravelu, Fl. Palghat 492. 1990; Sasi. & Sivar., Flow. Pl. Thrissur For. 454. 1996; Sivar. & P. Mathew, Fl. Nilambur 698. 1997. *Epidendrum retusum* L., Sp. Pl. 953. 1753. *Saccolabium rheedii* Wight, Ic. Pl. Ind. Or. 5(1): 18, Pl. 1745-46. 1851.

(Plate VI-C).

Epiphytic herbs. Stems 10-25 cm long, covered with leaf sheaths. Leaves 15-30 x 2-3 cm, linear, distichous, densely arranged, articulate, praemorse at apex. Racemes 20-30 cm long, drooping. Peduncle 9-10 cm long, stout, bearing two or more sterile bracts. Floral

bracts 2.5 x 2.5 mm, cordate, acute. Flowers 1.8 cm across, white, tinged with violet-pink. Dorsal sepal 18 x 8 mm, ovate or ovate-oblong, obtuse or emarginate. Lateral sepals 12 x 9 mm, obliquely and broadly ovate, acute. Petals 11.5 x 4.5 mm, oblong-ovate. Lip 3-lobed, clawed, deeply saccate or spurred beyond; sidelobes obscure; midlobe elongated, inflexed, cuneiform. Spur 6-7 mm long, laterally compressed, pinkish, pubescent within. Column 3.5 mm long, slender, heavily spotted with magenta, with a short foot. Operculum short, narrowed into a beak. Pollinia 2. Fruits 1.5-2 cm long, oblong-obovoid, capsules.

Fl. & Fr.: Nov.-Jun.

Distr.: India, Thailand, Myanmar, Indo-China, China, Philippines, Malaysia, Java, Sumatra, and Kangean Archipelago.

Note: This is one of the most beautiful epiphytic orchids of Kerala known for its Fox-tail inflorescence.

Occurrence & Specimens examined: **Kollam Dist.**: Kulathupuzha, *AESK 5231*; Chankili, *AESK 7406*; Placherry, *C.N. Mohanan 63431* (MH); Perunthenaruvi, *C.N. Mohanan 63451* (MH). **Idukki Dist.**: Kulamavu, *Raju 71177* (MH); Mundakayam, *Antony 671* (MH); *Ibid.*, *Vivekananthan 21366*. **Kottayam Dist.**: Mundakayam, *Vivekananthan 21366* (MH). **Thrissur Dist.**: Wadakkancherry, *Ramamaurthy 48436* (CAL, MH). **Palakkad Dist.**: Anamooly, *Ansari 51499* (MH); Thiruvizhamkunnu, *Vajravelu 26201* (MH); Attappadi *Vajravelu 26201* (MH). **Malappuram Dist.**: Nilambur, *A.C.F. s.n.* (Acc. No. 94025- MH). **Kozhikode Dist.**: Kuttiyadi, *Naithani 24161* (MH). **Kannur Dist.**: Kannothe, *Ramachandran 58210* (MH); Karimbam, *Ansari 67841* (CAL); Panathur, *Ansari 64851*

(MH). Thaliparamba, *Barber 7382* (MH). **Wyanad Dist.:** Kalpetta, *Sathish Kumar 36907* (CALI).

RHYTIONANTHOS Garay, Hamer & Siegerist

Nord.J. Bot. 14(6): 637. 1994.

Epiphytic plants with long, sometimes branching rhizomes. Pseudobulbs mostly well spaced, often grooved. Inflorescence short or elongate, many-flowered. Flowers rather fleshy, attractly coloured. Dorsal sepals free, concave, incumbent towards lateral sepals and serves as a lid over their opening. Lateral sepals elongate, involute, firmly united along both margins, horn or pouch-like. Petals small, lip hinged.

Note: Garay *et al.*, (1994) provided a new generic circumscription to the genus *Bulbophyllum* Thou. and proposed a new genus *Rhytionanthos*. In this genus dorsal sepals are free and serve as a lid over the opening of the lateral sepals. Lateral sepals are firmly united along both the margins, and are horn or pouch-like. Petals are small and lip-hinged.

One species occur in Kerala.

Rhytionanthos rheedei (Manilal & Sathish) Garay, Hamer & Siegerist, Nordic J. Bot. 14(6): 639. 1994. *Bulbophyllum rheedei* Manilal & Sathish, Rheedeia 1 (1 & 2): 52-56. 1991; Mohanan & Henry, Fl. Thiruvananthapuram 450. 1994. (**Fig. 20**).

Small pseudobulbous herbs. Pseudobulbs 3-7 mm long, 3-5 mm broad, ovoid-globular, dark green with a few sheaths at base. Leaves 80-20 x 5-8 mm, oblong-ovate or

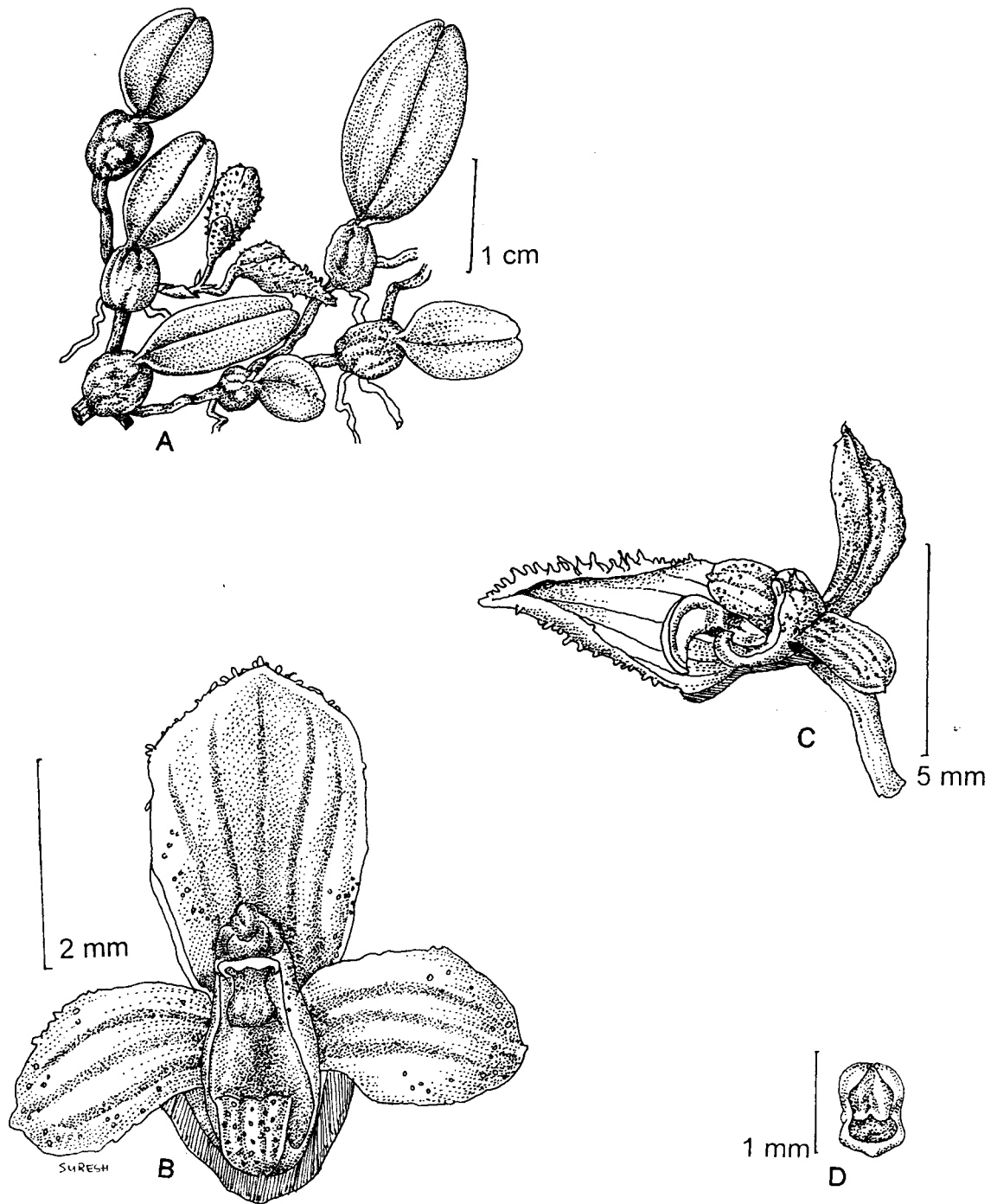


Fig. 20. *Rhytionanthos rheedei* (Manilal et Sathish) Garay, Hamer et Siegerist: A. Habit; B. Flower – inside view with lateral sepals removed; C. Flower – side view with one of the lateral sepals removed; D. Operculum with pollinia.

elliptic with a very small petiole, midvein prominent, dark green with small brown spots, bifid at apex. Inflorescence from the basal part of the rhizome, near the pseudobulb. Scape about 5-10 mm long, pinkish-violet, bracteate with mostly 2-flowers or rarely a single flower. Flowers creamy white with violet spots. Dorsal sepal 5-6 x 3-4 mm, oblong, oblique, boat-shaped, gland-dotted, papillose on the outer side, 5-veined with 4 purplish lines inside, cohering on margins throughout, attached to the column-foot at base, acute at apex. Petals 2.5 x 1.5 mm, oblong, 3-purple lines inside, gland-dotted, 3-veined, entire or inconspicuously 3-dentate at apex. Lip thick, creamy yellow with dark purple markings, attached to the column-foot by a short ligament. Column 1 mm long, thick, narrowly winged laterally with an incurved foot. Operculum 1 mm; pollinia 4, in 2 equal pairs. Fruit 1-1.2 x 0.5-0.6 cm, globose to round, stalked.

Fl. & Fr.: May-Sept.

Distr.: Endemic to South India.

Note: Small epiphytic herbs on tree trunks in riverine vegetation at low elevations (50-175 m).

Occurrence & Specimens studied: **Thiruvananthapuram Dist.**: Palode, *AESK* 7412; *Ibid.*, *Sathish Kumar* 505, 507, 4643 4686 (CALI). **Kollam Dist.**: Cheenikala, *AESK* 7365; *Ibid.*, *Sathish Kumar* 1622 (CALI). **Alappuzha Dist.**: Muhamma, *Suresh* 10230 (CALI).

ROBIQUETIA Gaudichaud

in Freycinet, Voyage Monde, Uranie Physicienne Bot. 426. 1829.

Epiphytes, with stout, elongated, pendulous stems. Leaves broadly oblong. Inflorescence pendulous, unbranched, with many, crowded, small flowers. Sepal and petals spreading. Lip 3-lobed, spurred, more or less jointed to the base of the column; side lobes short with a fleshy thickening on the inside; midlobe straight, very small. Spur large with 2-lobed projection. Column short; foot 0. Rostellum bifid. Anther pointed. Pollinia 2, notched on a more or less spatulate or often uncinata stipe.

About 40 species distributed in India, Malaya, Sri Lanka, Australia. Five species are known to occur in India. Kerala has two species.

Key to the species

1. Plants erect; stems stright; inflorescence an erect raceme **R. josephiana**
1. Plants pendulous; stems zig-zag; inflorescence a pendulous raceme **R. gracilis**

Robiquetia gracilis (Lindl.) Garay, Bot. Mus. Leafl. Harvard Univ. 23(4): 197. 1972; Jayaw. in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 2: 251. 1981; Manilal, Fl. Silent Valley 302. 1988. *Saccolabium gracile* Lindl., Gen. Sp. Orch. 225. 1983; Hook. f., Fl. Brit. India 6: 57. 1890; Fischer in Gamble, Fl. Pres. Madras 1446. 1928. *Malleola gracilis* (Lindl.) Schltr., Feddes Rep. 1: 981. 1913; Abraham & Vatsala, Intr. Orch. 491. 1981; Vajravelu, Fl. Palghat 485. 1990.

Pendulous epiphytes. Stems 5-35 cm, zig-zag or flexuous. Leaves 6.3-10 x 0.8 cm, elongate, linear-lanceolate, acuminate, flat, straight or falcate, narrowed at both ends. Racemes 10-15 cm long, pendulous, slender, many-flowered. Flowers 0.6 cm long, white; bracts minute, subulate. Sepals oblong, obtuse, 1-veined. Lateral sepals large. Petals oblong, narrow, 1-veined, obtuse. Lip long sub-incurved, obtuse; sidelobes absent; midlobe very small, ovate or lanceolate, acute; mouth of the spur very oblique. Column short. Foot 0. Anther terminal, depressed, 2-loculed. Pollinia 2, globose; strap of pollinia slender. Ovary with pedicel 2.5 mm long. Fruits globose capsules.

Fl. & Fr.: May-Sept.

Distr.: Kerala, Tamil Nadu and Sri Lanka.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Athirumala, AESK 5205, 7487; *Ibid.*, N. Mohanan 8982, 9410, 9668. Agastyamala, AESK 7399; *Ibid.*, William D'cruz 15176; *Ibid.*, N. Mohanan 8251; Near Karupuswami Kovil, Bonaccord, AESK 7329; Pongalappara, Sathish Kumar 1325. **Palakkad Dist.:** Silent Valley, Sathish Kumar 10136 (CALI). Kudam to Muthikulam, *Vajravelu* 62970 (MH); Silent Valley, *Vajravelu* 33225 (MH).

Robiquetia josephiana Manilal & Sathish Kumar, *Orch. Rev.* 92(1091): 293. 1984; Sath. Kumar & Manilal, *Cat. Ind. Orchids* 84. 1994.

Epiphytic herbs. Stem short, 1-6.5 cm long, very rarely branched, rooting at base only. Leaves 0.8-4 x 0.3-0.9 cm, oblong, purple-spotted throughout the entire stem,

articulates and deep purple at base, grooved along dorsal side, fleshy, notched at apex. Inflorescence much longer than the leaf, unbranched, purplish-violet with many, long-pedicelled, white flowers. Floral bracts ovate, 1-nerved, closely clasping the pedicel at base, acuminate. Sepals and petals widely patent. Dorsal sepal 2 x 1.5 mm, cymbiform, ovate, gland-dotted, acute. Lateral sepals 2 x 1 mm, ovate, adnate to the spur base, obtuse or blunt at apex. Lip obscurely 3-lobed with a large, conspicuous spur; sidelobes insignificant, fleshy; midlobe triangular, from the rim of the spur, finely muricate within. Spur 6 x 1.8 mm, white, with a flesh or purple in front and base, projecting downwards, laterally compressed, slightly reflexed upwards, blunt and rounded, naked within, but thickened just below the column. Column 1 mm long, deep purple, fleshy, hammer-shaped. Foot absent. Rostellum fleshy, with 2 teeth at apex. Operculum 1 x 0.5 mm, 2-celled, deep purple, tailed. Ovary short, long-stalked. Fruits long stalked capsules.

Fl. & Fr.: Nov.-Feb.

Distr.: Endemic to Kerala and Tamil Nadu.

Note: This species related to *R. rosea* (Lindl.) Garay, but differs in having an inflorescence that is much longer than leaves, narrower petals, and the lip having a fleshy triangular midlobe with a long spur which is incurved and laterally compressed.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.**: Ponmudi, AESK 15680; *Ibid.*, Sathish Kumar 1956. **Idukki Dist.**: Vandanmedu, Vivekananthan & Gopalan 50562 (MH). **Palakkad Dist.**: Silent Valley, Sathish Kumar 10788 (CALI).

SCHOENORCHIS Blume

Bijdr. 6: t. 3. 8: 361. June 1825.

Erect or pendulous epiphytes. Stems branching and rooting at base. Leaves narrow. Inflorescence simple or branched, bearing many, very small flowers. Sepals and petals similar. Lip 3-lobed, spurred, often with a callus at the entrance to the spur on opposite side of the column. Column short, Foot. 0. Stigma at the base of column. Rostellum prominent, long, acicular, distinctly bilobed. Anther with a long beak.

An Indo-Malesian genus of about 24 species. India is reported to have 5 species. Kerala has three species.

Key to the species

1. Petals linear; flowers white with pink flush **S. jerdoniana**
1. Petals oblong; flowers pure white **2**
2. Leaves not twisted, semiterete, notched at apex **S. nivea**
2. Leaves twisted, linear-lanceolate, acute at apex **S. manilaliana**

Schoenorchis jerdoniana (Wight) Garay, Bot. Mus. Leafl. Harvard Univ. 23(4): 202. 1972; Manilal, Fl. Silent Valley 304. 1988; Vajravelu, Fl. Palghat 492. 1990. *Taeniophyllum jerdonianum* Wight, Ic. 5(1): 22, t. 1756. 1851. *Saccolabium gemmatum* Lindl., Bot. Reg. 24: 50. 1838; Abraham & Vatsala, Intr. Orch. 478. 1981.

S. jerdonianum Reichb.f, Walp. Ann. 6: 886. 1864; Hook. f., Fl. Brit. India 6: 59. 1890; Fischer in Gamble, Fl. Pres. Madras 1446. 1928.

Slender, epiphytic herbs. Stems up to 9 cm long, base with leafy sheaths. Leaves 2.5-4 x 0.5-0.6 cm, linear, flat, acute. Inflorescence axillary, much longer than the leaves, simple or branched, many-flowered racemes. Floral bracts minute, ovate-lanceolate, exceeding the pedicel, acute. Flowers white with pink flush on apices. Dorsal sepal 1.5 x 0.1 mm, oblong, 1-veined, obtuse. Petals 1.8 x 0.5 mm, linear-lanceolate, falcate, 1-veined, obtuse. Lip 2 x 1 mm, spurred at base, 3-lobed; sidelobes small, rounded; midlobe oblong, concave, sub-truncate, undulate. Spur subglobose, naked inside. Column very short. Operculum broad, 2-celled. Pollinia 4, unequal, in 2 pairs, on strap-shaped stipes to a large narrow viscidium. Rostellum 2-lobed. Fruits globose.

Fl. & Fr.: Oct.-Mar.

Distr.: Endemic to Kerala and Tamil Nadu.

Note: It is a very distinctive species characterized by the narrow linear petals and white flowers with pink flush.

Occurrence & Specimens studied: **Idukki Dist.**: Devikulam, AESK 42130. **Palakkad Dist.**: Silent Valley, Koomankundu, *Sathish Kumar 10743*; Karapara river side, *Vajravelu 46137, 48753* (CAL, MH).

Schoenorchis manilaliana M. Kumar *et* Sequiera, Kew Bull. 55: 241. 2000.

Erect or pendulous herbs. Stems 1.5-6 cm long, curved upwards, with remains of old petiolar sheaths covering them at the base. Leaves 1-3.5 x 0.2-0.4 cm, linear-lanceolate, recurved, twisted, fleshy, semiterete, upper side concave, channelled, apex emarginate. Inflorescence a leaf-opposed raceme, up to 6.5 cm long. Peduncle 2.5 cm long, semiterete with 3 or 4 sterile bracts. Floral bracts 1.3-1.9 x 0.6 mm, triangular-ovate, acuminate, 1-veined, induplicate. Flowers 3 x 2 mm, white; sepals and petals dissimilar. Dorsal sepal 1.8-1.9 x 0.8 mm, elliptic to oblong, obtuse, 1-veined. Lateral sepals 1.8-1.9 x 0.8 mm, obliquely obovate, subacute, tip arching backward, slightly twisted, keeled on lower side towards the apex, 1-veined. Petals 1.5-1.7 x 0.3-0.5 mm, oblong-obovate, subacute, twisted, 1-veined. Lip 2 mm long, pandurate, white, fleshy; lateral lobes 1 mm long, curved inwards; midlobe 1 x 0.75 mm, subglobose. Stigma at the base. Anther terminal, 2-loculed; operculum 0.3 x 0.2 mm with upwardly curved beak; pollinia 4, unequal, the 2 larger 0.1 x 0.05 mm, the 2 smaller 0.05 x 0.03 mm, collateral, attached to oblong-lanceolate, cymbiform stipe; ovary with pedicel 2.5 cm long.

Fl. & Fr.: Nov.-May.

Distr.: Endemic to Kerala.

Note: Epiphytic on tree trunks in evergreen forests above 850 m.

Occurrence & Specimen studied: **Palakkad Dist.**: Siruvani, Stephen & Michael 008885 (KFRI).

Schoenorchis nivea (Lindl.) Schltr., Feddes Rep. Beih. 1: 986. 1913; Jayaw. in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 2: 245. 1981. *Saccolabium niveum* Lindl., Gen. Sp. Orch. 224. 1833.

Epiphytic herbs. Stems 1-9 cm, curved upwards, ensheathed by leaf base. Leaves 4-10 x 0.5 cm, semiterete, linear, distichous, spreading, recurved, notched at apex. Panicles 6-10 cm long, leaf-opposed. Flowers 2 x 1.2 mm, white. Floral bracts 1.6-2.1 x 1.2-1.4 mm, triangular-ovate, acuminate, green, papillate, 1-veined. Dorsal sepal 2 x 1 mm, oblong, 1-veined, obtuse. Lateral sepals 2 x 1 mm, obliquely oblong, 1-veined, obtuse. Petals 2 x 0.5 mm, oblong, partially fused with the lateral sepals, truncate or obtuse. Lip 2-2.3 mm long, thick, fleshy, 3-lobed, spurred at base; sidelobes blunt, curved inwards; midlobe spatulate, thick, very fleshy, pointed. Column 0.3 mm long, globular. Operculum 2-celled. Pollinia 4, in 2 unequal pairs, attached to the spatulate-oblong stipes by a short caudicle; viscidium large. Fruits 5 mm long capsules.

Fl. & Fr.: Jun.-Oct.

Distr.: Kerala, Tamil Nadu and Sri Lanka.

Note: *S. nivea* is closely related to *S. jerdoniana* but differs by having the pure white flowers and linear petals.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.**: Athirumala, Aesk 13245 Agastyamala, Aesk 5444; Agastyamala, Gangaprasad & William D'cruz 18434; Bonaccord, J. Joseph 44518 (MH). **Idukki Dist.**: Vandanmedu, Vivekananthan 50528

(CAL, MH); Devikulam, *AESK* 7398, 42126; *Ibid.*, *Sathish Kumar* 1424; Anjurile, Thekkady, *Sharma* 42402 (MH); Vandanmedu, *Gangaprasad* 15114.

SEIDENFADENIELLA Sathish

in Sathish & Manilal, *Cat. Ind. Orch.* 43. 1994.

Pendulous epiphytes. Stems and leaves terete. Inflorescence racemose, erect or decurved, many-flowered. Flowers purple-violet or rose. Dorsal sepals oblong or oblong-lanceolate. Lateral sepals incurved. Lip fixed to the base of the column, 3-lobed; sidelobes erect, obtuse. Pollinia 4, in 2 unequal pairs. Stigma at the base of the column.

It is an Indo-Sri Lankan genus of 2 species. The two species are present in Kerala.

Key to the species

1. Flowers purplish-violet to rose; petals 2.75 x 2.5 mm, incurved, papillate; spur 3.5 mm long **S. rosea**
1. Flowers orange-yellow; petals 4 x 3.5 mm, incurved at apex, glabrous; spur 3.6-7 mm long..... **S. filiforme**

Seidenfadeniella filiformis (Reichb.f.) E.A.Chr. & Ormerod in Matthew, *Fl. Palni Hills* 1258.1999. *Saccolabium filiforme* Reichb.f. in Walp., *Ann. Bot. Syst.* 6: 887. 1864. *Sarcanthus filiformis* Wight, *Ic.* 5(1): 10, t.1684. 1851, *nom. Illeg.*, non Lindl., 1842.

Saccolabium filiforme Lindl., J. Linn. Soc. 3:36. 1859, *nom. Illeg.*; Hook.f., Fl. Brit. India 6:56. 1890; Fischer in Gamble, Fl. Pres. Madras 1446. 1928. *Schoenorchis filiformis* (Wight) Schltr., Fedde Rep. Beih. 1: 986. 1913, *nom. illeg.*; Abraham & Vatsala, Intr. Orch. 475.1981; Manilal, Fl. Silent Valley 304. 1988. *Saccolabium chrysanthum* Alston in Trimen, Handb. Fl. Ceylon 6: 277. 1931. *Seidenfadeniella chrysantha* (Alston) Sathish in Sathish & Manilal, Cat. Ind. Orch 47. 1994.

Pendulous epiphytes. Stems 50-60 cm long, terete, ensheathed. Leaves 6-15 cm long, terete, articulate at base, ventrally grooved, acute at apex. Inflorescence 5-7 cm long, very shortly peduncled, densely-flowered. Bracts 1.2-2.2 x 1.2 mm, ovate-lanceolate, acuminate. Flowers orange-yellow, streaked with crimson-brown lines. Dorsal sepal 4.5 x 2.2 mm, oblong, 1-veined, obtuse. Lateral sepals 3.5 x 1 mm, obliquely sub-spathulate. Petals 4 x 3.5 mm, sub-orbicular, 4-veined, incurved portion glabrous. Lip represented by a large inflated spur, 3.6-7 mm long; sidelobes erect, rounded; midlobe ovate, fleshy, papillate outside. Column 1.5 mm, with very long peculiar rostellar arms extending beyond clinandrium. Pollinia 2. Ovary with pedicel 6 mm long. Fruits about 1 cm long, fusiform capsules.

Fl. & Fr.: May-Sept.

Distr.: Kerala, Tamil Nadu and Sri Lanka.

Occurrence & Specimen studied: **Idukki Dist.**: Munnar, Top Station, *Sathish Kumar 4683*; Way to Kundaley estate, *Sathish Kumar 16615*; Rajamala, *AESK 7341*; Umayyamala, Devikulam, *Shetty 28325* (MH).

Seidenfadeniella rosea (Wight) Sathish in Sathish & Manilal, Cat. Ind. Orch. 46. 1994.

Sarcanthus roseus Wight, Ic. t. 1685. 1851; *Schoenorchis roseus* (Wight) Bennet, J.

Econ. Tax. Bot. 6(2): 456. 1985. *Saccolabium filiforme* Lindl. var. *nilgirica* Fyson, Fl.

Nilgris & Pulney Hill tops 1: 136. 1915.

Pendulous epiphytes. Stems 8-35 cm long, terete, sheathed below. Leaves 5-8 cm long, terete, ventrally grooved, narrowly tapering. Inflorescence 2.5-8 cm long, extra-axillary racemes. Floral bracts 1.5 mm long. Flowers purplish-violet, pale-purple to rose, not fully opening, densely arranged on an erect raceme. Dorsal sepal 3 x 1.5 mm, linear-oblong to triangular, 1-veined, acute. Lateral sepals 3 x 1 mm, oblong-triangular, 1-veined acute. Petals 2.75 x 2.5 mm, sub-orbicular, incurved at apex, pale violet with a broad median dark band on both sides, papillate on incurved region. Lip purplish-violet, glossy, 3-lobed, spurred at base; sidelobes united with the spur, auricular-ovate, obtuse; midlobe ovate, triangular, violet; margins darker, acute. Spur 3.5 mm long, stout with back wall thickening. Column 1.2 x 1.2 mm, light green with 2-lobed rostellar arms. Operculum orbicular, beaked. Pollinia 2. Fruits 1.5 cm long, pyriform capsules.

Fl. & Fr.: Feb.-Jul.

Distr.: Endemic to Nilgiris and adjoining districts of Kerala and Karnataka.

Occurrence & Specimens studied: **Palakkad Dist.**: Sispara Ghats, *Sathish Kumar 11242* (CALI); Way to Walghat from Sispara, *N.C. Nair 77225* (MH). **Wayanad Dist.**: Pakshipathalam, *Sathish Kumar 3676*.

SIRHOOKERA O. Kuntze

Rev. Gen. 2: 681. 1891.

Epiphytes. Stem short. Leaves coriaceous. Flowers small in terminal panicles. Sepals sub-equal, dorsal concave, hooded. Petals narrower. Lip adnate to the base of column, concave, 3-lobed; sidelobes small, incurved; midlobe entire with a basal callus. Column erect, winged. Foot 0. Pollinia 4, clavate in pairs, sessile.

The genus is distributed in India and Sri Lanka with two species. Both are present in Kerala.

Key to the species

1. Leaves oblong-lanceolate; peduncle 15-20 cm long; midlobe of the lip sub quadrately rounded**S. lanceolata**
1. Leaves ovate or oblong; peduncle 10-15 cm long; midlobe of the lip ovate
.....**S. latifolia**

Sirhookera lanceolata (Wight) Kuntze, Rev. Gen. Pl. 2: 681.1891; Abraham & Vatsala, Intr. Orch. 258:1981; Jayaw. in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 2: 266 1981; Manilal, Fl. Silent Valley 305. 1988; Ramachandran & Nair, Fl. Cannanore 462. 1988; Mohanan & Henry, Fl. Thiruvananthapuram 470. 1994. *Josephia lanceolata* Wight, Ic. Pl. Ind. 5(1): 19, t. 1742. 1851; Hook. f., Fl. Brit. India 5: 823. 1890; Fischer in Gamble, Fl. Pres. Madras 1428. 1928.

Epiphytic herbs, with thick vermiform roots. Leaves 6-9 x 1.5-3 cm, oblanceolate, oblong-elliptic, coriaceous sheathing base, acute at both ends; lower surface of the leaves purple. Inflorescence an axillary, simple or branched raceme, longer than leaves. Flowers snowy white, little pink on nerves beneath, not fully opening. Branch short 1.4-2 x 1.2-2 mm, broadly ovate, acute or sub-acute, 1-veined. Sepals sub-orbicular, tinged with yellow. Dorsal sepal obovate, acuminate. Lateral sepals obliquely oblong, obtuse or rounded, 3-veined. Petals linear-subulate, 1-veined, acute, truncate or hooked at apex. Lip pure white, 3.5 x 2.6 mm, saccate at base, closely embracing the column, reddish-lilac, 3-lobed; sidelobes sub-orbicular; midlobe base with an erect, transverse plate, entire, truncate or quadrate at apex. Column 2.4-2.8 mm high, obconical. Anther terminal, 2-loculed. Pollinia 4, club-shaped, adnate to a shield shaped gland. Ovary with pedicel 2.4-4 mm long. Fruit 4 mm long, sessile capsule.

Fl. & Fr.: Aug.-Mar.

Distr.: Kerala, Karnataka, Tamil Nadu and Sri Lanka.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.**: Ponmudi, *Sathish Kumar* 1425; Athirumala, *AESK* 7338; *Ibid.*, *N. Mohanan* 4232, 8985; Chemunji, *N. Mohanan* 8224; *Ibid.*, *AESK* 10773; Attayar, *N. Mohanan* 8903; Pongalappara, *N. Mohanan* 9484; Agastyarkudam, *M. Mohanan* 66053 (MH). **Kollam Dist.**: Anathode, *Vivekananthan* 46604 (MH). **Pathanamthitta Dist.**: Thriveni, *Sharma* 42477. **Idukki Dist.**: Pachakanum, *AESK* 37697; Kulamavu, *C. N. Mohanan* 80154; Calvary Mount, *Pandurangan* 79272; Rajamala, *Gangaprasad* 12245; Walara, *AESK* 12809. **Palakkad Dist.**: Silent Valley,

AESK 25472; Ibid., N.C. Nair 81151 (MH); Aruvanpara, Sathish Kumar 10590 (CALI).

Kannur Dist.: Theerthundamala, *Ramachandran 63911 (MH).*

Sirhookera latifolia (Wight) Kuntze, *Rev. Gen. Pl.* 681.1891; Jayaw. in Dassan. & Fosb., *Rev. Handb. Fl. Ceylon* 2: 268. 1981; Manilal, *Fl. Silent Valley* 305. 1988; Vajravelu, *Fl. Palghat* 493. 1990; Mohanan & Henry, *Fl. Thiruvananthapuram* 470. 1994; Sasi. & Sivar., *Flow. Pl. Thrissur For.* 454. 1997. *Josephia latifolia* Wight, *Ic. t.* 1743. 1851; Hook. f., *Fl. Brit. India* 5: 823. 1890; Fischer in Gamble, *Fl. Pres. Madras* 1428. 1928.

Epiphytic herbs, with thick roots. Leaves 5-9 x 2.5-4 cm, oval or oblong, apiculate, narrowed into a channelled petiole. Inflorescence 10-12.5 cm long, branched panicles. Flowers yellowish-green with pinkish-violet lines beneath. Floral bracts minute, subulate, coriaceous. Sepals and petals yellowish-green. Petals linear-oblong, 1-veined. Lip with rounded lateral lobes, saccate in between; midlobe ovate. Column slender, pale-green. Operculum deep yellow, having a bifid inner cover. Rostellum peculiar with nodular arms joining in the middle. Stigma not covered. Fruits globose, 6-ribbed capsules.

Fl. & Fr.: Aug.-Apr.

Distr.: South West India and Sri Lanka.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Ponmudi, *AESK 7245; Ibid., Sathish Kumar 1304, 1931. Bonaccord, AESK 5454; Agastyamala, M. Mohanan 66053; Western slopes of Agastyamala, J. Joseph 4461. Pathanamthitta Dist.* Vellachimala, *Kiran Raj 38516. Idukki Dist.:* Thriveni, *Sharma 42477 (MH);*

Kuttikanum, *Vivekananthan* 46733 (MH). Pachakanum, *AESK* 37698. **Palakkad Dist.:** Silent Valley, *Vajravelu* 27556 (MH); *Ibid.*, *Ansari* 51491 (MH); Silent Valley, Kunthipuzha, *N.C. Nair* 56683 (CAL, MH); Dam site, *Sathish Kumar* 101321 (CALI).

SMITHSONIA C. J. Saldanha

J. Bombay Nat. Hist. Soc. 71: 73. 1974.

Short-stemmed epiphytes. Leaves retuse or unequally lobed at apex. Flowers in few to many-flowered, lateral racemes. Sepals and petals similar. Lip sessile on the column, 3-lobed, spurred; sidelobes small, erect; midlobe below the rim of the lip triangular, entire; spur curved forward. Column is reclining with a prominent, bilobed, vertical rostellum.

An endemic genus of South West India, with three species. All the species occur in Kerala.

Key to the species

1. Inflorescence longer than the leaves; spur hairy **S. maculata**
1. Inflorescence shorter than the leaves; spur glabrous **2**
2. Midlobe of lip overhanging the spur completely, lateral wings long, triangular, acute; flowers greenish white **S. viridiflora**
2. Midlobe of lip not overhanging spur completely; lateral wings short, obtuse; flowers straw coloured, spotted with red **S. straminea**

Note: It was based on the species *Micropera maculata* Dalz. The genus was established. J.D. Hooker (1890) transferred the species to *Saccolabium*, Kuntze (1891) to *Gastrochilus*, Garay (1972) to *Loxoma*, and Saldanha (1976) to *Smithsonia*. Garay's (1972) *Loxoma* is an illegitimate homonym of earlier *Loxoma* R. Br. ex A. Cunningham. Hence Saldanha's treatment (1974 b) is followed here.

Smithsonia maculata (Dalz.) Saldanha, J. Bombay Nat. Hist. Soc. 71: 74. 1974.

Micropera maculata Dalz., Hooker's J. Bot. Kew Gard. Misc. 3: 282. 1851.

Saccolabium maculatum (Dalz.) Hook. f., Fl. Brit. India 6: 64. 1890. *Gastrochilus*

maculatus (Dalz.) Kuntze, Rev. Gen. Pl. 2: 661. 1891. **(Plate V-E).**

Epiphytic herbs. Stems 1 cm long. Leaves 4-8 x 1.5-2.5 cm, 2-4, dark green, often mottled with purple, sheathing at base, obtusely 2-lobed at apex. Racemes 5-15 cm, axillary. Bracts 1.5 x 2 mm, broadly oblong-ovate, acute. Flowers yellow, up to 20, with single reddish spots on sepals and petals. Dorsal sepal 6 x 3.5 mm, ovate-oblong, narrowed at base, 5-veined, obtuse. Lateral sepals 5 x 3 mm, obovate-oblong, 5-veined, obtuse. Petals 5 x 3 mm, obovate-oblong, narrowed at base, 5-veined; obtuse. Lip white fleshy, curiously constructed, shortly saccate at base, 3-lobed; sidelobes white, connate below, narrow and recurved; midlobe entire, rounded, roughly, 3-lobed, forming a side saddle. Spur interior with a tuft of white hairs. Column 2 mm long, with violet tinge at base. Rostellum 2-lobed, overhanging stigmatic area. Operculum conical. Pollinia 2, unequally notched. Fruits 5 cm long, oblong.

Fl. & Fr.: Mar.-Sept.

Distr.: Endemic to Karnataka, Kerala and Tamil Nadu.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.** Uthipanji, *AESK* 5214, 7323; Attayar, *Sathish Kumar* 576, 1303, 3556; *Ibid.*, *N. Mohanan* 8473, 9880; TBGRI-cultivated, *AESK* 7345. **Idukki Dist.:** Walara, *AESK* 42123.

Smithsonia straminea Saldanha, *J. Bombay Nat. Hist. Soc.* 71: 74. 1974; Ramachandran & Nair, *Fl. Cannanore* 463. 1988; Vajravelu, *Fl. Palghat* 493. 1990; Sasi. & Sivar., *Flow. Pl. Thrissur For.* 454. 1996; Sivar. & P. Mathew, *Fl. Nilambur* 698. 1997. *Loxoma straminea* (Sald.) Pradhan, *India Orch.* 2: 522. 1979.

Epiphytic herbs. Stem 5-7 cm long, leafy. Leaves 4 x 0.6 cm, oblong, unequally lobed at apex; slightly falcate. Racemes 1.5 cm long. Bracts ovate-triangular, acute. Flowers yellow, with 1-2 violet spots on sepals and petals. Dorsal sepal 3.5-4 x 1.5 mm, obovate, 3-veined, obtuse. Lateral sepals 3 x 1.2 mm, obovate, 3-veined, obtuse. Petals 3 x 1.2 mm, oblong, 3-veined. Lip white, with a deep saccate spur, 3-lobed. Spur pink, more or less straight, naked within; sidelobes triangular, erect, acute; midlobe on rim of lip, triangular-ovate, overhanging the spur. Column 1 mm long, thick. Rostellum very peculiar, narrowly 2-lobed, overhanging stigmatic cavity. Pollinia 2, deeply cleft. Ovary with pedicel 5.5 mm long. Fruit. 1 cm across, globose.

Fl. & Fr.: Apr.-May

Distr.: Endemic to Kerala and Tamil Nadu.

Note: Joseph and Vajravelu (1979) reported the species from Kerala for the first time.

Occurrence & Specimen Studied: **Thiruvananthapuram Dist.** Palode, *AESK* 7366, 13078; *Ibid.*, Sathish Kumar 3557; Athirumala, *AESK* 13249; Attayar, Gangaprasad 15123. **Idukki Dist.:** Walara, *AESK* 7544. **Palakkad Dist.:** Mukkali, *Vajravelu* 44841 (MH); Near Blind Bridge, *Vajravelu* 48885 (MH); Farm area to Kaikatty, *Vajravelu* 45751 (MH). **Kannur Dist.:** Chandanathodu, *J.L. Ellis* 27178 (MH).

Smithsonia viridiflora (Dalz.) Saldanha, *J. Bombay Nat. Hist. Soc.* 71: 75. 1974.

Micropera viridiflora Dalz., *Hooker's Bot. Kew. Gard. Misc.* 3: 282. 1851. *Sarcochilus dalzellianus* Sant. *Kew Bull.* 1949: 498.1949. *Gastrochilus dalzellianus* (Sant.) Sant. & Kapadia, *J. Bombay Nat. Hist. Soc.* 59: 842. 1963. *Aerides dalzellianus* (Sant.) Garay, *Bot. Mus. Leafl. Harvard Univ.* 23 (4): 158. 1972. *Loxoma viridiflora* (Dalz.) Pradhan, *Ind. Orch.* 2: 522. 1979.

Epiphytic herbs. Stems very short, sheathed. Leaves 3-9 x 1.5-2 cm, linear-oblong or elliptic lanceolate, unequally 2-lobed. Inflorescence a short, laterally corymbose-umbellate raceme. Bracts 1.5 x 2 mm broadly ovate-obtuse. Flowers greenish. Dorsal sepals 7 x 3 mm, oblanceolate, 3-veined, gland-dotted. Lateral sepals broadly ovate, 3-veined, gland-dotted, slightly falcate, obtuse. Petals 6 x 3 mm, obovate, 3-veined, gland-dotted, obtuse. Lip deeply spurred, fleshy, white, 3-lobed; sidelobes short, erect, pinkish, acute; midlobe 3 x 6 mm, orbicular with jointed lateral wings, covering the spur. Spur 3-4 mm long, fleshy, white, naked within, apex on back having a few serrate markings. Column 2 mm long, semiterete. Pollinia 2, deeply cleft, with a narrow stipes and a broad,

oblong viscidium. Rostellum 2-lobed., vertically extending down and upwards. Ovary with pedicel 7 mm long. Fruits 3-5 cm long, fusiform capsule.

Fl. & Fr.: Jan.-Apr.

Distr.: Endemic to Karnataka and Kerala.

Note: Dalzell's *Micropera viridiflora* was transferred to the genus *Sarcochilus* by Cooke (1907), but as the name *S. viridiflorus* (Thw.) Hook. f. has priority, Santapau proposed a new name as *S. dalzellianus*, and it was later transferred to the genus *Aerides* by Garay (1972). Christenson (1985) stated that Garay believed that *Smithsonia viridiflora* generally differed from the other two species. The long curved spur, and the rostellum with 2-lobes pointing down and upwards make this species distinct from the other two species. Here I follow Christenson in dealing with the species in *Smithsonia*.

Occurrence & Specimens studied: **Kollam Dist.:** Cheenikala, *AESK* 5453. **Pathanamthitta Dist.:** Mukkenpetty, *AESK* 17506. Sabarimala slopes, *Sharma* 49931 (MH). **Idukki Dist.:** Walara, *AESK* 13034. **Malappuram Dist.:** Nilambur, *AESK* 7482.

TAENIOPHYLLUM Blume

Bijdr. 6: t. 3, 8: 355. 1825.

Small leafless epiphytes. Stems short. Roots flattened or terete. Inflorescence short, bearing flowers in succession, one or two at a time. Flowers small, spicate. Sepals and petals free or united. Lip simple or 3-lobed, spurred, the apex with or without a slender

spine-like appendage. Spur rounded, conic. Column short. Anther with short or long beak.
Pollinia 4.

The genus is with about 170 species distributed in Sri Lanka, India, Malaysia, Japan, and Australia, Java and New Guinea. India is reported to have 8 species. Only one species is reported from Kerala.

Taeniophyllum scaberulum Hook. f., Fl. Brit. India 6: 77. 1890; Fischer in Gamble, 1449. 1928; Rajesh *et al.*, Rheedea 7(1): 44. 1997.

Small leafless epiphytes. Stem much reduced. Roots sub-terete, 50-80 x 1 mm. Spikes 15-20 mm long, produced from the center of the reduced stem, 2-4-flowered; peduncle angular. Bracts 0.9 x 1 mm, ovate-acute, persistent. Flowers sub-sessile, 3.5-4 x 2 mm, creamy-white. Sepals and petals united into a 6-toothed tube. Dorsal sepal 1-1.1 x 0.9 mm, ovate sub-acute, basally 2-veined. Lateral sepals 1.1 x 0.8 mm, ovate, 1-veined. Petals 0.9 x 0.8 mm, ovate, acute 1-veined. Lip 2.2 x 1 mm, ovate, acute, tip recurved into a mucro; base saccate, basally 4-veined, united to form a single vein of the apex. Column 0.5 x 0.6 mm with two lateral oblong rounded outgrowths at base. Rostellum acute. Anther terminal 0.2 x 0.1 mm, unequally 4-locular; pollinia 4, in 2 unequal superposed pair, pyriform, papillate. Ovary 1-1.8 x 0.2 mm. Capsule 10-12 x 2 mm, oblong, sub-falcate, 9-ribbed, scaberulous.

Fl. & Fr.: Feb.-Jun.

Distr.: Endemic to Kerala.

Note: Hooker (1890) described the species based on Johnson's collections made in 1854 from Kottayam district. Since then it could not be located till recent times. Rajesh *et al.* (1997) rediscovered this species from Periyar Tiger Reserve, Idukki District.

Occurrence & Specimen studied: **Idukki Dist.:** Periyar Reserve, *Rajesh 16214, 16831* (KFRI). **Kottayam Dist.:** Kottayam, *Johnson 11/67* (K).

THELASIS Blume

Bijdr. 6: t. 2, 8: 385. 1825.

Small epiphytic herbs. Pseudobulbs with 1-2 leaves. Leaves jointed on the sheath. Scape from the base of the pseudobulbs. Flowers very small. Lip sessile, on the base of the column, entire. Column very short. Foot 0. Pollinia 8 in 2 groups.

It is an Indo-Malaysian genus with about 25 species. India is reported to have 4 species. Only one is present in Kerala.

Thelasis pygmaea (Griff.) Bl., Fl. Jav. 23.1853; Hook. f., Brit. India 6: 86. 1890; Fischer in Gamble, Fl. Pres. Madras 1450. 1928. *Euporboscis pygmaea* Griff., Calcutta J. Nat. Hist. 5: 171, t. 26. 1845; Wight, Ic. t. 1732. 1851.

Epiphytic herbs. Pseudobulbs 1.1-1.8 x 1-1.4 cm, globose, leafy. Leaves 4.5-9 x 0.5-1 cm, oblong-lanceolate, sessile, 2 per pseudobulb, bluntly bilobed at apex. Inflorescence 6.2. cm long, brownish, arise from between the old and new pseudobulbs. Sterile bracts 4, tubular, sheathing the peduncle. Floral bracts 2 x 2 mm, ovate, gland-dotted, 1-veined, acuminate. Flowers small, clustered at the apex. Dorsal sepal 3 x 1.5 mm, oblong, gland-dotted, 1-veined, obtuse. Lateral sepals 2.8 x 1.5 mm, oblong, gland-dotted, 1-veined, strongly keeled on the vein outside, obtuse. Petals 2.5 x 1 mm, oblong, ovate, gland-dotted, 1-veined, acute. Lip 2.5 x 1.8 mm, triangular, gland-dotted, 1-veined, acute. Column short, with a forked rostellum.

Fl. & Fr.: Apr.-Jun.

Distr.: India and South East Asia.

Note: This species is very rarely collected from Kerala.

Occurrence & Specimen Studied: **Idukki Dist.:** Kuttikanum, *Vivekananthan 24344* (MH).

Thrissur Dist.: Parambikulam, *Ramamurthy 16119* (MH). **Palakkad Dist.:** Karivara, *V.J.*

Nair 67472 (CAL).

THRIXSPERMUM Loureiro

Fl. Cochin. 516, 519. 1790.

Epiphytes. Stems short or long. Leaves sessile, subulate or loriform. Flowers laterally compressed. Bracts lanceolate, fleshy, distichous. Lateral sepals adnate to the foot

of the column. Lip sessile, recurved, 3-lobed. Column short. Anther terminal, 2-loculed. Pollinia 2, bifid. Fruit a linear, capsule.

About 160 species; distributed from India, Sri Lanka through Malaya, Indo-china, Formosa and southwards to Java, Sumatra, Borneo, Celebes and Philippine Islands. Eight species are present in India. Kerala has got 3 species.

Key to the species

1. Flowers white on terete, cylindrical rachis **T. pulchellum**
1. Flowers yellow, along the margins of the flat rachis **T. walkeri**

Thrixspermum pulchellum (Thw.) Schlechter, Orchis 5: 57. 1911; Jayaw. in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 2: 193. 1981; Manilal & Sathish Kumar, Ind. J. Bot. 9 (1):11-13. 1986. *Dendrocolla pulchella* Thw., Enum. Pl. Zeyl. 430. 1864.

Epiphytic herbs. Stems 5-20 cm long, thin, woody with sheathing leaves and profuse roots. Leaves 2-7 x 0.5-1.2 cm, oblong-lanceolate, fleshy, acute-apiculate. Inflorescence with scape up to 12 cm long, extra-axillary. Floral bracts 2 x 1 mm, triangular, gland-dotted, acuminate. Flowers white, short-lived, opening 1-3 at a time. Dorsal sepal 7 x 3 mm, oblong-ovate, 5-veined, apiculate. Petals 5 x 2 mm, oblanceolate, 3-veined, obtuse. Lip 6-8 mm, broader than long, 3-lobed, embracing the column and parallel to it, saccate at base; sac scrotiform, with 2 brownish yellow spots, dorsal ridge forked at apex; sidelobes longer than the midlobe, slightly falcate, glandular-hairy on

dorsal side; midlobe triangular, glandular-hairy on the dorsal side, glabrous with a patch of brownish-yellow spots beneath. Column 1.5 mm long, white, with 3 mm long foot. Operculum 2-celled. Pollinia 4, in 2 unequal pairs; stipes short; viscidium large and broad. Ovary with pedicel 2 cm long.

Fl. & Fr.: Feb.-May

Distr.: Extending from India (Kerala) to Sri Lanka.

Note: Manilal and Sathish Kumar (1986b) reported this species for the first time from India. This species is more or less similar to *T. trichoglottis* (Hook. f.) Kuntze, but the shape of sepals, petals and lip of the latter species is different. The descriptions of *T. album* (Rid.) Schltr. and *T. pulchellum* are tallying each other. Hence I suspect that the specimen reported from Kollam as *T. album* by Nair and Mohanan (1982) may be *T. pulchellum*.

Occurrence & Specimen studied: **Thiruvananthapuram Dist.**: Palode, *AESK* 7480, 7484; *Ibid.*, Sathish Kumar 501, 3688; 36969 (CALI). **Idukki Dist.**: Peermade, Narayana Iyer *s.n.* (Acc. No. 1707 – TBGT).

Thrixspermum walkeri Seidenf. & Ormerod, Desc. Epidendr. Koenig 26.1995. (**Fig. 21**).

Epiphytic herbs. Stems up to 15 cm long, profusely rooting. Leaves 5-15 x 0.4-1 cm, loriform, unequally 2-lobed, obtuse. Inflorescence 8 cm long, leaf-opposed. Racemes laterally compressed. Bracts 3 x 2 mm, oblong, obtuse. Flowers 1.5 cm across, yellowish.

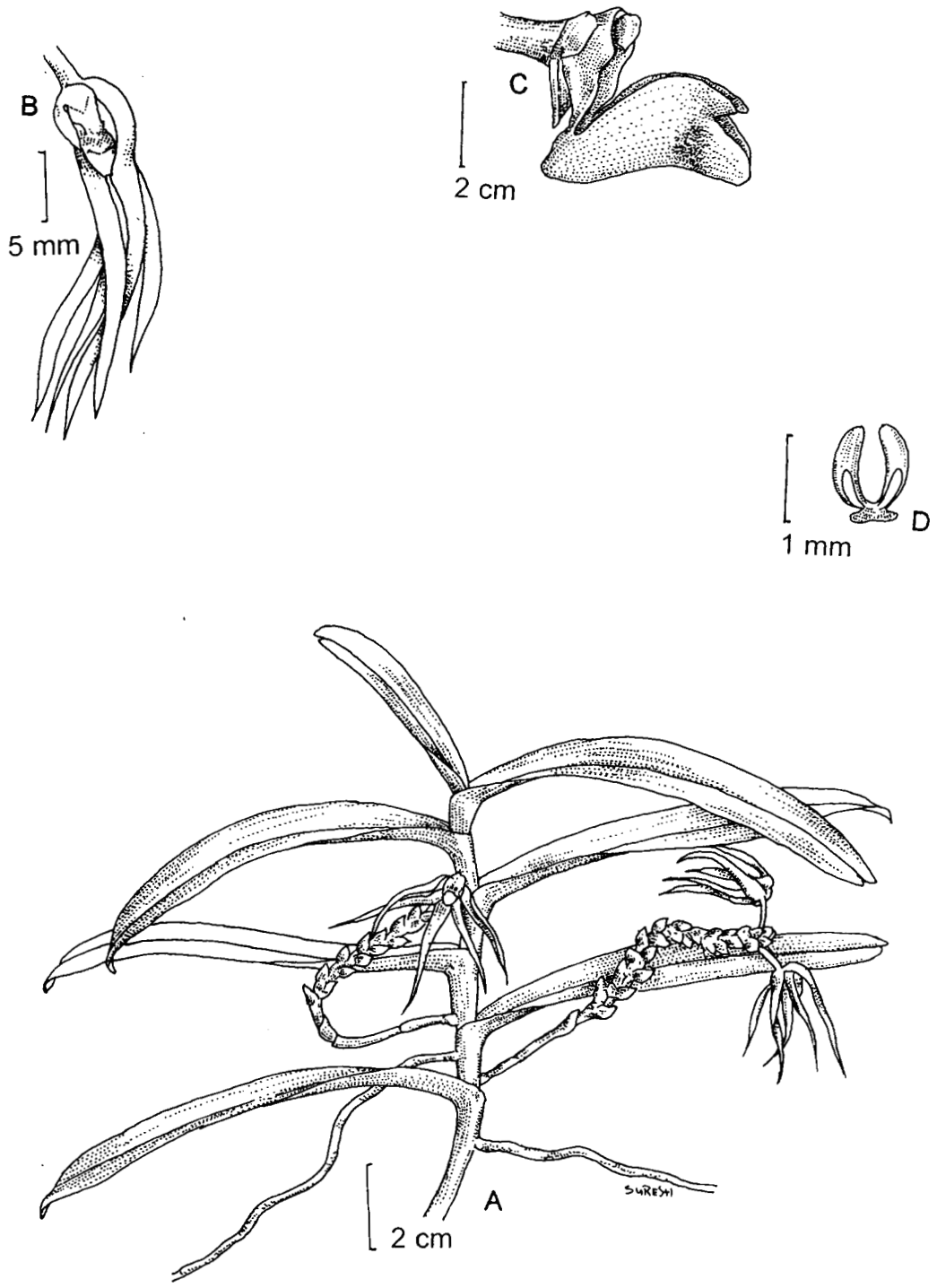


Fig. 21. *Thrixspermum walkeri* Seidenf. et Ormerod: A. Habit; B. Flower; C. Column with lip; D. Pollinia.

Dorsal sepal 20 x 3.5 mm, linear-subulate, 5-veined, obtuse. Lip 17 mm long, sessile, deeply saccate at base, 3-lobed; sidelobes falcately oblong, triangular, obtuse; midlobe saccate at base. Disc with a callus at base and a tooth-like lamella at distal region, obtuse. Column 8 mm long, with a broad foot. Operculum 2-celled. Pollinia 4, in 2 unequal pairs; stipes broad, transparent; viscidium triangular, yellow.

Fl. & Fr.: Dec.-Mar.

Distr.: Kerala, Sikkim, Assam, Sri Lanka, Myanmar, Malaysia, Java and Thailand.

Note: This species is nearly related to *T. centipeda* Lour. which has narrow sepals and petals and no callus in the saccate lip.

Occurrence & Specimen Studied: **Kollam Dist.**: Pandimotta, Aesk 25443. **Wayanad Dist.**: Mananthavady, Sathish Kumar s.n. (TBGT). **Kannur Dist.**: Chandanathodu, Ramachandran s.n. (MH).

TRIAS J. Lindley

Gen. Sp. Orch. 60. May 1830.

Epiphytes with slender, creeping rhizomes. Pseudobulbs globose. Leaves solitary on pseudobulbs. Flowers in lateral, few-flowered racemes. Dorsal sepal free; lateral adnate to the column-foot. Petals smaller than sepals, linear oblong. Lip clawed, articulate with foot, fleshy, spatulate. Column winged at apex. Pollinia 4, globose, in pairs.

A genus of about 12 species distributed in India, Myanmar and Thailand. Five species are reported from India. Kerala has two species.

Key to the species

1. Flowers 2 cm across; sepals 10-veined; petals broad-based, shorter than column, 3-veined; lip glabrous; operculum 4 mm long **T. bonaccordensis**
1. Flowers less than 1 cm across; sepals 7-veined; petals narrower, longer than the column, 1-veined; lip papillose on epichile region; operculum 2 mm long.....
..... **T. stocksii**

Trias bonaccordensis Sath. Kumar, Blumea 34(1): 105. 1989; Mohanan & Henry, Fl. Thiruvananthapuram 471. 1994.

Epiphytic herbs. Pseudobulbs 8-12 x 7-9 mm, globose, greenish-yellow. Flowers solitary, lateral, creamy-yellow with crimson red spots, 2 cm across. Dorsal sepal 12 x 11 mm, triangular-ovate, gland-dotted, 10-veined, obtuse. Lateral sepals 14 x 12 mm, triangular-ovate, 10-veined, fused slightly by base. Lip 10-12 mm long, mobile, attached to the column by a short ligament, creamy-yellow at basal half having a triangular cavity, with a few crimson spots, upper half medially grooved, crimson-violet; sidelobes represented by 2 auricles. Column 5-6 mm long, with 2 broad, lateral wings, which extend to operculum. Column-foot 8 mm long with crimson patches. Clinandrium semi-lunar.

Operculum 4 mm long; pollinia naked, unequal in sub-coherent pairs. Fruits 2.2 x 1.1 cm, obovoid, 6-ribbed capsules.

Fl. & Fr.: Jan.-Mar.

Distr.: Endemic to Southern Western Ghats.

Note: Growing as epiphytes in the evergreen and semi-evergreen forests.

Occurrence & Specimen Studied: **Thiruvananthapuram Dist.:** Agastyamala, AESK 5440; Bonaccard, Sathish Kumar 559; *Ibid.*, Sathish Kumar 3668 (Holotype); Athirumala, N. Mohanan 92249.

Trias stocksii Benth. ex Hook.f., Fl. Brit. India 5: 781. 1890; Abraham & Vatsala, Intr. Orch. 346. 1981; Manilal, FL. Silent Valley 306. 1988; *Vajravelu* Fl. Palghat 494. 1990; Mohanan & Henry, Fl. Thiruvananthapuram 471. 1994; Sasi. & Sivar., Flow. Pl. Thrissur For. 455. 1997. (**Fig. 22**).

Epiphytic herbs with creeping rhizomes. Pseudobulbs 6-8 mm across, globose, reddish brown. Leaves 4 x 1.5 cm, elliptic-oblong, acute or obtuse, coriaceous. Racemes 0.5-1 cm, 1-2-flowered. Bracts tubular, oblong. Flowers purple-yellow. Dorsal sepal 7 x 5 mm, broadly ovate-obtuse. Laterals obliquely ovate, acute. Petals 2 x 0.75 mm, oblong-acute, with a broad base. Lip 4 mm, fleshy, mobile, red punctuate; sidelobes represented by 2-auricles; midlobe column 7-9 mm long, broadly 2-winged, produced below in to a distinct foot. Operculum 2 mm long, papillose. Fruits ovoid-orbicular, strongly ribbed capsules.

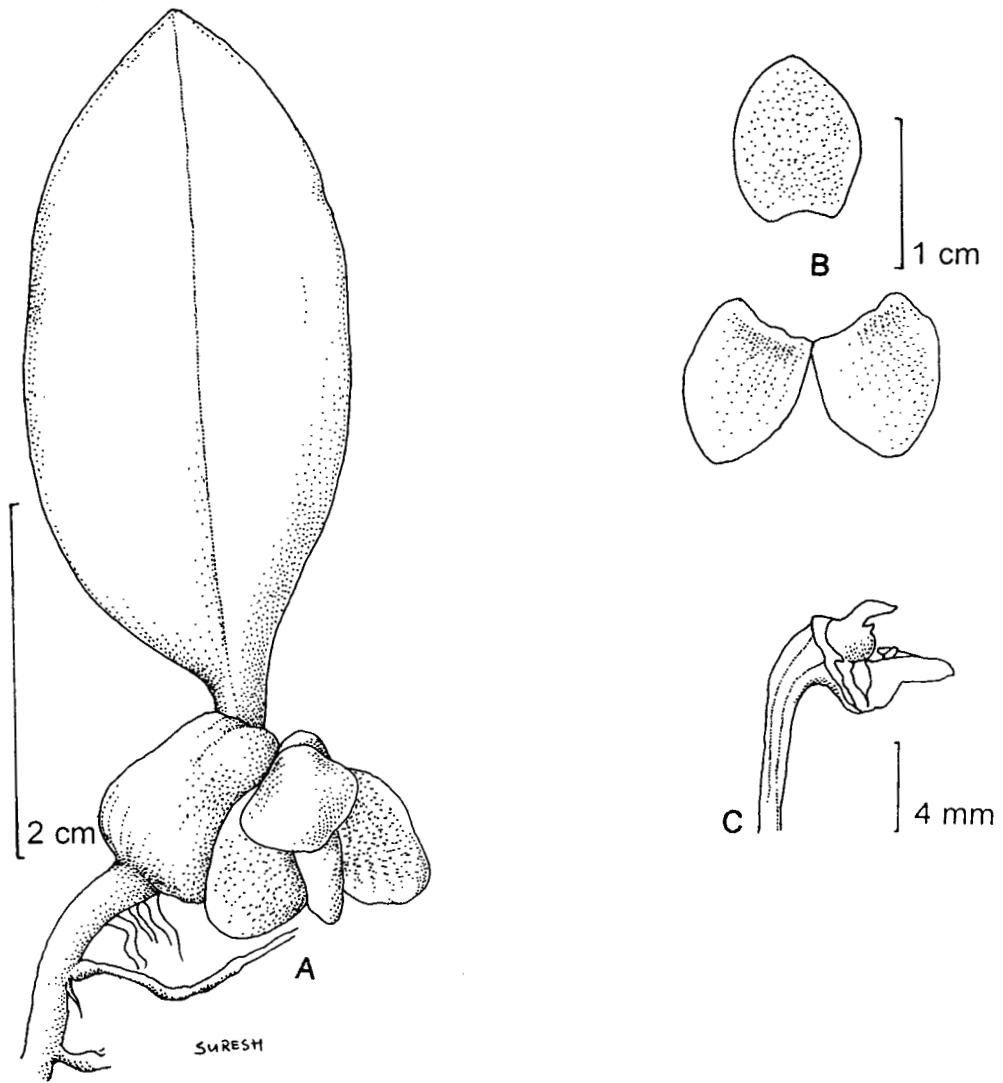


Fig. 22. *Trias stocksii* Benth. et Hook. f.: A. Habit; B. Sepals; C. Column with lip.

Fl. & Fr.: Jan.-Mar.

Distr.: South West India.

Note: It is seen as epiphytes in partially exposed areas.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Agastyamala, *AESK* 5439; Attayar, on the way to Agastyamala, *Sathish Kumar* 1309; Athirumala, *AESK* 7285, 7505; *Ibid.*, *N. Mohanan* 9402, 8998. Ponmudi, *Sathish Kumar* 706; Bonaccord, *AESK* 22336; *Ibid.*, *Sathish Kumar* 3699. **Idukki Dist.:** Walara, *AESK* 18294, 42132; Santhanpara, *AESK* 29733; Kuttikanum, *Vivekananthan* 22362, 22934 (MH). **Palakkad Dist.:** Silent Valley, *Vajravelu* 59104 (MH); Chembotti, *Sathish Kumar* 10509 (CALI). **Wayanad Dist.:** Periya, *AESK* 23310; *Ibid.*, *Ravi* 33751.

TRICHOGLOTTIS Blume

Bijdr. 6: t. 3. 8: 359. 1825.

Scandent epiphytes with long stem. Leaves equidistant, base jointed. Flowers in a few-flowered, fascicles. Sepals sub-similar, lateral connate to the base of column-foot. Petals smaller than sepals. Lip adnate to the base of column, saccate or spurred, 3-lobed; side lobe connate with the base of column; midlobe entire or 3-lobed, often hairy. Spur incurved. Column short. Pollinia 2.

An Indo-Malaysian genus with 70 species. India is reported to have four species. Only one is present in Kerala.

Trichoglottis tenera (Lindl.) Schltr., Bull. Herb. Boiss (Ser.2) 6: 471. 1906; Abraham & Vatsala, Intr. Orch. 460. 1981; Jayaw. in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 2: 238. 1981; Manilal, Fl. Silent Valley 306. 1988; Sasi. & Sivar., Flow. Pl. Thrissur For. 455. 1996; Sivar. & P. Mathew, Fl. Nilambur 699. 1997. *Oeceoclades tenera* Lindl., Gen. Sp. Orch. 236. 1833, Wight, Ic. t. 1683. 1851. *Cleisostoma tenerum* (Lindl.) Hook.f., Fl. Brit. India 6: 73. 1890; Fischer in Gamble, Fl. Pres. Madras 1448. 1928.

Wiry, scandent, epiphytes. Stems 20-80 cm long, terete. Leaves 1.5-4 x 0.5-1.5 cm, oblong, alternate, distichous, notched at tip, rounded at base. Inflorescence 1-1.5 cm, leaf-opposed, 2-3-flowered racemes. Peduncle 0.5-0.7 cm long. Flowers 1.2 cm across, yellow, with longitudinal red lines. Sepals and petals sub-similar. Dorsal sepal 9-10 x 2-3 cm, oblanceolate, 3-veined, obtuse. Lateral sepals 7-8 x 2-2.5 mm, obliquely lanceolate, 3-veined, obtuse. Petals 7-8 x 2.5 mm, oblanceolate, 3-veined, obtuse. Lip 0.6-0.8 mm long, violet, spurred at base, 3-lobed; side lobes erect, ovate, truncate or acute; midlobe broadly lanceolate, 3-lobulate. Spur 2 mm long, vertically septate, hairy within, mouth of the spur with a 2-lobed callus. Column 3 mm long. Operculum 1-celled. Pollinia 2-cleft, with narrow stipes and small viscidium. Fruits 2.5 cm long, oblong or fusiform capsules.

Fl. & Fr.: Feb. & Jun.

Distr.: South West India and Sri Lanka.

Note: Grows in Sholas and as a foot-epiphyte on secondary forests, usually in low growing shrubs on partially exposed areas.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Pongalappara, *AESK* 7332, 7453; *Ibid.*, *Sathish Kumar* 1332; Agastyamala Peak, *N. Mohanan* 9438, 9532; *Ibid.*, *Gangaprasad* 15135. **Idukki Dist.:** Guderale, *AESK* 13075; Munnar, *AESK* 13076; Near Bridge, *Sathish Kumar* 564; Riverside, *Radhakrishnan* 16239 (MH). **Palakkad Dist.:** Silent Valley, *Sispara*, *Sathish Kumar* 10548 (CALI); *Sispara* near banks of river, *Sathish Kumar*, 11208 (CALI).

VANDA W. Jones & R. Brown

Bot. Reg. 6: t. 506. 1820.

Epiphytes. Stems elongated, stout. Leaves usually channelled above and keeled below. Flowers in few to many-flowered racemes or panicles. Sepals and petals sub-similar, narrowed towards base, spreading. Lip saccate or spurred at base, 3-lobed; sidelobes small or large; midlobe fleshy. Disc ridged or lamellate. Column short; foot short. Pollinia 2, furrowed to deeply 2-partite, subglobose; caudicle short or long. Glands large.

About 40-45 species distributed throughout India, Sri Lanka, Malaya, Myanmar, Thailand, Cambodia, Indo-China, China, Java, Sumatra, Borneo, Celebes, Australia, and Philippine Islands. India is reported to have 11 species. Kerala has four species.

Key to the species

- 1. Leaves 10-26 cm long 2
- 1. Leaves 5.5-10 cm long 3
- 2. Flowers 1.8 cm across, light yellow; lateral lobes of lip obtuse. **V. testacea**
- 2. Flowers 5 cm across, pink or blue; lateral lobes of lip acute **V. tessellata**
- 3. Plants not scandent; raceme 2 or more-flowered; flowers yellowish green.....
..... **V. thwaitesii**
- 3. Plants scandent; raceme 4 or 5-flowered; flowers bright yellow **V. spathulata**

Vanda spathulata (L.) Spreng., Syst. Veg. 3: 719. 1826; Wight, Ic. 915. 1844. 45; Hook. f., Fl. Brit. India 6: 50.1890; Fischer in Gamble, Fl. Pres. Madras 1444. 1928; Abraham & Vatsala, Intr. Orch. 438. 1981; Jayaw. in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 2: 222. 1981; Mohanan & Henry, Fl. Thiruvananthapuram 471. 1994. *Epidendrum spathulatum* L., Sp. Pl. 952. 1753. (**Plate VI-E; Plate VII-A**).

Scandent epiphytes. Stems 30-60 cm long, with vermiform roots. Leaves 5.5-8.5 x 1-5 cm, keeled, distichous, recurved, coriaceous, bilobed at apex with one half shorter than the other, reddish-green, spotted on the upper surface. Inflorescence 4-5-flowered racemes, 30-45 cm long, with papery sterile bracts. Flowers 3.7 cm across, bright yellow. Floral bracts 7.5 x 6 mm, broadly ovate, acute 5-7-veined. Dorsal sepal 1.9 x 1.1 cm, obovate oblong, obtuse or rounded. Lateral sepals 1.8 x 1.2 cm, obovate oblong, rounded. Petals 2 x 1 cm, obovate, rounded, 5-veined. Lip 1.8 x 1 cm, 3-lobed; side lobes small, oblong, erect, laterally notched, with a brown streak through the middle; midlobe

reniform, ribbed in the middle, obtuse, emarginate or notched. Spur conical, very short. Column 0.7 cm high. Anther 2-celled. Pollinia 2. Ovary with pedicel 3.5-4.8 cm long. Fruit 4-6.5 cm, fusiform capsule

Fl. & Fr.: May-Nov.

Distr.: Kerala, Tamil Nadu and Sri Lanka.

Note: This is one of the beautiful species of *Vanda*, peculiar for its golden yellow flowers and lip. Once this species was very common in Veli area of Thiruvananthapuram, but now the species is not available there due to over collection and habitat destruction.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Veli, *Krishna Kurup s.n.* (Acc. No. 1712 -TBGT); Ponmudi, *Kumara Pillai s.n.* (Acc. No. 1708 - TBGT). **Alappuzha Dist.:** Vandanam, *AESK 44204*. **Palakkad Dist.:** Attappadi near Mulli, *AESK 5601*. **Wyanad Dist.:** Mananthavady, *s. coll., s.n.* (Acc. No. 50568 -MH).

Vanda testacea (Lindl.) Reichb. f., *Gard. Chron.* 2:166.1877; Abraham & Vatsala, *Intr. Orch.* 436. 1981; Manilal, *Fl. Silent Valley* 307.1988; Ramachandran & Nair, *Fl. Cannannore* 464. 1988; Vajravelu, *Fl. Palghat* 495. 1990; Sasi. & Sivar., *Flow. Pl. Thrissur For.* 456. 1996; Sivar. & P. Mathew, *Fl. Nilambur* 700. 1997. *Aerides testacea* Lindl., *Gen. Sp. Orch.* 238. 1833. *A. wightiana* Lindl., *Edward's Bot. Reg.* 30: Misc. 57. 1844; Hook. f., *Fl. Brit. India* 6: 50. 1890; Fischer in Gamble, *Fl. Pres. Madras* 1444. 1928. *Vanda parviflora* Lindl., *Jayaw. in Dassan. & Fosb., Rev. Handb. Fl. Ceylon* 2: 215. 1981. **(Plate VII-B).**

Epiphytic herbs. Stems 10-5 cm long, stout, basal portion covered with leaf sheaths. Leaves 10-26 x 1.3-1.5 cm, linear, lorate, distichous, unequally lobed at apex with a mucro. Racemes 6-5 cm, many-flowered. Flowers 1.8 cm across, creamy-yellow with a purple or reddish pink lip. Bracts 2 x 3 mm, broadly-ovate, acute. Dorsal sepal 6-11 x 3-5.2 mm, obovate-spathulate, obtusely rounded and incurved at apex. Lateral sepals 5.6-9.2 x 2.8-5.4 mm, obovate-spathulate, rounded, incurved. Petals 5-10 x 2-4 mm, spathulate, concave, narrow, twisted at the base downwards. Lip 9.5 mm long with the spur, sessile, 3-lobed; sidelobes oblong, obtuse, erect; midlobe 6.4 x 3.5 mm, quadrate-oblong, recurved, emarginated, crenulate. Disc with two broad fleshy ridges. Spur narrow, funnel-shaped. Column 2.8 mm long, truncate. Anther terminal, 2-loculed. Pollinia 2. Ovary with pedicel 2.5 cm long. Fruits 2-5 cm long, pedicelled, clavate capsules.

Fl. & Fr.: Apr.-May

Distr.: India, Myanmar and Sri Lanka.

Note: Common in moist deciduous forests

Occurrence & Specimens studied: **Thiruvananthapuram Dist.**: Chippanchira, *AESK* 5466, 7275; Palode, TBGRI Campus, *Sathish Kumar* 4709; Karimancode, *AESK* 7517; Kurisadi, *AESK* 7208; Attayar, *William D'cruz* 15172; *Ibid.*, *N. Mohanan* 7876; **Kollam Dist.**: Palaruvi, *AESK* 7364; Cheenikala, *AESK* 741; Ranni, *C.N. Mohanan* 65095 (MH); Thenmala, *C.C. Calder & M.S. Ramaswamy* 830 (CAL). **Idukki Dist.**: Deviara, *AESK* 7543, Adimali, *AESK* 7473; *Ibid.*, *Gangaprasad*. 12217; Thekkady, *Sharma* 42097 (MH); Chinnar to Marayoor, *Sebastine* 18302 (MH); Vandiperiyar, *Vivekananthan* 24338 (MH); **Thrissur Dist.**: Thumbermuzhi, *Ramamurthy* 27016 (MH); Irinjalakkuda, *Ramamurthy*

49354 (MH); **Palakkad Dist.:** Makkali, *Sathish Kumar* 11251 (CALI); Attappady, *Vajravelu* 32196 (MH); Agali, *Vajravelu* 26316 (MH). **Kozhikode Dist.:** Kuttiyadi, *Naithani* 24160 (MH); **Wayanad Dist.:** Begur, *Ramachandran* 62746 (MH); Chandanathodu, *AESK* 44202.

Vanda tessellata (Roxb.) Hooker ex G. Don in Loud., Hort. Brit. 372. 1830; Fischer in Gamble, Fl. Pres. Madras 1445. 1928; Abraham & Vatsala, Intr. Orch. 438. 1981; Jayaw. in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 2: 218. 1981; Manilal, Fl. Silent Valley 307. 1988; Sivar. & P. Mathew, Fl. Nilambur 700. 1997. *Epidendrum tessellatum* Roxb., Pl. Corom. 1: 34. 1795. *Vanda roxburghii* R. Br., Bot. Reg. 6: 506. 1820; Wight, Ic. 916. 1844-45; Hook. f., Fl. Brit. India 6: 52. 1890. (**Plate VI-B**).

Stout, epiphytic herbs. Stem 30-40 cm, with branching roots. Leaves 15-20 x 1.5-2.4 cm, strap-shaped, recurved, distichous, thick, obtusely keeled, tip bilobed with a mucro in between. Inflorescence 15-20 cm long, 4-10-flowered racemes. Flowers 5 cm across, fragrant, showy, greyish-blue, tessellated on a yellow background. Bracts 2.7 x 6.4 mm, broadly triangular-ovate, clasping the rachis, obtuse or rounded. Dorsal sepal 2.4 x 1.4 cm, obovate, faintly trifold, margin wavy and many-veined. Lateral sepals 2.5 x 1.8 cm, obovate, obtuse, wavy and many-veined. Petals 2.4 x 1.5 cm, obovate, obtuse or sub-acute. Lip funnel-shaped, 3-lobed; sidelobes erect, 10 x 4.5 mm, obliquely oblong, acuminate; midlobe panduriform, 1.7 x 1.25 cm, constricted below the bifid apex. Disc swollen. Spur conical, 6.7 mm long, laterally compressed. Column 9 mm long. Anther terminal, 2-

loculed; pollinia 2. Ovary with pedicel 3.7 mm long. Fruit 9 mm long, clavate, ribbed, capsule with a short pedicel.

Fl. & Fr.: May-Nov.

Distr.: India, Sri Lanka and Myanmar.

Note: This is seen in the lower elevations, on road side trees or cultivated trees, and deciduous forest patches. In Munnar near Bodimettu, this species grows as lithophytes in large numbers on fully exposed roads.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Dillenooy Fort, *AESK* 5450, 7395, 7427; Venganur, *Sathish Kumar* 583. **Idukki Dist.:** Chinnar, *AESK* 37626; *Ibid.*, *C.E.C. Fischer* 3433 (CAL). **Palakkad Dist.:** Mully, *AESK* 25459; Aruvanpara, *Sathish Kumar* 10553, 10554 (CALI). **Wayanad Dist.** Manantoddy, *s. coll.*, *s.n.* (Acc. No. 50587-MH). “**Travancore**”, *C. E.C. Fischer* 3433 (CAL).

Vanda thwaitesii Hook. f. in Trimen, *Handb. Fl. Ceylon* 4: 193. 1898; Jayaw. in Dassan. & Fosb., *Rev. Handb. Fl. Ceylon* 2: 220 1981; *Sathish Kumar & S.Kumar*, *Rheedea* 8(2): 249. 1998.

Epiphytic herbs. Stems 15-30 cm long, lower portion covered with brown sheaths. Leaves 7.5-10 cm long, falcately recurving, bifid at apex. Inflorescence 10 cm long, 3-4-flowered racemes. Flowers 3.7 cm across, yellowish-green, streaked and spotted with red and white or pale yellow. Floral bracts very small. Dorsal sepal obovate-oblong, obtuse. Lateral sepals larger than dorsal sepal, orbicular-ovate and obtuse. Petals as big as dorsal

sepal obovate-oblong. Lip shorter than sepals, sessile on the base of the column, infundibuliform, 3-lobed; sidelobes small, erect; midlobe broad, ovate, 2-lobulate. Spur shorter than the lobes, straight, acute. Column short. Rostellum truncate. Anther terminal, 2-loculed. Pollinia 2, obovoid, sulcate. Ovary with pedicel 2.5 cm long.

Fl. & Fr.: Apr.-Sept.

Distr.: Endemic to Sri Lanka, but recently reported from Kerala.

Occurrence & Specimens studied: **Palakkad Dist.:** Arukanpara, *Sathish Kumar 10553, 10554* (CALI); On the way to Poochapara, *Suresh Kumar 31451* **Wayanad Dist.:** Thirunelli, *AESK 44203; Ibid., Sathish Kumar & Suresh Kumar 31462*; Changanalappara-Lakkidi, *Sathish Kumar & Suresh Kumar 31453*; Mananthavadi, *Sathish Kumar 24309*.

XENIKOPHYTON Garay

Bot. Mus. Leaflet. Harvard Univ. 23: 374. 1974.

Epiphytic herbs. Stems sheathed. Leaves unequally lobed at apex. Sepals and petals similar. Lateral sepals connate with the base of the column. Lip sessile, scrotiform at base, recurved at apex. Column short. Pollinia 4. Rostellum large, erect, prominently bifurcate; stigma vertical.

It is a monotypic genus endemic to Kerala and Karnataka.

Xenikophyton smeeanum (Reichb. f.) Garay, Bot. Mus. Leafl. Harvard Univ. 23(10): 374. 1974; Manilal, Fl. Silent Valley 308.1988. *Saccolabium smeeanum* Reichb. f., Gard. Chron. Ser. 3, 2: 214. 1887. *Rhynchostylis latifolia* Fischer, Kew Bull. 1927: 358. 1927, & in Gamble, Fl. Pres. Madras 1440. 1928. *Schoenorchis latifolia* (Fischer) Saldanha, J. Bombay Nat. Hist. Soc. 70: 414. 1974; Abraham & Vatsala, Intr. Orch. 473. 1981.

Non-pseudobulbous epiphytes. Stem 6 cm long, thick, curved, ensheathed in the petiolar leaf bases, bearing stout roots at base. Leaves 4-7.5 x 1.8-2.2 cm, thickly coriaceous, unequally bilobed at apex, lobes rounded. Flower 0.2 cm across, in stout compact racemes. Peduncle 6.5 cm long. Floral bract 0.2 x 0.2 cm, elliptic-ovate, acute. Pedicel 0.2 cm long, sepals and petals not thick. Dorsal sepal 2.5 x 1.5 mm, oblong, rounded or obtuse at apex, 1-veined. Lateral sepal 3 x 1 mm, oblong, obtuse or rounded at apex, 1-veined. Petals 2.5 x 1.5 mm, elliptic-obovate, obtuse or rounded, 1-veined. Lip fleshy 2 x 1 mm, concave and rounded dorsally, papillose, strongly reflexed with a conical projection near the tip. Spur short, rounded. Column short 0.5 mm long. Anthers terminal, 2-loculed. Operculum large. Pollinia in 4, globose, with a slender stipe and an elliptic viscidium.

Fl. & Fr.: May-Aug.

Distr.: South West India occurring in Karnataka and Kerala.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.**: Ponmudi, Aesk 5458, 7243; Chemunji, Aesk 21420; Athirmala, Aesk 7340, 15669; Agastyamala, William

D'cruz 18432. Kollam Dist.: Pandimotta, *AESK 18290. Idukki Dist.:* Munnar, *Sathish Kumar s.n.; Vandanmedu, Vivekananthan 50523 (MH).*

PEPEROMIACEAE A.C. Smith

Fl. Vit. Nova 2: 75. 1981

Succulent herbs, rarely subshrubs, many being epiphytic or lithophytic. Leaves sometimes very large, without stipules, alternate, rarely opposite or whorled. Flowers bisexual, very small, usually aggregated in dense spikes, subtended by fleshy or succulent bracts, sepals and petals absent. Stamens 2, fused in their upper part to form a single anther. Gynoecium consists of a single carpel, containing a single basal ovule; style simple, rarely divided. Fruit a berry, succulent, thin or dry pericarp and contain a small seed with small embryo surrounded by a mealy endosperm.

A family consisting of 4 genera and about 1000 species distributed through tropics and subtropics.

The earlier workers treated the above genera in the family Piperaceae along with other genera. Thorne (1976) has recognized *Piper* and *Peperomia* under 2 subfamilies viz., Pipoideae and Peperomioideae respectively. Smith (1972) and Airy Shaw (1973) segregated them giving the Peperomioideae a family status as Peperomiaceae. This family is distinguished from Piperaceae by the lack of stipules, having only two stamens in the flower, and by certain unique anatomical features like scattered vascular bundles and the

presence of translucent cells in the outer cortex and epidermis. The cytological studies conducted by Mathew *et al.* (1999) on the two genera from the South Indian region provided confirmatory evidences supporting the proposed segregation of *Peperomia* in to a separate family, Peperomiaceae.

PEPEROMIA Ruiz & Pavon

Prodr. 8. 1794

Herbaceous perennials or annuals. Stems not articulated, creeping, ascending or erect, not climbing but often rooting from the nodes and epiphytic. Leaves alternate, opposite or apparently whorled; petioled, without stipules. Leaf blade orbicular, ovate, elliptic, obovate or lanceolate, fleshy, mostly with 1-3 pairs of veins from the base, rarely venation pinnate. Spikes solitary, terminal or axillary, erect. Bracts glabrous, distinct, peltate, orbicular. Flowers hermaphrodite, sometimes partly immersed in spike axils. Stamens 2, with a short, subulate filament and globose bi-sporangiate anthers. Pollen grains without an aperture. Ovary distinct, globose or ovoid, with an entire, simple stigma. Fruits distinct, exserted, less mucilaginous, sessile or shortly stipellate brown at maturity.

A genus of presumably 1000 species centered in Tropical America. Three of the subgenera distinguished by Dahlstedt (1900) have a pantropical distribution and are represented in Kerala.

Key to the species

1. Stem and undersurface of leaves pubescent.....2
1. Stem and undersurface of leaves glabrous, or ciliolate along anterior margin only.....4
2. Leaves mostly in whorls of 4, very fleshy, coarsely wrinkled when dry; stem deeply fluted and acutely wrinkled in dried specimen; plants drying yellowish-green; spike axis pubescent.....**P. tetraphylla**
2. Leaves usually opposite or in whorls of 3, neither very fleshy nor finely wrinkled when dry; stem shallowly fluted or smooth in dried specimens; plants drying dark when pressing; spike-axis glabrous.....3
3. Stem 9-40 cm tall, densely pubescent; leaf blade mostly 1-4 cm long; palmately veined; peduncle 1-3 cm long; spike 3-8 cm long **P. blanda**
3. Stem 5-15 cm tall, sparsely pubescent; leaf blade up to 2 cm long; pinnately veined; peduncle 0.5-1.5 cm long; spike 1.5-3.5 cm long **P. heyneana**
4. Annuals; petiole clasping, decurrent at base; leaf blade broadly triangular ovate, as long as wide, shallowly cordate; distantly-flowered **P. pellucida**
4. Perennials; petiole not clasping not decurrent; leaf blade longer than broad, not cordate; spikes often slender, densely flowered 5
5. Leaves alternate, the uppermost in whorls of three; spikes slender 6
5. Leaves opposite, the uppermost rarely in whorls of 3; 3-veined; spikes stout**P. portulacoides**
6. Leaves 5-veined; peduncle shorter than the spike **P. pseudo-rhombea**
6. Leaves 3-veined; peduncle as long as or longer than the spike **P. wightiana**

Peperomia blanda (Jacq.) Kunth, Nov. Gen. Sp. 1: 67.1815; Huber in Dassan. & Fosb.,
Rev. Handb. Fl. Ceylon 6: 293.1987. *Piper blandum* Jacq., Collect. 3: 211.1789

Perennial herbs, 9-40cm tall, densely pubescent with mostly crispate hairs. Leaves opposite; petiole 2-10mm long; lamina 1-4 x 0.5-2 cm, rhombic, obovate or almost orbicular, persistently pubescent on both surfaces. Spikes solitary; spike axis glabrous. Flowers immersed for 2/3rd in the spike axis. Ovary with a fleshy, sub-apical stigma. Fruits ellipsoidal, coarsely verrucose, without a pseudo cupule.

Distr.: Pantropical.

Key to the varieties

1. Fruit stipitate when fully mature; leaves large, often glabrate with age
..... var. **blanda**
1. Fruit sessile at maturity; leaves variable in size, never glabrate var. **floribunda**

Peperomia blanda (Jacq.) Kunth, var. **blanda**. *P. blandum* Jacq., Collect. 3: 211. 1789;
Huber in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 6 : 294. 1987.

Perennials, 9-40 cm tall. Stems ascending or erect, densely pubescent with crispate hairs, striate when dry. Leaves usually opposite, often in whorls of 3 towards the apex of the stem; petiole 2-10 mm long, puberulous. Lamina 2-4 x 0.6-2.2 cm, rhombic, obovate, acute or obtuse at base, shortly acuminate at apex, moderately fleshy, turning dark with

pressing, persistently puberulous on both surfaces, palmately veined from the base. Spikes solitary, terminal, often with additional spikes from the axils of the upper leaves, 3-8 cm long; spike-axis glabrous. Peduncle 1-2 cm long, glabrate. Bracts 0.6 mm in diameter. Flowers immersed for two third in the spike axis. Ovary with a fleshy, oblique, sub-apical stigma. Fruit 1 mm long, roundish, ellipsoidal, coarsely verrucose, without a pseudo cupule.

Chrom.No: 2n= 24 (Hauser, 1916).

Fl. & Fr.: Mar. – Nov.

Distr.: Pantropical

Note: On moist rocky areas.

Occurrence & Specimen studied: **Thrissur Dist.:** Vazhachal, Pandurangan 31176.

Peperomia blanda (Jacq.) Kunth, var. **floribunda** (Miq.) Huber in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 6: 294. 1987. *P. arabica* Decne., var. *floribunda* Miq., Syst. Pip. 122. 1843. *P. dindugulensis* Miq., Syst. Pip. 122. 1843; Hook.f., Fl. Brit. India 5: 98. 1886; Gamble, Fl. Pres. Madras 1210. 1925; Ramachandran & Nair, Fl. Cannanore 385. 1988; Vajravelu, Fl. Palghat 396. 1990; Mohanan & Henry, Fl. Thiruvananthapuram 383. 1994; Sivar. & P. Mathew, Fl. Nilambur 585. 1997. *P. heyneana* sensu Wight, Ic. t. 1922., f.1. 1853, non Miq., 1843.

Leaves and stem pubescent with crisped hairs. Leaves usually opposite, to 3.5 x 1.2 cm, 3-5-ribbed from the base, but rather obscurely, elliptic-ovate or obovate, rounded or

slightly acute, petiole to 1.25 cm long. Spikes slender, in terminal panicles, up to 10 cm long; peduncle 2 cm long. Fruits globose.

Chrom. No.: n=44 (Mathew *et al.*, 1999).

Fl. & Fr.: Mar.- Nov.

Distr.: Widely distributed throughout the Old World tropics.

Note: Epiphytic on trees of evergreen forests.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Athirumala, *N.Mohanan* 7893; Bonaccord, *J.Joseph* 46524 (MH). **Kollam Dist.:** Aryankavu, *C.N.Mohanan* 59538 (MH). **Pathanamthitta Dist.:** Pamba, *Deb* 30374 (MH). **Idukki Dist.:** Kattappana, *Ramanujam* 72425 (MH); Ayappankovil, *N.C.Nair* 50801 (MH); Pachakkanam, *Vivekanandan* 45379 (MH); Thadiyanpadu, *Raju* 71242 (MH). **Palakkad Dist.:** Karivara Forest, *Vajravelu* 44867 (MH). **Wayanad Dist.:** Kabini, *J.L.Ellis* 20451 (MH). Chandanathodu, *Ramachandran* 63429 (MH).

Peperomia heyneana Miq., *Syst. Pip.* 123. 1843; Hook.f., *Fl. Brit. India* 5: 99. 1886; Gamble, *Fl. Pres. Madras* 1210. 1925; Huber in *Dassan. & Fosb., Rev. Handb. Fl. Ceylon* 6 : 297. 1987. **(Plate III-B).**

Perennials, 5-15 cm tall, erect or ascending; stem glabrous or thinly pubescent, striate when dry. Leaves opposite or ternately whorled; petiole 3-7 mm long, glabrous or puberulous. Lamina 0.5-2 x 0.5-1.5 cm, elliptical or obovate, lower leaves nearly orbicular, tapering to an obtuse base, faintly short-acuminate or sometimes emarginate at

apex, slightly fleshy, not wrinkled, glabrous except the ciliolate margins or thinly pubescent on the lower or on both the suture; venation pinnate. Spikes solitary, terminal, 1.5-3.5 cm long, with glabrous axis. Peduncle 0.5-1.5 cm long, always shorter than the spike, glabrous or sparsely pubescent. Bracts about 0.3 mm in diameter. Flowers half immersed. Ovary with a fleshy, oblique, subapical stigma. Fruits about 0.7 mm long, globose-ellipsoidal, minutely stipitate, finely verrucose, without a pseudo cupule.

Chrom. No.: n=22 (Mathew *et al.*, 1999)

Fl. & Fr.: Mar.-Nov.

Distr.: Himalayas, southern Deccan Peninsula, and Sri Lanka

Occurrence & Specimens studied: **Idukki Dist.:** Munnar, *Santhosh Kumar 15664*; Rajamala, *AESK 7577*; Thekkady, *Vivekanandan 48613* (MH); Edamalayar, *Sharma 41680* (MH); Erattayar dam, *C.N. Mohanan & Ramanujan 72188* (MH); Kulamavu, *Vivekanandan 50425* (MH); Adukkam, *Fr. Kadavil 1261* (MH). **Palakkad Dist.:** Silent Valley, *AESK 5291*. **Wayanad Dist.:** Thirunelly, *Ramachandran 62777* (MH).

Peperomia pellucida (L.) Kunth, *Nov. Gen. Sp.* 1: 64. 1815; Hook. f., *Fl. Brit. India* 5: 98. 1886; Gamble, *Fl. Pres. Madras* 1210. 1925; Manilal & Sivar., *Fl. Calicut* 248. 1982; Huber in *Dassan. & Fosb., Rev. Handb. Fl. Ceylon* 6: 299. 1987. Ramachandran & Nair, *Fl. Cannanore* 386. 1988; Vajravelu, *Fl. Palghat* 396. 1990; Mohanan & Henry, *Fl. Thiruvananthapuram* 383. 1994; Sivar. & P. Mathew, *Fl. Nilambur* 575. 1997. *Piper pellucidum* L., *Sp. Pl.* 30. 1753.

Delicate, glabrous annuals; stem erect 5-30 cm long, pellucid, branched, finely striate when dried. Leaves alternate; petiole 6-15 mm long, clasping decurrent along the stem. Lamina 1-3 cm long and wide, triangular-ovate, cordate at base, obtuse and often short acuminate at apex, pale green, thinly membranous, pellucid and not wrinkled when pressed; palmately 5-7-veined from the base. Spikes solitary, terminal, but frequently leaf-opposed by overtopping, 2-5 cm long, very slender with glabrous axis; peduncle 2-5 mm long, about as thick as spike axis. Bracts 0.2-0.3 mm in diameter. Flowers scarcely immersed. Ovary with a fleshy, oblique, subapical stigma. Fruit about 0.8 mm long, globose-ellipsoidal, sessile, pointed at the apex, with an apical stigma; lacking pseudo cupule, blackish brown at maturity.

Chrom. No.: n= 22 (Mathew *et al.*, 1999).

Fl. & Fr.: Round the year

Distr.: Pantropical of American origin.

Note: A plant of disturbed vegetation found on wet rocks and epiphytic on trees. Common in moist places.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Palode, *AESK* 38959; Pulimathu, *Mohanan* 52667 (MH, CAL); Neyyar Dam, *J. Joseph* 44196 (MH). **Pathanamthitta Dist.:** Pathanamthitta, *Anil Kumar* 87 (MH); Konni, *Chandrabose* 49125 (MH). **Idukki Dist.:** Moolamattam, *Raju* 71179 (CAL, MH); Neriamangalam, *Sebastine* 25080 (MH, CAL); Vandiperiyar, *Vivekandandan* 20387 (MH); Kalikavu, *Bhargavan* 81193 (CAL). **Kottayam Dist.:** Nalukody, *Antony* 121 (MH). **Alappuzha Dist.:** Vembanadu, *M.S. Swaminathan* 95659 (MH). **Ernakulam Dist.:** Chiklai, *Ramamurthy*

74959 (MH). **Thrissur Dist.:** Vazhachal, *Pandurangan* 31117; *Ibid.*, *Ramamurthy* 74738 (CAL, MH); Athirappally, *Sebastine* 27509 (MH). **Palakkad Dist.:** Mukkali, *Vajravelu* 32071 (MH); Anamuli, *Vajravelu* 27591 (MH); Kanjirapuzha, *Sebastine* 22329 (MH); Dhoni R.F., *J. Joseph* 17199; Thenkara, *N.C. Nair* 64586 (MH); Palakkadu, *Subramanyan* 8963 (MH). **Kozhikkode Dist.:** Calicut, *G.V. Narayana* 62090 (MH). **Kannur Dist.:** Payyannoor, *Ansari* 64749 (MH); Thellicherry, *Ramachandran* 52108 (MH). **Kasaragod Dist.:** Kasargod, *Ramachandran* 59255 (MH). **“Travancore”**, *Sebastine* 44196 (MH); *Ibid.*, *Rama Rao* 579 (CAL).

Peperomia portulacoides (Lamk.) Dietr., Sp. Pl. 1: 172. 1839; Hook.f., Fl. Brit. India 5: 98. 1886; Gamble, Fl. Pres. Madras 1209. 1925; Ramachandran & Nair, Fl. Cannanore 386. 1988; Vajravelu, Fl. Palghat 396. 1990; Mohanan & Henry, Fl. Thiruvananthapuram 383. 1994; Sivar. & P. Mathew, Fl. Nilambur 576. 1997; Wight, Ic. t. 1922. 1853. *Piper portulacoides* Lamk., Encyl. 1: 82. 1791. **(Plate III-A).**

Glabrous perennials, 10-25 cm tall; stems ascending, often creeping at base, striate when dry. Leaves opposite at base, 3-4 at apex; petiole to 1-7 mm long, shorter than the blade. Lamina 1-4 x 0.3-1.5 cm, obovate, elliptical, acute or obtuse at base, obtuse or rounded at apex, moderately fleshy, finely wrinkled and turning black when dry; palmately veined from the base. Spikes solitary, terminal, often with additional spikes from the axils of the upper leaves, 1.5- 9 cm long, with glabrous axis. Peduncle 0.6-1.5 cm long. Bracts 0.5-0.6 mm in diameter. Flowers slightly immersed. Ovary with a fleshy

oblique, subapical stigma. Fruit 0.6-0.7 mm long, ellipsoidal, sessile, finely verrucose with a pseudo cupule.

Chrom. No.: n= 22 (Mathew *et al.*, 1999).

Fl. & Fr.: Round the Year.

Distr.: India, Mauritius, and Madagascar. Throughout Kerala.

Note: Seen as epiphytic in evergreen forests or on mossy rocks.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Ponmudi, *AESK* 7234,19136; *Ibid.*, *M.Mohanan* 52520, 58503 (MH); Athirumala, *AESK* 7292, 26802; *Ibid.*, *Kiran Raj* 34767; Pongalappara, *AESK* 5450; Braemore, *AESK* 41186; Bonaccord, *M.Mohanan* 59441 (MH); *Ibid.*, *J.Joseph* 44523 (MH); Agastyamala, *Henry* 17321 (MH). **Kollam Dist.:** Pandimotta, *AESK* 12895, 15654, 15684, 18301, 23263. **Idukki Dist.:** Peerumedu, *P. Bhargavan* 87421 (CAL, MH); Calvary mount, *Pandurangan* 79258 (MH). **Palakkad Dist.:** Valiyaparathodu, *N.C.Nair* 69584 (MH); Karivara Forest, *Vajravelu* 26125 (MH); Silent Valley, *Vajravelu* 26125 (MH). **Wayanad Dist.:** Chandanathodu, *Ramachandran* 58645 (MH). **Kannur Dist.:** Kannur, *C.N.Mohanan* 76169 (MH).

Peperomia pseudo-rhombea C. DC. in DC., *Prodr.* 16(1): 440. 1869; Hook.f., *Fl. Brit. India* 5: 97. 1886; Huber in *Dassan. & Fosb., Rev. Handb. Fl. Ceylon* 6: 296. 1987. *P. thomsonii* Hook.f., *Fl. Brit. India* 5: 97. 1886; Gamble, *Fl. Pres. Madras* 1210. 1925. *P. dindigulensis* Wight, *Ic. t.* 1921. 1853, non *Miq.*, 1843.

Glabrous perennials, 10-30 cm tall, with slender, long stolons; the stolons ascending, striate or smooth when dried. Leaves alternate, rarely uppermost opposite or in whorls of three; petiole 0.5-2 cm long. Lamina 3-8 x 1-5 cm, rhombic, elliptical, obtuse, rarely acute or rounded at base, faintly acuminate at apex, moderately fleshy, not wrinkled when pressed, palmately veined from the base. Spike solitary, terminal, often with additional spikes, 4-8 cm long, with glabrous axis. Peduncle 1-2 cm long. Bracts about 0.5 mm in diameter. Flowers slightly immersed. Ovary with a fleshy, oblique, sub-apical stigma. Fruit about 1 mm long, almost globose, sessile, finely verrucose, without a pseudo cupule.

Fl. & Fr.: Apr.-Aug.

Distr.: India and Sri Lanka. Rare in Kerala.

Note: Epiphytic on mossy trees in the evergreen forests.

Occurrence & Specimen studied: **Idukki Dist.:** Walara, AESK 19119.

Peperomia tetraphylla (Forst.) Hook. & Arn., Bot. Beech. Voy. 97. 1841; Huber in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 6:292. 1987; Manilal, Fl. Silent Valley 230. 1988; Ramachandran & Nair, Fl. Cannanore 386. 1988; Vajravelu, Fl. Palghat 397. 1990; Sivar. & P. Mathew, Fl. Nilambur 576. 1997. *Piper tetraphyllum* Forst., Fl. Ins. Austr. Prodr. 5. 1786. *Piper refluxum* L.f., Suppl. 91. 1781. *Peperomia reflexa* (L.f.) A. Dietr., Sp. Pl. (ed.6) 1: 180. 1831, non H.B.K., 1816; Hook.f., Fl. Brit. India 5: 99. 1886; Gamble, Fl. Pres. Madras 1209. 1925; Wight, Ic. t. 1923. 1853.

Perennials, 3-12 cm tall, main axis creeping, branched; branches erect. Stem patently pubescent, shallowly channelled when fresh, deeply furrowed when dry. Leaves usually 4, in a whorl, rarely ternate. Petiole 1-3 mm long, densely pubescent. Lamina 0.5-1 x 0.4-0.7 cm, elliptical, rhombic or almost orbicular, rounded or obtuse at both ends, fleshy when alive, coarsely wrinkled when dry, yellowish-green when pressed; mostly glabrous above and finely pubescent beneath; midrib and venation obscure. Spikes solitary, terminal, 0.6-2.5 cm long, rarely longer, 1-2 times longer than the peduncle; spike axis hairy. Peduncle 8-15 mm long, thinly pubescent. Bracts about 0.6 mm in diameter; Flowers immersed in the axis of the spike for about half of their length. Ovary with a fleshy, terminal stigma. Fruit about as long as wide, sessile, smooth, with the basal one-third forming a mucilaginous pseudo cupule.

Chrom. No.: n=22 (Mathew *et al.*, 1999).

Fl. & Fr.: Jul.- Sept.

Dist.: Pantropical

Note: Epiphytic or on mossy trees in evergreen forests.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Agastyamalai, N.Mohanan 8031; Karuppuswamimala, AESK 5211. **Kollam Dist.:** Shembagavally, C.N.Mohanan 73410 (MH). **Idukki Dist.:** Thediampadu, Raju 71241 (MH); Mlappara, Sebastine 17525 (MH); Devicolam, Sebastine 17525 (MH); Munnar, Deb 30771 (MH); *Ibid.*, AESK 13069, 23365; Wagavurrai, Shetty 26456 (MH); Idukki, N.C.Nair 70129 (CAL). **Kottayam Dist.:** Upper Wagamon, Shetty 26456 (MH). **Palakkad Dist.:** Palakkadu, N.C.Nair 69599 (MH); Silent Valley, Abdul Jabbar 15908 (MH). **Wayanad**

Dist.: Tolpetty, *Ramachandran* 53809 (MH); Thirunelly, *Ramachandran* 62055 (MH); *Ibid.*, *AESK* 20083; Brahmagiri, *Fischer* 27 (CAL); Sultan Bathery, *Ellis* 18640 (MH).

Peperomia wightiana Miq. in Hook., London J. Bot. 5: 548. 1846; Wight, Ic. t. 1924.1853; Hook. f., Fl. Brit. India 5: 98. 1856; Gamble, Fl. Pres. Madras 1210. 1921; Manilal, Fl. Silent Valley 230. 1988.

An almost glabrous, perennial herb. Stems creeping, ascending, up to 8 cm tall glabrous, striate when dry. Leaves alternate at base, opposite or in whorls of 3 towards the apex. Petiole 5-10 mm, glabrous. Blade 0.6-2 x 0.6-1.5 cm, broadly elliptical, ovate, obovate or orbicular, obtuse at base, rounded at apex, slightly fleshy, not wrinkled; glabrous except at the ciliolate anterior margin. Spikes solitary, terminal, 1.5-3 cm long, 0.5-1.2 mm in diameter with glabrous axis. Peduncle 1-3 cm long, as long as or longer than the spike exceeding the upper leaves, glabrous. Bracts about 0.2 mm in diameter. Flowers half immersed. Ovary with a subapical stigma.

Fl. & Fr.: Mar.-Nov.

Distr.: Peninsular India, Sri Lanka.

Occurrence & Specimens studied: **Idukki Dist.:** Munnar, *AESK* 38962; Adukkum, *Fr. Kadavil* 1261 (CAL). **Palakkad Dist.:** Silent Valley, *Sabu* 10018 (CALI).

PARASITES

BALANOPHORACEAE L. C. M. Richard

Mem. Mus. Hist. Nat. 8: 429. 1822, *nom. cons.*

Glabrous, fleshy root parasites, without leaves. Rhizomes hard and warty, through the rind of which flowering stem burst. Flowers monoecious or dioecious, crowded in large globose or elongate stoutly-peduncled heads, male and female flowers dissimilar. Male flowers with 4-8 tepals, fairly large, sometimes round. Female flowers without tepals, very minute and confluent with ovary, often mixed with clavate bodies. Stamens as many as the tepals and opposite to them, or the filaments connate in a column; anthers free or connate, 2-many-celled, opening by pores or valves. Ovary 1-3-celled; ovule 1 in each cell, pendulous; styles 1-2; stigma simple or capitate. Fruit one seeded with minute embryo. Seeds usually adherent to pericarp.

A family of very wide distribution through out the world.

BALANOPHORA J.R. Forster & J.G.A. Forster

Char. Gen. Pl: 99, t. 50.1776.

Herbaceous, red, brown or yellow to yellowish-white parasites, destitute of chlorophyll and roots. Stems appearing from a greater or smaller pit at the apical part of each tuber. Scale leaves 2-40, broad-based, whorled, opposite, distichous, or spirally

arranged. Inflorescence spadix like, terminating the stem. Flowers unisexual, pedicellate or sessile. Male inflorescence racemose or spicate. Female inflorescence spicate, ovoid, ellipsoid, obovoid or spherical. Tepals ovate to lanceolate, acute or almost square and truncate. Stamens without filaments; anthers 4-5 forming a more or less synandrium. Ovary 1-celled; ovule 1 pendulous. Fruit indehiscent, nut like.

Distributed through temperate to tropical Asia, Malaysia, Pacific Islands, tropical Australia, Cameroon, Madagascar and tropical Africa.

Key to the species

- 1. Plants monoecious; male flowers zygomorphic; scale leaves distichous
..... **B. abbreviata**
- 1. Plants dioecious; male flowers actinomorphic; scale leaves spirally arranged
..... **B. fungosa** subsp. **Indica** var. **indica**

Balanophora abbreviata Bl., Enum. Pl. Jav. 1:98. 1827; Miq., Fl. Ind. Bat. 2: 1065. 1859; Eichl. in DC., Prodr. 17:148. 1873; Hansen, Dansk. Bot. Ark. 28:135. 1972; Arekal & Shivamurthy, Curr. Sci. 44: 96. 1975; Sasi. & Sivar., Flow. Pl. Thrissur For. 389. 1996. **(Fig. 23)**.

Monoecious root parasites, creamy-white to pale yellow. Length from the point of fusion with host-root to tip of inflorescence 5-8 cm. Tubers several together in a mass; branching from the base. Single tuber obconical, narrow at base, broadening near top,

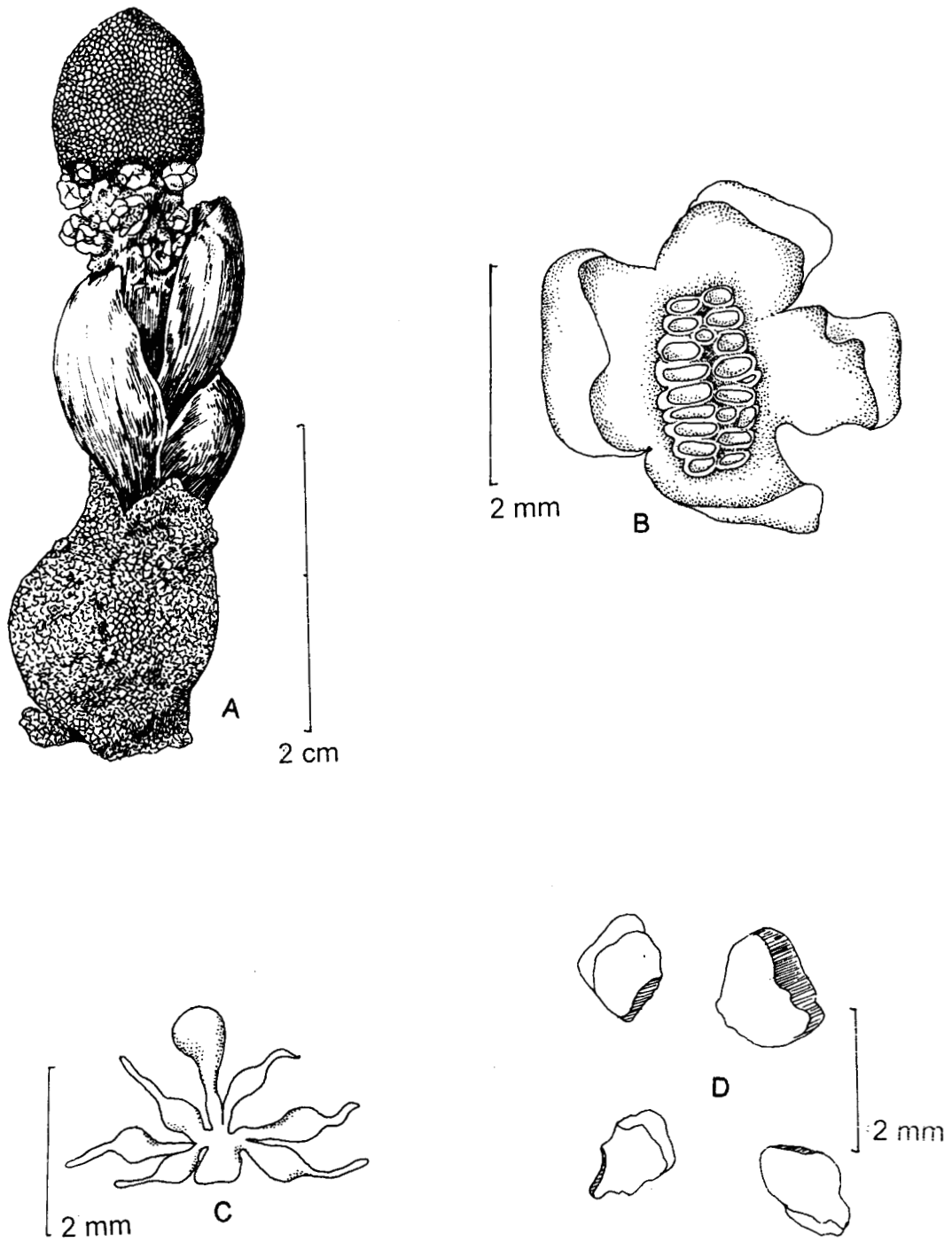


Fig. 23. *Balanophora abbreviata* Bl.: A. Habit; B. Male Flower; C. Ovary with style and spadicle; D. Tepals.

1-1.7 x 1-1.5 cm; surface fine granular with stellate warts. Leaves 4-5, distichous, evenly spaced, slightly imbricate, 1-2 x 1 cm, ovate, obtuse or emarginate. Flowers 4-merous, conspicuously zygomorphic. Tepals are of different shape and size, in all cases tip incurved. Synandrium with fertile part about 1 mm long, slightly compressed. Anthers divided into 16-20 parallel loculi, running from base to top of the synandrium. Female inflorescence ovoid, 1.5 x 1.2 cm. Spadicle 0.75 mm long with a lower cylindrical part and an upper truncate part. Flowers on main axis of inflorescence and on lower part of spadix. Largest flower with pistil c. 0.9 mm long. Ovaries obovoid-ellipsoid.

Fl. & Fr.: Jul.-Oct.

Distr.: Africa, Cameroon, Madagascar, South West China, India, Indo-Chinese subcontinents and Pacific Islands. In Kerala this species was reported from Thrissur and Pathanamthitta districts.

Note: In evergreen forests.

Occurrence & Specimens studied: **Pathanamthitta Dist.:** Kattathippara, AESK 44401. **Thrissur Dist.:** Peechi, Sasidharan 4679, 5171 (KFRI).

Balanophora fungosa J. & G. Forst., Char. Gen. Pl. 100, t. 50. 1776. subsp. **indica** (Arn.)

Hansen, Dansk. Botan. Ark. 28: 100. 1972, var. **indica**; Ramachandran & Nair, Fl. Cannanore 403. 1988; Manilal, Fl. Silent Valley 242. 1988; Vajravelu, Fl. Palghat 414. 1990; Mohanan & Henry, Fl. Thiruvananthapuram 402. 1994. Sivar. & P. Mathew, Fl. Nilambur 599.1997; *Langsdorffia indica* Arn., Ann. Nat. Hist. 2: 37. 1838. *Balanophora indica* (Arn.) Wall. ex Griffith, Trans. Linn. Soc. Bot. London 20: 95.

1846; Hook. f., Fl. Brit. India 5: 237. 1886; Gamble, Fl. Pres. Madras 1263. 1925.

(Plate VIII-E, F)

Dioecious plants; yellow to orange-yellow or pink. Length from the point of fusion with the host-root to the tip of the inflorescence 1.3-22 cm. Tubers in a mass, more or less branched from the base. Single tuber subspherical, 0.5-5.6 cm wide and slightly shorter; surface coarsely tessellate to fine granular, with stellate warts. Stem elongate. Leaves 10-20, spirally arranged, imbricate, to 3 x 2 cm, obtuse. Male inflorescence 2-7 x 2-6 cm, with expanded flowers, ovoid-ellipsoid. Pedicels 7-10 mm long. Male flowers subtended by a truncate bract, 5 x 4 mm., 6-merous, actinomorphic. Tepals 3-7 x 1-2.5 mm, elliptic-lanceolate, acute. Synandrium on a short torus, slightly compressed, 2.5-5 mm long, anterior posterior width 2mm, lateral width 3.5 mm, often slightly obconical. Anther horse-shoe shaped. Female inflorescence 1-6 x 1-4 cm, depressed-ellipsoid, sub-spherical or obovoid, reddish-pink in colour; flowers on the main axis of the inflorescence. Style simple. Fruits crustaceous, 1-seeded.

Fl. & Fr.: Nov.-Feb.

Distr.: Indian and Indo-Chinese subcontinents, Malaya, Sumatra, Pacific Islands, Australia

Note: In evergreen forests at 150-1000 m elevation.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.**: Bonaccord, *AESK* 7438; Ponmudi, *AESK* 7265; Chemunji, *M. Mohanan* 61756, 61757 (MH). **Kollam Dist.**: Aryankavu, *C.N. Mohanan* 59600 (MH). **Idukki Dist.**: Mlappara, *N.C. Nair* 69899 (MH); Walara Valley, *Lawson* 46118 (MH). **Palakkad Dist.**: Valiyaparathodu,

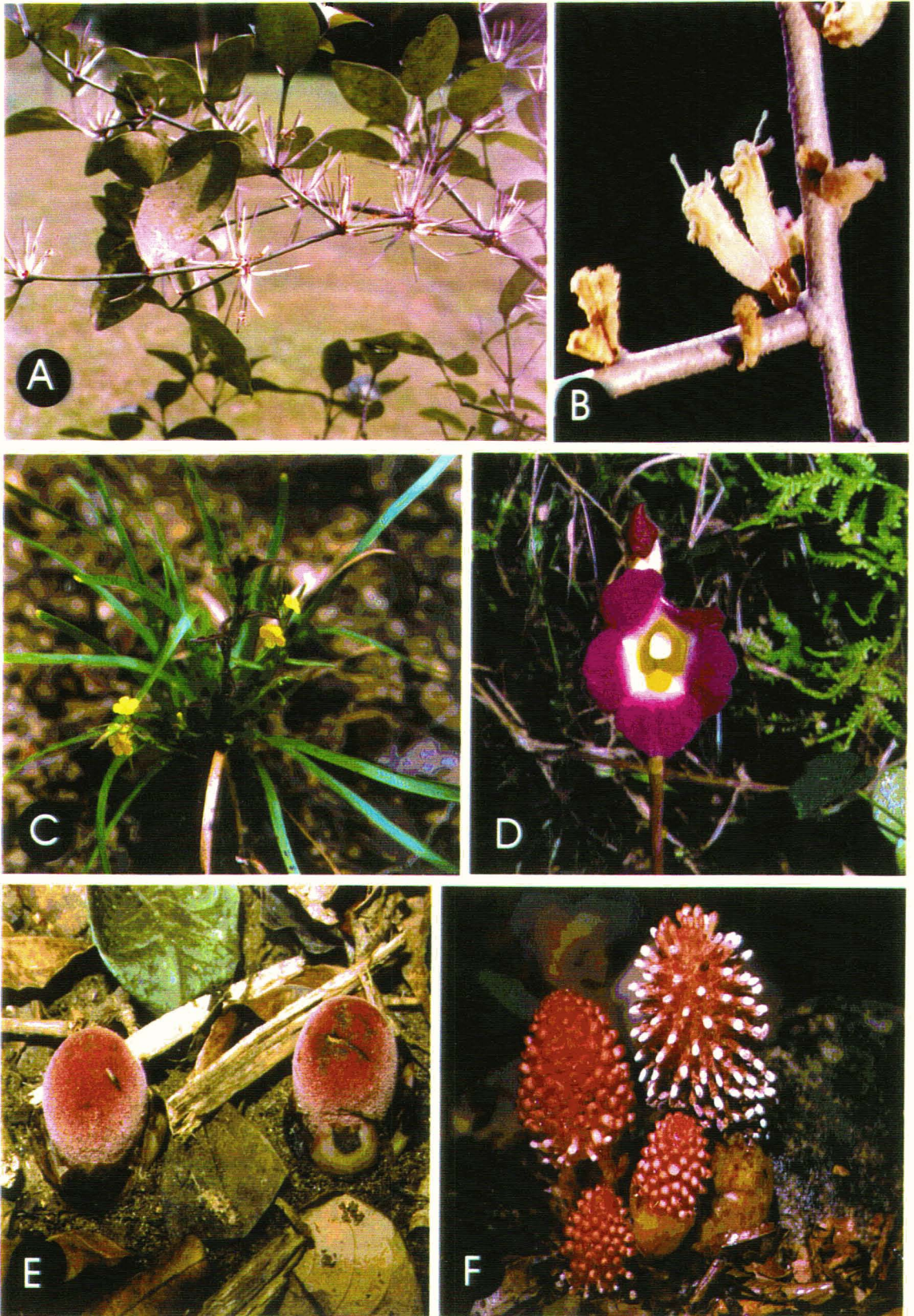


Plate VIII. A. *Helicanthus elastica* (Desr.) Danser; B. *Taxillus tomentosus* (Heyne ex Roth.) Tiegh.; C. *Striga asiatica* (L.) Kuntze; D. *Christisonia tubulosa* Benth. ex Hook. f.; E. *Balanophora fungosa* J.R. ex G. Forst. subsp. *indica* (Arn.) Hansen var. *indica* – Female plant; *Balanophora fungosa* J.R. ex G. Forst. subsp. *indica* (Arn.) Hansen var. *indica* – Male plant.

AESK 13022, 13023; Ibid., Vajravelu, 60595 (MH); Silent Valley, Bhargavan 65523 (MH); Thodukki, AESK 25475; South Walakkad, Sathish Kumar 10142 (CALI). Malappuram Dist.: Karuvarakundu, Philip Mathew 33816 (CALI). Wayanad Dist.: Kottiyoor, AESK 44223; Chandanathodu, Ramachandran 53964, 65397 (MH).

CASSYTHACEAE Bartling ex Lindley

Nix. Pl. 15. 1833, *nom. cons.*

Parasitic or partly autotrophic, twiners, with small haustoria. Stems filiform, containing chlorophyll. Leaves reduced to minute scales, arranged spirally. Inflorescence indefinite, spicate or racemose or reduced to heads. Flowers pedicellate or sessile within a minute bract and two bracteoles. Tepals 6, persistent; tube shallow, enlarged, and enveloping the fruit. Fertile stamens 9, 2-celled; the outer two whorls without glands and with introrse anthers; second whorl staminodes; the third whorl flanked by glands and with extrorse anthers; the fourth whorl of distinct, sessile or stipitate staminodes. Stigma small, obtuse or capitellate. Fruits completely included in the enlarged succulent flower tube. Testa membranous or coriaceous. Cotyledon thick, fleshy, unequal.

Earlier the genus *Cassytha* L. was included in the family Lauraceae. Lindley (1833) created a new family for this genus of parasitic herbs. Kostermans (1957) classified the family Lauraceae into two subfamilies viz., Lauroideae and Cassythoideae and

included the genus *Cassytha* L. in the subfamily Cassythoideae. As the family name Cassythaceae Bartl. ex Lindl. is a conserved name, the same is followed here.

CASSYTHA Linnaeus

Sp. Pl. 1: 35. 1753

Plants filiform, twining parasites. Flowers small, hermaphrodite. Fruit a drupe enclosed in the enlarged, inflated perianth tube, crowned by the remains of the lobes and stamens.

The genus with about 15 species is distributed in India, Sri Lanka, Australia and South Africa.

Cassytha filiformis L., Sp. Pl. 1: 35.1753; Hook.f., Fl. Brit. India 5:188.1883; Wight, Ic. t.1847.1848; Gamble, Fl. Pres. Madras 1240.1923; Manilal & Sivar., Fl. Calicut 250. 1982; Ramachandran & Nair, Fl. Cannanore 392. 1988; Mohanan & Henry, Fl. Thiruvananthapuram 397.1994.

Stems ca. 3 mm thick, very long and twining like chord. Flowers small, spicate, sessile; spikes 1.5-5cm long. Perianth tube short and turbinate; lobes 6, outer 3 smaller. Perfect stamen 9, 2-celled. Ovary globose, free in flower but included in the perianth tube, which closely covers the fruit; style short; stigma capitate. Fruit a globose drupe.

Fl. & Fr.: Aug.-Dec.

Distr.: Pantropical. Throughout Kerala.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.**: Karyavattom, *P.J. Mathew* 2716; Amboory, *P.J. Mathew* 2703; Pulimathu, *M. Mohanan* 63809 (MH); Vellayani, *M. Mohanan* 52654 (MH). **Kollam Dist.**: Paravur, *C.N. Mohanan* 55767 (MH). **Thrissur Dist.**: Wadakkanchery, *AESK* 17359. **Palakkad Dist.**: Tippu Fort, *Ramamurthy* 80477 (MH). **Malappuram Dist.**: Thenhippalam, *AESK* 1814. **Kannur Dist.**: Ezhimala, *Ansari* 67883 (MH); Ezhuvamalai, *Ramachandran* 65269 (MH). **Kasaragod Dist.**: Kasaragod, *V.J. Nair* 73881 (MH).

CUSCUTACEAE Dumortier

Anal. Fam. Pl.: 20, 25.1829, *nom. cons.*

Leafless twining parasitic herbs, yellow or reddish. Flowers small, white or rose-coloured. Bracts small or 0. Corolla ovoid, or campanulate, glabrous, usually with a ring of fimbriate or lobed scales near the base or below the stamens, sometimes wanting; lobes 5, short, imbricate. Stamens as many as the corolla lobes, inserted on or below the throat of the corolla. Ovary more or completely 2-celled; ovules 4; styles 1 or 2; stigmas 2. Fruit a globose or ovoid, dry or succulent capsule. Seeds 4, glabrous; albumen fleshy; embryo slender.

The genus *Cuscuta* was considered as a member of the family Convolvulaceae by Bentham and Hooker (1883), and Thorne (1976). The family Cuscutaceae with the only genus *Cuscuta* is assigned to the Order Polemoniales by Hutchinson (1959), Thakthajan (1966) and Cronquist (1981). Dahlgren (1983) treated the family Cuscutaceae in the Order Solanales.

The Cuscutaceae differs from the family Convolvulaceae in the nature of its parasitic habit and their leafless and rootless, thread-like herbaceous stem, etc. The presence of 5, scale-like staminodes, alternate with stamens or at the base of corolla is quite characteristic. In the family Convolvulaceae, internal phloem is present whereas in Cuscutaceae the phloem is absent.

The family is represented in Kerala by a single genus *Cuscuta*.

CUSCUTA Linnaeus

Sp. Pl. 124. 1753.

Vines without or with little chlorophyll; stems twining, filiform, yellow or orange or rarely greenish, attached to host plants by haustoria. Roots withering and absent in mature plants. Leaves reduced to scales or completely absent. Inflorescence cymose, composed of small whitish flowers. Calyx gamosepalous, 5-lobed, rarely free. Corolla campanulate or urceolate, 5-lobed, usually with basal scale-like appendages inside, opposite to the stamens. Ovary 2-celled, biloculate; styles 1-2; stigma capitate or elongate,

triangular, fleshy. Fruit a capsule, dehisce by an interstyler opening or thrash or irregular line of circumscissions near the base. Seeds 2 or 4.

A cosmopolitan genus with 140-165 species, distributed in the warm and temperate parts of America, China, India, Sri Lanka and many other countries. In Kerala it is represented by 4 species.

Key to the species

1. Style one; stigma conical..... **C. reflexa**
1. Styles two; stigmas globose-peltate..... **2**
2. Infra-staminal scales absent **C. hyalina**
2. Infra-staminal scales present **3**
3. Calyx lobes slightly overlapping; corolla campanulate; scales ovate, abundantly fimbriate, exserted **C. campestris**
3. Calyx lobes overlapping; corolla urceolate; scales oblong truncate or somewhat bifid with numerous fimbriae, not exserted..... **C. chinensis**

Cuscuta campestris Yuncker, Mem. Torrey Bot. Cl. 18: 138, f. 14. 1932; Sant. & Korl., J. Bombay Nat. Hist. Soc. 62: 598. 1965; Srini., Bull. Bot. Surv. India 15 (1&2): 160. 1973.

Stems slender, filiform, terete, glabrous, orange to dull yellow. Flowers 3-3.5 mm long, yellow, in more or less many-flowered clusters. Pedicels 1-1.5 mm long, glabrous.

Bract minute. Calyx greenish-yellow, campanulate; lobes 5, broadly ovate, imbricate. Corolla pale white, membranous, campanulate; lobes 5, broadly triangular, acute or sub-acute, tips incurved. Stamens 5, shorter than corolla lobes, alternating with them; filaments equal or longer than anthers. Anthers ovate, basifixed; infra-staminal scales ovate, abundantly fimbriate, exserted. Ovary slightly depressed globose, 2-celled, with 2 ovules in each cell; styles 2, slender, shorter than ovary; stigmas 2, capitate, peltate. Capsule 3 mm in diameter, more or less 4-lobed, depressed globose with intra-stylar opening. Seeds 4, sometimes only 2, 1.5 mm long, brown, ovate, depressed on one side.

Fl. & Fr.: Dec.-Apr.

Distr.: A native of North America and is reported from West Indies, Argentina, Britain, France, Italy, Africa, Hungary, China, Japan, Java, Australia, Polynesia and Tahiti. In India it is reported from W.Bengal, Pune, Coimbatore and Nilgiris. In Kerala it is reported from Ernakulam.

Note: This species was reported from India by Santapau and Korlahalli (1965), and later by Srinivasan (1973) from Tamil Nadu.

Occurrence & Specimens studied: **Ernakulam Dist.:** Ernakulam, *N. Mohanan 3426*; Mangalavanam, *M.S.Swaminathan 9572* (MH).

Cuscuta chinensis Lamk., Encyl. Meth. 2: 229. 1786; Wight, Ic. t.1373. 1848; Clarke in Hook.f., Fl. Brit. India 4: 226. 1883; Gamble, Fl. Pres. Madras 931.1923. *C. reflexa* sensu Moon, Cat. 12.1824, non Roxb., 1798. *C. hyalina* Wight, Ic. t. 1372. 1848, non Roth, 1821.

Stems slender, filiform. Flowers 2.5 mm long or slightly longer, shortly pedicellate or sessile, bracteate, in few-flowered clusters. Calyx as long as the corolla tube, fleshy; lobes equal or slightly unequal, broadly triangular, obtuse, overlapping, strongly curved on one side. Corolla 2.5-3 mm long, urceolate or globular; lobes narrowly triangular, acute; as long as the tube, spreading. Stamens shorter than the corolla lobes; filaments longer than the ovate anthers. Infra-staminal scales reaching up to the staminal filaments, oblong, shortly fimbriate on the upper half, 1.8 mm long. Ovary depressed; styles 2, unequal in length; stigmas globose-peltate. Capsule up to 3 mm in diameter, depressed globose, somewhat 4-lobed, completely enveloped by the persistent corolla, distinctly circumscissile. Seeds 1-1.5 mm long, brown, glabrous, minutely foveolate.

Fl. & Fr.: Aug. – Oct.

Distr.: Native of China, distributed throughout India, Abyssinia, Sokotra, Iran, Afghanistan, Sri Lanka and Australia. Common in Western Ghats. Throughout Kerala.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.**: Kowdiar, *Biju* 23966 (CALI). **Idukki Dist.**: Neymakkadu, *AESK* 7575. **Ernakulam Dist.**: Malayatoor, *Biju* 15355 (CALI).

Cuscuta hyalina Roth, Nov. Pl. Spec. 100. 1821, *non* Wight, 1848; Clarke in Hook f., Fl. Brit. India 4: 226.1883; Gamble, Fl. Pres. Madras 931. 1923. *C. arabica* Wight, Ic. t.1371.1848.

Stems filiform, slender. Flowers 2.5-3.5 mm long, pedicellate, bracteate in distinct cymes; pedicels as long as the flowers and somewhat clavate. Bracts distinct, triangular.

Calyx funnel-shaped, 2, 5-3 mm long, longer than the corolla tube; lobes longer than the calyx tube, narrowly triangular, tapering. Corolla 3-3.5 mm long, campanulate; lobes as long as or longer than the tube, lanceolate, slightly spreading, reflexed in front. Stamens shorter than the corolla lobes; filaments inserted at the base of the sinuses, slightly longer than the ovoid anthers. Infra-staminal scales absent. Ovary globose with a ring-like structure at the base of the styles; styles unequal, uniform thickness; stigmas capitate. Capsule 3-4 mm in diameter, globose or sub-globose, brown, 2-celled, with a narrow inter-stylar aperture surrounded by the persistent corolla, circumscissile. Seeds 1.5 mm long, broadly ovoid, brownish black, hilum, horizontal, oblong.

Fl. & Fr.: Aug.–Nov.

Distr.: Throughout India, Baluchistan, Southern Tropical Africa. In Kerala it is known only from Palakkad district.

Occurrence & Specimen studied: **Palakkad Dist.:** Kanjikode, *AESK 42672*.

Cuscuta reflexa Roxb., *Pl. Corom.* 2: 3, t. 104.1798; Thw., *Enum. Pl. Zeyl.* 213. 1860; Clarke in Hook. f., *Fl. Brit. India* 4: 226. 1853; Gamble, *Fl. Pres. Madras* 931. 1923.

Stems large, up to 2.5 mm in diameter, pale green or yellowish green. Flowers 6-8 mm long, shortly pedicellate, bracteate, in cymes or paniculate clusters. Pedicels 3 mm long, fleshy. Bracts 1 mm long, broadly triangular. Calyx cupulate, lobes subequal, the outer two slightly shorter. Corolla white, tubular, fleshy, 6-8 mm long; lobes triangular-ovate, obtuse; margins wavy. Stamens somewhat shorter than the corolla lobes; filaments

very short, inserted at the base of the sinuses; anthers oblong, dorsifixed. Infra staminal scales about one-third as long as corolla, oblong or ovate, incurved; margins fimbriate with fine multicellular fimbriae. Ovary ovoid-conical, glabrous, 2 mm in diameter; stigmas stout, velvety, longer than the thick style. Capsule globose, apiculate, glabrous, shrivelled when dry, 6 mm in diameter, circumscissile. Seeds 1-2, 3.5 mm in diameter, sub-orbicular, brown, glabrous.

Fl. & Fr.: Nov. – May.

Distr.: Throughout India, Afghanistan, Yunnan, China and Java. Throughout in Kerala.

Note: Parasitic on various species of plants.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Agastyar Hills, *Biju 25901*. **Kollam Dist.:** Kollam, *C.N.Mohanan 63790 (MH)*. **Idukki Dist.:** Umayamala, *Shetty 26618 (MH)*; On the way to Mattupetty, *Biju 15369*. **Thrissur Dist.:** Kannankuzhy, *Pandurangan 30947 (MH)*. **Palakkad Dist.:** Mukkali, *AESK 25446*. **Wayanad Dist.:** Thavinjal, *AESK 44206*. **Kannur Dist.:** Nedumpoil, *AESK 42196*.

LORANTHACEAE A. L. Jussieu

Ann. Mus. Natl. Hist. Nat. 12: 292. 1808, *nom. cons.*

Plants usually shrubby, aerial, hemiparasites on other plants, glabrous or variously pubescent. Stem usually forked, brittle and often much branched, with swollen nodes. Leaves mostly opposite, but sometimes sub-opposite to alternate, simple, entire, often

coriaceous. Flowers dichlamydous, varying greatly in size, mostly bisexual, rarely unisexual and dioecious. Calyx reduced to an entire or lobed limb, adnate to the ovary. Corolla polypetalous or sympetalous, actinomorphic or zygomorphic, valvate, usually 4-6-merous. Stamens opposite, adnate and equal in number to the petals. Anthers mostly basifixed and immobile, but occasionally dorsifixed and versatile, 2-4-loculed, opening longitudinally. Pollen mostly trilobate. Ovary inferior, uni or multiloculate, without true ovules. Fruits drupaceous, several millimeter long, occurring singly in the fruit, eaten and distributed by birds.

A family of perhaps more than 60 genera and about 700 species found in all continents, but with the greatest development in the tropical, subtropical and south temperate regions.

The number of genera in the family Loranthaceae is a matter of controversy. Engler (1889, 1897) listed 10 genera but the number of genera now accepted varies from 50-80, depending on the treatment. Hundreds of species which were originally described in the genus *Loranthus* L. (except for *L.europaeus* Jacq.) have been assigned to other genera. Van Tieghem (1894 -1902) described more than 110 genera in Loranthaceae and Viscaceae. About 30 of his genera are now generally accepted including *Korthalsella* and *Amyema*. Polhill (1989) enlisted 15 genera from the New World.

The family is represented in India by 9 genera (*Dendrophthoe*, *Elytranthe*, *Helicanthes*, *Helixanthera*, *Hyphear*, *Loranthus*, *Macrosolen*, *Taxillus*, *Tolypanthus*). Seven genera are known from the Kerala State.

Key to the genera

1. Branches dichotomous; leaves decussate; corolla lobes spirally twisted
 **Helicanthes**
1. Branches not dichotomous; leaves alternate or subopposite; corolla lobes not spirally
 twisted **2**
2. Petals 6; flowers subtended by 1 bract and 2 bracteoles; inflorescence an apically
 crowded spike; the flowers occasionally in decussate pairs.....**Macrosolen**
2. Petals 4 or 5; individual flowers subtended by single bract; inflorescence never a spike
 with flowers in decussate pairs.....**3**
3. Petals 5 **4**
3. Petals 4 **6**
4. Corolla zygomorphic by the presence of a single, long conspicuous split
 **Taxillus**
4. Corolla actinomorphic, without a conspicuous split..... **5**
5. Inflorescence surrounded by a conspicuous red involucre.....**Tolypanthus**
5. Inflorescence not surrounded by a conspicuous involucre.....**Dendrophthoe**
6. Corolla gamopetalous, zygomorphic.....**Scurulla**
6. Corolla polypetalous, actinomorphic.....**Helixanthera**

DENDROPTHOE C. F. P. Martius

Flora 13: 109. 1830.

Aerial parasites, often forming large shrubs with haustoria bearing surface - runners, pubescent or glabrous. Branches terete, but often somewhat flattened terminally. Leaves alternate to sub-opposite. Petioles often flattened above, rounded below. Inflorescence racemose or sub-umbellate, sometimes pubescent. Individual flowers, with single bract. Corolla 5-merous, gamopetalous, often zygomorphic by the presence of a long split; lobes spreading or reflexing at constriction. Anthers basifixed, 4-loculate. Style not articulated. Fruit a berry.

A genus of perhaps 30-35 species centered in the South East Asia, Australia, India, and Africa. Four species occur in Kerala.

Key to the Species

- 1. Branchlets trigonous **D. trigona**
- 1. Branchlets terete.....**2**
- 2. Flowers distributed evenly on the peduncle **D. falcata**
- 2. Flowers crowded on the top of the peduncle**3**
- 3. Crowded flowers on the top of the peduncle forming a superficial umbel
.....**D. neilgherrensis**
- 3. Crowded flowers on the top of the peduncle forming a cyme **D. memecylifolia**

Dendrophthoe falcata (L.f.) Etting., Denkschr. Kaiserl. Akad. Wiss. Wien. Math.-Naturwiss. Kl. 32: 52, 53, 58, t. 13, f. 14. 1872; Manilal & Sivar., Fl. Calicut 252. 1982; Wiens in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 6: 134. 1987; Manilal, Fl. Silent Valley 239. 1988; Ramachandran & Nair, Fl. Cannanore 399. 1988; Vajravelu, Fl. Palghat 409. 1990; Mohanan & Henry, Fl. Thiruvananthapuram 399. 1994; Sasi. & Sivar., Flow. Pl. Thrissur For. 385. 1996; Sivar. & P. Mathew, Fl. Nilambur 591. 1997. *Loranthus falcatus* L.f., Suppl. Pl. 211. 1782. *L. longiflorus* Desr. in Lamk., Encyl. 3: 598. 1792; Hook.f. Fl. Brit. India 5: 214. 1886; Gamble, Fl. Pres. Madras 1253. 1925. *L. longiflorus* Desr. var. *falcata* (L.f.) Kurz, For. Fl. Burma 2: 321. 1877; Hook.f., Fl. Brit. India 5: 215. 1886; Gamble, Fl. Pres. Madras 1253. 1925. *L. longiflorus* Desr. var. *amplexifolia* (DC.) Thw., Enum. Pl. 134. 1859; Hook. f., Fl. Brit. India 5: 215. 1886; Gamble, Fl. Pres. Madras 1253. 1925.

Stem woody, terete. Leaves subopposite, ovate-oblong, highly variable. Inflorescence axillary and lateral curved racemes, many-flowered. Calyx cupular with lobes small or minute, glabrous or pubescent. Corolla tube at anthesis pink or greenish yellow. Stamens with filaments red or green.

Key to the varieties

1. Corolla pink; peduncle, bracts and calyx glabrous var. **falcata**
1. Corolla greenish-yellow; bracts and calyx pubescent..... var. **pubescens**

Dendrophthe falcata (L.f.) Etting var. **falcata**

Aerial parasites, with thick haustoriferous runners; branches greyish-brown, glabrous. Leaves amplexicaule, subopposite, to 20 x 8 cm, ovate-oblong, highly variable, obtuse at both ends, glabrous; petiole short, 2-5 mm long or 0. Inflorescence axillary, solitary, stout, curved, puberulent or not, to 7 cm long; peduncle up to 4 cm long, thick, to 50 flowers; pedicels to 3 mm long; bracts 1 mm long, broadly rounded. Mature floral bud white to pink or bright red, up to the neck and with a dark green band just below which, clavate portion bright green. Calyx lobes rudimentary or very minute. Corolla tube at anthesis 50 mm long, bright red or rose, split to 13 mm deep; lobes to 9 x 1 mm, white to red; margin green, sublinear, acute. Filaments bright red, erect, free portion 4 mm long; anthers 5 mm long, linear-oblong, yellow. Style to 60 mm long, light reddish-brown, exceeding corolla lobes; stigma dark reddish-brown, slightly larger than style. Fruits to 17 x 6 mm, oblong, bright pink.

Chrom. No.: n = 9 (Kumar & Abraham, 1942; Barlow, 1966).

Fl. & Fr.: Throughout the year.

Distr.: India and Sri Lanka.

Occurrence & Specimens examined: **Thiruvananthapuram Dist.:** Braemore, *AESK* 7213; Trivandrum city, *AESK* 7267; Bonaccord, *AESK* 7226, 8451, 37664, 37665; Agastyamala, *AESK* 7226; *Ibid.*, *N.Mohanan & Shaju* 2039; Chathankode, *AESK* 7215; Anad, *AESK* 2330; Bharathannoor, *AESK* 2972; Attayar, *N.Mohanan* 10563; Kappukadu, *N.Mohanan* 13714; Vithura, *J.Joseph* 46553 (MH). **Kollam Dist.:** Elavupalam, *AESK* 15611; Kodumon, *C.N. Mohanan* 63500 (CAL, MH). **Pathanamthitta Dist.:** *Dan* 5014, 5999.

Idukki Dist.: Gerssopa falls, *Meebold 10298* (CAL); Kotagiri, *Fischer 2097* (CAL); Dhanas valley, *Bhargavan 90957* (MH). **Kottayam Dist.:** Nalukodu, *Antony 312* (CAL, MH). **Ernakulam Dist.:** Pooyamkutty, *AESK 18363*. **Thrissur Dist.:** Wadakkanchery, *Ramamurthy 48435* (CAL, MH); Peechi, *Ramamurthy & Rajan 66228* (CAL, MH). **Palakkad Dist.:** Mully, *AESK 25464*; Mannarkad, *AESK 25449*; Nelliampathy, *Radhakrishnan 28127*; Mangala Dam, *Vajravelu 46143* (MH); Anamooly, *Bhargavan 65766* (CAL, MH). **Wayanad Dist.:** Brahmagiri, *Balakrishnan 41872* (CALI); Adivaram, *AESK 23301*; Manathavady, *AESK 22351*; Thirunelly, *AESK 17311*; Begur R.F., *Ramachandran 53848* (MH); Tholpetty, *Ramachandran 52273* (MH). **Kannur Dist.:** Palchuram, *AESK 23316, 23317*; Chala, *AESK 13082*; Cheruvathoor, *Ansari 70998* (CAL, MH). **Kasaragod Dist.:** Poovadukkam, *AESK 13094*.

Host Plants: *Abrus precatorius* L., *Acacia caesia* Willd., *A. ferruginea* DC., *A. latronum* DC., *A. leucophloea* Willd., *A. pennata* Willd., *A. tomentosa* Willd., *A. torta* Craib, *Adina cordifolia* Hook.f., *Albizia amara* Boiv., *A. lebbeck* Benth., *A. odoratissima* Benth., *A. procera* Benth., *Annona squamosa* L., *Anogeissus latifolia* Wall., *Aporusa lindleyana* Baill., *Artocarpus integrifolius* L.f., *Atalantia missionis* Oliv., *Azadirachta indica* A. Juss., *Barringtonia acutangula* Gaertn., *Bassia longifolia* L., *Bauhinia malabarica* DC., *B. racemosa* Lam., *Bombax malabarica* DC., *Buchanania angustifolia* Roxb., *B. lanzan* Spreng., *Butea frondosa* Koen., *Careya arborea* Roxb., *Carissa carandas* L., *C. hirsuta* Roth., *Casearia esculenta* Roxb., *Cassia montana* Heyne, *C. siamea* Lam., *Casuarina equisetifolia* Forst., *Citrus acidum* L., *Combretum ovalifolium* Roxb., *Commiphora caudata* Engl., *C. beryi* Engl., *C. pubescens* Engl., *Cordia evolutior* Gamb., *Dalbergia*

latifolia Roxb., *D. paniculata* Roxb., *Derris scandens* Benth., *Desmodium rufescens* DC.,
Dichrostachys cineria Wight & Arn., *Dolichandrone crispa* Seem., *D. falcata* Seem.,
Enterolobium saman Benth., *Ehretia laevis* Roxb., *Feronia elephantum* Corr., *Ficus*
gibbosa Bl. var. *parasitica* (Willd.) King, *F. hispida* L.f., *F. retusa* L., *F. talboltii* King.,
F. tsiela Roxb., *Flacourtia ramontchi* L'Her., *F. sepiaria* Roxb., *Fluggea leupyrus* Willd.,
Gmelina asiatica L., *Grevillia robusta* R. Br., *Grewia tiliaefolia* Vahl, *Glycosmis*
cochinchinensis Pierre, *Gymnosporia montana* Roxb., *Gyrocarpus americana* Jacq.,
Hardwickia binata Roxb., *Helicteres isora* L., *Hemicyclea sepiaria* Wight & Arn.,
Hugonia mystax L., *Ixora parviflora* Vahl, *Jatropha curcas* L., *Lagerstroemia lanceolata*
Wall., *Lansium* sp., *Lepisanthes tetraphylla* Radlk., *Limonia alata* Wight & Arn., *Limonia*
crenulata Roxb., *Lumnitzera racemosa* Willd., *Maba buxifolia* Pers., *Maesa indica* Wight,
Mallotus philippinensis Muell.-Arg., *Mangifera indica* L., *Memecylon umbellatum* Brum.,
Mimusops hexandra Roxb., *Morinda tinctoria* Roxb., *Myragyna parviflora* Korth.,
Ochna beddomei Gamb., *Pithecellobium dulce* Benth., *Plectronia parviflora* Vahl,
Pongamia glabra Vent., *Prosopis spicigera* L., *Pterocarpus santalinus* L.f.,
Pterospermum heyneanum Wall., *Randia dumetorum* L., *Rhizophora* sp., *Rhodomyrtus*
tomentosa Wight, *Sapindus laurifolius* Vahl, *Shorea talura* Roxb., *Stereospermum*
chelonoides DC., *Strychnos potatorum* L.f., *Syzygium alternifolium* Walp., *S.arnottianum*
Walp., *Syzygium jambolanum* DC., *Syzygium wightianum* Wall., *Tamarindus indica* L.,
Tectona grandis L., *Terminalia bellirica* Roxb., *T. chebula* Retz., *T. pallida* Brand., *T.*
paniculata Roth, *Thespesia populnea* Cav., *Vitex altissima* L.f., *Wrightia tinctoria* Br., *W.*
tomentosa Roem. & Schult., *Zizyphus oenoplea* Mill., *Z. xylopyrus* Willd.

Dendrophthoe falcata (L.f.) Etting. var. **pubescens** (Hook.f.) Chandras. in Henry *et al.*,
Fl. Tamil Nadu I, 2: 215. 1987. *Loranthus longiflorus* Desv. var. *pubescens* Hook.f.,
Fl. Brit. India 5: 215. 1886; Gamble, Fl. Pres. Madras 1253. 1925.

Aerial parasites with well developed haustoriferous surface runners; branches greyish-brown. Leaves sub-opposite, to 15 x 5 cm, ovate-lanceolate, acute at base, obtuse at apex, glabrous above and pubescent on the main nerves beneath; nerves red; petiole to 5 mm long. Inflorescence an axillary, long, solitary raceme, pubescent; peduncle to 7 cm long, pubescent. Bracts 0.5 mm, obliquely cupular, obtuse at apex. Mature floral buds yellowish-white, the clavate portion green. Calyx cupular, lobes 5, pubescent. Corolla tube at anthesis creamy-yellow, strongly pubescent, splitting to 15 mm from the base; lobes 7 mm long, dark green, oblong, acute, pubescent. Filaments green, hairy; free portion 3 mm long; anthers 2 mm long, brownish-red. Style 25 mm long, filiform, green; stigma slightly longer than style, red. Fruit 10 x 5 mm, oblong, crowned by calyx lobes, strongly pubescent.

Chrom. No.: n = 9 (Soman & Ramachandran, 1987)

Fl. & Fr.: Jan. – Mar.

Distr.: India; endemic.

Occurrence & Specimens examined: **Thiruvananthapuram Dist.:** TBGRI Campus, AESK 5464, 5471, 7279, 13290, 23332; Palode, AESK 5472, 7496; Peringamala, AESK 7201, 19942; Kurisady, AESK 7210; Bonaccord AESK 7217. **Kollam Dist.:** Puthukkadu, AESK 15682. **Thrissur Dist.:** Wadakkanchery, Ramamurthy 48435 (MH). **Palakkad**

Dist.: Mannarkadu, *AESK 25450*; Bhavany Bank, *Vajravelu 27588* (MH); Mukkali, *Vajravelu 44884* (MH); Olipara, *Vajravelu 45772* (MH). **Waynad Dist.:** Brahmagiri, *AESK 42179*; Thirunelly, *AESK 1103*; *Ibid.*, *Ramachandran 62115* (MH). **Kannur Dist.:** Chala, *AESK 13082*; Sultan Batheri, *Ellis 18674* (MH).

Host Plants: *Albizzia lebbbeck* Benth., *A. odoratissima* Benth., *Careya arborea* Roxb., *Dalbergia latifolia* Roxb., *D. paniculata* Roxb., *D. sissoo* Roxb., *Eriolaena quinquelocularis* Wight, *Ficus hispida* L.f., *Helicteres isora* L., *Schleichera trijuga* Willd., *Scleropyrum wallichianum* Arn., *Tectona grandis* L.f., *Terminalia paniculata* Roth.

Dendrophthoe memecylifolia (Wight & Arn.) Danser, Bull. Jard. Bot. Buitenz. Ser. 3, 10: 310. 1929; Mohanan & Henry, Fl. Thiruvananthapuram 399. 1994. *Loranthus memecylifolia* Wight & Arn., Prodr. 383. 1834; Hook.f., Fl. Brit. India 5: 217. 1886; Gamble, Fl. Pres. Madras 1254. 1925.

Plants often with haustoria bearing surface runners; branches woody, terete. Leaves opposite, 4-5 x 2-3 cm, ovate-oblong, attenuate at base, rounded at apex; 3-nerved from the base; petiole very short. Inflorescence axillary, few-flowered, crowded cymes; peduncle 10 mm long; pedicels 2 mm long; bracts to 1 mm, obliquely cupulate, close to the ovary. Mature floral buds 11-20 mm long, 3 mm wide at middle, dull white at base, green above, 5-angled; lobes green, tube split to 12 mm from apex. Calyx cup-shaped, irregularly and bluntly 5-toothed. Corolla 5-lobed, one of the fissures considerably deeper than the others; lobes 10 mm long, linear-lanceolate, erect, green. Filaments dark red, free

portion from the lobes 10 mm long; anthers 2 mm long, yellowish, linear. Style to 22 mm long, terete, reddish; stigma capitate. Fruits not seen.

Fl.: Jan. – May

Distr.: Nilgiri hills, Kerala.

Occurrence & Specimens examined: **Thiruvananthapuram Dist.**: Chemunji, AESK 25447; *Ibid.*, N. Mohanan 11052. **Idukki Dist.**: Anamalai, Fischer 3417 (CAL).

Host Plants: *Rhamnus wightii* Wight & Arn., *Vaccinium leschenaultii* Wight, *Rhodomyrtus nilagiricum* Zenk., *Rapanea wightiana* Mez., *Daphniphyllum glaucescens* Bl., *Glochidion zeylanicum* (Gaertn.) A. Juss.

Dendrophthoe neelgherrensis (Wight & Arn.) Tieghem, Bull. Soc. Bot. France 42: 252. 1895. *Loranthus neelgherrensis* Wight & Arn., Prodr. 382. 1834; Wight, Ic. t. 1020. 1845; Hook. f., Fl. Brit. India 5: 216. 1886; Gamble, Fl. Pres. Madras 1254. 1925; Wiens in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 6: 130. 1987.

Plants with well developed haustoria bearing surface runners, older plants sometimes covering large portions of the host; branches usually greyish, terete, sometimes terminal, branching in whorls of 3-5. Leaves opposite, to 15 x 8 cm, ovate-lanceolate to elliptical, attenuate at base, acute at apex; venation inconspicuous except for the purplish midrib; subsessile or shortly petioled. Inflorescence fascicled on nodes; flowers crowded on the apex of peduncle forming an umbel, to 10 mm long; pedicels 2 mm long; bracts

acute, 2 mm long. Mature floral buds 22 mm long, either dark red or dull white on basal half and greenish on the upper half; lobes first separating slightly at the constriction, thereafter explosively reflexing upon contact and scattering pollen. Calyx to 3 mm long, urceolate with minute teeth. Corolla tube at anthesis 15 mm long, dark red or dull white, straight, split up to 12 mm deep; lobes to 8 x 1 mm, dark red or greenish-white, linear, reflexed and twisted with age. Filaments greenish-yellow, free portion above the lobes 5 mm long; anthers to 3 mm long, whitish-yellow, oblong, acute, exceeding corolla lobes. Style pale yellow, minutely angled; stigma capitate, reddish-orange. Fruits to 10 mm long, oblong, green.

Chrom. No.: n = 9 (Bir *et al.*, 1982)

Fl. & Fr.: Apr.-July

Distr.: India (Nilgiri, Kerala), and Sri Lanka.

Occurrence & Specimens examined: **Idukki Dist.:** Kanthalloor, *AESK 37619*; Munnar, *AESK 37604*; Santhanpara, *Meebold 13166, 13225 (CAL.)*; *Ibid.*, *Sebastine 18370 (MH)*; Vandanmedu, *Bourdillon 510 (CAL.)*; Udumbancholai, *Barber 57673 (CAL.)*; Peerumedu, *Saulier 369 (CAL.)*. **Palakkad Dist.:** Anavai Tribal colony, *N.C.Nair 56815 (MH)*.

Host Plants: *Berberis tinctoria* Lesch., *Mahonia leschnaultii* (Wight & Arn.) Takeda ex Gamble, *Citrus medica* L., *Ilex wightiana* Wall., *Ilex denticulata* Wall., *Turpinia nepalensis* Wall., *Cassia laevigata* Willd., *Prunus persica* Stokes, *Acacia melanoxylon* R. Br., *A. decurrens* Willd., *Terminalia chebula* Retz., *Rhodomyrtus tomentosa* Wight, *Eucalyptus globulus* Labill, *Vaccinium leschenaultii* Wt., *Viburnum erubescens* Wall., *V.*

coriaceum Bl., *Oldenlandia stylosa* O. Kze, *Rhododendron nilgircum* Zenk., *Ligustrum roxburghii* Cl. , *Strobilanthes foliosus* T. And., *Litsea wightiana* Benth. & Hook., *Daphniphyllum glaucescens* Bl., *Debregeasia velutina* Gaud., *Mangifera indica* L., *Citrus medica* L., *Osbeckia reticulata* Bedd.

Dendrophthoe trigona (Wight & Arn.) Danser ex Sant., Rec. Bot. Surv. India 16(1): 163. 1953; Manilal, Fl. Silent Valley 239. 1988; Sivaraj & P. Mathew, Fl. Nilambur 592. 1997. *Loranthus trigonus* Wight & Arn., Prodr. 386. 1834; Hook. f., Fl. Brit. India 5: 219. 1886; Gamble, Fl. Pres. Madras 1253. 1925.

Aerial parasites, with very thick haustoriferous surface runners, often covering a large portion of the host; branchlets very robust, glabrous; young shoots triangular. Leaves opposite or ternately whorled, 9-15 x 6-10 cm, broadly elliptic, cuneate at base, obtuse at apex, thickly coriaceous, penninerved; petiole to 2.5 cm long. Inflorescence axillary, crowded racemes; peduncle to 14 mm long; pedicels very short, 1 mm long; bracts a shallow oblique cup, 2 mm across. Mature floral buds to 17 mm long; base orange-red, neck green and clavate portion red. Calyx cupular, to 3.5 mm long, truncate. Corolla at anthesis 17 mm long, orange in colour, splitting to 5 mm above the base; lobes 8 mm long, lanceolate, yellow. Style to 17 mm long, green, filiform; stigma capitate, thick. Fruit to 12 x 5 mm, ellipsoid, crowned by the calyx cup.

Chrom. No.: n = 9 (Soman & Ramachandran, 1987)

Fl. & Fr.: Nov.-Jan.

Distr.: Southern Western Ghats.

Occurrence & Specimens examined: **Thiruvananthapuram Dist.:** Ponmudi, *AESK* 7233, 22394; Bonaccord, *AESK* 37657; **Kollam Dist.:** Quilon, *Lawson* 101 (MH); Cheenikala, *AESK* 8851. **Pathanamthitta Dist.:** Kottampara, *AESK* 15614. **Idukkii Dist.:** Painavu, *Raju* 71204 (CAL, MH); Thekkady, *Vivekananthan* 45672 (MH). **Ernakulam Dist.:** Pooyamkutty, *AESK* 23419. **Palakkad Dist.:** Chittar, *Vajravelu* 60675 (MH). **Wayanad Dist.:** Kuruva Islands, *AESK* 22361; Thirunelly, *AESK* 11030, 23325, 42180. "Travancore", *Barber* 6191 (MH).

Host Plants: *Dalbergia latifolia* Wight, *Eriodendron pentandrum* Kurz, *Ficus benghalensis* L., *F. heterophyllus* L.f., *Mesua ferrea* L., *Scleropyrum wallichianum* Arn., *Syzygium* sp., *Vateria indica* L.

HELICANTHES Danser

Verh. Kon. Ned. Akad. Wetensch., Afd. Tweede Sect. 29(6): 55. 1933.

Aerial parasites, often covering a large portion of the host plants, glabrous; branchlets woody, dichotomous. Leaves decussate, 3-nerved from the base. Flowers in short axillary fascicles. Corolla lobes 5, spirally twisted. Stamens 5; anthers narrowly oblong. Stigma obovoid. Fruits globose, red when ripe.

An endemic genus of India, with one species.

Helicanthes elastica (Desr.) Danser, Verh. Kon. Ned. Akad. Wetensch., Afd. Tweede Sect. 29(6): 55. 1933. Manilal & Sivar., Fl. Calicut 253. 1982; Manilal, Fl. Silent Valley 239. 1988; Vajravelu, Fl. Palghat 410. 1990; Sasi. & Sivar., Flow. Pl. Thrissur For. 385. 1996. *Loranthus elasticus* Desr. in Lamk., Ency. 3: 599. 1792; Wight, Ic. t. 343. 1840; Hook.f., Fl. Brit. India 5: 216. 1886; Gamble, Fl. Pres. Madras 1254. 1925. (Plate VIII-A).

Large shrubs with well developed, dichotomously branched haustoria bearing surface runners, usually covering a large portion of host; branchlets woody, terete, dichotomous, green; nodes swollen. Leaves decussate, 5-12 x 2.5-6.5 cm, obovate-lanceolate to elliptic, variable, coriaceous, acute-cuneate at base, acute-acuminate at apex, 3-5-nerved from base, shortly-petioled. Flowers in axillary fascicles. Mature floral buds 4 cm long, acute, basal portion white; bracts 0.6 mm, ovate-obtuse. Calyx very small, truncate. Corolla tube 4 cm long, splitting to 2.5 cm from apex; lobes 5, to 25 mm long, linear-lanceolate, spirally twisted, acute at apex. Stamens 5; filaments reddish brown, to 15 mm long; anthers linear-lanceolate, to 6 mm long. Ovary 4 mm long, red; style filiform, 40 mm long; stigma obovoid, deep red. Fruits ovoid-elliptic, surrounded by a small beak, red.

Chrom. No.: n = 9 (Bir *et al.*, 1982)

Fl. & Fr.: Sep.-Dec.- Apr.

Distr.: Deccan Peninsula. Throughout Kerala.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Ponmudi, *AESK* 19133, 7391; Peroorkada, *AESK* 13216; Palode, *AESK* 7268; *Ibid.*, *M. Mohanan* 52605 (MH, CAL); Koviltherimala, *Dan* 9213. **Pathanmthitta Dist.:** Pathanamthitta, *Dan* 5988; Kokkathodu, *AESK* 13059. **Idukki Dist.:** Vallakkadavu, *Sharma* 43820 (MH). **Alappuzha Dist.:** Vandanam, *AESK* 11043; Cherthala, *AESK* 25451. **Ernakulam Dist.:** Edamalayar, *AESK* 18340; Cochin, *Meebold* 12542 (CAL). **Thrissur Dist.:** Thriprayar, *Ramamurthy* 48410 (MH, CAL). **Palakkad Dist.:** Silent Valley, *AESK & Binoy* 5272; Mannarkadu, *AESK* 25453; *Ibid.*, *Vajravelu* 59117 (MH, CAL); Mukkali, *Bhargavan* 65731 (MH, CAL). **Wayanad Dist.:** Kuruva islands, *AESK* 23323; Tadagam, *Fischer* 2852 (CAL); **Kannur Dist.:** Kalliassery, *Ansari* 64987 (MH, CAL). ‘**Malabar**’, *Fischer* 2523 (CAL). “**Travancore**”, *Barber* 6714 (MH).

Host Plants: *Actinodaphne hookeri* Meissn., *Anacardium occidentale* L., *Annona muricata* L., *Antidesma menasu* Miq., *Aporosa lindleyana* Baill., *Artocarpus integrifolia* L., *Bassia latifolia* Roxb., *Calotropis gigantea* Br., *Citrus* sp., *Erythroxylon monogynum* Roxb., *Euphorbia antiquarum* L., *E. torilis* L., *Ficus benghalensis* L., *Hevea braziliensis* L., *Hydnocarpus wightiana* Bl., *Lantana* sp., *L. camera* L., *Magifera indica* L., *Memecylon edule* Roxb., *Myristica fragrans* Houtt., *Punica granatum* L., *Saraca asoka* (Roxb.) de Wilde, *Tectona grandis* L.f., *Tetrameles nudiflora* R.Br., *Thespesia populnea* Cav., *Vateria indica* L.

HELIXANTHERA Loureiro

Fl. Cochinch. 142. 1790.

Aerial parasites, with haustoria bearing surface runners. Leaves opposite to subopposite or alternate. Inflorescence racemose or spicate. Individual flowers subtended by minute separate bracts. Flowers bisexual. Corolla 4-7-merous, actinomorphic. Anthers basifixed. Style filiform. Stigma capitate. Fruit ovate or elliptical.

A genus of about 25 species occurring throughout the South East Asia and Africa.

Key to the species

1. Flowers in spikes, on excavations in a thickened rachis; spikes 2.5-5.0 cm long.
..... **H. hookeriana**
1. Flowers in racemes, solitary or fascicled on the nodes of old branchlets.....**2**
2. Branchlets, leaves and inflorescence ferruginously pubescent..... **H. obtusata**
2. Branchlets, leaves and inflorescence glabrous **3**
3. Flowers in bud less than ca. 0.6 cm long, straight, terete, in slender racemes of 2.5-7.5 cm long. **H. wallichianus**
3. Flowers in bud more than ca. 1.2 cm long, straight or curved, angular, in rather stout often solitary racemes up to 1.0 cm long. **H. intermedius**

Helixanthera hookeriana (Wight & Arn.) Danser, Bull. Jard. Bot. Buitenz. Ser.3, 10: 310. 1929; Wiens in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 6: 148. 1987. *Loranthus*

hookerianus Wight & Arn., Prodr. 381. 1834; Hook.f., Fl. Brit. India 5: 207. 1886; Gamble, Fl. Pres. Madras 1251. 1925.

Aerial parasites often forming densely branched shrubs, with very feeble haustoria bearing surface runners; branches greyish brown, rounded or slightly angled terminally, lenticellate; young internodes rusty tomentose. Leaves subopposite, to 12 x 8 cm long, ovate-elliptic, acute-obtuse at base, obtuse-acute at apex, rusty-tomentose when young, glabrous at maturity. Inflorescence an elongated, lateral, axillary spike with numerous flowers, rusty-tomentose when young; bracts 3 mm long, adnate to individual flowers. Mature floral buds rusty-red, straight, sub-clavate, somewhat keeled towards the base. Corolla at anthesis dark-red; petals connivent to half of their length, then spreading; lobes 5-8 mm long, dark red. Filaments rusty-red, free and erect above the lobes, free portion 4 mm long; anthers 4 mm long, oblong, dark red, filiform, up to 20 mm long, curved, persistent after anthesis; stigma dark red, capitate, exserted above the petals. Fruits 5 mm across, brownish-purple, orbicular.

Chrom. No.: n = 9 (Soman & Ramachandran, 1987)

Fl. & Fr.: Mar.–Jun.

Distr.: India and Sri Lanka. In Kerala it is seen at higher elevations of Wayanad and Idukki districts only.

Occurrence & Specimens examined: **Idukki Dist.:** Kundali, Aesk 7584, 7587; Guderale, Aesk 7586; Chinnar, Aesk 37621; Neymakadu, Aesk 7568; Mattupetty, Aesk 7585;

Wayanad Dist.: Mananthavady, Aesk 22348, 22349; *Ibid.*, Mathew 2735.

Host Plants: *Amoora rohituka* Wight & Arn., *Aporusa lindleyana* Baill., *Elaeocarpus tuberculatus* Roxb., *Garcinia indica* Chois., *Grewia tiliaefolia* Vahl, *Mallotus philippinensis* Muell.-Arg., *Mangifera indica* L., *Melia dubia* Chois., *Nageia wallichiana* (Presl.) Kuntze, *Swietenia mahagony* L., *Wendlandia notoniana* Wall.

Helixanthera intermedia (Wight) Danser, Bull. Jard. Bot. Buitenz. Ser. 3, 10: 310. 1929; Ramachandran & Nair, Fl. Cannanore 400. 1988; Sivar. & P. Mathew, Fl. Nilambur 593.1997; Vajravelu, Fl. Palghat 410. 1990; Mohanan & Henry, Fl. Thiruvananthapuram 392. 1994. *Loranthus intermedius* Wight, Calcutta J. Nat. Hist. 6: 361. 1846; Hook.f., Fl. Brit. India 5: 205. 1886; Gamble, Fl. Pres. Madras 1251. 1925.

Aerial parasites, often forming densely branched shrubs, apparently with many thin haustoriferous surface runners; branches whitish brown, terete or very slightly angled, terminally lenticellate, young internodes rusty-tomentose. Leaves subopposite, ovate-elliptic, to 8 x 6 cm, acute at base, obtuse or shortly acute at apex, glabrous at maturity; petiole to 1.5 cm long. Inflorescence an elongated axillary, solitary or fascicled racemes with many flowers, glabrous; bracts subtending to individual flowers, minute, 0.5 mm long, ovate, acute. Mature floral buds straight to, 13 mm long, the clavate portion 4 mm long, angular. Corolla at anthesis green with a flesh-coloured base; lobes green, 4 mm long, ovate-elliptic, acute. Filaments blackish-red, free portion 2 mm long; anthers red, 2 mm long. Style to 13 mm long, filiform; stigma capitate, red. Fruits elliptic-oblong, to 8 x 6 mm, smooth.

Chrom. No.: n = 9 (Soman & Ramachandran, 1987)

Fl. & Fr.: Feb. – Nov.

Distr.: India; endemic.

Occurrence & Specimens examined: **Thiruvananthapuram Dist.:** Bonaccord, *AESK* 8849, 13201; Ponmudi, *AESK* 27903, 27908; *Ibid.*, M. Mohanan 69222 (CAL); Palode, *AESK* 5469, 8848; Chemunji, *Bourdillon s.n.*; *Ibid.*, Blatter & Hallberg *s.n.* (CAL); Karamanayar, N. Mohanan 10025. **Kollam Dist.:** Kottavasal, *AESK* 13213; Achancovil, C.N. Mohanan 63090 (CAL). **Idukki Dist.:** Kanthalloor, *AESK* 37622; Walara, *AESK* 7476. **Palakkad Dist.:** Seethargund, *AESK* 15774. **Wayanad Dist.:** Mananthavady, *AESK* 11032. **Kasaragod Dist.:** Poovadukkam, *AESK* 13095.

Host Plants: *Ailanthus excelsa* Roxb., *Bischofia javanica* Bl. *Cinnamomum wightii* Meissn., *Cinnamomum zeylanicum* Breyn., *Citrus medica* L., *Diospyros ebenum* Koen., *Helicteres isora* L., *Knema attenuata* Warb., *Lanea coromandelica* (Houtt.) Merr., *Machilus macrantha* Nees, *Myristica malabarica* Lam., *Strychnos nux-vomica* L.

Helixanthera obtusata (Schult.) Danser, Bull. Jard. Bot. Buitenz. Ser. 3, 10: 317. 1929; Manilal, Fl. Silent Valley 240. 1988. *Loranthus obtusatus* Schultes in Roem. & Schult., Syst. 7: 1650. 183; Hook.f., Fl. Brit. India 5: 205. 1886; Gamble, Fl. Pres. Madras 1251. 1925.

Aerial parasites, often forming densely-branched shrubs, with haustoriferous surface runners; branches greyish-brown, rough, terete or slightly angled at apex,

lenticellate, young internodes softly fulvous-tomentose, glabrous on aging . Leaves subopposite, 4.5-10 x 2.5-8 cm, ovate or broadly ovate-elliptic, attenuate at base, obtuse or rarely notched at apex, glabrescent; petiole to 2 cm long. Inflorescence an elongated raceme, lateral, to 11 cm long, up to 20 flowers, fulvous-tomentose when young; bracts 1 mm long, sub-ovate, minutely trilobed. Mature floral buds to 28 mm long, with crimson base at green apex, subclavate, keeled towards the base. Calyx 0.5 mm long, minutely 4-lobed. Corolla at anthesis greenish-red, connivent about 1/3 their length, then spreading; lobes 6x2.5 mm, spathulate, obtuse at apex, glabrous within. Filaments glabrous, free portion 5 mm long; anthers 1 mm long, oblong, dark red, introrse, surrounding the style. Style dark red, filiform, to 3 cm long, curved, persistent. Stigma red, subcapitate, exserted, 0.5 mm long. Fruits 5 mm long, elliptic-oblong, strongly rugulose.

Chrom. No.: n=9 (Soman & Ramachandran, 1987)

Fl. & Fr.: Jan. – Sep.

Distr.: India; endemic.

Occurrence & Specimens studied: **Idukki Dist.:** Munnar, *AESK 42142, 42139*; Mattupetty, *AESK 37611*; Idukki, *Bhargavan 87309* (MH). **Palakkad Dist.:** Nelliampathy, *AESK 15798*; Aruvanpara, *Sabu 10460* (CALI). **Wayanad Dist.:** Pakshipathalam, *AESK 17356*.

Host Plants: *Acacia melanoxylon* R. Br., *Anogeissus latifolia* Wall., *Bischofia javanica* Bl., *Elaeocarous tuberculatus* Roxb., *Litsea* sp., *Maesa perottettiana* DC., *Myristica*

beddomei King, *Olea dioica* Roxb., *Rapanea wightiana* Mez., *Rhododendron nilagiricum* Zenk., *Symplocos spicata* Roxb.

Helixanthera wallichiana (Schult.) Danser, Bull. Jard. Bot. Buitenz. Ser. 3, 10: 319. 1929; Manilal & Sivar., Fl. Calicut 252. 1982; Manilal, Fl. Silent Valley 240. 1988; Ramachandran & Nair, Fl. Cannanore 400. 1988; Vajravelu, Fl. Palghat 410. 1990; Mohanan & Henry, Fl. Thiruvananthapuram 400. 1994; Sasi. & Sivar., Flow. Pl. Thrissur For. 386. 1996; Sivar. & P. Mathew, Fl. Nilambur 593. 1997. *Loranthus wallichianus* Schult., Syst. 7:100.1829; Hook.f., Fl. Brit. India 5: 205. 1886; Wight, Ic. t. 143. 1846.

Aerial parasites, without haustoria bearing surface runners; branches pale brown, lenticellate, terete. Leaves subopposite, 7-10 x 3.5-6 cm, ovate-elliptic, acute at base, obtuse at apex, coriaceous, nerves slender; petiole to 10 mm long. Inflorescence racemes, fascicled on the nodes, shorter than leaves; pedicels linear, 3 mm long; bracts lateral, 0.5 mm long, cucullate. Mature floral buds terete, subclavate, red, 4 mm long. Calyx green, very small. Corolla at anthesis dark red, splitting towards the base; lobes red, linear-cuneate. Filaments small; anthers brownish. Style filiform, 4 mm long; stigma capitate, red. Fruits greenish-pink, globose, 3 mm wide, warty.

Chrom. No.: n = 9 (Soman & Ramachandran, 1987)

Fl. & Fr.: Mar.-Oct.

Distr.: India; endemic. Throughout Kerala.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Palode, *AESK* 5470,7272, 7277; *Ibid.*, *Dan* 7316, 22612; Bonaccord, *AESK* 13204; *Ibid.*, *N.Mohanan* 11416; Ponmudi, *M. Mohanan* 69257 (CAL, MH). Kappukadu *N. Mohanan* 10678; Kottur, *J. Joseph* 41991(MH). **Kollam Dist.:** Cheenikala, *AESK* 7510; Kottavasal, *AESK* 13297; Palaruvi, *AESK* 7357; Kulathupuzha, *Dan* 4095. **Idukki Dist.:** Adimaly, *AESK* 7528, 29800; Walara, *AESK* 7477; Meenmutty, *Pandurangan* 76688 (CAL, MH); Painavu, *C.N. Mohanan* 74013 (CAL, MH); Kulamavu, *C.N.Mohanan* 74124 (CAL); Kattappana, *Pandurangan* 79209 (CAL, MH); Marakkanam, *Vivekananthan* 49700 (CAL); Thekkady, *Sharma* 42809 (MH). **Pathanamthitta Dist.:** Kottampara, *AESK* 15624; Vellachimala, *Kiran Raj* 38513; Thriveni, *Raveendran* 1924; Attathodu, *Vajravelu* 80624 (CAL, MH). **Thrissur Dist.:** Vazhachal, *Pandurangan* 30684; Parambikkulam, *Vajravelu* 49365 (MH). **Palakkad Dist.:** Nelliampathy, *AESK* 15670, 15758; Silent valley, *Dan* 5273; Parambikulam, *Meebold* 12419 (CAL); *Ibid.*, *Ramamurthy* 49635 (CAL); Thathamangalam, *Vajravelu* 49793 (CAL); Poochappara, *V.J.Nair* 67424 (CAL, MH); Panthenthodu, *N.C.Nair* 56638 (CAL, MH); Mukkali, *Vajravelu* 32164 (MH). **Malappuram Dist.:** Eramekkara, *AESK* 5422. **Wayanad Dist.:** Chandanathodu, *Ramachandran* 61636 (CAL, MH); Thirunelly, *Balakrishnan* 40328 (CAL); Meppady, *Barber* 7401 (CAL); Chandanathodu, *Ellis* 25237 (MH). **Kannur Dist.:** Aralam, *Dan* 13212. **“Travancore State”:** Karippanthodu, *Rama Rao* 1511 (CAL); **“Travancore”,** *Rama Rao s.n.* (CAL).

Host Plants: *Amoora rohituka* Wight & Arn., *Antidesma menasu* Miq., *Bauhinia phoenicea* Heyne, *Bischofia javanica* Bl., *Cinnamomum wightii* Meissn., *Citrus*

aurantiaca L., *C. indica* L., *Diospyros ebenum* Koen., *Ficus asperima* Roxb., *Helicteres isora* L., *Knema attenuata* Warb., *Litsea travancorica* Gamb., *Mappia foetida* Miers, *Memecylon malabaricum* Cogn., *Myristica malabarica* Lam., *Salacia reticulata* Wight, *Strychnos nux-vomica* L.

MACROSOLEN (Blume) Blume

in J.A.Schultes & J.H.Schultes

in J.J.Roemer & J.A.Schultes, Syst. Veg. 7: 1731. 1830

Aerial parasites, often forming large shrubs, with or without haustoriferous surface runners; glabrous. Branchlets terete, rarely flattened or angled terminally. Nodes swollen 2-3 times the diameter of the internodes; petiole usually flattened or some times grooved above, rounded below. Leaves subopposite. Inflorescence racemose or spicate, rarely umbels. Individual flowers subtended by 1 bract and 2 bracteoles. Corolla 6-merous, gamopetalous, actinomorphic or sometimes zygomorphic by the presence of a single split. Corolla lobes reflexing at the constriction. Usually twisted with aging. Anther basifixed. Style generally articulated or obviously constricted at some point. Fruits orbicular-elliptical.

A genus of about 35-40 species distributed throughout the South Eastern Asia and India. Two species present in Kerala.

Key to the species

1. Peduncle at anthesis about 3-5 mm long, usually terete or quadrangular; mature corolla tube about 5 mm long, flesh-coloured at base, otherwise greenish-yellow **M. capitellatus**
1. Peduncles at anthesis about 7-9 mm long, usually flattened; mature corolla tube 15 mm long; uniformly bright pink to rose red **M. parasiticus**

Macrosolen capitellatus (Wight & Arn.) Danser, *Blumea* 3: 36. 1936; Wiens in Abeywick., *Fl. Ceylon* 1: 64. 1973; Manilal & Sivar., *Fl. Calicut* 252. 1982; Wiens in Dassan. & Fosb., *Rev. Handb. Fl. Ceylon* 6: 126. 1987; Vajravelu, *Fl. Palghat* 411. 1990; Sivar. & P. Mathew, *Fl. Nilambur* 594. 1997. *Loranthus capitellatus* Wight & Arn., *Prodr.* 382. 1834; Hook.f., *Fl. Brit. India* 5: 221. 1886. *Elytranthe capitellata* (Wight & Arn.) Engl., *Pflanzenf.* 3(1): 189. 1889; Gamble, *Fl. Pres. Madras* 879. 1925.

Plants without haustoriferous runners, base of the plant along with host tissue form a spherical mass which is easily detachable after the death of parasite, glabrous; branches greyish to white, terete or slightly angled apically, the internodes usually twisted to 90°. Leaves variable, 4.5-8 x 2-5 cm, ovate-elliptic, acute at base, acute-acuminate at apex, dark green above; petiole to 6 mm long. Inflorescence spicate, with a pair of opposite-decussate, apically crowded flowers; peduncle terete or somewhat quadrangular due to the presence of scars of the fallen flowers, to 3 mm long; bracts and bracteoles to 3 mm long, rounded to obtuse at apex, bracts coalescent at the base, bracteoles hooded. Mature flower

bud to 11 mm long, strongly constricted and dilated at the very base, greyish-white. Calyx cylindrical, truncate, to 4 x 2 mm. Corolla tube at anthesis 5 mm long, greenish-yellow within and without; lobes 6 mm long, reflexed, creamy-white, linear-lanceolate, acute. Filaments to 5 mm long, subfiliform, yellowish-green below; anthers yellow, free and crested above the lobes, linear-oblong. Style to 12 mm long, light green; stigma light yellow, globose, slightly 2-lobed, exserted, slightly longer than anthers. Fruits globose, 8 x 6 mm, glaucous when young, crowned by calyx.

Chrom. No.: n = 12 (Soman & Ramachandran, 1987)

Fl. & Fr.: May-Sept.

Distr.: Deccan Peninsula (South West India) and Sri Lanka.

Note: During the last five years this species has largely infested almost all Jack trees (*Artocarpus integrifolia* L.) in Kerala.

Occurrence & Specimens examined: **Thiruvananthapuram Dist.:** Chippanchira, *AESK* 22322; Chembikunnu, *AESK* 5443; Elavupalam, *AESK* 15612, 15642; Palode, *AESK* 5446; Chathankodu, *AESK* 7216; Merchinston estate, *M. Mohanan* 66642 (MH); Kottoor, *J. Joseph* 44018 (MH). **Kottayam Dist.:** Wagamon, *AESK* 13282. **Idukki Dist.:** Marayur, *AESK* 37623; Devikulam, *Meebold* 13365 (CAL). **Pathanamthitta Dist.:** Moozhiar, *AESK* 15728. **Palakkad Dist.:** Karivara, *Vajravelu* 49762 (CAL, MH); Naduvattom, *Meebold* 11763 (CAL). **Malappuram Dist.:** Kottakkal, *AESK* 23303. **Wayanad Dist.:** Mananthavady, *AESK* 23318, 22350; Kuruva islands, *AESK* 22363; Periya, *Bourne s.n.* (CAL). **Kannur Dist.:** Panothu, *Ramachandran* 66936 (CAL, MH); Chala, *AESK* 13083. Perumal slope, *Fischer* 1899 (CAL).

Host Plants: *Artocarpus integrifolia* L., *Buchanania lanzan* Spreng., *Calophyllum wightianum* Wall, *Ficus benjamina* L., *F. talbolti* King, *Mangifera indica* L.

Macrosolen parasiticus (L.) Danser, Bumea 2: 36. 1936; Wiens in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 6: 128. 1987; Manilal, Fl. Silent Valley 240. 1988; Ramachandran & Nair, Fl. Cannanore 401. 1988; Vajravelu, Fl. Palghat 411. 1990; Sasi. & Sivar., Flow. Pl. Thrissur For. 386. 1996; Sivar. & P. Mathew, Fl. Nilambur 594. 1997. *Lonicera parasitica* L., Sp. Pl. 175. 1753. *Loranthus loniceroides* L., Sp. Pl. ed. 2, 1: 473, 1762; Wight, Ic. t. 203. 1839; Hook.f., Fl. Brit. India 5: 221. 1886. *Elytranthe loniceroides* (L.) G. Don, Gen. Syst. 3: 427. 1834; Gamble, Fl. Pres. Madras 1255. 1925.

Plants with haustoriferous runners; branches studded with lenticular lenticels, glabrous, greyish-brown, terete or slightly angled; internodes usually twisted to 90°. Leaves 5-13 x 2.3-5 cm, ovate-lanceolate, dark green above; petiole 5-15 mm long. Inflorescence spicate, usually 3-4 pairs of decussate, apically crowded flowers; peduncle terete, to 1 cm long; bracts 2, rounded, keeled, to 1.75 mm long. Mature flower bud to 6 cm long, bright red, curved at base. Calyx truncate and minutely laciniate at apex. Corolla tube 2.5-4.5 cm long, bright pink; lobes to 1.5 cm long, linear-oblongate, green and pink, reflexed, acute at apex, twisting with age. Filaments green, to 10 mm long, thick, flattened, free from the lobes; anthers to 2 mm long, yellow, oblong-linear. Style to 6 cm long, green, minutely angled, constricted below the stigma; stigma bright red, globose,

minutely 2-lobed, c. 11 mm above the lobes, exceeding the anthers. Fruits to 11 x 7 mm, green turning dark red at maturity, crowned by calyx segment.

Chrom. No.: n = 12 (Soman & Ramachandran, 1987)

Fl. & Fr.: Nov. – Jun.

Distr.: South West India and Sri Lanka.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Nedumangadu, *AESK* 7276, 7278; Chathankodu, *AESK* 7214; Bonaccord, *AESK* 7223, 7227; *Ibid.*, Jabbar 16009; *Ibid.*, N.Mohanan 9895; Palode, N.Mohanan & Shaju 1969; *Ibid.*, *AESK* 5447, 5643, 8852, 13208, 15635; *Ibid.*, N. Mohanan 177; Karamanyar, *AESK* 5217; Trivandrum, Jabbar & *AESK* 16027. **Kollam Dist.:** Ayrankavu, Bourdillon 1690; Pathanapuram, Venkoba Rao 1499; Kulathupuzha, *s.coll.* 3309; Cheenikkala, *AESK* 12829. **Pathanamthitta Dist.:** Kurumbanmoozhi, *AESK* 2233; Thriveni, Pandurangan 12946; Pamba, Deb 30392, 34392 (MH). **Idukki Dist.:** Rajamala, *AESK* 7566; Munnar, *AESK* 12814; *Ibid.*, Ridsdale 161 (MH); Meenmutty, C.N.Mohanan 76277 (MH); Chinnar, *AESK* 37629; Adimaly, *AESK* 7478; Puliyanmala, Raju 71164 (MH); Old Devikulam, Sebastine 18505 (MH); Marayur, Sebastine 16560 (MH); Chinnakanal, Sebastine 18348 (MH); Vandiperiyar, Vivekananthan 24333 (MH). **Thrissur Dist.:** Vazhachal, Pandurangan 30691. **Palakkad Dist.:** Nelliampathy, *AESK* 15759, 22321; Mukkali, Vajravelu 27722; *Ibid.*, N.C.Nair 64664 (MH); **Wayanad Dist.:** Mananthavady, Ramachandran 62689 (CAL); Thirunelly, *AESK* 11021. **Kannur Dist.:** Kannur, *AESK* 13088; Kalliassery, Ansari 64990 (CAL). **Kasaragod Dist.:** Kasaragodu, *AESK* 13089; Mulleria, V.J.Nair 71069 (MH). **"Travancore",** Bourdillon 676 (CAL); Mavanatham, Fischer 28 (CAL).

Host Plants: *Acacia dealbata* Link, *Allophylus cobbe* Bl., *Alstonia scholaris* R. Br., *Anogeissus latifolia* Wall., *Aporosa lindleyana* Baill., *Careya arborea* Roxb., *Celtis tetrandra* Roxb., *Cinnamomum wightii* Meissn., *Citrus aurantiacum* L., *Dendrophthoe falcata* (L.f.) Etting., *Eurya japonica* Thunb., *Ficus benjamina* L., *F. glomerata* Roxb., *F. heterophylla* L.f., *F. infectoria* Roxb., *F. religiosa* L., *F. tetrandra* Roxb., *F. tsiela* Roxb., *Garcinia indica* (Thouars) Choisy, *Grewia tiliaefolia* Vahl, *Madhuca longifolia* L., *Myristica* sp., *Neolitsea zeylanica* Merr., *Pavetta indica* L., *Prunus persica* Stokes, *Salix tetrasperma* Roxb., *Scleropyrum pentandrum* Arn., *Sterospermum suaveolens* D.C., *Terminalia arjuna* Bedd., *T. crenulata* Roth, *T. paniculata* Roth, *Xanthophyllum flavescens* Roxb.

SCURRULA Linnaeus

Sp. Pl. 110. 1753.

Aerial parasites, forming moderately large shrubs, pubescent or glabrate, without haustoria bearing surface runners, Branches terete, terminally angled, lenticellate. Leaves sub-opposite. Inflorescence racemose in axillary fascicles, tomentose, the flowers arranged sub-decussately, each with a minute awl shaped bracts. Flowers bisexual. Corolla narrowly cylindrical and acutely clavate in bud, 4-merous, zygomorphic. Filaments adnate to the corolla tube, free above the lobes. Anthers basifixed. Style filiform; stigma rounded. Fruit baccate, conspicuously clavate, long attenuated towards the base. Seed in the enlarged portion.

A genus of perhaps 40-50 species, widely distributed in South East Asia and India.

Two species reported from Kerala.

Key to the species

1. Mature leaves usually glabrous or only sparsely brownish tomentose below; principal veins often purplish when fresh; fruit light green, some times slightly puberulent**S. parasitica**
1. Mature leaves densely white tomentose, at least below; venation inconspicuous; fruits whitish-tomentose**S. cordifolia**

Scurrula cordifolia (Wall.) G. Don, Gen. Syst. 3: 421. 1834; Vajravelu, Fl. Palghat 411. 1990. *Loranthus cordifolius* Wall. in Roxb., Fl. Ind. 2: 222. 1824; Hook.f., Fl. Brit. India 5: 209. 1886; Gamble, Fl. Pres. Madras 1252. 1925.

Hanging shrubs, without haustoria bearing surface runner, older branches brown, young shoots whitish-tomentose. Leaves 5-7 x 3.5-4.5 cm, subopposite, orbicular-subcordate, varying greatly in shape and size, cordate to subtruncate at base, obtuse or rounded at apex, pale green above, whitish tomentose below; petiole to 7 mm long. Inflorescence racemose, superficially umbellate, whitish tomentose; peduncle 3 mm long, to 6-flowered. Mature floral buds 12 mm long, pale green with white pubescence. Calyx rudimentary. Corolla at anthesis green; lobes green, turning yellow at aging. Filaments red; anthers white. Style red; stigma green. Fruits pyriform, densely whitish tomentose.

Fl. & Fr.: Sept.-Feb.

Distr.: India and Sri Lanka.

Occurrence & Specimens studied: **Idukki Dist.:** Marayur, *AESK 23372*. **Pathanamthitta Dist.:** Kattathippara, *AESK 15623*. **Thrissur Dist.:** Vettilipara, *Ramamurthy 75578* (MH). **Palakkad Dist.:** Kanjirappara, *AESK 13278*; Chittoor, *Fischer 4418* (CAL). Karivara, *Vajravelu 60534* (MH, CAL). “**Malabar**”, *Beddome s.n.* (MH).

Host Plants: *Ficus heterophylla* L.f., *Grewia tiliaefolia* Vahl, *Lanea coromadelica* (Houtt.) Merr.

***Scurrula parasitica* L.**, Sp. Pl. 110.1753; Wiens in Dassan. & Fosb. Rev. Handb. Fl. Ceylon 6: 145. 1987; Manilal, Fl. Silent Valley 240. 1988; Ramachandran & Nair, Fl. Cannanore 401. 1988; Vajravelu, Fl. Palghat 412. 1990; Mohanan & Henry, Fl. Thiruvananthapuram 400. 1994; Sasi. & Sivar., Flow. Pl. Thrissur For. 386. 1996; Sivar. & P. Mathew, Fl. Nilambur 595. 1997. *Loranthus buddleioides* Desr. in Lamk., Encycl. 3: 600. 1792; Gamble, Fl. Pres. Madras 1253. 1925. *L. scurrula* L., Sp. Pl. ed. 2, 1: 472. 1762; Roxb., Pl. Corom. t. 140. 1800; Hook.f., Fl. Brit. India 5: 208.1886. **(Fig. 24).**

Large shrubs without haustoria bearing surface runners; older branches usually brown. Leaves subopposite, 3-12 x 2-7 cm, ovate-oblong to obovate, acute-obtuse at base, obtuse-rounded at apex, dark green above, rusty tomentose below, young leaves rusty tomentose on both surfaces; principal nerves often brownish-purple beneath; petiole

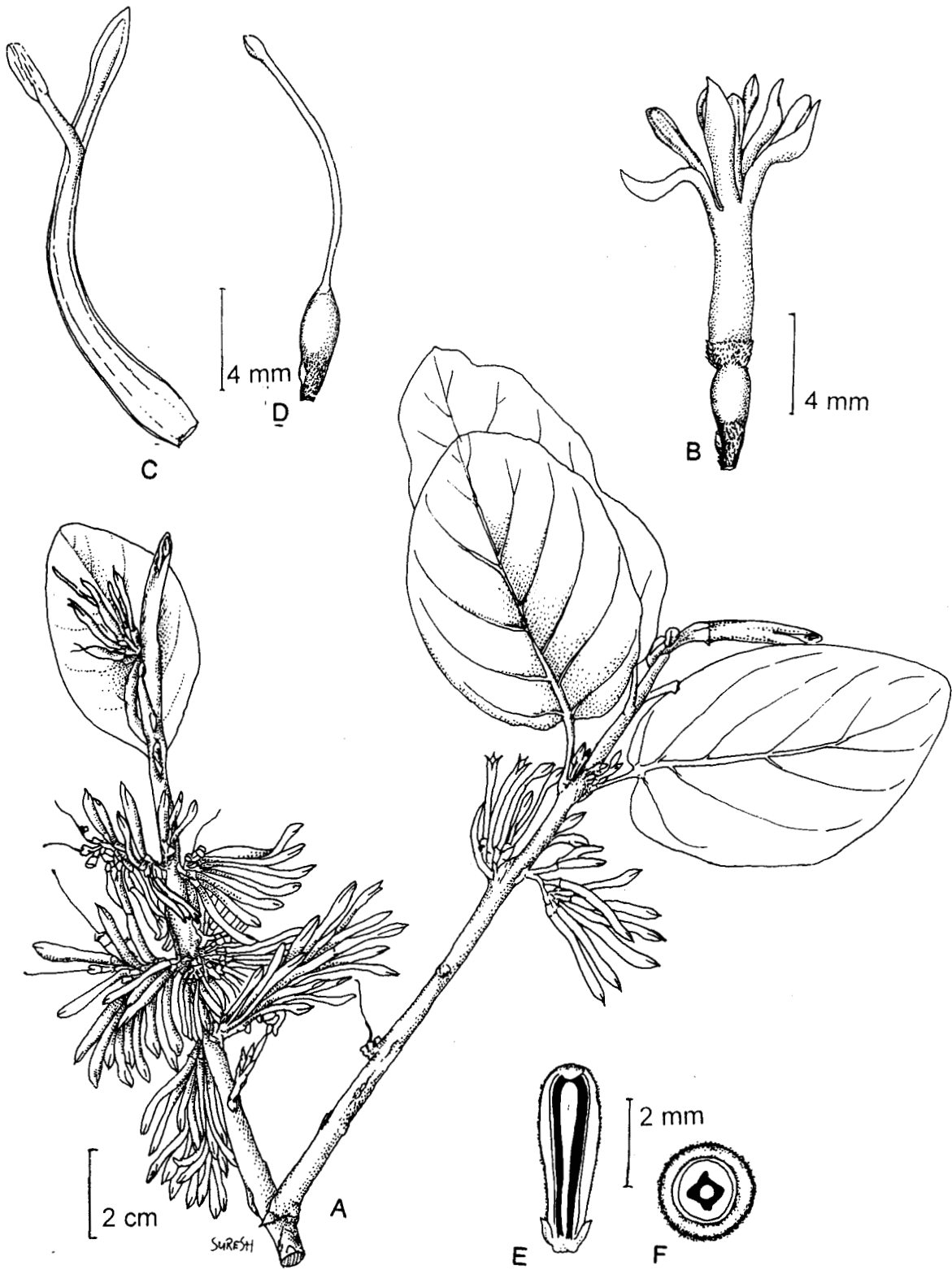


Fig. 24. *Scurrula parasitica* L.: A. Habit – a twig; B. Flower; C. Single petal with basal part of corolla tube bearing a stamen; D. Pistil; E. Ovary - L. S.; F. Ovary - C. S.

6-10 mm long, scattered rusty tomentose. Inflorescence racemose, superficially umbellate with 6 or less flowers; peduncle 3 mm long, brownish tomentose; bracts very small, cup-shaped acuminate at apex; mature floral bud 16 mm long, pale green up to constriction, clavate portion brownish green. Calyx rudimentary. Corolla at anthesis yellowish-green turning red; tube 14 mm long; lobes 4 x 1 mm, linear-oblongate, brownish green, spreading or partially reflexed. Filaments to 3 mm long, free portion from corolla maroon. Style bright red; stigma deep red. Fruits to 10 x 5 mm, pale green, turning yellow on ripening, pyriform. Seeds same size as the fruits, tetragonous with a long tail.

Chrom. No.: n = 12 (Bhaumic, 1971)

Fl. & Fr.: Aug.-Mar.

Distr: Indo-Malaya and Sri Lanka.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Palode, *AESK* 7494; *Ibid.*, *Shaju* 11617; Adipprambu, *AESK* 26850; Kurisady, *AESK* 7206; Bonaccord, *AESK* 5479, 7321, 37559, 8411; Mottamoodu, *AESK* 7348; Braemore, *AESK* 7206. **Kollam Dist.:** Cheenikala, *AESK* 12877. **Pathanamthitta Dist.:** Kattathipara, *AESK* 15623; Kottampara, *AESK* 15616; Achankovil, *AESK* 13294. **Idukki Dist.:** Neriamangalam, *AESK* 18384; Rajamalai, *AESK* 7567; Munnar, *AESK* 37606; Painavu, *Pandurangan* 66478 (CAL). **Kottayam Dist.:** Pampady, *Meebold* 12760 (CAL); Wagamon, *AESK* 13279. **Ernakulam Dist.:** Pooyamkutty, *AESK* 18352. **Thrissur Dist.:** Melalkkappara, *Ramamurthy* 80863 (CAL); Vettilappara, *Ramamurthy* 75578 (CAL). **Palakkad Dist.:** Melemulli, *AESK* 5606; Palakkad, *AESK* 8846; Mulli, *AESK* 25458, 25462; Mannarkadu, *AESK* 25452; Mukkali, *AESK* 42175; Palakkad, *Fischer* 1702 (CAL); Silent valley,

Bhargavan 65714 (CAL). **Wayanad Dist.:** Periya, Aesk 44212; Mananthavady, Aesk 2307; Chandanathodu, Aesk 23308.

Host Plants: *Acacia caesia* Willd., *A. intsia* L., *A. pennata* Willd., *A. leucophloea* Willd., *Alangium salvifolium* Wang, *Albizia odoratissima* Benth., *Anogeissus latifolia* Wall., *Bauhinia phoenicia* Heyne, *Butea frondosa* Koen., *Calotropis gigantea* R. Br., *Citrus decumana* L., *Coffea arabica* L., *Cordia meiodii* Hook.f., *C. obliqua* Willd., *Dalbergia lanceolaria* L.f., *D. latifolia* Roxb., *D. paniculata* Roxb., *D. sissoo* Roxb., *Dendrophthoe falcata* (Wight & Arn.) Tieghem, *Elaeagnus latifolia* L., *Erythrina indica* Lam., *Ficus asperrima* Roxb., *Ficus benghalensis* L., *F. hispida* L.f., *F. infectoria* Roxb., *Firmiana colorata* R.Br., *Flacourtia ramontchi* L'Her., *Fluggea leucopyrus* Willd., *Grewia hirsuta* Vahl, *G. orientalis* L., *G. tiliaefolia* Vahl, *Holarrhena antidysenterica* Wall., *Holoptelia integrifolia* Planch., *Ixora parviflora* Vahl, *Knema attenuata* Warb., *Lantana camera* L., *Leea* sp., *Ligustrum neilgherrense* Wight, *Maesa perottettiana* DC., *Mallotus* spp., *Melastoma malabathricum* L., *Morinda tinctoria* Roxb., *M. umbellata* L., *Nerium odoratum* Soland., *Pavetta indica* L., *Phyllanthus emblica* L., *Plectronia didyma* Roxb., *Premna tomentosa* Willd., *Pterocarpus marsupium* Roxb., *P. santalinus* L.f., *Catunaregam spinosa* (Thunb.) Tirv., *C. malabarica* (Lam.) Sivar., *Shorea tumbaggaia* Roxb., *Spatholobus roxburghii* Benth., *Syzygium calophyllifolium* Walp., *Viburnum coriaceum* Bl., *V. erubescens* Wall., *Vitex altissima* L., *V. negundo* L.

TAXILLUS Van Tieghem

Bull. Soc. Bot. France 42: 256. 1895.

Aerial parasites, forming moderately sized shrubs, with haustoria bearing surface runners, bisexual, pubescent or glabrous. Inflorescence clustered, few-flowered, axillary umbels or sometimes occurring singly. Leaves alternate. Corolla 5-merous, strongly zygomorphic by the presence of a single split. Corolla lobes reflexing at the constriction opposite to the split. Anthers basifixed. Fruit oblong.

A genus of perhaps 12-16 species occurring in South Asia through the Malay Peninsula, southwards to Borneo and Philippines. Three species are reported from Kerala.

Key to species

1. Leaves, young shoots usually glabrous or sometimes sparsely or minutely pubescent.
..... **T. cuneatus**
1. Leaves, young shoots rusty tomentose or variously pubescent **2**
2. Bracts 3-5 mm long, enveloping the ovary and calyx; corolla long, shaggy tomentose.....**T. tomentosus**
2. Bracts 1.5 mm long, never enclosing ovary and calyx; corolla tomentose, not shaggy.
.....**T. recurvus**

Taxillus cuneatus (Heyne ex Roth) Danser, Bull. Jard. Bot. Buitenz. Ser. 3,10: 354. 1929; Wiens in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 6: 144. 1987; Mohanan & Henry, Fl. Thiruvananthapuram 399. 1994; Sasi. & Sivar., Flow. Pl. Thrissur For. 387. 1996; Sivar. & P. Mathew, Fl. Nilambur 596. 1997. *Loranthus cuneatus* Heyne ex Roth., Nov. Pl. Sp. 193. 1821; Hook.f., Fl. Brit. India 5: 214. 1886; Gamble, Fl. Pres. Madras 1253. 1925.

Aerial parasites often forming relatively small rounded clusters; branches greenish brown, terete, lenticellate. Leaves alternate or fascicled in groups of 2-3, to 4 x 2 cm, obovate, strongly cuneate at base, rounded at apex, glabrous or sparsely pubescent; subsessile or short-petiolate; inconspicuously 3-nerved at base. Flowers axillary, solitary or in 2-3-flowered axillary umbels; bracts 2 mm long, obtuse. Mature floral buds 25 mm long, light green at base, dark green at middle; clavate portion light brown. Corolla tube at anthesis yellowish-green, turning greenish-red at age, subcylindric, expanding gradually from the base, split on one side, to 2-3 mm above the base; lobes 5 mm long, green turning red at age, linear, acute. Stamens 4; filaments deep red; anthers dark red, linear, exserted, 5 mm long including the filament. Style green, curved towards the slit; stigma dark red, subopposite, exceeding the anthers. Fruits 10 x 5 mm, oblong, glabrous to sparsely tomentose.

Chrom. No.: n = 9 (Bir *et al.*, 1982)

Fl. & Fr.: Nov.-Jan.

Distr.: Deccan Peninsula from Concan southwards and SriLanka.

Occurrence & Specimens examined: **Thiruvananthapuram Dist.:** Agastyamala, N.Mohanan 2033; Athrumala, Aesk 7282; Bonaccord, Aesk 5480, 7225; 7283, Braemore, Aesk 7212, 7382. **Kollam Dist.:** Cheenikala, Aesk 26851. **Idukki Dist.:** Mattupetty, Aesk 37615; Devikulam, Aesk 5880; Munnar, Aesk 7159; *Ibid.*, Aesk 7458. **Palakkad Dist.:** Attappady, C.E.C. Fischer 2489 (CAL). **Wayanad Dist.:** Brahmagiri, Aesk 42181; Thirunelly, Aesk 17312.

Host Plants: *Acacia* sp., *Allophylus cobbe* Bl., *Atalantia monophylla* Corr., *Berberis tinctoria* Lesch., *Celtis tetrandra* Roxb., *Coffea arabica* L., *Commiphora berryi* Engl., *Debrageasia velutina* Gaud., *Dendrophthoe falcata* (L.f.) Etting var. *falcata*, *D. neelgherrensis* (Wight & Arn.) Tieghum, *Desmodium rufescens* DC., *Dodonaea viscosa* L., *Ficus bengalensis* L., *F. hispida* L.f., *Flacourtia sepiaria* Roxb., *Fluggea leucopyrus* Willd., *Glochidion malabaricum* Bedd., *G. neelgherrese* Wight, *G. tomentosum* Dalz., *G. zeylanicum* A. Juss., *Hypericum mysorense* Heyne, *Ixora notoniana* Wall., *Lasiosiphon eriocephalus* DC., *Ligustrum perrottetii* A.DC., *L. roxburghii* Cl., *Limonia crenulata* Roxb., *L.alata* Wight & Arn., *Olea dioica* Roxb., *Opilia amentacea* Roxb., *Pavetta breviflora* DC., *Phyllanthus emblica* L., *Plectronia didyma* Roxb., *Premna latifolia* Roxb., *Prunus persica* Stocks, *Putranjiva roxburghii* Wall., *Randia dumetorum* L., *Rapanea wightiana* Metz., *Rhodomyrtus tomentosa* Wight, *Salix tetrasperma* Roxb., *Scutia myrtina* Kurz, *Sophora glauca* Lesch., *Strobilanthes kunthiana* (Nees) T. And., *Toddalia asiatica* Lam., *Vitex altissima* L.f., *Wendlandia notoniana* Wall.

Taxillus recurvus (DC.) Tiegh., Bull. Soc. Bot. France 42: 256. 1895. *Loranthus recurvus* Wall. in DC., Prodr. 4: 299. 1830; Hook.f., Fl. Brit. India 5: 213. 1886; Gamble, Fl. Pres. Madras 1252. 1925.

Aerial parasites with haustoriferous surface runners; branches usually stout, lenticellate; bark blackish-brown; young shoots rusty-tomentose. Leaves alternate, 4-5-7x2.5-3.5 cm, obovate, cuneate at base, rounded at apex, glabrous above, ashy-pubescent beneath; petiole to 5 mm long. Inflorescence axillary, 2-flowered fascicles; peduncle very short; bracts 1.5 mm long, ovate, acuminate, adpressed with calyx tube, tawny-tomentose. Mature floral buds 16 mm long, gibbously inflated below the middle, constricted at the neck; clavate portion 4 mm long. Corolla tube 12 mm long at anthesis, light green within; basal portion light reddish without, gibbously inflated, 5 mm above the base; lobes 4 mm long, brownish, linear, acute, deflexed. Filaments to 3 mm long, dark red; anthers 1 mm long, yellow, exserted. Style 1.7 cm long, light green, terete, curved towards the split; stigma green turning red, exceeding anthers. Fruits oblong, puberulent.

Fl. & Fr.: Oct. – Dec.

Distr.: Western Ghats.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.**: Athrumala, AESK 5491, 7320. **Palakkad Dist.**: Mully, AESK 25460. **Wayanad Dist.**: Peria, AESK 44207.

Host Plants: *Elaeagnus latifolia* L., *Glochidion* sp., *Limonia alata* Wight & Arn.

Taxillus tomentosus (Heyne ex Roth) Tiegh., Bull. Soc. Bot. France 42: 256. 1895; Wiens in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 6: 139. 1987; Ramachandran & Nair, Fl. Cannanore, 401. 1988; Vajravelu, Fl. Palghat 412. 1990; Mohanan & Henry, Fl. Thiruvananthapuram 401. 1994; Sivar., & P. Mathew, Fl. Nilambur 596. 1997. *Loranthus tomentosus* Heyne ex Roth, Nov. Pl. Sp. 191. 1821; Hook.f., Fl. Brit. India 5: 212. 1886; Gamble, Fl. Pres. Madras 1252. 1925. **(Fig. 25; Plate VIII-B).**

Aerial parasites with haustoriferous surface runners; branches dark brown, terete; young shoots rusty stellate-tomentose. Leaves 2.5-4.5 x 1.5-2.5 cm, ovate-oblong to elliptic, rounded at apex, acute at base, glabrous or stellately pubescent above, light brown or buff-tomentose beneath; penninerved. Flowers axillary, 1-3-flowered, short-peduncled fascicles, rusty-villous with hispid hairs; bracts 3 mm long, subovate, obtuse at apex, rusty-tomentose, longer than calyx lobes. Mature floral buds 13 mm long, inflated at the base, constricted at the neck initiating the clavate portion, shaggy, tannish pubescent over the entire surface except the clavate tip, which is rusty brown pubescent. Calyx minute, 2 mm long, rusty-tomentose. Corolla tube 10 mm long, at anthesis light green within, the split c. 5 mm long; lobes 3 mm long, light green, linear to sub-spathulate, acute, deflexed. Stamens 4 mm long; filaments light green where adnate to corolla and the rest bright red, bend forward towards the split in the corolla; anthers 1 mm long, yellow, oblong, terete, curved towards the split; stigma bright red, exserted, exceeding the anthers. Fruits elliptic-oblong.

Chrom. No.: n = 9 (Bir *et al.*, 1982)

Fl. & Fr.: Nov.-Jan.

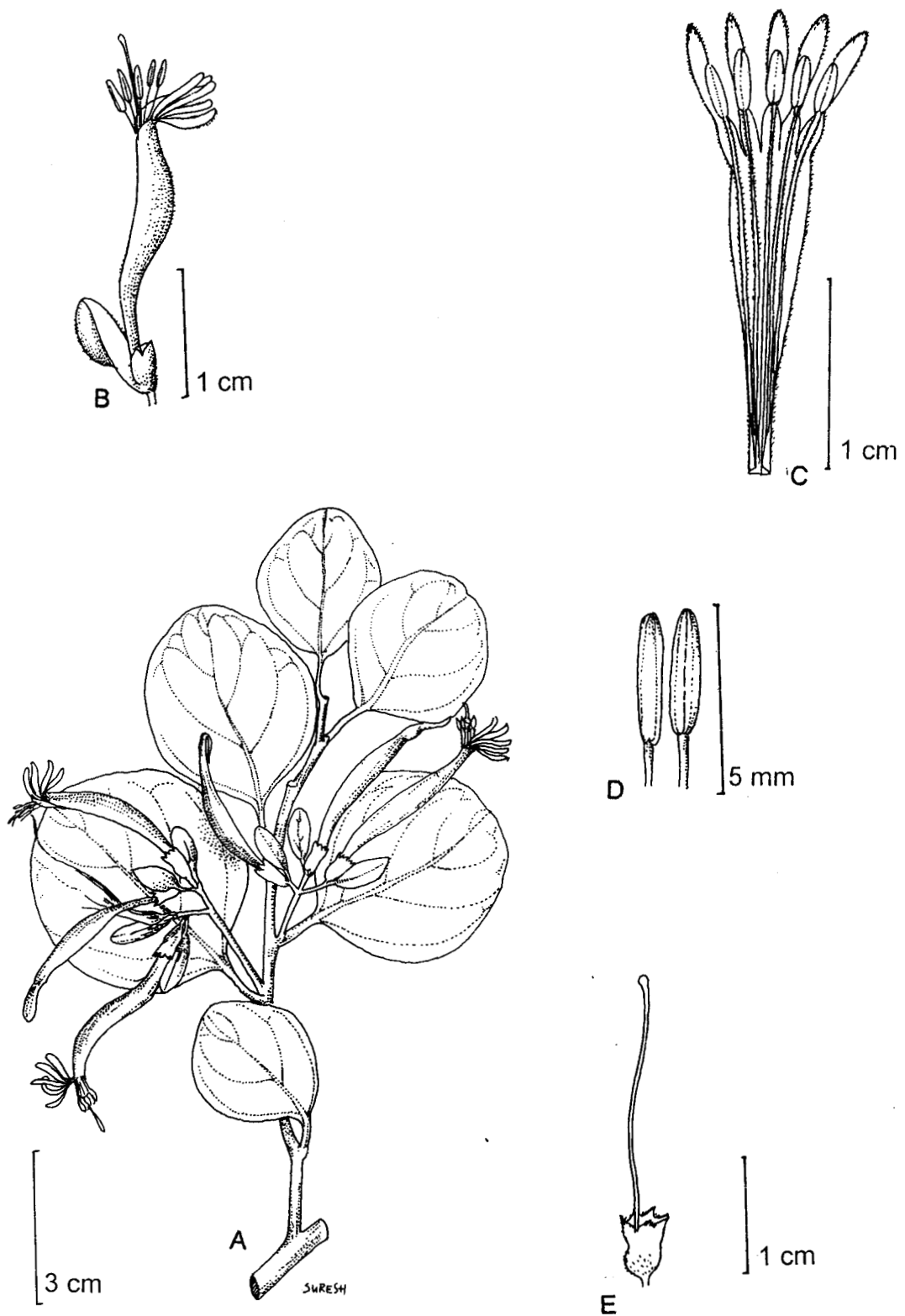


Fig. 25. *Taxillus tomentosus* (Heyne ex Roth.) Tiegh. A. Habit – a twig; B. Flower; C. Corolla – Split open; D. Stamens; E. Pistil.

Distr.: India, Sri Lanka.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Bonaccord, AESK 7219; *Ibid.*, N.Mohanan 1725; Athrumala, AESK 7281,7283; Ponmudi, AESK 7245; *Ibid.*, N.Mohanan 56977; *Ibid.*, M.Mohanan 54755, 56977, 66612 (MH). **Idukki Dist.:** Thekkady, Vivekananthan 45644 (MH); *Ibid.*, Sharma 42082 (MH); Idukki, N.C.Nair 70144 (MH); *Ibid.*, C.N.Mohanan 76091 (MH); Kulamavu, C.N.Mohanan 7608 (MH). **Thrissur Dist.:** Sholayar, K. Ramamurthy 72799 (MH). **Palakkad Dist.:** Kunthipuzha, N.C.Nair 6921 (MH); Aruvanpara, Bhargavan 65546 (MH); Ommalia, Vajravelu 48929 (MH); Panthenthodu, Vajravelu 33093 (MH); Muthikulam, Vajravelu 62921 (MH). **Wayanad Dist.:** Manathavady, Ramachandran 53879 (MH); Hillclate, Ramachandran 58777 (MH); Chandanathodu, Ellis 29437 (MH). Sultan's Bathery, Ellis 18626, 25758 (MH); *Ibid.*, Gamble 5462 (CAL); Thirunelly, AESK 42182.

Host Plants: *Acacia caesia* Willd., *A. pennata* Willd., *Albizia lebbeck* Benth., *Anogeissus latifolia* Wall., *Antidesma menasu* Miq., *Breynia patens* Rolfe, *Bridelia scandens* Graham, *Casearia graveolens* Dalz., *Dalbergia paniculata* Roxb., *Desmodium rufescens* DC., *Elaegnus latifolia* L., *Ficus hispida* L.f., *Glochidion neilgherrense* Wight, *G. velutinum* Wight, *Glochidion* sp., *Grewia tiliaefolia* Vahl, *Helixanthera obtusata* (Shultes) Danser, *Jasminum flexile* Vahl, *Litsea stocksii* Hook.f., *Maesa indica* Wight, *Meliosma wightii* Planch., *Neolitsea zeylanica* Merr., *Phyllanthus emblica* L., *Premna tomentosa* Willd., *Strychnos colubrina* L., *Viburnum coriaceum* Bl., *V. rubescens* Wall.

TOLYPANTHUS (Blume) Reichenbach

Deut. Bot. Herb.-Buch. (Nom.) 73. 1841.

Aerial parasites, forming moderately large shrubs, bisexual, glabrous or glabrate. Leaves alternate or subopposite. Inflorescence a sessile head, surrounded by a prominent involucre. Flowers bisexual. Corolla 5-merous, gamopetalous, actinomorphic with reflexing lobes. Anthers basifixed. Fruits baccate.

A small Malayan genus of four species. Only one species occur in Kerala.

Tolypanthus lagenifer (Wight) Tiegh., Bull. Soc. Bot. France 42: 249. 1895; Danser, Bull. Jard. Bot. Buit. Ser. 3, 10: 355. 1929; Vajravelu, Fl. Palghat 421. 1990; Manilal, Fl. Silent Valley 241. 1988; Ramachandran & Nair, Fl. Cannanore 402. 1988. *Loranthus lagenifer* Wight, Ic. t. 306. 1840; Hook.f., Fl. Brit. India 5: 218. 1886; Gamble, Fl. Pres. Madras 1254. 1925. (**Fig. 26**).

Aerial parasites, forming moderately large shrubs with blackish brown haustoriferous runner having two types of lenticels; longitudinally elongated raised ones and rounded dotted ones; branches blackish-brown, older bark exfoliating, glabrous. Leaves opposite, 8-2 x 5-8 cm, ovate-oblong, rounded or cordate at base, acute at apex, red-dotted, midrib raised, red coloured beneath. Inflorescence usually with 5-flowers; involucre composed of 5-basally connivent, dark pink, acute bracts, 3 cm long; individual flowers ebracteate. Mature floral buds slightly dilated above, 6 cm long, sparsely

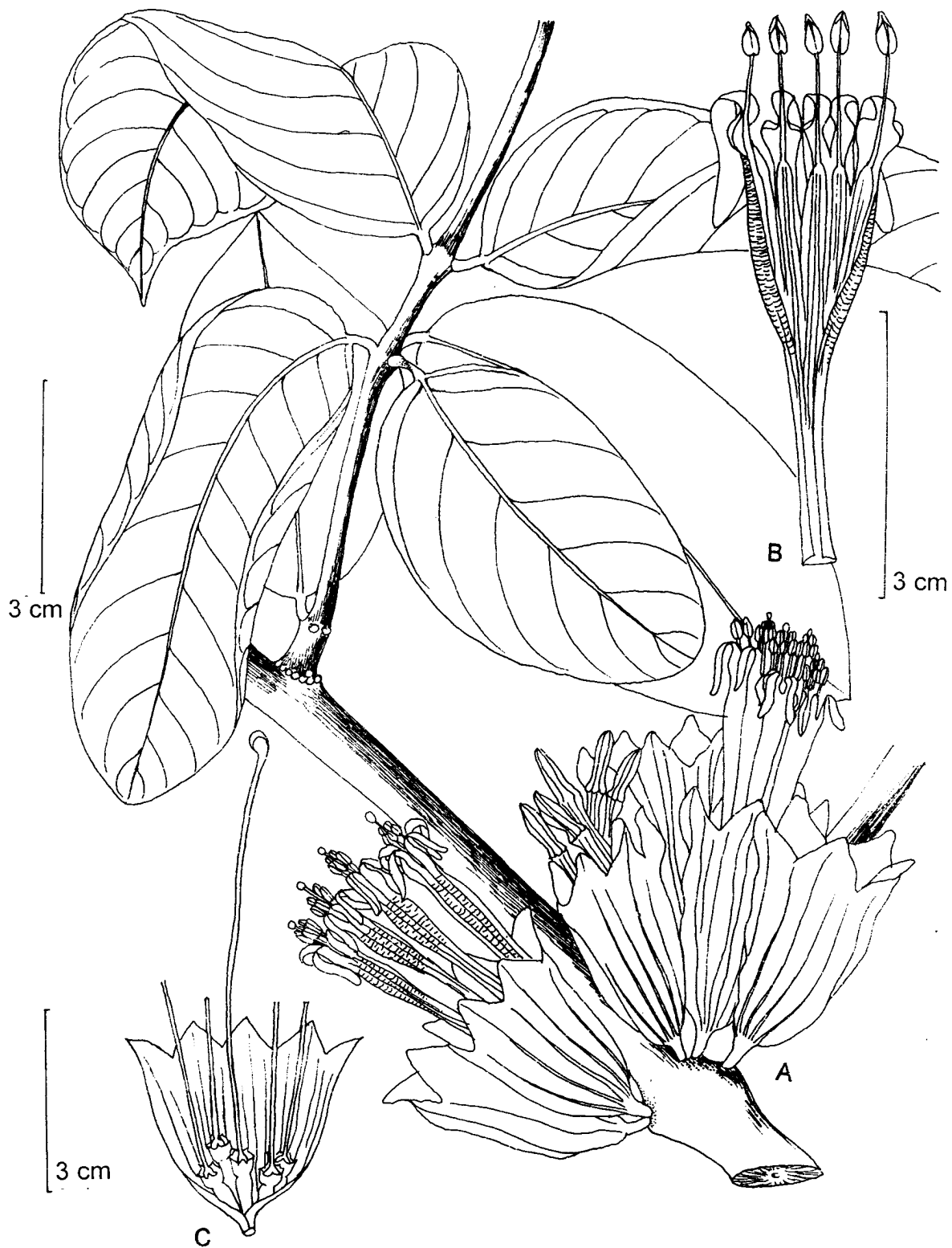


Fig. 26. *Tolypanthes lagenifer* (Wight) Tiegh.: A. Habit – a twig; B. Corolla – split open; C. Involucre – split open showing pistils.

puberulent. Calyx 3 mm long, tomentose. Corolla tube red; lobes greenish-yellow, 5 mm long, oblong-lanceolate, spreading or slightly recurved. Filaments free and erect above the corolla tube, 5 mm long; anthers introrse, linear-oblong, sub-dorsifixed. Style filiform; stigma capitate. Fruits red, obovate-oblong, to 1.2 cm long.

Fl. & Fr.: Aug.-Nov.

Distr.: India; endemic.

Occurrence & specimens studied: **Wayanad Dist.**: Mananthavady, *AESK 44220*; Chandanathodu, *Ramachandran 63933* (MH, CAL); Kuruva, *AESK 23319*. **Palakkad Dist.**: Mukkali, *Bhargavan 48914* (MH, CAL); Anammooly, Silent Valley, *Ansari 51500* (MH, CAL); Karivara, *Vajravelu 48914* (MH). **Kannur Dist.**: Kannur, *AESK 13211*. **Kasaragod Dist.**: Puthiaparambil, *Sarajini Menon 17611*; Kasaragod, *AESK 39217*; Cherulam, *AESK 39225*.

Host Plants: *Casuarina equisetifolia* Forst., *Derris indica* (Lam.) Bennet., *Holarrhena antidysentrica* (L.) Wall. ex A. DC., *Hopea wightiana* Wight & Arn., *Randia uliginosa* DC., *Strychnos nux-vomica* L.

OROBANCHACEAE Ventenat

Tabl. Regne Veg. 2: 292. 1799, *nom. cons.*

Leafless, annual root-parasites. Stem usually simple, stout or slender, scaly. Flowers solitary or in spikes or racemes, irregular. Calyx spathaceous or of 4-5 free or

connate sepals. Corolla tube curved, usually 2-lipped, sometimes subequally 5-lobed; upper lobes often arched, lower 3-lobed, throat often with 2 villous folds. Stamens 4, didynamous, inserted on the corolla tube; anthers 1-2 celled, cells spurred at the base, opening by slits or basal pores, one often imperfect. Disc usually obscure. Ovary of 2-connate carpels, 1-rarely 2-celled; style long, tip curved; stigma capitate, 2-lobed; ovules many on free or confluent parietal placentas. Fruit a capsule, usually 1-celled; valves 2 or 3. Seeds many, minute; testa pitted or reticulate; albumen fleshy; embryo ovoid, often undivided.

The family includes about 17 genera and 230 species, mostly from Northern hemisphere, temperate and subtropical areas. The family is included in the order Scrophulariales by Cronquist (1981) and Dahlgren (1983). It is treated in the Order Personales by Bentham and Hooker (1883) and Hutchinson (1959). Engler (1897) included it in the order Tubiflorae, while Thorne (1976) assigned it to the Order Bignoniales. E.J. Livera (1927) created a new family Aeginetiaceae and included most of the genera except *Orobanche* L. in the new family. But as the family name Orobanchaceae is a conserved one (*nom. cons.*), all the genera are treated in the family Orobanchaceae as has been done by the recent workers.

It is represented in India by 8 genera; and only 2 genera are represented in Kerala.

Key to the genera

1. Calyx spathaceous, split in front nearly to the base; anther cells unequal, not spurred at the base **Aegenetia**
1. Calyx tubular-campanulate, 5-lobed; anther cells 2, spurred at base; stigma peltate **Christisonia**

AEGINETIA Linnaeus

Sp. Pl. 632. 1753.

Simple or branched herbs, with naked or scaly scapes. Flowers few, large, solitary or corymbose. Bracteoles 0. Calyx spathaceous, split in front nearly to the base. Corolla tube broad, spreading, the two upper connate. Stamens 4, didynamous, included; anthers meeting in pairs with 1 perfect cell adnate to the filament, not spurred below, the outer absent from the upper pairs. Ovary 1-celled; placentas 2 or more-lobed, filling the cavity bearing ovules all over; style slender; stigma large, peltate. Fruit a partially 2-valved capsule. Seeds crowded, minute, reticulate.

A genus of about 3 species, distributed from East Asia to Indo-Malesian region, parasitic on the roots of monocots, especially grasses.

Key to the species

1. Scape short, 15-35 cm long, slender, naked; corolla deep purple **A. indica**
1. Scape short or very short, stout, bracteate **2**

2. Scape very short, only up to 8 mm; corolla tube yellow, lobes deep violet
**A. acaulis**
2. Scape short, about 8 mm long; corolla tube yellow; lobes blue
**A. pedunculata**

Aeginetia acaulis (Roxb.) Walp., Repert. 3:481. 1844-1845; Erady & Rajappan, J. Bombay Nat. Hist. Soc. 55(1): 125-128. 1958. *Orobanche acaulis* Roxb., Fl. Ind. 3: 28. 1832, & Pl. Corom. t. 292. 1819. *Aeginetia pedunculata* Wall. var. *acaulis* (Walp.) Beck Mannagetta in Engler, Pflanzenr. 96: 21. 1930. *A. pedunculata* Wall. var. *abbreviata* (Buch.-Ham.) Beck Mannagetta in Engler, Pflanzenr. 96: 20. 1930.

Plants parasitic, on the roots of grasses. Rhizomes very short, simple, up to 8 mm long. Roots few-many, wiry. Inflorescence solitary and terminal or rarely 2-3, arising from the axils of scale leaves; racemes 1-3 flowered or rarely 4-5 in sessile clusters. Peduncle creamy white, glabrous, not reaching much above the soil, and up to 6 mm thick and 2.5 cm long. Bracts 3-8 mm long; lower ones sterile and upper ones fertile, ovate or ovate-triangular, imperfectly 3-lobed. Pedicels much shorter than the flowers. Flowers zygomorphic, 1.5-3.8 cm long. Calyx spathaceous, split in the front to the base, at the back to a quarter to its length. Corolla tube as long as the calyx, yellow, glabrous, lobes 5, bright violet, orbicular-reniform, crenulate, imbricate. Stamens 4, didynamous; filaments glabrous; anther cells divergent; one sterile and one fertile. Ovary 2-carpelled, syncarpous, unilocular; style glabrous, persistent; stigma large, peltate, densely pubescent. Fruits ovoid, beaked.

Fl. & Fr.: Sept. – Nov.

Distr.: Endemic to Kerala and Karnataka.

Note: According to Hooker (1892), *Aegenetia abbreviata* Buch.-Ham. and *A. acaulis* (Roxb.) Walp. are synonyms of *A. pedunculata* Wall. Beck Mannagetta (1930) recognized the above species as varieties of *A. pedunculata* Wall. A study conducted by Erady and Rajappan (1958) using the live materials collected from Ponmudi, revealed the species status of *A. acaulis* (Roxb.) Walp. I have seen some specimens, collected by N. Mohanan from Karamanayar matched with the description given by Erady and Rajappan (1958), and I follow their treatment. Shivamurthy and Rajanna (1994) published a new species namely *A. sessilis*, based on a few collections from Karnataka. Based on detailed study of the protologue, it is felt that the new species is conspecific with *A. acaulis* (Roxb.) Walp.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Karamanayar, N.Mohanan 1182, 10015, 10757. **Wayanad Dist.:** Adivaram, Jayakrishnan 102 (MH).

Aegenetia indica L., Sp. Pl. 632. 1753; Wight, Ic. t. 895. 1845; Hook.f., Fl. Brit. India 4: 320. 1884; Gamble, Fl. Pres. Madras 974. 1924; Ramachandran & Nair, Fl. Cannanore 323. 1988; Manilal, Fl. Silent Valley 198. 1988; Vajravelu, Fl. Palghat 328. 1990; Mohanan & Henry, Fl. Thiruvananthapuram 333. 1994; Sasi. & Sivar., Fl. Pl. Thrissur For. 327. 1996; Sivar. & P. Mathew, Fl. Nilambur 479. 1997.

Plants parasitic, on roots of various plants. Rhizomes short, simple, thick, irregularly cylindrical. Roots few to many, wiry, thick and occasionally developing adventitious buds that serves for vegetative propagation. Scape solitary, or several, 15-35

cm long, glabrous, decurved. Calyx spathaceous, pinkish, 1.8-5 cm long, acute. Corolla lobes suborbicular, to reniform; margins fimbriate, purple with white throat. Stamens 4, didynamous; filaments glabrous; anther cells divergent, one sterile and 1 fertile, anther of lower cells with a thick, gibbous, obtuse, spur behind. Ovary of 2-carpels, syncarpous, unilocular; placentation parietal; style glabrous, persistent; stigma large peltate. Capsule 2-valved, fleshy, irregularly dehiscent.

Fl. & Fr.: Dec.-Feb.

Distr.: India, China, Sri Lanka, Japan and Philippines. Throughout in India. In Kerala it is seen in almost all districts.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Kallar, *AESK 5229*; Bonaccord, *Mathew 2831*; Cheenikala, *Mathew 696*; *Ibid.*, *Santhosh & Jabbar 14440*; *Ibid.*, *Shaju 16220*; *Ibid.*, *N. Mohanan 8126*; *Ibid.*, *M. Mohanan 58522* (MH); Ponmudi, *Narayana Iyer s.n.*; *Ibid.*, *M. Mohanan 69201* (MH); Palode, *N. Mohanan 189*; Kottur, *J. Joseph 41985* (MH). **Kollam Dist.:** Achancovil, *Narayanaswami 868* (MH). **Thrissur Dist.:** Peechi, *Ramamurthy 47619* (MH); Parambikulam, *Sebastine 14512* (MH). **Palakkad Dist.:** Chindaki, *Vajravelu 48906* (MH); Mukkali, *N.C.Nair 64496* (MH); Dhoni, *J. Joseph 17192* (MH); Anakaranam, *Sebastine 20811* (MH). **Malappuram Dist.:** Manjeri, *Ellis 35372* (MH). **Kozhikode Dist.:** Chedaletu, *Ellis 19957* (MH). **Kannur Dist.:** Kannothe, *Barber 9404* (MH); *Ibid.*, *Ramachandran 64008* (MH). **"Malabar"**, *Austead 83404* (MH).

Aeginetia pedunculata Wall., Pl. Asiat. Rar.3:13, t. 219. 1831; Wight, Ic. t. 1421. 1845; Hook.f., Fl. Brit. India 4: 320. 1884; Gamble, Fl. Pres. Madras 974. 1924; Ramachandran & Nair, Fl. Cannanore 323. 1988; Vajravelu, Fl. Palghat 329. 1990; Mohanan & Henry, Fl. Thiruvananthapuram 333. 1994; Sasi. & Sivar., Fl. Pl. Thrissur For. 327. 1996; Sivar. & P. Mathew, Fl. Nilambur 480. 1997.

Plants parasitic, on the roots of grasses. Rhizomes short, thick. Roots many, wiry. Scapes short with a few scales near the base. Flowers bracteate, pedicellate, glabrous, decurved. Pedicels 2.5-10 cm long, stout, bracteate at the base. Bracts 6-10 mm, ovate-obtuse. Calyx 3-5 cm long, fleshy, red fading to white, tip obtuse, acute or shortly-beaked. Corolla tube as long as the calyx, yellow; limb dark blue, crenate and rose. Stamens 4, didynamous; filaments glabrous; anthers of lower stamens with a large dorsal fleshy horn. Stigma broadly cordiform, peltate. Capsule ovoid. Seeds brown.

Fl. & Fr.: Sept.-Nov.

Distr.: Indo-Malesia. Throughout in India. In Kerala it is seen in almost all districts.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Way to Agastyakoodam, M. Mohanan 59328 (MH); Bonaccord, J. Joseph 44568 (MH). **Kollam Dist.:** Mannarappara, Chandrabose 74684 (MH). **Idukki Dist.:** Calvary mount, Panduranagan 74684 (MH); Kulamavu, C.N. Mohanan 71960 (MH); Painavu, C.N. Mohanan 80172 (MH). **Palakkad Dist.:** Kunthipuzha, Vajravelu 48858 (MH); Silent Valley, N.C.Nair 64287 (MH); *Ibid.*, Ansari 51473 (MH); *Ibid.*, AESK 5271, 5268. **Wayanad Dist.:**

Nadugani, *Lawson* 36486 (MH); Chandanathodu, *Ramachandran* 26371 (MH). **Kannur**

Dist.: Mattanur, *Ramachandran* 59085 (MH); Thalipparambu, *Barber* 7706 (MH).

CHRISTISONIA G. Gardner

Calcutta J. Nat. Hist. 8: 153. 1847.

Parasitic herbs. Stem short, simple or branched; leafless. Flowers large yellow, white, rose or bluish-purple, pedicellate. Pedicels 2-bracteate or not. Calyx tubular, 5-angled, often obscurely 5-lobed, subequal or sub-bilabiate. Corolla tube infundibuliform, enlarged at mouth; limb 5-lobed, sub-bilabiate. Stamens 4, inserted on corolla tube, didynamous, included or rarely exerted; anthers 1-locular, dorsally spurred, dehiscing by a pore at apex. Disc lacking. Ovary ovate-oblong, 1-locular, parietal placenta, bifid, both lobes multi-ovulate; style filiform, simple; stigma bilabiate; upper lip small or aborted; lower oblong or suborbicular. Capsule subglobose, 1-locular, 2-valved, included in calyx. Seeds many, oblong, obtuse, usually reticulate.

A genus of about 17 species from China, South East Africa and Indo-Malesia.

Key to the species

1. Stamens not didynamous; ovary 1-locular above and 2-locular below
.....**C. neilgherica**
1. Stamens didynamous; ovary 1-locular throughout.....**2**

- 2. Scape only up to 12 cm long; pedicels bracteate **C. bicolor**
- 2. Scape more than 12 cm long; pedicels ebracteolate.....**3**
- 3. Corolla tube glandular hairy; anthers opening by a longitudinal slits
..... **C. keralensis**
- 3. Corolla tube glabrous; anthers opening by a pore **C. tubulosa**

Christisonia bicolor Gard., Calcutta J. Nat. Hist. 8 : 160. 1847; Hook.f., Fl. Brit. India 4: 322. 1884; Gamble, Fl. Pres. Madras 975. 1924; Sasi. & Sivar., Flow. Pl. Thrissur For. 327. 1996. *C. aurantiaca* Wight, Ic. t. 1486. 1849.

Stem 3-12 cm long, slender, ascending, unbranched, densely squamose above, naked below. Scales 2-5 mm long, broadly ovate, obtuse, glabrous. Flowers shortly pedicellate or subsessile, solitary in the axils of upper scales; pedicels 6-25 mm long, stout, sparsely pilose to subglabrous. Bracteoles 2, 6-6.5 x 3.5 mm, glabrous, ovate-lanceolate, acute. Calyx 13-4.5 mm long, orange-scarlet to brick red, sparsely short villous; lobes acute to subacuminate. Corolla 4.5-5 cm long; limb 2.5-2.75 cm diam., tube pale yellow or white, shortly villous without, limb pure white with yellow throat. Stamens shortly-filamented, glandular pilose.

Fl.: July-Sept.

Distr.: South India and Sri Lanka.

Note: Fairly common in evergreen forests above 1200 m. Parasitic mainly on members of Acanthaceae.

Occurrence & Specimens studied: **Idukki Dist.:** Anathodu, *Pandurangan* 75299 (MH); Mangaladevi, *Vivekanandan* 50551 (MH). **Palakkad Dist.:** Anawai, *AESK* 25468; Naduvattam, *Lawson* 36508 (MH); Poochapara, *V.J. Nair* 67428 (MH). Mahendragiri, *Shetty* 32366 (MH).

Christisonia keralensis Erady, J. Bombay Nat. Hist. Soc. 64 (1): 10-12. 1967.

Parasitic herbs; stem 2-8 cm long, irregularly cylindrical, unbranched with deltoid scale leaves. Inflorescence solitary and terminal or rarely 2-3 arising from the axils of scale leaves, 5-10-flowered racemes. Peduncles 20-30 cm long, up to 1.2 cm thick at the base, glabrous and light brownish-pink. Bracts 1-1.5 x 0.5-0.8 cm, light brownish pink; lower ones sterile and deltoid; upper one fertile and ovate; pedicels 1.5-3 cm long, brownish pink. Flowers 3.5-3.8 x 1.2-1.5 cm, glabrous, light brownish-pink; tubular, campanulate with 5-subequal triangular lobes. Corolla tube slightly curved, creamy white, glandular hairy, sub-bilabiate; lobes 5, 0.8-1 cm broad, bright violet, orbicular, reniform. Stamens 4; filaments light purplish, glandular hairy; anthers 2-celled, one of the cells fertile, dehiscing longitudinally. Ovary unilocular; style glabrous, included but reaching above the level of anthers; stigma peltate with a narrow depression in the centre.

Fl. & Fr.: Aug.-Sept.

Distr: South India; endemic.

Note: On the roots of *Ficus asperrima* Roxb.

Occurrence & Specimen studied: **Palakkad Dist.:** Nelliampathy, *Erady 1117* (Victoria College Herbarium, Palakkad).

Christisonia neilgherrica Gard., Calc. J. Nat. Hist. 8: 157. 1847; Hook.f., Fl. Brit. India 4: 322. 1884. *Campbellia cytinioides* Wight, Ic. t. 1425. 1849; Gamble, Fl. Pres. Madras 976. 1921.

Scapes 3-10 cm long, stout, simple, densely squamose below inflorescence, less dense below. Scales up to 1 cm long, broadly ovate, obtuse, imbricate. Flowers 3-8, densely crowded, racemose, yellow. Pedicels 1-1.25 cm long, thick from axils of large bracts about equalling its length, with two bracteoles. Bracteoles oblong-spathulate, acute, denticulate at apex. Calyx 2 cm long, glabrous or pubescent, persistent; lobes broadly triangular, subacute. Corolla 3-3.75 cm long, tubular below, infundibuliform above, pubescent without, glabrescent, upper lip 2-lobed, lower 3-lobed; lobes obtuse, rounded, middle lobe smaller. Ovary ovoid, glabrous. Style filiform, glabrous, persistent. Capsule 1-1.3 cm wide, globose, enclosed within persistent calyx. Seeds 1 mm long, narrowly oblong, obtuse, pale yellow-brown, reticulated.

Fl. & Fr.: Sep.-Nov.

Distr.: India and Sri Lanka. Very rare in Kerala.

Note: Parasitic on the roots of the species of *Strobilanthes*. Panigrahi and Das (1982) treated *Campbellia* Wight as a distinct genus. In 1983, Panigrahi reversed his earlier

opinion and agreed with Hooker's taxonomic treatment of *Capmbellia* Wight as congeneric with *Christisonia* Gard. Hooker's view is followed here.

Occurrence & Specimen studied: Idukki Dist.: Devikulam, Umayya Mala, Shetty 26628 (MH).

Christisonia tubulosa Benth. ex Hook.f., Fl. Brit. India 4: 321. 1884; Gamble, Fl. Pres.

Madras 975. 1924; Mohanan & Henry, Fl. Thiruvananthapuram 334. 1994.

Oligopholis tubulosa Wight, Ic. t. 1422. 1849. (**Plate VIII-D**).

Parasitic herbs. Stem tall, flexuous, up to 25 cm, simple or branched. Scape very few, distant, acute, glabrous. Flowers pedicellate, solitary in the axils of scales. Pedicels slender, 2.5-5 cm, glabrous. Bracts obtuse. Bracteoles 0. Calyx 2.5-3.5 cm long, pink, glabrous; lobes angular, acute. Corolla 3.5-6 cm long, whitish-yellow, glabrous; lobes rounded, entire, pink to magenta. Stamens 4; filaments pubescent; spur of anther acute. Ovary 1-celled; stigma cupular. Capsule spherical.

Fl. & Fr.: Aug.-Nov.

Distr.: India; endemic. Throughout in Kerala.

Note: Occur in evergreen forests above 1200 m.

Occurrence & Specimens studied: Thiruvananthapuram Dist.: Chemunji, N. Mohanan 8153; Athirumala, N. Mohanan 4217, 4219; *Ibid.*, J. Joseph 44554 (MH); Dharpakulam, Ponmudi, N.C. Nair 51098 (MH). **Idukki Dist.:** Peruvanthanam, Ravi 24768; Walara, AESK 12812; Neriamangalam, AESK 18395; Munnar, Abdul Jabbar 14470; Iruttukanam, Pandurangan 66472 (MH); Nadugani, Vivekananthan 50543 (MH); Kuttampuzha,

Bhargavan 92084 (MH); Kazhalipuzha, *Bhargavan 90038* (MH). **Thrissur Dist.:** Vazhachal, *Pandurangan 31136* (MH); Sholayar, *AESK 31168*. **Kottayam Dist.:** Cheeyapara, *Sebastine 25332* (MH). **Kozhikkode Dist.:** Chedalethu, *Ellis 19988* (MH). **Wayanad Dist.:** Pakshipathalam, *AESK 17347*. **Kannur Dist.:** Santhigiri, *AESK 42185*.

SCROPHULARIACEAE A. L. Jussieu

Gen. Pl. 117. 1789, *nom. cons.*

Unarmed, annual or perennial herbs or shrubs, sometimes root parasites. Leaves usually opposite, rarely all alternate or whorled. Flowers axillary, solitary, or in terminal spikes, bisexual, zygomorphic. Calyx generally tubular or campanulate; lobes 4-5, free at base. Corolla limb 2-lipped; lobes 4-5, imbricate or valvate in bud. Stamens inserted on corolla tube, generally 2 or 4 with anterior one sometimes reduced to staminodes, didynamous. Ovary superior, sessile, 2-locular, with axile placentation; ovules numerous in each cell; style terminal; stigma capitate. Fruit a capsule, septicidally or loculicidally dehiscent.

A large family considered to be tropical in origin but cosmopolitan in distribution, with about 220 genera and 3000 species.

STRIGA Lourerio

Fl. Cochinch. 17, 22. 1790

Annual, semiparasitic, scabrid herbs; stem erect. Leaves opposite below, alternate above, generally linear to subulate, sometimes reduced to scales. Flowers axillary, solitary, in terminal bracteate spikes, usually minutely bi-bracteolate. Calyx tubular, strongly 5-15-ribbed; lobes 5-fid. Corolla tube narrow, incurved near middle, two posterior lobes of limb inside in bud; upper lip usually emarginate or bifid; lower lip spreading, 3-lobed. Stamens 4, included, didynamous; anthers 1-celled, vertical, the connective sometimes mucronate. Stigma thickened or clavate. Capsule oblong, loculicidally 2-valved; valves entire. Seeds numerous, obovoid or oblong.

Paleotropic in distribution and having about 40 species.

Key to the species

1. Stem leafless; leaves reduced to scales; calyx-ribs as many as the number of lobes
.....**S. gesnerioides**
1. Stem with ordinary leaves; calyx-ribs more than the number of lobes.....**2**
2. One calyx-rib terminating at the tip of each lobe, the rest terminating at sinuses;
flowers chrome-yellow **S. asiatica**
2. Three Calyx-ribs terminating at the tip of each lobe; flowers white.....
..... **S. angustifolia**

Striga angustifolia (Don) Saldanha, Bull. Bot. Surv. India 5: 70. 1963; Cramer, in Dassan. & Fosb., Rev. Hanb. Fl. Ceylon 3: 401. 1981; Manilal & Sivar., Fl. Calicut 195. 1982; Manilal, Fl. Silent Valley 196. 1988; Ramachandran & Nair, Fl. Cannanore 321. 1988; Vajravelu, Fl. Palghat 327.1990; Mohanan & Henry, Fl. Thiruvananthapuram 331. 1994; Sasi. & Sivar., Flow. Pl. Thrissur For. 325. 1996. *Buchnera angustifolia* Don, Prodr. Fl. Nep. 91. 1825. *B. euphrasioides* Benth., Scroph. Ind. 41. 1835, non Vahl, 1794. *Striga euphrasioides* (Benth.) Benth. in Hook., Comp. Bot. Mag. 1: 364. 1836; Hook.f., Fl. Brit. India 4: 299. 1884; Wight, Ic.t. 855. 1834; Gamble, Fl. Pres. Madras 2: 968. 1921.

Stem up to 40 cm high, obtusely quadrangular, scabrid, often branched. Leaves 10-20 x 1.5-2.5 mm, linear, setulose on both surfaces, ciliolate on margins. Flowers in lax, erect spikes. Pedicels 1 mm long. Bracteoles subulate, 2 mm long, minutely strigose without. Calyx tube 5-6 mm, 15-ribbed; lobes linear-lanceolate, 3 x 1 mm, acuminate, faintly purplish at tips. Corolla white; tube linear, 10-11 mm long, minutely hirsute without; upper lip broadly orbicular, 3 x 5 mm, shallowly emarginate; lower lip 10-12 mm across; lateral lobes 3-4 mm long; mid one broadly ovate, 6 x 3 mm. Style gabrous. Capsule 5-6 x 3 mm, ovoid, rounded at top, apiculate by withered style, glabrous; dehisced valves strongly reflexed. Seeds cuneiform, trigonous, glabrous, black.

Fl. & Fr.: Aug.-Oct., Dec.-May.

Distr.: India, Sri Lanka, Indonesia. Throughout in Kerala.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Athirumala, AESK 7257; Veli, Narayana Iyer s.n. **Kollam Dist.:** Kollam, C.N. Mohanan 69341 (MH). **Idukki Dist.:** Thekkady, Sharma 40873 (MH). **Thrissur Dist.:** Trichur, Ramamurthy 47229 (MH). **Palakkad Dist.:** Olavakkode, J. Joseph 17763 (MH); Aruvanpara, N.C. Nair 64419 (MH); Nelliampathy, Radhakrishnan 29082. **Kannur Dist.:** Muthaplangady, Ramachandran 66995 (MH); Kuthuparamba, s.coll. 9246 (MH); Thalipparamba, Barber 6481 (MH). **Kasaragod Dist.:** Hosdurg, Ansari 64840 (MH).

Striga asiatica (L.) Kuntze, Rev. Gen. Pl. 2: 466. 1891; Hepper, Rhodora 76: 46. 1974; Cramer in Dassan. & Fosb., Rev. Hanb. Fl. Ceylon 3: 400. 1981 Manilal & Sivar., Fl. Calicut 194. 1982; Manilal, Fl. Silent Valley 194. 1988; Ramachandran & Nair, Fl. Cannanore 321. 1988; Mohanan & Henry, Fl. Thiruvananthapuram 332. 1994; Sasi. & Sivar., Flow. Pl. Thrissur For. 326. 1996. *Buchnera asiatica* L., Sp. Pl. 630. 1753, p.p. *Striga lutea* Lour., Fl. Cochinch. 22. 1790; Hook.f., Fl. Brit. India 4: 299. 1885; Gamble, Fl. Pres. Madras 2: 967. 1921. **(Plate VIII-C).**

Stem up to 22 cm high, rigid, occasionally branched above, setulose. Leaves linear, 5-11 x 1-2 mm, rounded at base, subacute at apex, ciliolate at margins, setulose on both surface. Flowers in terminal lax spikes. Bracts linear-lanceolate, 3-6 x 0.5-1 mm, minutely hispid on both surface. Bracteoles linear-subulate, 2-4 mm long, ciliolate at margins. Calyx tube 3-4 mm long, acuminate, scabrid without. Corolla creamy yellow; tube glandular puberulous without; throat villous; upper lip suborbicular, 2-lobed above; lower lip 6-7 mm across, lobes obovate, 2-3 mm long, minutely dotted, brown above; midlobe

larger than the lateral. Style glabrous; stigma 2-lobed. Capsule ovoid, obtuse at apex, glabrous, dark brown. Seeds irregularly oblong-cuneate, black.

Fl. & Fr.: Round the year.

Distr.: South Africa, India, Sri Lanka and South East Asia. Throughout in Kerala.

Notes: Occur in open grassy places of hilly areas, and parasitic on the roots of grasses.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Athirumala, N. Mohanan 9613; Ponmudi, AESK 2264; Veli, M. Mohanan 54900 (MH); Trivandrum, J. Joseph 46493 (MH); Veli, Narayana Iyer s.n.; Nadayara, C.N. Mohanan 63158 (MH). **Pathanamthitta Dist.:** Ranni, C.N. Mohanan 68374 (MH); Pamba, Vivekananthan 48348 (MH); Pathanamthitta, C.N. Mohanan 58346 (MH). **Idukki Dist.:** Kuttikkanam, Vivekananthan 20323 (MH); Kulamavu, C.N. Mohanan 74038, 74520 (MH); Painavu, C.N. Mohanan 55749 (MH). **Kottayam Dist.:** Manganum, Antony 849 (MH); Kottayam, Deb 30349 (MH). **Ernakulam Dist.:** Ernakulam, Binoy 233. **Thrissur Dist.:** Athirappally, Panduranagan 30703. **Malappuram Dist.:** Calicut University Campus, Shanti K.Nair 2149; *Ibid.*, Jayalekshmi 12621. **Kannur Dist.:** Hosdurg, Ansari 64780 (MH); *Ibid.*, Gamble 9246 (MH); Thalipparamba, Barber 7119 (MH); Kuthuparamba, Gamble 9248 (MH).

Striga gesnerioides (Willd.) Vatke, Oesterr. Bot. Z. 25: 11. 1875; Cramer in Dassan. & Fosb., Rev. Hanb. Fl. Ceylon 3: 399. 1981; Manilal, Fl. Calicut 194. 1982. *Buchnera gesnerioides* Willd., Sp. Pl. 3: 338, 1800. *B. orobanchioides* R. Br., Salt. Abyss. App. 64. 1814, *nom. nud. ex* Endl., Bot. Zeit. 2: 388, t. 2.1832. *Striga orobanchioides*, (R.

Br. ex Endl) Benth. in Hook., *Comp. Bot. Mag.* 1: 36, t. 19. 1836; Hook. f., *Fl. Brit. India* 4: 299.1885; Wight, *Ic. t.* 1414. 1849; Gamble, *Fl. Pres. Madras* 966. 1921.

Stem erect, 20-40 cm high, leafless, terete, scabrid, globose, tuberous at base. Scales triangular, 3-4 cm long, crowded and overlapping at base. Flowers whorled in erect, tapering spikes. Bracts 7 x 2.5 cm, ovate, sub-acuminate, concave, pale green. Bracteoles linear-lanceolate, 3.5 x 1 mm, acuminate, scabrid. Calyx tube 2.5-3 mm long, scabrid without, 5-ribbed; ribs terminating at the apex; lobes unequal, linear, 3-5 mm long, acuminate, pale green. Corolla white or pale pink; tube up to 11 mm long, glabrous; upper lip irregularly obovate, 3 mm long; lower lip 5 mm long, lobes cuneiform; throat villous within. Filaments short. Style glabrous; stigma capitate, bent. Capsule 5-7 x 3 mm, ovoid, globose, glabrous apiculate by long, withered style

Fl. & Fr.: Aug. – Feb.

Distr.: South Africa, Arabia, Sind, India and Myanmar.

Note: Found as root parasites in grasslands.

Occurrence & Specimens studied: **Kannur Dist.:** Thaliparamba, Barber 7116 (MH).

Kasaragod Dist.: Kasaragod, Ansari 73973 (MH).

VISCACEAE Batsch

Tab. Affin. Regni. Veg. 240. 1802.

Aerial parasites, pubescent or glabrous. Branches evergreen, usually forked, brittle and much branched with generally swollen and articulated nodes. Leaves opposite, simple, entire, evergreen or sometimes reduced to scales. Flowers minute, unisexual, solitary or clustered at the nodes or in cymes. Perianth segments 2-4, valvate. Staminate flowers with stamens opposite, adnate or free, equal in number to the tepals, sometimes with a vestigial style. Pollen spherical. Pistillate flowers with simple style and terminal stigma. Ovary inferior, uniloculate and with one ovule. Fruit baccate with a viscous layer and persistent tepals. Seeds with endosperm, single; eaten and distributed by birds.

A family of 7 genera and about 400 species is found in all continents but with greatest development in tropical, subtropical and north temperate regions. Two genera are known from Kerala.

Key to the genera

1. Mature plants usually 5-8 cm high; internodes not twisted above the nodes; inflorescence with pubescence between the flowers**Korthalsella**
1. Mature plants usually over 20 cm high; internodes twisted to 90° just above the nodes; inflorescence glabrous.....**Viscum**

KORTHALSELLA Tieghem

Bull. Soc. Bot. France 43: 83. 1896.

Plants monoecious, leafless, less than 8 cm high; glabrous except for the inflorescence. Internodes often flattened, compressions always on the same plane. Inflorescence apparently a dichasium produced laterally at the nodes, flowers subtended by trichomes. Flowers 3-merous; staminate flowers without filaments. Pistillate flowers with a short tube giving rise to the perianth segment. Fruit clavate or pyriform.

Seen in Asia, Africa and Pacific with about 20 species. Only one species is seen in India. It is very rare in Kerala.

Korthalsella japonica (Thunb.) Engler in Engler & Prantl, Pflanzenf. 1: 138.1887, var.

japonica . Gamble, Fl. Pres. Madras 1256. 1925. *Viscum japonicum* Thunb., Trans.

Linn. Soc. London 2: 329. 1794; Hook.f, Fl. Brit. India 5: 226. 1886.

A small tufted leafless parasite; branches flattened, contracted at nodes furnished with bracteate scale at the joints. Internodes 6-8 mm long, 2-4 mm wide. Flowers in the axils of the scales, monoecious, surrounded by tufts of hairs; male and female with 3 perianth lobes, which are persistent after fruiting. Anthers 2-3-celled, cells opening introrsely by longitudinal slits, connected at their margins. Ovary obovoid, placenta central; stigma small. Fruit an obovoid fleshy berry with viscid mesocarp; embryo basal. Seeds albuminous.

Chrom. No.: n=14 (Barlow, 1964)

Fl. & Fr.: Round the year.

Distr.: India, China, Mauritius, Japan and Australia.

Occurrence & Specimens studied: **Idukki Dist.:** Umayamala, Shetty 26493 (MH).

Anamala, Fischer 3322 (CAL); *Ibid.*, AESK 8364; Kundalai, Fischer 2544 (CAL).

Host Plants: *Rhododendron neilgiricum* Zenk., *Vaccinum leschenaultii* Wight.

VISCUM Linnaeus

Sp. Pl. 1023. 1753.

Plants monoecious, glabrous, forming orbicular masses or sometimes pendulous, di- or trichotomously branched. Internodes terete or flattened, with or without leaves. Inflorescence axillary or sometimes reduced to a single flower. Flowers mostly 4-merous, bracteate. Staminate flowers with the anthers adnate to the perianth segment, opening by the lateral pores. Pistillate flowers with sub-conical style and stigma. Fruit with the perianth segments usually dehiscent.

A genus of about 75 species occurring throughout the tropical and subtropical areas of the Old World, but with the greatest development of species in Tropical Africa and the Malagasy Republic. Seven species are reported from Kerala.

Key to the species

- 1. Plants leafless. **2**
- 1. Plants leafy, but older plants sometimes with only with a few persistent leaves.
..... **3**
- 2. Internodes terete or angled, usually less than 2 mm in diameter, often filiform.
..... **V. angulatum**
- 2. Internodes flattened, usually over 3 mm wide, never filiform. **V. articulatum**
- 3. Fruits warty during development..... **V. heyneanum**
- 3. Fruits sometimes gland-dotted, but smooth during all phases of development.
..... **4**
- 4. Leaves at maturity conduplicately folded, mostly deciduous with age... **V. capitellatum**
- 4. Leaves at maturity never folded, persistent with age **5**
- 5. Leaves truncate or shallowly trilobate..... **V. trilobatum**
- 5. Leaves never truncate or trilobate..... **6**
- 6. Leaves highly variable, but mostly ovate to oblong-elliptical, usually not lanceolate or
falcate; fruits usually ovate to orbicular, not apically truncated; peduncle persistent.
..... **V. orientale**
- 6. Leaves usually elliptic-lanceolate and falcate; fruits oblong, apically truncated;
peduncle caducous or absent **V. monoicum**

Viscum angulatum Heyne ex DC., Prodr. 4: 283. 1830; Hook.f., Fl. Brit. India 5: 225.
1886; Gamble, Fl. Pres. Madras 1259.1925; Rao, J. Ind. Bot. Soc. 36: 140. 1957;
Manilal, Fl. Silent Valley 241. 1988; Ramachandran & Nair, Fl. Cannanore 402.

1988; Vajravelu, Fl. Palghat 409. 1990; Sasi. & Sivar., Flow. Pl. Thrissur For. 385. 1996; Sivar. & P. Mathew, Fl. Nilambur 591. 1997. *V. ramosissimum* Wall. ex Wight, Ic. t. 1017. 1845.

Plants slender, pendulous, yellowish-green; internodes at base terete, mostly 2-2.5 cm long, 1-2 mm wide, young shoots 4-angled; nodes not swollen or contracted, minutely scaly. Inflorescence dichasia or very minute flowers, sometimes solitary or whorled at the nodes. Bracts 2, minute. Perianth tubular in staminate flowers; united with ovary in pistillate flowers, slightly 4-lobed, minute, 1-celled; ovule 1; stigma short, sessile. Berry globose, smooth, hyaline on ripening, 3-5 mm in diam.

Chrom. No.: n = 12 (Soman & Bhavanandan, 1995)

Fl. & Fr.: Oct.–July

Distr.: Indo-Malesia to Australia

Note: There are variations in species with very long, terete, slender young branches which resembles *V. ramosissimum* Wall. ex Wight. Rao's (1957) treatment in merging this with *V. angulatum* is justifiable.

Occurrence & Specimens studied: **Idukki Dist.:** Marayoor, AESK 23375. **Palakkad Dist.:** Mully, AESK 25456, 25463. Nelliampathy, Vajravelu 60403 (CAL); Ayyappankovil, Vajravelu 60403 (MH). **Wayanad Dist.:** Sultan Bathery, Ellis 18699 (MH); Thirunelly, AESK 17315, 23326; *Ibid.*, Ramachandran 53824 (MH); Kuruwa, AESK 22360; Periya, AESK 20305; SE Wayanad, Gamble 15436 (MH); Boys Town, AESK 44223.

Host Plants: *Acacia sundra* DC., *Cassia montana* Heyne, *Erythrina monogynum* Roxb., *Ficus bengalensis* L., *F. benjamina* L., *F. retusa* L., *Fluggea leucopyrus* Willd., *F. microcarpa* Bl., *Ligustrum travancoricum* Gamb., *Litsea* sp., *Taxillus cuneatus* (Heyne ex Roth) Danser, *Dendrophthoe memecylifolia* (Wight & Arn.) Danser, *Olea dioica* Roxb., *Opilia amentacea* Roxb., *Rhus mysorensis* Heyne, *Santalum album* L., *Terminalia paniculata* Roth, *Ziziphus jujuba* Lam., *Z. nummularia* Wight & Arn., *Ziziphus xylopyrus* Willd.

Viscum articulatum Burm.f., Fl. Ind. 211. 1768; Hook.f., Fl. Brit. India 5: 226. 1886, *p.p.*; Gamble, Fl. Pres. Madras 1259.1925; Rao, J. Ind. Bot. Soc. 36: 126. 1957; Wiens in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 6: 134. 1987; Sasi. & Sivar., Flow. Pl. Thrissur For. 388. 1996. *V. nepalense* Spreng., Syst. Veg. 4: 47. 1827; Danser, Blumea 4: 283. 1841; Vajravelu, Fl. Palghat 413. 1990. (**Fig. 27**).

Plants usually pendulous, sometimes whorled; yellowish-green; basal internodes often rounded; succeeding internodes decussately flattened, although appearing in a single plane because of 90 degree twist just above the nodes, 3-4 cm long, 3-5 mm wide, longitudinally striated. Flowers subtended by two coalescent bracteoles, originating at the nodes; pistillate flowers often solitary, but common; staminate flowers smaller and less prevalent. Fruits suborbicular, 4 mm in diameter, whitish.

Chrom. No.: n=12 (Barlow, 1963)

Fl. & Fr.: Round the year.

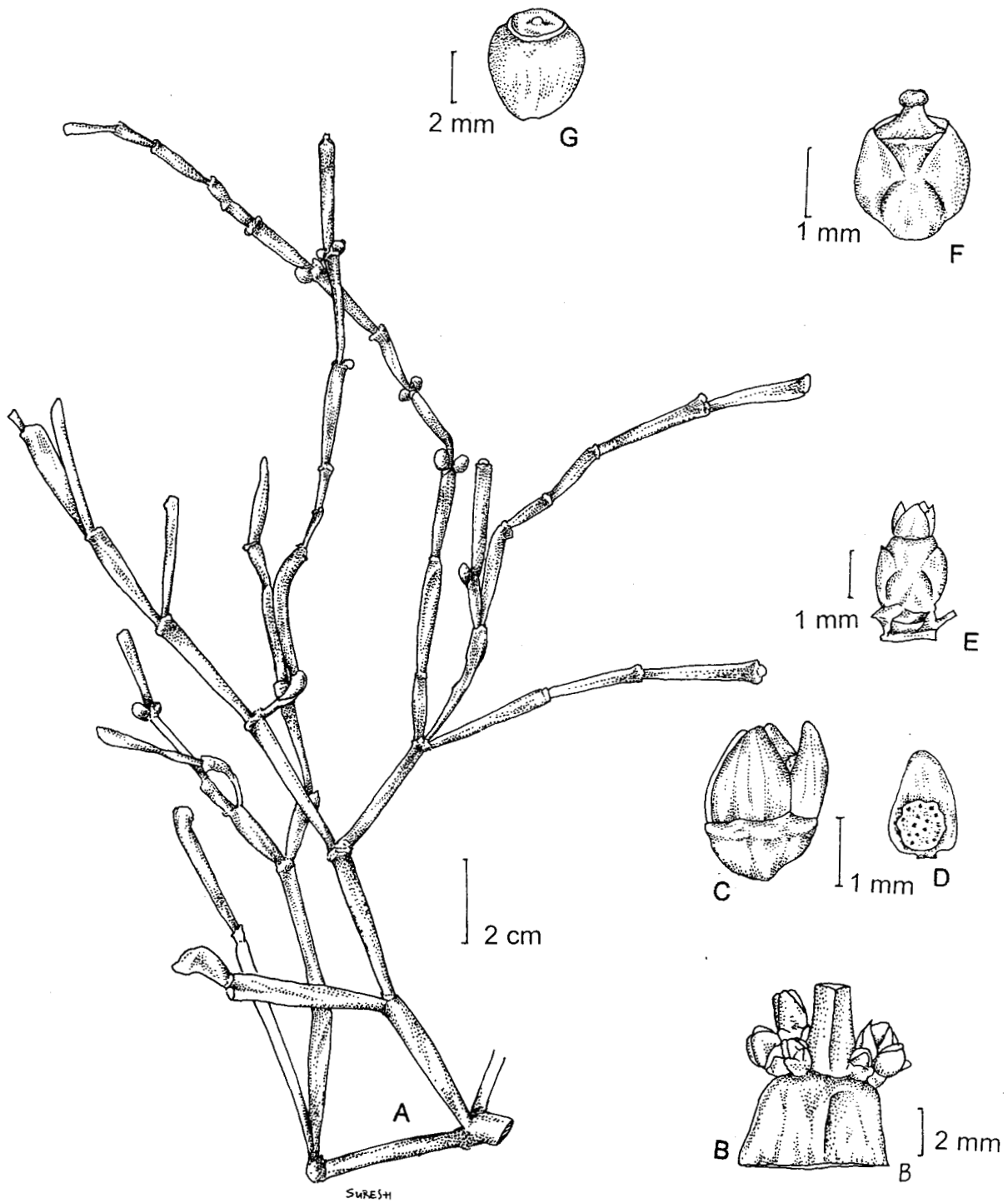


Fig. 27. *Viscum articulatum* Burm. f.: A. Habit; B. Male inflorescence; C. Male flower; D. Perianth with anther; E. Female flower; F. Carpel; G. Fruit.

Distr.: Indo-Malaysia to Australia.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.**: Bonaccord, *AESK* 7224, 16004. **Kollam Dist.**: Aryankavu, *Bourdillon* 693 (CAL). **Idukki Dist.**: Kundalay, *AESK* 7558; Marayoor, *AESK* 23373. **Palakkad Dist.**: Attappady, *Fischer* 1764 (CAL); Chindaki, *N.C. Nair* 64680 (MH, CAL); *Ibid.*, *Vajravelu* 27753 (MH); Sappal hills, *Joseph* 17830 (MH). “**Travancore**”, *RamaRao s.n.* (CAL).

Host Plants: *Acacia sundra* DC., *A. ferruginea* DC., *A. tomentosa* Willd., *Anogeissus latifolia* Wall., *Buchanania lanzan* Spreng., *Cassia montana* Heyne, *Diospyros melanoxyton* Roxb., *D. paniculata* Roxb., *D. tomentosa* Roxb., *Dalbergia latifolia* Roxb., *Elaeocarpus tuberculatus* Roxb., *Grewia tiliaefolia* Vahl, *G. rotundifolia* Juss., *Hardwickia binata* Roxb., *Ixora parviflora* Vahl., *Kydia calycina* Roxb., *Macrosolen parasiticus* (L.) Danser, *Mundulea suberosa* Benth., *Ochna squarosa* L., *O. beddomei* Gamble, *Premna tomentosa* Willd., *Rhus mysorensis* Heyne, *Santalum album* L., *Schleichera oleosa* (Lour.) Oken, *Terminalia paniculata* Roth, *Ziziphus jujuba* Lam., *Z. oenoplia* Mill, *Z. xylopyrus* Willd.

Viscum capitellatum J.E. Smith in Rees, *Cyclop.* 37: 18. 1817; Hook.f., *Fl. Brit. India* 5: 225. 1886 *p.p.*; Gamble, *Fl. Pres. Madras* 1258. 1925; Rao, *J. Ind. Bot. Soc.* 36: 166. 1957; Wiens in Dassan. & Fosb., *Rev. Handb. Fl. Ceylon* 6: 418. 1987; Manilal & Sivar., *Fl. Calicut* 253. 1988.

Plants usually pale green, densely branched, producing a whorl of stem form a shortened, swollen, basal attachment; older branches whorled at the nodes; internodes

rounded or compressed; sometimes grooved, greatly variable in size, up to 6 cm long, 1-3 mm diameter. Leaves usually present on young plants, often deciduous on older plants, subsessile, obovate 2-2.5 x 1 cm, cuneate-decurrent at the base, rounded at apex, generally conduplicate and vertically folded or rolled. Inflorescence mostly axillary; dichasia born on peduncle, up to 5 flowers, dichasia subtended by two coalescent bracts forming a naviculate involucre, 2-3 mm long, the peduncle sometimes bearing 2 whorls of dichasia, the central flower of each dichasium staminate, laterals pistillate. Fruits 4 x 3 mm, orbicular-elliptical, smooth, apparently light green at maturity.

Chrom. No.: n =12 (Barlow, 1963)

Fl. & Fr.: Dec.-July

Distr.: India and Sri Lanka.

Occurrence & Specimens studied: **Palakkad Dist.:** Attappady, *Fischer 1743* (CAL); Mulli, *AESK 25448*; Bhavani Bank, *Vajravelu 27742* (MH.); Mangalam Dam, *Vajravelu 46144* (MH). **Kozhikkode Dist.:** Kozhikkode, *Sivarajan 1115* (CALI)

Host Plants: *Albizzia odoratissima* Benth. , *Dendrophthoe falcata* (L.f.) Etting., *Erythroxylum monogynum* Roxb., *Excoecaria agallocha* L., *Taxillus tomentosus* (Roth) Tiegh.

Viscum heyneanum DC., Prodr. 4: 278. 1830; Rao, J. Ind. Bot. Soc. 36: 140. 1957; Wiens in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 6: 417. 1987. *V. verruculosum* Wight & Arn.,

Prodr. 379. 1834; Hook.f., Fl. Brit. India 5: 224. 1886; Gamble, Fl. Pres. Madras 1258.1925.

Plants usually dark green; branches dense and sometimes whorled apically, decussately arranged basally, internodes generally terete; younger internodes minutely ridged and tip of the branches flat. Leaves 3-4.5 x 1.5-3 cm, mostly obovate to oblong-elliptic, acute-cuneate at abse, obtuse-rounded at apex, glabrous, coriaceous, curvinervous with 3-distinct veins. Inflorescence axillary, 3-5 per node, dichasia short-peduncled, 4-6 mm long, bearing 3 flowers subtended by 2 coalescent bracts forming a naviculate involucre of 3 mm long. Female flowers 3.5 x 2 mm. Perianths 4, oblong, obtuse at apex, gland-dotted, margins hyaline, creamy-yellow with red dots inside, 1.25 x 0.9 mm. Ovary green, warty, stigma truncate, staminode 1. Male flowers 2.5 x 1.5 mm; perianth linear-oblong, acute at tip, creamy-yellow. Stamens 4, adnate to perianth, attached to the upper portion; anthers globose, opening by the lateral pores. Fruits elliptic-ovate, warty; ovule 1, embedded in thick slimy mucilage.

Chrom. No.: n =14 (Soman & Bhavanandan, 1995)

Fl. & Fr.: Apr.-Dec.

Distr.: South India and Sri Lanka.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Bonaccord, N. Mohanan 8172,11405; Ponmudi, Aesk 8837; Palode, Aesk 15752; **Kollam Dist.:** Venkolla, Aesk 7507. **Pathanamthitta Dist.:** Moozhiar, Aesk 15731. **Thrissur Dist.:** Athirappally,

Pandurangan 30501. **Palakkad Dist.:** Mukkali, AESK 25447; Mulli, AESK 25466.

“**Travancore**”, *Boudillon* 650 (CAL).

Host Plants: *Fluggea microcarpa* Bl., *Grewia flavescens* Juss., *Helicteres isora* L., *Helixanthera wallichiana* (Schult.) Danser, *Mallotus philippinensis* Muell.-Arg., *Memcylon umbellatum* Burm., *Putranjiva roxburghiana* Wall., *Santalum album* L., *Syzygium jambolanum* DC.

Viscum monoicum Roxb. ex DC., Prodr. 4: 278. 1830; Hook.f., Fl. Brit. India 5: 224.

1886; Gamble, Fl. Pres. Madras 1258.1925; Wiens in Dassan. & Fosb., Rev. Handb. Fl.

Ceylon 6: 420. 1987; Manilal, Fl. Silent Valley 242. 1988; Sivar. & P. Mathew, Fl.

Nilambur 597. 1997.

Plants pale green, densely and often decussately branched at base; internodes generally terete, 3-5 cm long and 2-3 mm wide. Leaves 5-8 x 1-2.5 cm, elliptic-lanceolate, often falcate, acute-obtuse at base, usually acute at apex, occasionally subacuminate, curvinervous with 5 distinct veins; petiole to 3 mm long. Inflorescence mostly axillary; dichasia subsessile or short pedunculate; peduncle to 1 mm long, 3-5-flowered, subtended by two coalescent bracts forming a naviculate involucre, 2-3 mm long. Bracts apiculate. Perianth 4-lobed. Fruits to 5 x 3mm, oblong, apically truncate.

Fl. & Fr.: Jan.– Nov.

Distr.: India, Sri Lanka, Myanmar.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Bonaccord, *AESK 13202*.
Kollam Dist.: Kottavasal, *AESK 13296*. **Pathanamthitta Dist.:** Muzhiyar, *AESK 15731*;
Kottampara, *AESK 15615*. **Idukki Dist.:** Udumbancholai, *Meebold 13034* (CAL).
Palakkad Dist.: Mulli, *AESK 25457*; Mukkali, *AESK 42174*; Palakkad, *Fischer 1707*
(CAL). **Wayanad Dist.:** Chandanathodu, *AESK 23306*.

Host Plants: *Acacia caesia* Willd., *Adina cordifolia* Hook.f., *Albizzia amara* Boiv., *A. odoratissima* Benth., *Atalantia monophylla* Corr., *Macaranga peltata* Muell.-Arg., *Murraya koenigii* Spreng., *Myristica malabarica* Lam., *Pongamia glabra* Vent., *Punica granatum* L., *Putranjiva roxburghii* Wall., *Santalum album* L., *Schrebera swietenoides* Roxb., *Strychnos nux-vomica* L. *Tetrameles nudiflora* R. Br., *Wrightia tomentosa* R. Br., *W. tinctoria* R. Br., *Ziziphus oenoplea* (L.) Mill.

Viscum orbiculatum Wight, Ic. t.1016. 1845; Hook. f., Fl. Brit. India 5: 224. 1886;
Gamble, Fl. Pres. Madras 1258.1925. *V. heyneanum* DC. var. *liocarpum* Danser,
Blumea 4: 305. 1841.

Small bushy shrubs; branches and branchlets acutely angled and deeply grooved. Leaves 5 x 3 cm, elliptic, obtuse or slightly acute, wavy at margins; 3-5- nerved at base; shortly-petioled. Inflorescence triad in sessile or peduncled axillary clusters. Flowers all or lateral female; inner male; often with 3 perianth lobes. Fruit oblong, rounded at both ends.

Fl. & Fr.: Jun.

Distr.: Kerala and Tamil Nadu.

Occurrence & Specimen studied: **Palakkad Dist.:** Palakkad, *Vajravelu* 62865 (CAL).

Host Plant: *Vaccinium leschenaultii* Wight

Viscum orientale Willd., Sp. Pl. 4: 737. 1805; Hook.f., Fl. Brit. India 5: 224. 1886, p.p.; Gamble, Fl. Pres. Madras 1258. 1925; Wiens in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 6: 419. 1987; Mohanan & Henry, Fl. Thiruvananthapuram 401. 1994; Sasi. & Sivar., Flow. Pl. Thrissur For. 385. 1996.

Plants dark green, branches dense and often branched apically, usually decussately arranged basally; internodes generally terete, younger internodes minutely ridged. Leaves 2-3 x 0.2-0.3 cm, ovate-oblong or elliptic, attenuate at base, obtuse or slightly acute at apex, 3-nerved from the base. Inflorescence axillary, 3-5 per node, dichasia with a short but distinct peduncle, 3-4 mm long, usually the central pistillate and the lateral staminate; subtended by two coalescent bracts forming a naviculate involucre, 2-3 mm long. Fruits ovate-orbicular, smooth, papillose, 6 mm long and 4 mm wide; style deciduous.

Fl. & Fr.: Round the year.

Distr.: India, Sri Lanka, Malaya islands, China, New Guinea, Australia, Bangladesh, Singapore.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Bonaccord, *AESK* 7220, 37663. **Kollam Dist.:** Palaruvi, *AESK* 7358. **Idukki Dist.:** Bodimotta, *Meebold* 13731 (CAL); Chembakala, Chinnar, *AESK* 23380. **Thrissur Dist.:** Chimmini Dam,

Ramamurthy 66238 (CAL). Palakkad Dist.: Attappady, Fischer 1743 (CAL); Mully, AESK 25466. Wayanad Dist.: Mananthavady, AESK 11012.

Host Plants: *Acacia caesia* Willd., *A. amara* Boiv., *Albizzia odoratissima* Benth., *Aphania trifoliolata* Radlk., *Capparis sepiaria* L., *Citrus decumana* L., *Cleistanthus collinus* Benth., *Cryptolepis grandiflora* Wight, *Decalepis hamiltonii* Wight & Arn., *Elaeagnus latifolia* L., *Erythroxylum acuminatum* Walp., *Excocaeria agallocha* L., *Fluggea leucopyrus* Willd., *F. microcarpa* Bl., *Gardenia gummifera* L., *Grewia tiliaefolia* Vahl, *Helecteres isora* L., *Diospyros ebenum* Koen., *Lepisanthes tetraphylla* Radlk., *Loranthus longiflorus* Desr. var. *falcate* (L. f.) Kurz, *Loranthus wallichianus* Schult., *Mallotus philippinensis* Muell.-Arg., *Mangifera indica* L., *Memecylon umbellatum* Burm., *Pongamia glabra* Vent., *Punica granatum* L., *Putranjiva roxburghii* Wall., *Randia longispina* Wight & Arn., *Santalum album* L., *Scutia myrtina* Kurz, *Shorea tumbaggaia* Roxb., *Strychnos nux-vomica* L., *Terminalia arjuna* Wight & Arn., *Wrightia tinctoria* R.Br., *Ziziphus oenoplea* (L.) Mill.

Viscum trilobatum Talb., Forest Fl. of Bombay Pres. & Sind 2: 419. 1976.

Plants usually pale green, much branched; branches terete, somewhat swollen at the nodes; branchlets opposite or whorled, angular, drying yellow. Leaves 2.5-3.6 x 1.5-2.5 cm, triangular-obovate, truncate or trilobate at the apex; middle lobe short, triangular, obtuse, sometimes unequal-sided and narrowed into the petiole at the base, thinly coriaceous, glabrous, drying black; basal nerves obscure; petiole to 0.6 cm long, flattened.

Flowers shortly-peduncled, solitary or in pairs, seated on the concave, boat-shaped, acute, thick, yellow, shining, connate bracteoles. Perianth segments triangular, sub-acute, caducous. Fruits subglobose, 0.6 cm diameter, smooth, shiny, crowned with truncate perianth tube, apiculate.

Fl. & Fr.: Feb.-Apr.

Distr.: Western Ghats; endemic.

Occurrence & Specimens studied: **Thiruvananthapuram Dist.:** Agastyamalai, *AESK* 7218. **Idukki Dist.:** Chinnar, *AESK* 37628; Marayur, *AESK* 23373. **Wayanad Dist.:** Thirunelly, *AESK* 11048.

Host Plant: *Macrosolen parasiticus* (L.) Danser.

TAXONOMIC AND MORPHOLOGICAL ANALYSIS

The study conducted by the Conservation Biology Division of the Tropical Botanic Garden and Research Institute, Palode, Thiruvananthapuram reported that there are approximately 4572 species of angiosperms, belonging to 1278 genera and 207 families in Kerala. The present study revealed that in Kerala there are 209 species of angiospermic epiphytes and parasites belonging to 64 genera and 16 families which represent 4.57%, 5%, and 7.72% of the species, genera and families respectively occurring in Kerala. (Figs. 28, 29, 30).

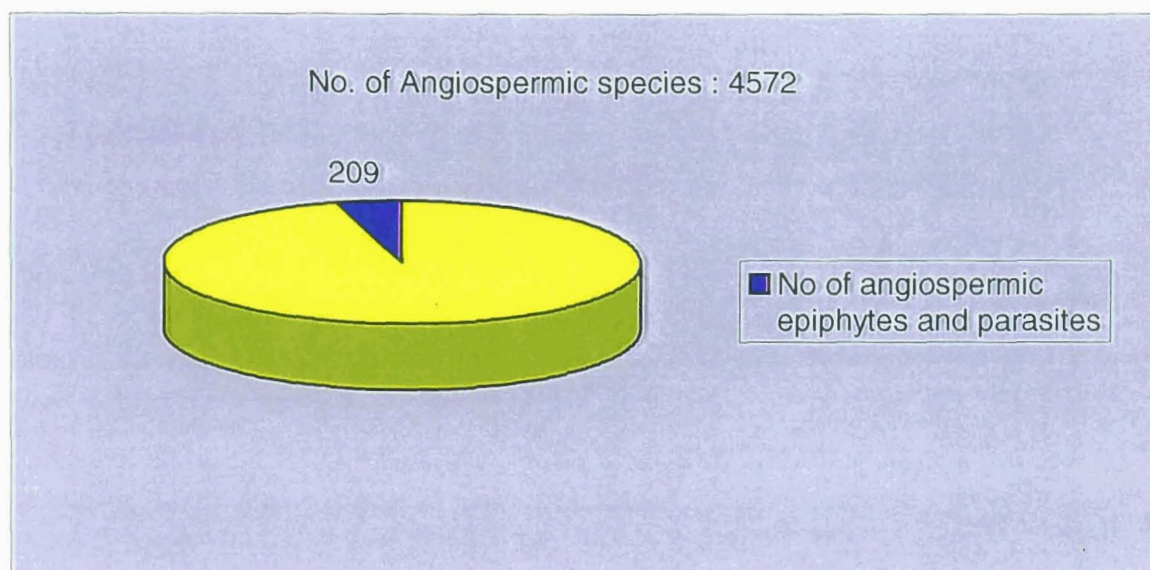


Fig. 28. Relative abundance of angiospermous Epiphytic and parasitic species diversity in Kerala

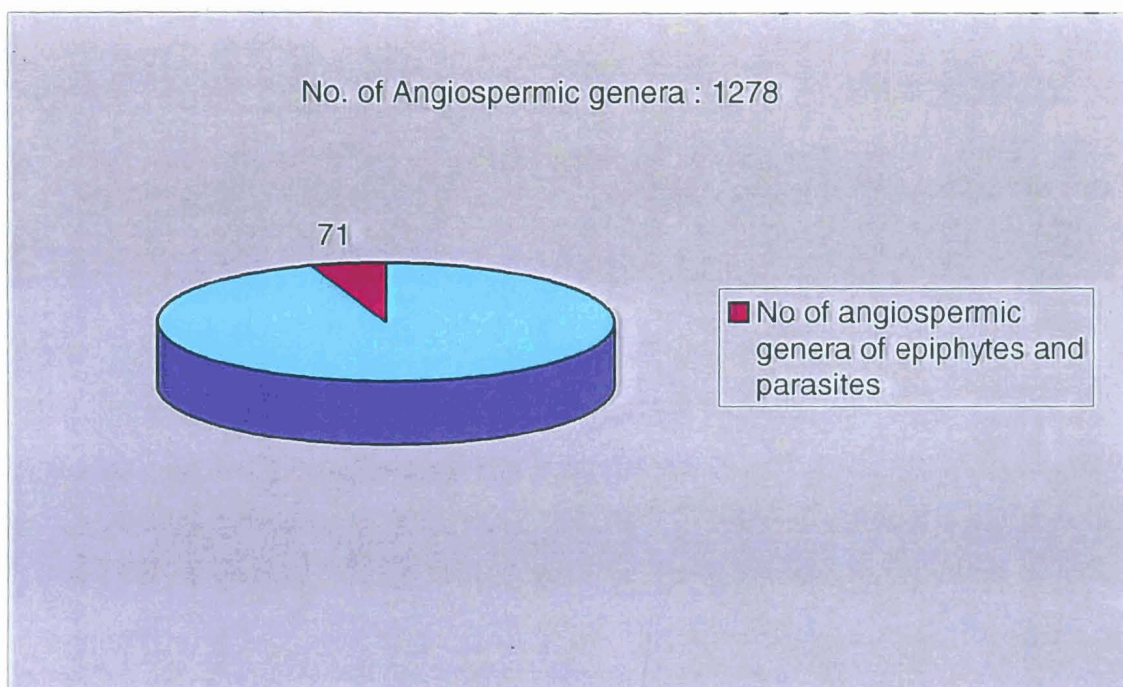


Fig. 29. Relative abundance of angiospermous Generic diversity of epiphytes and parasites

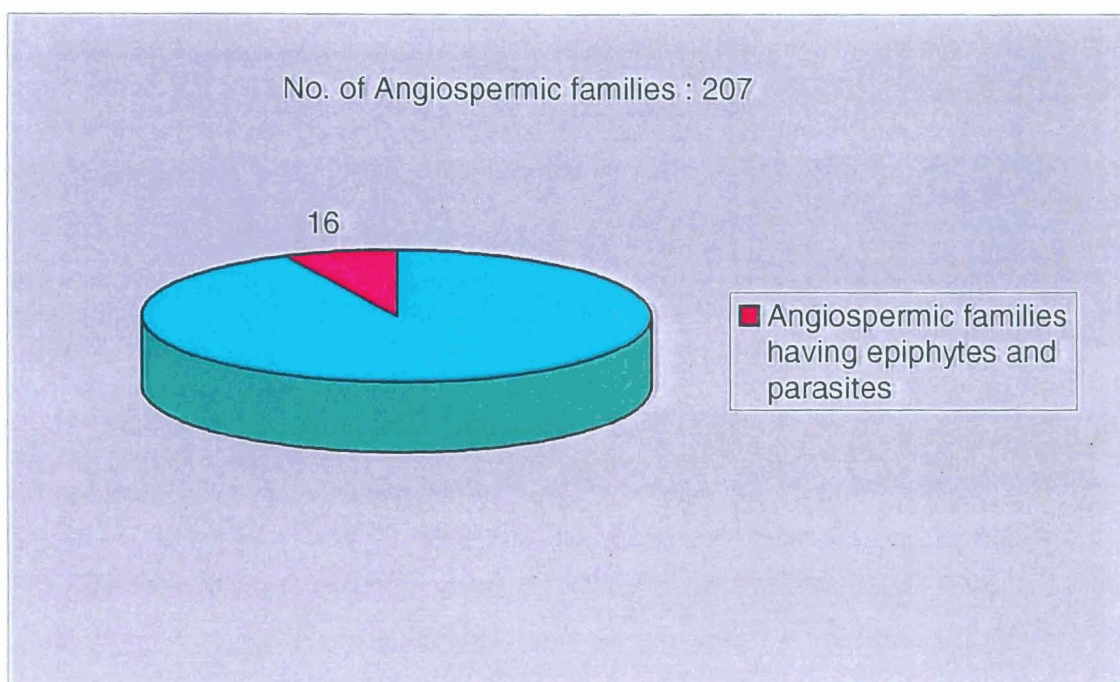


Fig. 30. Relative abundance of angiospermous Epiphytic and parasitic families

EPIPHYTES

The true angiospermic epiphytes alone constitute 165 species belonging to 50 genera and 9 families, which represent 3.60% of the total species, 3.91% of the total genera, and 4.34% of the total angiospermic families of Kerala. Among the epiphytic species the family Orchidaceae represents the largest family with a total of 138 species, which form 83.63% of the total epiphytic species and 82% of the epiphytic genera occurring in Kerala. The monocotyledonous families constitute the major share i.e., 85.45% of the total epiphytes. Among the dicotyledonous families Peperomiaceae, Balsaminaceae and Asclepiadaceae are the families, each with more than 5 species of epiphytes. In the following table, the families with the constituent number of epiphytic species are arranged in the descending order of the abundance of species. The relative abundance of the representative families is graphically represented in Fig. 31.

Sl. No.	Family	Genera	Species
1.	Orchidaceae	41	138
2.	Peperomiaceae	1	7
3.	Balsaminaceae	1	8
4.	Asclepiadaceae	1	5
5.	Araceae	2	2
6.	Melastomataceae	1	2
7.	Loganiaceae	1	1
8.	Gesneriaceae	1	1
9.	Commelinaceae	1	1

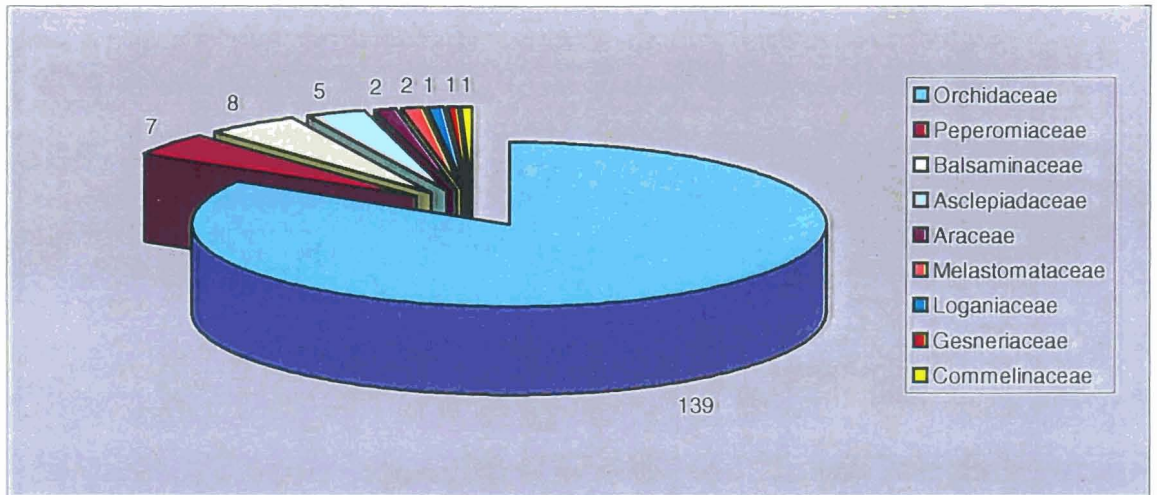


Fig. 31. Relative abundance of the representative families with epiphytic species

A complicated interaction of the microclimatic gradient with the factors of the substratum gives rise to a very great complexity in the distribution of epiphytes within a given area of forest, but in general, they form a number of fairly well defined superposed communities. These were recognised by Schimper (1888) and named, then as 'etages' (stories), which according to Richards (1979) is a somewhat misleading term.

Gams (1918) introduced the term 'synusia' to denote a group of plants of similar life-forms filling the same niche and playing a similar role in the community in which it forms a part. Saxton (1924) attributed broader meaning to the term and accordingly it is an aggregation of species or individuals making similar demands on a similar habitat. The species of the same synusia, though often widely different taxonomically, are to a large extent ecologically equivalent. As suggested by Richards (1979) the storeys of epiphytes are better recognised as synusiae and for practical purposes these distinct synusiae are

recognised as: (a) Shade epiphytes, (b) Sun epiphytes, and (c) Extreme xerophyllous epiphytes. The Shade epiphytes are mostly seen in the lower storey or stratum of the forests and generally occupy the trunks and branches. Genera like *Peperomia*, *Medinilla*, and some species of orchids belong to this group.

Sun epiphytes usually occupy the centre of the crowns and along the longer branches of trees of middle and top storeys. On very large trees they spread down to the trunk below the first fork. They live in a microclimate intermediate between that in the undergrowth and that in the open, and receive some shade, but less than that of shade epiphytes. This synusia is usually the richest of the epiphytic communities in both species and individuals. Most of the epiphytic orchids present in Kerala belong to this group. Extreme xerophyllous epiphytes live on the topmost branches and twigs of the taller trees. They are almost fully exposed to sun and wind and live under conditions closely resembling those in the open.

There are different kinds of epiphytes: true epiphytes, hemi-epiphytes, casual epiphytes, and in some cases semi-epiphytic climbers. In the present study only the true epiphytes are included. Even though the species like *Raphidophora pertusa* and *Fagraea ceilanica* are not strictly true epiphytes, they are included in this work because both the species were seen as true epiphytes on many occasions. Among the various kinds of forest types present in Kerala, the tropical rain forests harbours the maximum number of epiphytic species.

The habitat of the epiphytes is to some extent similar to that of plants growing on rocks. In both, there is little soil, intermittent water supply, and the light availability and with relative humidity, etc. are almost similar. Therefore, the flora of the rock habitat is much like that of tropical epiphytes and in some cases epiphytic species are found to occur on rocks. The minerals present in the atmospheric dust particles, bird's excreta and decaying barks of the host trees, mostly feed the epiphytic species. For luxuriant colonies of epiphytes, on the roadside trees, the mineral nutrients conveyed by the dust particles are no doubt, important. The epiphytic vegetation of the tree also depends on its age and species. The transpiration rate of epiphytic orchids has been investigated by Kamerling (1912), who found that the transpiration rates are very low in epiphytic orchids, and based on this it is supposed that the epiphytes as a group are characterized by low rates of transpiration (Richards, 1979).

Another interesting feature observed during the study is the high degree of vegetative reduction found in the epiphytic orchids, which are explained below.

VEGETATIVE REDUCTION IN EPIPHYTIC ORCHIDS

The family Orchidaceae is unsurpassed in ecological diversity, tolerance of various environmental stresses and numerous variations from conventional patterns of flowering plants in form and function. The orchids range across a broad ecological spectrum; thousands of species endure severe drought as extreme epiphytes, many are adapted to soil and *Habenaria repens* can grow as a floating aquatic bog-dweller.

Orchids also exhibit a variety of unusual growth habits, especially among the epiphytic genera and achlorophyllous terrestrials. Some of these involve major modification and reduction of leaves, stems and roots that have necessitated usual displacements and combinations of basic vegetative function. One of the most deviant of the orchid body-plan is the shootless condition, characteristic of a number of Old and New world epiphytic genera. Here, apparently by the progressive reduction of its monopodial stems and its leaves, the shoot has become abbreviated in form and relegated to the limited role of initiating roots and production of sexual apparatus. Except when supporting fruit, the entire shoot is but a few percent of the total body mass. In 1914, Rolfe claimed that the shootless body-plan is an extreme adaptation against drought. Ruinen (1953) and Johansson (1977) suggested that the reduced vegetative body reflects an epiparasitic mode of nutrition.

The roots of shootless species contain more chlorophyll than roots from leafy species. The environmental factors favoured a relocation of the photo-assimilatory apparatus to the root system, among shootless orchids.

Benzing and Ott (1981) believed that the success of an epiphyte is closely related to its ability to use its resources ultra-efficiently, particularly for sexual propagation and recruitment of new micro-sites. For carbon gain, and mineral and moisture procurement, the shootless orchids employ an extensive system of velamen-covered roots. Still they require a small slow growing shoot/stem as a generator of roots and occasional inflorescence production. One hypothesis is that the leafless and shootless orchids have

evolved due to the extreme drought conditions of the epiphytic nature. But in the present study the shootless orchids have been observed distributed in the high humid areas of evergreen forests under heavy shades.

The members of subfamily Epidendroideae are all advanced types. With regard to the development of floral parts, the subfamily represents the final stage in the organogenesis of the column, because there is complete fusion of the reproductive organs in every species. Correlated with this fusion is a fully functional rostellum to which the pollinia are attached. There is also a correlation between the position of the anther and the rostellum and between the position of the rostellum and structural changes in the pollinia. The evolutionary success of the Epidendroideae is primarily due to the epiphytic mode of life.

The family Orchidaceae originated in the area known phyto-geographically as Malesia, during the Cretaceous period, when most angiospermic families became differentiated. At that time, all species were geophytes. The epiphytic mode of life is a rather recent development, dating back to Pliocene-Pleistocene. While the terms geophytes and epiphytes convey the meaning of ecological habitats, in reality they express distinct evolutionary adaptations through morphological modification of the roots. In the terrestrial roots, which may be thin and fibrous or thick and fleshy, the epidermis consists of one to three layers of cells, the outermost layer being provided with root hairs. In the derived epiphytic roots the layers of epidermal cells are greatly increased in number into a spongy velamen, with the outermost layer cutinized and devoid of root hairs.

Robinson and Burns–Balogh (1982) suggested an epiphytic ancestry for terrestrial orchids, based on certain characters of the family, involving seed, root and flowers. But Ackerman (1983), Bennet (1983) and various other workers proposed a terrestrial ancestry for the epiphytic orchids. They questioned all points raised by the Robinson and Burns–Balogh and sufficiently explained their view and that of earlier workers regarding terrestrial ancestry of the epiphytic orchids. Most students of Orchidaceae agree that ancestral orchids were terrestrial plants (Dressler, 1981; Van der Pijl & Dodson, 1966; Garay, 1972).

Dressler and Dodson (1960), Garay (1972), and Ackerman and Williams (1980) suggested that certain primitive characters of orchids were, the possession of more than one anther per flower, pollen unit as a single grain, absence of pollinarium-accessories like stipe, viscidium and caudicle, sympodial growth, elongate stem, spiral phyllotaxy and plicate and non-articulated leaves. Ackermann (1983) stated that primitive orchid taxa with a relatively high number of plesiomorphic characters would most likely be terrestrial plants. In fact, the genera with greatest number of primitive floral and vegetative characters are terrestrial orchids.

Adaptations including mineral absorption through velamen roots or trichomes, vegetative reduction, Crassulacean Acid Metabolism and slow growth rates are characteristic of many vascular epiphytes. These characters are best developed in the extreme epiphytes (Benzing, 1978) and also found in many desert plants.

Kress (1986) estimated that 440 out of 725 genera of the family Orchidaceae are epiphytes. In this study 41 genera of epiphytic orchids, which represents less than ten percent of the epiphytic genera in the family have been enumerated. As Benzing and Ott (1981) rightly reported, a great degree of vegetative reduction in these 39 genera of epiphytic orchids have been observed. However it is inappropriate to come to any general conclusion after studying only 10% of the total genera. All the same, the phenomenon observed among epiphytic genera of orchids in Kerala is presented for further discussion. Most of the workers like Ackerman (1983), Bennet (1983) *et al.* advocate a terrestrial ancestry for the epiphytic Orchidaceae. They argued that epiphytes are highly advanced than the primitive geophytes. The advanced characters like reduced stem, Crassulacean Acid Metabolism (Benzing & Ott, 1981), monopodial growth, presence of pollinarium accessories and articulated leaves, etc. are prevalent in the epiphytic genera of Orchidaceae.

Based on the morphological characters, the epiphytic orchids seen in Kerala can be grouped under various heads.

1. Plants with well-developed roots, stem and leaves:

Genera like *Acampe*, *Aerides*, *Rhynchostylis*, *Diplocentrum*, *Cottonia*, *Thrixspermum*, *Trichoglottis*, *Vanda* and *Xenikophyton* come under this group. These genera are mostly seen on main trunks (except *Diplocentrum*) at lower level of host trees, almost fully exposed to sunlight. Taxa coming under these genera have well developed shoots of more than 10 cm long.

2. Plants with well developed roots and stem, but leaves terete or narrow:

Papilionanthe, *Luisia*, *Robiquetia*, *Cleisostoma*, *Seidenfadeniella*, etc. are the genera under this group. In most of the cases stem also has some amount of chlorophyll and help the plant for photosynthesis. These genera also occupy the main trunks or branches of trees but mostly at a higher level (except *Luisia*). *Seidenfadeniella* prefers generally shady areas.

3. Plants with well-developed leaves and roots, but stem reduced to a pseudo stem or pseudobulb:

The genera like *Dendrobium*, *Bulbophyllum*, *Cirrhopetalum*, *Eria*, *Liparis*, *Coelogyne*, *Cymbidium*, *Pholidota*, *Polystachya*, and *Trias* belong to this group. The genus *Dendrobium* shows great degree of variation among its constituent members. It ranges from the small pseudobulbous *D. nanum* to the fairly large *D. aquem* and *D. heterocarpum*. *Cymbidium* and *Pholidota* are having very broad long leaves and occupy the areas where sunlight is received in plenty. Pseudo stems of *Dendrobium* and pseudobulbs of *Bulbophyllum* and *Cirrhopetalum* are variously coloured, ranging from green, greenish-yellow to lemon yellow.

4. Plants with well-developed roots and leaves, but stem reduced or almost absent:

Genera like *Kingidium*, *Sirhookera*, *Gastrochilus*, *Smithsonia*, *Oberonia*, and *Pomatocalpa* come under this group. Roots are dorsiventrally flattened and firmly adpressed over the hosts and contain a good amount of chlorophyll. They generally spread

over the host and occupy more space. Leaves of this group are broad and green, and they prefer shady areas. The genus *Oberonia* is having very small terete roots and fleshy leaves. Some of the species of this genus prefer sunlight, and in that case they are a little brownish or reddish or otherwise green and prefer shady places.

5. Stem reduced to a small flattened pseudobulbs, but roots and leaves are feebly developed:

The genus *Porpax*, which spreads over the tree trunks and rocks belongs to this group. The leaves are occasional and the photosynthesis is carried out in the pseudobulbs. Roots are very poorly developed.

6. The shoots and leaves are not developed and body composed of roots:

The genus *Chiloschista*, *Taeniophyllum*, etc. have a well-developed root system, which is green in colour and closely adpressed over the host. They have very minute shoots at the middle, from where roots are produced. This denotes the high level of advancement in the epiphytic orchid genera.

A schematic representation of the probable vegetative reduction in the course of evolution among the different groups of orchids with representative genera is given in Fig. 32.

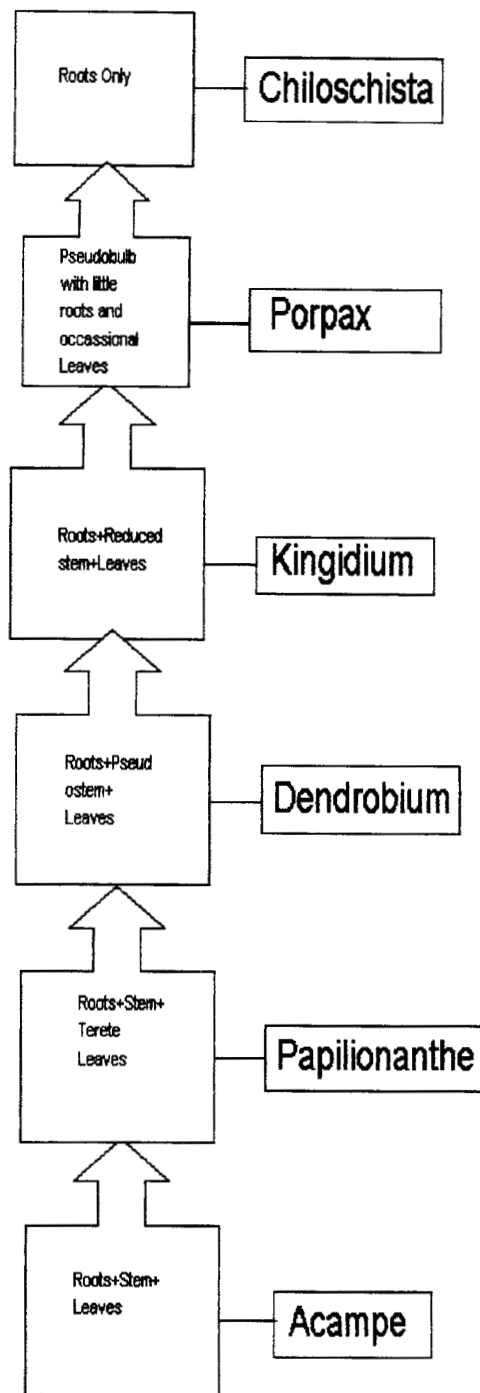


Fig. 32. Probable vegetative reduction among the epiphytic Orchids

PARASITES

Parasitic members are present in 7 families, having 15 genera and 44 species, which represent 3.38 % of the total angiospermic families and 1.17% of the genera and 0.96% of the species, present in Kerala. Aerial parasites are present in 4 families and the other families contain root parasites. Of the four aerial parasitic families, Cuscutaceae and Cassythaceae are with parasitic twiners and the Loranthaceae and Viscaceae have bushy aerial shrubs. Aerial parasites represent 76.2 % of the total angiospermic parasites present in Kerala and the rest are root parasites (Fig. 33).

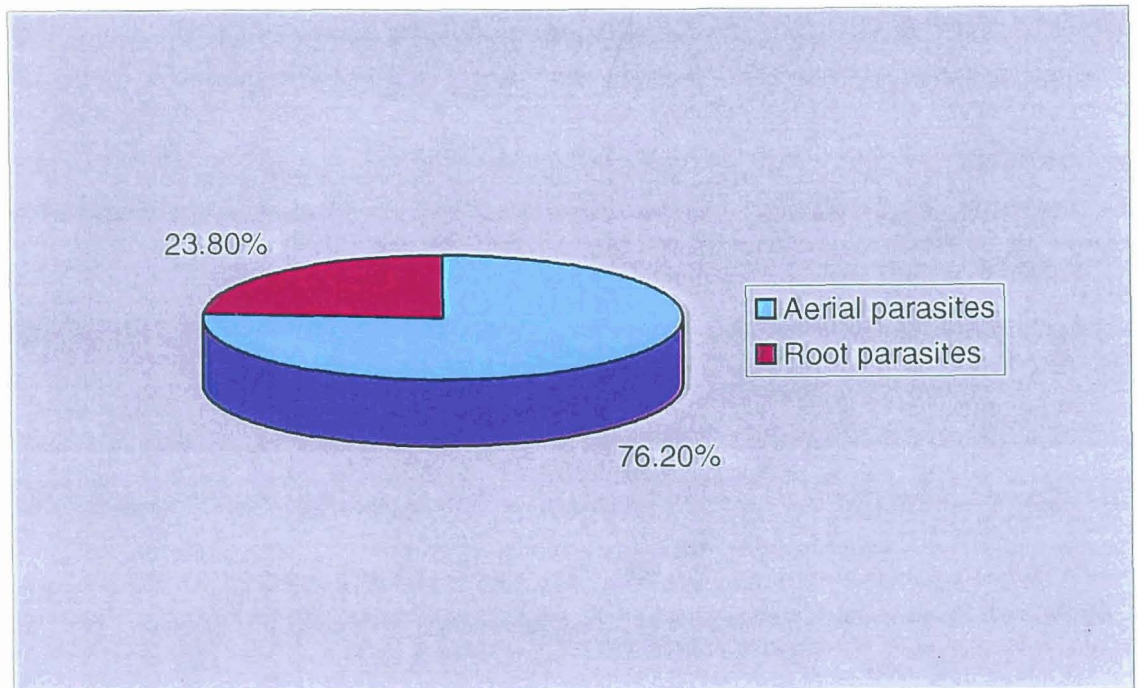


Fig. 33. Relative abundance of aerial and root angiospermic parasites in Kerala

The table below shows the families of angiospermic parasites with the number of genera and species under each in the descending order. A graphical representation of the data is also given in Fig. 34.

Family	Genera	Species
Loranthaceae	7	18
Viscaceae	2	9
Orobanchaceae	2	7
Cuscutaceae	1	4
Scrophulariaceae	1	3
Balanophoraceae	1	2
Cassythaceae	1	1

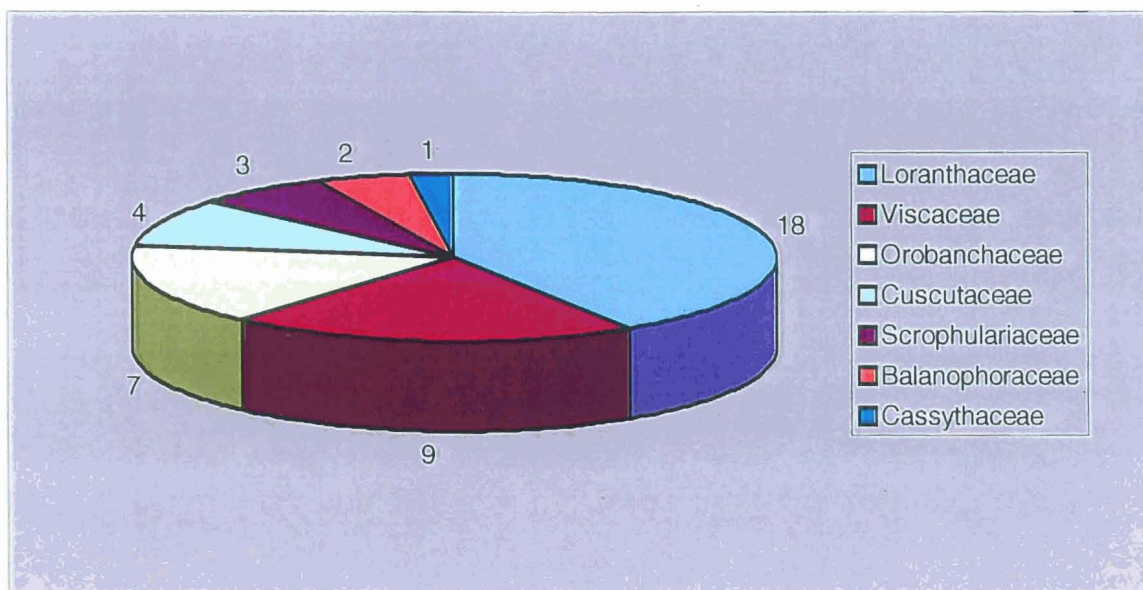


Fig. 37. Relative abundance of Parasitic species in different families

Monoculture plantations like teak plantations of Kerala are found to be heavily infested by *Dendrophthoe falcata* and fruit-tree plantations are severely damaged by *Helicanthes elastica*. Since birds disperse the seeds of mistletoes, the fruit trees are found more infected than other trees with parasites. The plantations, which are damaged by forest fires, are highly susceptible to the parasitic infestation. Because of the attractive greenish-yellow colour, the people unknowingly put the vines of *Cuscuta*, over their ornamental plants. This is at a later stage hazardous to the plantations. Within the family Loranthaceae and Viscaceae, 'Hyperparasitism' i.e., the phenomenon where members of the family attacking their own family members, is noticed on many occasions.

Host-Parasite Attachment Pattern and Generic Delimitation of Loranthaceae

In India Loranthaceae is represented by 9 genera. Gamble (1925) described 4 genera namely, *Elytranthe* Bl., *Korthalsella* Tiegh., *Loranthus* L. and *Viscum* L. *Korthalsella* and *Viscum* are now included in the family Viscaceae. Species of *Loranthus* and *Elytranthe* described by Gamble are now segregated into 7 genera viz., *Dendrophthoe* Mart., *Helicanthes* (Desr.) Danser, *Helixanthera* Lour., *Macrosolen* (Bl.) Rich., *Scurrula* L., *Taxillus* Tiegh., and *Tolypanthus* Bl. In all the taxonomic treatments and classification of the family, the vegetative and floral characters are employed for segregation of genera and species.

The various types of union between the members of Loranthaceae and their host plants had been the subject of numerous investigations and it has been fully summarized by Engler and Krause (1935). In some members of the family, particularly those from

tropical and subtropical region, root-like structures grow along the surface of the host plants to which they became attached at intervals by absorbing-organs termed as 'haustoria'. These structures, which contain tracheids but no sieve tubes, became very intimately connected with the vessels of the host from which the nutrients are directly absorbed (Metcalf & Chalk, 1950). Species such as *Viscum angulatum* has root-like structures, that are embedded in the cortex of the host and from these short haustoria arise and serve as direct connections to the xylem of the host. The parasites sometimes induce considerable modifications and hypertrophy of the host tissue, whilst the base of the parasite itself often become enlarged. In some instances, after the parasite has decayed, the swollen and ruptured host tissue assumes a somewhat radiate structure and is some times referred as 'Wood – flowers'.

During the course of the present study, it has been observed that the members of the family Loranthaceae showed some similarity among the genera in the attachment pattern with their host. Though slight variations are there, they possess some characteristic features which are specific to each genus. While studying the living specimens, such attachment pattern could be used, as a parameter for delimiting the genera of the family. Based on that, a key to the genera of Loranthaceae of Kerala has been prepared (Shanavaskhan & Sivadasan, 1996). This key is an added identifying tool to the conventional morphological key to the genera of the family and could be employed in identifying even dead specimens, devoid of leaves and flowers.

Dendrophthoe Mart. (Fig. 35-A)

The parasitic plants initially get established at one point on the host plant and then produce haustoriferous runners, one on either side of the attachment, along the long axis of the host branch. The runner growing towards the tip of the host branch generally dies. The runner growing towards the base produces cylindrical haustoria at irregular intervals and establishes connection with the host at several points. Mostly aerial branches are produced from its runners from the point of attachment with the host. Later, in many cases the portion of the runner with the points of haustorial attachment may dry up. In advanced stages, it may seem that a number of parasites have infected a branch of host, rather than many plants being produced from a single plant by dying of the haustorial runners in between the points from where the aerial branches have been produced. Runners of this genus have a maximum diameter of 3.75 cm; they are cylindrical in shape and are studded with minute lenticels. Colour of the parasite was found to be varied depending on the hosts on which they were growing. And, at each point of attachment, the host tissue got activated and grew vigorously over the base of the parasites (**Plate IX-A**).

The dead parasites can be distinguished from other mistletoes by its drooping or pendulous branches with swollen nodes. Internodes were usually 5-8 cm in length at the basal portion of each branchlet. Swollen nodes are also seen in *Helicanthes* but branching is dichotomous and characteristic. The outgrowth of host tissue over the base of the parasite is another distinguishing feature of this genus. Gradual breaking off of the branchlets at nodes from apices to base is also another significant character.

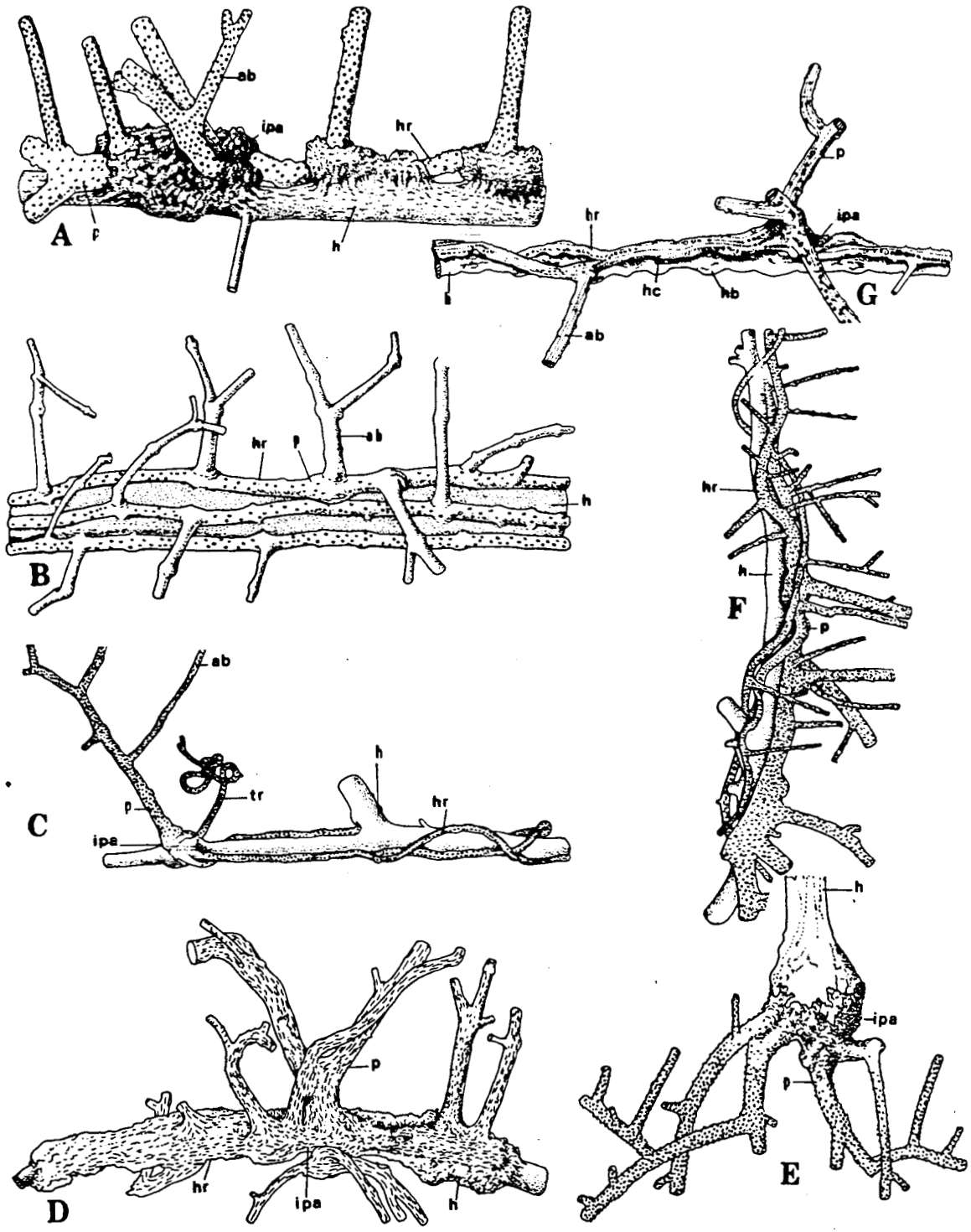


Fig. 35. Attachment pattern of various genera of Loranthaceae: A. *Dendrophthoe* Mart.; B. *Helicanthes* (Desr.) Danser; C. *Helixanthera* Lour.; D. *Macrosolen* (Bl.) Reich.; E. *Scurrula* L.; F. *Taxillus* Tiegh.; G. *Tolypanthes* Bl. (ab-aerial branch; h-host; hb-host bulging; hc-haustorial connection; hr-haustoriferous runner; ipa-initial point of attachment; p-parasite; tr-tendril like runner).

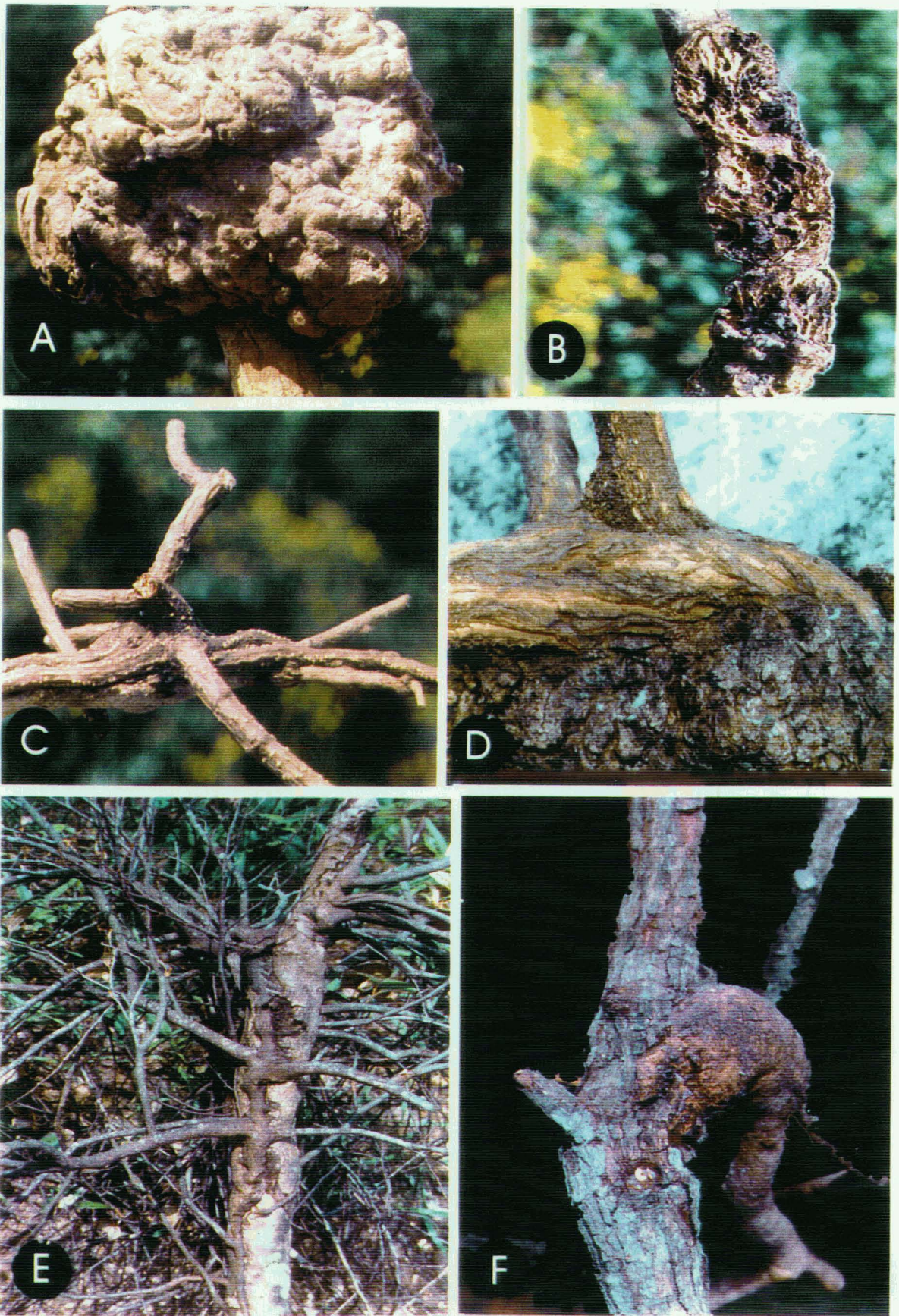


Plate IX. A. Cancerous out growth of host tissue due to the attack of *Dendrophthoe falcata* (L. f.) Etting.; B. *Wood flower* – an affected portion of the host tissue after the detachment of *Macrosolen* as parasite; C. Haustoriferous runner of *Tolypanthes* Bl.; D. Haustoriferous runner of *Macrosolen* (Bl.) Reich.; E. Haustoriferous runner of *Taxillus* Teigh.; F. Haustoriferous runner of *Helixanthera* Lour.

Helicanthes Danser (Fig. 35-B)

This is the most delicate mistletoe, which can grow rapidly over the host. Once the parasite infects a host it starts producing a number of haustoriferous runners from its base to all sides. These runners grow fast over the host and produce a number of haustoria at regular intervals and dichotomous leafy branches here and there. Within a short period, the parasite makes a network over the host and branches profusely which helps the mistletoe to establish even on the vertical, smooth trunks of a number of trees.

The dead parasites can be distinguished by the net-like haustorial growth, dichotomous branching and swollen nodes.

Helixanthera Lour. (Fig. 35-C, Plate IX-F)

The members of this genus produce a number of haustoriferous runners from their initial point of attachment. Runners twist and run over the host and establish connections all along the body of the host. The runner, when not attached to the host remained coiled and tendril-like, but on contact with suitable substratum develop further normally. Numerous minute lenticels are arranged very closely over the stem. Aerial branches are often produced on the runner, at the points of attachment with the host.

The whole appearance of the parasite on the host after the death is similar to that of *Taxillus*. But the longer internodes, distantly placed aerial branches, and the presence of tendril-like coiled runners make them distinct from *Taxillus*. In *H. wallichiana*, a single attachment to host is noticed and half of its basal portion is engulfed by the host tissue.

Macrosolen Bl. (Fig. 35-D, Plate IX-B,D)

In this genus, the plants get established at one point and later produce haustoriferous runners (hr) to both sides, along the long axis of the host. These runners produce disc-shaped haustoria at close intervals. These haustoria later become enlarged and get connected mutually resulting in a strong and lengthwise attachment over the host. Thus the base of the parasite grows closely adpressed over the host and grows further, along with the host.

The dichotomous branching of the main stem and the presence of a number of long white lens-shaped lenticels on the runners are distinguishing characters of the genus. In this genus the base of the parasite is never engulfed by the host tissue as the body of the parasite is growing simultaneously. The dead parasite is almost similar to *Dendrophthoe* but the characteristic base, presence of white lens-shaped lenticels, and the short internodal length of about 3-4.5 cm at the basal portion of each branchlet can help to distinguish it from other genera.

A unique feature observed in this genus is the detachable nature of the parasite from the host after death. In woody hosts, this detached portion may leave channel as big as that of the base of the parasite with perforations indicating the penetration points of the haustoria.

Macrosolen capitellatus found on *Artocarpus integrifolia* showed a similar kind of attachment but the attached portion never elongated and a circular obconic pit as big as the base of the parasite is left on the host when the parasite is detached from it after its death.

Scurrula L. (Fig. 35-E)

In this genus no haustoriferous runners are observed. These parasites infect at a single point and the base of the parasite together with the host tissue forms a spherical ball-shaped base, the tissue of which is equally contributed by the parasite and the host. From this attachment point, one to many leafy branches are produced. These parasites have a particular type of branching pattern, in which alternate branches are not developed and internodes are twisted to 90°. The whole stem of the parasite is studded with small lenticels and at the base they are not closely arranged.

Its ball-shaped single attachment point, peculiar type of branching pattern, and the distantly placed lenticels at the base help to distinguish this parasite.

Taxillus Tiegh. (Fig. 35-F; Plate IX-E)

All the species of this genus produce a number of haustoriferous runners, which twist invariably over the host. The runners produce a number of haustoria, at close intervals and thus establish a strong connection over the host. Branches are produced at short intervals from the runners, which give the parasite a crowded appearance. Runners and branches are studded with numerous dot-like lenticels. The closely twisted runners and the over-crowded branches, with short internodes are the main features observed in this genus.

Tolypanthes Blume (Fig. 35-G; Plate IX-C)

After establishing at a single point, the parasite produces 1-2 haustoriferous runners on either side of the attachment, towards the axis of the host. These runners produce haustoria at several points and thus establish haustorial connections with the host. The runners are blackish-brown in colour, having two types of lenticels. Some are longitudinally elongated, raised and without slits, while others are round, dot-like, and linearly arranged. In some cases, these runners are found to be branching. Aerial branches are produced from the points of attachment only, and are longitudinally irregularly-fissured.

A striking feature of this genus is the bulging of host tissue at the points where the haustoria penetrated. Distinguishing features of the genus are blackish-brown haustoriferous runners, with two types of lenticels and the longitudinally irregularly-fissured branches.

Various opinions have been expressed concerning the morphological nature of the haustoriferous runner. Mc Luckie (1923) concluded that the haustorial system of *Loranthus celastroides* Siev. represents root tissues, developed from primary root of seedling, which is very sensitive to gravity. Mc Luckie also found that the haustoria penetrate the host partly by mechanical pressure and partly by enzyme action. The disorganized host tissues provide some of the nourishment for the parasite, before the latter becomes firmly established. Hamilton and Barlow (1963) have studied Australian Loranthaceae and found that within the genera, the type of attachment usually is constant

and its distribution conforms to the taxonomic system. In this study, seven out of the nine Indian genera of the family which are present in Kerala, also reveal the importance of attachment pattern as a delimiting feature of the genera. Differences of opinion exist among scientists regarding the formation of different attachment pattern in Loranthaceae. According to Mc Luckie (1923), both chemical and mechanical forces take part in the process of penetration of haustoria. The host tissue reacts to the entry of the haustorium by swelling and forming a 'burr' (Johri & Bhatnagar, 1972).

Scot (1871) stated that the habit and chemical qualities of the host plants, chiefly determine their relations to the Loranthii. If this statement is true, in the host-parasite relationship, all the parasites found on a single host would have developed a single attachment pattern. During the course of the present study it is observed that more than one genus of Loranthaceae infected a single host in which all the genera followed their own typical pattern of attachment. From this it is concluded that the host-parasite relationship is chiefly determined by the habit and chemical quality of the parasite rather than that of the host.

The data obtained from the observations on host-parasite attachment patterns revealed some specific features exhibited by the various genera. Based on these attachment patterns and features, a key to the genera of Loranthaceae of Kerala is given below..

Key to the genera of Loranthaceae of Kerala

1. Parasite without haustoriferous runners.....**Scurrula**
1. Parasite with haustoriferous runners..... **2**
2. Haustoriferous runners 1 or 2, which never form a network over the host **3**
2. Haustoriferous runners many, which twist invariably to form a network over the host
..... **6**
3. Haustoriferous runners terete **4**
3. Haustoriferous runners dorsiventrally flattened, adpressed over the host, never
engulfed by the host tissue.....**Macrosolen**
4. Haustoriferous runners studded with 1 type of lenticel which are dot-like, and scattered
in arrangement; host tissue grows over the base of the parasite and runners become
engulfed by it.....**Dendrophthoe**
4. Haustoriferous runners studded with 2 types of lenticels which are dot-like, linearly
arranged, and lenticular; host tissue never engulf the parasite but bulge at the areas of
haustorial connections.....**Tolypanthes**
- 5 Leafy branches with swollen nodes, dichotomously branched **Helicanthes**
5. Leafy branches without swollen nodes, not dichotomously branched **6**
6. Leafy branches at close intervals with internodes of ca. 0.4-1.5 cm long **Taxillus**
6. Leafy branches with internodes of ca. 1.7-3.0 cm long.....**Helixanthera**

Host Specificity in Loranthaceae

During the course of the study, the host plants infested by parasites had been recorded, and an attempt was made to check whether any specificity was seen between parasites and their hosts. The study involved travel across the Kerala State, right from the sea level to the midland and highland. During these trips, the details of parasites and their hosts were recorded carefully in the field book. Whenever there was doubt regarding the identity of the species of the hosts, specimens were collected and identified in the laboratory

One of the reasons for recording these host plants is that the general floras is mostly silent with regard to the host plants. Rao, (1923) provided a note on the South Indian Loranthaceae, and their host plants. Fischer (1926) made an attempt to record the host plants of the Loranthaceae of South India. Ghosh (1968), and Moore and Inamdar (1976), recorded a few more additional hosts of *Dendrophthoe falcata*. Johri and Bhatnagar (1972), in their botanical monograph of Loranthaceae provided a list of host plants, attacked by *Dendrophthoe falcata* (L. f.) Etting. Ravindranath and Rao (1959) compiled the list of host plants infested by the *Dendrophthoe falcata* and provided an additional 17 new hosts. Sampathkumar and Kunchithapatham (1968) provided another list of hosts of *Dendrophthoe falcata*. In 1962, Singh published the life history and list of hosts and control measures of *Dendrophthoe falcata*. Host plants of *Macrosolen cochinchinensis* (Lour.) Tiegh. were recorded by Ghosh (1969).

There is a belief among some workers that different races or varieties of parasites can be distinguished by their occurrence in specific hosts. A lot of variations in leaf size

and shape of some species of parasites occurring in different hosts and have been observed during the present study. But these variations are not uniformly specific to their hosts and hence cannot be called a race or variety. Moreover, closely related species are found to infest the same hosts.

Another theory is that Loranthii tend to infect plants possessing foliage, similar to their own. This also is not always true and it has been observed that some host plants with very broad leaves are attacked by some parasites having smaller leaves. Leafless parasites like *Viscum angulatum* and *Viscum articulatum* are found growing on leafy trees. *Helixanthera wallichiana* is generally seen on *Helecteres isora*. But the leaves of both the species have entirely different size and shape. Again, when a particular species of parasite infects a number of hosts, the parasite displays significant differences of leaf in texture, shape, size and appendages.

Seeds of Loranthii can germinate on any substratum without any stimulus from the medium. Once the haustorium is produced, it expands more or less in an oblong manner and forms a discoid attachment on the surface of the bark of the host plants. This seems to be the critical period and though the seedlings may thus retain their vitality for a year or more, many do ultimately die, due to the inability of the root to penetrate the dry, dead and hardened bark. Some species in which the bark is peeled off periodically in large plates provide unfavourable nidus and thus do not easily foster parasites.

The trees having compact habit and heavy evergreen foliage are found unsuited for parasites. If these plants are found infested, it will be restricted to the extreme ends of

branches. Heavy foliated deciduous trees are also generally unfavourable, owing to the dry, scaly nature of the bark, loss of foliage in dry or cold season and heavy shade during monsoon. Lushington (1902) observed that in almost all forests where the vegetation has been damaged by forest fires, the Loranthii abound. The vegetation already weakened by fire becomes totally incapable of battling against the Loranthaceae.

Scot (1871) reported that trees whose bark has acrid, bitter or astringent qualities, with limpid or milky juice, are but little liable to be affected by Loranthii. The present study showed that this may not be always true. A lot of rubber trees (*Hevea brasiliensis*) and neem trees (*Azadirachta indica*) are attacked by parasites. Even, the heavy barked trees like the species of *Terminalia* are attacked by parasites. *Lagerstroemia lanceolata* Wall. and *Anogeissus latifolia* Wall., etc. are the species that shed their bark freely, in small scales. Yet this species is the host of many different species of *Loranthus* and in some localities, it is more commonly attacked than any other forest trees.

It is assumed that attachment is very much a matter of opportunity and not of selection on the part of either element. There are indications that if there is no positive attraction there is repulsion, and effective placement of parasites takes place when this repulsion is absent. Generally speaking, the commonest and widespread species exhibit the greatest varieties of parasites. Similarly the commonest species of *Loranthus* infests the greatest number of host plants. Further, the species of parasites, which exhibits greatest variation, has also the longest list of host plants.

It is certain that failure to attach itself to a particular host by a parasite is due to definite repulsion or inhibition of some kind. This is proved by the fact that individual *Loranthii* are not found parasitic on their own species, though some are parasitic on other species of the same genus. It was noticed that the seeds of some species germinated on the same branch, but in all these cases the seedlings failed to establish.

Mostly birds disperse Loranthaceous seeds. It is expected that the trees are more likely to receive them, than the smaller plants. Fischer (1926) listed 274 hosts of south Indian Loranthaceae, out of which 185 are trees, 54 are larger shrubs, 9 are under-shrubs, 17 are climbers, 7 are *Loranthus* itself and only 2 are herbs. Twenty-three of the hosts have milky juice, 2 have poisonous properties, and 7 are parasites themselves. *Dendrophthoe falcata* is the most cosmopolitan parasite, which attack maximum number of hosts. No parasite was observed on the monocotyledons. Loranthaceous parasites are most abundantly seen in the dry deciduous forests than in the evergreen or alpine forests. It is also observed that the exotic species are most severely damaged than the indigenous species, by the parasites.

Double or triple parasitism representing 1 or 2 parasites, attacking another parasite was also seen during the study. One host attacked by more than one parasite is another phenomenon seen among mistletoes. Most of the economic plants are attacked by *Helicanthus elastica*, which cause severe damage to the trees. By having the dichotomous branching pattern of haustoriferous runners, it can even attack the main trunk of trees and in a short while it covers a large area of the host-body. During the earlier period of this study, it was found that the species *Macrosolen capitellatus* is very rare in Kerala, and it

could be collected only from the Kasaragod district . But now, during the last 5 years, this has spread vastly and infested majority of the Jack trees of all the 14 districts of the State. *Taxillus* species are mainly seen on the Euphorbiaceous members.

An analysis of the epiphytes and parasites collected during the present study included 101 species which are considered to be endemics of South India (Appendix-I). Eighteen species occurring in Himalayas are also present in the study area (Appendix-II). Likewise, several Sri Lankan elements are also noticed in Kerala (Appendix-III). The species included in the **Red Data Book of Indian Plants** are given in Appendix-IV. All the available local names of the species collected and included in the present treatment are given in Appendix-VI.

ETHNOBOTANIC TREATMENT

ARACEAE

Remusatia vivipara (Roxb.)Schott

Kattu chembu: Muthuvan (Idukki).

Corms are made into a paste and applied to head wounds.

Kattu chembu: Adiyar (Wayanad).

Paste made out of the tubers is applied on the breast, in case of breast-tumour.

Mara chembu: Malapandaram (Pathanamthitta).

Tubers are cut into small pieces and boiled in water. Then it is cooled down to a tolerable heat, and is poured on the affected areas of itching and soil borne diseases.

Mara chembu: Koragas (Kasaragod).

Leaves are made into a paste and mixed with rice and cooked. This is given to children once in an year during festival to make them brilliant.

Juice of the plant mixed with cow's urine is considered to be alexipharmic. The root with turmeric is made into an ointment and used as a remedy for itching. (Nambiar *et al.*, 1985.)

Phytochemical studies conducted at the Ethnopharmacology Division, Tropical Botanic Garden and Research Institute, Palode, Thiruvananthapuram confirmed the cytotoxic and anti-tumour properties of the plant (Dr. P.G. Latha, pers. comm.).

Rhaphidophora pertusa (Roxb.)Schott

Velleli thandu: Muthuvan (Idukki).

Macerated stem is applied for skin diseases.

Elithandan, Neeruvally: Kanikar (Thiruvananthapuram).

Stem chopped into small bits and boiled with rice and given internally three times a day for curing intestinal ulcers.

Elithandan: Mala-arayan (Ernakulam).

For inflammation on the body, the patients are advised to take bath in the medicated water, prepared by boiling the leaves and stem of the plant, twice a day for seven days.

BALANOPHORACEAE

Balanophora fungosa J.R. & G. Forst. subsp. **indica** (Arn.) Hansen var. **indica**

Nilachakka: Paniyan (Wayanad).

The whole plant is dried, powdered and taken internally with honey to cure piles. It is also used along with other herbs in many preparations for curing internal haemorrhages.

CASSYTHACEAE

***Cassytha filiformis* L.**

Moodillathali: Kurava (Kollam).

The whole plant is used to wash hair and considered to promote hair growth. A pudding made of the plant extract, rice powder and jaggery is considered to be a good health restorer. Fresh extract of the plant is given in coconut milk to cure leucorrhoea and other venereal diseases.

Moodillathali: Kanikar (Thiruvananthapuram).

Vines are collected and macerated. The paste is tied in cotton cloth and dipped in warm neem oil and applied over joints in the case of sprain.

CUSCUTACEAE

***Cuscuta reflexa* Roxb.**

Akasavalli: Kurichiyan (Wayanad).

The whole plant is crushed well and the extract is used as a shampoo for washing hair. Checks dandruff and prevents hair fall. Internally, taken as a purgative and to relieve flatulence.

Kaithankodi: Muthuvan (Idukki).

The juice extracted from the stem is poured into boiled milk for the easy coagulation of milk.

The whole plant is used to control childbirth (Girach, 1992). The plant and black pepper in 2:1 ratio are crushed and the aqueous extract is taken orally twice a day for spermatorrhoea (Sahu & Mudgal, 1995). Plant is edible (Birkumar *et al.*, 1997). About 500 gm of fresh plant mixed with cattle feed is given to cattle and yak suffering from haematuria (Chaurasia *et al.*, 1999).

LORANTHACEAE

Dendrophthoe falcata (L.f.) Etting.

Ottu: Irulas (Palakkad).

The leaves are made into a paste and given internally in lukewarm water for the easy delivery of placenta (afterbirth).

Ittil: Cholanaickens (Malappuram).

A dye obtained from the base of the flower is applied as a nail polish.

Twigs are used to prepare a khaki coloured biological dye (personal observation). Plants collected from *Artocarpus heterophyllus* Lam. is dried and powdered. This is given internally with honey to reduce inflammation on the body. It is aphrodisiac and good for uterine disorders (folk information: Kollam).

Plants collected from *Careya arborea* L. is good for treating smallpox and rheumatic complaints (folk information: Alappuzha). It reduces cholesterol level in the blood, when 5 gm of the plant is given in *Phyllanthus amarus* Schum. & Thonn. decoction (folk information: Alappuzha). Plants collected from *Albizzia lebbek* (L.) Willd. cures diarrhoea (folk information: Alappuzha).

Bark is astringent and narcotic. Plants collected from *Tamarindus indica* L. is valuable for treating impotency (Jain, 1965). Bark is used to treat menstrual troubles, tuberculosis and asthma (Nambiar *et al.*, 1985). The tender shoots of *D. falcata* (L.f.) Etting. contain 10 % tannins, which are used as finishing tan stuff for softening leather (Anonymous, 1952). The bark is used as a substitute for betel nut (Chopra, 1933; Kirtikar & Basu, 1935). About 5gm of powdered flower is given 2-3 times a day in malarial fever, small pox and chicken pox (Brahman & Saxena, 1990). The extract obtained by crushing the plant is given as a drink, twice a day. It is continued for a week to cure leucorrhoea (Sahu & Mudgal, 1995). One of the ingredients of the ayurvedic preparation '*Mutravirecaniya Kasaya Curna*' is the stolon of *D. falcata* (L.f.) Etting. (Anonymous, 2000).

***Helicanthes elastica* (Desr.) Danser**

Alottu: Irulas (Palakkad)

There is a strange belief among the tribals of Palakkad district, that keeping twigs of this plant and *Viscum angulatum* Heyne *ex* DC., while attending the court helps win their legal cases.

Plants collected from *Samadera indica* Gaertn. is believed to be highly poisonous (folk information: Thiruvananthapuram).

Leaves are used for checking abortion and also for removing stones in the urinary bladder and kidney (Kirtikar & Basu, 1935).

***Scurrula parasitica* L.**

Ottumaram: Irulas (Palakkad).

Leaves and haustoriferous base are dried and made into powder. This is given internally for checking internal bleeding.

***Taxillus cuneatus* (Heyne ex Roth) Danser**

Plants collected from *Moringa oleifera* Lam. is used to prepare medicated oil for small pox. This is also used for rituals (folk information: Thiruvananthapuram).

***Taxillus tomentosus* (Heyne ex Roth) Tiegh.**

Puluchedi: Irulas (Palakkad).

Tender leaves are made into paste and given internally for deworming.

***Tolypanthes lagenifer* (Wight) Tiegh.**

Plants collected from *Strychnos nux-vomica* L. is good for menstrual disorders and excess bleeding. It is also good for rheumatism and poisonous bites (folk information: Kollam).

MELASTOMATACEAE

***Medinilla beddomei* Clarke**

Thali: Muthuvan (Idukki).

Leaves of the plant are eaten fresh for reducing body heat.

ORCHIDACEAE

Acampe praemorsa (Roxb.) Blatt. & McCann

Maravazha: Kanikar (Thiruvananthapuram).

Seeds from the pods are applied on the old wounds as an antibiotic.

Juice extracted from the leaves is applied over the nipple for stomach-ache. It is also used for ear-ache and it reduces body temperature (folk information: Alappuzha).

Plant is tonic (Chopra *et al.*, 1956) and used in the treatment of rheumatism (Kirtikar & Basu, 1935; Chopra *et al.*, 1956).

Bulbophyllum sterile (Lam.) Suresh

Elakkavalli: Kanikar (Thiruvananthapuram).

Chopped pseudobulbs are boiled in coconut oil and applied to cure rheumatism.

Kamalpullaruvi: Malavedan (Kollam)

The whole plant is made into a paste and applied on swellings.

Cleisostoma tenuifolium (L.) Garay

Pannivalan: Malapandaram (Pathanamthitta).

Whole plant is made into a paste in water. This paste is mixed with the supernatant of rice gruel and is consumed as a drink by anaemic patients. Salt and spices are avoided during medication.

Cymbidium aloifolium (L.) Sw.

Ckukkampoathy: Muthuvans (Idukki).

Juice of the leaves mixed with salt is used for ear-ache.

Seguttu ola : Irulas (Palakkad).

Leaves are gently heated and squeezed to extract juice and a drop is applied to the ear for severe ear-ache.

Plant is emetic and purgative. Furnishes salep, which is used as nutrient and demulcent (Chopra *et al.*, 1956). The juice from the pod is used against ear-ache (Joseph, 1977).

Dendrobium ovatum (Willd.) Kranzl.

Unnesh chedi: Paniyan (Wayanad).

Juice expressed from the pseudostem is given internally as a laxative.

Plant is emollient. Plant juice is stomachic and laxative. It excites a flow of bile (Chopra *et al.*, 1956).

Flickingeria nodosa (Dalz.) Seidenf.

Chadakkampothi: Muthuvans (Idukki).

Juice of the pseudobulb and leaves is given internally for asthma.

Plant is stimulant, demulcent and tonic (Chopra *et al.*, 1956), alterative, astringent to the bowels, aphrodisiac and expectorant (Kirtikar & Basu, 1935). Fruit is aphrodisiac (Joseph, 1977). The plant is used for the treatment of asthma, bronchitis, consumption, fever, burning sensation, biliousness and diseases of the blood (Kirtikar & Basu, 1935). This plant is regarded as 'Jeevanti', a herbal drug mentioned in the **Charaka-Samhita** (Kaushik, 1983).

Luisia zeylanica Lindl.

Plant is emollient (Chopra *et al.*, 1956). Plant is applied as poultice to boils, abscesses and tumours (Nambiar *et al.*, 1985).

Pholidota imbricata W.J. Hook.

Mulluthuppi: Muthuvan (Idukki).

Crushed pseudobulbs are applied on the body to expel the spines.

Neervazhakam: Ulladar (Pathanamthitta).

Pseudobulbs are collected fresh and made into a paste in the juice expressed from coconut kernel. This paste is applied on the inflamed areas until the swelling or inflammation subsides.

Rhynchosyilis retusa (L.) Bl.

Maravazha: Malakurava (Pathanamthitta).

A single leaf is made into paste without using water and applied externally on the throat in cases of throat inflammation.

Plant is emollient (Anonymous, 1960)

Sirhookera lanceolata (Wight) Kuntze

Muthuvan (Idukki).

Plant extract is applied for poisonous bites.

Vanda spathulata (L.) Spreng.

Ponnampon Maravazha (Nambiar *et al.*, 1985)

Plant juice is given to temper bile and to abate frenzy. Flowers are given against consumption, asthma and mania (Kirtikar & Basu, 1935; Chopra *et al.*, 1956).

Vanda tessellata (Roxb.) Hook. ex Don

Ottu: Irulas (Palakkad).

Leaf-juice is applied for ear-ache.

Maravazha: Kurava (Kollam).

Leaf-poultice is applied to relieve sprains, lumbago and back pain.

Maravazha: Nayadis (Wayanad).

Juice of the leaves and aerial roots mixed with neem oil and garlic is used to treat ear-ache.

Root is alexiteric and antipyretic (Kirtikar & Basu, 1935). A paste of the leaves is applied to the body during fever. Leaf juice is instilled into the aural meatus as a remedy for otitis media (Kirtikar & Basu, 1935; Chopra *et al.*, 1956). Root enters into the composition of various medicated oils for external application in nervous disorders and rheumatism (Chopra *et al.*, 1956). It is used to treat bronchitis, inflammation, hiccup, piles and boils on the scalp etc. (Kirtikar & Basu, 1935). This is regarded as the *rasna* mentioned in the Sanskrit literature (Vaish, 1953). The alcohol extract of flowers and roots is found to stimulate the sexual behavior of male mice (Suresh Kumar *et al.*, 2000)

Vanda testacea (Lindl.) Reichb.f.

Leaves are used in asthma, malaria, rheumatism and nervous disorders (Khasim & Mohana Rao, 1999).

VISCACEAE

Viscum articulatum Burm.f.

It is with cooling, alexipharmic, aphrodisiac and alterative properties. A preparation of the paste is given in fever, blood diseases, ulcers, epilepsy and biliousness (Kirtikar & Basu, 1935).

Viscum angulatum Heyne ex DC.

Muncha ottae: Irulas (Palakkad).

Branches are made into a paste and wrapped in cloth. This bundle is put in boiled water and applied over the inflamed body and face after severe jaundice.

Viscum monoicum Roxb. ex DC.

Ittil: Muthuvan (Idukki)

The seeds are boiled in water and the decoction is given to patients suffering from jaundice, fever, typhoid and stomach disorders. Leaf extract is mixed with wild turmeric and applied to the fungal infected area.

Karottai: Irula (Palakkad).

Leaves are made into a paste and bundled in cloth and placed in between the hip joints for healing inflammation of the hip.

The powder of dry leaf was used as a substitute for strychnine and brucine (Kirtikar & Basu, 1935).

ETHNOBOTANICAL ANALYSIS

The centuries old Indian Medical Heritage is being practiced in India through two main streams. The classical stream, which is highly codified and supported by countless literature, is taught in many universities. The second stream, which is represented by the folk and tribal system comprises generally of oral traditions and are transmitted from generation to generation. Among these, the tribal system is in the crude form and is location-specific and species-specific. The practitioners of the tribal system invariably use many plants for their ailments together with taboos and *mantras*.

Tribals of Kerala are generally lazy people and they do not try to collect epiphytes and parasites from other plants for their medical requirement, because they have so many other herbal drugs available on the ground. The present study reported the use of 26 species, which represent 12.44% of the total epiphytes and parasites present in Kerala. The twenty-six species of plants are used for 48 disease conditions or for corrective measures. Among the 48 disease conditions, 28 are treated with one species each, 16 are treated with 2 species each, 2 are treated with 3 species, one with 4 species, and another with 5 species. *Flickingeria nodosa* is used for treating 13 conditions and *Dendrophthoe falcata* is used for 6 diseases.

Earlier workers have reported the properties of 15 species and pharmacological studies were conducted on some of these species. Regarding the method of application and administration, 7 conditions are treated with the paste of the plant part, 4 are given with the rice gruel, 3 conditions are treated with the powder of the plant mixed with

honey, 2 conditions with warm water, 2 with coconut milk, 2 with coconut oil, 1 with turmeric and 1 with pepper, and another with *Phyllanthus amarus* decoction. Regarding plant parts used, 14 conditions are treated with leaves, 5 with whole plant, 3 with twigs, 4 with stem, 3 with tubers, 3 each with seeds, flowers and pseudobulbs, and 2 with bark.

The traditional physicians of Kerala invariably use the word *Ittil* for any kind of plant growing on other plants. So both the epiphytes and parasites are *Ittil* according to them and they believe that these epiphytes and parasites growing on various hosts have different properties and uses. During the study, this kind of information has also been recorded. Various ailments and medicinal properties of various species of epiphytes and parasites are given in the following table.

Sl. No.	Properties / Conditions	Plants used
1	2	3
1.	Alterative	<i>Flickingeria nodosa</i>
2.	Anaemia	<i>Cleisostoma tenuifolium</i>
3.	Aphrodisiac	<i>Flickingeria nodosa</i>
4.	Asthma	<i>Flickingeria nodosa</i> <i>Vanda spathulata</i>
5.	Astringent	<i>Flickingeria nodosa</i>
6.	Brilliance	<i>Remusatia vivipara</i>
7.	Bronchitis	<i>Flickingeria nodosa</i>
8.	Burning sensation	<i>Flickingeria nodosa</i>
9.	Consumption	<i>Flickingeria nodosa</i> <i>Vanda spathulata</i>
10.	Cooling	<i>Viscum articulatum</i>

1	2	3
11.	Dandruff	<i>Cuscuta reflexa</i>
12.	Demulcent	<i>Flickingeria nodosa</i>
13.	Deworming	<i>Taxillus tomentosus</i>
14.	Diarrhoea	<i>Dendrophthoe falcata</i>
15.	Disposal of placenta	<i>Dendrophthoe falcata</i>
16.	Ear ache	<i>Acampe praemorsa</i> <i>Cymbidium aloifolium</i> <i>Vanda tessellata</i>
17.	Emollient	<i>Dendrobium ovatum</i> <i>Luisia zeylanica</i> <i>Rhynchosyilis retusa</i>
18.	Expectorant	<i>Flickingeria nodosa</i>
19.	Fever	<i>Flickingeria nodosa</i> <i>Viscum angulatum</i>
20.	Hair growth	<i>Cassytha filiformis</i> <i>Cuscuta reflexa</i>
21.	Health restorer	<i>Cassytha filiformis</i>
22.	Inflammation	<i>Raphidophora pertusa</i> <i>Viscum monoicum</i> <i>Pholidota imbricata</i> <i>Rhynchosyilis retusa</i>
23.	Internal haemorrhage	<i>Balanophora fungosa</i> <i>Taxillus cuneatus</i>
24.	Jaundice	<i>Viscum angulatum</i> <i>Viscum monoicum</i>

1	2	3
25.	Leucorrhoea	<i>Dendrophthoe falcata</i> <i>Cassytha filiformis</i>
26.	Malaria	<i>Dendrophthoe falcata</i> <i>Vanda testacea</i>
27.	Menstrual disorders	<i>Tolypanthus lagenifer</i>
28.	Milk coagulant	<i>Cuscuta relexa</i>
29.	Nail polish	<i>Dendrophthoe falcata</i>
30.	Piles	<i>Balanophora fungosa</i>
31.	Poisonous bites	<i>Tolypanthus lagenifer</i> <i>Sirhookera lanceolata</i>
32.	Purgative/Laxative	<i>Cuscuta reflexa</i> <i>Dendrobium ovatum</i>
33.	Reducing body heat	<i>Medinilla beddomei</i> <i>Acampe praemorsa</i>
34.	Reducing cholesterol	<i>Dendrophthoe falcata</i>
35.	Rheumatism	<i>Dendrophthoe falcata</i> <i>Tolypanthes lagenifer</i> <i>Acampe praemorsa</i> <i>Bulbophyllum sterile</i> <i>Vanda testacea</i>
36.	Skin diseases	<i>Rhaphidophora pertusa</i> <i>Viscum monoicum</i>
37.	Small pox/ Chicken pox	<i>Dendrophthoe falcata</i> <i>Taxillus tomentosus</i>

1	2	3
38.	Soil borne diseases	<i>Remusatia vivipara</i>
39.	Sprain	<i>Cassytha filiformis</i> <i>Vanda tessellata</i>
40.	Stimulant	<i>Flickingeria nodosa</i>
41.	Stomach ache	<i>Acampe praemorsa</i>
42.	To pull out spine	<i>Pholidota imbricata</i>
43.	Tonic	<i>Acampe praemorsa</i> <i>Flickingeria nodosa</i>
44.	Tumour	<i>Remusatia vivipara</i> <i>Luisia zeylanica</i>
45.	Venereal diseases	<i>Cassytha filiformis</i>
46.	Wounds	<i>Remusatia vivipara</i> <i>Acampe praemorsa</i>

SUMMARY

Owing to its isolation from the Deccan Plateau by the Western Ghats, the tiny state of Kerala possesses a diverse vista of climatic conditions harbouring varied types of vegetation. Occurrence of the epiphytes and parasites has been observed from the sea level to the highest peak (2695 m). The generic and specific representation is maximum in the middle zone (700-1500 m), followed by the upper most zone (1500-2695 m).

Extensive multilocation collections of plants were made in different seasons for a period of about 10 years. The 209 species studied were identified and classified according to the Bentham and Hooker's system of classification, with necessary alterations and additions proposed by Hutchinson. Artificial keys were provided for families, genera and species. Keys were strictly dichotomous and bracketed. A short description of the family, followed by the generic description and a detailed species description was provided. For each species, detailed nomenclature citation, data on the phenology, worldwide distribution, chromosome numbers if available, pertaining notes, occurrence in Kerala and the specimen studied were also provided. Illustrations of 27 selected species and 34 colour photographs on the interesting plants were also provided.

A total of 209 taxa, belonging to 64 genera and 16 families were recorded during this study. Only true epiphytes, aerial parasites and root parasites of flowering plants were included. Orchidaceae is the family having maximum number of epiphytes, and Loranthaceae is the family having maximum number of aerial parasites. Based on the distribution of epiphytes on various levels on the host trees, three synusiae were identified

as: (a) Shade epiphytes, (b) Sun epiphytes and (c) Extreme xerophyllous epiphytes. Most of the epiphytes in Kerala are Sun epiphytes, and are seen on the centre of the crowns and along the larger branches of the trees of middle and top storeys. On very large trees, the Sun epiphytes sometimes spread down to the trunk, below the first fork.

The most prolific epiphytic genera are *Oberonia* (25 species) and *Dendrobium* (17 species) in the Orchidaceae and *Peperomia* (7 spp.) in the Peperomiaceae. The genus *Viscum* with 8 species, *Dendrophthoe* with 4 species and a variety, *Helixanthera* with 4 species, and *Cuscuta* with 4 species constitute the major aerial parasitic genera. *Christisonia*, *Aeginitia*, *Striga* and *Balanophora* are the parasitic genera that infest the roots of various host plants. The monotypic genera represented are *Cottonia* and *Xenikophyton*.

Dendrobium and *Eria* exhibit great polymorphism, ranging from button like pseudobulbous forms like *Dendrobium peguanun* Lindl., *Eria exilis* Hook.f., *Eria reticosa* Wight, to large and big plurinodal forms like *Dendrobium aqueum* Lindl., *Dendrobium jerdonianum* Wight, *Eria pauciflora* Wight and *Eria pseudoclavicaulis* Blatt.. Some of the species of the genera like *Dendrobium*, *Eria* and *Porpax* exhibit both epiphytic and lithophytic habitats. The phenomenon of high degree of vegetative reduction in the epiphytic orchids was reported. This ranges from *Acampe* species with well-developed stems, roots and leaves to the tiny *Chiloschista* and *Taeniophyllum* comprising a body mass of only a few roots.

Eria exilis Hook.f. and *Porpax reticulata* Lindl. are the smallest epiphytes in size and *Aeschynanthus perrottetii* A.DC. and *Hoya* species which grows to several metres form the largest epiphytes. Flowering has been observed to be concentrated to two periods: post-monsoon (August–October) and pre-summer (December–February), with a few species, violating this general rule and flowering in different isolated periods. In response to the changes in temperature, *Flickingeria nodosa* (Dalz.) Seidenf. produces flowers irregularly. The flowering in *Thrixspermum pulchellum* (Thw.) Schlich. was found to be very short-lived.

Of the 209 species, 1 is paleotropic, 6 are pantropic, 1 is world-wide, 101 are endemic to South India, 80 have Sri Lankan distribution, and 18 are Himalayan in distribution. Thirty seven species are found confined only to Kerala and its adjoining areas.

Pholidota imbricata W.J. Hook., *Cymbidium aloifolium* (L.) Sw., *Acampe praemorsa* (Roxb.) Blatt. & McCann, *Peperomia pellucida* (L.) Kunth, etc. are epiphytic species found throughout Kerala and all other species are represented by scanty collections or restricted to certain pockets in few numbers. All the epiphytic species of Kerala are facing severe threat, due to various reasons, mainly of habitat destruction and micro-climatic changes. Conservation strategies are to be developed to protect the populations of these precious taxa from disappearing. *Ex-situ* conservation efforts are being carried out at the Tropical Botanical Garden and Research Institute, Thiruvananthapuram.

Mistletoes are found in Kerala, from lower elevations to higher elevations. The Viscaceae members, especially the leafless ones are seen in the medium elevation to the higher and the Loranthaceae members are found distributed from lower elevation. As the seeds of the parasites are dispersed by birds, most of our fruit crops are severely attacked by parasites. *Helicanthes elastica* (Desr.) Danser is the most deleterious mistletoe found on fruit trees and *Dendrophthoe falcata* (L.f.) Etting. is found commonly on mono-culture plantations. *Macrosolen capitellatus* (Wight & Arn.) Danser is found on most of the jack trees in Kerala. Many instances of death of the host, by the severe attack of aerial parasites have been noticed. But no lethality was found by the attack of root parasites. Among the Loranthaceae members, a specific host-parasite attachment pattern was noticed and it was used for making generic delimitation of seven genera present in Kerala. An artificial key was prepared, based on the attachment pattern of host and parasite. Parasites found attacking different host plants showed a little variation in the size, shape and texture of leaves, but the variants cannot be treated as different varieties or species. The seeds of many parasites can germinate on any substratum but the further development depends on the host. The plantations, which are severely damaged by the forest fires, are found infested by more parasites. The phenomenon of hyper-parasitism, that is some species of parasites attacking the members of the same family was noticed during this study.

An exclusive ethnobotanical study on the epiphytes and parasites of Kerala was conducted and the use of 26 species reported. As the tribes of Kerala have a lot of herbal drugs available around their premises, they did not take much effort to climb the host trees to collect plants for their ailments. So, their knowledge on epiphytes and parasites was

found to be very meager. However, the earlier workers have pharmacologically validated some of the information collected from them. If a thorough investigation on the pharmacology of these epiphytes and parasites is undertaken, it would result in the discovery of new promising drugs for the modern pharmaceutical industry.

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Appendix-I

SOUTH INDIAN ENDEMIC PLANTS FOUND IN KERALA

- Aeginetia acaulis* (Roxb.) Walp.
Aerides crista Lindl.
Aerides maculosa Lindl.
Aerides ringens (Lindl.) Fischer
Aeschynanthus perrottetii A.DC.
Belosynapsis vivipara (Dalz.)
C.E.C. Fischer ex Sprague
Bulbophyllum tremulum Wight
Bulbophyllum acutiflorum A.
Reichb.
Bulbophyllum aureum (Hook. f.)
Smith
Bulbophyllum elegantulum (Rolfe)
J.J. Sm.
Bulbophyllum fimbriatum (Lindl.)
Reichb. f.
Bulbophyllum fusco-purpureum
Wight
Bulbophyllum josephi Muktesh &
Stephen
Bulbophyllum keralensis Muktesh
& Stephen
Bulbophyllum silent-valliensis
Sharma & Srivastava
Bulbophyllum sterile (Lam.)
Suresh
Christisonia keralensis Erady
Christisonia tubulosa Benth. ex
Hook.f.
Cirrhopetalum nilgherrense
Wight
Cirrhopetalum gamblei Hook. f.
Coelogyne glandulosa Lindl.
Coelogyne mossiae Rolfe
Coelogyne nervosa Rich.
Dendrobium anamalayanum
Chandrab., Chandras. & Nair
Dendrobium aquem Lindl.
Dendrobium barbatulaum Lindl.
Dendrobium heyneanum Lindl.
Dendrobium jerdonianum Wight
Dendrobium lawianum Lindl.
Dendrobium microbulbon A. Rich.
Dendrobium nanum Hook.f.
Dendrobium ovatum (Willd.)
Kranz
Dendrobium wightii Hawkes &
Heller
Dendrophthoe falcata (L.f.) Etting. var.
pubescens (Hook.f.) Chandras.
Dendrophthoe trigona (Wight &
Arn.) Danser ex Sant.
Dendrophthoe memecylifolia
(Wight & Arn.) Danser
Diplocentrum congestum Wight
Eria mysorensis Lindl.
Eria reticosa Wight
Eria albiflora Rolfe
Eria dalzellii (Hook. ex Dalz.)
Lindl.
Eria exilis Hook.f.
Eria microchilos (Dalz.) Lindl.
Eria muscicola (Lindl.) Lindl.
var. *brevilinguis* Joseph & Chandras.

- Eria nana* A. Rich.
Eria pauciflora Wight
Eria polystachya A. Rich.
Eria pseudoclavicaulis Blatt.
Eria tiagii Manilal, Sathish Kumar
& Wood
Helixanthera intermedia (Wight)
Danser
Helixanthera obtusata (Schultes)
Danser
Helixanthera wallichiana
(Schultes) Danser
Hoya kanyakumariana Henry &
Swamin.
Hoya pauciflora Wight
Hoya retusa Dalz.
Impatiens auriculata Wight
Impatiens denisonii Bedd.
Impatiens jerdoniae Wight
Impatiens kulamavensis
Pandurangan & V.J Nair
Impatiens modesta Wight
Impatiens parasitica Bedd.
Impatiens sivarajanii Muktesh &
Stephen
Impatiens viridiflora Wight
Kingidium niveum Sathish
Kingidium mysorensense (Sal.) Sath.
Kumar
Luisia abrahamii Vatsala
Luisia evangelinae Blatt. & Mc
Cann
- Luisia macrantha* Blatt. & Mc
Cann
Medinilla beddomei Clarke
Medinilla malabarica Bedd.
Oberonia agastyamalayana
Sath.Kumar
Oberonia anamalayana Joseph
Oberonia brachyphylla Blatt. &
Mc Cann
Oberonia brunoniana Wight
Oberonia josephii Sald.
Oberonia nayarii Ansari & Balakr.
Oberonia platycaulon Wight
Oberonia sebastiana Shetty &
Vivek.
Oberonia wayanadensis Sivad. &
Balakr.
Oberonia chandrasekharanii Nair,
Ramachandran & Ansari
Oberonia proudlockii King &
Pantl.
Oberonia santapau Kapad.
Oberonia seidenfadeniana Joseph
& Vajravelu
Oberonia verticillata Wight
Pteroceras leopardinum (Par. &
Reichb. f.) Seidenf. & Smith
Rhytionanthos rheedei (Manilal &
Sathish) Garay, Hamer &
Siegerist
Robiquetia josephiana Manilal &
Sath. Kumar

Schoenorchis jerdoniana (Wight)

Garay

Schoenorchis manilaliana

Muktesh & Stephen

Seidenfadeniella rosea (Wight)

Sathish

Smithsonia maculata (Dalz.) Sald.

Smithsonia straminea Sald.

Smithsonia viridiflora (Dalz.) Sald.

Taeniophyllum scaberulum Hook.

f.

Taxillus recurvus (DC.) Tiegh.

Tolypanthus lagenifer (Wight)

Tiegh.

Trias bonaccordensis Sath. Kumar

Trias stocksii Benth. ex Hook.f.

Viscum orbiculatum Wight

Viscum trilobatum Talb.

Xenikophyton smeeanum

(Reichb.f.) Garay

Appendix-II

HIMALAYAN PLANTS FOUND IN KERALA

Acampe ochracea (Lindl.) Hochr.

Acampe praemorsa (Roxb.) Blatt. & McCann

Acampe rigida (Buch.-Ham. ex J. E. Smith) P.F. Hunt

Bulbophyllum careyanum (Hook.) Spreng.

Bulbophyllum xylophyllum Par. & Reichb. f.

Chiloschista lunifera (Reichb. f.) J.J. Sm. ex Holtt.

Cymbidium aloifolium (L.) Sw.

Cymbidium bicolor Lindl.

Dendrobium herbaceum Lindl.

Dendrobium peguanum Lindl.

Liparis caespitosa (Thouars) Lindl.

Liparis elliptica Wight

Liparis viridiflora (Bl.) Lindl.

Luisia brichea (A. Rich.) Bl.

Luisia zeylanica Lindl.

Oberonia ensiformis (Smith) Lindl.

Remusatia vivipara (Roxb.) Schott

Thelasis pygmaea (Griff.) Bl.

Appendix-III

SRI LANKAN PLANTS FOUND IN KERALA

- Acampe ochracea* (Lindl.) Hochr.
Acampe praemorsa (Roxb.) Blatt.
& McCann
Aeginetia indica L.
Aeginetia pedunculata Wall.
Aerides crispa Lindl.
Chiloschista pusilla (Retz.) Schl.
Christisonia bicolor Gard.
Christisonia neelgherica
Cleisostoma tenuifolium (Lindl.)
Garay
Coelogyne breviscapa Lindl.
Coelogyne odoratissima Lindl.
Cottonia peduncularis (Lindl.)
Reichb. f.
Cymbidium aloifolium (L.) Sw.
Cymbidium bicolor Lindl.
Dendrobium haemoglossum Thw.
Dendrobium heterocarpum Wall. ex
Lindl.
Dendrobium macrostachyum Lindl.
Dendrobium nutantiflorum Hawkes
& Heller
Dendrobium panduratum Lindl.
Dendrophthoe falcata (L.f.) Etting.
Dendrophthoe neelgherrensis
(Wight & Arn.) Tiegh.
Diplocentrum recurvum Lindl.
- Flickingeria nodosa* (Dalz.)
Seidenf.
Gastrochilus acaulis (Lindl.)
Kuntze
Helixanthera hookeriana (Wight &
Arn.) Danser
Hoya ovalifolia Wight & Arn. ex
Wight
Kingidium deliciosum (Reichb. f.)
Sweet
Korthalsella japonica (Thunb.)
Engl. var. *japonica*
Liparis caespitosa (Thouars) Lindl.
Liparis elliptica Wight
Liparis viridiflora (Bl.) Lindl.
Luisia birchea (A. Rich.) Bl.
Luisia zeylanica Lindl.
Macrosolen capitellatus (Wight &
Arn.) Danser
Macrosolen parasiticus (L.) Danser
Oberonia arnottiana Wight
Oberonia ferruginea Par. ex Hook. f.
Oberonia longibracteata Lindl.
Oberonia recurva Lindl.
Oberonia tenuis Lindl.
Oberonia thwaitesii Hook. f.
Oberonia wightiana Lindl.
Papilionanthe cylindrica (Lindl.)
Seidenf.

Peperomia blanda (Jacq.) Kunth
var. *blanda*
Peperomia blanda (Jacq.) Kunth
var. *floribunda* (Miq.) Huber
Peperomia heyneana Miq.
Peperomia pellucida (L.) Kunth
Peperomia portulacoides (Lamk.)
Dietr.
Peperomia pseudo-rhombea C.DC.
Peperomia tetraphylla (Forst.)
Hook. & Arn.
Pholidota imbricata W.J. Hook.
Podochilus malabaricus Wight
Porpax jerdoniana (Wight) Rolfe
Rhaphidophora pertusa (Roxb.)
Schott
Robiquetia gracilis (Lindl.) Garay
Schoenorchis nivea (Lindl.) Schltr.
Scurrula cordifolia (Wall.) G. Don
Scurrula parasitica L.
Seidenfadeniella filiformis (Reichb.f.)
E.A. Chr. & Ormerod
Sirhookera lanceolata (Wight)
Kuntze

Sirhookera latifolia (Wight) Kuntze
Striga angustifolia (Don) Sald.
Striga asiatica (L.) Kuntze
Striga gesnerioides (Willd.) Vatke
Taxillus cuneatus (Heyne ex Roth)
Danser
Taxillus tomentosus (Heyne ex
Roth) Tiegh.
Thrixspermum pulchellum (Thw.)
Schlch.
Thrixspermum walkeri Seidenf. et
Ormerod
Trichoglottis tenera (Lindl.) Schltr.
Vanda spathulata (L.) Spreng.
Vanda tessellata (Roxb.) Hook. ex
G. Don
Vanda testacea (Lindl.) Reichb.f.
Vanda thwaitesii Hook. f.
Viscum angulatum Heyne ex DC
Viscum articulatum Burm.f.
Viscum capitellatum J.E. Smith
Viscum heyneanum DC.
Viscum monoicum Roxb. ex DC
Viscum orientale Willd.

Appendix-IV

PLANTS INCLUDED IN THE RED DATA BOOK

- Bulbophyllum acutiflorum* A. Reichb.
Bulbophyllum aureum (Hook. f.) Smith
Bulbophyllum elegantulum (Rolfe) J.J. Sm.
Bulbophyllum fusco-purpureum Wight
Bulbophyllum josephi Muktesh & Stephen
Bulbophyllum keralensis Muktesh & Stephen
Bulbophyllum silent-valliensis Sharma & Srivastava
Bulbophyllum sterile (Lam.) Suresh
Christisonia keralensis Erady
Coelogyne mossiae Rolfe
Coelogyne odoratissima Lindl.
Eria albiflora Rolfe
Hoya kanyakumariana Henry & Swamin.
Impatiens auriculata Wight
Impatiens denisonii Bedd.
Impatiens kulamavuensis Pandurangan & V.J. Nair
Impatiens viridiflora Wight
Medinilla malabarica Bedd.
Oberonia brachyphylla Blatt. & McCann
Taxillus recurvus (DC.) Tiegh.

Appendix-V

LIST OF SCHEDULED TRIBES IN KERALA

- | | |
|-------------------------|----------------------------------|
| 1. Adiyar | 19. Maha Malassar |
| 2. Arandan | 20. Malai Arayan |
| 3. Eravalan | 21. Malai Pandaram |
| 4. Hill Pulaya | 22. Malai Vedan |
| 5. Irular, Irulan | 23. Malakkuravan |
| 6. Kadar | 24. Malassar |
| 7. Kammara | 25. Malayan |
| 8. Kanikkaran / Kanikar | 26. Malayanayar |
| 9. Kattunayakan | 27. Mannan |
| 10. Kochuvelan | 28. Marati |
| 11. Konda Kapuz | 29. Muthuvan / Mudugan / Muduvan |
| 12. Kondaraddis | 30. Palleyan |
| 13. Koraga | 31. Palliyan |
| 14. Kota | 32. Palliyar |
| 15. Kudiya / Melakudi | 33. Paniyan |
| 16. Kurichiyan | 34. Ulladan |
| 17. Kurumans | 35. Uraly |
| 18. Kurumbas | |

Appendix-VI

LOCAL NAMES AND THEIR BOTANICAL NAMES

Akasavalli	:	<i>Cuscuta reflexa</i> Roxb.
Alottu	:	<i>Helicanthes elastica</i> (Desr.) Danser
Chadakkampothi	:	<i>Flickingeria nodosa</i> (Dalz.) Seidenf.
Chukkampothy	:	<i>Cymbidium aloifolium</i> (L.) Sw.
Elakkavalli	:	<i>Bulbophyllum sterile</i> (Lam.) Suresh
Elithandan	:	<i>Rhaphidophora pertusa</i> (Roxb.) Schott
Ittil	:	<i>Dendrophthoe falcata</i> (L. f.) Etting, <i>Viscum monolcum</i> Roxb. ex DC.
Kaithankodi	:	<i>Cuscuta reflexa</i> Roxb.
Kamalpullaruvi	:	<i>Bulbophyllum sterile</i> (Lam.) Suresh
Karottae	:	<i>Viscum monolcum</i> Roxb. ex DC.
Kattu chembu	:	<i>Remusatia vivipara</i> (Roxb.) Schott
Mara chembu	:	<i>Remusatia vivipara</i> (Roxb.) Schott
Maravazha	:	<i>Acampe praemorsa</i> (Roxb.) Blatt. & McCann, <i>Rhyncostylis retusa</i> (L.) Bl., <i>Vanda tessellata</i> (Roxb.) Hook. ex Don
Moodillathali	:	<i>Cassytha filiformis</i> L.
Mulluthuppi	:	<i>Pholidota imbricata</i> W.J. Hook.
Muncha ottae	:	<i>Viscum angulatum</i> Heyne ex DC.
Neeruvally	:	<i>Rhaphidophora pertusa</i> (Roxb.) Schott
Neervazhakam	:	<i>Pholidota imbricata</i> W.J. Hook.
Nilachakka	:	<i>Balanophora fungosa</i> J.R. Forst. subsp. <i>indica</i> (Arn.) Hansen var. <i>indica</i> , <i>Vanda tessellata</i> (Roxb.) Hook. ex Don
Ottu	:	<i>Dendrophthoe falcata</i> (L.f.) Etting.
Ottumaram	:	<i>Scurrula parasitica</i> L.
Pannivalan	:	<i>Cleisostoma tenuifolium</i> (L.) Garay
Ponnampon Maravazha	:	<i>Vanda spathulata</i> (L.) Spreng.

Puluchedi	:	<i>Taxillus tomentosus</i> (Heyne ex Roth.) Tiegh.
Segutta ola	:	<i>Cymbidium aloifolium</i> (L.) Sw.
Thali	:	<i>Medinilla beddomei</i> Clarke
Unnesh chedi	:	<i>Dendrobium ovatum</i> (Willd.) Kranzl.
Velleli thandu	:	<i>Rhaphidophora pertusa</i> (Roxb.) Schott

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