

TAXONOMIC AND MORPHOLOGIC
STUDIES ON THE FAMILY
CONVOLVULACEAE
OF SOUTHERN PENINSULAR INDIA

Thesis
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DOCTOR OF PHILOSOPHY
OF
THE UNIVERSITY OF CALICUT

By
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Dedicated
to the cherished memory of late
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Certificate

This is to certify that the thesis entitled "**Taxonomic and morphologic studies on the family Convolvulaceae of Southern Peninsular India**", submitted by Sri. S.D. Biju for the degree of **Doctor of Philosophy** in Botany of 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 or recognition.

Sri. Biju has successfully completed the qualifying examination prescribed by University of Calicut as part of the Ph.D programme.

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Declaration

I hereby declare that the thesis ` **Taxonomic and morphologic studies on the family Convolvulaceae of Southern Peninsular India** ', submitted by me in partial fulfilment for the **Ph.D degree** of the University of Calicut, incorporates the results of the work done by me. This thesis has not been submitted by me to any other University for the award of any degree or diploma and it represents the original work done by me.

S.D. Biju

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Thesis Abstract

The family Convolvulaceae of Southern Peninsular India is taxonomically revised giving special emphasis to its economic potential. The study area includes Kerala, Tamil Nadu, Andhra Pradesh, Karnataka and Union Territory of Pondicherry, totally covering 4,67,186 sq. km.

As a result of these investigations 104 taxa (102 species and 2 subspecies) including 4 new species and 4 new records have been identified and characterised. Nomenclature problems that persisted for several taxa in the family have been resolved.

Typification, synonymy, vernacular names, detailed description, distribution, ecology and flowering and fruiting period are given for all species. Illustrations and photographs are provided for most of the species. Type photographs are also provided wherever necessary. Seedling morphology and extrafloral nectary studies are also included. A complete bibliography and an index to scientific names are provided at the end.

New Species

Argyreia kudajadrya Biju & Mathew
Lepistemon verdcourtii Mathew & Biju
Stictocardia sivarajania Biju,
Pushp. & Mathew
Rivea palayamkottensis Biju & Mathew
Argyreia sp. A
Ipomoea sp. A

New records

Ipomoea parasitica (Kunth) G. Don
Merremia hirta (Linn.) Merrill
Merremia cissoides (Lamk.) Hall.f.
Operculina ventricosa (Bertero) Peter

Nomenclatural problems of the following species are solved

Typification

Dinetus malabarica (Clarke)
Staples ined.
Evolvulus nummularius (Linn.) Linn.
Ipomoea batatas (Linn.) Lamk.
Ipomoea quamoclit Linn.
Lepistemon leiocalyx Stapf.
Merremia aegyptia (Linn.) Urban.
Merremia hederaceae (Burm.f.) Hall.f.
Merremia vitifolia (Burm.f.) Hall.f.

Type designation

Argyreia involucrata Clarke
Merremia emarginata (Burm.f.) Hall.f.

INTRODUCTION

S D Biju “Taxonomic and morphologic studies on the family Convolvulaceae of Southern Peninsular India” Thesis. Department of Botany , University of Calicut, 1997

Introduction

INTRODUCTION

The members of the family Convolvulaceae are called 'Morning Glories' where they occur, their foliage merge with the landscape making no visual impact. But when they manifest themselves in flowers, they blossom to glory with the rising sun. This ephemeral glory slowly dwindles down and depart them when their flowers wither by noon. The lyrical name 'Morning Glory' hence suits them well.

They possess bell shaped flowers. Flowers come in high profusion and have exceedingly delightful colours and surprisingly outlined geometrical dimensions. Even a casual observer will find it hard to miss the aesthetic ecstasy that these bindweed flowers exude. Forest is their natural habitat but more they prefer hedges and waysides spreading the landscape with spots of glory.

Tennyson's thoughts on *Convolvulus* come as:

*"A low breath
Of tender air made tremble in the hedge
The fragile bindweed bells, and briony rings."*

and Webster sings about them:

*"In all fair hues from white to mingled rose,
Along the hedge the clasping bindweed flowers,
* * * * *
Along the hedge, besides the trodden lane
Where day by day we pass, and pass again."*

The pleasing shape and the range of colours make morning glory an ideal ornamental plant for tropics and subtropics. Utility wise also they are in the forefront. Some of them like sweet potato (*Ipomoea batatas*) are among the highest yielding tuber crops. Other members yield vegetable, medicine and narcotics.

The family Convolvulaceae is included in the order Polemoniales by Bentham and Hooker (1876), Cronquist (1981) and Takhtajan (1980). While Hutchinson (1926), Thorne (1981) and Dahlgren *et al.* (1981) assigned the family to the order Solanales, Engler considered it under the order Tubiflorae.

Austin (1980 a) mentioned that the family is probably more closely related to Polemoniaceae than to Solanaceae. But the presence of tropane alkaloids in Solanaceae and Convolvulaceae indicates their close association (Romeike, 1978). Besides this, the two families have some flavonoid profiles, caffeic acid esters and coumarins (Gornall *et al.*, 1979; Harborne & Swain, 1979; Wagner, 1973). The family Convolvulaceae could be easily distinguished from related families by the presence of milky sap or latex, bicollateral vascular strands, large to medium sized flowers, tubular, funnel form, campanulate or urceolate corolla with midpetaline bands, buds mostly in duplicate, distinct stamens, erect sessile ovules with axile placentation, fruits 1 to 4 locular, capsule dehiscent or indehiscent and folded cotyledons.

Generic delimitation of this extremely natural family is a most difficult task. (Ooststroom, 1953; Wilson, 1960; Verdcourt, 1963; Austin 1980 a). According to Robert Wight (1840-1850) "difficulties have always been attended in the investigation of the species, not so much in their discrimination as in the correct limitation of the genera to which they require to be referred a point on which for a long time, no two Botanists could agree". The genus *Operculina* is separable from *Merremia* only on the basis of fruit characteristics. *Ipomoea* is generally distinguished from *Merremia* on the basis of pollen characters. The genus *Rivea* is the most poorly defined taxon, most of the characters being shared with *Argyreia*. Currently Paul Wilkin (Kew) is studying the subdivision of *Ipomoea* and its relatives. He plans to sink *Stictocardia* and *Argyreia* into *Ipomoea* (Verdcourt, Pers. comm., 1996).

The present study holds that many of the genera need a thorough study throughout their ranges to give a satisfactory classification. Hallier (1893 a, b) first recognised the genus *Merremia* from *Ipomoea* on the ground of its non-spinulose pollen grains. However, in many herbaria the transfer of all the relevant material from *Ipomoea* to *Merremia* has not yet been made or, only partially made. This reveals that a revisionary study in the global perspective is most urgent for this family. To start with, intensive taxonomic studies on local or regional basis must be initiated. Keeping this in backdrop, we chose to undertake the revisionary study of Peninsular Indian Convolvulaceae. This study is intended to provide material and conceptual support to future revision of the family throughout its distribution .

Early botanical studies in Peninsular India was done by Wight (1840-1850) who made an extensive collection in South India. He described these plants as. "..... the species of that beautiful but difficult and hitherto ill-understood family of plants." After the creditable works of Clarke (1883) and Gamble (1923) no reliable work has been undertaken on this family.

Historical Review of the Family Convolvulaceae

The dried milky juice of Scammonium (*Convolvulus scammonia*) had been used as a medicine from ancient times. Theophrastus in third century B.C was familiar with its medicinal use. The drug was used in Britain in 10th and 11th centuries and appears to be one of the medicines recommended to King Alfred the Great, by Helias patriarch of Jerusalem (Fluckiger & Hanbury, 1986 rep.).

Linnaeus (1753) listed many species of this family from Asia under 'Pentandria Monogynia'. *Convolvulaceis Orientalis*, the first specialist book on this family was by Choisy (1833). This work retains its significance even now. It included description of many new genera (eg. *Aniseia*, *Jacquemontia* and *Rivea*) and new sections (eg. *Ipomoea* sect. *Erpipomoea* Choisy). German Botanist Hallier (1868 - 1932), another expert on this family, followed Choisy and described many new taxa. Subsequently many authors (Peter, 1891; Prain, 1894; House, 1909; Roberty, 1952) brought out series of publications on this group. Following these works, a large number of publications relating to

individual genera or restricted areas of the family appeared. Taxonomic treatment of Convolvulaceae in Malaysia (Ooststroom, 1953), East Africa (Verdcourt, 1963), Panama (Austin, 1975 b), Ceylon (Austin, 1980 a), W. Pakistan (Austin & Ghazanfar, 1979) and Ecuador (Austin, 1982 a), influenced further studies on this family in other regions.

Several monographs and revisions dealing with selected genera of Convolvulaceae appeared. The first among them was the monograph of the genus *Cuscuta* by Yuncker (1932). In 1934 Ooststroom composed an excellent world monograph of the genus *Evolvulus*. He maintained a life-long interest in the family. His excellent works on Malaysian Convolvulaceae (1939, 1940, 1943 and 1950) served as classical reference to future workers world around. Robertson (1971) revised the genus *Jacquemontia* in North and Central America and West Indies. Staples (1987) made a revision of *Porana* and an evaluation of the tribe Poraneae for his Ph.D. dissertation.

In 1968 Myint and Ward published a taxonomic revision of the genus *Bonamia*. Significant contributions were made by Hoogland (1953), Myint (1966) and Austin and Huaman (1996) on the genus *Erycibe*, *Stylisma* and *Ipomoea* respectively. Staples (1979) studied the generic relationships of *Ipomoea*, *Merremia* and *Operculina*. Besides these, several publications have been made by O'Donnell (1941ab), Gunn (1972 a,b) and Austin (1978, 1979), mostly dealing with North and South American members of this family.

During the British reign in India botanical sciences, especially floristic studies flourished. Van Rheedee in his monumental work, *Hortus Malabaricus* (1678 - 1703) described and illustrated 17 Convolvulaceae species from Kerala. *Hortus Malabaricus* was one of the main sources for Linnaeus to master his knowledge on the tropical flora of Asia (Heniger, 1986). Based on Rheedee's figures in *Hortus Malabaricus*, besides Linnaeus several workers like Adanson, de Jussieu, Hamilton, de Candolle etc, described many taxa of Indian plants and adopted the vernacular names into botanical nomenclature (Sivarajan & Pradeep, 1996). Roxburgh had made extensive collections in Bengal and Eastern India. His *Hortus Bengalensis* (1814) contained the names of many members of Convolvulaceae. Later in *Flora Indica* (1832) he included detailed descriptions of 100 species belonging to 10 genera of Convolvulaceae. In 1839

British Botanist Robert Wight published his well known work '*Icons Plantarum*', which carried 25 illustrations of Convolvulaceae members.

J.D. Hooker published his monumental seven volume work, '*Flora of British India*' from 1872-1897. In the fourth volume, Convolvulaceae was treated by C.B. Clarke (1883). It summarises the results of the collections made by Roxburgh, Wallich, Wight and Arnott, Griffith, J.D. Hooker and others. In *Flora of British India* the family Convolvulaceae includes the description of 152 species belonging to 15 genera. Gamble's *Flora of Presidency of Madras* (1915-1936) is a classical floristic account covering a major area of the Peninsular India. It includes the description of 21 genera and 79 species of Convolvulaceae.

After the classical floras by Hooker and Gamble, no serious attempt had been made on this family in India except by others of the local floras. Santapau and Patel (1958, 1961) studied the Convolvulaceae of Bombay. Recently Johri (1984 b) made a taxonomic treatment on the Indian genus of *Ipomoea*. Several new taxa and new reports have been published from India by Santapau (1947), Santapau and Patel (1958), Balakrishnan (1961), Santapau and Korlahalli (1966), Mukherjee and Bhattacharyya (1970), Rao and Sastry (1971), Singh *et al.* (1973), Nair (1976), Mitra and Roy (1975), Chandrabose *et al.* (1979), Bandari (1990), Singh (1990), Mathew and Biju (1991), Biju and Mathew (1993, 1994), Biju *et al.* (1996), Rajagopal (1996) etc.

Considerable work has been done on the anatomy of Convolvulaceae. Carlquist and Hanson (1991) made a quantitative and qualitative study of the wood and stem anatomy of 16 genera and 35 species of Convolvulaceae. Occurrence of tracheids together with fibriform vessel elements in the wood of many members suggests relationship of Convolvulaceae to Polemoniaceae and Hydrophyllaceae. Intraxylary phloem and other wood features suggest relationship between Convolvulaceae and Solanaceae. Kennedy and Crafts (1931) studied the genus *Convolvulus*. Mc Cormick (1916), Kennedy and Crafts (1931), Inamdar (1969), Kaur and Singh (1970), Govil (1971 b), Seago (1971), Wilson and Lowe (1973), Singh *et al.* (1974), Bhattacharyya (1976), Scott (1981), Lowell and Lucansky (1986, 1990), Shanmukha Rao and Leela (1990), Uma Devi *et al.* (1990), Mc Donald (1992) and Frey (1995) made the anatomical studies on the genus *Ipomoea*. Bhattacharyya (1988) made vascular cambial studies of the genus *Cuscuta*.

Rodella *et al.* (1993) studied the comparative leaf and stem anatomy of *Merremia* species.

The floral anatomy of the family has been studied by Govil (1972). Govil (1971 a) and Shanmukha Rao and Leela (1993) studied the seed coat morphology and epidermal patterns. The morphological studies of staminal hairs of certain members of Convolvulaceae have been studied by Kannabiran and Nandanakunjidam (1993). Nyawuambe and Gill (1991) studied the cuticular aspects of 30 species of this family.

Pollen morphology plays an important role in the generic delimitation in Convolvulaceae. The genera *Ipomoea* and *Merremia* are separable only on the basis of spinulose and non-spinulose pollen grains.

Hallier (1893 a) was probably the first worker to use pollen morphology as a taxonomic character in his extensive taxonomic revision of the Convolvulaceae. Manitz (1969) and Huang (1972), have made general survey of the pollen type, confined to a particular geographical region. In *Flora of Presidency of Madras*, Gamble (1923) grouped different genera in Convolvulaceae based on pollen grains. He observed that pollen grains are spinulose in *Argyreia*, *Ipomoea*, *Rivea* and *Stictocardia* and non spinulose in *Aniseia*, *Breweria*, *Convolvulus*, *Cressa*, *Cuscuta*, *Erycibe*, *Evolvulus*, *Hewittia*, *Jacquemontia*, *Merremia*, *Neuropeltis*, *Operculina* and *Porana*. Nair and Rehman (1963) studied 49 species in 16 genera of this family and proposed a classification on the basis of pollen studies. Their pollen studies provided evidence to support the conclusion that Convolvulaceae is less evolved than Boraginaceae and has affinity to Acanthaceae. Sengupta (1972) made an extensive investigation of the pollen morphology of the family and gave excellent description of the range of pollen types. Recently Ferguson *et al.* (1977) made an excellent and extensive study of the pollen morphology of 250 species of *Ipomoea* (not published), 53 species of *Merremia* and 5 species of *Operculina*. Lewis (1971), Parveen and Bhandari (1982), Austin and Staples (1980, 1985) and Severova (1995), studied the pollen grains of several taxa of this family.

Cytological and cytogenetical investigations have been carried out on several members of Convolvulaceae by many workers (King & Bamford, 1937;

Wolcott, 1937; Rao, 1947; Ting *et al.*, 1957; Sharma & Datta, 1958; Nakajima, 1963; Jones, 1964, 1968; Sampathkumar, 1971, 1979; Magoon *et al.*, 1972; Bhan & Kaul, 1973; Vij *et al.*, 1977; Saeed *et al.*, 1990; Yen *et al.*, 1992; Luque & Lifante, 1994; Oziaa - Akins & Jarret, 1994).

Chemotaxonomic studies of the family have been done by Wagner (1973) and Nair *et al.* (1988). The extracts of 14 species of *Ipomoea* have been analysed for amino acid. The results suggest that *Merremia tuberosa* is an integral constituent of *Ipomoea* and *Quamoclit* cannot be treated as a distinct genus (Shanmukha Rao and Leela, 1992). Leela and Shanmukha Rao (1994) analysed phenolic compounds of 13 taxa of *Ipomoea*. The distribution of these compounds in different taxa is found to be useful for taxonomy. Different biochemical aspects of *Ipomoea* species have been worked out by Chaudhary *et al.* (1957), Hofmann (1963), Ishikura and Shimizu (1975), Daulatab *et al.* (1992) and Sattar *et al.* (1995). Chao and Marderosian (1973) studied the ergoline alkaloids in the genus *Argyreia* and discussed their chemotaxonomic implication for the family.

Economic importance of the family

Many species supply food and medicine while several others are valuable ornamentals. Sweet potato (*Ipomoea batatas*) is grown throughout the Tropics for its edible tubers which are an important source of food in many countries. In India, more than 60% of the sweet potato cultivation is confined to Uttar Pradesh and Bihar (Rajendran *et al.*, 1992). The tuber is used as a source of starch in many countries especially in Japan and USA. A variety of products such as edible and fermentable syrups, industrial alcohol, acetone, lactic acid, vinegar and yeast can be prepared from the tubers. Apart from the tuber, the tender parts of the plant are used as vegetable in Africa, Papua New Guinea, Philippines, Indonesia, Malaysia, Ceylon and India (Ghosh *et al.*, 1988; Austin, 1980 a). Sweet potato vines serve as nutritive and palatable green feed for cattle. The young twigs and leaves of *Ipomoea aquatica* are used as vegetable in Malaysia, India and China (Ooststroom, 1953 and Austin, 1980 a). The fleshy and tender fruits of *Ipomoea turbinata* are used as vegetable in Ceylon and India. The wood of the weedy species *Ipomoea carnea* is used locally as a

source of fuel. Some Convolvulaceae members are used as cover crops, since they have luxuriant growth. *I. pes-caprae* is planted on sandy coasts as a sand-binder.

Several members of this family are used in traditional systems of medicine. The glycoresins represent an important chemotaxonomical marker of this family, and are responsible for the purgative properties of some members of Convolvulaceae (Rogelio, 1995).

Trivrit (*Operculina turpethum*) is long noted in India for its laxative property. It has found its way to European markets since early times through Arabs as mentioned in Garcia da Orta's writings. The root and root bark are cathartic, purgative and particularly useful in rheumatic and paralytic disorders. Traditionally, it is administered for dropsy due to heart, kidney and liver diseases (Sivarajan & Indira Balachandran, 1994). *Evolvulus alsinoides* commonly known as 'Visnukranthi' is used for all kinds of fever; and is a powerful brain stimulant and aphrodisiac. *Argyreia nervosa* is reported to be useful in urinary, heart and skin diseases and intermittent fever. 'Prasarini' (*Merremia tridentata*) is used for the treatment of rheumatic disorder with contraction and stiffness of the joints. *Prasarini* is also reported to promote sexual vigour, increase in semen, enhanced body strength and youthful glow. It is useful in curing piles and oedema (Aiyer & Kolammal, 1963). In India *Ipomoea marginata* is believed to be capable of bestowing a male child and hence the synonyms *Putrada* or *Putrajani*. In ayurvedic practise it is considered as a single drug to cure sterility in women (Sivarajan & Indira Balachandran, 1994). The drug produced from the subterranean tuber of *Ipomoea mauritiana* is galactagogue. *Ipomoea nil* is used as a purgative in cases of gastric disorders, flatulence, oedema, fever, headache and worm infestations. The leaves of *Ipomoea batatas* are used as a poultice for the treatment of inflammatory tumors and their decoction is used in baths and gargles for tumors of the mouth and throat (Rogelio, 1995). Bactericidal and fungicidal substances have been isolated from the vines and tubers of sweet potato. It is used as an antidiabetic in Philippines. Roots are considered as a laxative (Ghosh *et al.*, 1988). The aerial parts of *Ipomoea pes-caprae* in the form of a decoction or a poultice are applied to ulcerating tumors and used for the treatment of rheumatic pain.

The infusion is drunk to treat kidney ailments, functional digestive disorders and internal pain. The antispasmodic activity of the extract of *Ipomoea pes-caprae* is found to be in the same range as that of papaverine, a general spasmolytic agent (Pongprayoon *et al.*, 1992). The alcoholic extracts of leaves of *I. pes-caprae* are also insulinogenic and have hypoglycemic activity (Khan *et al.*, 1994). The pharmacology of *I. carnea* had been studied by Tirkey *et al.* (1988) and is used against scorpion sting (Jain & Sahu, 1993).

The complex alkaloids of the seeds of several members of this family have hallucinogenic property. In the genus *Argyreia* there are 13 species containing amides of lysergic acid, which are responsible for the potent hallucinating experience. They are natural sources of chemicals that are closest to the potent psychotomimetic known as, LSD-25 (Emboden, 1979).

Horticultural potential of Convolvulaceae has been already recognised. Many are extremely beautiful and are cultivated in the tropical and subtropical belts of both the hemispheres. They are cultivated for their large and showy funnel-like or bell shaped beautifully coloured flowers and are quite useful as vegetation cover on walls or fences (Sivarajan, 1976).

The genera represented in Indian gardens are *Ipomoea*, *Argyreia*, *Porana*, *Merremia* and *Jacquemontia*. Of these *Ipomoea* forms the largest ornamental genus of the family with about 15 species. Indian pink or Cyperss vine (*I. quamoclit*), a delicate annual with pinnatisect leaves with bright scarlet red flowers, blooms from August to November in South Indian gardens. *Ipomoea cairica*, (railway creeper) is suitable for garden fences, producing flowers almost throughout the year. The Lady Doorly morning glory or Cardinalcreeper (*I. horsfalliae*) with deep rose flowers, is a native of West Indies and is very common in Indian gardens. *I. nil*, *I. leari*, *I. indica*, *I. hederifolia*, *I. macrantha* etc. are the other common garden plants in Peninsular India. *Ipomoea alba* is also called 'Moon flower' since it is nocturnal, and has white fragrant flowers.

Argyreia nervosa commonly called 'baby wood rose' is an indigenous species producing pinkish flowers. The dry fruits are used for flower arrangements. Christmas vines (*Poranopsis paniculata* and *Porana volubilis*) are very attractive twiners suitable for arches and pergolas. *Merremia tuberosa*, called 'wood rose'

is popular in Indian gardens for its sulfur yellow flowers and showy accrescent fruits for dry flower arrangement. *M. vitifolia* and *M. dissecta* are also used as ornamental climbers in gardens, for covering the fences, trellis and walls. *Operculina turpethum* and *O. ventricosa* horticulturally known as 'transparent wood rose' are ideal for flower and dry fruit arrangement. *Jacquemontia pentantha*, *Stictocardia tiliifolia* and *S. brevicalyx* are other three ornamental species in Peninsular India.

Area of the study

This study covers Southern Peninsular India, consisting of the states of Kerala, Tamil Nadu, Andhra Pradesh, Karnataka and Union territory of Pondicherry (fig. 1), covering an area of 4,67,186 sq. km. The region is bounded by Maharashtra, Madhya Pradesh and Orissa on the north, by Bay of Bengal on the east, Indian Ocean on the south and Arabian sea in the west (Sivarajan & Pradeep, 1996). This entire area can be broadly subdivided into two - Malabar and Deccan. The former is a long and narrow strip of southern Western Ghats, rich in flora - accounting for several endemic species. The Ghats, while merging smoothly into the Deccan Plateau East, descend steeply to the coastal plain in the West. Anamudi, the highest peak of the Ghats south of Himalayas rises to 8846 feet/2695 meters. Out of the estimated 15,000 plant species in India, nearly 4000 are found in the Western Ghats (Manickam and Irudayaraj, 1992). The Western Ghats harbours the tropical moist evergreen forests and moist deciduous forests on the western slopes. The development of vegetation is at its peak towards the southern portion of the Western Ghats.

Deccan, the great table-land of South Indian Peninsula, stretches from the Aravalis, Malwa, the Vindhya, the Satpura and Chota Nagpur Hills, almost upto Kanniyakumari in the south. The northern part of the plateau slopes westwards while the southern part slopes towards the south east. It is the rainshadow region of the Western Ghats, characterised by the tropical deciduous forest. The eastern coastal plains of the Deccan plateau run as a broad strip, parallel to the Bay of Bengal (Coromandel coast) and gradually rise towards the inland.

Together, Malabar and Deccan regions provide a wide variety of climatic

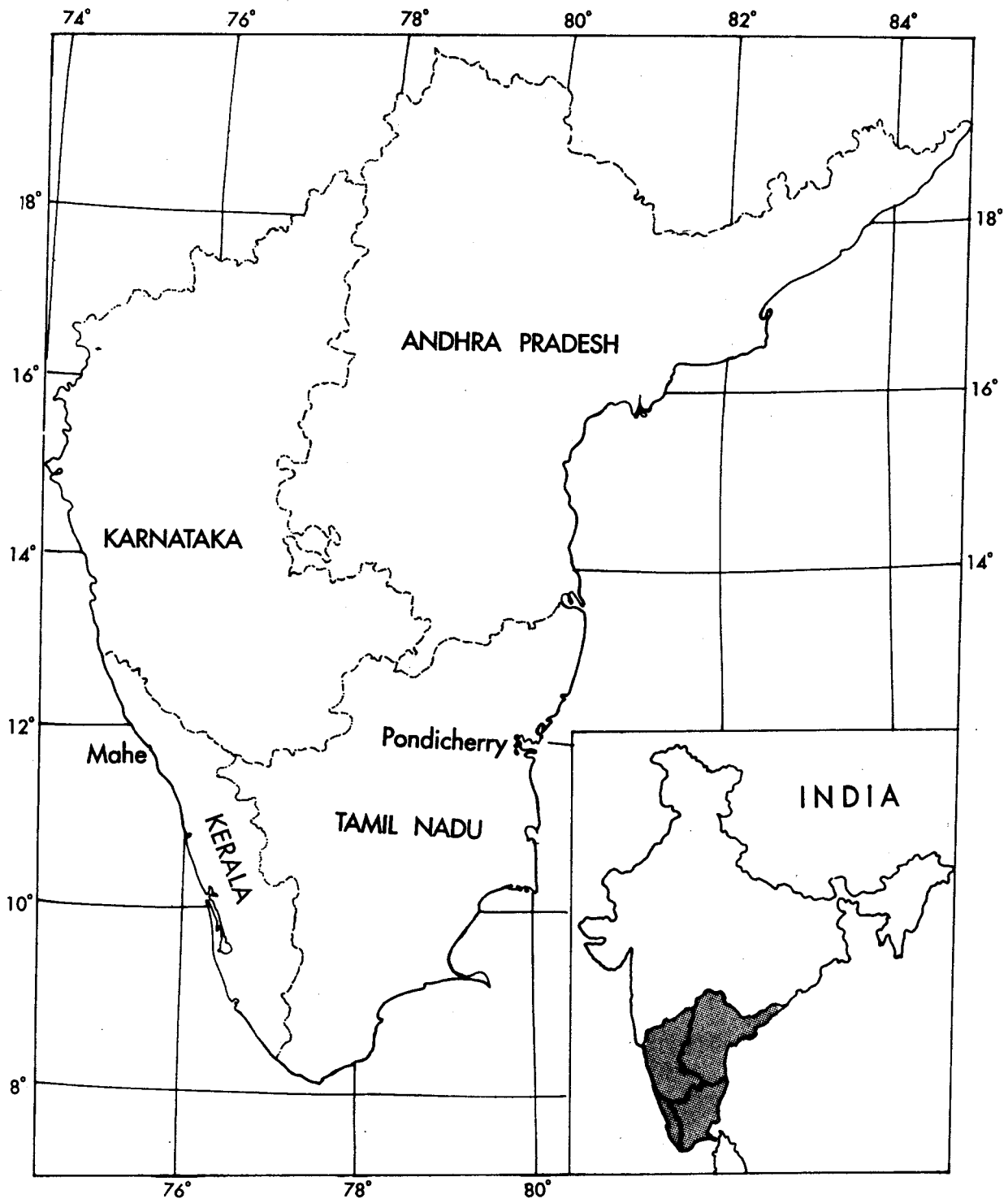


Fig. 1. Map of study area

and edaphic zones. It includes mountain ranges, hillocks, valleys, swamps, streams, rivers, ponds and backwaters. This diversity of habitat allows for a wide range of vegetation (Sivarajan & Pradeep, 1996).

During the South West monsoon, the southern region receives a heavy rainfall for upto 8-9 months, a year and towards the northern parts of the Western Ghats, this dwindles down to about 4 months. Peninsular India registers both North East monsoon (October, December) and South-West monsoon (June - September). The climate in Peninsular India is in general, megathermal (Subramanyam *et al.*, 1965; Rao *et al.*, 1972). Chowdhury and Sarwade (1982) classified the homo climatic regions of India into 5 categories namely arid region, semi-arid region, sub-humid region, humid region and super-humid region. The coastal districts of Andhra Pradesh, interior Karnataka and some districts in Tamil Nadu come under semi-arid climate. Northern coastal Andhra Pradesh, southern districts of Karnataka and Northern Tamil Nadu experience dry sub-humid climate while coastal Karnataka and Northern Kerala have moist sub-humid type of climate. The humid regime predominates in southern districts of Kerala and at higher elevations around Conoor and Ooty (Tamil Nadu) whereas super-humid regime is evident only at Kodaikanal in Tamil Nadu (Sivarajan & Pradeep, 1996).

Distribution and Ecology

The family Convolvulaceae has a world wide distribution and has about 55 genera and more than 1650 species. It is primarily tropical and subtropical with ranges extending to North and South temperate regions. It attains abundance in tropical America and tropical Asia. The genus *Ipomoea* has the largest number of species within the family. Throughout the world *Ipomoea* is estimated to be between 600 to 700 species and over half of them are concentrated in the America, where the total may approach 500 taxa (Austin & Huaman, 1996). The genus is represented by 55 species in India (Johri, 1983), of which 42 species occur in Peninsular India. Many species belonging to the genera such as *Bonamia*, *Convolvulus*, *Cuscuta* and *Merremia* are pantropical, while *Evolvulus* and *Jacquemontia* are mainly reported from the

New World (a few species introduced in other parts). But some genera like *Argyreia* and *Rivea* have a very narrow range of distribution in South Asia, and some are endemic to South India (see table-1). The genus *Erycibe* is exclusively of Asiatic origin. *Aniseia*, *Cressa* and *Operculina* are distributed in the tropical and subtropical regions of both hemispheres, while *Hewittia*, *Lepistemon*, *Porana* (s.l.), *Seddera* and *Stictocardia* are concentrated both in Africa and Asia (some are introduced and naturalised in the new world). But the genus *Neuropeltis* is distributed only in tropical Asia.

Table 1. Endemic taxa

Taxa	Endemic Area
<i>Argyreia arakuensis</i> Bal.	Andhra Pradesh
<i>Argyreia coonoorensis</i> Smith & Ramas.	Tamil Nadu
<i>Argyreia cuneata</i> (Willd.) Ker Gawl.	Peninsular India
<i>Argyreia fulgens</i> Choisy	Kerala & Tamil Nadu
<i>Argyreia involucrata</i> Clarke	Peninsular India
<i>Argyreia kudajadrya</i> Biju & Mathew	Karnataka
<i>Argyreia lawii</i> Clarke	Karnataka
<i>Argyreia leschenaultii</i> Choisy	Peninsular India
<i>Argyreia nellygherya</i> Choisy	Peninsular India
<i>Argyreia pilosa</i> Wt. & Arn.	Peninsular India
<i>Argyreia sericea</i> Dalz.	Peninsular India
<i>Dinetus malabarica</i> (Clarke) Staples ined.	Kerala, Tamil Nadu & Karnataka
<i>Lepistemon verdcourtii</i> Mathew & Biju	Kerala
<i>Neuropeltis malabarica</i> Ooststr.	Kerala & Karnataka
<i>Rivea palayamkottensis</i> Biju & Mathew	Tamil Nadu
<i>Stictocardia sivarajania</i> Biju et al.	Kerala

Most members of Convolvulaceae grow in places exposed to sunlight. In general they often are found along edges of thickets and forests. Many herbaceous species are found as weeds along waysides and wastelands while some like *Argyreia*, *Lepistemon*, *Neuropeltis* and *Stictocardia* occur in forest areas.

In the area of present study the genus *Argyreia* is very frequent in semi-deciduous and evergreen forests. Many species are cultivated as ornamentals (for details see the generic distribution and notes).

Materials and Methods

The present study looks at 102 species, including two infraspecific taxa belonging to 21 genera. This work is based on extensive field studies and collections made from different parts of the Southern Peninsular India, during the last seven years. Both flowering and fruiting materials are necessary for the correct generic identification of this family (Ooststroom, 1953; Wilson, 1960). So special attention was paid in collecting both the fruiting and flowering materials in almost all the cases. The specimens deposited in other herbaria were also examined to understand more on the variation pattern exhibited by different taxa. Types and protologues (either specimens, cibachromes or microfische) were studied in cases where there were identity problems. To make this treatment as useful as possible genera and species have been alphabetized. This may break the relationship between species, but will help users to identify their plants very easily. The study includes native, naturalised and cultivated species.

Descriptions and illustrations are entirely based on fresh specimens except in few cases. The most typical form is illustrated in all cases with special emphasis on the variations. Flowering and fruiting seasons and flower opening time documented from field observations have been given in almost all cases.

This study also focuses on the extrafloral nectaries and extrafloral visitors. Specimens collected during the course of the study were sent to the Commonwealth Entomological Society (London) for identification. The results are discussed under separate subheadings.

Seedling morphology of 58 species, belonging to 10 genera were studied. The results are given in the form of a table.

All the specimens collected during the course of the work are deposited either in the herbaria of Department of Botany, University of Calicut (CALI) or Tropical Botanic Garden and Research Institute (TBGT). Some of the

specimens referred to Dr. B. Verdcourt (K) and Dr. Daniel F. Austin (US) are deposited in their respective herbaria.

Seedlings and early development

Seedling studies are of great importance due to the high level of constancy of seedling morphology in this highly polymorphic family. The taxonomic importance of the seedling studies has been highlighted by Austin and Staples (1980, 1985) and Sampathkumar (1982).

The seeds collected from dry fruits were stored at room temperature and sown in pots filled with soil after a minimum period of two weeks. The period of germination varied from species to species. The germination was fast for the genus *Hewittia*, *Ipomoea* and *Merremia* (with few exceptions) and slow in *Argyreia*, *Bonamia*, *Rivea* and *Operculina*. But in the genus *Stictocardia*, the germination was very slow.

Germination was epigeal, with the radicle emerging first, followed by the hypocotyl and the two cotyledons in all the species except *Merremia tuberosa*. In *M. tuberosa* the germination was hypogeal. Rare instance of tricotyledons has been observed in *M. cissoides* and *M. emarginata*. Sampathkumar (1982) explained tricotily as a correlate of trimerous root.

Mature seedlings were collected with first eophyll, except for the genus *Merremia* in which it was collected after the emergence of cotyledonary leaves. In all species, except in *Merremia tridentata* and *M. tuberosa*, two lateral veins were seen running parallel to each other and converging at the tip in the cotyledons. Another feature observed was that the lateral veins produced secondaries only towards the margin and not midrib (Fig. 2-6). The veins are generally raised beneath and appressed above. The hypocotyl and the cotyledonary leaves are glabrous except in *Merremia cissoides*.

Certain important characters of the seedlings observed in the family are summarised below.

Table 2. Germination and seedling morphology

Taxa	Germination type	hypocotyl length (cm)	Cotyledonary leaf size L x B (cm)	Cotyledonary leaf sinus (cm)	Colyledonary petiole length (cm)
ARGYREIA					
<i>A. fulgens</i>	Epigeal	9-10	2 x 4	1.5	1.5

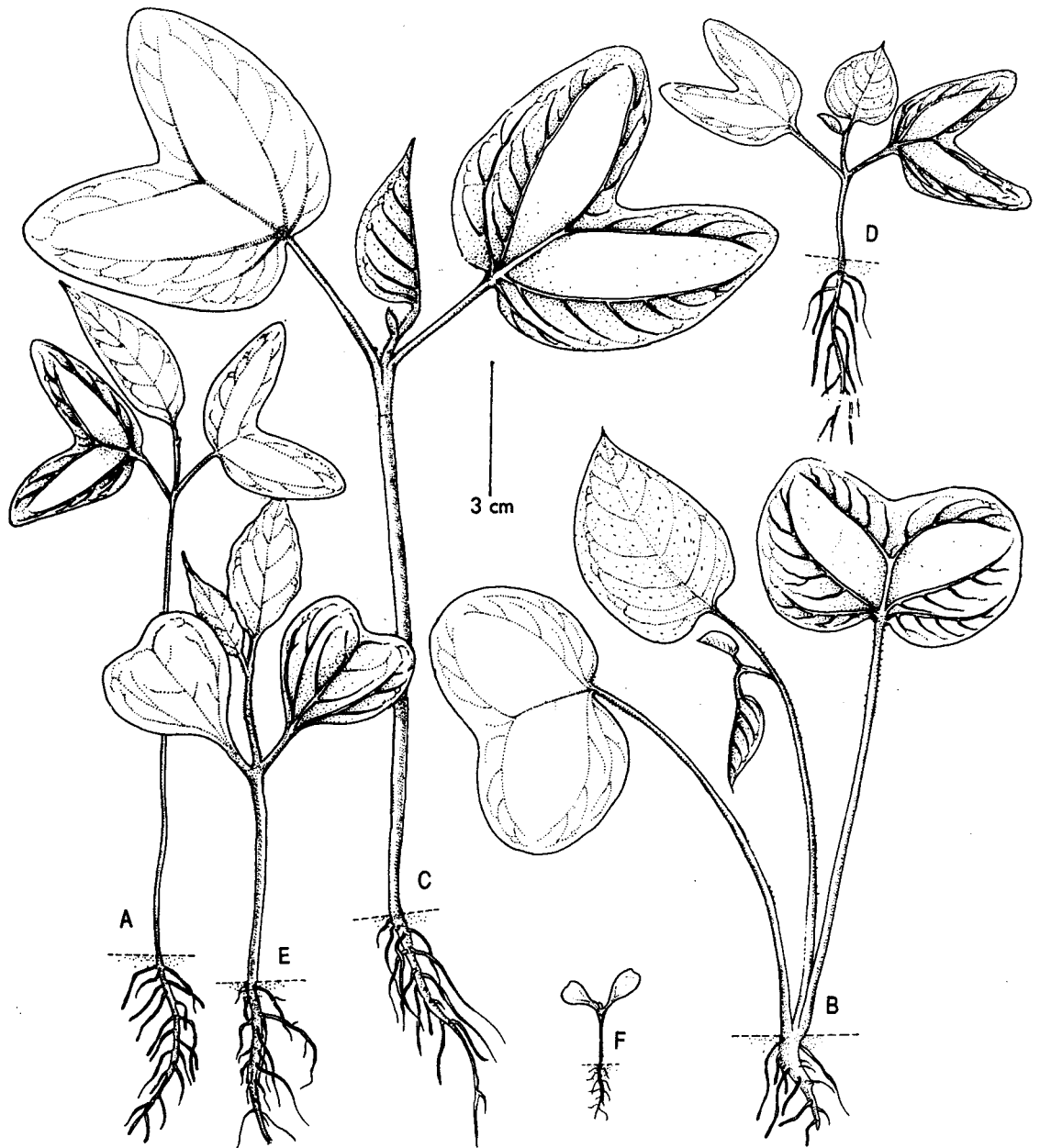


Fig. 2. Seedlings of *Argyreia*, *Bonamia* and *Evolvulus*. A. *Argyreia fulgens*, B. *A. hirsuta*, C. *A. nervosa*, D. *A. osyrensis*; E. *Bonamia semidigyna*; F. *Evolvulus nummularius*.

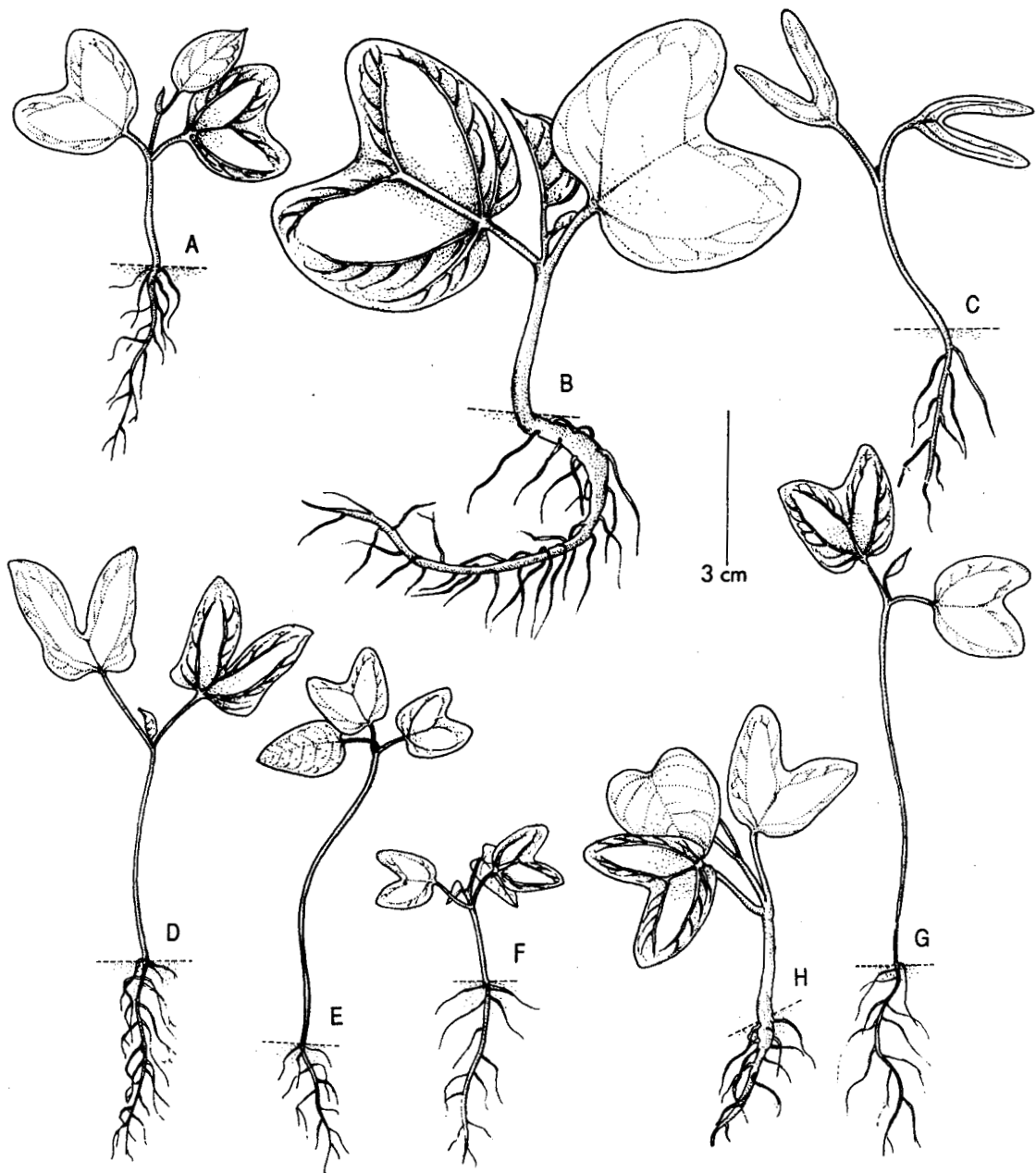


Fig. 3. Seedlings of *Hewittia* and *Ipomoea*. A. *Hewittia malabarica*; B. *Ipomoea alba*, C. *I. aquatica*, D. *I. batatas*, E. *I. deccana*, F. *I. eriocarpa*, G. *I. hederifolia*, H. *I. marginata*.

<i>A. hirsuta</i>	"	absent	3.5 x 5.5	0.5	10
<i>A. nervosa</i>	"	11.5	5.7 x 6	2.3	2.5
<i>A. osyrensis</i>	"	2	3 x 2.5	1.5	1
BONAMIA					
<i>B. semidigyna</i>	"	4.5	3	0.4	1.3
EVOLVULUS					
<i>E. nummularius</i>	"	1	1 x 0.4	absent	0.2
HEWITTIA					
<i>H. malabarica</i>	"	2	2 x 2.5	0.7	0.8
IPOMOEA					
<i>I. alba</i>	"	3	4 x 5	1	1
<i>I. aquatica</i>	"	3	2.3 x 1.2	1.5	1.4
<i>I. batatas</i>	"	4	2.5 x 2	1.6	1.5
<i>I. deccana</i>	"	5.7	1.4 x 1.5	0.4	1.5
<i>I. eriocarpa</i>	"	1.5	1.5 x 1.3	0.5	0.8
<i>I. hederifolia</i>	"	7	2 x 2.3	0.7	1.3
<i>I. marginata</i>	"	2	2 x 3	0.8	1.4
<i>I. mauritiana</i>	"	0.4	2.8 x 3.2	1.3	3
<i>I. nil</i>	"	5	2.4 x 3.5	1.4	2
<i>I. obscura</i>	"	2.7	2 x 1.7	1.8	1
<i>I. pes-caprae</i>					
<i>ssp. pes-caprae</i>	"	4.5	2.2 x 4	1	2.6
<i>I. pes-caprae</i>					
<i>ssp. brasiliensis</i>	"	7.5	1.7 x 3.4	1	2
<i>I. pes-tigridis</i>	"	2	2 x 1.8	0.8	0.7
<i>I. quamoclit</i>	"	6	2.8 x 3.5	2.5	1.8
<i>I. triloba</i>	"	3	1.6 x 1.4	1.2	1.5
MERREMIA					
<i>M. aegyptia</i>	"	1.6	1.1 x 1.8	0.2	0.3
<i>M. cissooides</i>	"	1.9	1.1 x 1.2	0.4	0.7
<i>M. dissecta</i>	"	absent	2.1 x 4	1.1	0.5
<i>M. emarginata</i>	"	3.4	0.7 x 0.8	0.25	0.2
<i>M. hederacea</i>	"	1.5	1 x 1.2	0.25	0.2
<i>M. tridentata</i>					
<i>ssp. tridentata</i>	"	1.7	2 x 2.2	1.9	0.4
<i>M. tridentata</i>					
<i>ssp. angustifolia</i>	"	1.7	2.6 x 1.8	2	0.2



Fig. 4. Seedlings of *Ipomoea*. A. *Ipomoea mauritiana*, B. *I. nil*, C. *I. obscura*, D. *I. pes-caprae* ssp. *pes-caprae*, E. *I. pes-caprae* ssp. *brasiliensis*, F. *I. pes-tigridis*, G. *I. quamoclit*, H. *I. triloba*.

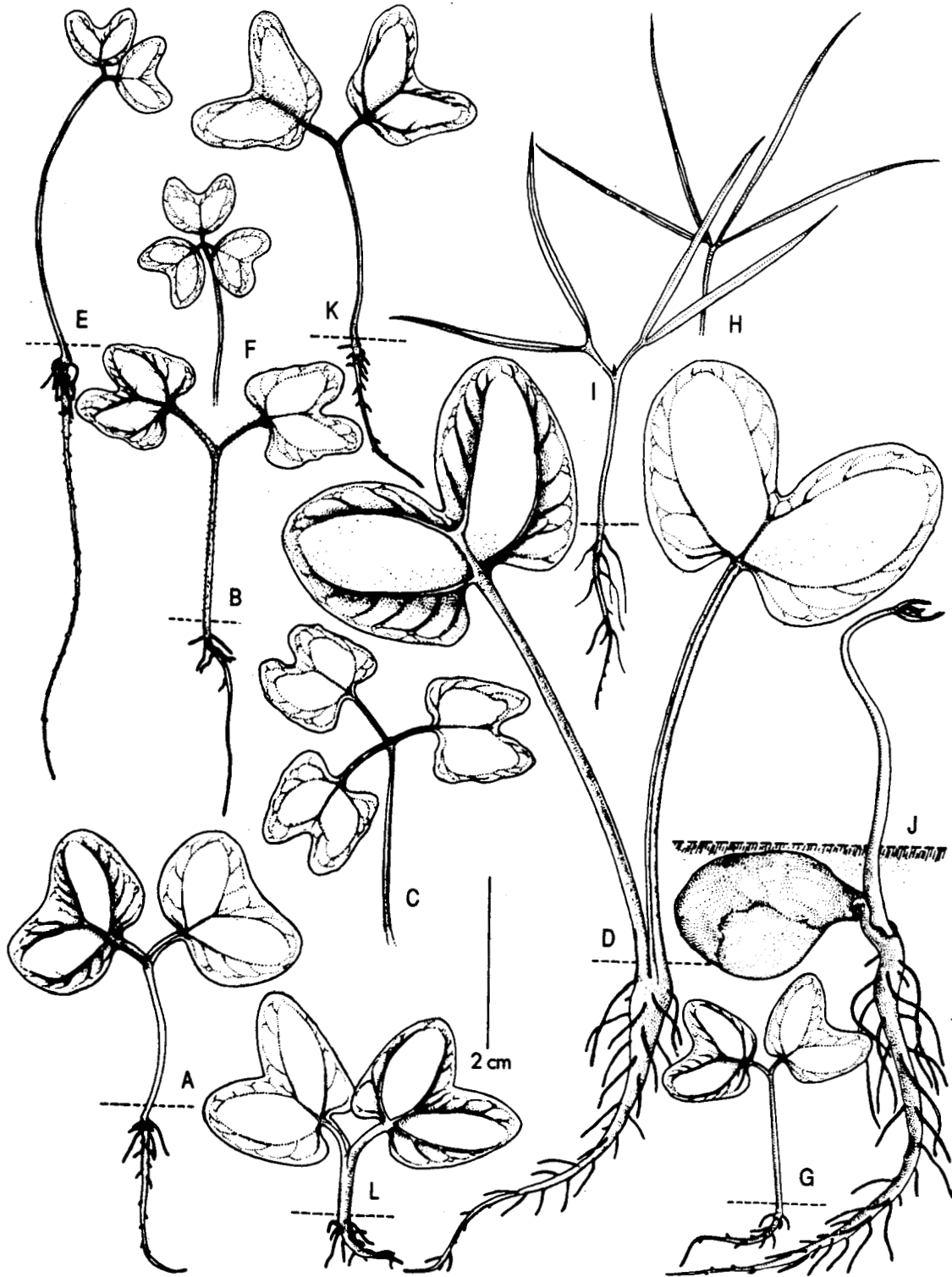


Fig. 5. Seedlings of *Merremia*. A. *Merremia aegyptia*, B & C. *M. cissoides*, D. *M. dissecta*, E & F. *M. emarginata*, G. *M. hederacea*, H. *M. tridentata* ssp. *tridentata*, I. *M. tridentata* ssp. *angustifolia*, J. *M. tuberosa*, K. *M. umbellata*, L. *M. vitifolia*.

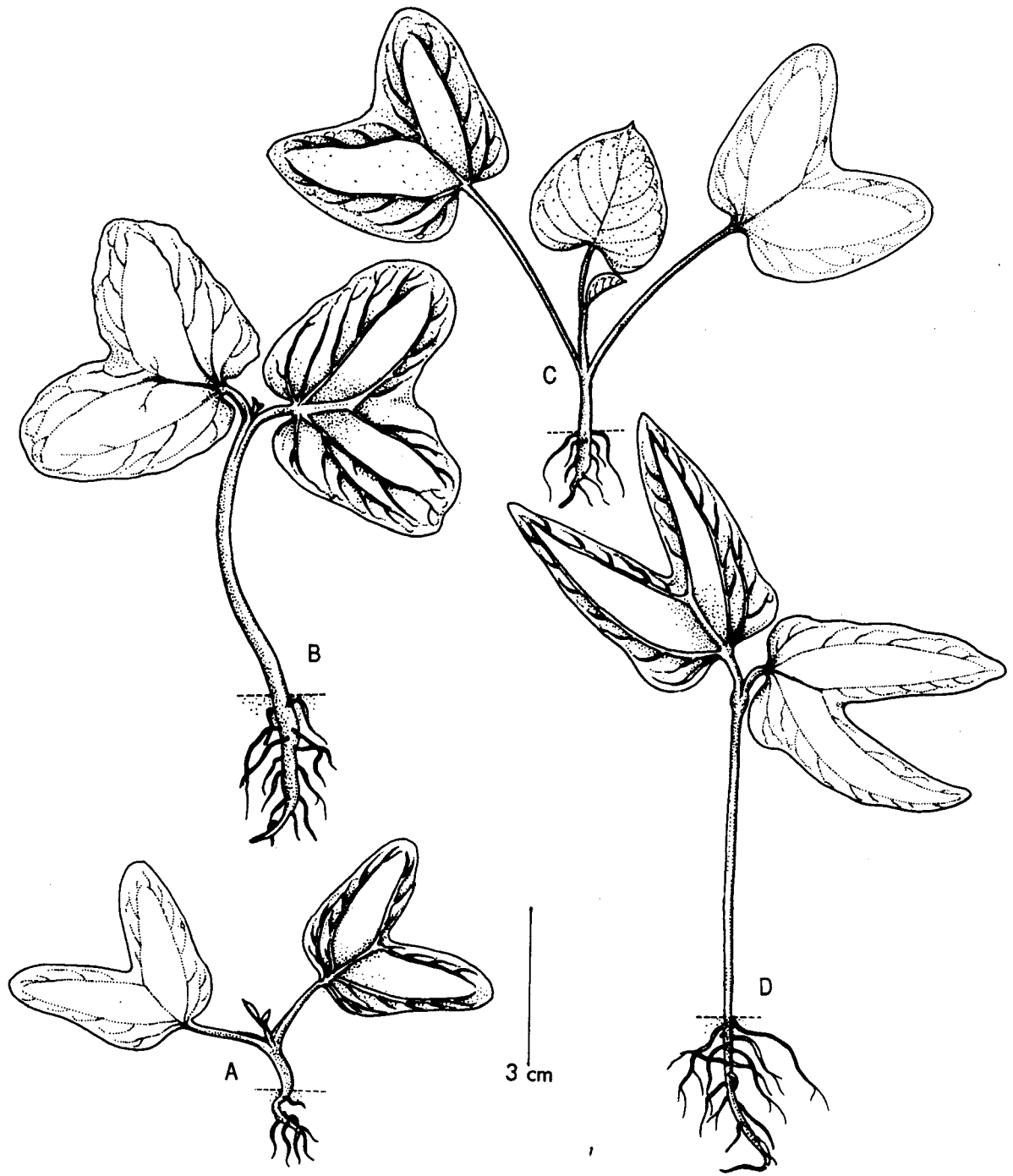


Fig. 6. Seedlings of *Operculina*, *Rivea* and *Stictocardia*. A. *Operculina turpethum*, B. *O. ventricosa*; C. *Rivea hypocrateriformis*; D. *Stictocardia sivarajania*.

<i>M. tuberosa</i>	hypogaeal	nil	nil	nil	nil
<i>M. umbellata</i>	epigeal	2.1	1.8 x 1.5	0.5	0.4
<i>M. vitifolia</i>	"	0.7	1.9 x 1.8	0.5	0.4
OPERCULINA					
<i>O. turpethum</i>	"	0.8	3.2 x 3	2.1	1.3
<i>O. ventricosa</i>	"	5	4 x 6	2.2	1.2
RIVEA					
<i>R. hypocrateriformis</i>	"	1.2	3.3 x 4.3	1	4.4
STICTOCARDIA					
<i>S. sivarajania</i>	"	6.5	5 x 3.5	3.5	1

Extrafloral nectaries

Extrafloral nectaries (EFNs) have been a subject of numerous investigations since their initial description in the 18th century (Bentley, 1977a). Keeler (1977) and Keeler and Kaul (1979) defined the EFNs as nectar producing glands on a plant that do not function in pollination and that can be found on above-ground parts of plants, outside the flower. Numerous studies have suggested that EFNs have an important role in attracting insects which then defend the plant by repelling or preying on herbivores (Elias & Gelband, 1975; Bentley, 1976, 1977 a, b; Keeler, 1977, 1979; Schemske, 1978, Tilman, 1978; Inouye & Taylor, 1979).

The morphology, chemical composition and even function of EFNs have been analysed in a number of cases. The EFNs studies, especially ecology, function and morphology, in the Convolvulaceae members have been done by several workers (Keeler, 1977, 1980; Keeler & Kaul, 1979; Beckmann & Stucky, 1981; Devall & Thien, 1989). Nevertheless from the taxonomic point of view, this is not yet well studied. However Keeler and Kaul (1979) point out that EFNs are rather variable in relatively close taxa.

This study specifically looked for the presence or absence of petiolar and pedicellar EFNs. Observations were also made on the nectar feeding insects, especially ants, wasps and other flies, which visited these plants. Such nectary visitors were collected and sent to the Commonwealth Entomological Society (London) for identification.

EFNs were morphologically classified in some species of *Ipomoea* (Poulsen, 1877; Gardiner, 1887; Ewart, 1895; Keeler & Kaul, 1979). In the present study we are reporting the presence or absence of EFNs in the species studied. Macro morphological EFNs are described under the respective species description.

Table 3. Presence of petiolar and pedicellar nectaries in species studied.

Taxa	Petiolar nectary	Previous report	Pedicellar nectary
<i>Ipomoea alba</i>	*	a, g	*
<i>I. asarifolia</i>	*	-	*
<i>I. batatas</i>	*	a, g	-
<i>I. cairica</i>	*	g	*
<i>I. campanulata</i>			*
<i>I. carnea</i> ssp. <i>fistulosa</i>	*	d, e, f, g	*
<i>I. coptica</i>			*
<i>I. horsfalliae</i>	*	b, g	*
<i>I. indica</i>	*	g	
<i>I. laciniata</i>			*
<i>I. macrantha</i>	*		*
<i>I. marginata</i>	*		*
<i>I. mauritiana</i>	*	c, g	*
<i>I. obscura</i>			*
<i>I. pes-caprae</i> ssp. <i>pes-caprae</i>	*	g, h	*
<i>I. pes-caprae</i> ssp. <i>brasiliensis</i>	*		*
<i>I. staphylina</i>	*		
<i>I. triloba</i>	*	g	*
<i>I. turbinata</i>	*	a, g	*
<i>Merremia dissecta</i>			*
<i>M. hederacea</i>			*
<i>M. tridentata</i> ssp. <i>angustifolia</i>			*
<i>M. tuberosa</i>			*
<i>M. umbellata</i>			*
<i>M. vitifolia</i>			*
<i>Operculina turpethum</i>			*
<i>O. ventricosa</i>			*

a. Poulsen, 1877; b. Gardiner, 1887; c. Ewart, 1895; d. Nieuwenhuis, 1907; e. Spegazzini, 1923; f. Leal, 1974; g. Keeler & Kaul, 1979; h. Devall & Thien, 1989.

Plan of the thesis

The introductory part consists of historical review of the family, economic importance of the family, brief description of the study area, distribution and ecology, materials and methods, extrafloral morphology and seedling studies.

The systematic treatment starts with the brief description of the family, followed by the subdivision of the family. Key to genera is provided with a brief general account comprising of their circumscription and ethymological derivation, relevant bibliographical data and synonymy, generic description, distribution and ecology. Species is also treated in the same fashion as the genus but information on flowering and fruiting seasons are also included.

For each species the following information are provided : correct nomenclature, (typification, if any), relevant synonymy, vernacular name, common name if any, complete species description, distribution, ecology, flowering and fruiting seasons alongwith flower opening time and floral and extrafloral visitors, if any. Notes on economic use, nomenclature, taxonomy and horticultural potential are given where ever relevant. List of specimens examined from the area of study is given at the end of each species mentioning state, district and place starting from South to North (Kerala, Tamil Nadu, Karnataka and Andhra Pradesh). Distribution maps and illustrations are provided for most of the species. Type photographs are provided for the relevant cases. Colour photographs of 100 species are given in the form of plates for easy identification.

SYSTEMATIC TREATMENT

S D Biju “Taxonomic and morphologic studies on the family Convolvulaceae of Southern Peninsular India” Thesis. Department of Botany , University of Calicut, 1997

Systematic treatment

SYSTEMATIC TREATMENT

CONVOLVULACEAE Jussieu

Type genus : *Convolvulus* Linn.

Common name : Morning - glory family

Annual or perennial herbs, shrubs, trees, lianas, twiners, creepers and sometimes parasitic; often with milky juice; rootstocks sometimes large; branchlets terete, ribbed or winged. Leaves alternate, exstipulate, usually simple, entire, lobed, palmately compound or reduced to scale in *Cuscuta*. Flowers usually bracteate, axillary or terminal, solitary or in inflorescence. Flowers regular or slightly zygomorphic, usually 5-merous, various in size and colour, showy but mostly wilting quickly; sepals 4-5 lobed, free or jointed at base, imbricate, equal or unequal, persistent, often accrescent in fruit; corolla sympetalous, funnel form, campanulate, tubular, urceolate or salvarform, 5 lobed or entire, with plicae and interplicae, in bud mostly induplicate; stamens 5; filaments inserted at the corolla tube base, alternate to the corolla lobes; anthers mostly linear or oblong, 2-celled, straight or spirally twisted after dehiscence; pollen smooth or spinulose; ovary superior, 2 to 4 carpels, 2-or 3-locular, each locule biovulate; disc annular or cupuliform, entire or 5-lobed (rarely absent); style filiform, simple, bifid or distinct to the base, stigma capitate, 2 lobed, ellipsoid, branched or globose. Fruits capsular, rarely berry or nut-like, dehiscing by valves or circumscissile or irregularly dehiscing; seeds 1-4, glabrous or pubescent, albumen scanty; cotyledons folded.

In Southern Peninsular India 21 genera and 102 species (excluding 2 subspecies) are recorded, of which 11 species are introduced for horticultural purpose (not naturalised) and 8 species are endemic (Table 2). The largest genera of the family found in the study area is *Ipomoea* with 31 species and 1 subspecies, *Argyreia* with 22 species and *Merremia* with 11 species (1 subspecies). The other genera with their respective species number are *Convolvulus* and *Cuscuta* (4), *Operculina* and *Rivea* (3), *Dinetus*, *Evolvulus*, *Jacquemontia*, *Lepistemon* and *Stictocardia* (2) and *Aniseia*, *Bonamia*, *Cressa*, *Erycibe*, *Hewittia*, *Neuropeltis*, *Porana*, *Poranopsis* and *Seddera* with 1 species. Among these, *Hewittia* is a monotypic genus and *Cressa* is probably monotypic. The genus *Neuropeltis* is vulnerable and *Dinetus* is very rare. Most of the *Argyreia* species like *A. fulgens*, *A. involucrata*, *A. choisyana* and *A. lawii* are rare in the study area.

Classification of the family

In 1893 Hallier divided the family into two groups, the Psiloconiae with smooth pollen and the Echinoconiae with spinulose pollen (rank not designated) and into nine tribes (Wilson, 1960). Ooststroom (1953) recognised two subfamilies (Cuscutoideae and Convolvuloideae), three tribes (Cuscuteae, Convolvuleae and Ipomoeae) and nine sub-tribes (Cuscutinae, Wilsoniinae, Dichondriane, Dicranostylineae, Poraninae, Erycibinae, Convolvulinae, Ipomoeinae and Argyreiinae) in Maleayasia Convolvulaceae. Austin (1980 a) assigned the Ceylon members of the family Convolvulaceae to two subfamilies and eight tribes.

The tribal classification of Austin (1980 a) is almost applicable to Peninsular Indian Convolvulaceae and this is used for the present study. A review of these classification systems indicate that a global revisionary study is needed for a clear and contemporary classification.

Subfamily **Convolvuloideae**

Tribe **Erycibae**
 Erycibe

- Tribe **Cresseae**
Bonamia
Cressa
Seddera
- Tribe **Convolvuleae**
Convolvulus
Evolvulus
Jacquemontia
Neuropeltis
- Tribe **"Merremioids"**
Aniseia
Merremia
Hewittia
Operculina
- Tribe **Ipomoeae**
Ipomoea
- Tribe **Argyreieae**
Argyreia
Rivea
Stictocardia
- Tribe **Poraneae**
Dinetus
Porana
Poranopsis
- Sub family **Cuscutioideae**
- Tribe **Cuscuteae**
Cuscuta

KEY TO THE GENERA

- 1a. Parasitic plants without leaves and chlorophyll.
Corolla with 5 fimbriate scales inside 6. **CUSCUTA**
- 1b. Non parasitic plants with green leaves. Corolla
scales absent 2

- 2a. Style 2, free or united about half of their length.. 3
- 2b. Style 1 or absent 5

- 3a. Leaves coriaceous. Stigma kidney shaped.
Fruiting bracts much enlarged 15. **NEUROPELTIS**
- 3b. Leaves not coriaceous. Stigma globular, peltate,
filiform or clavate. Fruiting bracts
not much enlarged 4

- 4a. Herbaceous plants, never twining. Style free,
each two branched; stigma filiform 9. **EVOLVULUS**
- 4b. Woody twiners. Style united below;
stigma globose 3. **BONAMIA**

- 5a. Corolla lobes deeply bifid, style absent;
stigma 5-10 rayed 8. **ERYCIBE**
- 5b. Corolla lobes not bifid; style 1; stigma 2 6

- 6a. Erect or prostrate shrubs or subshrubs.
Leaves small, less than 1 cm long 7
- 6b. Medium sized to large climbing or prostrate
herbs, lianas or rarely shrubs. Leaves medium
to large, more than 2 cm long 8

- 7a. Stem woody. Stamens and style included 20. **SEDDERA**
- 7b. Herbaceous plants. Stamens and style included .. 5. **CRESSA**

- 8a. Seed 1; fruits indehiscent 9
- 8b. Seeds more than 1; fruits dehiscent
(rarely indehiscent) 11
- 9a. All sepals enlarged in fruit, persistent, scarious,
with 7-8 prominent longitudinal nerves 10
- 9b. Only 3 outer sepals enlarged in fruits, persistent,
with a single prominent mid vein, prominently
pubescent **18. PORANOPSIS**
- 10a. Bracts leafy, upto 3 cm long, cordate.
Fruiting sepals broadly elliptic to oblanceolate .. **7. DINETUS**
- 10b. Bracts small, \pm 1mm long, linear - lanceolate.
Fruiting sepals oblong to spatulate **17. PORANA**
- 11a. Leaf blade minutely glandular punctate below.
Flowers reddish purple with a darker centre **21. STICTOCARDIA**
- 11b. Leaf blade without glands 12
- 12a. Stigma filiform to elliptic, linear or oblong13
- 12b. Stigma biglobular16
- 13a. Flowers nocturnal; corolla salver form, white,
tube upto 9 cm long; stigma linear - oblong.
Seeds enveloped with a mealy pulp **19. RIVEA**
- 13b. Flowers diurnal; corolla funnel shaped or
campanulate, tube short, less than 3 cm long;
stigma filiform to elliptic or oblong 14
- 14a. Stem and leaves with stellate indumentum.
Stigma linear - elliptic **12. JACQUEMONTIA**
- 14b. Stem and leaves without stellate indumentum.
Stigma filiform or oblong 15
- 15a. Outer 2 sepals shorter or equal to the inner 3

- upto 1 cm long, oblong - elliptic, ovate -
elliptic or lanceolate; corolla white,
yellow or purple. Capsule glabrous 4. CONVOLVULUS
- 15b. Outer 2 sepals large, upto 2.5 cm long, much
broader than inner ones, broadly ovate; stigma
globular to oblong or ovate oblong; ovary
glabrous or hairy 16
- 16a. Outer sepals decurrent on the pedicel; corolla
white; stigma globular to oblong; ovary
glabrous. Capsule glabrous 2. ANISEIA
- 16b. Outer sepals not decurrent on the pedicel; corolla
yellow to white with a purple centre; stigma
ovate- oblong; ovary hairy. Capsule hairy 10. HEWITTIA
- 17a. Corolla urceolate; filaments dilated at the base
into a concave scale 13. LEPISTEMON
- 17b. Corolla campanulate, funnel shaped or salver
shaped; filaments not dilated at the base into a
concave scale18
- 18a. Capsule circumscissile, upper part of the epicarp
separating from the lower part. Stem terete
or often winged 16. OPERCULINA
- 18b. Capsule valvular or irregularly dehiscent.
Stem terete 19
- 19a. Corolla with hairy mid-petaline bands outside.
Fruits fleshy or leathery, rarely dehiscent 1. ARGYREIA
- 19b. Corolla mostly without hairy midpetaline bands.
Fruits dehiscent 20
- 20a. Pollen grains spinulose; corolla variously
coloured, often purple or reddish purple11. IPOMOEA
- 20b. Pollen grains smooth; corolla nearly always
yellow or white,with or without a red
or purple centre..... 14. MERREMIA

ANISEIA Choisy

Aniseia is a small genus of about 5 species. In India, the genus is represented by only one species, *A. martinicensis* (Jacq.) Choisy.

Aniseia Choisy, Mem. Soc. Phys. Geneve 6:481.1834; Hall.f. in Engl., Bot. Jahrb. 16: 579. 1893; Ridley, Fl. Malay Penins. 2:456.1923.

Ipomoea subg. *Aniseia* Clarke in Hook.f., Fl. Brit. India 4: 200. 1883; Prain, Journ. As. Soc. Bengal 63: 104. 1894.

Type species: *Aniseia martinicensis* (Jacq.) Choisy.

Annual or perennial twiners, prostrate or repent. Leaves simple, linear or elliptic, sometimes lanceolate, often mucronate, entire. Flowers axillary, solitary or in few flowered dichasia; bracts small; sepals 5, unequal, herbaceous, outer 3 larger, acute or acuminate, decurrent on the pedicel, slightly enlarged in fruit; corolla white, campanulate, small, 5 distinctly pubescent midpetaline bands; stamens and style inserted; anthers straight after dehiscence; pollen smooth, pantocolpate; style 1, slender, glabrous; stigma oblong ; ovary glabrous, 2-locular, each locus with 2 ovules; disc usually absent. Fruit capsular, globose, glabrous, usually dehiscing by 4 valves; seeds 4, rarely less, trigonous, glabrous, pubescent along the margins.

Distribution and Ecology. *Aniseia* is a small genus confined to tropical and subtropical America with exception of one species, which occurs in the tropics of the New and Old World. They are commonly seen in moist localities of the plains.

Aniseia martinicensis (Jacq.) Choisy, Mem. Soc. Phys. Geneve 8:66.1838; Ooststr., Blumea 3(2): 279. 1939 & Fl. Mal., ser. 1,4. 435. 1953; Mani. & Sivar., Fl. Calicut 185. 1982; Mohan & Henry, Fl. Thiruvananthapuram 311. 1994.

Type: West Indies, Martinique, "*vicum Roberti*" (not seen).

Convolvulus martinicensis Jacq., Sel. Stirp. Amer. 26.t.17.1763.

Convolvulus uniflorus Burm.f., Fl. India 47.t.21.f.2.1768.

Ipomoea uniflora (Burm.f.) Roemer & Schultes, Linn. Syst. Veg. 4: 247.1819;
Clarke in Hook. f., Fl. Brit. India 4: 201.1883; Trimen, Handb. Fl. Ceylon
3: 215.1895.

Convolvulus rheedi Wall. in Roxb. Fl. India 2: 70.1824.

Aniseia uniflora (Burm.f.) Choisy, Mem. Soc. Phys. Geneve 6:483.1834; Wight,
Icon. pl. Ind. or. 3.t.850.1843-47; Cooke, Fl. Pres. Bombay 2: 231.1905;
Gamble, Fl. Pres. Madras 2: 924. 1923.

Ipomoea pterocarpa (Bert.) Don, Gen. Syst. 4: 282.1838.

Aniseia emarginata (Vahl) Hassk., Cat. Hort. Bogor. 139.1844.

-*Ben-tiru-tali* Rheede, Hort. Malab. 11:111, t. 54.1692.

(Fig. 7)

Perennial herbs; stem prostrate or twining, rooting in the nodes and internodes, terete, glabrous or sparsely pubescent; latex white. Leaves simple, narrow to broad-oblong, 2-6 x 0.3-2.2 cm, apically obtuse, emarginate or rarely acute, mucronulate, basally attenuate, glabrous or glabrescent above, sparsely pilose beneath; midrib slightly raised beneath; petiole 0.5-2.2 cm long, much shorter than the blade. Flowers axillary, solitary, rarely 2 or 3 flowered; peduncle shorter than the leaf, upto 1.3 cm long; bracts narrow-lanceolate to subulate, 3 x ± 1 mm, apically acute, hairy along the margin; pedicels shorter than peduncle, upto 0.8 cm long, appressed pilose with short, soft hairs; sepals unequal, herbaceous, reticulately nerved, outer 2 large, broadly ovate, 1.3-1.5 x 0.7-0.9 cm, apically acute to mucronulate; basally short decurrent on the pedicel, sparsely pilose, third medium sized, lanceolate, more or less falcate, 1.2-1.5 x 0.5-0.7 cm, sparsely pilose on both sides, innermost 2 larger, ovate-lanceolate, oblique, 0.9-1.2 x 0.2-0.4 cm, apically acute to acuminate, sparsely pilose on both sides, outer sepal enlarged in fruit; corolla white, campanulate, 1.2-1.6 cm long, limb 5 lobed, upto 2.6 cm across, midpetaline bands hairy outside; stamens inserted; anthers upto 3 mm long, straight after dehiscence; filaments attached 6 mm above the corolla base, upto 6 mm long, ciliolate at dilated base; style inserted, upto 1 cm long, glabrous; stigma oblong, 1 x 1.2 mm; disc small or nearly absent. Fruit capsular, ovoid, 1-1.6 x 1.3-1.5 cm, valvular dehiscent, glabrous, crowned with style base; seeds usually 4, 4-5 x 6-7 mm, woolly at the angles, minutely pilose outside, dull black.

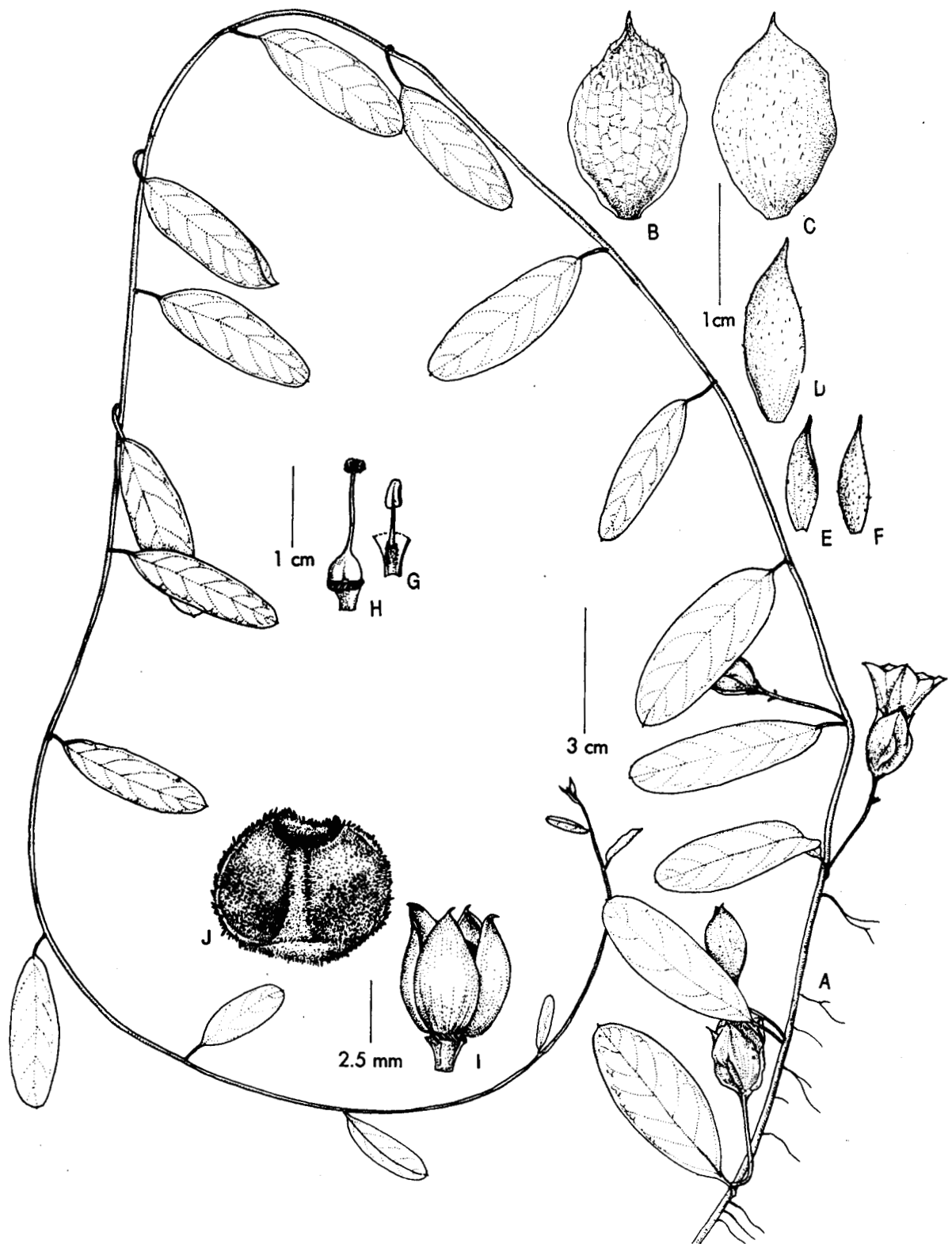


Fig. 7. *Aniseia martinicensis*. A. Flowering and fruiting twig; B & C. Outer sepals, D-F. Inner sepals; G. Stamen; H. Pistil; I. Capsule (without calyx); J. Seed (from Biju 44268 TBGT).

Flowering : August-December

Flower opening : 8.00 am to 9.00 am

Fruiting : October-March

Distribution. *Aniseia martinicensis* is originally from the tropics of Central and South America, now distributed in the Old World. It is distributed throughout in India.

Ecology. It occurs in moist, swampy or in marshy grass fields, rather frequent in some localities, but in general rare.

Specimens examined: KERALA: Thiruvananthapuram Dt.: Veli, Mohan 52689 (MH), Biju 44268 (TBGT). Kollam Dt.: Natayara, Mohan 63796 (MH). Alappuzha Dt.: Arukkutty, Swaminathan 95678 (MH); Ambalapuzha, Bhargavan 46085 (MH). Thrissur Dt.: Koratti, Sebastine 26745 (MH); Kaladi Forest range, Ramamoorthy 25974 (MH). Kozhikode Dt.: Parappanangadi, Biju 25943 (CALI); Ramanattukara, Biju 25945 (CALI & TBGT). TAMIL NADU: Kanniyakumari Dt.: Thengapatanam, Henry 61542 (MH), Swaminathan 68956 (MH).

ARGYREIA Lour.

The genus *Argyreia* is commonly known as 'woolly morning glory' or 'small wood rose'. The name is derived from the Latin word *Argyrios*, referring to the 'silvery' undersides of the leaves. The genus comprises about 90 species, all of which are native to continental Asia, Malaysia and one species in Australia (Ooststroom, 1953). Clarke (1883) reported 46 species (including *Lettsomia*) in India, which is the second largest genus in Indian Convolvulaceae.

The genus was originally described by Loureiro in his *Flora of Cochinchinensis* (1790) and distinguished it from the related taxa by '5 partite corolla with oblong reflexed segments, capitate emarginate stigma and subglobular 4 celled berry'. Roxburgh (1832) in the first edition of *Flora Indica*, established the new genus *Lettsomia*, mainly based on the same characters of *Argyreia* but differing in its 2 celled ovary. But the characters he raised to

describe the genus *Lettsomia* is not constant and conspecific to *Argyreia*.

Miquel (1857), Bentham & Hooker (1876), Clarke (1883), Peter (1891), Trimmen (1895), Prain (1906) and Ridley (1923) kept the two genera separate, several of them with little hesitation (Ooststroom, 1943). Prain (1906) retained the two genus *Argyreia* and *Lettsomia*, overlooking the partial dissepiment he found in the 2 celled ovary of *Lettsomia*. However he himself did not want to disturb the genus status and hence distinguished *Argyreia* and *Lettsomia* in the traditional way.

Choisy (1833, 1845) did not consider *Lettsomia* to be a distinct genus and instead, mentioned as the synonym of *Argyreia* and this was accepted by Hallier (1893 a,b), Boerlage (1899) and Gagnepain and Courchet (1915).

Insufficient studies have been made on the Indian species, with exception to Clarke's work in Hook.f., *Flora of British India* (1883), and the limits of several species are in question. Many of the genus characters existing now are conspecific to *Ipomoea* and other related genera. The only distinguishing characters, with exceptions, are the number of cells of the ovary and indehiscent fruit type. The difference in the number of cells of the ovary appears to be of little value in several genera of the family Convolvulaceae (Ooststroom, 1943). The present study revealed the fact that the only constant character to distinguish this genus is the indehiscent fleshy nature of fruit.

The intergeneric classification of this intricate genus *Argyreia* is very poorly discussed. Don (1838) and Endlicher (1841) based the corolla and stamen characters for the classification. A thorough study of all species of *Argyreia* is essential for giving a satisfactory knowledge of the natural sub-division of this genus.

Argyreia Lour., Fl. Cochinch. 134.1790; Choisy, Mem. Soc. Phys. Geneve 6:412. 1833; Benth. & Hook., Gen. Pl. 2:869.1876; Clarke in Hook. f., Fl. Brit. India 4:184.1883; Trimmen, Handb. Fl. Ceylon 3:206.1895; Ooststr., Blumea 5:352.1943; Hoogl., Blumea 7:179.1952; Ooststr., Fl. Mal., ser.1, 4:494.1953.

Type Species: *Argyreia obtusifolia* Lour.

Lettsomia Roxb., Fl. Ind. ed. Carey and Wall., 2:75. 1824; Clarke in Hook.f., Fl. Brit. India 4:191.1883; Prain, Journ. As. Soc. Bengal 124:321.1906.

Moorcroftia Choisy, Mem. Soc. Phys. Geneve 6:431.1833.

Annual or perennial woody twiners or very rarely suberect shrubs. Leaves very variable, entire, hairy to glabrous. Flowers axillary, cymose, few to many flowered, often capitate; bracts small or large; sepals 5, herbaceous or subcoriaceous, slightly or sometimes much enlarged in fruit, often hairy outside, glabrous inside, persistent in fruit; corolla regular, tubular, large and showy, red or purple, 5 distinctly hairy midpetaline bands; stamens 5, inserted or exserted; filaments filiform, often dilated at the base; anthers straight after dehiscence; pollen spinulose; ovary glabrous, 2 or 4 celled, 4 ovuled; style filiform, inserted or exserted; stigma biglobose. Fruits dry or fleshy indehiscent berry, leathery, seeds 4 or less, glabrous.

Distribution and Ecology. *Argyreia* is a native of continental Asia, Malaysia and Australia (Ooststroom, 1953). In India, it occurs as an undergrowth in dry deciduous forests, scrub jungles and adjoining grasslands at an altitudinal range of 250-1200 m.

KEY TO THE SPECIES

- 1a. Leaves whitish or golden tomentose below2
 1b. Leaves glabrous to hirsute or woolly beneath9
- 2a. Outer bracts large, foliaceous, broadly ovate
 to ovate elliptic, more than 2 cm broad,
 tomentose beneath3
 2b. Outer bracts small, not broadly ovate,
 less than 2 cm broad5
- 3a. Leaves densely appressed above. Peduncle
 shorter than petiole; bracts pinnately nerved..... **1. A. arakuensis**
 3b. Leaves glabrous or remotely pubescent above.
 Bracts palmately nerved (at least 2 pairs)4

- 4a. Outer bracts persistent; sepals linear- oblong,
less than 4 mm long, more than 8 mm broad,
velutinous below, margin ciliolate.....21. **A. sericea**
- 4b. Outer bracts early caducous; sepals ovate
to orbicular, more than 8 mm broad, tomentose
below, glabrous above16. **A. nervosa**
- 5a. Leaves apically obtuse to truncate
(rarely emarginate). Corolla only upto 2 cm long;
style and stamens well exerted. Fruits red17. **A. osyrensis**
- 5b. Leaves apically acute to acuminate. Corolla
more than 4 cm long; style and stamens
inserted. Fruits not red6
- 6a. Leaves elliptic, apically acuminate, black colour
above when dry. Fruits orange or
brownish orange8. **A. fulgens**
- 6b. Leaves ovate or broadly ovate, apically acute or
acuminate, prominently pubescent above7
- 7a. Leaves broadly-ovate, apically acuminate,
petiole more than 5 cm long. Fruits greenish
yellow when ripe14. **A. leschenaultii**
- 7b. Leaves ovate to ovate - lanceolate, apically acute;
petiole less than 2.5 cm long8
- 8a. Leaves golden tomentose on both sides
(more below). Outer bracts oblong to
elliptic oblong19. **A. pomacea**
- 8b. Leaves white tomentose only below, pilose above.
Outer bracts broadly elliptic11. **A. kleiniana**

- 9a. Leaves glabrous or remotely puberulent above ..10
- 9b. Leaves pubescent to villous or woolly
on both sides18
- 10a. Leaves strictly glabrous on both sides (except
the dorsal veins). Sepals glabrous, ciliate at
apex, disc fully or nearly covering the ovary.....23. **A. sp. A**
- 10b. Leaves glabrous or pubescent above. Sepals
remotely pubescent to tomentose.....11
- 11a. Suberect shrubs. Leaves obovate, apically
obtuse, glabrous above, silky pubescent below.
Fruits yellowish brown when dry.....4. **A. cuneata**
- 11b. Climbing shrubs. Leaves lanceolate, ovate to
broadly ovate or elliptic - ovate.....12
- 12a. Outer 2 sepals ovate-elliptic or orbicular.....13
- 12b. Outer 2 sepals lanceolate, ovate, elliptic to
elliptic-oblong.....14
- 13a. Inner 2 sepals oblong, apically acute; corolla
tube upto 4.5 cm long , sparsely
pubescent outside.....5. **A. cymosa**
- 13b. Inner 2 sepals orbicular, apically obtuse;
corolla tube only upto 2 cm long,
densely strigose outside.....22. **A. setosa**
- 14a. Leaves ovate to broadly ovate, glabrous above.
Inner sepals broader than outer.....15
- 14b. Leaves lanceolate, elliptic or ovate.
Outer sepals longer than inner.....16

- 15a. All sepals ovate, minutely and densely
appressed pubescent.....20. **A. populifolia**
- 15b. Inner three sepals suborbicular, glabrous
except for very few strigose bulbous
based hairs3. **A. coonoorensis**
- 16a. Leaves elliptic or elliptic-oblong; primary nerves
very oblique. Bracts oblong or spatulate6. **A. daltoni**
- 16b. Leaves lanceolate or ovate; primary
nerves not oblique. Bracts ovate-elliptic
or elliptic-oblong.....17
- 17a. Leaves lanceolate, glabrous above, remotely
pubescent and purplish violet below.
Sepals elliptic-lanceolate.....12. **A. kudajadrya**
- 17b. Leaves ovate, pubescent above, densely
velutinous and green below.
Sepals lanceolate.....10. **A. involucrata**
- 18a. Leaves broadly ovate or deltoid, apically acute
to acuminate, basally cordate.....19
- 18b. Leaves longer than broad, apically acute
(rarely acuminate), basally obtuse
or truncate.....20
- 19a. Branchlets and leaves densely covered with
golden brown strigose. Peduncle
shorter than leaves.....15. **A. nellygherya**
- 19b. Branchlets sparsely pubescent, leaves
indumentum not golden brown.
Peduncle longer than leaves.....9. **A. hirsuta**

- 20a. Entire exposed portion strigose hirsute; leaves densely hirsute above. Outer sepals slightly smaller than inner, pilose outside.....18. **A. pilosa**
- 20b. Entire exposed portion not hirsute; leaves densely hirsute below. Outer sepals longer than inner..... 21
- 21a. Leaves ovate-elliptic to elliptic-oblong, silk hirsute below. Sepals long, lanceolate, apically acuminate.....2. **A. choisyana**
- 21b. Leaves elliptic or elliptic- ovate (rarely obovate). Peduncle longer than petiole.....22
- 22a. Peduncle upto 12cm long, sepals elliptic -ovate, apically acute to obtuse; corolla tube upto 5 cm long.....13. **A. lawii**
- 22b. Peduncle upto 10 cm long, sepals ovate or orbicular, apically obtuse; corolla tube upto 2.8 cm long.....6. **A. elliptica**

1. *Argyreia arakuensis* Bal., Bull.Bot. Surv. India 3(2):163-165.1961.

Type: India, Andhra Pradesh, Vishakhapatnam, *Balakrishnan* 540 A (MH).

Perennial herbs; stem terete, twining, appressed - tomentose to pale fulvous woolly. Leaves simple, large, ovate to orbicular, 6-20 x 5-17 cm, apically acute or shortly broad-cuspidate, mucronulate, basally cordate or rarely rounded, sparsely appressed-hispid above, densely white, greyish or fulvous woolly tomentose below; midrib and lateral veins raised beneath, lateral veins 7-12 pairs; petiole upto 2-8 cm long, shorter than blade, densely woolly-tomentose. Flowers axillary, 1-4 flowered subcapitate cymes; peduncle upto 6 cm long, shorter than the petiole, tomentose or woolly; bracts large, persistent, foliaceous, ovate-elliptic, 1.5-2.5 x 0.5-2 cm, apically acute, shortly petiolate, pinnately veined, densely fulvous tomentose below, appressed-hispid above, inner bracts narrow, linear-oblong or spatulate, 1-2 x 0.2-0.4 cm, apically

acute to obtuse, lateral veins not prominent; pedicels upto 3-7 mm long, pubescent like peduncle; sepals subequal, outer 2 long, linear-oblong, \pm 2 cm long, apically acute, inner 3 short, \pm 1.5 cm long, linear-oblong, apically acuminate, hispid outside on all exposed regions, glabrous inside; corolla pale to dark purple, funnel-shaped, corolla tube upto 4.5 cm long, midpetaline bands pubescent; stamens included; filaments pilose at base; ovary conical, glabrous, 4 celled; style and stigma included, style glabrous. Fruit not seen.

Flowering : August-September

Fruiting : Not known

Distribution. *Argyreia arakuensis* is endemic to Andhra Pradesh.

Ecology. It occurs as an undergrowth in Araku Valley of Andhra Pradesh at an altitude of about 800 m.

Notes. During the course of the present study we could not locate this species in Andhra Pradesh.

Specimens examined: ANDHRA PRADESH: Vishakhapatnam Dt.: Araku Valley, *Balakrishnan* 10751 A-F (MH).

2. *Argyreia choisyana* Wight ex Clarke in Hook. f., Fl. Brit. India 4:190.1883; Trimen, Handb. Fl. Ceylon 3:208. 1895; Gamble, Fl. Pres. Madras 2: 906. 1923; Austin in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1:293. 1980.

Type: India, *Wight* 1961 (K).

Batatas choisyana Wight in Thw., Enum. pl. zeyl. 210.1860, nomen nudum; Wight Icon. pl. Ind. or. t. 491.1948.

Ipomoea atropurpurea Choisy in DC., Prodr. 9:366.1845. Type: India, *Wallich* 1345 (G-DC, not seen).

(Fig. 8)

Perennial herbs; stem robust, herbaceous towards the tip, twining, terete, shortly strigose. Leaves simple, ovate-oblong to elliptic-oblong, 4-7.5 x 2-3.8 cm, apically acute to acuminate, basally truncate, margin entire, glabrous above, strigose beneath; midrib and lateral veins raised beneath, primary veins 7-8 pairs; petiole upto 1.2 cm long, strigose. Flowers axillary,



Fig. 8. Type specimen of *Argyreia choisyana* Wight ex Clarke (Wight, 1961. K).

1-4 flowered cymes; peduncle upto 3 cm long, terete, pubescent like stem; bracts 3-4, narrowly elliptic-oblong, 0.8-2 x 0.1-0.2 cm, apically acute to acuminate, glabrous inside, velutinous outside; pedicels upto 1 cm long; sepals subequal, outer 2 long, lanceolate, 1-1.5 x 0.1-0.2 cm, apically acuminate, sericeous outside, glabrous inside, inner 3 short, lanceolate, 0.9-1.2 x 0.1 cm, apically acuminate, sericeous outside except margin, glabrous inside; corolla pink, funnel-shaped, corolla tube upto 3 cm long, mouth slightly 5 lobed, 2.2 cm across, midpetaline bands hairy; stamens inserted; anthers upto 5 mm long, straight; filaments attached 5 mm above the corolla base, unequal, 2 long, upto 1 cm, 3 short, upto 0.7 cm, dilated at base; ovary conical, 1x1.2 mm, glabrous; disc annular, \pm 1 mm, glabrous; style upto 1.2 cm long, glabrous; stigma biglobose, 1x1 mm, papillate. Fruit baccate, globose with persistent style base, 1-1.2 x 0.8-1 cm, glabrous, fruiting calyx slightly enlarged, outer sepals 1.8-2.1 x 0.3-0.4 cm, inner sepals 1.4 x 0.4-0.6 cm; seeds 2-4, generally 2, globose, 5-6 x 4-5 mm, pubescent, dull black.

Flowering : August - October

Fruiting : September - December

Distribution. This is endemic to South India and Sri Lanka. It is considered to be a rare plant in India. During the course of the present study we couldn't locate this plant in Southern Peninsular India except in Subba Rao's collection from Andhra Pradesh in MH. Austin (1980 a) mentioned that this plant had not been found in Ceylon since 1850.

Ecology. The specimen from Andhra Pradesh was collected from the dry zones.

Notes. Austin (1980 a) raised doubts about the identity of this species, and mentioned its similarity to *A.bracteata*. During the study we consulted the type materials and found *A.choisyana* to be a distinct species. Clarke (1883) had recognized a variety under this taxa namely var. *wightii*. But very little is known about this plant.

Specimens examined: ANDHRA PRADESH: Chittoor Dt.: *Subba Rao* 45896; Tirumala, *Ranga Charyalu* 786; Akasaganga, *Subba Rao* 46875 (MH).

3. *Argyreia coonoorensis* Smith & Ramas., Rec. Bot. Surv. Ind. 6:30 1914; Gamble, Fl. Pres. Madras 2:907. 1923.

Type: Nilgiris, Coonoor, *Meebold* 12397 (not found)

(Fig.9)

Perennial herbs; stem woody, herbaceous towards the tip, twining, terete, hollow, strigose, bulbous based white hairy. Leaves simple, ovate or broadly ovate, 7-12 x 5-10 cm, apically acuminate, basally cordate or cordately truncate, sparsely scabrous, fulvous strigose beneath; midrib and lateral veins raised beneath, prominently strigose, lateral veins 10-11 pairs; petiole upto 9.5 cm long, pubescent like stem. Flowers axillary, few to several flowered cyme; peduncle upto 6.5 cm long, terete, pubescent; bracts small, elliptic or linear-elliptic, 1.2-2.2 x 0.2-0.7 cm, apically acute to acuminate, shortly petiolate, pubescent; pedicels short, upto 1 cm long, pubescent; sepals unequal, 4-5 x 2-3 mm, apically acute, very few strigose hairs, glabrous inside, inner 3 large, suborbicular, 6-7 x 4-5 mm, apically obtuse, both sides glabrous; corolla purple, funnel shaped, tube 3.2 cm long, mouth slightly five lobed, 4.2 cm across; stamens inserted; anthers upto 4 mm long, whitish pink, straight; filaments attached 3 mm above the corolla base, subequal, 3 short, upto 1 cm, 2 long, upto 1.4 cm, dilated at base, papillate; ovary conical, 1-1.3 x 1-1.2 mm glabrous; disc slightly lobed; style single, inserted, upto 3.2 cm long, glabrous; stigma biglobose, 1 x 1.5 mm, papillate. Fruit not seen.

Flowering : August-November

Fruiting : December-January

Distribution. *Argyreia coonoorensis* is endemic to India and has restricted occurrence, confined to the hill slopes of Southern Peninsular India.

Ecology. It grows along the forest margins and grasslands of the Nilgiris (Coonoor) at an altitude above 6,000 ft.

Specimens examined: KERALA: Malappuram Dt.: Kottakkal, *Biju* 22801 (TBGT). TAMIL NADU : Nilgiris Dt.: Coonoor, *Biju* 44227 (CALI & TBGT).

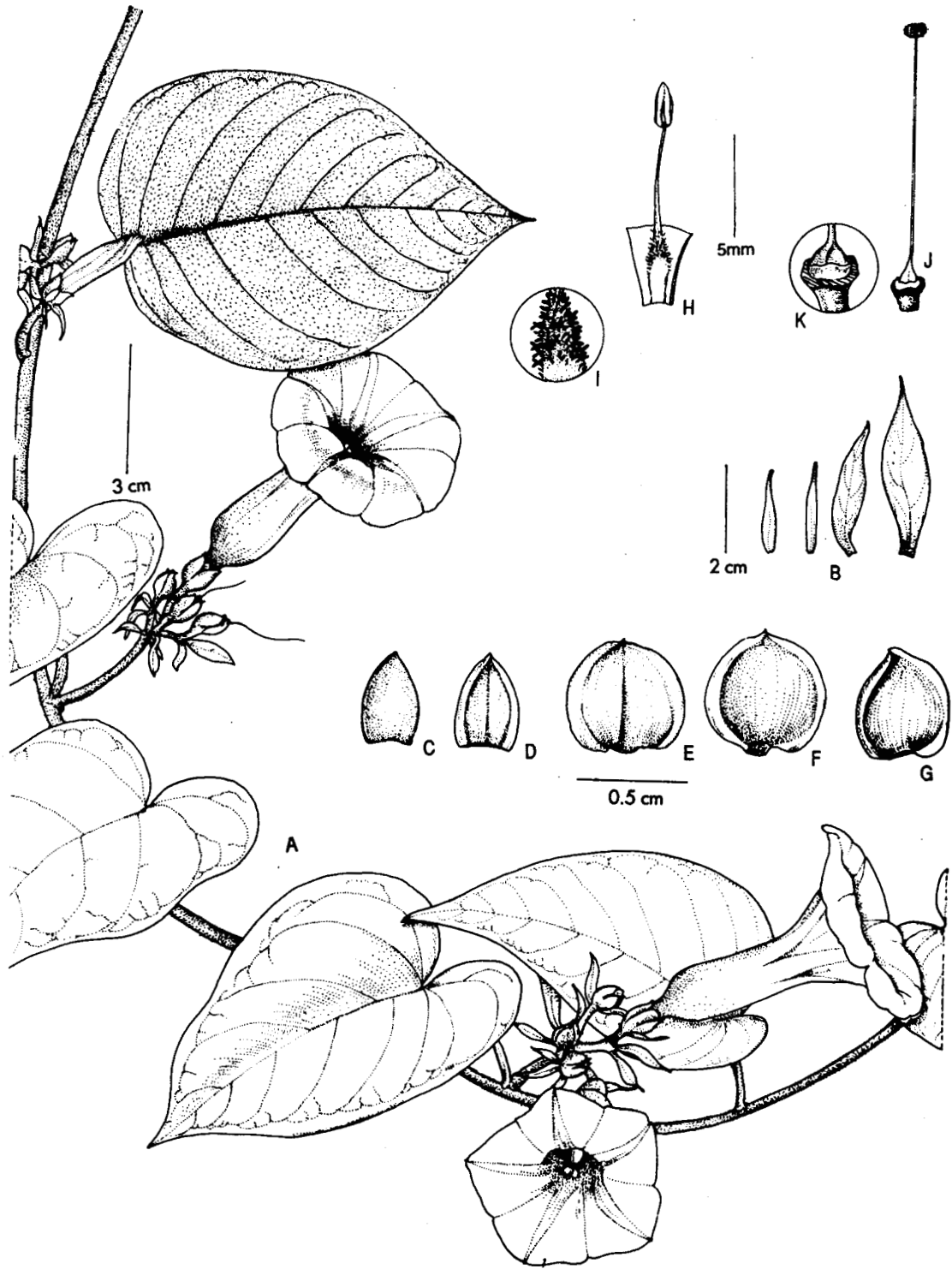


Fig. 9. *Argyreia coonoorensis*. A. Flowering twig; B. Bracts; C-D. Outer sepals, E-G. Inner sepals; H. Stamens, I. Filament base showing hyaline hairs; J. Pistil; K. Ovary enlarged (from *Biju* 44227, CALI).

4. *Argyreia cuneata* (Willd.) Ker Gawl, Bot. Reg. 8:t.661. 1822; Choisy in DC., Prodr. 330.1845; Clarke in Hook. f., Fl. Brit. India 4:191. 1883; Gamble, Fl. Pres. Madras 2:907.1923; Fyson. Fl. Ind. hill stat. 415.t.354. 1932; Gandhi in Sald. & Nicolson, Fl. Hassan Dist. 464. 1978; Rani & Matthew in Matthew, Fl. Tam. Carnatic 3:1007.1983.

Type: India, B-W 3676 (G-DC).

Convolvulus cuneatus Willd. Sp. Pl. 1:873. 1798.

Lettsomia cuneata Roxb. Hort. Beg. 13. 1814

Rivea cuneata Wight, Icon. pl. Ind. or. t. 890.1844-45.

Vernacular names: Tam. *Vettai chedi*, *Kanvalipoo*; Kan. *Achhegide*, *Attarigidda*, *Kallana hambu*.

(Fig. 10)

Perennial bushy erect herb, 2-5 ft high, stem woody, herbaceous towards the tip, somewhat twining, terete, glabrous to shortly pubescent in younger parts. Leaves simple, obovate or elliptic, 4-8 x 2-3.2 cm, apically obtuse, mucronulate or emarginate, basally cuneate or obtuse, glabrous above, grey silky villous beneath, midrib raised beneath, lateral veins inconspicuous on both sides; petiole upto 5 mm long, tomentose. Flowers axillary, 3-5 flowered cymes; peduncle upto 5 cm long, pubescent; bracts small, 3-4, linear-lanceolate, deciduous, 5-7 x 2-2.5 mm, apically acute, glabrous above, pubescent below; pedicels upto 1 cm long, pubescent like peduncle; sepals subequal, ovate to broadly ovate, 3-4 x 3-5 mm, outer 3 apically acute, glabrous inside, shortly hirsute outside, inner 2 apically obtuse, pubescent outside except the margins; corolla bright purple, funnel shaped, mouth slightly lobed, 2.3 cm across, tube upto 3 cm long, midpetaline bands shortly hairy; stamens inserted; anthers upto 4 mm long, white, straight; filaments attached 4 mm above the corolla base, subequal, 1-1.5 cm long, dilated at base, shortly hyaline hairy; ovary conical, 1.2 x 1 mm glabrous; disc annular, slightly lobed, ± 1 mm; style single, inserted, upto 1 cm long, glabrous, dilated at base; stigma biglobose, 1 x 1.5 mm papillate. Fruit berry, indehiscent, articulate, yellowish brown when dry, ovoid, crowned with short style base, 1-1.5 x 0.8-1.2 cm, calyx lobes slightly enlarged and reflexed; seeds 2-3 or 4, obovate, 6-8 x 4-7 mm, apically obtuse, basally acute to obtuse, pubescent, dull black.



Fig. 10. *Argyreia cuneata*. A. Flowering twig; B. Fruits (from *Biju* 15389 TBGT).

Flowering : August-October

Fruiting : November-January

Distribution. This species is endemic to peninsular India. It is generally gregarious in the restricted regions of its distribution.

Ecology. It is common in the plains along waysides and Ghat roadsides, also as an undergrowth in semideciduous forests, with an altitudinal range from 1000-2500 mt.

Medicinal use. The leaves are reported to be effective in the treatment of diabetes (Wealth of India).

Horticultural potential. With its purple coloured funnel shaped exquisite flowers in clusters, the plant is suitable for gardening. The yellowish brown dry fruits, crowned with short style base is also suitable for dry flower arrangement.

Specimens examined: KERALA: Palakkad Dt.: Anakatti, *Ansari* 51451 (MH). Malappuram Dt.: Kottakkal, *Biju* 15389 (TBGT). Kozhikode Dt.: Pavagada, *Ellis* 20414 (MH). TAMIL NADU: Coimbatore Dt.: Vadakumali, *Viswanathan* 717, *Narayanaswamy* 18766; Anamalais, *Barber* 3624 (MH). Nilgiris Dt.: Gudalur, *Narayana & Raju* 18499, *Gamble* 17877, *Subba Rao* 36206 (MH). N.Arcot Dt.: Kottur R.F., *Viswanathan* 671; Poovankolam R.F., *Subramanyam* 6052 (MH). S. Arcot Dt.: *Barber* 1114 (MH). Dharmapuri Dt.: Mamarathupatti, *Ravishankar* 45598 (MH). Salem Dt.: Yercaud, *Karthikeyan* 26856 (MH), *Biju* 23921 (TBGT). Periyar Dt.: Dhimbam Forest, *Vajravelu* 80675 (MH). KARNATAKA: Mysore Dt.: *Barber* 6899 (MH); *Biju* 44279 (CALI); Bandipur, *Naithani* 21117; *Brown s.n.* (MH). ANDHRA PRADESH : Chittoor Dt.: *Jacob* 444 (MH).

5. *Argyreia cymosa* (Roxb.) Sweet, Hort. Brit. 2:373. 1830; Wight, Icon, pl. Ind. or.t.839.1845; Clarke in Hook. f., Fl.Brit. India 4:190.1883; Gamble, Fl.Pres.Madras 2:905.1923; Rani & Matthew in Matthew, Fl. Tam. Carnatic 3:1008.1983.

Type: India (not seen)



Fig. 11. *Argyreia cymosa* flowering twig (from Henry 47021 MH).

Lettsomia cymosa Roxb. Fl. India 2:82.1824.

Convolvulus glomeratus Wall. Cat. 2257.

(Fig. 11)

Perennial herbs; stem woody, herbaceous towards the tip, twining, terete, pubescent. Leaves simple, deltoid to reni-form, 3-8 x 1.5-10 cm, apically acute or obtuse, basally truncate to cordate, glabrous to puberulous above, pubescent beneath; midvein and lateral veins raised beneath, prominently tomentose, primary veins 8-9 pairs; petiole upto 4.5 cm long, pubescent like stem. Flowers axillary, several flowered cymes; peduncle upto 10 cm long, terete, pubescent; bracts leafy, 2-4 in number, broadly ovate to orbicular or elliptic, 0.5-1.5 x 0.2-1.5 cm, apically acute, obtuse or retuse, pubescent on both sides; pedicels short, 1-1.5 cm long, terete, pubescent; sepals unequal, outer 3 large, ovate to orbicular, 1.3-1.6 x 0.9-1.3 cm, apically obtuse, inner 2 small, oblong, 1-1.2 x 0.3-0.5 cm, apically acute, pubescent outside, glabrous inside; corolla pale purple, darker near the centre, funnel shaped, corolla tube upto 4.5 cm, mouth 5 lobed, 3-3.2 cm across; stamens inserted; anthers upto 5 mm, straight; filaments attached 1.5 cm above the corolla base, subequal, upto 4 cm long, papillate; ovary globular, 1-1.5 x 1.5-2 mm, glabrous; disc annular, 5 lobed, ± 1 mm; style single, upto 3.8 cm, glabrous; stigma white, biglobose, 1 x 1 mm. Fruit berry, depressed globose, 1.8 x 1.4 cm, glabrous, fruiting sepal enlarged, 1.5-2 x 1-2 cm; seeds 2, 3 or 4, ovate to elliptic, 8 x 6 mm, glabrous to pubescent, black.

Flowering : October-December

Fruiting : November-January

Distribution. *A. cymosa* is distributed throughout Southern Peninsular India and Philippines (Clarke, 1883). In India it is more frequently found in Andhra Pradesh.

Ecology. It is found in the drier parts of Southern Peninsular India.

Specimens examined: TAMIL NADU: Chengalpattu Dt.: Vedanthangal Birds Sanctuary, Henry 47021 (MH). N. Arcot Dt.: Viswanthan 948 (MH). ANDHRA PRADESH: Anantapur Dt.: Kadiri, Yesoda 645 (MH). Kurnool Dt.: Ellis 32573

(MH). Godavari Dt.: *Barber* 4775 (MH). Warangal Dt.: Kanapur R.F., *Sebastine* 11576 (MH). Vishakhapatnam Dt.: *s.coll.* 11695; *Jacob* 17138 (MH).

6. *Argyreia daltoni* Clarke in Hook. f., Fl. Brit. India 4:190.1883; Gamble, Fl. Pres. Madras 2:905. 1923; Rani & Matthew in Matthew, Fl. Tam. Carnatic 3:1008.1983.

Type: India, Singhboom, Bundgao, *C.B.Clarke* 20583 D (K).

(Fig.12)

Perennial herbs; stem robust, herbaceous towards the tip, terete, glabrous to pubescent. Leaves simple, elliptic, ovate-elliptic, 8-20 x 3-7 cm, apically subacute, basally truncate to obtuse, glabrous above, fulvous - strigose to pubescent below; mid rib and lateral veins raised beneath; petiole upto 4 cm long, pubescent. Flowers axillary, 4-7 flowered cymes; peduncle upto 9 cm long, terete, pubescent like stem; bracts 3-4, oblanceolate to spatulate, 1-1.8 x 0.4-0.5 cm, apically acute to obtuse, glabrous above, pubescent below; petiole upto 0.8 cm long; pedicels short upto 1 cm long; sepals unequal, outer 3 long, elliptic to elliptic-oblong, 1-1.3 x 0.1-0.3 cm, apically acute, pubescent outside, glabrous inside, inner 2 short, ovate-lanceolate, 6-7 x 1-2 mm, apically acute to acuminate, pubescent outside, glabrous inside; corolla purple, tube upto 4 cm long, mouth slightly 5 lobed, 3-3.5 cm across, midpetaline bands sericeous; stamens inserted; anthers upto 6 mm long, straight; filaments attached 1 cm above the corolla base, subequal, 2 long, upto 3 cm, 3 short, upto 2.4 cm long, dilated at base, hyaline hairy; ovary conical, 1-1.5 x 1 mm, glabrous; disc annular, \pm 1 mm long, lobed, glabrous; style single, upto 3.5 cm long, glabrous, dilated at base; stigma biglobose, papillose, 1 x 1.5 mm. Fruit berry, globose with persistent style base, 1-1.5 x 0.8-1.2 cm; seeds not seen.

Flowering : August-October

Fruiting : November-January

Distribution. *A. daltoni* is endemic to India.

Ecology. Plants are found in dry and deciduous habitat.

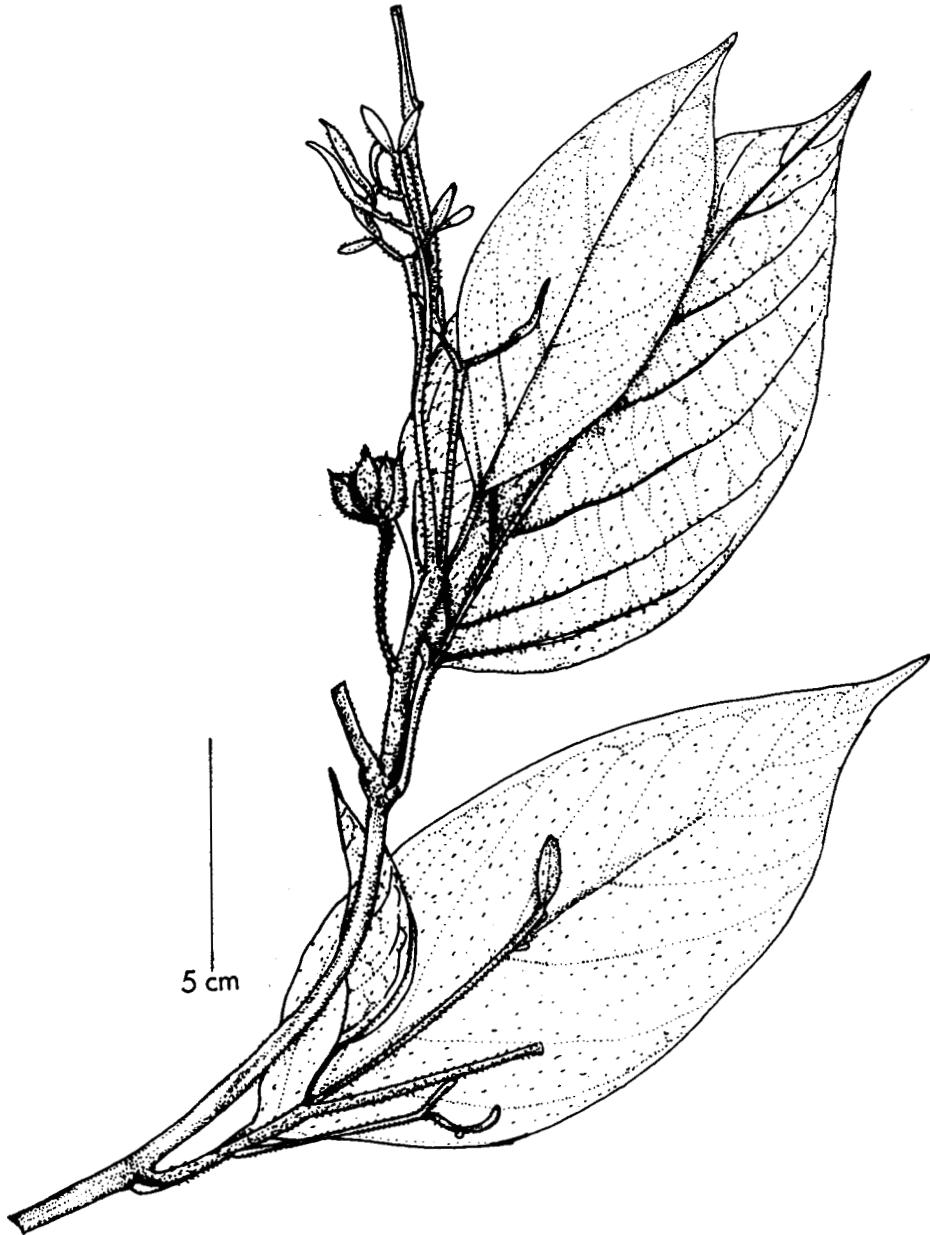


Fig. 12. *Argyreia daltoni* fruiting twig (from Clarke 20583 BM).

Specimens examined : ANDHRA PRADESH: Vishakhapatnam Dt.: *Subba Rao* 31164, *Balakrishnan* 10967 (MH). Srikakulam Dt.: way to Seethi, *Sreekumar* 76894 (MH).

7. *Argyreia elliptica* Choisy, Mem. Soc. Phys. Geneve 6:330.1834 & in DC., Prodr. 9:330.1845 (pro parte); Gandhi in Sald. & Nicolson, Fl. Hassan Dist. 466. 1978; Austin in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1:294.1980; Rani & Matthew in Matthew, Fl. Tam. Carnatic 3:1010.1983; Ramach. & Nair, Fl. Cannanore 297. 1988.

Type: India, *Wallich* 1417 (G-DC).

Lettsomia elliptica Wight, Icon. pl. Ind. or. 4(2):12.1850; Clarke in Hook. f., Fl. Brit. India 4:192.1883; Trimen, Handb. Fl. Ceylon 3:209.1895; Gamble, Fl. Pres. Madras 2:911.1923.

Vernacular names: Tam. *Unnayangodi*, *Thaalvendaankodi*; Kan. *Ugani hambu*

(Fig. 14)

Perennial herbs; stem robust, terete, glabrous or sparsely stiff hairy. Leaves simple, variable in form, ovate, elliptic-ovate, obovate or orbicular, 2-13.5 x 1.5-5.2 cm, apically acute to acuminate, basally cuneate, obtuse or slightly rounded, margin entire, glabrescent to pubescent above, appressed trichomes beneath; mid rib and lateral veins raised beneath, prominently pilose, primary veins 7-9 pairs; petiole upto 3.5 cm long, pubescent. Flowers axillary or terminal, 2-8 flowered cymes; peduncle upto 10 cm long, terete, pubescent; bracts small, caducous, narrowly lanceolate, 1.2 x 1 mm, apically acute to slightly acuminate, pubescent, short ciliate at the margin; pedicels upto 2 cm long, terete, pubescent; sepals subequal, ovate or orbicular, 3.5-4.5 x 3-4 mm, apically obtuse, outer 2 pubescent outside, glabrous inside, inner 3 nearly orbicular, pubescent only in the middle portion of outer side; corolla lavender, funnel shaped, corolla tube dark pink, upto 2.8 cm across; stamens inserted; anthers upto 3 mm long, straight; filaments attached 5 mm above the corolla base, subequal, upto 6 mm long, dilated base, papillose; ovary conical, 1 x 1 mm glabrous; disc slightly five lobed, yellowish white, ± 1 mm; style single, inserted, upto 1.5 cm long, glabrous, dilated at base; stigma white, biglobose,

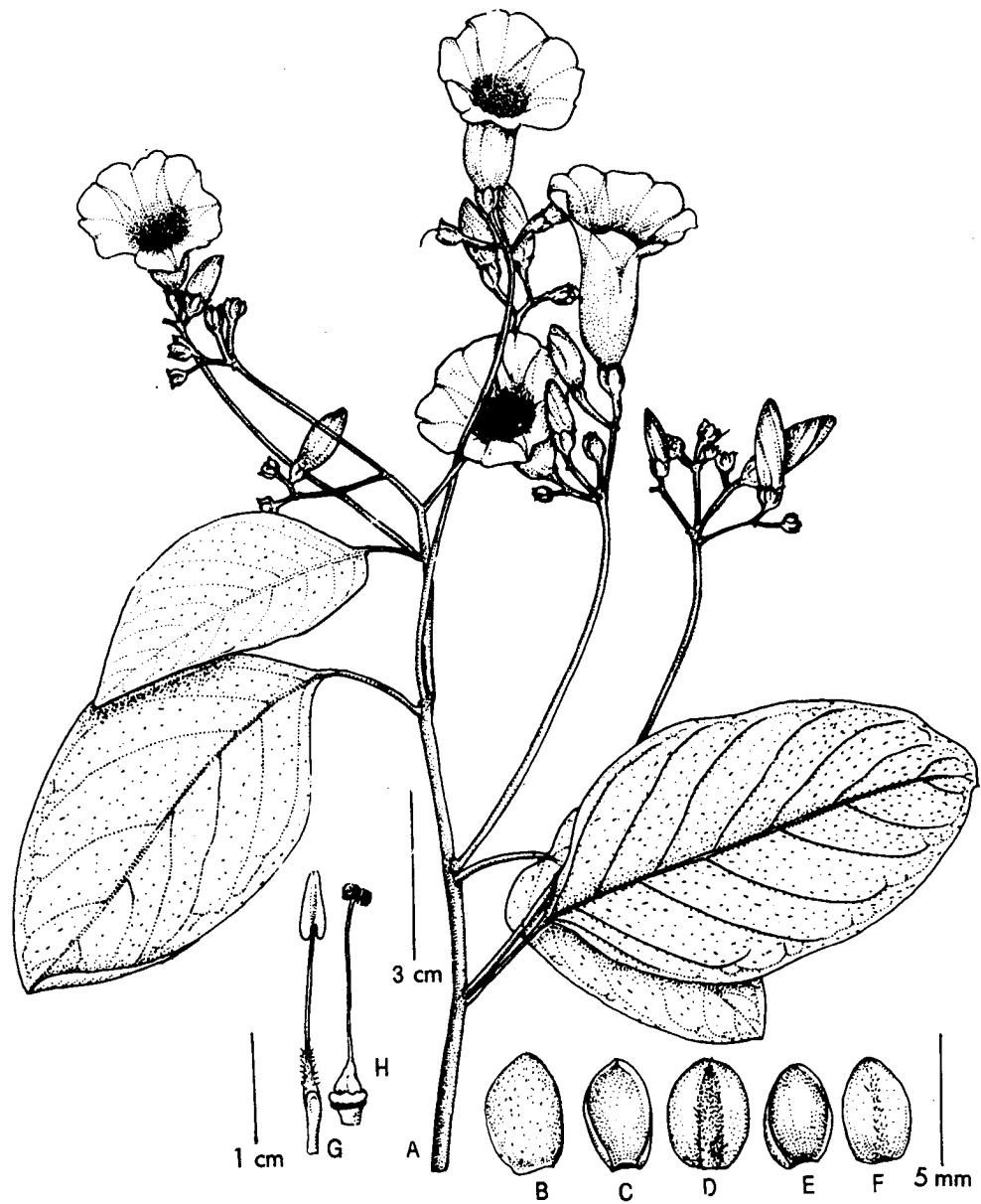


Fig. 13. *Argyreia elliptica* . A. Flowering twig; B- F. Sepals; G. Stamen; H. Pistil (from *Biju* 15391 TBGT).

1 x 1.5 mm. Fruit berry, orange in colour, subglobose, 6-8 x 5-7 mm, glabrous, fruiting calyx slightly enlarged, 0.9-1.1 x 0.6-0.8 cm; seeds 2, 3 or 4, obovate, 0.5-0.7 x 0.4-0.5 cm, glabrous, black.

Flowering : November-March

Flower opening : 10 am -11 am

Fruiting : February-April

Distribution. It is found in the plains and forest fringes in Southern India and the Central Province of Ceylon.

Ecology. Occurs as an undergrowth in wet evergreen and dry deciduous forest in Peninsular India, at an altitudinal range of 1500 - 3000 ft.

Economic potencial. Fresh leaves and twigs of the plant are used as green manure in paddy fields (Wealth of India).

Taxonomic notes. Austin (1980 a) mentioned that the plants can be recognised by its purplish secondary veins on the leaves. But the secondary veins are not purplish in colour in the population studied.

The leaf shape and pubescence are highly variable. One specimen in MH (*K.C.Jacob and Danial, 152*) collected from Tamil Nadu had leaves which are orbicular and glabrous on both sides.

Specimens examined : KERALA: Kollam Dt.: Achankovil, *Narayanaswamy 787* (MH); Chingavanam, *Bourdillon 394* (MH). Pathanamthitta Dt.: Muzhiyar, *Biju 44258* (CALI), *Nair 50846* (MH). Kottayam Dt.: Peruvanthanam, *Vivekananthan 22938* (MH). Idukki Dt.: *Valea, Jose et al. 14465* (TBGT). Wayanad Dt.: Sultan Bathery, *Ellis 19918* (MH); *Barber 5626* (MH); way to Pakshipathalam, *Biju 15391* (TBGT). Kannur Dt.: Bralimagiri, *Ramachandran 58759* (MH); TAMIL NADU: Tiruchirappalli Dt.: Chengattupatti, *Sebastine 7026, Lawson s.n* (MH). Coimbatore Dt.: *Jacob & Danial 152, Narayanaswamy 19520, Raju 343* (MH). Salem Dt.: *s.n 9779* (MH). Nilgiris Dt.: Bokkapuram R.F., *Sharma 35460, Gamble 17984* (MH). KARNATAKA: Mysore Dt.: Bandipur, *Naithani 23235, 21140* (MH). Shimoga Dt.: Bhadravati, *Biju 16277* (TBGT).

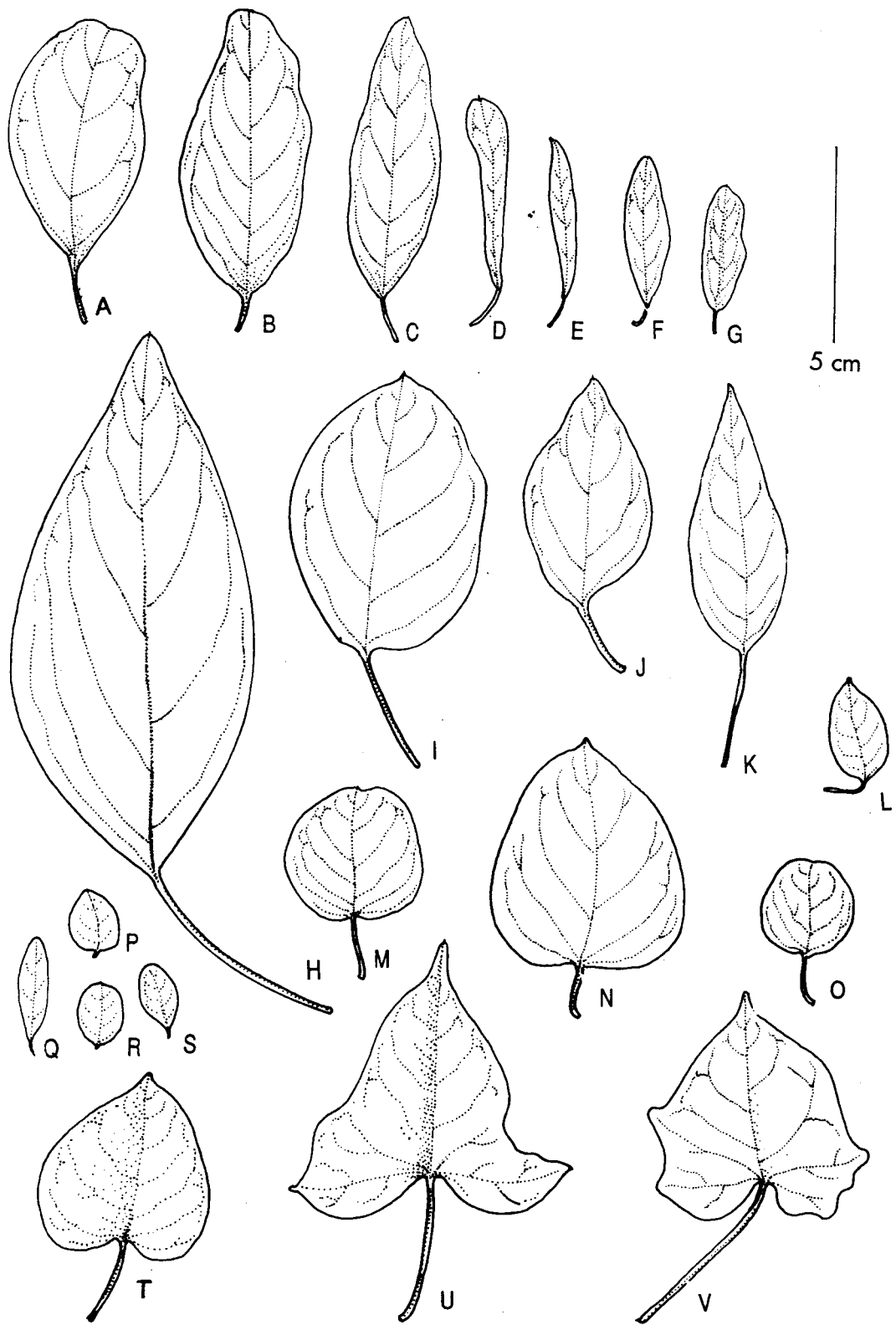


Fig.14. Leaf variation. A-G. *Aniseia martinicensis*; H-O. *Argyreia elliptica*; P-S. *Evolvulus alsinoides*; T-V. *Hewittia malabarica*.

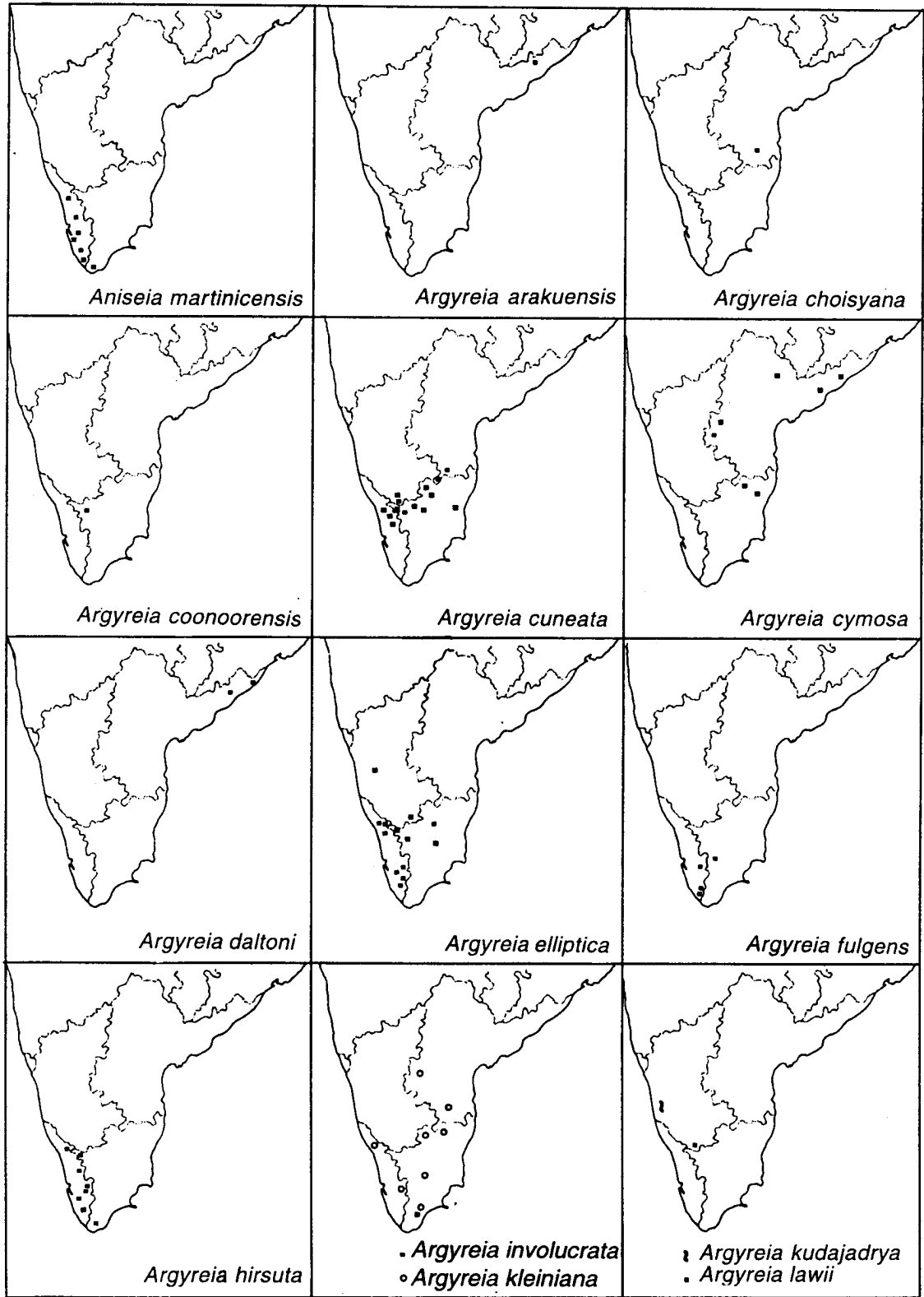


Fig. 15. Distribution maps of species of *Aniseia* and *Argyreia*

8. *Argyreia fulgens* Choisy, Convolv. Or. 33.1834, Wight in Calcutta Journ. Nat. Hist. 8:179, t.5, fig.3 & Icon.pl. Ind. or. t.1357 1845; Clarke in Hook.f., Fl. Brit. India 4:191, 1883. Gamble, Fl. Pres. Madras 2:907.1923; Mohan & Henry, Fl. Thiruvananthapuram, 312. 1994.

Type : India, *Wallich* 1394

Convolvulus fulgens Wall. Cat. 1394.

(Fig. 16)

Perennial bushy herbs or climbers; stem woody, herbaceous towards the base, somewhat twining, terete, silky white pubescent. Leaves simple, elliptic to broadly elliptic, 8-13 x 6-4 cm, apically acuminate, basally rounded to rhomboidal, densely silky shining beneath, glabrous above; midrib raised beneath; lateral veins 16-18 pairs, slightly conspicuous beneath, in young leaves the midrib and lateral veins brownish purple in colour; petiole upto 4.8 cm long, woolly. Flowers axillary, 3-5 flowered cymes; peduncle upto 2.3 cm, terete, pubescent; bracts 3-5, linear-elliptic, 0.8-1.2 x 0.2-0.3 mm, apically acute to acuminate, tomentose below, glabrous above; pedicels upto 8 mm long, pubescent like peduncle; sepals subequal, elliptic-oblong, 4-4.5 x 2-2.5 mm, outer 3 apically acute to acutish and tomentose, inner 2 obtuse and pubescent only in the middle portion, glabrous inside; corolla dark purple, tubular, tube upto 2.4 cm long, mouth slightly 5 lobed, 2.3 cm across, midpetaline bands sparsely pubescent; stamens inserted; anthers upto 5 mm long, white, straight; filaments attached 4 mm above the corolla base, subequal, long upto 9 mm, short upto 6 mm long, dilated at base, shortly hyaline hairy; ovary conical, 1.2 x 1 mm, glabrous; disc \pm 1 mm long, nearly covering the ovary; style single, inserted, upto 1 cm long, glabrous; stigma biglobose, papillate. Fruit baccate, indehiscent, globose, 1-1.2 x 1-1.2 cm, orange to orange purple, crowned with short style base; fruiting sepals recurved and slightly enlarged, glabrous; seeds usually less than 4, generally 2(3), broadly obovate to orbicular, 7-8 x 5-7 mm; seed germination epigeal, hypocotyl upto 10 cm long, bicotyledonary, apically emarginate, sinus upto 1.5 cm deep, basally truncate, glabrous, deep purplish, petiole upto 1.5 cm long.

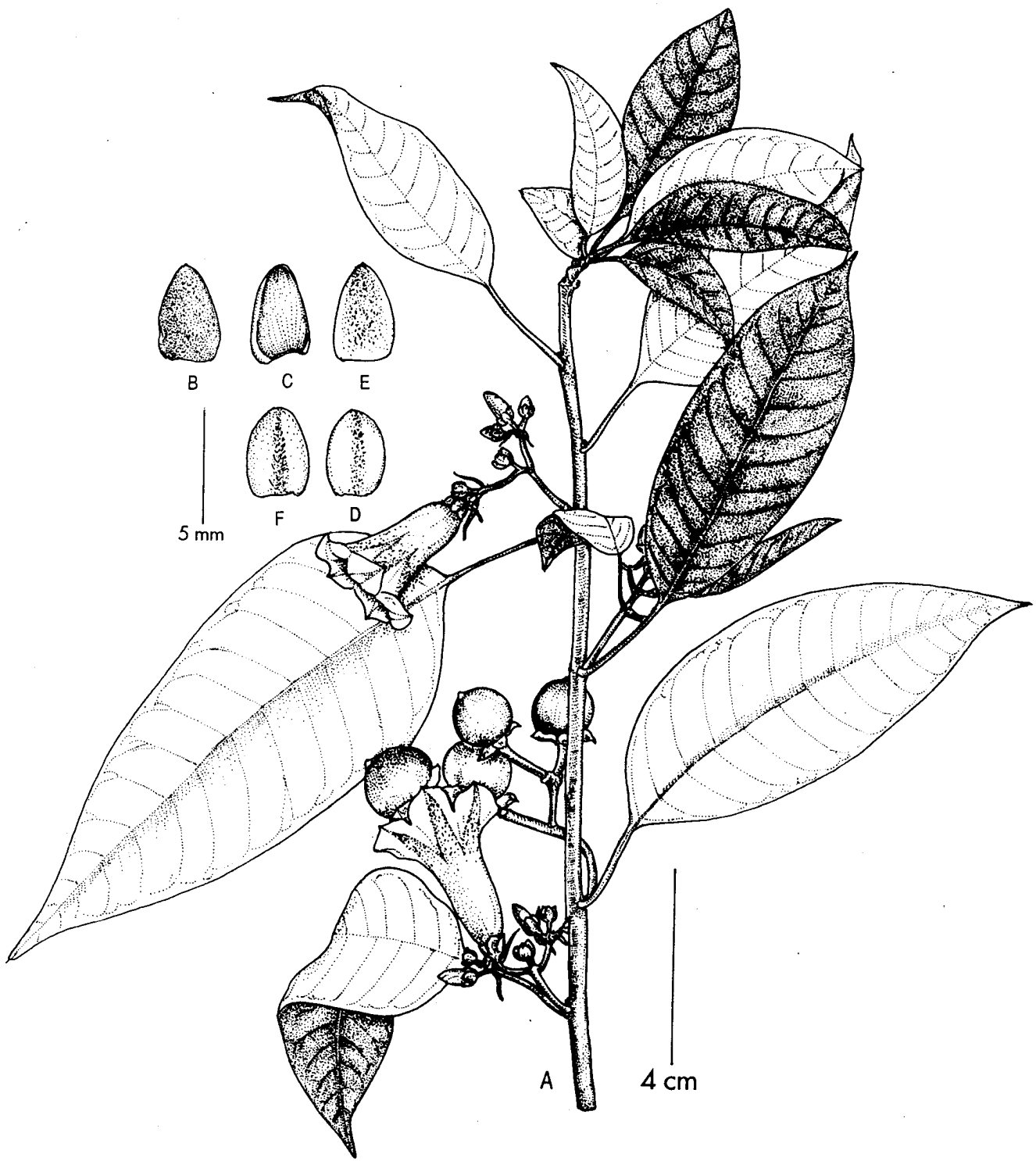


Fig. 16. *Argyreia fulgens*. A. Flowering and fruiting twig; B - D. Outer sepals, E & F. Inner sepals (from *Biju* 15355 (CALI))

Flowering : December-February

Fruiting : March-May

Distribution. This species is endemic to South India, restricted to the evergreen forests of Kallar Valley and Agasthyar hills of Thiruvananthapuram district, Idukki district of Kerala and Madurai district of Tamil Nadu. In view of its rarity, it is a species to be saved from the possible threat of extinction.

Ecology. This species is scattered in the highland semi-evergreen and deciduous forests of W.Ghats, Anamalais and hills of Travancore and Tirunelvely at about 3,000 ft. (Gamble, 1923). Mostly it is confined to river banks.

Medicinal use. The leaves are antiphlogistic and also used as an aphrodisiac (Kirtikar & Basu, 1918).

Specimens examined: KERALA: Thiruvananthapuram Dt.: Ponmudi Mohanan 69255 (MH); Palode, K.V. Rao (University College Herbarium, TVM); Kallar Valley, Biju 15355 (TBGT & CALI); Agasthyar hills, Biju 15348 (TBGT). Idukki Dt.: Cheruthony, Ramachandran 76251 (MH). TAMIL NADU: Madurai Dt.: Jacob 17794 (MH).

9. *Argyreia hirsuta* Arn., Nova Acta Phy.Med.Acad. Caes. Leop. Carol. Nat. Cur. 18:365c. 1836; Austin in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1:296.1980; Ramach. & Nair, Fl. Cannanore 297. 1988; Mohan & Henry, Fl. Thiruvananthapuram 312. 1994.

Type: India, in montibus Peninsulae australioribus, Wight 2254 (K).

Rivea zeylanica var. *hirsuta* Thw., Enum. pl.zeyl.209.1860. Type: Ceylon, Central Province Hewahetta, s.coll. Oct.1853, C.P.1944 (PDA, lectotype).

Argyreia hirsuta var. *coacta* Clarke in Hook. f., Fl.Brit.India 4:189. 1883. Type: based on *Rivea zeylanica* var. *hirsuta* Thw,

Argyreia populifolia var. *coacta* (Clarke) Trimen, Handb. Fl.Ceylon 3:208. 1895.

Argyreia coacta (Clarke) Alston, Ann.R. Bot.Gard. Perad. 11:209. 1929.

(Fig. 17, 18)

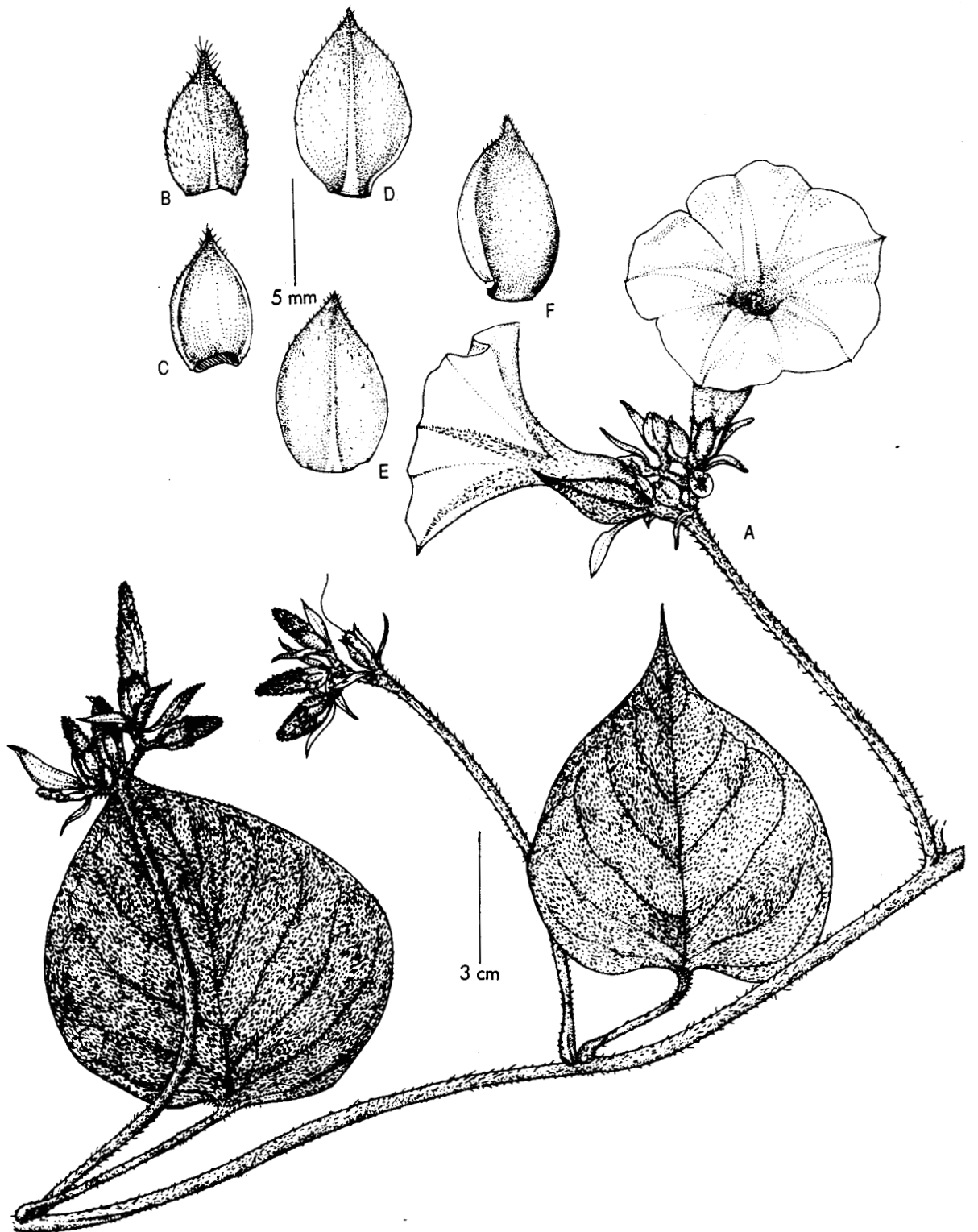


Fig. 17. *Argyreia hirsuta* . A. Flowering twig; B - F. Sepals (from *Biju* 15391 TBGT).



Herb. Wight, propr.

Argyreia hirsuta

Peninsula Ind. orientalis.

PENINSULA OF MADRAS

Fig. 18. Type specimen of *Argyreia hirsuta* Arn. (Wight, 2254. K).

Perennial climbing herbs; stem woody, herbaceous towards tip, terete, hollow, sparsely puberulous. Leaves simple, broadly ovate to deltoid, 7-11 x 6-9 cm, apically acute to acuminate, basally cordate, short silky hairs beneath, pubescent above; midrib and lateral veins raised beneath, lateral veins 9-10 pairs. Flowers few to many, compound cymes; peduncle upto 14 cm long, pubescent like stem; bracts 2-5, outer pair leaf like, large, elliptic, 2-2.5 x 0.8-1.2 cm, apically acuminate, often petiolate, upto 1 cm long, sparsely pubescent like leaf, inner 3 or 4, small, linear - lanceolate, 1.2-1.8 cm, pubescent like leaf; pedicels short, upto 1 cm long; sepals subequal, ovate, 7-8.5 x 4-6 mm, apically acute to acuminate, outer pair completely pubescent outside, inner 3 sparsely or prominently long hairy at apex; corolla pinkish purple, funnel shaped, tube upto 4.5 cm long, mouth slightly 5 lobed, 5 cm across, midpetaline bands hairy; stamens inserted; anthers upto 4 mm long, straight; filaments attached 5 mm above the corolla base, subequal 1.3-2 cm long, dilated at base, papillose hairy; ovary conical, 1 x 1.2 mm, glabrous; disc annular, slightly lobed; style single, inserted, upto 2.8 cm long, glabrous, dilated at base; stigma biglobose, 1.2 x 1.3 mm, papillose. Fruit berry, globose, orange red when ripe, 2-2.5 x 3-3.8 cm, fruiting calyx slightly enlarged; seeds 2, 3 or 4, orbicular, 1.3-1.4 x 0.9-1.3 cm, glabrous, cream coloured; seed germination epigeal, hypocotyl absent, bicotyledonary, apically broadly retuse, sinus upto 5 mm deep, basally slight cordate, glabrous, petiole upto 10 cm long, pubescent.

Flowering : August-November

Flower opening : 8 am - 8.30 am

Fruiting : November-February

Distribution. *A. hirsuta* is endemic to the hill slopes of South India and Ceylon.

Ecology. This species occurs in grassy hill slopes and forest fringes of the Peninsular India at an altitude of about 2000 m.

Specimens examined: KERALA: Kollam Dt.: Pampa to Anathode, *Vivekananthan* 48357 (MH). Kottayam Dt.: Devikulam, *Sebastine* 16524, *Deb* 30702 (MH). Idukki Dt.: Rajamala, *Biju* 15391 & 23939 (CALI & TBGT); Dhanas

Valley *Bhargavan* 90910; Kanjiar, *Mohanan* 74654 (MH). Palakkad Dt.: *Vajravelu* 26047 (MH). Wayanad Dt.: *Beddome* 5527 (BM). TAMIL NADU: Kanniyakumari Dt.: Upper Kodayar, *Henry* 49633 (MH). Nilgiris Dt.: *Gamble* 17868, *s.coll. s.n.* (MH).

10. *Argyreia involucrata* Clarke in Hook. f., Fl. Brit. India 4:187.1883; Gamble, Fl. Pres. Madras 2:905.1923; Rani & Matthew in Matthew, Fl. Tam. Carnatic 3:1010. 1983.

Type: *Argyreia*, n.23. Stocks Law & c. (BM)

(Fig. 19, 20, 21)

Perennial herbs; stem herbaceous towards the tip, twining, hollow, terete, sericeous. Leaves simple, ovate to ovate-lanceolate, 7-13 x 8-10 cm, apically acute, basally truncate to subcordate, glabrous above, densely silky sericeous beneath, shining; midrib and lateral veins raised beneath not conspicuous due to the hairiness, lateral veins 8-10 pairs; petiole upto 3 cm long, pubescent like stem. Flowers axillary, few flowered cymose clusters; peduncle upto 9 cm long, terete, pubescent; bracts 2-4, ovate-elliptic to elliptic-oblong or lanceolate, 1.5-3 x 0.4-1 cm, apically long acuminate, glabrous above, sericeous below; pedicels upto 5 mm long; sepals unequal, outer 2 long, lanceolate, 1-1.2 x 0.2-0.3 cm, apically long acuminate, upto 3.5 mm, strigose outside, glabrous inside, inner 3 short, lanceolate or ovate-lanceolate, 0.5-0.7 x 0.2-0.3 cm, apically acuminate, strigose outside except margin, glabrous inside; corolla red with purple throat, funnel-shaped, corolla tube upto 4.3 cm long, mouth slightly 5 lobed, 3 cm across; stamens inserted; anthers upto 5 mm long, filaments attached 6 mm above the corolla base, unequal, 2 long, 1.2 cm long, 3 short, 0.8 cm long, dilated at base with hyaline hairs; ovary conical, 1x1 mm; disc slightly lobed, \pm 1 mm, glabrous; style single, inserted, upto 1.8 cm long, glabrous; stigma biglobose, papillate. Fruit baccate, ovate-deltoid, 1.5-1.8 x 1-1.6 cm, glabrous, crowned with short style base; fruiting calyx slightly enlarged, 1-1.3 x 0.8-0.9 cm; seeds 3-4, obovate, 0.8-1 x 0.6-0.8 cm, apically obtuse to truncate, basally obtuse, glabrous, pale black.

Renia stigoza

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Fig. 19. *Argyreia* sp. (*involucrata* ?) (*Argyreia*. 23. Dalzel, K).



Herb. Ind. Or. Hook. f. & Thomson.
 23. *Argyreia*
 Herb. Malabar Concan. Reyer. *Argy.*
 Coll. Hook. & Thomson.

Fig. 20. Type specimen of *Argyreia involucrata* Clarke (*Argyreia*. 23. Stocks Law & c., BM).

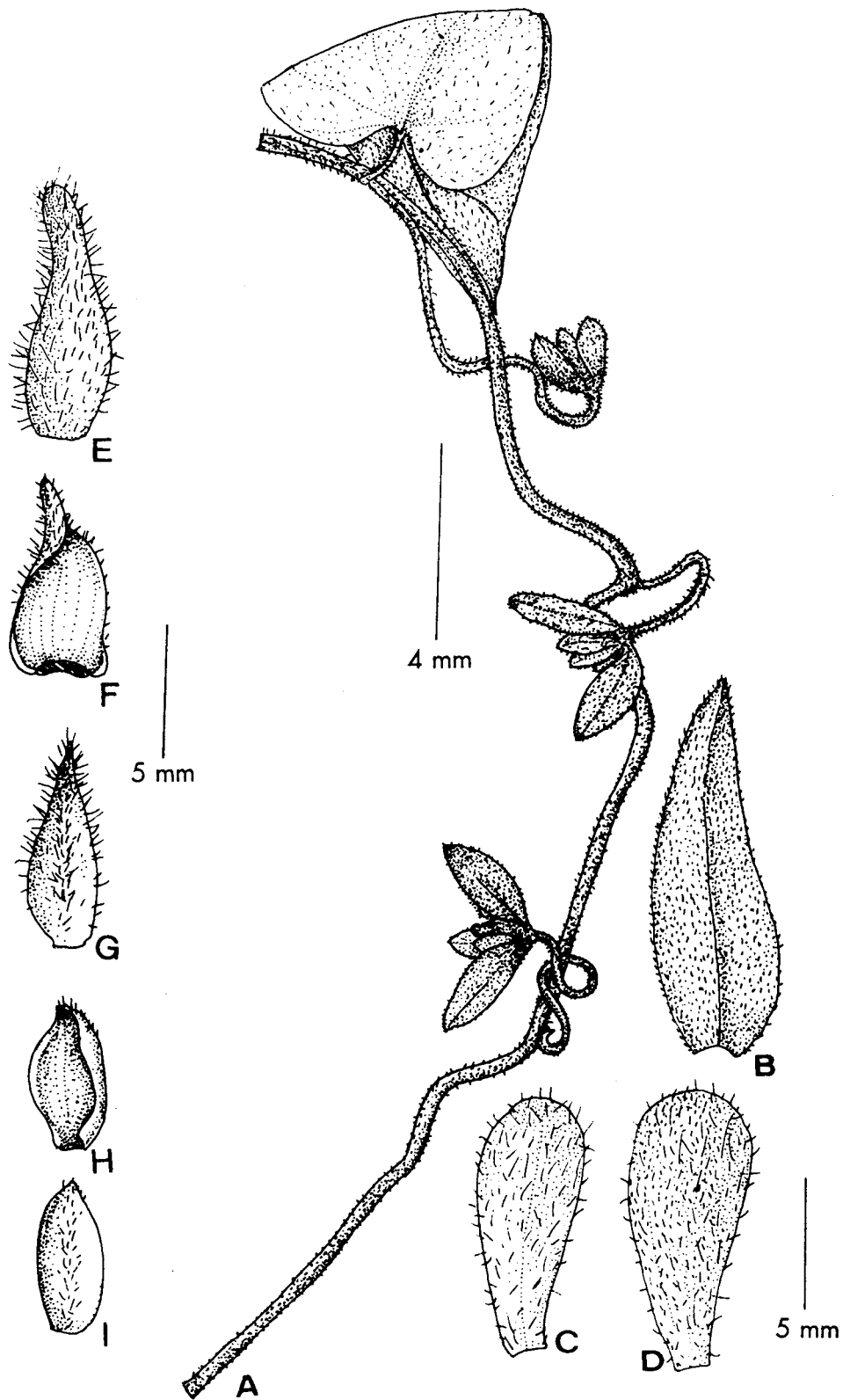


Fig. 21. *Argyreia involucrata*. A. Flowering twig; B. Outer bract, C & D. Inner bracts; E & F. Outer sepals, G - I. Inner sepals (from *Argyreia*, n.23. Herb. Ind. Or. H.F. & T. BM).

Flowering : August - October

Fruiting : September - December

Distribution. *A. involucrata* species is native to India.

Ecology. It occurs in the semi-evergreen and deciduous forests of Western Ghats.

Nomenclatural notes. Clarke (1883) published the name *Argyreia involucrata* with a detailed description of the plant. He mentioned *Argyreia* n. 23, Herb. Ind. or. H.f. & T. and also gave two different collection localities in his protologue - Law & Co. from Concan and Bababoodan Hills (British Museum) and Dalzell from Bombay (Kew). Both the materials are labelled 23 *Argyria* in same handwriting. Of these the BM material is found matching with the description of this taxa. The leaf size, shape, indumentum, bracts and sepals of the Kew material is different from the other. But this material labelled 23 *Argyreia* in Kew is found matching with *A. kudajadrya* Biju & Mathew *sp. nov.*

The material in BM, *Argyreia* 23 (Stocks Law & c.) fully agrees with the protologue and is selected as the holotype of *A. involucrata* Clarke.

Specimens examined : TAMIL NADU: Tirunelveli Dt.: *s.n.* 13153; Nadugani, *s.n.* 11009, *Sebastine* 95991 (MH). LOCALITY UNKNOWN: Malabar Concan, Stocks Law & c. 23 (BM).

11. *Argyreia kleiniana* (Roemer & Schultes) Raiz. Ind. Forester 92:302.1966; Rani & Matthew in Matthew, Fl.Tam. Carnatic 3:1010.1983.

Type: not found.

Ipomoea kleiniana Roemer & Schultes, Linn.Syst. Veg. 4:789.1819.

Argyreia bracteata Choisy, Convolv. Or., 30.1834 & in DC., Prodr. 9:328.1845; Clarke in Hook. f., Fl. Brit. India 4:188.1883; Gamble, Fl. Pres.Madras 2:905.1923.

(Fig. 22)

Perennial herbs; stem robust, terete, hollow, shortly tomentose. Leaves simple, broadly ovate to cordiform, 8-10 x 6-8.5 cm, apically obtusely acute,

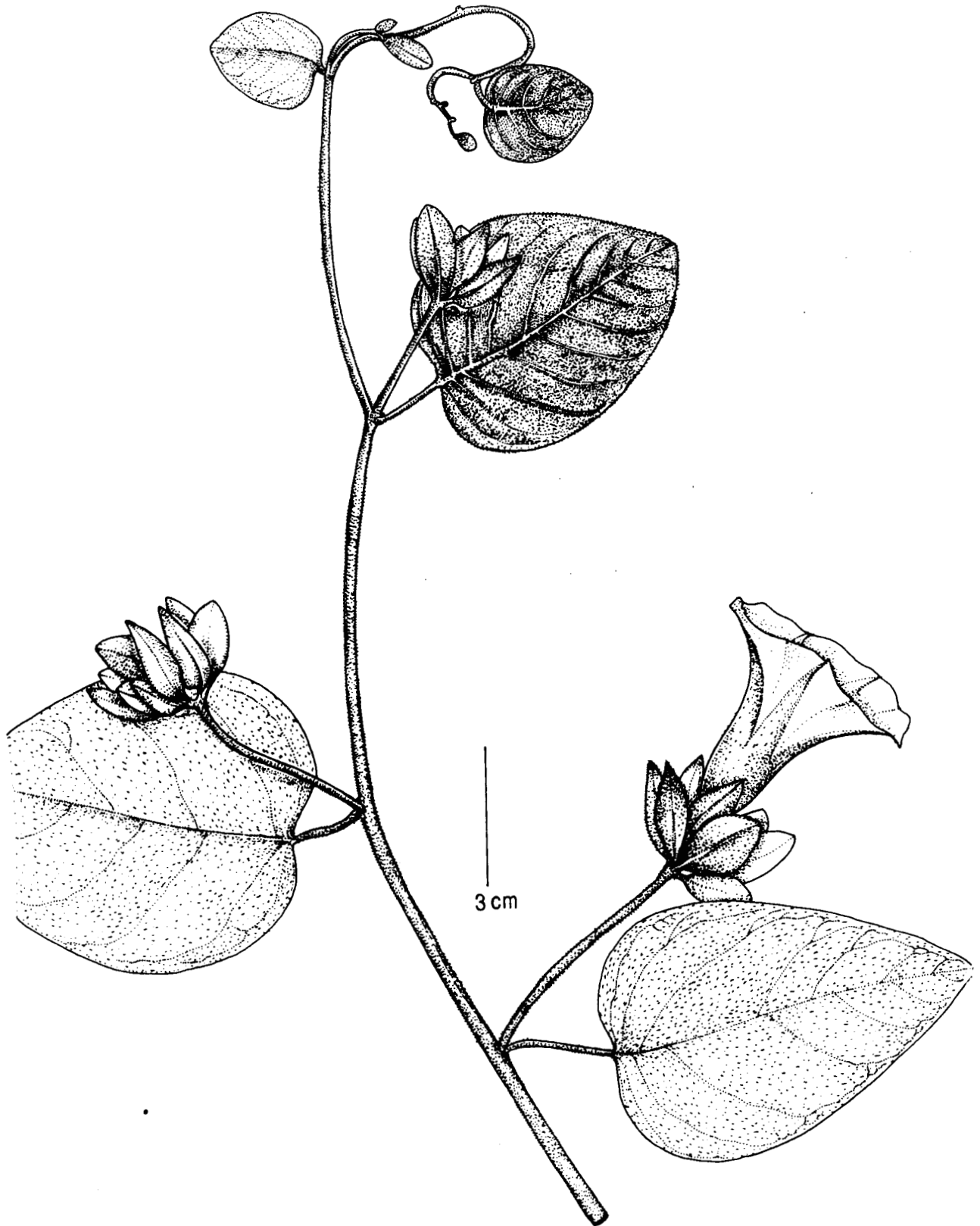


Fig. 22. *Argyreia kleiniana*. Flowering twig (from *Biju* 16234; TBGT).

basally truncate to sub-cordate, short pilose to glabrescent above, densely silky beneath; midrib and lateral veins raised beneath, prominently pubescent, lateral veins 10-12 pairs; petiole upto 6 cm long, tomentose. Flowers axillary, 1-5 flowered subcapitate cymes; peduncle upto 8.5 cm long, terete, tomentose; bracts ovate-elliptic to elliptic-oblong, 2-2.5 x 8-1.5 cm, apically obtuse to acute, silky villous outside, pubescent above; sepals subequal, ovate-lanceolate, 5-6 x 2.5-4.2 mm, apically acute, scarious, outer 2 slightly ciliate, shortly pilose outside in the middle portion only, glabrous within; corolla red-purple, campanulate, tube upto 4.5 cm long, mouth slightly 5 lobed, 6 cm across, midpetaline bands pilose outside; stamens inserted; anthers upto 4 mm long, straight; filaments attached 7 mm above the corolla base, subequal, upto 2.5 cm long, hyaline hairy at dilated base; ovary 1.5 mm; disc short, \pm 2 mm long, glabrous; style single, upto 2 cm long, glabrous; stigma biglobose, papillate. Fruit globose, yellowish, 1.5 cm across.

Flowering : June - August

Fruiting : August - October

Distribution. This species is found throughout India.

Ecology. The plants are found only in the dry areas of Southern India. The fleshy yellow fruits with slight aroma are eaten by bugs and beetles.

Specimens examined : KERALA: Idukki Dt.: Chinnar to Marayaur, *Biju* 16234 (TBGT). Kozhikode Dt.: Pavagada, *Ellis* 20413, 25749 (MH). TAMIL NADU: Tiruchchirappalli Dt.: *Sebastine* 6258 (MH). Tirunelveli Dt.: Thirukurungudi, *Karthikeyan* 40164 (MH). Pannad Dt.: *Vajravelu* 38710 (MH). Dharmapuri Dt.: *Vajravelu* 57941 (MH). N. Arcot Dt.: Kambukudi, *Subramanyam* 6064 (MH). ANDHRA PRADESH: Cuddapah Dt.: *Gamble* 15198 (MH). Kurnool Dt.: *Ellis* 42260 (MH).

12. *Argyreia kudajadrya* Biju & Mathew. *sp. nov.*

Typus: India, Karnataka, Kudajadri, *Biju* 44221 (holotypus K: isotypus CALI, TBGT & MH).

(Fig. 23)

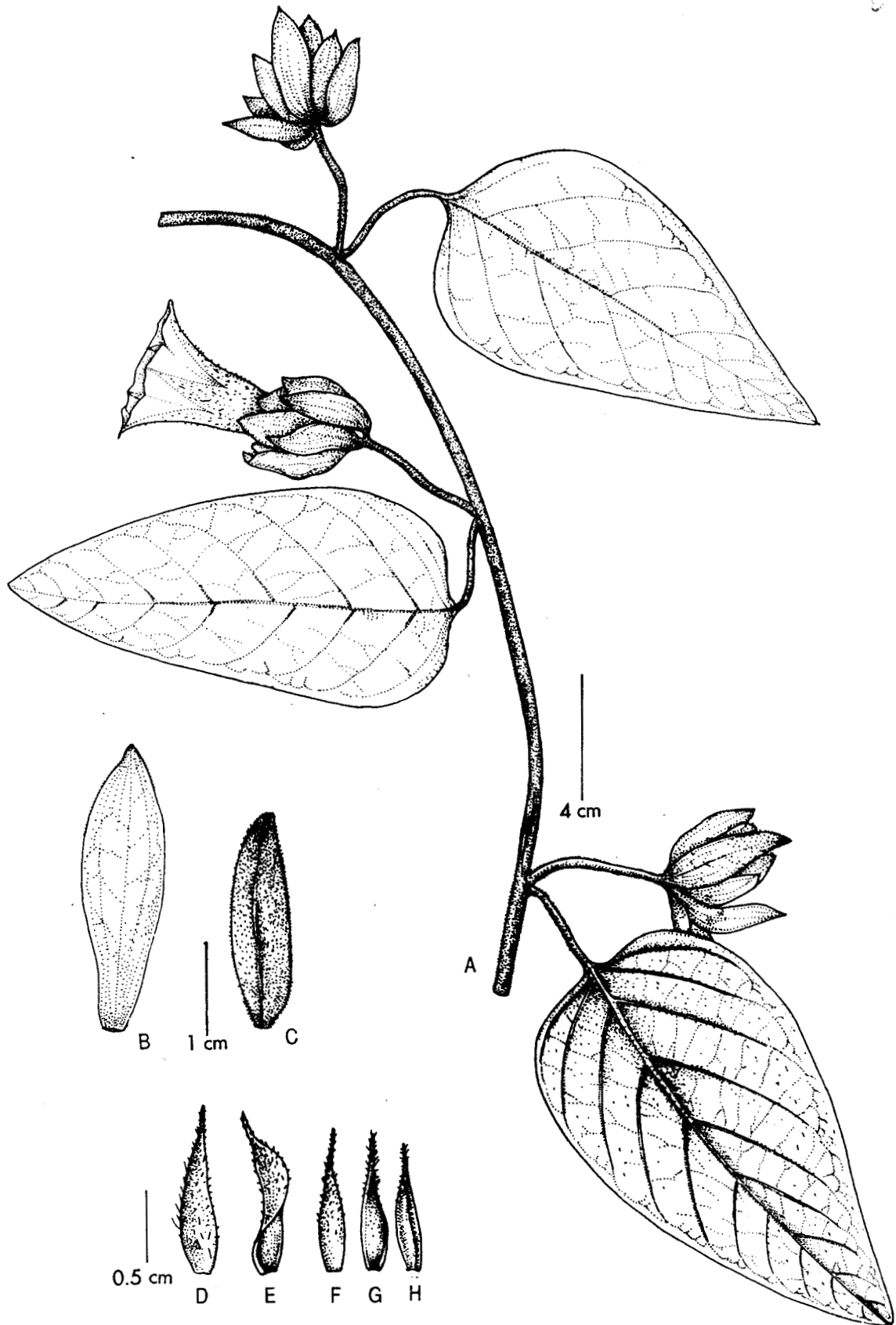


Fig. 23. *Argyreia kudajadrya*. A. Flowering twig; B & C. Bracts; D & E. Outer sepals, F - H. Inner sepals (from *Biju* 44221 CALI).

This species described below, although based upon imperfect material, is so distinct from its congeners differing widely in leaf shape from all previously known taxa. Similar to *A. kleiniana* (Roemer & Schultes) Raiz., but easily distinguished by its lanceolate, pubescent, apically acuminate to mucronulate and basally truncate leaves. The sepals are ovate-lanceolate with acuminate apex. In *A. kleiniana*, by contrast the leaves are broadly ovate to cordiform, densely silky beneath, apically acute and basally subcordate. The sepals are elliptic-lanceolate with acute apex.

Perennial herbs; stem robust, terete, herbaceous towards the tip, pubescent. Leaves simple, lanceolate, 13-17 x 5-8 cm, apically acuminate to mucronulate, basally truncate, glabrous above, pubescent below; midrib and lateral veins raised beneath, lateral veins 7-8 pairs; petiole upto 3.5 cm long, pubescent. Flowers axillary, 2-4 flowered capitate cymes; peduncle upto 4 cm long, terete, pubescent; bracts 3-4, elliptic-oblong, 1.5-3 x 0.5-0.8 cm, apically acute to acuminate, pubescent above, velutinous below, margin ciliate; pedicels upto 5 mm long, pubescent; sepals subequal, outer 2 slightly larger, elliptic-lanceolate, 1.3-1.5 x 0.2-0.3 cm, apically acute to acuminate, strigose outside, glabrous inside, inner 3 small, 0.8-1.1 x 0.1-0.2 cm, apically acute to acuminate, strigose outside except the base, glabrous inside, corolla pinkish red, funnel shaped, corolla tube upto 4.5 cm, mouth slightly 5 lobed, inserted; anthers upto 5 mm, straight, attached 5 mm above the base; filaments upto 3 cm long; ovary conical, 2-3 x 1-2 mm, glabrous; disc annular, slightly lobed, \pm 1 mm long; style single, glabrous, upto 3.8 cm long; stigma biglobose, papillate. Fruit not seen.

Flowering : July - September

Fruiting : not known

Distribution. The new species is known only from Western Ghats in Karnataka.

Ecology. *A. kudajadrya* grows in semi-evergreen forest along the lower hills of Kudajadri.

Specimens examined : KARNATAKA : Dakshinkannad Dt.: on the way to Kudajadri, Biju 44221 (K, TBGT, CALI & MH).

13. *Argyreia lawii* Clarke in Hook. f., Fl.Brit. India 4:190.1883; Gamble, Fl. Pres.Madras 2:906.1923.

Type: India, Mysore, Bababoodan Hills, *Law & C.* 28 (K).

(Fig. 24)

Perennial herbs; stem herbaceous towards the tip, white silky pubescent. Leaves elliptic-ovate, 8-10 x 5-6 cm, apically acute to slightly acuminate, basally rounded or rhomboid, softly strigose above, densely strigose below; lateral veins raised beneath, 9-10 pairs; petiole upto 4.2 cm long, pubescent like stem. Flowers 1 to few flowered cymes; peduncle 5-12 cm long, terete, pubescent like stem; bracts 1-4, linear oblong, 1-1.4 x 0.3-0.4 cm, apically acute, appressed pubescent; pedicels short, upto 4 mm long, pubescent; sepals subequal, ovate or elliptic ovate, 1.8-2 x 0.6-0.8 cm, acute to obtuse, outer 2 pubescent outside, inner 3 pubescent on mid region, glabrous inside; corolla tubular campanulate, tube upto 4 cm long, mouth 3 cm across, midpetaline bands pubescent outside; stamens inserted; anthers upto 4 mm long, straight; filaments attached upto 6 mm above the corolla base, subequal, 2-2.7 cm long; ovary conical, \pm 1x1 mm, glabrous; style filiform, upto 3.2 cm long, glabrous; stigma biglobose, papillose. Fruit not seen.

Flowering : July - September

Fruiting : Not seen

Distribution. Known only from Southern Peninsular India.

Ecology. This species is collected from Bababoodan hills of Karnataka.

Nomenclatural notes. When Clarke (1883) published the name *Argyreia lawii*, he gave a brief description of the plant and also indicated the material *Argyreia* n.28, Herb. Ind. Or.H.f. & T.

There are two sheets of *A.lawii* in the Kew herbarium (K) numbered '28 *Argyreia*' collected by *Stocks law & Co.* Both are flowering materials.

Specimens examined : KARNATAKA : Mysore, Bababoodan Hills, *Law & C.* 28 (K).

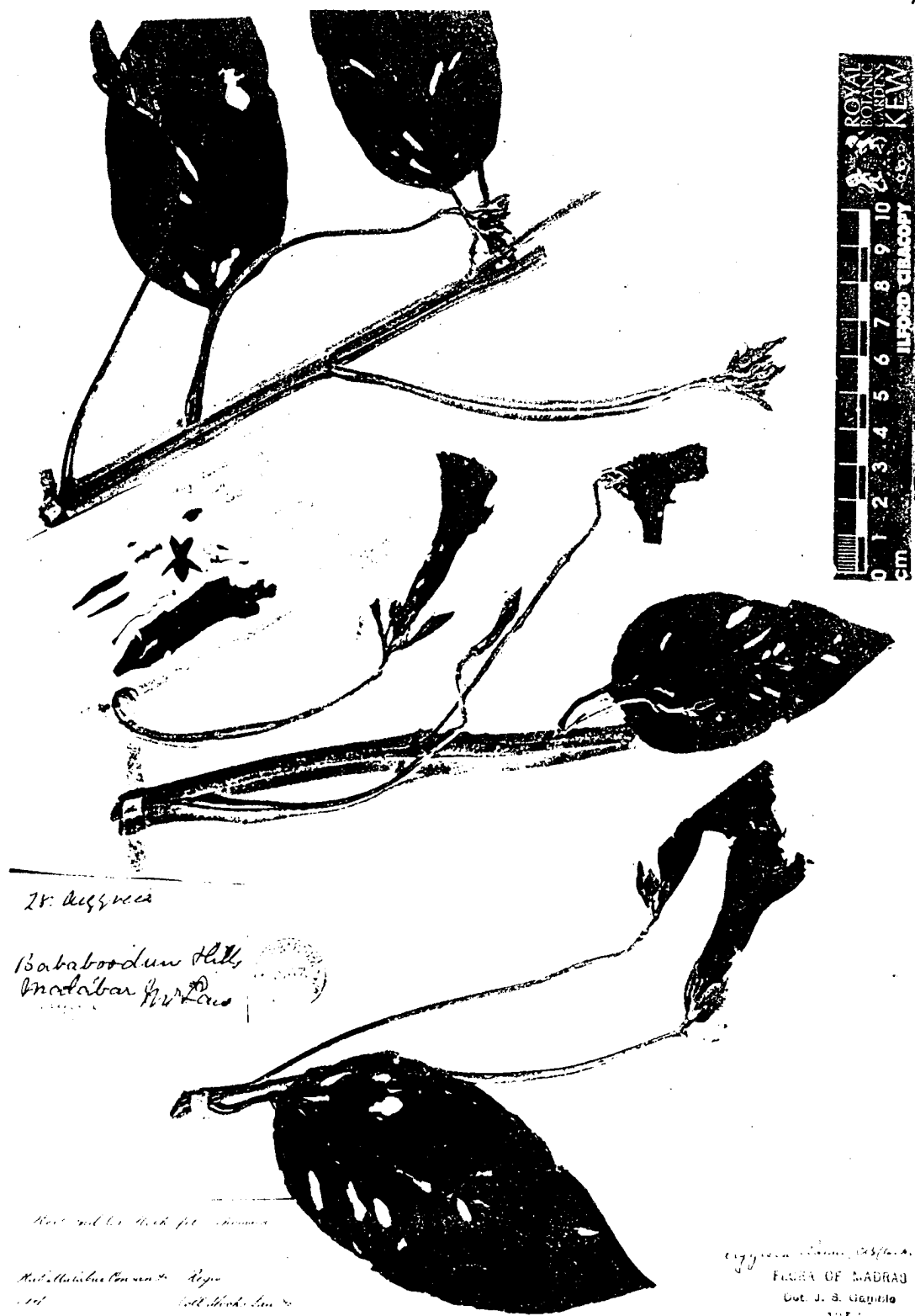


Fig. 24. Type specimen of *Argyreia lawii* Clarke (Stocks Law & c., 28. K).

14. *Argyreia leschenaultii* Choisy, Convolv. Or.31.1834 & in D C., Prodr.9:329. 1845; Clarke in Hook.f., Fl.Brit.India4: 188. 1883.

Type: India, Nellyghery, *Leschenault* 2259 (G-DC holotype).

Argyreia courtallensis Wight mss.

Convolvulus choisyanus Wall. Cat.2259.

(Fig. 25)

Perennial herbs; stem robust, herbaceous towards the tip, twining, terete, hollow, pubescent with whitish woolly indumentum. Leaves simple, ovate to broadly ovate, 10-15 x 8-11 cm, apically acute to acuminate, basally cordate or truncate, golden tomentose on both sides, more densely pubescent below; midrib and lateral veins raised beneath, lateral veins 10-11 pairs. Flowers few to several, cymous clusters; peduncle upto 5 cm long, patently hispid; bracts 2-6, outer pair leaf like, large, elliptic, 4-4.8 x 1-1.5 cm, apically acuminate, often petiolate, upto 1.4 cm, pubescent like leaf, inner 3 or 4 small, lanceolate to elliptic, 0.9-1.2 x 0.2-0.3 cm, pubescent like leaf; pedicels upto 5 mm long, pubescent like peduncle; sepals subequal, ovate-elliptic, 6-8 x 4-5 mm, apically acute to slightly obtuse (inner ones), outer 2 sparsely hairy outside, fifth innermost glabrous on both sides; corolla purple, funnel shaped, tube upto 4 cm long, mouth slightly 5 lobed, 4 cm across, mid petaline bands hairy; stamens inserted; anthers upto 4 mm long; filaments attached 5 mm above the corolla base, unequal, 2 long, upto 3 cm, 3 short, 1.5 cm long, dilated at base with papillose hairy; ovary conical, 1.2 x 1mm glabrous; disc annular, 5 lobed; style single, inserted, upto 3 cm long, glabrous, dilated base; stigma biglobose, 1.2 x 1-2 mm, papillose. Fruit berry, globose, greenish yellow, 1.5-2 x 1.8-2 cm, fruiting calyx slightly enlarged; seeds 2 to 4, orbicular, 1.2 x 1 cm glabrous, pale white.

Flowering : September-December

Flower opening: 8 am - 9 am

Fruiting : December-March

Distribution. Confined to Southern India in Karnataka, Kerala and Andhra Pradesh.

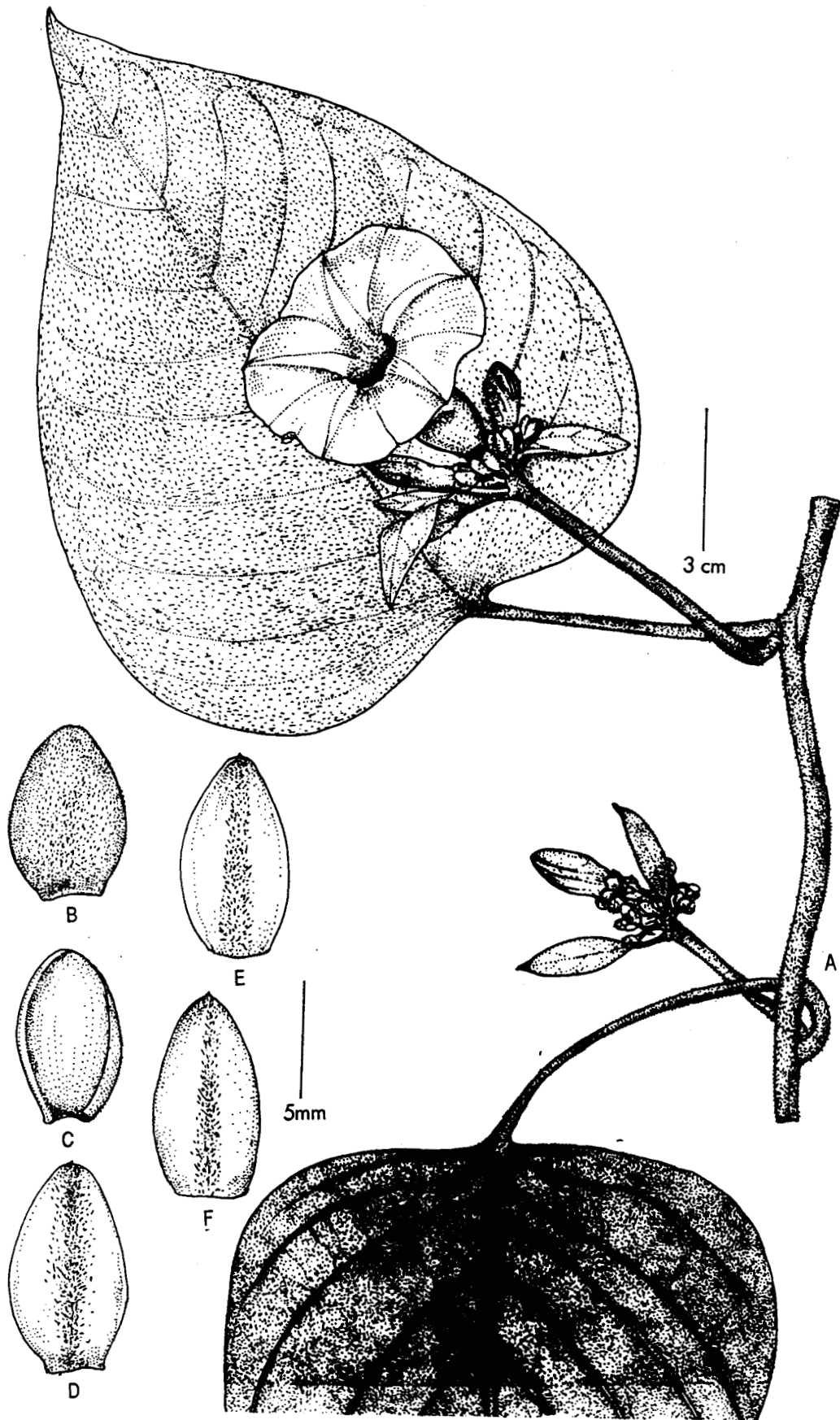


Fig. 25. *Argyreia leschenaultii*. A. Flowering twig; B - F. Sepals (from Biju 25939 CALI).

Ecology. A very common species along waysides and wastelands, Ghat road sides, and also as an undergrowth in semi-deciduous and evergreen forests, generally below 1000m.

Taxonomic notes. Many of the local floras treated *A.leschenaultii* as *A.hirsuta*. Gamble (1923) reduced this species into *A.nellygherya* Choisy. This species resembles *A.hirsuta* and *A.nellygherya* but differs in peduncle length and indumentum.

Nomenclatural notes. When Choisy (1833) first proposed the name *leschenaultii* in his *Convolvulaceis Orientalis*, he cited a specimen of Leschenult in Wallich Catalogue 2259. In addition to this he mentioned Wight(?)2405 of *A.courtallensis* published by Wight (Manuscript species) in DC.Prodromus. Hence, Wight having the name *A.leschenaultii* in excess, applied it to his n.2353. But unfortunately we couldn't locate this specimen during the course of this study.

Clarke (1883) expressed doubts about the identity of the three species *i.e.* *A.courtallensis* Wight, *A.leschenaultii* Choisy and *A.leschenaultii* Arn., under the notes of *A.malabarica* Choisy.

Specimens examined : KERALA: Thiruvananthapuram Dt.: Ponmudi, Mohanan 69229 (MH); Nedumangad, Biju 25939 (CALI & TBGT); Palode, Mohanan 1109 (TBGT).

15. *Argyreia nellygherya* Choisy, *Convolv.* Or. 32.1834 & in DC., *Prodr.* 9:329.1845; Clarke in *Hook.f., Fl. Brit. India* 4:189.1883; Gamble, *Fl.Pres.Madras* 2:906.1923.

Type: India, Nellyghery, *Leschenalt* (not seen).

Convolvulus pomaceus Wall. *Cat.* 1419 (partly).

(Fig. 26)

Perennial herbs; stem robust, herbaceous towards the tip, twining, terete, hispid. Leaves simple, broadly ovate to deltoid, 7-14 x 6-15 cm, apically abruptly acuminate, basally cordate, covered with grey or golden hairs, strigose above, densely villous beneath; midrib and lateral veins not

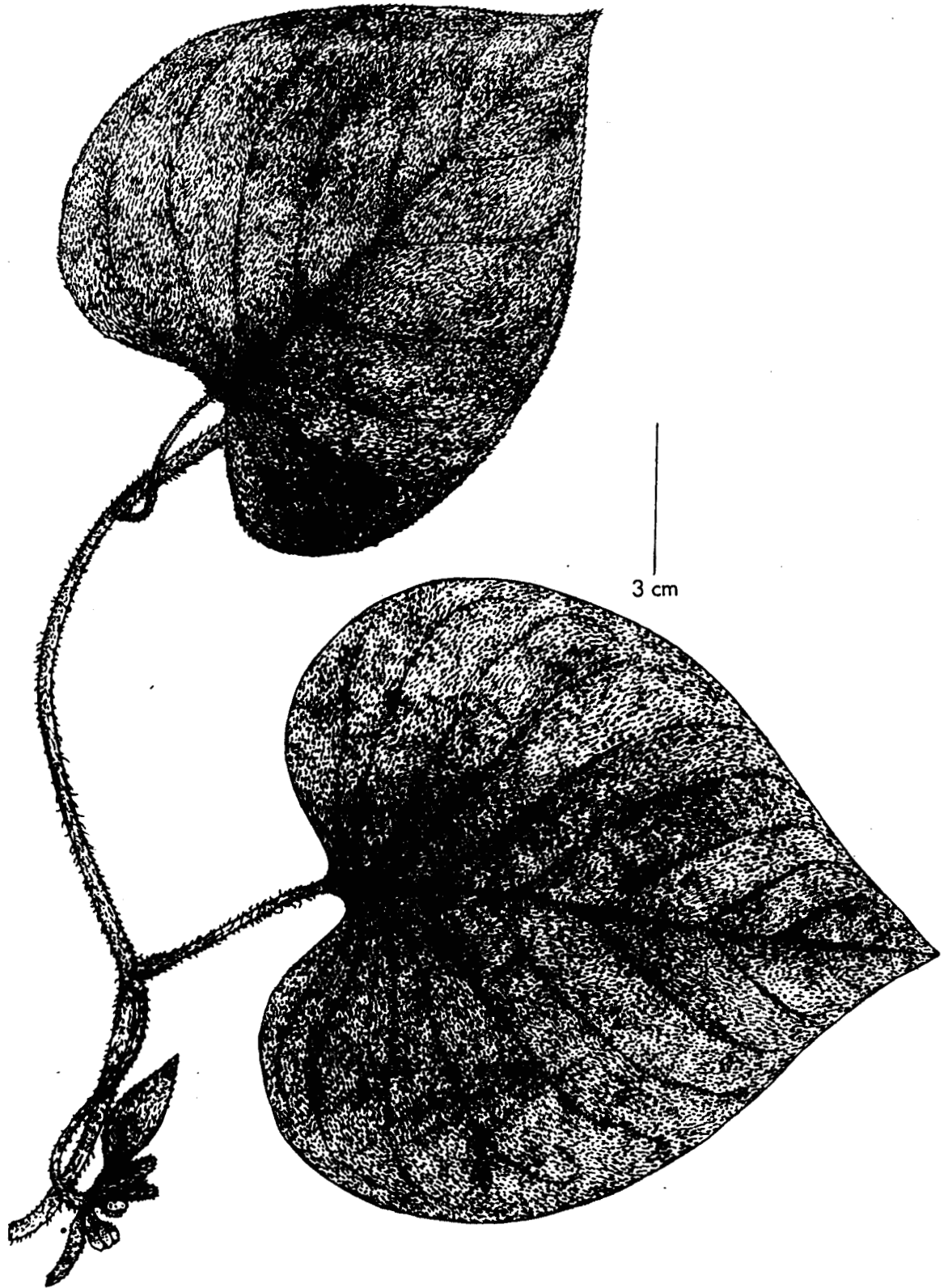


Fig. 26. *Argyreia nellygherya*. Flowering twig (from *Biju* 16232 TBGT).

prominently raised; lateral veins 8-10 pairs; petiole upto 5 cm long, pubescent like stem. Flowers axillary, 2- few flowered subcapitate cymes; peduncle upto 13 cm long, terete, pubescent like stem; bracts 3-5, outer 2-3 leafy, lanceolate, linear -elliptic, 1.5-2 x 0.2-0.6 cm, apically acute to acuminate, short petiolate, tomentose outside, inner 3-4 short, linear -elliptic, oblong, 1-1.5 x 0.1-0.3 cm, apically acuminate, sparsely hairy inside, tomentose outside; pedicels upto 1 cm long, hispid; sepals unequal, outer 2 small, elliptic-ovate, 5-8 x 2-3 mm, apically acute, sparsely sericeous outside; inner 3 slightly large, broadly ovate, 1-1.3 x 0.5-0.7 cm, apically acute to obtuse, glabrous on both sides or sparsely soft hairy; corolla rose purple, funnel-shaped, tube upto 6.5 cm long, mouth 5 lobed, 5 cm across, midpetaline bands hairy; stamens inserted; anthers upto 6 mm long, straight; filaments attached 7 mm above the corolla base, subequal, 2-2.5 cm long, dilated at base, papillose; ovary conical, 1.2 x 1 mm, glabrous; disc 5 lobed, \pm 1 mm; style single, inserted, upto 1.8 cm long, glabrous, dilated at base; stigma purplish white, biglobose, 1-1.2 x 1-1.8 mm. Fruit berry, depressed globose, 1-1.5 x 1-1.4 cm, glabrous, fruiting calyx slightly enlarged, 0.8-1.2 x 0.5-0.9 cm; seeds 2, 3 or 4, ovate, 0.8-1 x 0.6-0.8 cm, apically obtuse, glabrous, black.

Flowering : August-November

Fruiting : October-January

Distribution. *A. nellygherya* is known only from the Western Ghats, in Nilgiris.

Ecology. It grows in semi deciduous forest at high elevation generally above 3000 m.

Taxonomic notes. Clarke (1883) raised doubts about the identity of this taxa. According to him it is allied to *A. leschenaultii* (only leaf characters are different) and very near to *A. pomacea*. But critical study revealed that it is a distinct species.

Specimens examined : TAMIL NADU: Nilgiris Dt.: Kinnakurai, Shetty 3766; Naduvattam, Subramanyam 10533; Carrington to Kinnakurai, Shetty 34265 (MH); Coonoor, Biju 16232 (TBGT).

16. *Argyreia nervosa* (Burm.f.) Bojer, Hort. Maurit. 224.1837; Ooststr., Blumea 5(2): 364. 1943 & Fl.Mal., ser.1, 4:499.1953; Austin in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1:297.1980; Mani. & Sivar., Fl. Calicut 179. 1982; Nair & Nayar, Fl. Courtallum 2:241. 1986; Mani., Fl. Silent Valley 187. 1988.

Type: India, *Roxburgh s.n.* (K).

Convolvulus nervosus Burm.f., Fl.India 48, t. 20, f.1.1768.

Convolvulus speciosus Linn.f., Suppl. 137.1781.

Ipomoea speciosa (Linn.f.) Pers., Syn.Pl.1:183.1805.

Lettsomia nervosa (Burm.f.) Roxb., Fl.Ind. ed. Carey & Wall. 2:78.1824.

Argyreia speciosa (Linn.f.) Sweet, Hort. Brit. 289. 1827; Clarke in Hook.f., Fl.Brit. India 4:185.1883; Trimen, Handb. Fl.Ceylon 3:207.1895; Gamble, Fl.Pres.Madras2: 905. 1923.

Rivea nervosa (Burm.f.) Hall.f., Bull. Herb. Boiss. 5:381.1897.

Vernacular names : Mal.*Samudrapacha* (Samudra is a sanskrit word meaning ocean and the meaning of pacha is plant) and *Perumkurumba*; Tam. *Samudrapala*; Tel. *Chandrapada* and *Kadarapalai*; Sanskrit. *Samudrapalaka* and *Murva*.

Common name : Woolly morning glory or small wood rose.

(Fig. 27)

Perennial climber; stem woody, herbaceous towards the tip, twining, hollow, terete, young branches densely tomentose, whitish or fulvous; latex milky white. Leaves simple, large, cordate, 10-32 x 9-28 cm, apically obtuse or acute, basally cordate, glabrous above, densely fulvous or white tomentose below, shining; midrib and lateral veins raised beneath, lateral veins 10-14 pairs; petiole upto 30 cm long, tomentose like stem. Flowers axillary, 1- few flowered subcapitate cymes; peduncle upto 28 cm long, pubescent like stem, terete; bracts 3-5, large, outer 1 larger, broadly obovate, concave, 5-5.5 x 3-4.2 cm, inner small, ovate to oblong or elliptic, 1.5-3 x 0.8-1.4 cm, with a long and narrow acumen, membraneous, veined, softly pilose outside, glabrous inside; pedicels upto 1.2 cm long, pubescent like peduncle; sepals subequal,

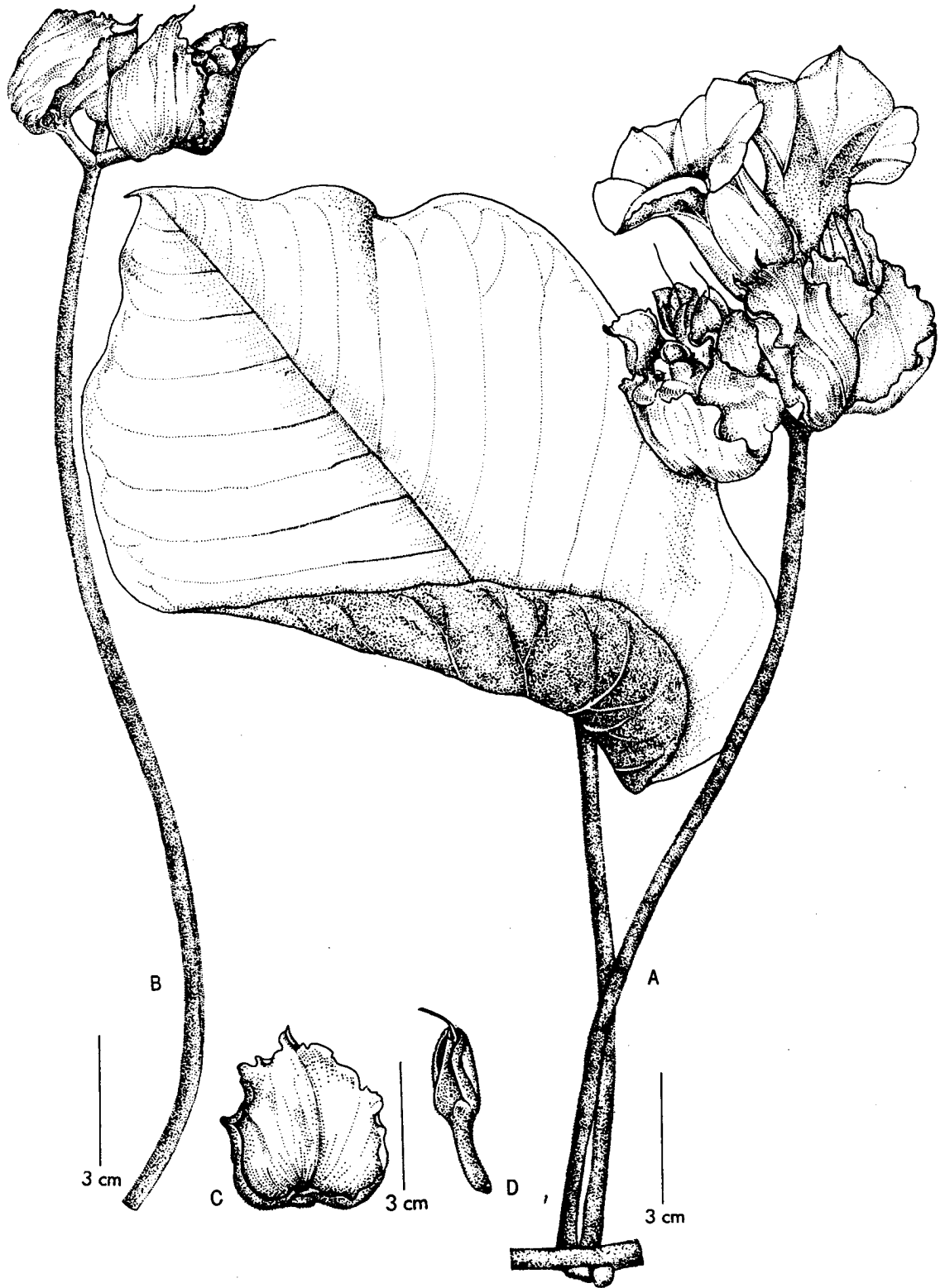


Fig. 27. *Argyreia nervosa* (Burm. f.) Bojer. A. Flowering twig; B. Inflorescence; C. Outer bract; D. sepals (From *Biju* 16219 TBGT).

outer 2 slightly larger, elliptic ovate, 1-1.9 x 1-1.4 cm, apically acute to slightly acuminate, densely white tomentose outside, glabrous inside, inner 3 little shorter, broadly elliptic, 1.4-1.5 x 0.8-1.2 cm, apically obtuse, retuse, tomentose outside, margin and inside glabrous; corolla rose purple, throat darker, tubular or funnel shaped, tube upto 1.4 cm long, mouth five lobed, 5 cm across; midpetaline bands pubescent; stamens inserted; anthers upto 7 mm long, pinkish white, straight; filaments attached 8 mm above the corolla base, subequal, upto 1.4 cm long, dilated base with papillose; ovary conical, 1-1.5 x 1-1.2 mm, glabrous; disc annular \pm 1 mm; style single, upto 3 cm long, glabrous; stigma biglobose, 1x1.5 mm, papillate. Fruits indehiscent, dry-baccate, articulate, sub globose, 2-2.2 x 2-2.5 cm, green, turns brown when dry, crowned with short style base, fruiting sepal accrescent and persistent, 2-2.4 x 1.3-1.5 cm; seeds 2-4, generally 4, ovate to orbicular, 7-8 x 7-7.8 mm, glabrous, brown; seed germination epigeal, hypocotyl upto 12 cm long, slightly pubescent above, apically obcordate, sinus upto 2.5 cm deep, basally cordate, glabrous, petiole upto 3 cm long.

Flowering : November-February

Fruiting : December-February

Distribution. *A.nervosa* is a native of India, found from Assam and Bengal to Belgaum. Cultivated in many tropical countries.

Ecology. In Southern Peninsular India, it occurs as a woody climber in dry deciduous forest, scrub jungles and adjoining grasslands at an altitude of 250-1000 m.

Medicinal and other economic potential. In Ayurveda this is one of the twentytwo drugs that constitute the emetic group, Madanadi gana (Sivarajan & Indira Balachandran,1994). It is reported to be bitter, heavy of digestion, laxative and useful in urinary, heart and skin diseases. The root is used for preparations like Ayaskrti, Varanadi Kasayam etc. The roots have aphrodisiac, antiseptic and emollient properties. Babbar *et al.* (1982) have reported interferon like activity against vaccinia viruses. The oil from the plant has been reported to possess moderate antiseptic activity against several gram-positive and gram-negative bacteria and pathogenic fungi (Batra &



Plate 1. A. *Aniseia martinicensis* B. *Argyreia cuneata* C. *Argyreia elliptica* D. *Argyreia fulgens* E & F. *Argyreia hirsuta* G. *Argyreia kleiniana* H & I. *Argyreia leschenaultii* J & K. *Argyreia nervosa*.

Mehta, 1985). The alcoholic extract of the plant has been shown to exhibit anti-inflammatory activity in rats (Srivastava *et al.*, 1972).

The plant is highly fibrous and is useful in making bow strings (Kolammal, 1979).

The complex alkaloids of the seeds cause hallucination and its hangover is characterized by blurred vision, vertigo and physical inertia (Emboden, 1979).

Horticultural potential. *Argyreia nervosa* is popularly known by the name Baby wood rose, Woolly morning glory and elephant creeper. The attractive leaves with deep green above and silvery white beneath and reddish pink flowers make this plant quite elegant in gardens. It is suitable for pergolas, trellises and other supports that accept their twining stem. The dry fruits in clusters with enlarged calyx is very attractive and is used for dry flower arrangement.

Specimens examined : KERALA: Kollam Dt.: Tenmalai, *Biju* 25970 (TBGT); Ariyankavu, *Rama Rao* 1191 (University College Herbarium, TVM). Kozhikode Dt.: on the way to Wayanad road, *Biju* 44260 (CALI). Kannur Dt.: Kuthuparamba, *Biju* 44277 (CALI), *s.n.* 9336 (MH); Periyaram, *Ansari* 67867 (MH). Malappuram Dt.: Kottakkal, *Biju* 16219 (CALI & TBGT). TAMIL NADU: Tirunelveli Dt.: Naterikal, *Vajravelu* 28380 (MH). Nilgiris Dt.: Anamallais, *Vajravelu* 28380 (MH). ANDHRA PRADESH: Chittoor Dt.: Tirumalai, *Subba Rao* 31941 (MH). Anantapur Dt.: Penukonda Hill, *Gamble* 15238 (MH). Kurnool Dt.: Srisailam, *Ellis* 16878 (MH). Krishna Dt.: Dalgattu, *Venkanna* 5483 (MH). Godavari Dt.: Addatigala, *Subba Rao* 68559 (MH). Vishakhapatnam Dt.: Araku Valley, *Subba Rao*, 32895 (MH); *s.coll. s.n.* (MH).

17. *Argyreia osyrensis* (Roth) Choisy, Mem. Soc. Phys. Geneve 6:427.1834 & in DC., Prodr. 9:333.1845; Ooststr., Fl. Mal., ser. 1, 4:508. 1983; Austin in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1:297.1980; Rani & Matthew in Matthew, Fl. Tam. Carnatic 3:1011.1983; Nair & Nayar, Fl. Courtallam 2:241. 1986.

Type: Wallich 1362 (G-DC).

Ipomoea osyrensis Roth, Nov. Pl. Sp. 117.1821.

Lettsomia aggregata Roxb., Fl.Ind. ed. Carey & Wall. 2:76.1824; Clarke in Hook.f., Fl. Brit. India 4:191.1883; Gamble, Fl.Pres.Madras 2:910.1923.

Argyreia aggregata (Roxb.) Choisy, Mem. Soc. Phys. Geneve 6:427.1834.

Lettsomia aggregata var. *osyrensis* (Roth) Clarke in Hook. f., Fl. Brit. India 4:192.1883; Trimen, Handb. Fl. Ceylon 3:209.1895.

Lettsomia mysorensis Clarke in Hook.f., Fl.Brit. India 4:192.1883.

(Fig. 28)

Perennial herbs; stem woody, herbaceous towards the tip, twining, terete, densely covered with short, white, greyish or pale brown tomentum. Leaves simple, ovate to broadly ovate, oblong-ovate or ovate-elliptic, 6-13 x 3-11 cm, apically acute to acuminate, obtuse to rounded or emarginate, basally cordate to truncate, densely tomentose to shortly lanate beneath, glabrous to pubescent above; midrib and lateral veins raised beneath, lateral veins 7-10 pairs; petiole upto 6 cm long, pubescent like stem. Flowers axillary, few to many flowered capitate cymose clusters; peduncle upto 7 cm long, terete, densely tomentose like stem; bracts 2, deltoid, rounded to ovate, orbicular, 5-8 x 2-4.5 mm, apically truncate, densely tomentose outside, glabrous within; pedicels short, upto 4 mm long, sometime sessile; sepals unequal, outer 2 large, broadly ovate to orbicular, 6-12 x 5-7 mm, apically acute to acuminate, slightly emarginate, tomentose outside, glabrous within, inner 3 short, ovate-lanceolate, 5-6 x 2-3 mm, apically acute to obtuse, tomentose outside except the base, glabrous within; corolla violet to purple, funnel-shaped, tube upto 1.3 cm long, mouth 5 lobed, 1.2 cm across, midpetaline bands hairy; stamens well exerted; anthers upto 4 mm long, straight; filaments attached 4 mm above the corolla base, equal, upto 1.7 cm long, dilated at base, hyaline hairy; ovary conical, 1-2 mm, glabrous; disc short, 1x2.5 mm, covering the ovary, not lobed; style single, exerted, upto 1.8 cm long, glabrous, pinkish; stigma biglobose, white, 1x2 mm, papillose. Fruit baccate, globose, 5-6 mm bright red, glabrous, fruiting sepals enlarged, outer two 1.2 x 0.6 cm, inner three 0.8 x 0.5 cm, reddish brown, and glabrous inside; seeds 1(2), subglobose, 4-5 mm, glabrous except the hilum, black; seed germination epigeal, hypocotyl upto 2 cm long, bicotyledonary, apically obcordate, sinus upto 1.8 cm deep,



Fig. 28. *Argyreia osyrensis*. Flowering twig (from *Biju* 16229 CALI).

basally attenuate, glabrous, petiole upto 1.2 cm long.

Flowering : January-March

Flower opening : 11 am -11.30 am

Fruiting : March-June.

Distribution. *A. osyrensis* is distributed in Peninsular India, Srilanka, Burma, Indo-China, Tenasserim and Sumatra.

Ecology. It occurs almost throughout Peninsular India and is found along scrub jungles as an undergrowth in dry deciduous forests, waysides and open waste lands. Austin (1980 a) mentioned that the fruits were dispersed by birds. During the present study we could find birds and small animals eating the bright red fruits.

Specimens examined : KERALA: Kollam Dt.: Achankovil, *Biju* 16229 (CALI), *Narayanaswamy* 730 (MH); Ariyankavu, *Biju* 15400 (TBGT); *Bourdillon* (TBGT). Thrissur Dt.: Chevoor, *Biju* 44271 (CALI), *s.coll. s.n.* (MH). Malappuram Dt.: Kottakkal, *Biju* 47611; Chemmad, *Biju* 47705 (CALI). TAMIL NADU: Kanniyakumari Dt.: way to Mahendragiri R.F., *Henry* 53233 (MH); *Biju* 15394 (CALI & TBGT). Tirunelveli Dt.: Courtalam, *Rama Rao* 1874 (University College Herbarium, TVM), *Daniel & Raju* 20399 (MH), *Subramanyam* 4964 (MH). Ramanad Dt.: Kodaikanal, *Vajravelu* 39413 (MH). Madurai Dt.: Karanda malai, *Chandrabose* 51719 (MH). Coimbatore Dt.: *Beddome s.n.* (BM); *Jacob* 13277, *Narayanaswamy* 20059, *Barber* 3625; Maruthamala, *Viswanathan* 265 (MH). S. Arcot Dt.: Vanjikuzhi, *Ramamurthy* 79651 (MH). KARNATAKA: Mysore Dt.: *Barber* 6944 (MH). Shimoga Dt.: Shimoga R.F. *Biju* 17221 (TBGT & CALI).

18. *Argyreia pilosa* Wt. & Arn., Pugill. Pl. Ind. Or.38.1836 ; Choisy in DC., Prodr. 9:330. 1845; Clarke in Hook f., Fl. Brit. India 4:189. 1883; Gamble, Fl. Pres. Madras 2:906.1923; Gandhi in Sald. & Nicolson, Fl. Hassan Dist. 466. 1978.

Type: not seen.

Perennial herbs; stem herbaceous towards the tip, terete, hirsute. Leaves ovate or broadly ovate, 6-9 x 4-7 cm, apically acute to acuminate, basally

rounded or very slightly cordate, hairy on both sides, long appressed pubescent above; midrib and lateral veins raised beneath, 9-10 pairs; petiole upto 3.8 cm long, pubescent like stem. Flowers axillary, few to several flowered cymes; peduncle upto 2.8 cm long, shorter than leaves, terete, pubescent like stem; bracts 2-4, elliptic-oblong or sub spatulate, 0.6-1.5 x 0.2-0.4 cm, apically acute, both sides pilose; pedicels upto 5 mm long, pubescent like stem; sepals subequal, ovate, 0.7-1 x 0.2-0.4 cm, apically acute to acuminate, exposed portion strigose (outer 2 prominently strigose), glabrous inside; corolla funnel-shaped, dark red or purple, tube upto 4.5 cm long, mouth 4 cm across; mid petaline bands and outer side pilose; stamens inserted; anthers upto 6 mm long, straight; filaments subequal, attached 5 mm above the corolla base, 2 long, upto 2.2 cm, 3 short, upto 1.6 cm, dilated at base, with hyaline pubescent; ovary conical, \pm 1x1 mm, glabrous; disc small. Fruit not seen.

Flowering : August - October

Fruiting : not seen

Distribution. Endemic to Peninsular India.

Specimens examined : KARNATAKA: Shimoga Dt. Shimoga Forest, *Biju* 44247 (CALI & TBGT).

19. *Argyreia pomacea* Choisy in DC., Prodr. 9:329.1845; Clarke in Hook.f., Fl. Brit. India 4:188.1883; Trimen, Handb. Fl. Ceylon 3:208.1895; Gamble, Fl. Pres. Madras 2:906.1923; Austin in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1:298.1980; Gandhi in Sald. & Nicolson, Fl. Hassan Dist. 467. 1978; Chand. & Nair, Fl. Coimbatore 191. 1987; Mohan & Henry, Fl. Thiruvananthapuram 312. 1994.

Type: India, *Wight* 1419 (G-DC, holotype?).

Lettsomia pomacea Roxb., Hort. Beng. 18. 1814.

Argyreia leschenaultii Thw., Enum. pl. zeyl. 210.1860, non Choisy (1845).

Argyreia pomacea var. *triflora* Clarke in Hook. f., Fl. Brit. India 4:188.1883.

Rivea pomacea Wight, Icon. pl. Ind. or. t.888. 1848.

Convolvulus pomaceus Wall. Cat. 1419.

(Fig. 29)

Perennial lianas; stem woody at base, herbaceous towards tip, twining, terete, hollow, soft whitish brown tomentose. Leaves simple, ovate to broadly ovate or ovate - lanceolate, 6-8 x 2.5-4.5 cm, apically acute, basally obtuse rounded, white-tomentose above, strigose to somewhat pubescent below; midrib and lateral veins raised beneath, lateral veins 9-10 pairs; petiole upto 2 cm long, pubescent like stem. Flowers few to many (2-5), capitate cymes; peduncle upto 2 cm long, terete, pubescent; bracts 2-4, oblong or elliptic oblong, 1.5-3 x 0.4-0.9 cm, apically acute to obtuse, pubescent; sepals unequal, outer 2 small, ovate, 6-7 x 4-5 mm, apically acute-obtuse, silky pubescent, glabrous inside, inner 3 little larger, ovate, 9-10 x 4-5 mm, apically obtuse, mucronulate, pubescent outside except the margins, glabrous inside; corolla lavender, tube darker, limbs pale, funnel-shaped, tube upto 3 cm long, mouth 5 lobed, 2.5 cm across, midpetaline bands hairy; stamens inserted; anthers upto 4 mm long; filaments attached 4 mm above the corolla base, subequal, 5-6 mm long, dilated base with hyaline hairs; ovary conical, glabrous; disc annular, \pm 1 mm long; style single, inserted, upto 2 cm long, dilated at base; stigma biglobose, papillate. Fruit baccate, yellowish brown, pulpy, depressed globose, 1.5-1.8 x 1.3-1.6 cm, glabrous, fruiting calyx slightly enlarged; seeds 2-4, generally 2, glabrous, black.

Flowering : July - September

Fruiting : August - November

Distribution. This species is known only from South India and Ceylon.

Ecology. In South India it occurs in hill slopes and forest fringes of the Nilgiris and Mysore at an altitudinal range of 1000-2500 m.

Specimens examined : KERALA: Kottayam Dt.: Chinnar to Marayoor, *Sebastine* 18310 (MH); Devikulam, *Sebastine* 16562 (MH). Palakkad Dt.: Sholayar, *Nair* 56896 (MH). TAMIL NADU: Coimbatore Dt.: Anakkatti, *Viswanathan* 669, *Sreemadhavan* 661; Marudamalai, *Narayanaswamy* 3212 (MH).

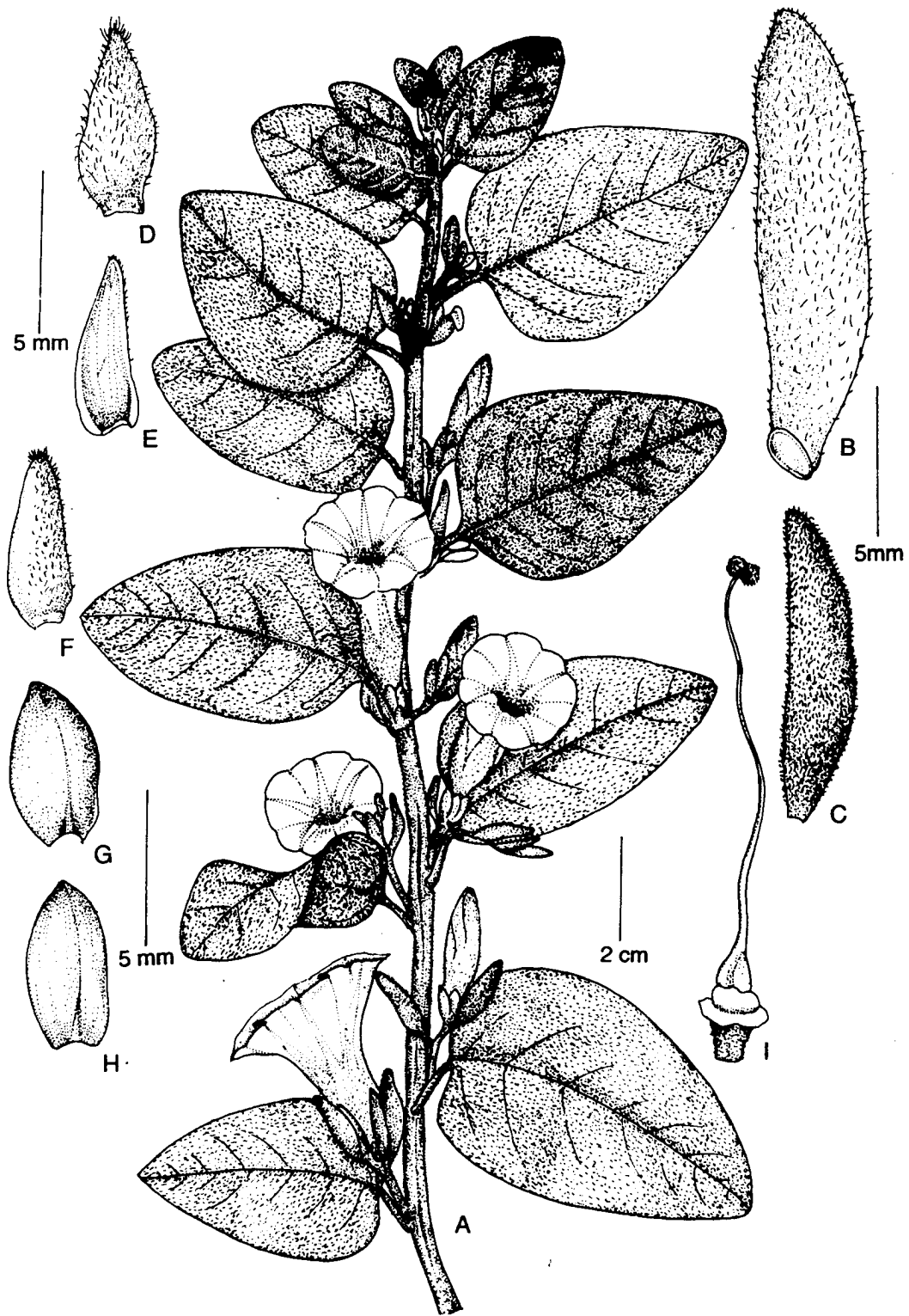


Fig. 29. *Argyreia pomacea*. A. Flowering twig; B & C. Bracts; D - H. Sepals; I. Pistil
(from Biju 25975 TBGT).

Nilgiris Dt.: Biju 25975 (TBGT); Manjoor, Shanavaskhan 5615 (TBGT); Sokkanalli, Subba Rao 36231 (MH); Kunjapanai, Vajravelu 35221, Subba Rao 36231 (MH).

20. *Argyreia populifolia* Choisy in DC., Prodr. 9:329.1845; Clarke in Hook. f., Fl. Brit. India 4:187. 1883; Austin in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1:299.1980; Gamble, Fl. Pres. Madras 2:905.1923; Ramach. & Nair, Fl. Cannanore 298. 1988.

Types: Ceylon, Colombo, Wallich 1414 (G-DC, holotype).

Convolvulus fastigatus Wall., Cat. 2258. 1830. nom. nud., non Sweet (1826).

Ipomoea zeylanica Gaertn., Fruct. 2:482. t.178, f.l. 1791.

Rivea zeylanica (Gaertn.) Thw., Enum. pl. zeyl. 209.1860.

Argyreia populifolia var. *fastigata* (Wall.) Clarke in Hook. f., Fl. Brit. India 4:187.1883.

Perennial herbs; stem woody, herbaceous towards tip, terete, glabrous to appressed pubescent. Leaves simple, broadly ovate, 8-18 x 6-20 cm, apically acute to acuminate or obtuse, basally cordate, glabrous above, sparsely hairy beneath; midrib and lateral veins raised beneath, lateral veins 8-10 pairs, minutely pubescent; petiole upto 8 cm long, glabrous. Flowers axillary, few to many flowered dense cymose clusters; peduncle upto 8 cm long, terete, pubescent; bracts 4-6, elliptic, 0.8-1 x 0.2-0.4 cm, apically acute, glabrous to pubescent outside; sepals subequal, ovate to broadly ovate, 4-6 x 2-4 mm, apically obtuse to acute; inner ones broader than outer, glabrous inside, minutely and densely appressed pubescent throughout; corolla rose-purple, funnel-shaped, tube upto 2.5 cm long, mouth slightly 5 lobed, 1.5-2 cm across; midpetaline bands pubescent; stamens inserted; anthers upto 4 mm long, straight; filaments attached 3 mm above the corolla base, unequal, 2 long, 8-9 mm, 3 short, 4-5 mm long, dilated base with hyaline hairy; ovary conical, 1.3 x 1mm, glabrous; disc nearly enclosing the ovary, \pm 2 mm long, slightly lobed; style single, upto 9 mm long, glabrous, dilated at base; stigma biglobose, papillate. Fruit baccate, depressed globose, 1-1.3 x 1.5-2 cm, glabrous, fruiting calyx slightly enlarged; seeds 2, 3 or 4, generally 2, 8-9 x 6-7 mm, glabrous, greyish black.

Flowering : June - August

Fruiting : August - November

Distribution. *A. populifolia* is endemic to Ceylon and Peninsular India.

Ecology. A very common weedy species in Ghat roadsides.

Specimens examined : KERALA: Idukki Dt.: Kulamavu, *Biju* 25956 (TBGT), *Mohanan & Ramanujam* 71945; Valayar waterfalls R.F., *Ramamurthy* 74789 (MH). Thrissur Dt.: Sholayar, *Ramamurthy* 80842 (MH). Kannur Dt.: Kuthuparamba, *s.coll.* 9337, Kannothe, *Ramachandran* 64098 (MH). TAMIL NADU: Dharmapuri Dt.: way to Guthirayan, *Ravishankar* 84194 (MH). Tirunelveli Dt.: *Henry* 17462 (MH). Thanjavur Dt.: Tiruvayur, *Ramamurthy* 51302 (MH). KARNATAKA: S. Kanara Dt.: *Barber* 2159, *Raju* 18245 (MH).

21. *Argyreia sericea* Dalz. in Dalz. & Gibs., Bombay Fl. 169: 1973; Clarke in Hook.f., Fl. Brit. India 4:188.1883; Gamble, Fl.Pres. Madras 2:906.1923.

Type : India, *Graham's Catalogue* no.985 (not seen).

Ipomoea bracteata Graham, Cat. Bomb. Fl. 131 (not of G.Don).

(Fig. 30)

Perennial herbs; stem robust, terete, herbaceous towards the tip, pilose. Leaves simple, ovate to broadly ovate, deltoid, 5-14 x 4-12 cm, apically acute to acuminate, basally cordate or truncate, sparsely hairy above, tomentose below; midrib and lateral veins raised beneath, lateral veins 8-9 pairs; petiole upto 5 cm, velutinous. Flowers axillary, 2-4 flowered subcapitate cymes; peduncle upto 8.5 cm long, terete, velutinous; bracts large, 2 leafy, ovate-elliptic, 4-6 x 1.3-2.2 cm, apically acute to obtuse, basally obtuse, pubescent above, velutinous below, margin ciliate, inner bracts small, elliptic, 1.5-2.2 x 0.6-1 cm, apically acute to obtuse, indumentum as on outer bracts, margin prominently ciliate; pedicels subsessile, upto 2 mm long, pubescent like peduncle; sepals unequal, outer 3 long, linear oblong, 1.2-1.6 x 0.2-0.4 cm, apically acute, velutinous outside, hispid inside from middle to above, margin ciliate, inner 2 short, linear elliptic, 8-10 x 1-2 mm, long acuminate, glabrous inside, velutinous outside; corolla pale purple, funnel shaped, tube upto

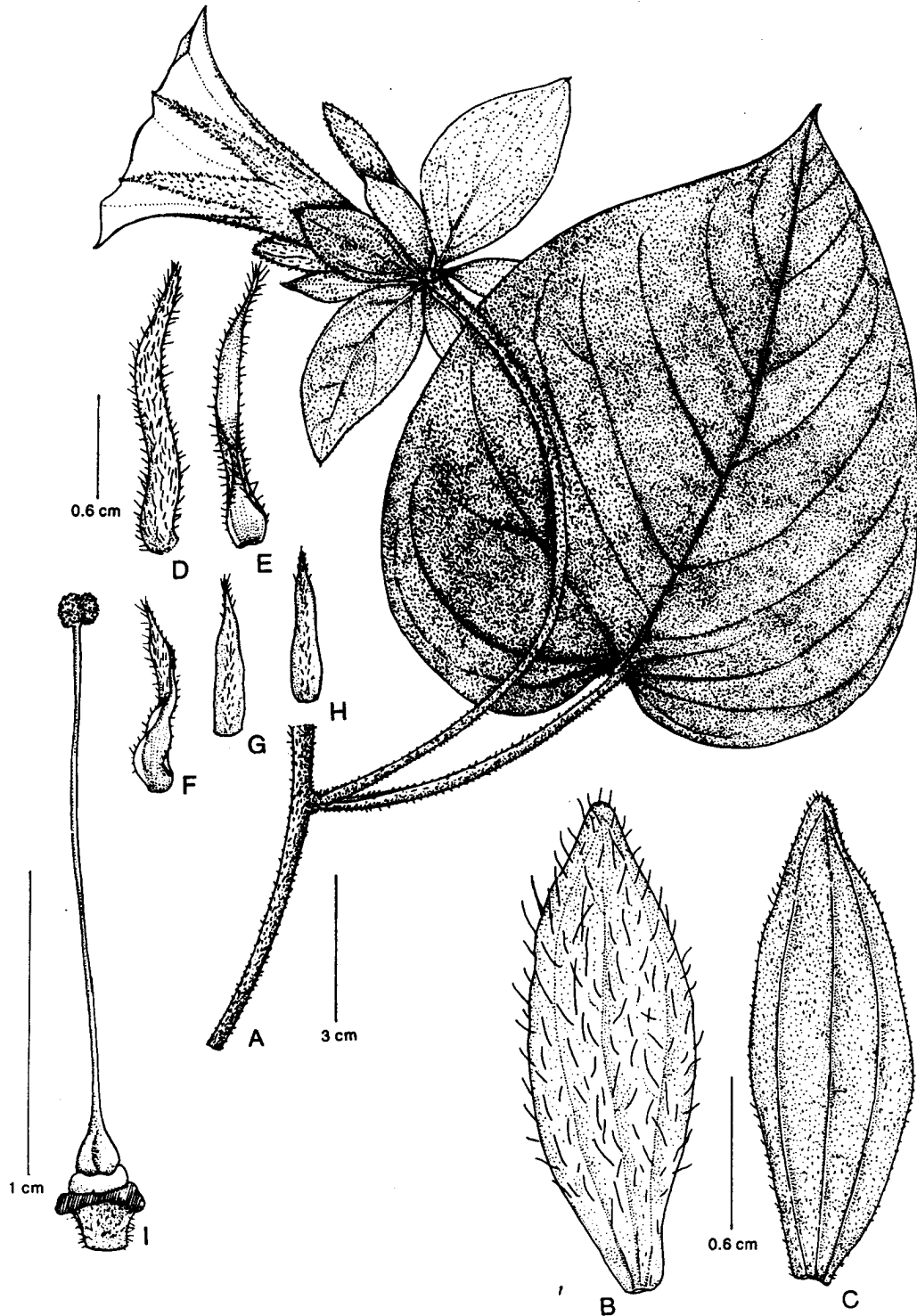


Fig. 30. *Argyreia sericea*. A. Flowering twig (*Joseph 14392*, MH); B. Bract showing inner surface; C. Bract showing outer surface; D-E. Outer sepals; F-H. Inner sepals; I. Pistil (*Stocks Law & c.s.n.*, BM).

2.5 cm long, mouth slightly 5 lobed, 3.5 cm across, midpetaline bands pubescent; stamens inserted; anthers upto 4 mm long, white; filaments attached 5 mm above the corolla base, subequal, 0.7-1 cm long, dilated at base, short hyaline hairy; ovary conical, 1.2 x 1mm, glabrous; disc annular, \pm 1 mm; style single, upto 1.3 cm long, glabrous; stigma biglobose, 1 x 1.5 mm, papillate. Fruit baccate, globose, to subglobose, 1-1.3 x 0.7-1 cm, crowned with short style base, fruiting sepals slightly enlarged, bracts persistent; seeds 2, 3 or 4, orbicular, glabrous, black.

Flowering : July - September

Fruiting : August - November

Distribution. Endemic to Peninsular India.

Specimens examined : KARNATAKA: Malabar Concan, *Stocks Law & Co. s.n.* (BM). ANDHRA PRADESH: Adilabad Dt.: Ontimamidi, *Ravishankar* 83111 (MH).

22. *Argyreia setosa* (Roxb.) Choisy in D C., Prodr. 9:332. 1845; Dalz. & Gibs., Bombay Fl.168. 1973.

Type: not seen

Lettsomia setosa Roxb., Hort. Beng. 13.1814. nom.nud.; Roxb., Fl.India 1:490 & Carey & Wall., 2:80.1824; Wight, Icon. pl. Ind. or. 2:t.1360.1848; Clarke in Hook.f., Fl.Brit. India 4:194.1883; Gamble, Fl. Pres. Madras 2:910.1923.

Lettsomia setosa var. *minor* Clarke in Hook.f., Fl. Brit. India 4:194.1883; Gamble, Fl.Pres. Madras 2:911.1915. Type: India, S.Concan, *Argyreia* n.21. *Law* (K).

Vernacular names : Tam. *Unnayangodi*; Tel. *Mayatige*.

(Fig. 31)

Perennial herbs; stem woody, herbaceous towards the tip, twining, terete, hollow, strigose. Leaves simple, narrow ovate to broadly ovate, 6-15 x 5-14 cm, apically acute to acuminate or obtuse, basally cordate to truncate, glabrous to pubescent above; midrib and lateral veins raised beneath, prominently short pilose, lateral veins 8-10 pairs; petiole upto 7 cm long, pubescent.

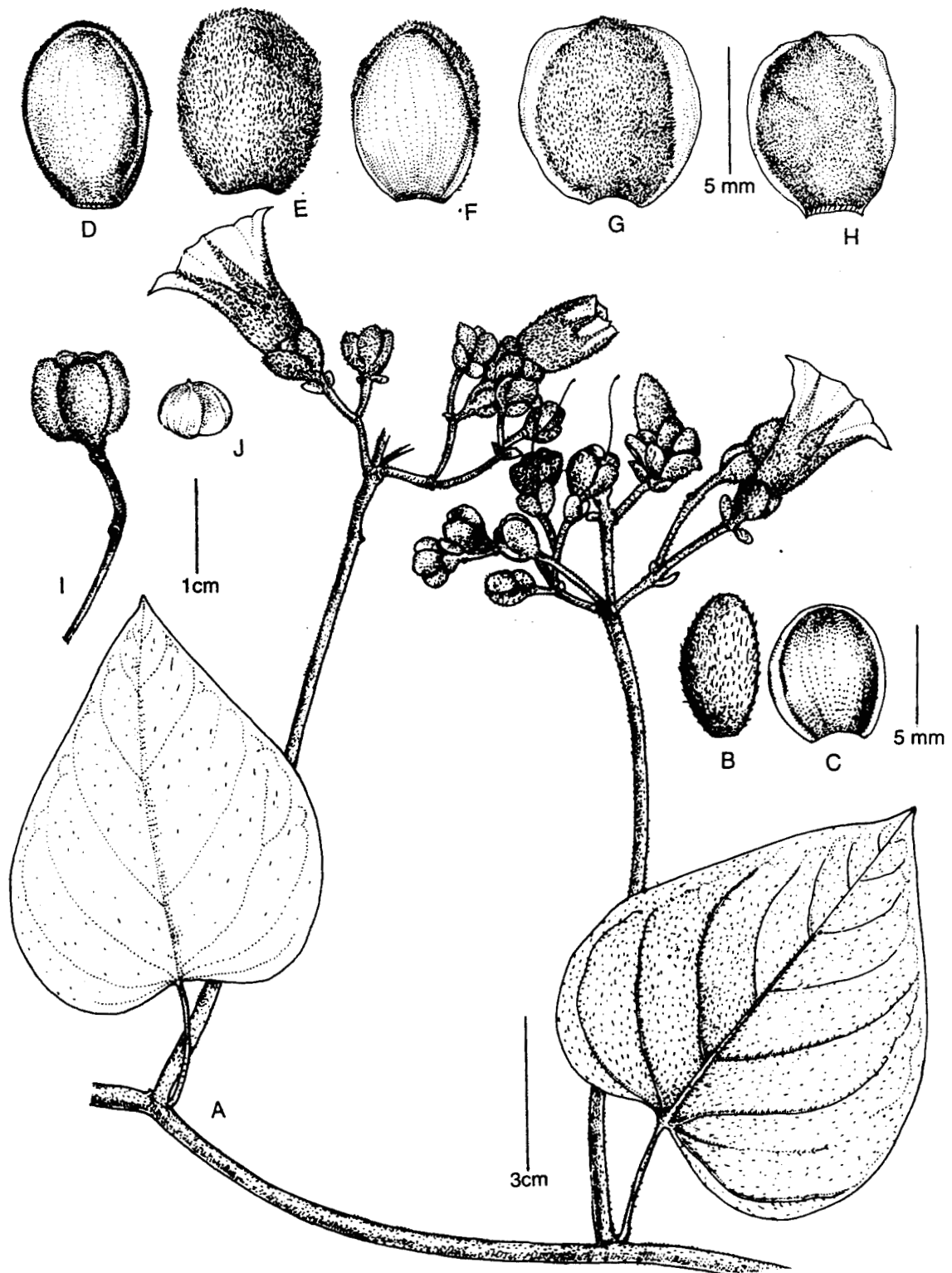


Fig. 31. *Argyreia setosa*. A. Flowering twig; B & C. Bracts; D-H. Sepals; I. Fruit; J. Capsule (from *Sebastine* 76366 MH).

Flowers axillary, few to several flowered (5-28) paniced cymes; peduncle upto 11 cm long, terete, pubescent like stem; bracts 2, elliptic to ovate, different sizes, 4-6 x 3-5 mm, apically obtuse, appressed strigose; pedicels upto 2 cm long, pubescent; sepals equal, ovate-elliptic to orbicular, 5-7 x 6-7 mm, apically obtuse, outer 2 densely tomentose outside, inner 3 densely tomentose, margins glabrous, glabrous inside; corolla purple, funnel-shaped, tube upto 2.5 cm long, mouth slightly five lobed, 2 cm across; midpetaline bands pubescent; stamens inserted; anthers upto 4 mm long, straight; filaments attached 8 mm above the corolla base, equal, upto 1.5 cm long, dilated base with hyaline hairs; ovary conical, 1 x 1 mm, glabrous; disc slightly lobed, \pm 1 mm; style single, inserted, upto 2 cm long, glabrous; stigma biglobose, 1 x 1.5 mm, papillate. Fruit berry, subglobose, 7-8 x 6-8 mm, green, turns brown when dry, fruiting sepal enlarged, 1-1.6 x 0.7-1.2 cm; seeds 2, 3 or 4, ovate, 4-6 x 4-5 mm, glabrous, brown.

Flowering : July - September

Fruiting : August - November

Distribution. Throughout tropical and sub-tropical India, from Oudh, Mt. Aboo and Bombay, to Pegu, Ceylon (Clarke, 1883).

Ecology. It occurs as an undergrowth both in wet evergreen and dry deciduous forest of Peninsular India. It is also found in Ghat roadsides and occasionally in scrub jungles in the drier areas of Palakkad.

Economic potential . The leaves are used as vegetable. The pliable stems are used as rope for tying bundles (Wealth of India).

Specimens examined : KERALA: Palakkad Dt.: *s.coll.* 14233 (MH). TAMIL NADU: Madurai Dt.: *s.coll. s.n.* (MH). Nilgiris Dt.: Mudumalai R.F., *Sebastine* 76366, *Gamble* 18466 (MH). KARNATAKA: Mysore Dt.: Billigiri hills, *Rao* 18209 (MH); Malabar Concan?, *Stock Law & Co. s.n.* (BM). ANDHRA PRADESH: Chittoor Dt.: Tirumala, *Ranga Charyalu* 1142 (MH). Kurnool Dt.: Gundlabrahmeswaram, *Ellis* 32680; Chelama, *Ellis* 18030 (MH). Godavari Dt.: Jeddangi, *s.coll.* 12648, *Barber* 5236 (MH). Vishakhapatnam Dt.: *Jacob* 17140; Tulabada gedda, *Subba Rao* 47377 (MH).

23. *Argyreia* sp.A.

(Fig. 32)

Perennial herbs; stem woody at base, herbaceous towards the tip, terete, glabrous or remotely pilose. Leaves simple, ovate-elliptic, 5-12 x 3-5 cm, apically acuminate, mucronate, basally truncate, glabrous above, glabrous or remotely pilose; midrib and lateral nerves raised and pilose below, lateral nerves 7-9 pairs; petiole upto 3.2 cm, sulcate above (grooved), remote pilose. Flowers axillary, 2-5 flowered cymes; peduncle upto 2.5 cm long, sparsely pilose; bracts 2-4, elliptic or elliptic-oblong, 0.8-2 x 0.3-1 cm, apically acute to acuminate, ciliate at apex, glabrous above, pilose below; pedicels short, upto 4 mm long, pilose like peduncle; sepals unequal, outer 2 ovate-lanceolate, 5-6 x 2-2.5 mm, apically acuminate, remotely pilose above, glabrous inside, shortly ciliate at apex (2-4 hairs); inner 3 ovate, 6-7 x 3-4.5 mm, shortly acuminate at apex, glabrous or remotely pilose or ciliate outside, mottled (glandular) inside; corolla purple, funnel-form, tube upto 4.3 cm long, mouth distinctly 5 lobed, 4-4.8 cm across, midpetaline bands pilose outside; stamens inserted; anthers upto 5-6 x 1.2-2 mm, straight after dehiscence; filaments attached 8 mm above the corolla base, subequal, 2 long, upto 3 cm, 3 short, upto 2.7 cm long, dilated at base with hyaline pubescent; ovary conical, \pm 1 x 1.2 mm, glabrous; disc \pm 1.3 x 1.2 mm, fully or nearly covering the ovary, slightly lobed; style inserted, single, upto 4 cm long, filiform, glabrous; stigma biglobose, papillate. Fruit not seen.

Flowering : June - August

Fruiting : not known

Distribution. Reported only from South India, from Idukki District of Kerala.

Ecology. This climber is found growing near stream banks in semi-evergreen forest along the lower hills of the Western Ghats.

Notes . This specimen was found quite different from other species found in India. Probably it is a new species, which could not be described by studying just a single collection.

Specimens examined : KERALA: Idukki Dt.: Mattupetty, *Biju* 23911 (TBGT).

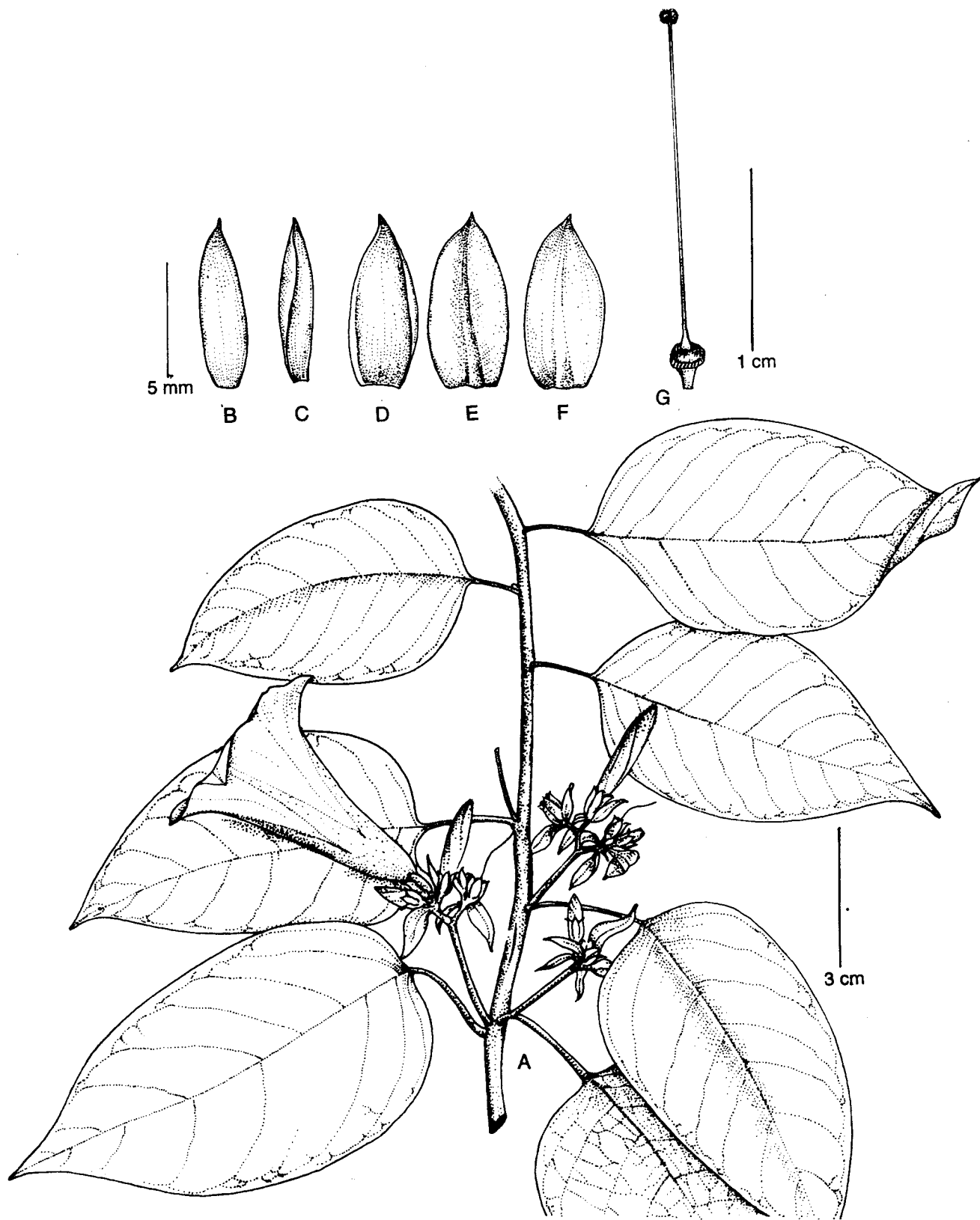


Fig. 32. *Argyreia* sp. A. A. Flowering twig; B-F. Sepals; G. Pistil (from *Biju* 23911 TBGT).

BONAMIA Thouars

The genus includes species of very different habit but could be distinguished by the bifid style and the capitate stigma. Due to their highly variable habit, various attempts have been made to split the genus: *viz.* *Breweria*, *Petrogenia* and *Stylisma*. Myint (1966) and Austin and Staples (1985) maintained the *Stylisma* as a distinct genus mainly based on the difference in the cotyledon shape. However the monotypic genus, *Petrogenia* is found to be congeneric with *Bonamia* and much confusion has surrounded the delimitation of *Bonamia* against *Breweria*.

The name *Bonamia* commemorates Francois Bonami (1710-1786), a French physician and botanist.

In 1862 Asa Gray suggested the reduction of the genus *Breweria* to *Bonamia*. Subsequent authors (Bentham & Hooker 1876; Clarke, 1883; Cooke, 1905; Gamble, 1923 and others) did not accept this suggestion. The present taxonomic opinion is in favour of accepting the genus *Bonamia* in broad sense (Ooststroom, 1953; Verdcourt., 1963; Myint & Ward, 1968 Austin, 1980 a).

Bonamia Thouars, Hist. Veg. Isl. France 1:33. 1804. nom.cons.; Myint & Ward, Phytologia 17:121. 1968; Austin & Staples, Brittonia 37(3) : 310-316.1985.

Type species : *Bonamia madagascariensis* Poir.

Breweria R.Br., Prod. 487. 1810. Type : *Bonamia linearis* (R.Br.) Hall.f.

Trichantha Karst. & Triana, Linnaea 28:437.1856, non Hook. (1844). Type:

T. ferruginea Karst. & Triana.

Petrogenia John., J. Arnold Arbor. 22:116.1941.

Perennial lianas to small scrambling shrubs or herbaceous vines; stem glabrous to pubescent. Leaves entire, lanceolate to ovate, herbaceous or subcoriaceous. Flowers axillary, solitary to few flowered cymes or panicles; bracts small; sepals 5, subequal, outer ones, slightly larger, orbicular to lanceolate, apically obtuse to acute, coriaceous or herbaceous; corolla medium sized, campanulate or funnel-shaped, white, limb plicate, midpetaline bands hairy outside; stamens included; filaments filiform, dilated and hairy at base; pollen smooth, 3-colpate; ovary 2-locular, 4-ovulate, glabrous or hairy at the

apex; style bifid or 2 free styles, often unequal (very rarely 1); stigma capitate, subglobose. Fruits capsular, subglobose or ovoid, pericarp membranaceous to fibrous, often coarsely longitudinally splitting on drying; seeds 4(2-4), glabrous or pubescent; cotyledons entire, apically emarginate.

Distribution and Ecology. A genus of about 40 or more species widely distributed in the tropics of both hemispheres. There is only one species in Southern Peninsular India. (Ecology see under the species).

Bonamia semidigyna (Roxb.) Hall.f. in Engl., Bot. Jahrb. 16:528.1893; Ooststr., Blumea 3:76. 1938 & FI.Mal., ser. 1,4:398.1953; Austin in Dassan. & Fosb., Rev. Handb. FI. Ceylon 1:303.1980; Mani. & Sivar., FI. Calicut 187.1982.
Type : India, grown from seeds sent by Capt., *Hardwicke* (not found).

Convolvulus semidigynus Roxb.Hort. Beng. 13.1814 (nomen nudum) & FI.Ind.ed. Carey & Wall.2:47.1824.

Breweria cordata Blume, Bidjr. 722.1825; Clarke in Hook.f., FI.Brit.India 4:223.1883; Trimen, Handb.FI.Ceylon3:227. 1895; Gamble, FI.Pres.Madras 2:923.1923.

Convolvulus malabaricus (?) sensu Moon, Cat.13.1824.

Breweria roxburghii Choisy, Mem.Soc.Phys. Geneve 6:493.1834; Wight, Icon. pl. Ind. or.t.370. 1848; Dalz. & Gibs., Bombay FI. 162. 1973.

(Fig. 33)

Perennial vines; stem suffruticose or herbaceous, terete, brown to reddish brown tomentose; latex white. Leaves simple, ovate to broadly ovate, 4-6.5 x 3-4.8 cm, apically short acuminate to cuspidate and mucronulate, basally cordate to rarely truncate, tomentose on both sides, densely below, the upper surface glabrescent; midrib and lateral veins inconspicuous above, raised beneath, the lateral veins 5-6 pairs; petiole upto 3 cm long, tomentose like stem. Flowers axillary, solitary or in 2-4 flowered umbelliform cymes; peduncle upto 5 cm long, terete, tomentose; bracts large, leaf-like, oblanceolate to spatulate, 7-8 x 2-3 mm, apically acute to acuminate, tomentose like leaves; pedicels upto 1 cm long, tomentose, terete, slightly

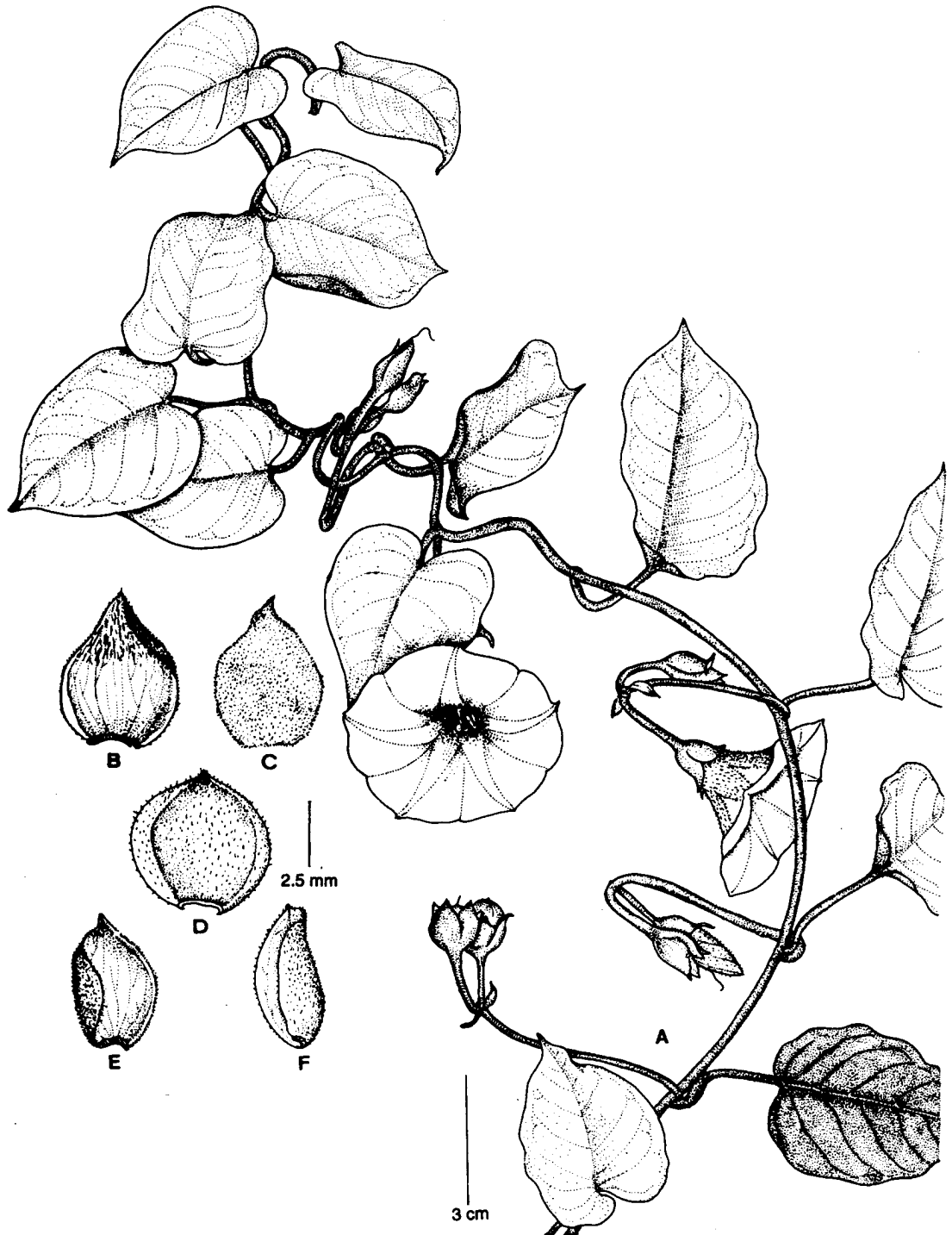


Fig. 33. *Bonamia semidigyna*. A. Flowering and fruiting twig; B-F. Sepals. (from *Biju* 44248 TBGT).

dilated at apex; sepals subequal, inner ones slightly shorter, outermost one larger, broadly ovate, 1-1.1 x 0.6-0.7 cm, second inner one small, ovate-oblong, 0.8-0.9 x 0.6-0.7 cm, inner 3 small, ovate, broadly ovate to ovate - oblong, 0.8-0.9 x 0.6-0.9 cm, apically acute to acuminate, outer 2 densely tomentose inside, inner 3 velutinous outside, glabrous inside; corolla white, throat slightly greenish in colour, campanulate to funnel-form, tube upto 2 cm long, mouth slightly 5 lobed, 4 cm across, midpetaline bands pilose outside; stamens subexserted; anthers white, upto 4 mm long, anthesis between 7 am to 7.30 am, straight after dehiscence; pollen smooth; filaments attached 7 mm above the corolla base, equal, upto 1 cm long, white ciliolate at dilated base; ovary narrow, ovate, long hairy only at apex, glabrous below, 2.5 x 1.5-2 mm; disc absent; style subexserted, bifid, upto 1.5 cm above, unequal, longer upto 8 mm long, shorter upto 5 mm long, few hairs near the base; stigma globose-peltate, 1x1.5 mm, papillate. Fruits capsular, broad ovoid to subglobose, 1.5-1.7 x 1.6-1.9 cm, hairy at the apex, glabrous below, fruiting sepals slightly enlarged; seeds 4, ovate to broadly ovate, 5-6 x 7-8 mm, glabrous, reticulate, black or greyish black; seed germination epigeal, hypocotyl upto 4 cm long, bicotyledonary, apically emarginate, sinus upto 4 mm deep, basally attenuate, glabrous, petiole upto 1 cm long.

Flowering : October- December

Flower opening : 6.30 am - 7.00 am

Fruiting : December- April

Distribution. *Bonamia semidigyna* occurs in Madagascar, India, Indo-China, Siam Malaysia and apparently also in Ceylon.

Ecology . It is found in the plains along waysides, thickets, hedges, riverbanks; also as an undergrowth in the edges of secondary forests generally below 600 m.

Specimens examined : KERALA: Thiruvananthapuram Dt.: Palode Biju 16255 (TBGT & CALI). Pathanamthitta Dt.: Adur, Anilkumar 116 (MH); Konni, Bourdillon 467, Narayanaswamy 1742 (MH). Kottayam Dt.: Kumarakam, Fr. Kadavil 19 (MH). Kozhikode Dt.: Kakanchery, Biju 44248 (CALI & TBGT). TAMIL NADU: Coimbatore Dt.: Anaimalai, s.coll. s.n. (MH).

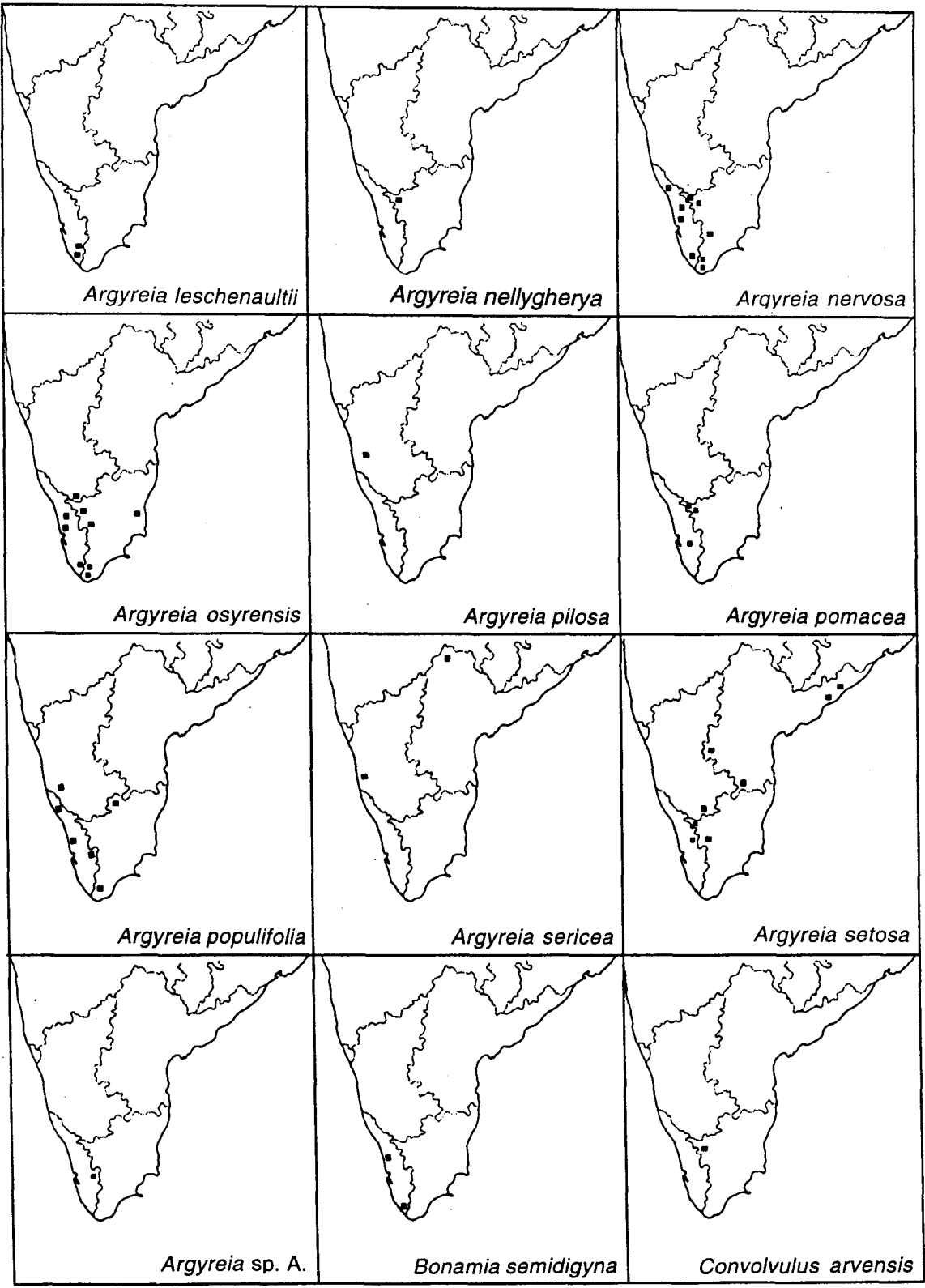


Fig. 34. Distribution maps of *Argyreia*, *Bonamia* and *Convolvulus*.

CONVOLVULUS Linn.

A cosmopolitan genus of about 250 species (Austin & Ghazanfar, 1979), mostly found in temperate and subtropical regions of both hemispheres, rare in the tropics. Represented in Peninsular India by 4 species.

Convolvulus Linn., Sp. Pl. 153. 1753 & Gen. Pl. ed. 5: 76. 1754; Blume, Bijdr. 724, 1825; Choisy, Mem. Soc. Phys. Geneve 6:477. 1833 & in DC., Prodr. 9:399. 1845; Benth. & Hook., Gen. Pl. 2:874. 1876; Clarke in Hook.f., Fl. Brit. India 4:217. 1883; Trimen, Handb. Fl. Ceylon 3:226. 1895; Cooke, Fl. Pres. Bombay 2:232. 1905; Gamble, Fl. Pres. Madras 2:924. 1923; Ooststr., Blumea 3(2):282. 1939 & Fl. Mal., ser. 1,4:436. 1953; Ghaza. in Nasir & Ali, Fl. W.Pakistan 7.1979.

Type species. *Convolvulus arvensis* Linn.

Stevotgia Neck., Elem. 2.23. 1790.

Rhodorrhiza Webb in Bot. Reg. 69. 1841.

Pantosekia Griseb. in Oesterr. Bot. Zeitschr. 23:267. 1873.

Annual, biennial or perennial (?) herbs or underherbs; stem erect, prostrate or twining, glabrous to spinulose. Leaves entire or rarely more or less deeply lobed. Flowers axillary, solitary or in few flowered cymes or in dense involucrate heads; sepals 5, equal or subequal, glabrous or hairy; corolla white, pink, blue or yellow, campanulate, various in length, 5 well-defined midpetaline bands with pilose outside; stamens and style inserted; filaments often subequal to unequal, filiform; pollen smooth, ellipsoid; ovary conical, 2-celled, each cell with 2-ovules; disc annular or cup-shaped; style simple, filiform; stigma 2, linear or oblong, filiform. Fruits capsular, globose, breaking irregularly or valved; seeds 2-4, glabrous, smooth or minutely tuberculate.

Distribution and Ecology. (See under species)

KEY TO THE SPECIES

- 1a. Leaves sessile, linear to oblong, entire.
Flowers less than 1 cm long2
- 1b. Leaves petiolate, ovate or ovate-oblong,
basally cordate or hastate.
Flowers more than 1 cm long3
- 2a. Peduncle absent; outer sepals lanceolate.
Fruits ovate-elliptic.....3. **C. prostratus**
- 2b. Peduncle long, upto 4 cm long; outer sepals
ovate-elliptic. Fruits depressed globose4. **C. rottlerianus**
- 3a Leaf margin entire. Sepals oblong-elliptic,
glabrous on both sides.....1. **C. arvensis**
- 3b. Leaf margin serrulate. Sepals ovate-elliptic,
pubescent to velutinous outside 2. **C. flavus**

1. **Convolvulus arvensis** Linn., Sp. Pl. 153. 1753; Choisy, Mem. Soc. Phys. Geneve 6:479. 1833; Clarke in Hook. f., Fl. Brit. India 4:219. 1883, Cooke, Fl. Pres. Bombay 2:234. 1905; Gamble, Fl. Pres. Madras 2:924. 1923; Ooststr, Blumea 3(2): 283. 1939; Verdc., Fl. Trop. E.Africa 41. 1969; Ghaza. in Nasir & Ali, Fl. W.Pakistan 28.1979; Chand. & Nair, Fl. Coimbatore 199. 1987.

Type: 'In Europea agris', *Linnaeus* 281.1 (LINN).

Convolvulus malcolmi Roxb., Fl. Ind. ed. Carey & Wall., 474. 1824.

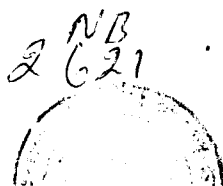
Convolvulus divaricatus Wall. Cat. 1422.

Convolvulus chinensis Ker in Bot. Reg. t. 322.

Vernacular names. Hindi. *Beri, Haranpadi, Prasarana*; Sanskrit. *Bhadrabala, Rajabala*.

Common name. Small bindweed.

(Fig. 35)



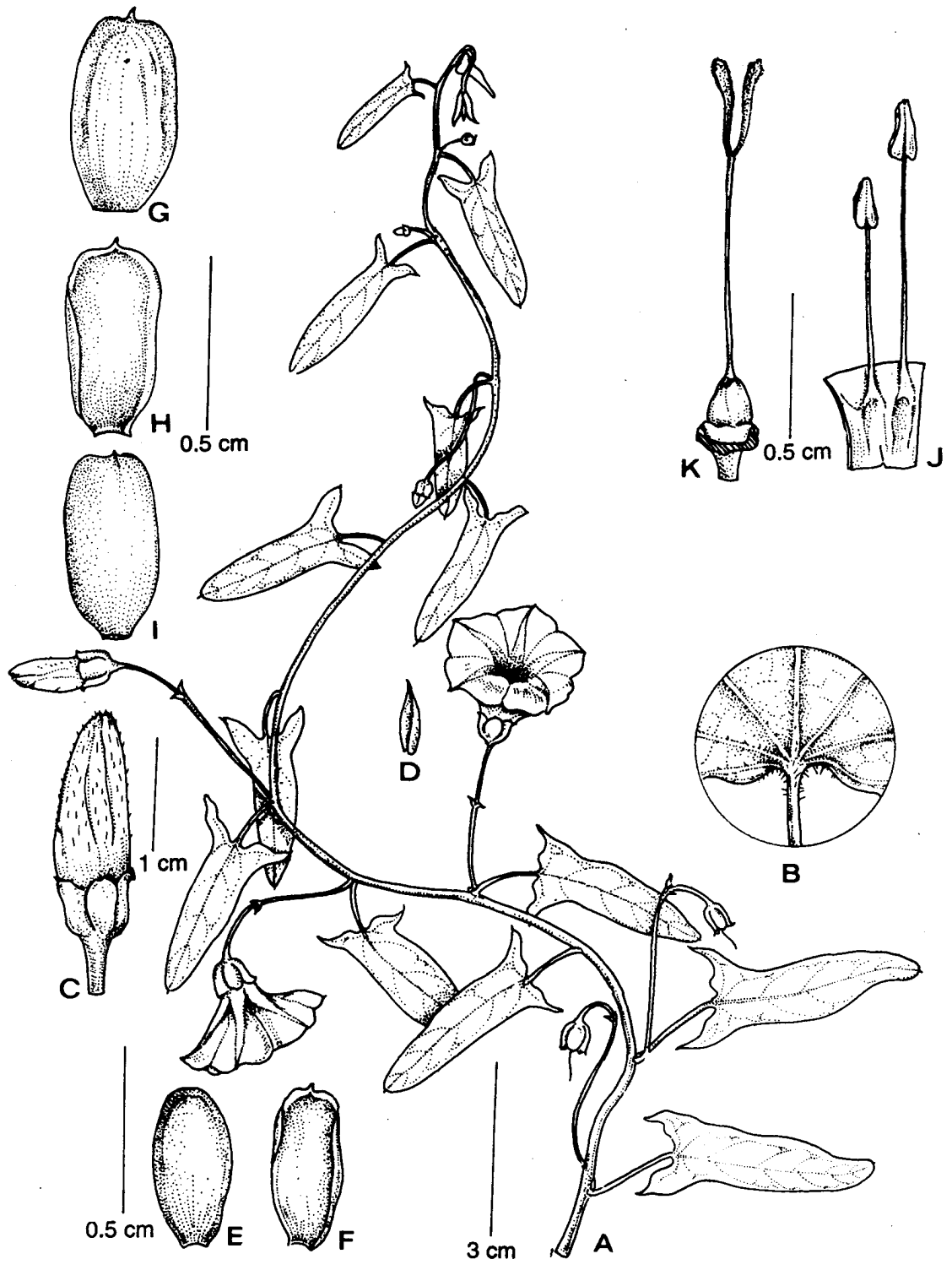


Fig. 35. *Convolvulus arvensis*. A. Flowering twig; B. Leaf base enlarged; C. Flower bud; D. Bract; E-I. Sepals; J. Stamens; K. Pistil (from *Biju* 16238 TBGT).

Annual vines; stem trailing or twining, terete or slightly angular, glabrous or sparsely pubescent. Leaves simple, ovate-oblong, oblong or lanceolate, variable in breadth, 1-5 x 0.5-1.5 cm, apically acute to obtuse, mucronulate, basally hastate or sagittate, glabrous or slightly pubescent below; midrib raised beneath, pubescent; petiole shorter than the blade, upto 2.5 cm long, pubescent. Flowers axillary, mostly solitary or 2-3 flowered cymes; peduncle upto 3 cm long, terete or angular; bracts small, 2, linear, about 3 mm long; pedicels upto 1.4 cm long, dilated at apex, pubescent above; sepals 5, subequal, outer 2 little shorter, oblong-elliptic, 4-4.2 x 2-2.5 mm, apically obtuse, shortly emarginate, glabrous on both sides, inner 3 broadly oblong - elliptic, 5-5.2 x 2.8-3.1 mm, apically obtuse to slightly retuse, more or less distinctly mucronulate, glabrous on both sides; corolla white or pink, broadly infundibuliform, tube upto 2 cm long, midpetaline bands pubescent outside, limb slightly 5 lobed, upto 1.2 cm across; stamens inserted; anthers upto 2.2 mm long, white; filaments attached 2 mm above the corolla base, subequal, 2 long, upto 1.1 cm, 3 short, upto 6 mm long, slightly broadened at base, papillose at the margins; ovary globose, 2x1.5 mm, glabrous; disc small, 1x2 mm; style inserted, upto 8.5 mm long, glabrous; stigma bifid, filiform, 4x ±1 mm, papillate. Fruits capsular, ovoid-globose, 5-8 mm long; seeds 4, dark brown or black, 3-4 mm long.

Flowering : September - January

Fruiting : December-March

Distribution. *Convolvulus arvensis* is a native of Europe and widely spread in the temperate and subtropical parts of both hemispheres except Australia, rarely in the tropics. In India it is distributed from Kashmir to Deccan (Clarke, 1883).

Ecology. Very variable in pubescence, leaf shape and size. Usually in disturbed habitat, hedges, thickets, waste places and marshes.

Specimens examined : TAMIL NADU: Coimbatore Dt.: Agricultural College (TNAU), Biju 16238 (TBGT), Chandrabose 30646, s.coll. s.n. (MH).

2. *Convolvulus flavus* Willd., Sp.Pl. 1:852. 1798; Choisy in DC., Prodr. 9: 415. 1845; Clarke in Hook.f., Fl. Brit. India 4:219. 1883; Gamble, Fl. Pres. Madras 2:925. 1923.

Type : not found

Convolvulus rufescens Choisy, Convolv. Or. 97. 1834 & in DC., Prodr. 9:408.1845; Wight, Icon. pl.Ind.or. 4:12.t.1365.1848.

Evolvulus hederaceus Burm.f., Fl.Indica 77.t.30.f.2. 1768.

(Fig. 36)

Annual vines; stem twining, terete, puberulous to slightly villous. Leaves simple, ovate, ovate-lanceolate, 4-5.6 x 2-3.8 cm, apically narrow acute to acuminate, basally angular lobed or toothed, cordate, margin serrulate, glabrous above, pubescent below; midrib and lateral veins raised beneath, prominently long pubescent; petiole upto 4 cm long, pubescent. Flowers axillary, 1-5 flowered cymes (mostly 3 flowered); peduncle upto 2.5 cm long, terete, prominently rusty-pubescent; bracts small, 2 x 1 mm, pubescent, apically acuminate; pedicels upto 1.8 cm long, dilated at apex, pubescent; sepals 5, unequal, outer 2 large, ovate-elliptic, 0.8-1 x 0.4-0.5 cm, apically acuminate, pubescent outside, velutinous above and below, glabrous inside, inner 3 short, elliptic-orbicular, 0.6-0.7 x 0.5-0.6 cm, apically acuminate, outer 2 pubescent, inner most one glabrous, margin ciliate; corolla yellowish, campanulate, tube upto 1.2 cm long, midpetaline bands pubescent outside, limb 5 lobed, upto 0.8 cm across; stamens subexserted; anthers upto 2 mm long; filaments attached 4 mm above the corolla base, subequal, 2 long, upto 6.5 mm, 3 short, upto 5.5 mm long, slightly dilated at base, papillate at margins; ovary conical, 1 x ± 1 mm, glabrous; disc small; style upto 7 mm, glabrous; stigma bifid, filiform, 3 x ± 1 mm, papillate. Fruit capsular, ovate, 1 x 0.8 cm, apically acute with style base, straw coloured, valvular, valves 4 but breaking by 2, glabrous, fruiting sepals slightly enlarged; seeds 4, ovate-elliptic, 4 x 2.5 mm, black, glabrous with small longitudinal scars.

Flowering : October - March

Fruiting : December - May

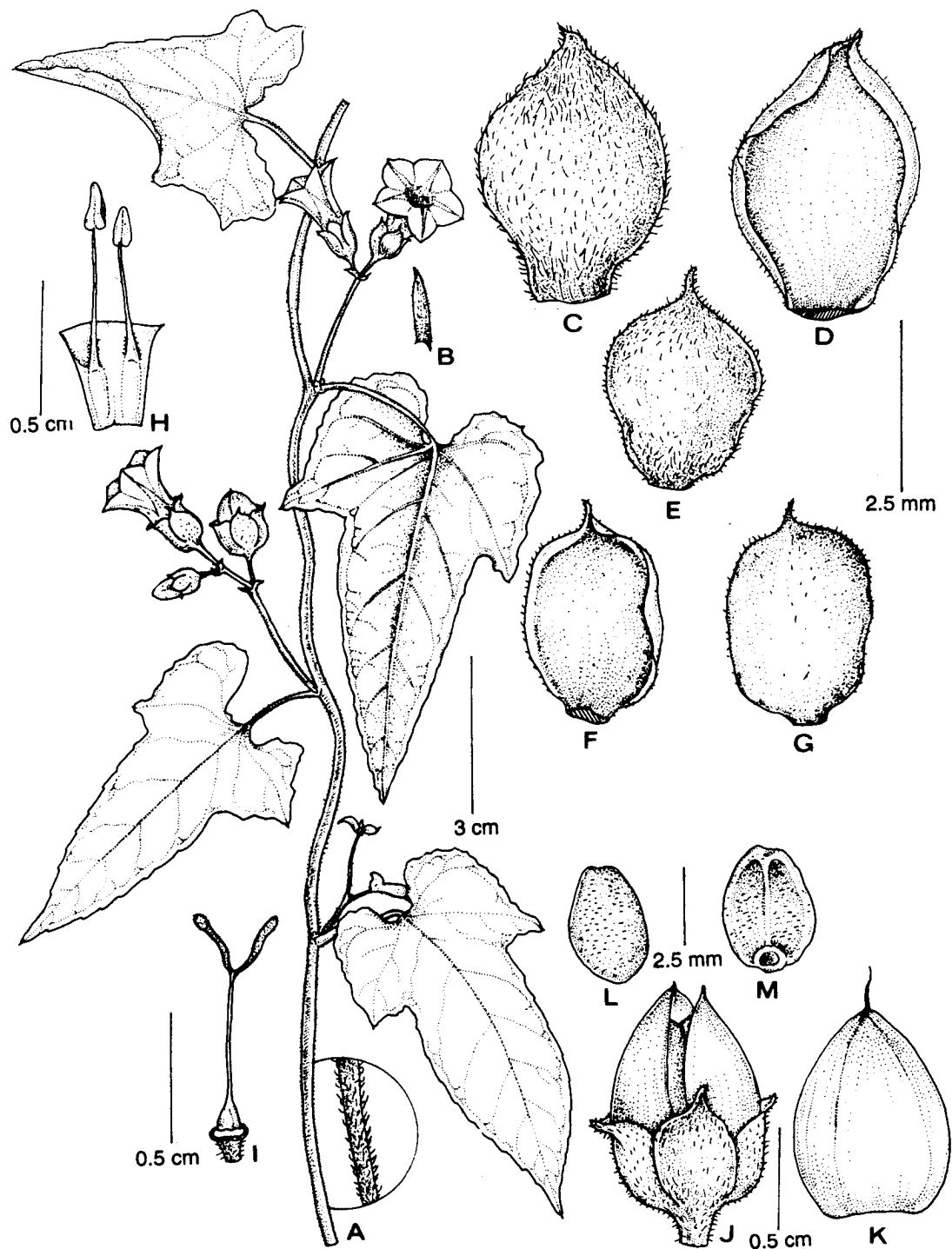


Fig. 36. *Convolvulus flavus*. A. Flowering and fruiting twig; B. Bract; C-G. Sepals; H. Stamens; I. Pistil; J. Fruit; K. Capsule; L & M. Seeds (from *Vajravelu* 39690 MH).

Distribution. *C. flavus* is distributed throughout the Peninsular India.

Ecology. In Tamil Nadu it is very frequent in the drier areas.

Specimens examined: TAMIL NADU: Coimbatore Dt.: Dupibari, *Branes s.n.*; Goddesal, *Jacob* 353 (MH). Nilgiris Dt.: Kailasa Pillai Estate, *Subba Rao* 40423; Kodanad, *Vajravelu* 39690 (MH).

3. *Convolvulus prostratus* Forssk., Fl. Aegypt. Arab. 203.1775; Sa'ad, *Convolv. Sp. Canar. Isl., Medit. Reg., near & Middle East*, 192. 1967; Ghaza. in Nasir & Ali, *Fl. W. Pakistan* 23. 1979.

Convolvulus microphyllous Sieb. ex Spreng., *Syst. Veg.* 1:611.1825; Choisy in DC., *Prodr.* 9:402. 1845; Tackholm, *Stud. Fl. Egypt*, ed. 2:429. 1974.

Convolvulus parviflorus Spreng., *Syst.* 1:611. 1825.

Convolvulus pluricaulis Choisy, *Mem. Soc. Phys. Geneve*, 6:477. 1833; Clarke in Hook. f., *Fl. Brit. India* 4:218. 1883.

Convolvulus pluricaulis var. *macra* Clarke in Hook. f., *Fl. Brit. India* 4:218. 1883.

Type: Forskal herb. 438. *Yemen Mor.* (Lectotype, C).

(Fig. 37)

Annual herbs; stem terete, hairiness highly variable, thinly or fulvous - villous. Leaves simple, alternate or whorled, linear, linear - oblong, 0.3-2 x 0.2-0.4 cm, apically acute or slightly obtuse, mucronulate, appressed hairy above, densely long trichomes below; midrib raised beneath; petiole short or absent, upto 1.5 mm long. Flowers axillary, mostly solitary, or upto 3 flowered cymes; peduncle upto 1 mm long; bracts small; pedicels upto 1.5 mm long, pubescent like stem; sepals 5, subequal, outer 2 larger, lanceolate, 6-6.5 x 2-2.5 mm, apically acuminate, deeply concave, densely hirsute on both sides except the inner basal part, inner 3 shorter, lanceolate, 5-5.2 x 1.5-2 mm, apically long acuminate, deeply concave, densely hirsute on both sides except the inner basal part; corolla white, rose or rose-yellow, funnel-shaped, tube upto 7 mm long, midpetaline bands pubescent outside, mouth 5 lobed, upto 1 cm across; stamens subexserted; anthers upto 1 mm long, white; filaments

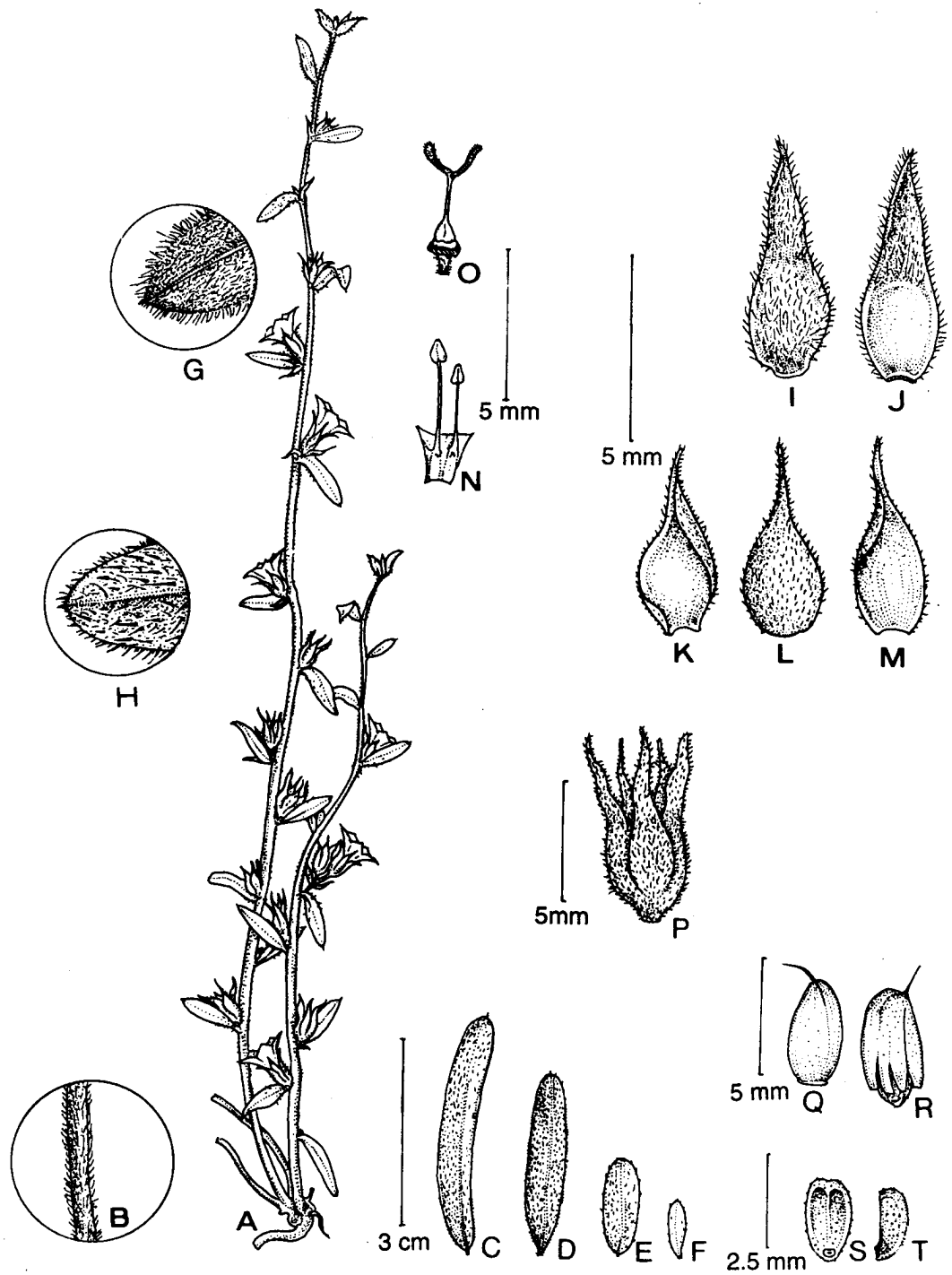


Fig. 37. *Convolvulus prostratus*. A. Flowering and fruiting twig; B. Stem enlarged; C-F. Leaf variation; G. Leaf pubescence (underside); H. Leaf pubescence (upper side); I & J. Outer sepals; K-M. Inner sepals; N. Stamens; O. Pistil; P. Fruit; Q & R. Capsule; S & T. Seeds (from Biju 23958 TBGT).

attached upto 1.5 mm above the corolla base, subequal, 2 long, upto 3.2 mm, 3 short, upto 2.7 mm long, slightly dilated at base; ovary conical, small, ± 1 mm in diameter; disc small, glabrous; style upto 2 mm long, glabrous; stigma, linear, upto 1.8 mm long, papillate. Fruit capsular, oblique, ovate-elliptic, 3x2 mm, straw coloured, persistent style base, breaking irregularly from base to above, fully covered with slightly enlarged sepals; seeds 1 or 2 (never 4), ovate elliptic, 2x1 mm, apically obtuse, laterally compressed, minutely muricate, black.

Flowering : June - October

Fruiting : August - December

Distribution. *C. prostratus* is distributed from Egypt to Pakistan and India.

Ecology. In Peninsular India it is apparently found in the drier regions of Andhra Pradesh.

Specimens examined : ANDHRA PRADESH: Warangal Dt.: Jangaon, *Biju* 23958 (CALI & TBGT).

4. ***Convolvulus rottlerianus*** Choisy, *Convolv. Or.* 95. 1834; Clarke in Hook. f., *Fl. Brit. India* 219. 1883; Cooke, *Fl. Pres. Bombay* 2:301. 1905; Gamble, *Fl. Pres. Madras* 2:925. 1923; Ghaza. in Nasir & Ali, *Fl. W.Pakistan* 26. 1979.

Type : India, Madras, *Rottler s.n.* (holotype, G-DC, not seen).

(Fig. 38)

Annual herbs; stem terete, silky - villous. Leaves simple, linear, 2-3 x 0.1-0.4 cm, apically acute to acuminate, basally attenuate, silky-villous on both sides, prominent on upper side, midrib raised beneath; petiole absent. Flowers axillary, 1-3 flowered cymes; peduncle upto 4 cm long, thin, terete, pilose; bracts small, 4-4.5 x 1-1.5 mm, long hirsute; pedicels shorter than peduncle, upto 4 mm long, slightly dilated at apex, silky - villous; sepals 5, subequal, outer 2 slightly narrower, ovate-elliptic, 3.8-4.2 x 2-2.3 mm, silky-villous outside, glabrous inside, inner 3 slightly broader, ovate-elliptic,

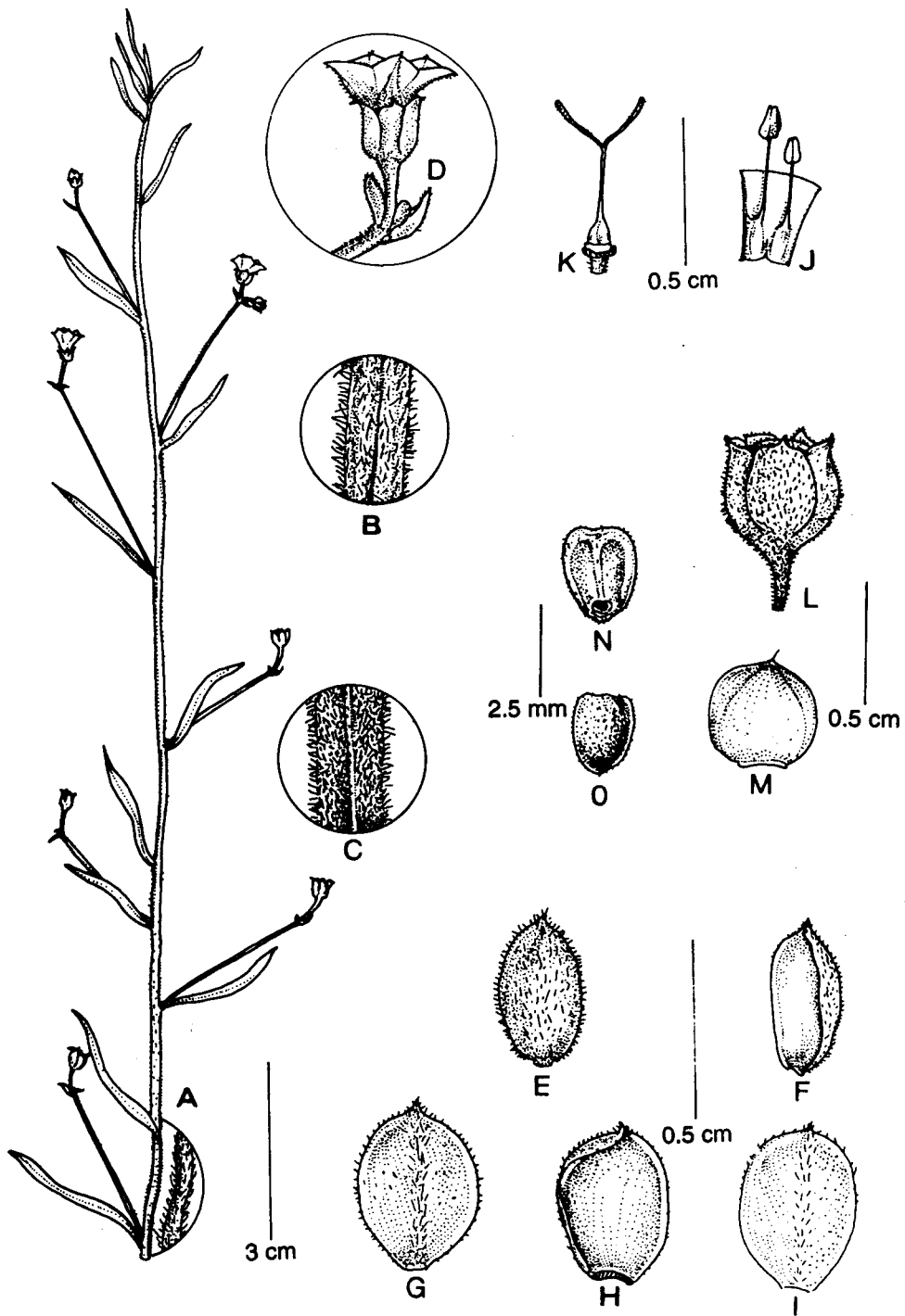


Fig. 38. *Convolvulus rottlerianus*. A. Flowering and fruiting twig; B. Leaf pubescence (lowerside); C. Leaf pubescence (upperside); D. Flower; E-I. Sepals; J. Stamens; K. Pistil; L. Fruit; M. Capsule; N & O Seeds (from Biju 15371 TBGT).

4-4.3 x 3-3.8 mm, apically apiculate, glabrous except margin and centre region; corolla campanulate, tube upto 3 mm long, midpetaline bands hairy outside, mouth 5 lobed, upto 8 mm across; stamens inserted; anthers \pm 1 mm long; filaments attached 1 mm above the corolla base, subequal, 2 long, upto 3.5 mm, 3 short, upto 2.5 mm long, slightly dilated at base, papillate at margins; ovary conical, $1x \pm 1$ mm, glabrous; disc small; style upto 3.5 mm long, glabrous; stigma upto 3 mm long, linear, papillate. Fruits capsular, depressed globose, 4 x 4 mm, 4-valved, fruiting sepal nearly enclosed; seeds 4, ovate, 2-2.5x2 mm, black, minutely pubescent.

Flowering : October - February

Fruiting : December - March

Distribution. Afganistan, Pakistan and India.

Ecology. Very variable in pubescence, size and shape of leaf.

Specimens examined: KERALA(?): Malabar, *Stocks & Law co. s.n.* (MH). TAMIL NADU: Kanniyakumari Dt.: *Biju* 15371 (TBGT). Salem Dt.: Santha Marandapalli, *s.coll.* 9900 (MH). Coimbatore Dt.: Vellapathy *s.coll.* 10480 ; Kollegal, *Narayanaswamy* 19496 (MH). KARNATAKA: Bellary Dt.: Hagani, *s.coll.* 14317 (MH). ANDHRA PRADESH: Chittoor Dt.: Mekalavanikunta, *Subba Rao* 46851 (MH). Nellore Dt.: Chintaldevi, *s.coll.* 16410 (MH). Kurnool Dt.: *Beddome, s.n.* (MH).

CRESSA Linn.

Cressa is a small genus of one or perhaps two species. The plants are unique because of their adaptation to arid and saline conditions.

Cressa Linn., *Sp.Pl.* 233. 1753 & *Gen. Pl.* ed. 5.104. 1754; Choisy in DC., *Prodr.* 9:439. 1845.

Perennials (?); erect herbs, stem much branched. Leaves simple, small, sessile, entire. Flowers small, subsessile, in bracteate clusters at the tips of the lateral branches; sepals 5, obovate, subequal, imbricate; corolla

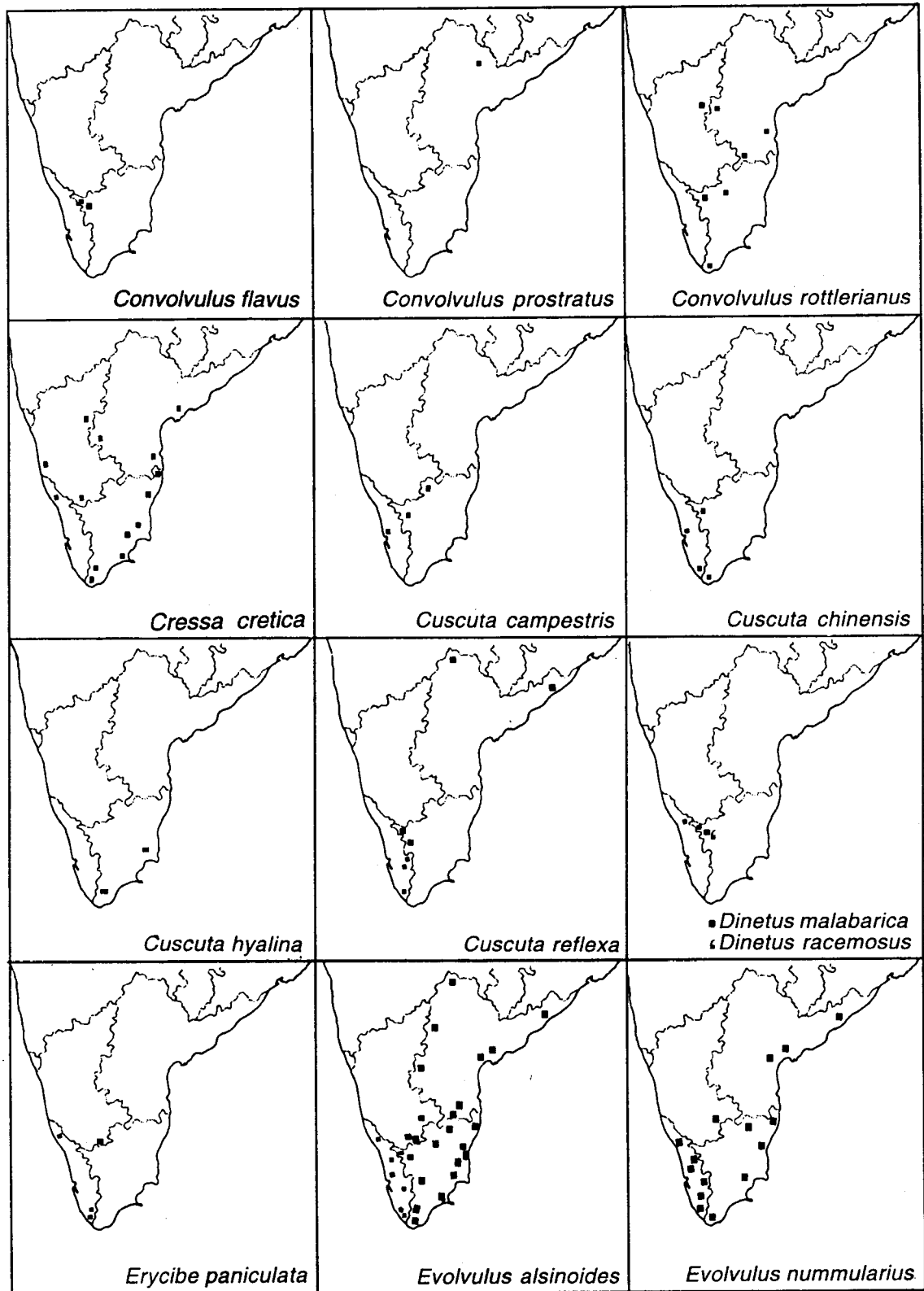


Fig. 39. Distribution maps of *Convolvulus*, *Cressa*, *Cuscuta*, *Dinetus*, *Erycibe* and *Evolvulus*.

campanulate, small, deeply lobed, lobes ovate, apically acute, spreading; stamens and style exserted; filaments filiform, glabrous; ovary 2-locular, 4-ovulate; style 2, distinct to the base, glabrous; stigma globose, papillate. Fruits capsular, 2-4 valved, 1-4 seeded; seeds glabrous and shining, dark brown.

Distribution and Ecology. This is found in the tropical xeric regions of both hemispheres. (Austin 1980 a).

Cressa cretica Linn., Sp.Pl. 223.1753; Clarke in Hook.f., Fl. Brit.India 4:225. 1883; Gamble, Fl.Pres. Madras 2:922. 1923; Verdc. Fl. Trop. E.Africa 33. 1963; Austin in Nasir & Ali, Fl. W.Pakistan 30. 1979; Austin in Dassan. & Fosb., Rev. Handb.Fl.Ceylon 1:304.1980; Rani & Matthew in Matthew, Fl. Tam. Carnatic 3:1012. 1983.

Type : Crete, LINN 317.1 (LINN., BM).

Evolvulus capitatus sensu Moon, Cat. 23.1824; Thw., Enum. pl. zeyl. 213. 1860.

(Fig. 40)

Annual or perennial herbs upto 18 cm height, stem erect, basally woody and glabrous, much branched above, terete, long pilose. Leaves simple, dimorphic, basal leaves deltoid, 6-7 x 4 - 5 mm, apically acute, basally truncate, appressed tomentose on both sides, normal leaves closely alternate, ovate-lanceolate to elliptic-oblong, 4-4.5 x 1-1.5 mm, apically acute, basally acute or cuneate, margin entire and ciliate, grey-green; midrib visible, lateral veins inconspicuous on both sides; petiole absent or short, ± 1 mm. Flowers in terminal clusters (spike) in axillary branches, upto 7 in number; peduncle absent; bracts, 2-4, elliptic-lanceolate, 2.3-3 x 0.5 mm, apically acute, pubescent on both sides; sepals subequal, obovate, outer four 2-2.5 x 2-2.2 mm, inner 1 very small, 1.5 - 2 x 1.5 mm, concave, apically acute, silky pubescent outside, glabrous within; corolla white with a pink tinge, campanulate, tube upto 2 mm long, sparsely hairy inside, deeply 5 lobed, upto 3 mm long, lobes oblong-ovate, apically acute, sparsely pubescent middle to above, mouth 2-3 mm across; stamens exserted; anthers upto 1.2 mm long, straight after dehiscence;

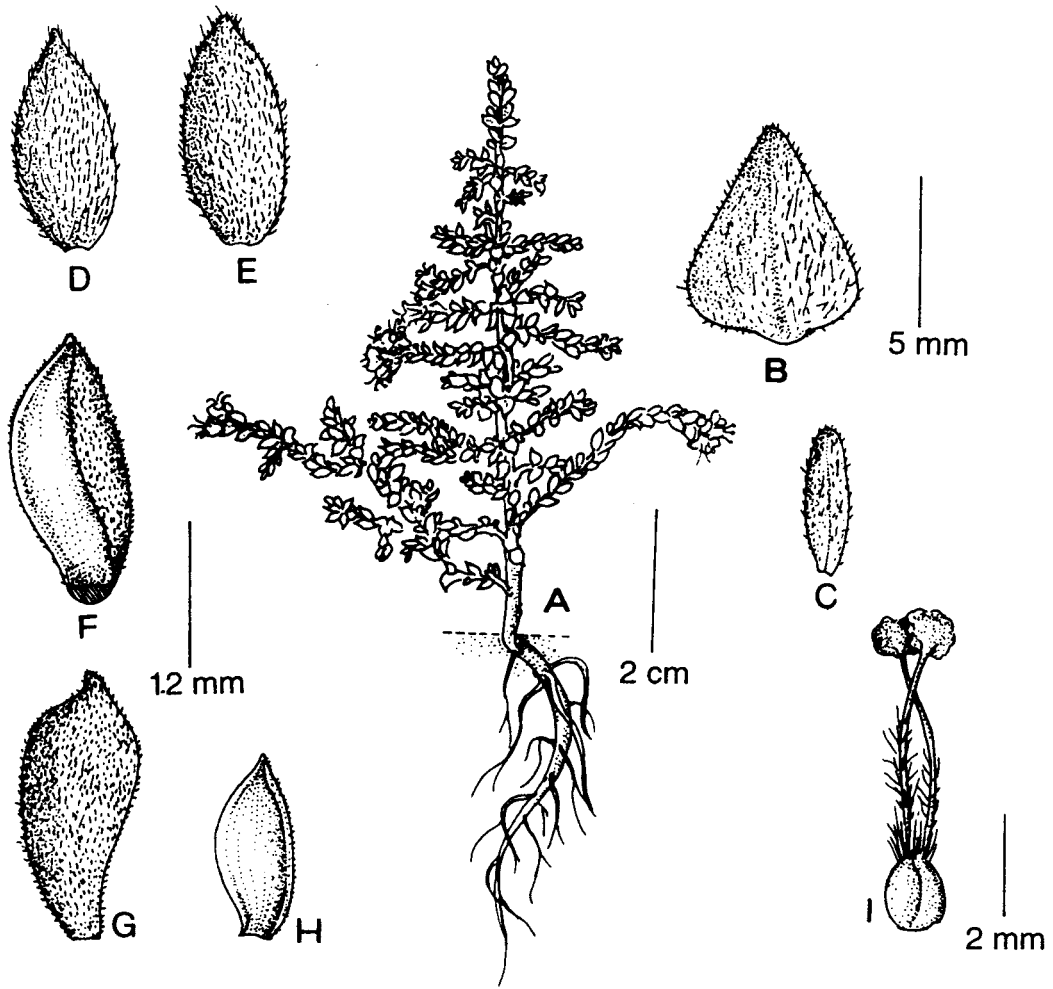


Fig. 40. *Cressa cretica*. A. Flowering plant; B & C. Leaves; D -H. Sepals; I. Pistil (from Biju 25969 TBGT).

ovary globose or ovate elliptic, upto 1 mm long, glabrous below, long pubescent above; nectary disc small or absent; style 2, distinct to the base, exserted, upto 3.3 mm long, glabrous; stigma large, capitate, papillate. Fruit capsular, ovoid, 3-4 x 2.5-3 mm, crowned with long hairs, fruiting sepals enlarged; seeds 1-4 (very rarely 4), 1.5-2 x 1 mm, glabrous, shining, dark brown.

Flowering : February-April

Fruiting : April-July

Distribution. *Cressa cretica* is found in the tropics of Africa, Pakistan, Australia and in other dry sites in Asia.

Ecology. In India, it is common in the coastal areas and other places which tend to be salty and sandy; usually found at sea level.

Specimens examined: KERALA: Kannur Dt.: Thaliparumba, *Barbar* 7727 (MH); Malabar Concan, *Stocks Law & c. s.n.* (MH). TAMIL NADU: Kanniyakumari Dt.: *Biju* 25969 (TBGT). Tinnevelly Dt.: Tuticorin, *s.coll.* 13721 (MH). Ramanathapuram Dt.: Achunthanvayal, *Balasubramaniam* 1664 (MH). Pudukkottai Dt.: Mananelkudi, *Arulappan* 762 (MH). Thanjavur Dt.: Kodikkarai, *Biju* 16248 (CALI), *Ramamurthy* 86473 (MH). S. Arcot Dt.: Parangipettai, *Ramamoorthy* 86462 (MH). Chengalpattu Dt.: Manali Andarkuppam, *Narasimhan* 494; Kelambakkam, *Henry* 47147 (MH). KARNATAKA: Mysore Dt.: *Thomson s.n.* (MH); S.Canara, *Beddome s.n.* (MH). Bellary Dt.: Ramandrug, *s.coll.* 14351 (MH). ANDHRA PRADESH: Nelloore Dt.: Ulavapad, *s.coll.* 12744 (MH). Anantapur Dt.: Khojjapalli, *Gamble* 20823 (MH). W.Godavari Dt.: Kolleru, *Subramanyam* 5087 (MH).

CUSCUTA Linn.

The genus was originally published by Linnaeus in 1753. There is a great diversity of opinion as to its circumscription. Bartling (1830) first separated the genus *Cusuta* from Convolvulaceae and attributed a family Cuscutaceae.

Many of the later authors like Choisy (1841), Rechinger (1964), Manitz (1976) and Bhattacharyya and Mukherjee (1978) accepted this concept. However, Bentham & Hooker and Engler & Thorne considered Cuscutaceae as a part of the family Convolvulaceae. The family Cuscutaceae is assigned to the order Polemoniales by Cronquist (1981), Hutchinson (1926) and Takhtajan (1980). But Dahlgren *et al.* (1981) treated it in the order Solanales.

The confusion in family delimitation persisted for well over two centuries. However, the current taxonomic consensus is in favour of treating it as a genus in the family Convolvulaceae [Clarke (1883), Gamble (1923), Santapau & Patel (1957), Verdcourt (1963) and Austin (1980 a)]. The present study does not intend to disturb the circumscription and delimitation of this genus. But a critical persual of the literature and the study of the live and herbarium materials reveals that this genus favours the family status.

Cuscutaceae differs from Convolvulaceae in the nature of its parasitic habitat; they are leafless and rootless total parasites with thread - like herbaceous stem. The presence of 5 scale - like appendages alternating with stamens at the base of corolla is quite characteristic. In the family Convolvulaceae internal phloem is present, whereas in the Cuscutaceae it is absent.

The name *Cuscuta* is derived either from the Arabic word '*kechout*' or from the medieval Latin word '*cuseutta*' meaning parasitic dodders.

Cuscuta Linn., Sp. Pl. 124.1753 & Gen. Pl. ed. 5.60.1754; Engelm., Trans. Acad. Sci. St. Louis 1:459. 1859; Yunck., Mem. Torrey Bot. Club 18:113.1932; Sant. & Patel, Journ. Bombay Nat. Hist. Soc. 54:707-713.1957; Rechinger in Fl. Iranica, No.4:1-16. 1964; Bhatt. & Mukh., Ind. Journ. Forestry 1(2):156-162.1978.

Type species : *Cuscuta europaea* Linn.

Parasitic vines; stem twining, filiform, yellow, orange or rarely greenish, twining by haustoria; roots withering and absent in mature plants. Leaves reduced to minute scales or absent. Flowers few to many, sessile or short pedicelled, mostly in cymose clusters, small; sepals 5 (4), subequal, free or

connate at the base; corolla whitish, tubular, urceolate, globose or campanulate, 5-lobed, generally with fimbriate episepalous scale - like appendage inside, opposite the stamens; stamens as many as corolla lobes; pollen ellipsoid, 3-colpate, smooth; ovary 2-locular, biovulate; styles 2 or 1, distinct; stigma globose, subglobose or elongate. Fruit capsular, ovoid or globose, opening irregularly, circumscissile, or remaining closed; seeds 1-4, smooth or rough, albumen fleshy; embryo slender, spiral, acotyledonous.

Distribution and Ecology. The genus *Cuscuta* is recently recognised of about 165 species (Austin, 1980 a). Yuncker (1943) considered more species to exist. Verdcourt (1963) disagrees with the Yuncker's species concept and considers it as narrow and Austin (1980 a) shared Verdcourt's opinion.

In the recent taxonomic studies on Indian *Cuscuta*, Bhattacharyya and Mukherjee (1978) recognised 16 species. In Peninsular India 4 species are reported viz., *C. campestris* Yunck., *C. chinensis* Lam., *C. hyalina* Roth and *C. reflexa* Roxb., the majority of the genus apparently being concentrated in America.

Infrageneric classification

Of the four subgenera recognised by Rechinger (1964), viz., subg. *Grammica* (Lour.) Engelm., subg. *Eugrammica* Yunck., subg. *Monogyna* (Engelm.) Yunck. and *Cuscuta*, the first and third are reported in Southern Peninsular India. Divided further into sections, these two subgenera can be identified as follows.

KEY TO THE SUBGENERA

- 1a. Style 2; stigma mostly globose or depressed - globose; capsule circumscissile or indehiscent subg. **Grammica**
- 1b. Style 1; stigma globose, ovate, conic or flattened; capsule circumscissile..... subg. **Monogyna**

The subgenera and sectional placements of the Peninsular Indian species are shown in the table 4.

Table 4. Infrageneric placement of Indian species of *Cuscuta*

Subgenus	Section	Species
<i>Grammica</i>	<i>Cleistogrammica</i> Engelm.	<i>C. campestris</i> Yunck.
	<i>Eugrammica</i> Yunck.	<i>C. chinensis</i> Lam.
		<i>C. hyalina</i> Roth
<i>Monogyna</i>	<i>Monogynella</i> (Engelm.)Yunck.	-
	<i>Callianche</i> Engelm.	<i>C. reflexa</i> Roxb.

Cuscuta subg. *Grammica* (Lour.) Engelm., Trans.Acad.Sci.St.Louis 1:459.1859.

Subgenus *Grammica* comprises of two sections, viz., sect. *Cleistogrammica* Engelm. (capsule indehiscent) and *Eugrammica* Yunck. (capsule circumscissile). In Peninsular India sect. *Cleistogrammica* represents one species, *C. campestris* and sect. *Eugrammica* represents two species, viz., *Cuscuta chinensis* and *C. hyalina*.

KEY TO THE SPECIES

- 1a. Scales on the corolla tube absent. Capsule circumscissile; seeds with few minute longitudinal grooves..... 3. *C. hyalina*
- 1b. Scales on the corolla tube present..... 2
- 2a. Calyx lobes triangular-ovate, apically obtuse to acute. Capsule circumscissile..... 2. *C. chinensis*
- 2b. Calyx lobes orbicular, apically rounded. Capsule indehiscent.....1. *C. campestris*

1. *Cuscuta campestris* Yunck., Mem.Torrey Bot. Club18:138 1932; Ooststr., Fl.Mal., ser.1, 4:392.1953; Rechín. in Fl.Iranica, No. 4:3. 1964; Sant.&

Korl., Journ.Bombay Nat. Hist. Soc. 62:598. 1965; Srini., Bull.Bot.Surv. India 15(1&2):160.1973; Chand. & Nair, Fl.Coimbatore, 200.1987.

Type: not seen.

Cuscuta arvensis Beyrich ex Engelm. in Gray, Man.Bot.ed.2, 336. 1856. non Beyrich (1834).

Cuscuta arvensis var. *calycina* Engelm. in Trans. Acad. Sci. St. Louis 1:495. 1859.

Cuscuta pentagona var. *calycina* Engelm., Am. Journ. Sc. & Arts 45:76.1845.

(Fig. 41)

Stem twining, slender, less than 0.5 mm in diameter, orange to yellow in fresh, pale brown to straw coloured when dry. Flowers many flowered compact cymose clusters, dull yellow, small, 3-3.5mm long; pedicels mostly shorter than the flowers, 1-1.5 mm long, dilated at apex; sepals 5, greenish yellow, campanulate, enclosing the corolla tube, lobes broadly ovate, imbricate, apically obtuse or somewhat acute; corolla pale white, tube upto 1.6 mm long, lobes triangular, apically acute or subacute with incurved tips; stamens subexserted; anthers 5, shorter than the corolla lobes, basifixed, alternate to the lobes, ovate; filaments inserted just below the sinus, equal, \pm 1mm long; corolla scale ovate, abundantly fimbriate, adnate only at the base, bridged below the middle, almost reaching the anthers; ovary slightly depressed globose, \pm 1.2 x 1mm, glabrous; style 2, equal, 1mm long, slender; stigma rounded. Fruits capsular, depressed globose, 3-3.2 x 2.8-3.2 mm, indehiscent, more or less 4-lobed, intrastylar opening small, \pm 0.75 mm long; seeds 2-4, small, \pm 1mm long.

Flowering : November- February

Fruiting : February-April

Distribution. This species was first recorded from India by Santapau and Korlahalli (1965) and recently by Srinivasan (1973) from Tamil Nadu. *Cuscuta campestris* is a native of N. America and is reported from West Indies, Argentina, Britain, France, Italy, Africa, China, Japan, Java, Australia and Polynesia (Santapau & Korlahalli, 1965).

Ecology. In India it is reported from open waste places.

Specimens examined: KERALA : Ernakulam Dt.: Mangalavanam, *Swaminathan* 95712 (MH). TAMIL NADU: Coimbatore Dt.: Vellalu, *Srinivasan* 42495 (MH); Avanashi Town area, *Joseph* 40807, 42499 (MH). Dharmapuri Dt.: Andiyur, *Vajravelu* 58017 (MH).

2. *Cuscuta chinensis* Lam., Ecn. 2:229.1786; Wight, Icon, pl. Ind. or.t.1373. 1848; Clarke in Hook.f., Fl.Brit. India 4:226.1883; Cooke, Fl. Pres. Bombay 2:225. 1905; Gamble, Fl. Pres. Madras 2:931.1923; Yunck., Mem. Torrey Bot. Club 18:209. 1932; Chavan & Sabnis, Sci. Cult. 25:544.1960; Rechin. in Fl. Iranica, No. 4:3. 1964; Austin in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1: 305. 1980; Rani & Matthew in Matthew, Fl. Tam. Carnatic 3: 1013. 1983.

Type. Specimen in Paris from seeds from China, *Lamarck* [P-LAM,K(photograph)].

Cuscuta reflexa sensu Moon, Cat. 12.1824, non Roxb. (1798).

Cuscuta hyalina Wight, Icon. pl.Ind. or. t. 1372.1848.

(Fig. 41)

Stem twining, slender, less than 0.5 mm in diameter, yellow, glabrous, terete. Flowers somewhat globular, sessile or shortly pedicellate, upto 3-6 mm long, dilated at apex; bracts small, oblong, 2x1 mm, apically obtuse to acute, fleshy, glabrous; sepals 4, lobes triangular - ovate, 1.5-2 x ± 1 mm (outer 2 slightly smaller), apically acute or obtuse, glabrous, fleshy, slightly overlapping; corolla yellowish, tube upto 2-3 mm long, 1-2 mm across, lobes triangular - ovate to oblong - ovate, upto 1.5-2 mm long, apically acute to obtuse, mostly inflexed; stamens subexserted; anthers less than 1 mm long; filaments inserted just below the sinus, sessile or subsessile, upto 1 mm long; corolla scale oblong, 1 mm long, filmbricate, whitish yellow, fleshy; ovary globose, 1 x -1 mm, glabrous; style 2, subequal, 1 mm long, glabrous; stigma rounded. Fruits capsular, depressed - globose, 2.5 x 3 mm, corolla along with stamens remains on the developing capsule, circumscissile, glabrous; seeds 4, broadly ovate, oblique, hilum not depressed, smooth, glabrous, brown, minutely muricate.

Flowering : January - March and August - September.

Fruiting : Almost throughout the year.

Distribution. This species is a native of China, now distributed throughout India and reported from Abyssinia, Sokotra, Iran, Afghanistan and eastward to Ceylon and Australia.

Ecology. In Southern Peninsular India it is common along waysides, waste places and cultivated lands on a variety of hosts generally below 2000 ft.

Specimens examined : KERALA: Thiruvananthapuram Dt.: Kowdiyar, *Biju* 23966 (CALI). Ernakulam Dt.: Malayattor, *Biju* 15355 (TBGT & CALI). TAMIL NADU: Kanniyakumari Dt.: Kodayar, *Biju* 16241 (TBGT). Coimbatore Dt.: *s.coll.* *s.n.* 12 (MH).

3. *Cuscuta hyalina* Roth, Nov. Plant. Spec. Ind. Orient, ex coll. Doct. Benj. Heynii 100. 1821 (not of Wight); Yunck., Mem. Torrey Bot. Club 18:235 1932; Clarke in Hook.f., Fl. Brit. India 4:226. 1883; Cooke, Fl. Pres. Bombay 2:225 1905; Gamble, Fl. Pres. Madras 2:931 1923; Narayan, Sci. Cult. 21:447-450. 1956; Verdc., Fl. Trop. E. Africa 8.1963.

Type: India 'orientale', *Heyne* (holotype, B; isotype, K).

Cuscuta arabica Wight, Icon., pl. Ind. or. t. 1371. 1848.

Cuscuta epitribulum Schinz in Bull. Herb. Boiss., ser. 2,1:880. 1901.

(Fig. 41)

Stem very slender, less than 0.5 mm in diameter, much branched, forming often a tangled mass, terete, glabrous. Flowers rather shining, 2.5-3 x 2.5 mm, loose umbellate clusters, shortly pedicellate, upto 3 mm long, dilated at the apex; bracts small, lanceolate, upto 2 mm long, glabrous; sepals 4, lobes triangular, 1-2 mm long, apex sharply acute, glabrous, fleshy, often exceeding the corolla; corolla whitish, tube upto 2 mm long, deeply 5 lobed, narrow and acute, erect or reflexed; stamens subexserted; anthers \pm 1 mm; filaments short, inserted just below the sinus; corolla scale absent; ovary depressed globose, 1-1.5 x \pm 1 mm, glabrous; style 2, equal or subequal, less than 1 mm

long; stigma capitate. Fruits capsular, thin walled, depressed - globose, interstylar opening small with a longitudinal groove; seeds 2-4, 0.8 x 0.6 mm, with longitudinal grooves.

Flowering: September - January

Fruiting : February - May

Distribution. *C. hyalina* is reported from Sudan Republic, Ethiopia, Southern Rhodesia, South West and South Africa and India (Verdcourt, 1963).

Ecology. not known.

Specimens examined : TAMIL NADU: Tirunelveli Dt.: Wight 2340 (MH). Thanjavur Dt.: T.B. Hospital compound, *Subramaniam*, s.n. (MH).

Cuscuta subg. **Monogyna** (Engelm.) Yunck., Ill. Biol. Monogr. 6:110.1921 & Mem. Torrey Bot. Club 18:248. 1932.

Two sections can be distinguished, *viz.*, *Monogynella* (Engelm.) Yunck., with the style as long as or longer than the stigma, and *Callianche* Engelm., with the style shorter than the stigma. The second section is monotypic and distributed in India.

4. ***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. 1883; Trimen, Handb. Fl. Ceylon 3:229. 1895; Cooke, Fl. Pres. Bombay 2:225. 1905; Gamble, Fl. Pres. Madras 2:931. 1923; Yunck., Mem. Torrey Bot. Club 18:259. 1932; Ooststr., Fl. Mal., ser. 1,4:393. 1953; Rechin. in Fl. Iranica, No. 4:6. 1964; Bhan & Kaul, Sci. Cult. 39(9): 403-404. 1973; Austin in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1:306 1980; Rani & Matthew in Matthew, Fl. Tam. Carnatic 3:1014. 1983; Chand. & Nair, Fl. Coimbatore 200. 1987.

Type: not found.

Vernacular names: Mal. *Moodilla thali* (common to all species of this genus); Tel. *Sitamma pogu nalu*; Sanskrit. *Amaarvela*.

(Fig. 41)

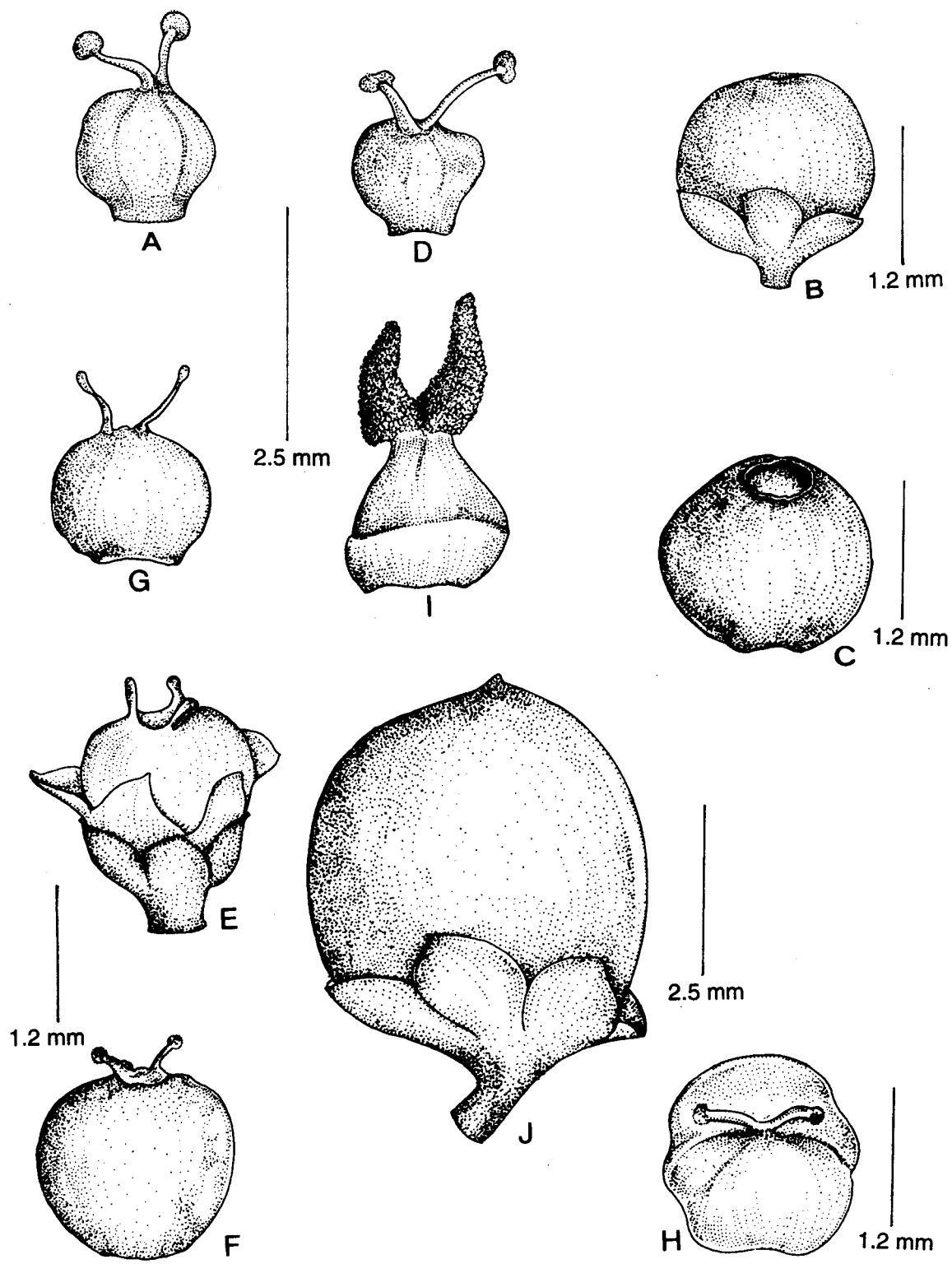


Fig. 41. A-C. *Cuscuta campestris*. A. Pistil; B. Fruit; C. Capsule (from *Joseph* 40807 MH); D-F. *Cuscuta chinensis*. D. Pistil; E. Fruit; F. Capsule (from *Biju* 15355 TBGT); G & H. *Cuscuta hyalina*. G. Pistil; H. Capsule (from *Wight* 2340 MH); I & J. *Cuscuta reflexa*. I. Pistil; J. Capsule (from *Biju* 25901 TBGT).

Stem twining, coarse, 2-2.5 mm in diameter, pale green or yellowish green, glabrous, terete or slightly angled. Flowers subracemose, subsessile to sessile, upto 4 mm long; bracts small, broadly ovate to deltoid, 1-1.5 x 2 mm, apically acute to obtuse, fleshy, glabrous; sepals 4, cupulate, subequal, 2 small, nearly obtuse, 2 x 2mm, apically obtuse, 3 large, ovate-orbicular, 3-3.5 x 2-2.5 mm, apically obtuse, overlapping, slightly verrucose, carinate outside, glabrous, fleshy, white; corolla white or cream, tubular, tube upto 1.3 cm long, deeply 5 lobed, 4-5mm across, lobes narrow-ovate to ovate-triangular, sub acute or slightly obtuse, spreading or reflexed; stamens exerted; anthers upto 1.5mm long, sessile or subsessile (maximum 1 mm), inserted just below the sinus, yellowish in colour; corolla scales attached 1 mm above the corolla base, ovate to oblong, 3x1 mm, fimbriate, white, fleshy; ovary ovate-conical, white, basally with a reddish ring, glabrous; style absent; stigma bilobed, lobes linear, 2.5 mm long, fleshy, papillate. Fruits, capsular, globose, circumscissile near base; seeds 4 or less, 3-3.5 x 2-2.5 mm, black.

Flowering : December-April

Fruiting : February - June

Distribution. *Cuscuta reflexa* occurs throughout India, Ceylon, China, Siam and Malaysia.

Ecology. Parasitic on a wide variety of plants in the mountain ranges above 1500 ft., but flowering and fruiting are seen only above 2500 ft. It occurs as large yellowish patches with its spreading vines often hanging from profusely branched trees.

Notes. The plant is purgative and is used internally in protracted fevers, retention of wind, and induration of the liver. It is applied externally for itching and a decoction of the plant is used as a wash for sores (Kirtikar & Basu, 1918).

Specimens examined : KERALA: Thiruvananthapuram Dt.: Agathyarhills, Biju 25901 (TBGT & CALI). Kottayam Dt.: Devikulam, Shetty 26618 (MH). Idukki Dt.: on the way to Mattupatty, Biju 15369 (TBGT). TAMIL NADU: Dindigul Dt.: Kodaikkanal, Barber 7475, 7221 (MH). Nilgiris Dt.: Palani, s.coll.

23383 (MH). ANDHRA PRADESH: Adilabad Dt.: *Ravishankar* 85162 (MH).
Vishakhapatnam Dt.: Minumuluru, *Subba Rao* 29619 (MH).

DINETUS Sweet

The genus *Dinetus* was segregated from *Porana* by Sweet in 1825, based on the shape of the corolla, the single filiform style and one celled ovary. He took up *Dinetus*, an unpublished herbarium name from Hamilton's specimen in the Lambert herbarium (Staples, 1993). Sweet included only a single species, *D. racemosus* when he erected the new genus.

Dinetus Sweet, Brit. Flower Gard. 2 : 127. 1825; Staples, Novon 3(2): 198-200.
1993.

Type species : *Porana racemosa* Roxb. ex Wall. [= *Dinetus racemosus* (Roxb.)
Hamil. ex Sweet].

Perennial climbing herbs; stem woody, herbaceous towards the tip. Leaves simple, entire, ovate or broadly ovate, often cordate, palmately nerved. Flowers axillary or terminal, many flowered racemes or panicle; bracts large, leafy, cordate; sepals 5, equal, sparsely pubescent outside; corolla small, white, campanulate, calyx lobes shorter than the corolla tube; stamens and style inserted; anthers straight; filaments equal, glandular pubescent at base; pollen smooth; ovary glabrous, one celled; disc annular; style single, glabrous; stigma bifid. Fruits capsular, indehiscent, seed 1, globose or sub globose, all sepals in fruit reflexed from or tightly wrapped around the fruit, comprised of accrescent sepals with multiple parallel longitudinal veins.

Distribution and Ecology. Mainly in tropical Asia including China, India, Java, Malaysia, Nepal and Pakistan.

KEY TO THE SPECIES

- 1a. Capsule cylindrical, fruiting sepal broadly elliptic with obtuse apex.....1. **D. malabarica**
 1b. Capsule sub cylindrical, fruiting sepal oblanceolate with apiculate apex..... 2. **D. racemosus**

1. *Dinetus malabarica* (Clarke) Staples, (Ph.D. Dissertaion, 1987) ined.*

Porana malabarica Clarke in Hook.f., Fl. Brit.India 4: 223. 1883;

Type : Herb.Ind.Or. *H.f.& T. Porana* n. 3 (lectotype, BM selected here).

(Fig. 42, 43, 44, 45)

Perennial climber, stem herbaceous towards tip, terete, glabrous, young parts puberulous. Leaves simple, broadly ovate, 4 - 9 x 3 - 6 cm, apically long acuminate, basally deep cordate, membranaceous, sparsely shaggy hairy on both sides, midrib and lateral veins raised beneath, 6-7 pairs, 4-5 pairs originating from one point; petiole upto 6 cm long, glabrous or nearly so. Flowers axillary or terminal, many flowered panicle; peduncle upto 20 cm long, terete, pilose; bracts large, leafy, cordate, 2 - 2.5 x 1.5 - 2 cm, apically acuminate, sessile, glabrous; pedicels short, 5 - 8mm long; sepals equal, sublanceolate, 1 - 1.5 x 1-1.5 mm, apically acute to acuminate, velutinous outside, glabrous inside; corolla white, fragrant, subcampanulate, tube short, ± 2 mm long, deeply 5 lobed, lobes, ovate acute, glabrous; stamens inserted; anthers less than 1 mm long, straight; filaments equal white, attached near the base of tube, arranged in two levels, 2 above, 3 below, ± 2 mm long; ovary conical, ± 1 mm long, smooth; style simple, 1 - 1.5 mm long, glabrous; stigma 2 lobed, ± 1 mm long, oblong, glabrous. Fruits capsular, indehiscent, cylindrical with pointed apex, 9 x 5 mm, glabrous, fruiting calyx persistent, all enlarged, broadly elliptic, 1.8 - 2 x 0.8 cm, apically obtuse, 7 strongly raised longitudinal nerves, reticulately veined between; seed one, globose, 6 - 6.5 x 2 - 3 mm, glabrous, black.

* Not published (Staples, Pers. comm., 1990).

Flowering : November - February

Flower opening : 10 am - 11am

Fruiting : March - May

Distribution. This species is endemic to southern Western Ghats. But Clarke (1883), Talbot (1909), Cooke (1905) and Dalzel & Gibson (1973), mentioned the distribution of this species in Maharashtra state (Bombay), in their respective floras. For this study, the herbarium specimens in Calcutta (CAL) and Coimbatore (MH) were examined. One herbarium in CAL was found with the name *P.malabarica* Clarke, P.V. Bole, 156, Mahabaleshwar, but the species is *P.racemosa* (= *Dinetus racemosus*). Dalzel's collection from Bombay in British Museum, London was denoted as *P. malabarica*, which was cited by Clarke (1883) and Gamble (1923), in *Flora of British India* and *Flora of Presidency of Madras* respectively. The specimen has only the flowering branch without fruits, probably also belonging to *P. racemosa* (= *Dinetus racemosus*). During the course of this study, we collected the specimen from Banasura hills of Wayanad district. This is the first collection made after 1902. It could be considered as a relocation after 93 years.

Ecology. Collection is from Banasura hills of Wayanad, from the forest edges as an under herb.

Nomenclatural notes. When C.B. Clarke published the name *Porana malabarica* in 1883, he gave a detailed description of the plant and a foot note for *P.truncata* (= *Dinetus truncatus*), "resembles *P.racemosa*, but is stouter and is intermediate between that species and *P. malabarica*Possibly *P. racemosa*, *P. malabarica* and *P.truncata*, are varieties of one; but the characters of the capsule and fruiting sepals seem well marked". The first aim is to clarify the doubts of the author, who described the species *Porana malabarica* Clarke. For this purpose, we consulted the type materials of *P. truncata* (Myanmar.F.Mason 17 K), *P.racemosa* (Wallich 1326 E. K) and *P.malabarica* (Stock, Law & C. 3 *Porana* BM, K & CAL), and found three species to be very distinct.

The second problem is the lectotypification of *P.malabarica*. In the protologue of *P. malabarica* Clarke (1883) simply mentioned - "*Porana* 3, Herb.Ind. Or. H. f. & T." There are three sheets labelled '3 *Porana*'. Of these,



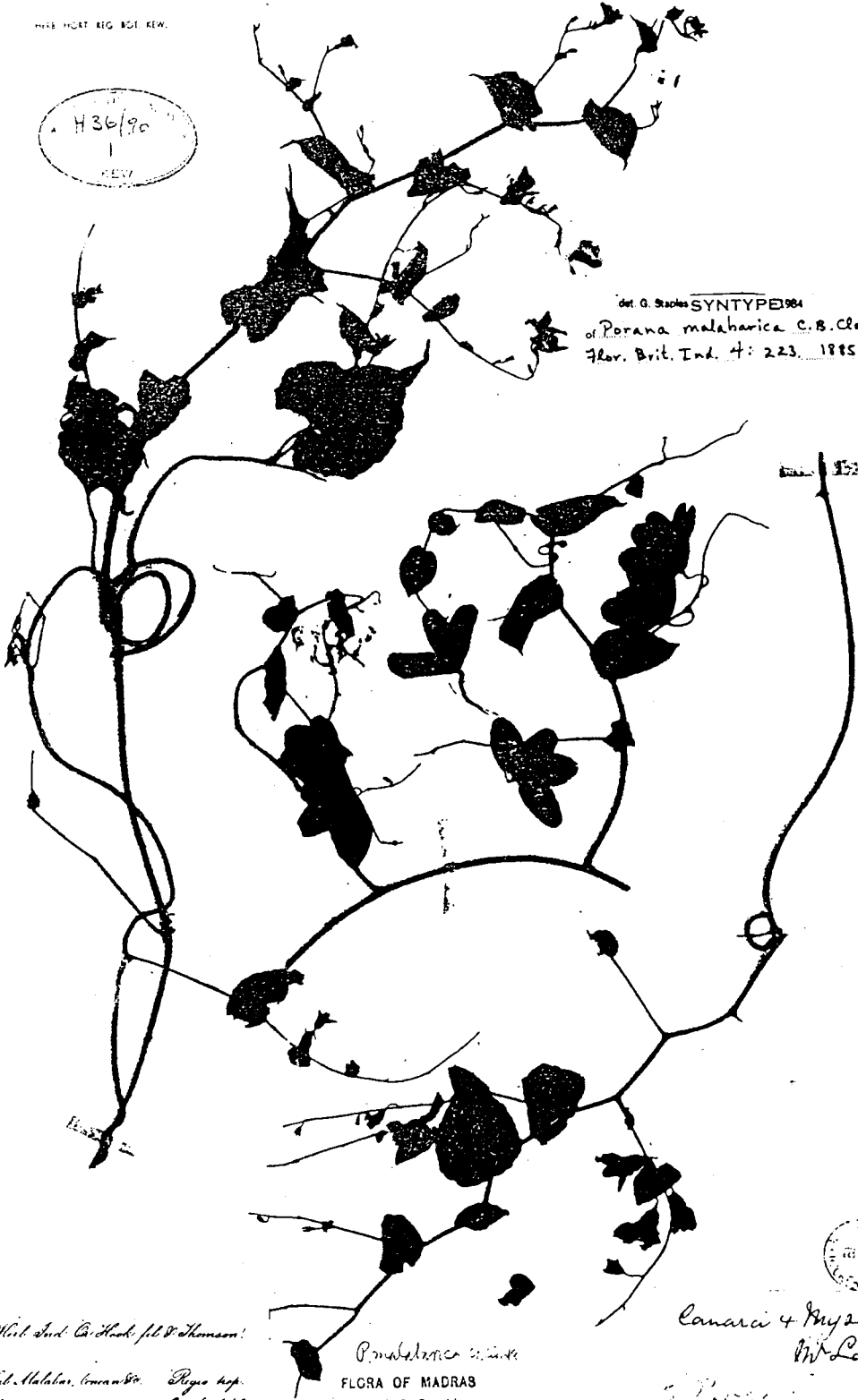
Fig. 42. Lectotype of *Porana malabarica* Clarke (= *Dinetus malabarica*): Herb. Ind. Or. H.f. & T. *Porana* n. 3 (BM).



Fig. 43. *Porana* sp. (= *Dinetus* sp.): Herb. Ind. Or. H.f. & T. *Porana* n. 3 (CAL).

H 36/90
REV

Det. G. Staples SYNTYPE 984
of *Porana malabarica* C. B. Clarke
Flor. Brit. Ind. 4: 223, 1885.



Herb. Ind. Or. H. F. & T. Thomson!

Herb. Malabar, Cochin etc. Pigeon Is. etc. etc.

Poranalar malabarica
FLORA OF MADRAS
Det. J. B. Gamble

Canara & Mysore
W. L. Cass



Fig. 44. *Porana malabarica* (= *Dinetus malabarica*) : Herb. Ind. Or. H. f. & T.
Porana n. 3 (K).

the Kew specimen is annotated '3 *Porana*' in the middle, meanwhile in the right hand corner it is labelled as "Canara and Mysore, *Law*". Another sheet from Malabar Concan in British Museum, London bears '3 *Porana*' and this material is in good condition and well differentiated from all other available species in India. The third sheet in Calcutta (CAL) with a writing '3 *Porana*' is from Malabar Concan. Its fruiting calyx size and shape is different from other two materials (3 *Porana*, BM & K) and this do not belong to this taxa. But the fruiting calyx and fruit is matching with the allied species, *P.racemosa* (= *Dinetus racemosus*).

The problem is, which of these materials should be selected as the lectotype. Clarke (1883) mentioned three different collection localities in his protologue - Bombay, *Dalzell*; Malabar and Concan, *Stocks Law* and Canara and Mysore, *Law & C*. The latter two are the original specimens mentioned by the author. It is clearly indicating that the type specimen mentioned in the protologue is from different localities, collected during different periods and by different collectors.

The specimen at British Museum, London annotated '3 *Porana*' is the original material of *Porana malabarica* Clarke and appears to be the better choice for the lectotype for several reasons.

First, much of the description in the protologue is fairly general and can apply well to three species, *P. racemosa*, *P.malabarica* and *P.truncata*. Clarke (1883) described the fruiting sepals always differing widely from the much smaller narrow ones of *P.racemosa* and *P.truncata*.

Second, the specimen at Kew is certainly from two different plants or times as evidenced by the presence of two flowering branches and one fruiting branch in the same sheet.

The material in the British Museum, fully agrees with the protologue. I therefore designate the fruiting branch of *P.malabarica* on sheet no.1 as Herb. Ind.Or.H.f & T. *Porana* n.3. This could be considered as the lectotype of *P.malabarica* Clarke, the basionym of *Dinetus malabarica*.

Specimens examined : KERALA: Wayanad Dt.: Banasura hills, *Sivarajan et al.* 44293 (CALI, TBGT, & K), *Biju* 15396 (TBGT & CALI). TAMIL NADU: Coimbatore Dt.: Anamalais, *Barber* 4120 (MH). Nilgiris Dt.: *Gamble* 15483 (MH). LOCALITY UNKNOWN: Malabar Concan (?): *Hook.f. & T.* '3 *Porana*' (K & BM).

2. *Dinetus racemosus* (Roxb.) Buch. - Hamil. ex Sweet, Brit.Fl.Gard.2 : pl.127.1825; Staples, Novon.3 (2): 199-200.1993.

Type : Herb. Roxburgh s.n. (Lectotype, K-W 1326 E).

Porana racemosa Roxb. ex Wallich in Roxb. Fl.India 2: 41.1824; Choisy in DC., Prodr. 9:436. 1845; Dalz. & Gibs., Bombay Fl. 162. 1973; Clarke in Hook.f., Fl. Brit. India 4:222. 1883.

Porana cordifolia Ledeb., Ind.Semin.Horti. Acad. Dorpat., suppl. 2:6.1824.

Porana racemosa Jacq. in Sprengel, Syst.Veg. ed.16,1:614.1825, non Roxb. ex Wall.

Porana dichotoma Buch. - Hamil. ex Don, Prodr. Fl.Nepal 99.1825.

Porana elegans Zoll. & Moritzi, Natuur-Geneesk. Arch. Ned. - Indie 2: 571. 1846.

Porana gagnepainiana Leveille, Cat. Pl. Yun - Nan 58. 1916.

Porana racemosa var. *tomentella* Wu Cheng-yi, Yunnan Trop. & Subtrop. Floristics Res.Rep.1:103.pl.33, fig. 4. 1965.

Porana racemosa var. *violacea* Wu Cheng - yi, Yunnan Trop. & Subtrop. Floristics Res.Rep. 1:103.pl.4, fig.1.1965.

Common name : Snow Creeper

(Fig. 45)

Perennial climbers; stem herbaceous towards tip, terete, glabrous, younger parts puberulous and purple in colour. Leaves simple, broadly ovate, 6 - 10 x 3.5 - 5 cm, apically acuminate, basally deep cordate, sparsely hairy on both sides, midrib and lateral veins raised beneath, 6 - 7 pairs; petiole upto 5 cm, glabrous. Flowers axillary or terminal, many flowered panicle or racemes; peduncle upto 22 cm long, terete, pilose; bracts large, leafy, cordate, 1.5 - 2 x 1-1.5 cm, apically acuminate, sessile, glabrous; pedicels short, \pm 7mm long, pubescent; sepals equal, sublanceolate, 2 - 2.5 x \pm 1mm, apically acute, velutinous outside, glabrous inside; corolla white, fragrant, sub campanulate, tube short, \pm 2 mm long, deeply 5 lobed, upto 6 mm long, lobes ovate, apically acute, glabrous; stamens inserted; anthers less than 1 mm long, straight; filaments equal, attached near the base of tube, arranged in two levels, 2 above, 3 below, \pm 2 mm long; ovary conical, \pm 1mm, smooth, glabrous; style

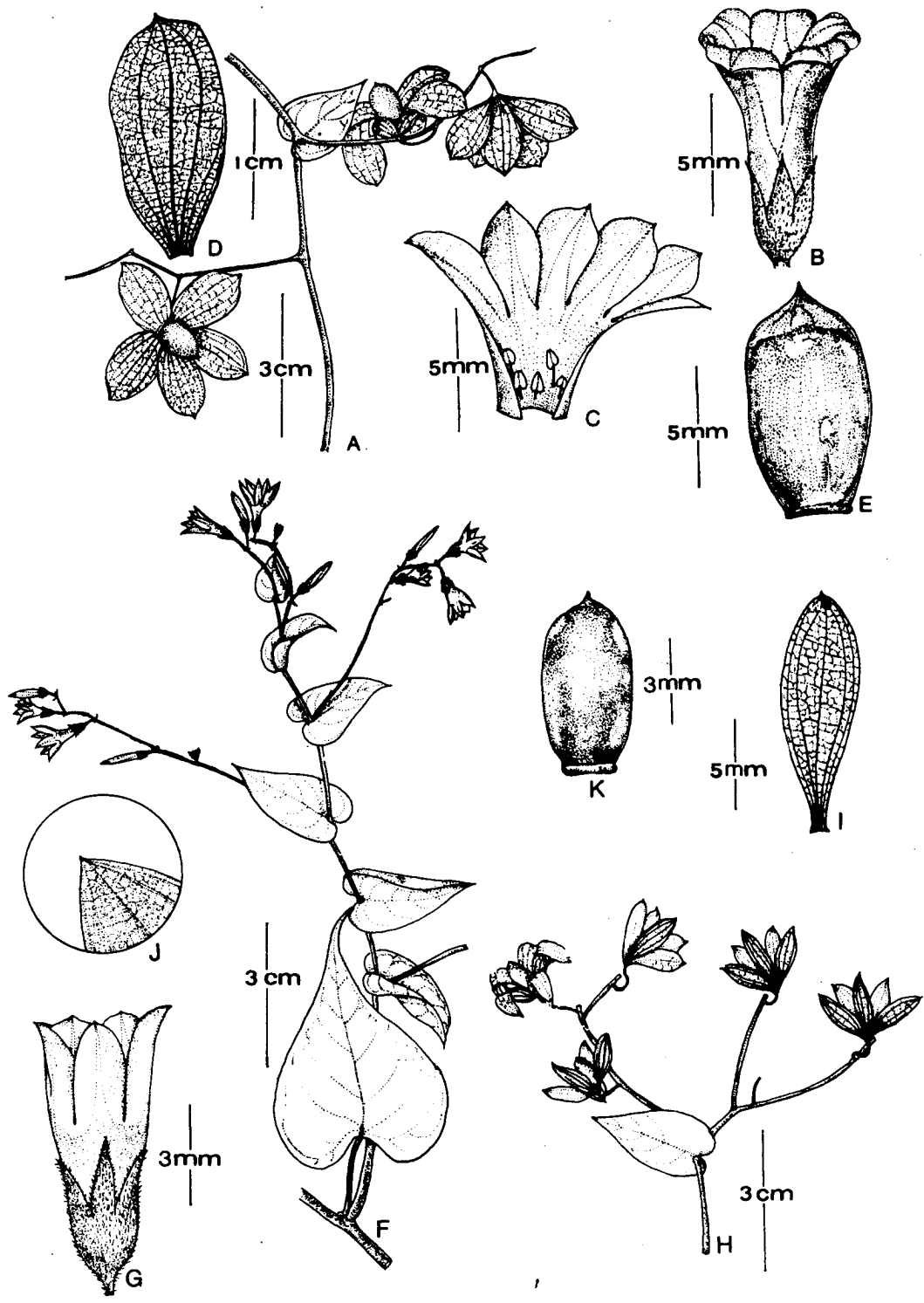


Fig. 45. A-E. *Dinetus malabarica*. A. Fruiting twig (*Porana n.3*, BM), B. Flower; C. Corolla opened, (from *Biju 15396* TBGT); D. Fruiting calyx; E. Capsule (*Porana n. 3*, BM); F-K. *Dinetus racemosus*. F. Flowering twig; G. Flower; H. Fruiting twig; I. Fruiting calyx, J. Fruiting calyx apex; K. Capsule (from *Biju 44250* TBGT).

simple, 1 - 1.5 mm long, glabrous; stigma 2 lobed, oblong. Fruit capsular, indehiscent, subcylindrical, apically apiculate, 7 x 4 mm, glabrous, fruiting calyx persistent, all enlarged, tinged with pink, oblanceolate, 1.5 - 2.1 x 0.2 - 0.4 cm, (base only - 1mm wide), apically apiculate, 6- 7 strongly raised longitudinal nerves, reticulately veined between; seed one, glabrous, 3 - 4 x 1 - 2 mm, black.

Flowering : November - January

Fruiting : February - May

Distribution. Southeast Asia to South China, Malaysia, Java and Sunda Islands.

Ecology. Widely ranges from the subtropical Himalaya to South India at an altitude ranging 2000 - 6000 ft.

Horticultural potential. The 'Snow - Creeper' of the English is one of the most beautiful climbers. The masses of dazzling white flowers, resemble snow patches in the jungle (Clarke, 1883).

Specimens examined : KERALA: Idukki Dt.: (probably cultivated) Devikulam, Meebold 13154 (CAL). TAMIL NADU: Coimbatore Dt.: (cultivation), Biju 44250 (TBGT).

ERYCIBE Roxb.

Roxburgh (1811) established the genus *Erycibe*, based on the species, *E. paniculata* from India. Since then several additional species have been discovered and described (Choisy, 1845; Clarke, 1883; Prain, 1894; Hoogland, 1953). Now the genus comprises about 70 species, the majority being distributed in mainland tropical Asia.

The genus name *Erycibe* is derived from two Greek words 'Eryo' meaning 'draw' and 'cibus' food.

Erycibe is unique in having the corolla - lobes divided at the apex into two, absence of style and 5-10 rayed conical or semiglobular stigma, a case not known in any other genera of the family Convolvulaceae.

Hallier (1897) recognised two series in *Erycibe*, namely, *Rimosae* and *Tereticaules*, on account of the structure of the bark (longitudinal cork-ridges in *Rimosae*, with lenticels in *Tereticaules*). The series *Tereticaules* is subdivided into two groups, mainly based on the venation pattern of the lower surface of the leaves, namely *Venulosae* (reticulately veined beneath) and *Fibrosae* (rugulose by sclerotic fibres).

The genus is represented in Peninsular India by a single species *E. paniculata*

Erycibe Roxb., Pl. Corom. 2:31, t. 159. 1798; Choisy, Ann.Sc. Nat. 2, 1:220. 1834 & in DC., Prodr. 9:463. 1845; Benth. & Hook., Gen. Pl. 2:868. 1876; Prain, Journ. As. Soc. Bengal 63(2):83. 1894 & Journ. As. Soc. Bengal 73(2): 14. 1904; Hoogl., Blumea 7:342 1953; Ooststr., Fl. Mal., ser. 1,4:404. 1953.

Type species: *Erycibe paniculata* Roxb.

Fissipetalum Merr., Journ. Straits Branch R. Asiat. Soc. 85:168. 1922; Airy Shaw, Kew Bull. 22. 1947.

Perennial lianas; stem climbing or creeping, rarely tree (not in India). Leaves entire, simple, mostly ovate to elliptic, apically acuminate. Flowers axillary or in terminal paniculate inflorescence; bracts small, caducous; sepals 5, free, pubescent outside, subequal, outer 2 sepals somewhat different in shape from the inner 3, pubescent outside, glabrous within; corolla deeply 5 lobed, each lobe with 2 lateral lobules, tube short, glabrous outside; stamens 5, inserted; filaments subequal, short triangular or laterally concave; anthers straight, apically obtuse to acuminate, basally cordate; pollen smooth, 3-colpate; ovary glabrous to pubescent, 1-celled, 4-ovulate; style absent; stigma conical, with 5 or 10 longitudinal straight or slightly contorted ridges. Fruits baccate, slightly fleshy, ellipsoid or rarely obpyriform, glabrous, smooth or pubescent; seeds usually 1, plain or strongly folded cotyledons.

Distribution and Ecology. The genus *Erycibe* Roxb. of about 70 species is found exclusively in Asia. The species are distributed from South Japan (Yakushima) to Western India and South Malaysia with one species in Queensland, Australia (Austin, 1980 a). In India, it occurs as an undergrowth in dry deciduous forests, scrub jungles and adjoining areas of 250 - 1000 m.

A Malaysian endemic species *E. stenophylla* Hoogl. is seen strictly as rheophyte.

Erycibe paniculata Roxb., Pl. Corom. 2:31. pl. 159. 1798; Thw., Enum. pl. zeyl. 213. 1860; Clarke in Hook. f., Fl. Brit. India 4:180. 1883; Trimen, Handb. Fl. Ceylon 3:205. 1895; Cooke, Fl. Pres. Bombay 2:225. 1905; Gamble, Fl. Pres. Madras 2:653. 1923; Hoogl, Blumea 7:352. 1953; Gandhi in Sald. & Nicolson, Fl. Hassan Dist. 467. 1978; Austin in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1:308. 1980; Mani. & Sivar, Fl. Calicut 179. 1982; Nair & Nayar, Fl. Courtallum 2:242. 1986; Ramach. & Nair, Fl. Cannanore 298. 1988; Vajravelu, Fl. Palghat Dist. 307. 1990; Mohan & Henry, Fl. Thiruvananthapuram 313. 1994.

Type: India (not found).

Erimatalia rheedei Schult. in Roem. & Schult., Syst. Veg. 5:311. 1819.

Erycibe rheedei (Schult.) Blume, Bijdr. 1047. 1827.

Erycibe paniculata var. *wightiana* (Grah.) Clarke in Hook. f., Fl. Brit. India 4:180. 1883; Cooke, Fl. Pres. Bombay 2:226. 1905.

Erycibe wightiana Grah., Cat. Bombay Pl. 137. 1839; Gamble, Fl. Pres. Madras 2:930. 1923; Alston in Trimen, Handb. Fl. Ceylon 6:201. 1931.

-*Erima-tali* Rheede, Hort. Malab. 7:73, t.39. 1688.

Perennial woody straggling shrubs; stem erect and herbaceous towards the tips, terete, younger parts covered with reddish brown indument. Leaves simple, ovate, obovate, elliptic, oblong or oblong-lanceolate, 5-12 x 3.5-8 cm, apically obtuse - acuminate to acute-acuminate, basally acute, coriaceous, glabrous; midrib and lateral veins raised beneath, lateral veins 4-6 pairs; petiole upto 1.5 cm long. Flowers axillary in many flowered racemes or panicles; peduncle upto 16 cm; bracts 2-4, linear, 1.5-2.3 x ± 1mm, apically acute, densely pubescent on both sides; pedicels short, upto 4 mm long, pubescent; sepals sub-equal, ovate to rounded, 3-3.2 x 2-2.5 mm, apically obtuse or rounded, densely brown - tomentose outside, glabrous within; corolla white, campanulate - rotate, tube upto 3 mm long, deeply lobed, lobes 4mm long, each divided into two, upto 1 cm across; midpetaline bands hairy ; stamens inserted; anthers ± 1. mm long, straight after dehiscence,

broadly elliptic, apically acute - acuminate; filaments attached 1 mm above the corolla base, \pm 1 mm long, glabrous; ovary orbicular, 1x1 mm, glabrous; style absent; stigma inserted, papillate. Fruits sub-baccate, somewhat leathery, ovoid to ellipsoid, 0.7-0.8 x 1-1.8 cm, glabrous; seed 1, glabrous.

Flowering : September - March

Fruiting : November - April

Distribution. *Erycibe paniculata* is a native of India, now distributed in Ceylon and the adjoining regions.

Ecology. In Peninsular India, it occurs as an undergrowth both in wet evergreen and dry deciduous forests. It is also found in river banks, Ghat - roadsides and occasionally in scrub jungles. But they are more common at higher altitudinal range between 1500 - 2700m.

Specimens examined: KERALA: Thiruvananthapuram Dt.: Agathyar hills, *Biju* 25967 (CALI & TBGT); Varkala, *Rama Rao* 1066 (University college Herbarium, TVM). Kollam Dt.: Madathara, *Biju* 44278 (CALI). Kannur Dt.: Kuthuparambu, *Biju* 23939 (CALI & TBGT). KARNATAKA: Mysore Dt.: Bandipur, *Biju* 16251 (TBGT).

EVOLVULUS Linn.

Chiefly a native of warm regions, almost exclusively in America, they include annuals, herbaceous perennials, undershrubs and shrubs. From the related genera *Convolvulus* they differ in their stem never twining, hence their name from the Latin '*evolvere*' meaning to unroll.

Evolvulus Linn, Sp. Pl., 2: 391. 1762 & Gen. Pl. 6 : 152. 1764; Ooststr., Mon.Evol., Thesis, Utrecht 19. 1934; Med., Bot. Mus. Herb. Utrecht 14:1 - 267. 1934; Blumea 3:74. 1938 & Fl. Mal., ser. 1, 4: 395. 1953.

Type species : *Evolvulus nummularius* (Linn.) Linn.

Annual or perennial herbs, undershrubs or shrubs; stem prostrate, never twining. Leaves simple, small, entire, ovate to almost linear. Flowers axillary, small, arranged in cymes or terminal spike like inflorescence; sepals small, equal or subequal, not accrescent; corolla funnel shaped, the limb plicate, mostly subentire; stamens 5, inserted or exserted, glabrous, attached just below the corolla tube; anthers not contorted after anthesis; pollen smooth, pantoporate; ovary glabrous, 2 celled, biovules, rarely 1 celled, 4 ovuled; disc small; style 2 or absent, each style 2-cleft; stigma long, filiform or slightly clavate, cupular or absent. Fruits capsular, globose to ovoid, mostly 4 valved, seeds (1)-4, small, smooth or minutely verrucose, glabrous.

Distribution and Ecology. A genus of about 100 species, almost all of which are found only in tropical America. Two species have been found in the Old World and both of these are in India.

KEY TO THE SPECIES

- 1a. Peduncle long; corolla shallowly lobed,
pale blue. Seeds glabrous.....1. *E. alsinoides*
- 1b. Peduncle absent or very short; corolla distinctly
lobed, white. Seeds muricate..... 2. *E. nummularius*

1. *Evolvulus alsinoides* (Linn.) Linn., Sp. Pl. 2: 392. 1762; Burm.f., Fl. Indica 77. 1768; Willd., Sp. Pl. 1:1517. 1797; Wall. Cat. n. 1317. 1828; Roxb. Fl. India 2:105. 1832; Wight, Ill. Ind. Bot. t. 168. 1850; Clarke in Hook. f., Fl. Brit. India 4: 220. 1883; Trimen, Handb. Fl. Ceylon 3: 227. 1895; Gamble, Fl. Pres. Madras 2:923. 1923; Ridley, Fl. Malay Penins. 2: 454. 1923; Ooststr., in Pulle. Fl. Surinam 4: 73. 1932; Med. Bot. Mus. Herb. Utrecht 14: 26-58. 1934 & Fl. Mal., ser. 1, 4: 395. 1953; Verdc., Fl. Trop. E. Africa 18. 1963; Austin in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1: 309. 1980; Rani & Matthew in Matthew, Fl. Tam. Carnatic 3: 1015. 1983; Chand. & Nair, Fl. Coimbatore 198. 1987; Mohan & Henry, Fl. Thiruvananthapuram 319. 1994.

Type: Ceylon, specimen in *Hermann* Herb. 3:55 (BM, Lectotype fide Verdcourt).

Convolvulus alsinoides Linn., Sp. Pl. 1:157. 1753.

Evolvulus pumilus Span. in Hook. Comp. Bot. Mag. 1: 348. 1835.

Convolvulus valerianoides Blanco, Fl. Filip. 1:90. 1837.

Evolvulus hirsutulus Herb. Brit. Mus. mss. ex Choisy, Mem. Soc. Phys. Geneve 8: 76. 1837.

Evolvulus filiformis Willd. ex Stud. Nom. 2, 1: 620. 1840.

Evolvulus ramiflorus Boj. ex Choisy in DC., Prodr. 9: 447. 1845.

-*Vistnu-Clandi* Rheede, Hort. Malab. 11:131-132. t.64. 1692.

Vernacular names: Mal. *Vishnukranti*; Tam. *Vshnukiranthi*; Sanskrit. *Visnukranta*.

(Fig. 46)

Annual or perennial herb; stem prostrate or ascending, slender, terete, pale green in colour, usually covered with rather long patent silky hairs. Leaves simple, elliptic to linear-oblong or spatulate, 0.4-1.5 x 0.1-1 cm, apically acute to slightly acuminate or rounded at both ends, margin entire, silky pilose on both surfaces, sometimes glabrous above, midrib and lateral veins not conspicuous on both sides; petiole very short, \pm 2 mm long. Flowers axillary, 1-8 flowered; peduncle upto 4 cm long, slender, terete, longer than leaf, pilose with appressed hairs; bracts 2, linear-lanceolate, 2mm long, apically acute to acuminate, shortly aristate, hairy on outer surface; pedicels upto 8 mm, with characteristic bending, hairy; sepals subequal, outer 3 large, lanceolate or ovate-lanceolate, 3 x 0.5mm, apically acute to acuminate, greenish brown in colour, villous from middle to apex on the outer surface, \pm 1 mm long, glabrous within; corolla pale blue or purple, rarely with white centre, campanulate to sub-rotate, or broadly funnel form, tube upto 1.5 mm long, 5- 8 mm wide across, midpetaline bands pale blue and pilose; stamens exserted; anthers small, 1 mm long, white, anthesis between 7 am - 8 am; filaments attached just 0.5 mm above the corolla base, subequal, \pm 2.5 mm long, not dilated at base, glabrous; ovary orbicular, 1 x 1 mm, glabrous; disc very small; style 2, exserted, upto 7 mm long, united at the base or free, glabrous; stigma 4 (each style 2- cleft), \pm 3 mm long, white, terete, slightly

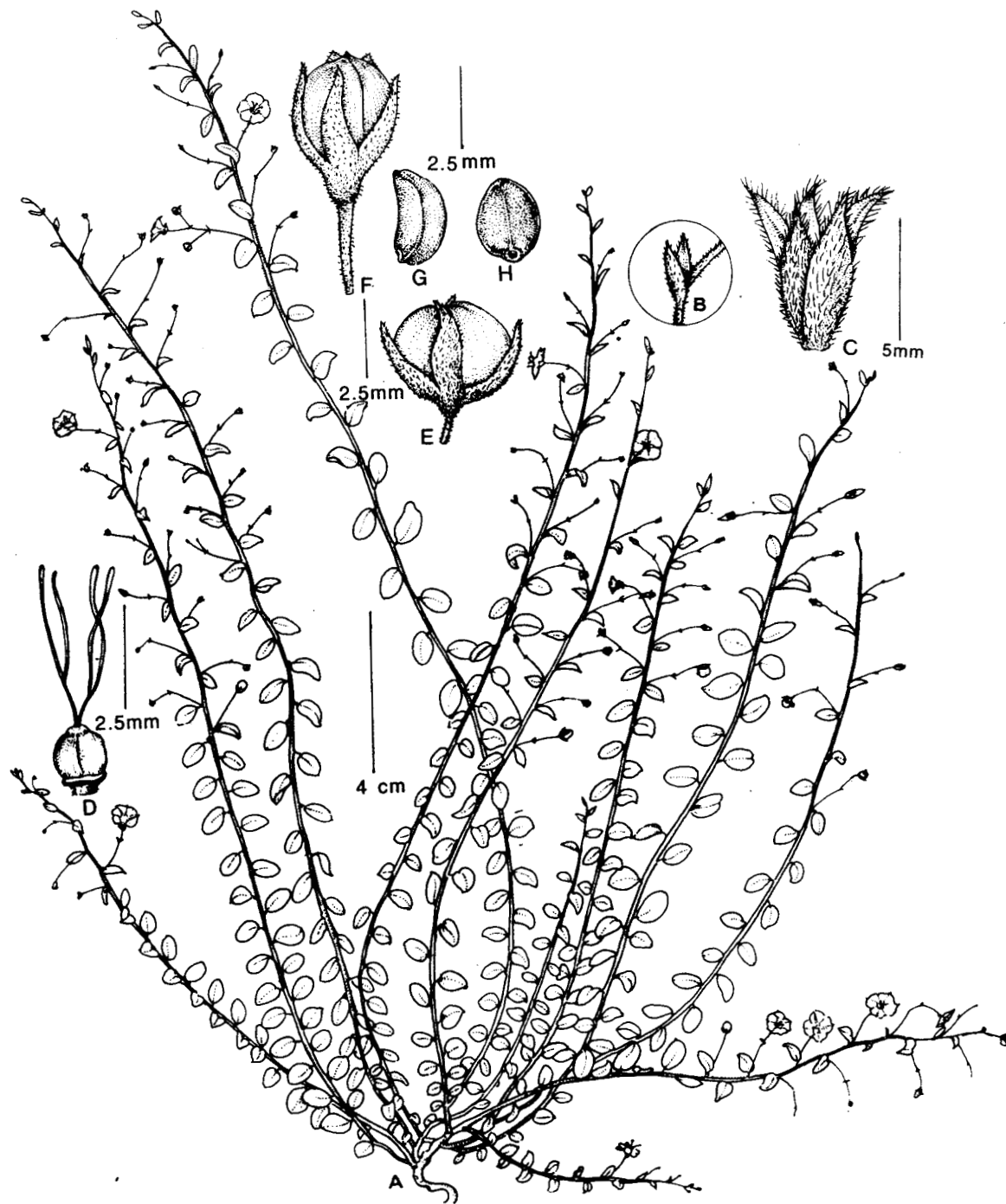


Fig. 46. *Evolvulus alsinoides*. A. Flowering and fruiting plant; B. Bracts; C. Calyx; D. Pistil; E & F. Fruits; G & H. Seeds (from Biju 22012 TBGT).

clavate. Fruits capsular, globose, 3-4 x 3-5 mm, glabrous; seeds usually 4, rarely less, 2 or 3, ovoid, 1-2 x 1-1.5 mm, apically apiculate, glabrous, pale brown to black.

Flowering : October - December(peak)

Flower opening : 8 am - 9 am

Fruiting : November - January

Distribution. A native of the American tropics which is now widely spread through out.

Ecology. The species is usually found in grassland areas but are much abundant in dry zones. In dry laterite soil, the plant shows considerable variation. Sometimes the prostrate forms will reach upto 9 feet with very small scale like leaves in the upper region.

Medicinal use. This plant has an important role in Ayurvedic medicine in India and Srilanka.

Rheede (1692) reported that this plant had been in use with the local name '*Vistnu-clandi*' (Rheede, Hort. Malab. 11: 131-132. t. 64). The plant is known today by the name '*Vishnu Kranti*'. There seems to be a lot of confusion in equating the term *Visnukranta*, *Sankhupuspi*, *Aparajita*, *Girikarni* etc. to their respective botanical sources (Sivarajan & Indira Balachandran, 1994). Certain people consider these names as synonyms. But others use them as different drugs (Aiyer & Kolammal, 1964).

The whole plant is used in medicinal preparations. It is considered an aphrodisiac and powerful brain stimulant toning up the intellectual powers. The drug is also useful in the cure of nervous debility and dysentery. Its flowers are reported to be good in the treatment of uterine bleeding and roots for gastric and duodenal ulcers (Sivarajan & Indira Balachandran, 1994).

The important preparations are *Mrtasanjivani*, *Aranyatulasimuladi Kasayam* etc.

In Ceylon the water extract of the stem and root has been used to cure almost everything from depression to dysentery. The root is considered to be febrifuge; smoking the leaves is said to be a remedy for asthma (Austin, 1980 a).

Taxonomic notes. Oostroom had maintained about 17 varieties of the species throughout their range. Most of these are intermediate and we prefer to consider these species in a broader sense. Meanwhile many of the Indian workers tried to assign the Indian materials to the Malaysian taxa, following Oostroom.

The present study suggests that many of the varieties are ecophenotypes. Oostroom's classification was solely based on the habit, indumentum of the stem and leaves, size, shape and arrangement of the leaves and length of the peduncle. A population study of the 4 forms (nearly matching Oostroom's varieties *i.e.* *alsinoides*, *hirsuta* and *decumbens*), which were available in this area was done in the experimental plot. The progeny showed considerable morphological variation especially in the size, shape and indumentum of the leaves. But the peduncle and pedicel characters are found without any variation. The two forms, *i.e.* ascending to erect plant, not having the leaves distinctly in 2 rows, *E. alsinoides* var. *alsinoides* and plant with prostrate or ascending habit and leaves more or less distinctly in 2 rows, *E. alsinoides* var. *hirsuta* showed some what constant characters. Even these varieties are difficult to be distinguished from each other in herbarium, and the characters are found to merge together so much that, they are not worthy of recognition.

Specimens examined : KERALA: Thiruvananthapuram Dt.: Ponmudi, *Biju* 15322 (TBGT); Kottur, *Joseph* 44453 (MH). Kollam Dt.: S.N. college campus, *Biju* 23946 (CALI), *Bourdillon* 1301 (University college Herbarium, TVM). Kottayam Dt.: Kangzha, *Antony* 811 (MH). Malappuram Dt.: Calicut University campus, *Biju* 44275 (CALI). Kannur Dt.: Tellichery, *Ramachandran* 57628 (MH); Bekal, *Ansari* 67940 (MH). KARNATAKA: Bangalore Dt.: *Barber* 8521 (MH); Bandipur, *Naithani* 21178 (MH). Mysore Dt.: *Thomson s.coll. s.n.* (MH); Parade Ground, *R.D.A* 50 (MH). TAMIL NADU: Kanniyakumari Dt.: Nagar Kovil, *Biju* 22012 (TBGT); Alagiyapandipuram, *Henry* 49456 (MH). Tinnevely Dt.: Courtallam, *Subramanyam* 2832 (MH), *Rama Rao* 1867 (University college Herbarium, TVM). Ramanathapuram Dt.: Valantharavai, *Balasubramaniam* 1058 (MH). Madurai Dt.: Kattupatti, *Subramanyam* 5737 (MH). Coimbatore Dt.: *Barber* 22 (MH). Pudukkottai Dt.: Adanakkottai, *Ramamurthy*

51332 (MH). Thanjavur Dt.: Thiruthuaipondi, *Ragupathy* 487 (MH). Salem Dt.: Hogainakkal, *Vajravelu* 20605 (MH). Nilgiris Dt.: Moyar R.F., *Sharma* 35583 (MH). S. Arcot Dt.: Shanikulam, *Barber* 826 (MH). N. Arcot Dt.: Thaliyar, *Viswanathan* 638 (MH). Chengallattu Dt.: *Lawson s.n.* (MH). PONDICHERY (U.T): Auroville, *Rajan* 86361, 91424 (MH). ANDHRA PRADESH: Chittoor Dt.: Komati, *Subba Rao* 45849 (MH). Cuddapah Dt. Guvalcheruvu, *Subramanyam* 6373 (MH). Kurnool Dt.: Chelama, *Ellis* 18058 (MH). Krishna Dt.: Agiripalle, *Venkanna* 5461 (MH). Godavari Dt.: Samalkota, *Barber* 4496 (MH). Medak Dt.: Narsapur, *Sebastine* 6623 (MH). Vishakhapatnam Dt.: Araku, *Balakrishnan* 10822 (MH). Adilabad Dt.: Kanchanpalli, *Ravishankar* 85229 (MH).

2. *Evolvulus nummularius* (Linn.) Linn., Sp. Pl., 2:391 1762; Ooststr., in Med. Bot. Mus. Herb. Utrecht 14:114-121. 1934 & Fl. Mal., ser. 1, 4: 558. 1958; Verdc., Fl. Trop. E. Africa 16. 1963; Sivar. & Mani., Bull. Bot. Surv. India 12:279. 1972; Stearn, Taxon 21: 649. 1972; Austin in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1:311. 1980; Mani. & Sivar Fl. Calicut 188. 1982; Rani & Matthew in Matthew, Fl. Tam. Carnatic 3:1016. 1983; Ramach. & Nair Fl. Cannanore 229. 1988; Staples in Richard A. Howard, Fl. Lesser Antilles 6 (3): 148. 1989. *Vajravelu*, Fl. Palghat Dist. 307. 1990; Mohan & Henry, Fl. Thiruvananthapuram 313. 1994.

Type: *Sloane*, Jamaica: t. 99, f.2 (lectotype, BM-SL, selected here).

Convolvulus nummularius Linn., Sp. Pl. 157. 1753.

Evolvulus veronicaefolius H.B.K. Nov. Gen. et Sp. 3:117, t. 215. 1818; Roem. & Schult. Syst. 4:193. 1820.

Evolvulus dichondroides Oliv. in Trans. Linn. Soc., Bot. 29: 117, t. 78 b. 1875.

Volvulopsis nummularium (Linn.) Roberty in Candollea 14:28. 1952.

(Fig. 47, 48, 49)

Perennial herbs; stem prostrate, rooting at nodes, terete, green in colour, pilose with short, patent curved hairs, glabrescent. Leaves simple, broad-ovate, elliptic or orbicular, 0.4-2.5 x 0.7-15 mm, apically rounded to subcordate to emarginate, basally rounded to subcordate, ciliate at base, deep green and

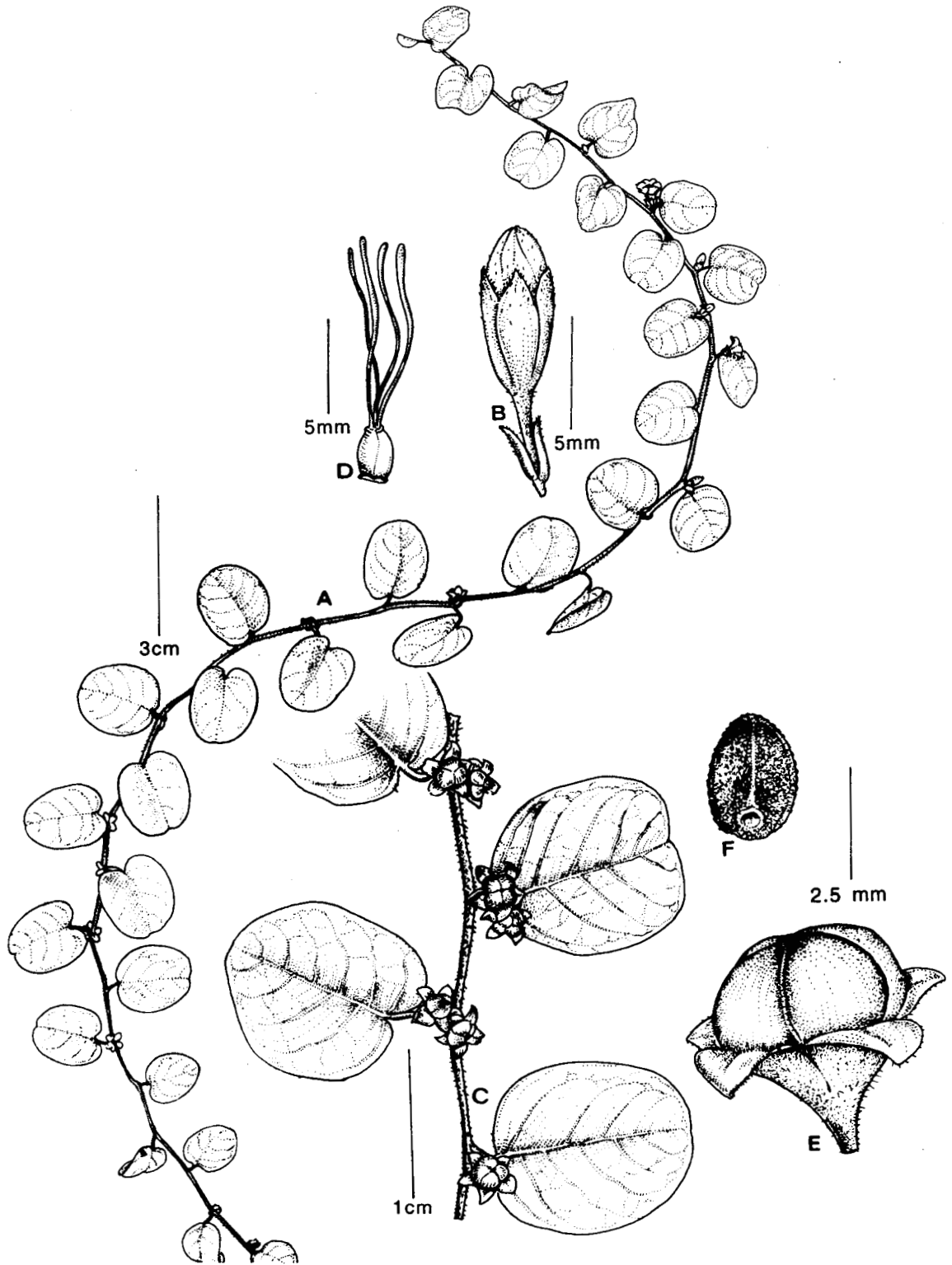


Fig. 47. *Evolvulus nummularius*. A. Flowering and fruiting twig; B. Flowering bud with bracts; C. Fruiting twig enlarged; D. Pistil; E. Fruit; F. Seed (from Biju 16237 TBGT).

glabrous above, pale green and glabrous or somewhat pubescent beneath; midrib and lateral veins raised beneath, lateral veins 4-5 pairs; petiole short, upto 7 mm long, short pilose to glabrous. Flowers axillary, solitary or 2-3 flowers in the leaf axils; peduncle none or very short; bracts 2 or 4, linear-lanceolate, 1-2 mm long, apically acute to shortly acuminate, pilose on tip and upper margins, attached to the base or middle of the pedicel; pedicels 1-2 mm long, terete, pilose to glabrous; sepals subequal, elliptic-ovate to ovate-oblong, 2-4 x 1-1.5 mm, apically acute to acuminate, sparsely pilose or glabrescent, ciliate; corolla white, without a coloured throat, rotate to broadly funnel shaped, tube 2-2.5 mm long, mouth deeply 5 lobed, 4-8 mm wide across, midpetaline bands well defined with pilose outside; stamens subexserted; anthers ovate to oblong, \pm 1mm long, anthesis between 9 am - 9.30 am, straight after dehiscence; filaments attached just below the corolla tube, unequal, 2 short, 1-1.5 mm long, 3 long, 2-2.5 mm, (rarely 3 short and 2 long), glabrous; pollen globose, smooth; ovary orbicular, 1-1.5 mm long; disc very small; style 1,2 or absent, \pm 1 mm long, glabrous; each style longitudinally bifid, 4-5 mm long, slightly subclavate tips; stigma 4. Fruit capsular, globose, 3-5 mm in diameter, 3 or 4 valved, reflexed; seeds 4, sub globose, 1.2 - 2 x 2 mm, young seeds brown with pink spots, muricate, brown to black; seed germination epigeal, hypocotyl upto 1 cm long, bicotyledonary, apically retuse, sinus absent, basally attenuate, glabrous, petiole upto 2 mm long.

Flowering : June-August

Flower opening : 8 am - 8.30 am

Fruiting : August-October

Distribution. Originally a species in America but now it is naturalized in several Old World regions including Africa, Malaysia, Ceylon and India.

Ecology. *E. nummularius* is found in a variety of disturbed sites such as grasslands, waste places, road sides, cultivated field margins. It prefers moist places and at the same time could also survive in dry laterite soil (Sivarajan & Manilal, 1972). But in the rocky areas, morphological variation such as reduction in internode length, leaf size etc. could be noticed.

Nomenclatural notes. *Evolvulus nummularius* (Linn.) Linn. is the type species of the genus *Evolvulus* which is widespread in tropical America and has been introduced into several Old World regions including Africa, Malaysia, India and Ceylon.

Verdcourt (1963) was the first to lectotypify *Convolvulus nummularius* Linn., the basionym of *Evolvulus nummularius* (Linn.) Linn. on a specimen in the Sloane herbarium, Indies, Jamaica, *Sloane* (BM-SL). Stearn (1972), Austin (1980a), and Jarvis *et al.* (1993) followed Verdcourt and cited the same Sloane material, 'Herb., *Sloane* 3, flo. 19 (BM)' as the typotype of *E. nummularius* (Powell & Staples, 1989). However, Stearn (1957) in his definition of typotype said "The type of such a name is ofcourse, the published illustration.....".

Both Verdcourt and Stearn seemed to have forgotten that the "typotype" of illustration cited by Linnaeus are not type of the Linnaeus name but 'types' of the illustration (Nicolson, Pers. Comm.).

The previous typification by Verdcourt and Stearn can be superseded because the Sloane specimen which Linnaeus had never seen, is not the original material for the name. However, the cited figure '*Sloane*, Jam. 58 hist. 1. p.157. t. 99. f. 2' is the original element.

We communicated our observation to Dr. Bernard Verdcourt (K), who agreed with the statement and wrote back, "I do not think any one will disagree with you giving the type as the figure t. 99/f.2..."

Here designate '*Sloane*, Voy. Jamaica. t. 99., f.2 (BM-SL)' as the lectotype of *Convolvulus nummularius* Linn.

Lectotype (here chosen) : *Sloane*, Voy, Jamaica : t. 99, f. 2 (BM-SL).

Specimens examined : KERALA: Thiruvananthapuram Dt.: Karamana, Biju 25984 (CALI & TBGT); Vellayani, Mohanan 52620 (MH). Kottayam Dt. Markulangara, Antony 213 (MH). Idukki Dt.: Kulamavu, Pandurangan 76678 (MH). Thrissur Dt.: Chalakudi, Sebastine 27529 (MH). Palakkad Dt.: Olavakkot, Biju 16237 (TBGT). Kannur Dt.: Ramachandran 52135; Bekkal, Ansari 67937 (MH). KARNATAKA: Bangalore Dt.: Anstad 128 (MH). TAMIL NADU: Kanniyakumari Dt.: Nesamani bridge, Henry 49560 (MH). Pudukkottai Dt.: Tirumayam, Arulappan 16 (MH). N.Arcot Dt.: Veerambakkam, Viswanathan



Fig. 2.

Convolvulus minor repens, nummularia: folio flore caeruleo.



Fig. 3.

Convolvulus rectus minor
folio angusto caudicante

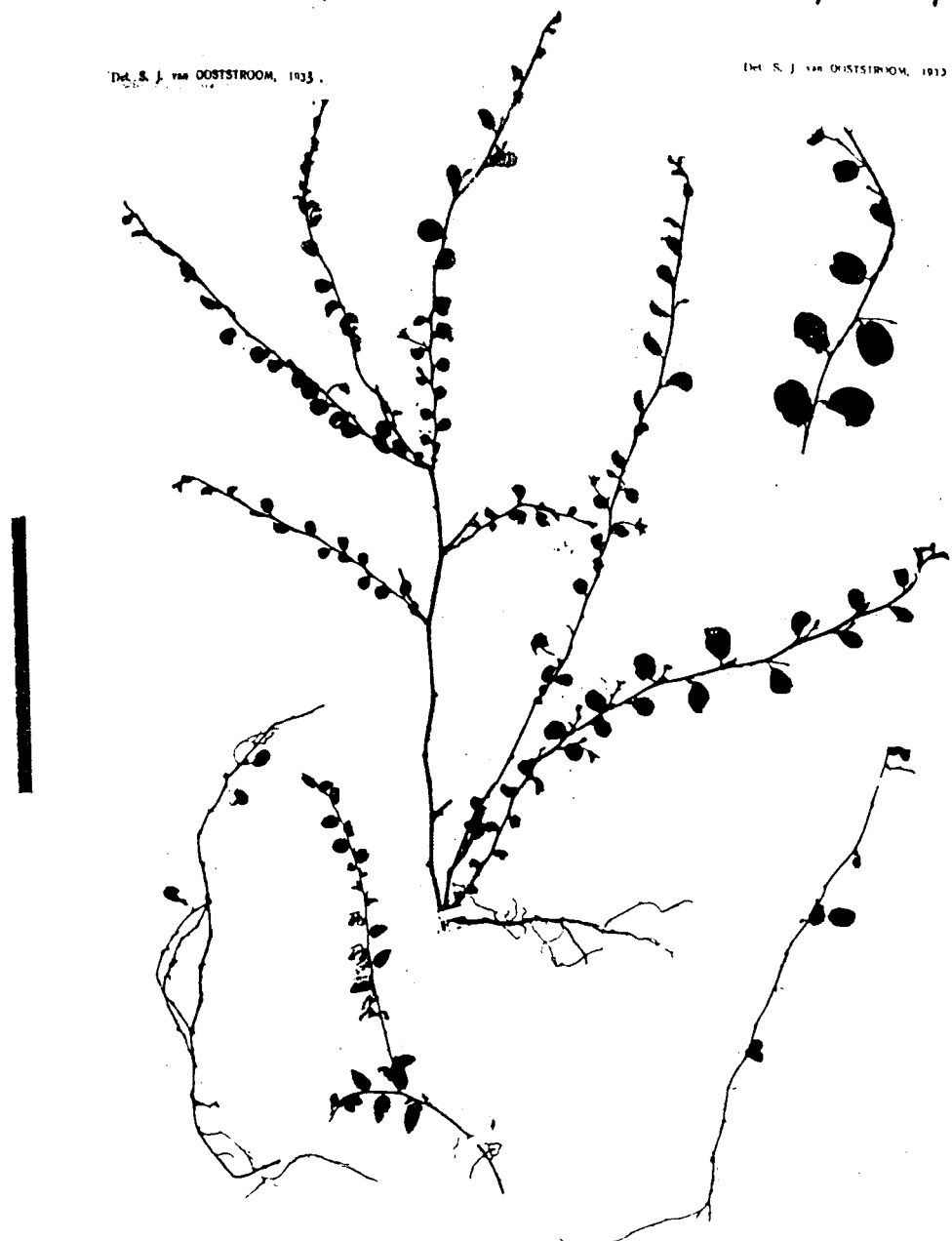
Fig. 48. Lectotype of *Convolvulus nummularius* Linn. [= *Evolvulus nummularius* (Linn.)] Linn.: Sloane, Jamaica: t. 99, f. 2 (BM - SL).

Evolvulus nummularius L.

Evolvulus glaber Spreng.

Det. S. J. VAN OOSTSTROOM, 1933.

Det. S. J. VAN OOSTSTROOM, 1933.



Leaves not too thick

Evolvulus nummularius L. Spreng. *Evolvulus glaber* Spreng.
 Bot. Tijdschr. Ned. Ind. 1877, p. 96. Bot. Tijdschr. Ned. Ind. 1878, p. 39.

Fig. 49. Typotype of *Evolvulus nummularius* (Linn.) Linn. Sloane, Herb., Indies, Jamaica, Sloane (BM).

728 (MH). Chengalpattu Dt.: Vandalur R.F., *Henry* 45570 (MH). PONDICHERRY (U.T): Auroville, *Rajan* 89787 (MH). ANDHRA PRADESH: Krishna Dt.: Gangineni, *Venkanna* 5659 (MH). E. Godavari Dt.: Tirumalaya Palam, *Subba Rao* 24511 (MH). Vishakhapatnam Dt.: Araku, *Balakrishnan s.n.* (MH).

HEWITTIA Wight & Arn.

This monotypic genus is widely distributed throughout the tropics of the Old World and also known from Jamaica.

Hewittia Wight & Arn., *Madras J. Sci.* 1 (5): 22. 1837.

Type Species : *Convolvulus malabarica* Linn. [(=*H. malabarica* (Linn.) Suresh)].

Shuterea Choisy, *Mem. Soc. Phys. Geneve* 6: 485, t.2, f.11. 1834, non *Shuteria* Wight & Arn., 1834, nom. cons.; Ooststr., *Blumea* 3 (2) : 286 1939.

Annual or biennial; stem prostrate or twining, herbaceous, pubescent. Leaves variable, entire, angular or lobed, ovate to broad-ovate, cordate or somewhat truncate at the base. Flowers axillary, in one-to few flowered (1-3) cymes; bracts 2, oblong or linear lanceolate, acuminate; sepals 5, usually acute, herbaceous, outer 3 (2+1) large, ovate, accrescent in fruit, inner 2 small, not accrescent; corolla regular, campanulate, 5 lobed; style single, hairy; stigma 2; ovary long, pubescent, 1-celled or imperfectly 2-celled at the top, 4-ovulate. Fruits capsular, 4-valved; seeds 4 or less, black.

Hewittia malabarica (Linn.) Suresh in Nicolson, Suresh & Mani., *Inter. Van Rheede's Hort. Malab.* 88. 1988.

Type: '*Kattu-Kelengu*' Rheede, *Hort. Malab.* 11: 105, t. 51. 1692 (Lectotype, fide Nicolson *et al.*).

Convolvulus malabaricus Linn., *Sp. Pl.* 155. 1753.

Convolvulus scandens Milne, *Descr. Cat.* 2. 1773.

Convolvulus sublobatus Linn.f., *Suppl. Pl.* 135. 1782.

Convolvulus bicolor Vahl, *Symb.* 3: 25. 1794, non. Desr. 1792, nomen illegit.

Ipomoea malabarica (Linn.) Roemer & Schultes, in *Linn. Syst. Nat.* 4: 235. 1819; *Blume Bijdr.*, 715. 1825.

- Argyreia malabarica* (Linn.) Choisy, Mem. Soc. Phys. Geneve 6: 420. 1834.
- Shutereia bicolor* Choisy, Mem. Soc. Phys. Geneve 6:486. 1834 (incl.? type of *Convolvulus sublobatus* Linn.f. 1782).
- Convolvulus hederaceus* Blanco, Fl. Filip. 1:90. 1837.
- Hewittia bicolor* Wight & Arn., Madras Journ. Lit. Sci. 1 (5) :22. 1837; Wight. Icon. pl. Ind. or. t. 835. 1844 - 1845 & Ill. Ind. Bot. t. 168. bis. f. 6. 1850; Clarke in Hook. f., Fl. Brit. India 4: 216. 1883; Gamble, Fl. Pres. Madras 2:294. 1923.
- Aniseia bracteata* Hassk., Pl. Jav. Rar. 516. 1848.
- Argyreia cymosa* (non Sweet) Clarke in Hook. f., Fl. Brit. India 4: 190. 1883.
- Hewittia sublobata* (Linn.f.) Kuntze, Rev. Gen. Pl. 2: 441. 1891; Ooststr., Fl. Mal., ser. 1,4; 438. 1953; Gandhi in Sald. & Nicolson, Fl. Hassan Dist. 468. 1976; Austin in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1:312. 1980; Rani & Matthew in Matthew, Fl. Tam.Carnatic 3: 1016-1017, 1983.
- Shutereia sublobata* House, Bull. Torrey Bot. Club 33:318. 1906; Ooststr., Blumea 3: (2) 287. 1939.
- Hewittia scandens* (Milne) Mabb., in Mani., Bot. Hist. Hot. Malab. 84. 1980; Mani. & Sivar., Fl. Calicut 179. 1982; Mani., Fl. Silent Valley 187. 1988.

(Fig. 50)

Annual or biennial herbs, woody at base; stem twining or prostrate, terete, pale green, densely pubescent. Leaves simple, ovate to broadly ovate, 4-13 x 2-10 cm, apically acuminate, acute or obtuse, mucronulate, basally cordate or sometimes truncate or hastate, the basal lobes entire or angular, margin entire or nearly so, short-pilose especially beneath and margin; midrib raised beneath, prominently hairy; petiole upto 7 cm long, terete. Flowers axillary, 1-3 flowered cymes; peduncle upto 8 cm long, terete, pubescent like stem; bracts oblong-lanceolate, upto 1.3 x 0.2 cm, acuminate, pubescent; pedicels upto 0.6 mm long, slightly dilated at apex; sepals unequal, outer 2 larger, broadly ovate, 1.5 - 2 x 0.8 - 1.2 cm, apically acute to acuminate, more or less hairy outside and along the margin, third single medium sized, lanceolate to ovate, more or less oblique, 1-1.7 x 0.5-0.9 cm, apically acute to acuminate, hairy outside, innermost pair small, narrowly ovate, 1-1.5 x 0.2-0.5 cm, apically

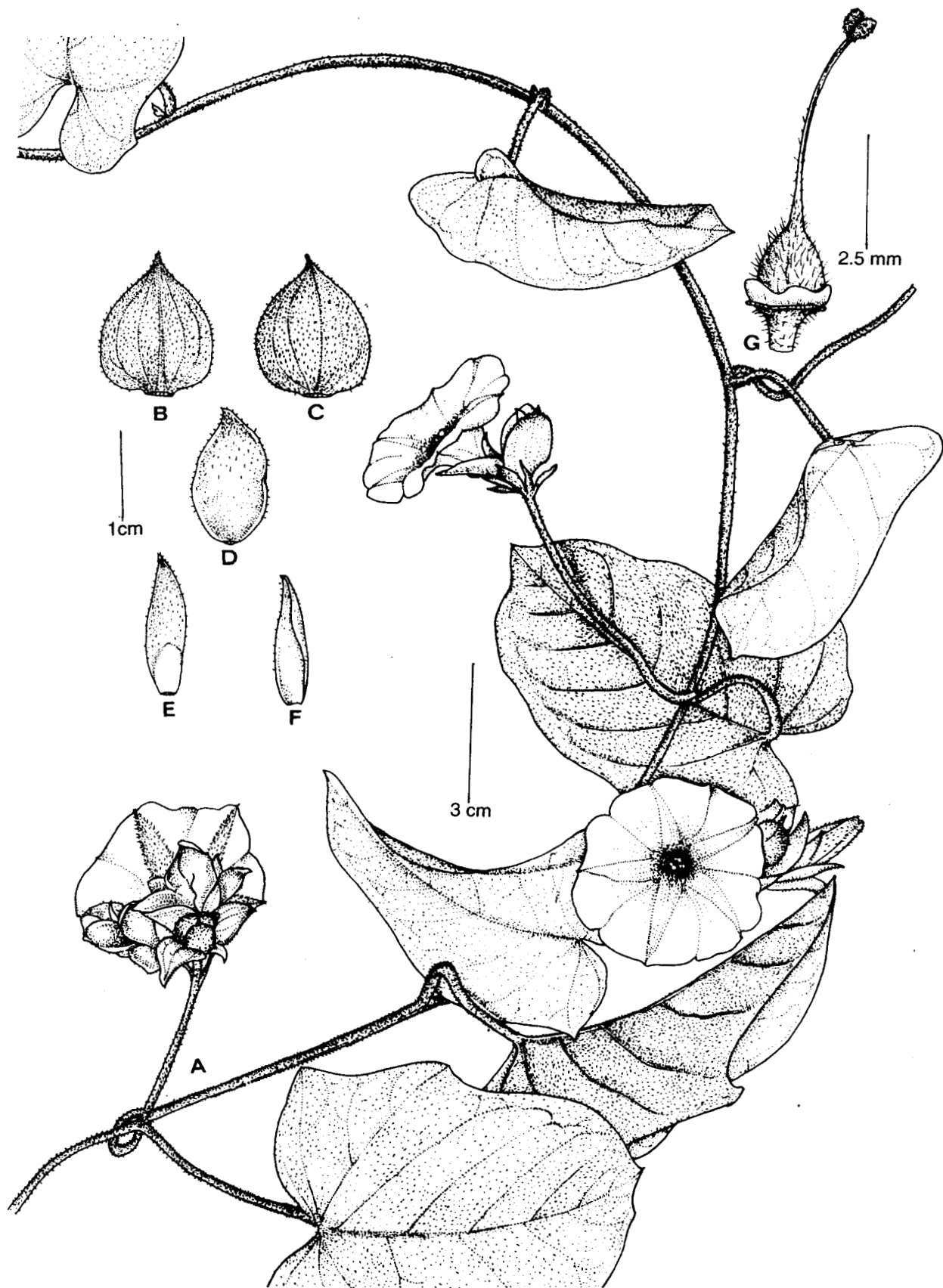


Fig. 50. *Hewettia malabarica*. A. Flowering and fruiting twig; B & C. Outer sepals; D-F. Inner sepals; G. Pistil (from Biju 23989 TBGT).



Plate 2. A & B. *Argyreia osyrensis* C. *Argyreia populifolia* D. *Bonamia semidigyna*
 E. *Cuscuta chinensis* F & G. *Cuscuta reflexa* H. *Evolvulus alsinoides* I. *Evolvulus nummularius* J. *Hewittia malabarica*.

acuminate, soft hairy; corolla pale yellow to white, with a conspicuous purple or purplish centre, campanulate, 2-2.2 cm long, mouth slightly 5 lobed, 2-2.6 cm across, midpetaline bands pilose; stamens inserted; anthers upto 3-4 mm long, yellowish white, spirally twisted after dehiscence, anthesis between 8 am - 9 am; filaments white, attached 3-4 mm above the corolla base, equal, 5-6 mm long, minutely papillate at dilated base; ovary ovoid, 1.5-2 x 1.3-1.8 mm; disc annular, 5 lobed, \pm 2 mm long; style single, inserted, upto 1-1.3 cm long, hairy at base; stigma white, oblong, papillate. Fruit capsular, depressed globose, 1-1.8 x 1-1.5 cm long, valves patently pilose, fruiting calyx persistent, outer 3 enlarged, 1-1.5 x 1-1.3 cm; seeds usually 4, very rarely less, ovate, 5-7 x 4 - 5 mm, apically obtuse, basally truncate, glabrous, often covered with ash coloured wrinkled membrane, hilum pubescent black; seed germination epigeal, hypocotyl upto 2 cm long, bicotyledonary, apically emarginate, sinus upto 7 mm deep, basally truncate, glabrous, petiole upto 8 mm long.

Flowering : September-December

Flower opening : 9 am - 9.30 am

Fruiting : October - January

Distribution. Found throughout tropical Africa, tropical Asia including India, Ceylon, China, Polynesia, Indo-China and throughout Malaysia.

Ecology. Throughout its range the plants could be found in open grasslands, thickets, hedges, waste places and way sides at low and medium altitudes.

Specimens examined : KERALA: Thiruvananthapuram Dt.: Nemom, *Biju* 23989 (CALI & TBGT). Kollam Dt.: Punalur, *Mohanan* 58457 (MH). Kottayam Dt.: Kumarakom, *Biju* 15336 (TBGT). Idukki Dt.: Cheruthony, *Mohanan* 76217 (MH). Palakkad Dt.: *s.coll.* 14268 (MH). Malappuram Dt.: Mancheri, *Ellis* 33540 (MH), Chellary, *Biju* 15257 (TBGT & CALI). Kannur Dt.: Kuthuparambu, *Ramachandran* 59174 (MH). TAMIL NADU: Kanniyakumari Dt.: Periyaruvi, *Subramanyam* 5332 (MH). Ramand Dt.: Iyyanar Koil, *Sakharama Rao* 22462 (MH). Tinnevelly Dt.: Kadayanallur, *s.coll.* 15222 (MH). Coimbatore Dt.: Noyil river side, *Chandrabose* 29033 (MH). ANDHRA PRADESH: Cuddapah Dt.: Balapalle, *Ellis* 14306 (MH). Nellore Dt.: Gudur, *Jacob* 18535 (MH). Godavari Dt.:

Amavaram, *s.coll.* 12574 (MH). Vishakhapatnam Dt.: Baranakonda, Jacob 17124 (MH), Anantagiri, Subba Rao 32816 (MH).

IPOMOEAE Linn.

It was Linnaeus (Gen.Pl.,1753) who attributed the name *Ipomoea*. The name *Ipomoea* is derived from the greek '*ips*' meaning worm that eat vines (Nayar,1985). But , according to Everett (1981) the name *Ipomoea* came from '*ips*' meaning worm and '*homios*' means resembling. Both interpretations are obscure and could not be correlated with habit or nature of the plant. The most colourful genus is popularly known by several names such as 'Morning Glory' since most of the flowers open during early morning, 'Moon flower' because in certain members the flowers open after dusk, or 'sweet -potato genus' due to the most economic potential member of the family. The earlier studies have mostly considered the genus in a restricted sense and excluded several species groups as separate genera (Austin, 1980), such as *Quamoclit* Moench (1794), *Batatas* Choisy (1834), *Calonyction* Choisy (1834), *Exogonium* Choisy(1834) and *Pharbitis* (Choisy 1834).

Ipomoea, as circumscribed by Linnaeus (1753 & 1754) is heterogenous consisting of at least two distinct elements, currently known as *Merremia* and *Ipomoea*. (For more detailed generic history see under *Merremia*).

Ipomoea Linn., Sp. Pl.159.1753 & Gen.Pl.ed. 5,76. 1754; Choisy, Mem. Soc.Phys. Geneve 6:444.1833;Benth., Fl. Australia 4:412.1869; Benth.&Hook., Gen. Pl. 2:870.1876; Clarke in Hook.f., Fl.Brit. India 4: 196.1883; Hall.f. in Engl., Bot. Jahrb. 16:583. 1893; Trimen, Handb. Fl. Ceylon 3:210. 1895; Ridley, Fl. Malay Penins. 2:459. 1923; Ooststr., Blumea 3(3): 481. 1940 & Fl. Mal., ser.1,4: 458.1953; Verdc., Fl.Trop. E. Africa 81.1963; Austin in Nasir & Ali, Fl. W. Pakistan 126: 34. 1979 & in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1:313. 1980; Johri, Journ. Econ. Tax. Bot. 5 (3) : 1113-1142. 1984.

Type Species: *Ipomoea pes-tigridis* Linn. (Lectotype).

- Quamoclit* Moench, Meth. Bot. 453.1794; Choisy, Mem. Soc.Phys. Geneve 6: 433. 1833; Prain, Journ. As. Soc. Bengal 74:318.1906. Lectotype: *Ipomoea coccinea* Linn.
- Batatas* Choisy, Mem.Soc.Phys. Geneve 6: 434.1833 & in DC., Prodr. 9:337. 1845. Lectotype : *B. edulis* Choisy [= *Ipomoea batatas* (Linn.) Lam.].
- Pharbitis* Choisy, Mem. Soc. Phys. Geneve 6: 438. 1833 & in DC., Prodr. 9:341. 1845. Lectotype: *P. hispida* Choisy [= *Ipomoea purpurea* (Linn.) Roth].
- Calonyction* Choisy, Mem. Soc. Phys. Geneve 6:441.1833; Hall. f. in Engl., Bot. Jahrb. 16: 583. 1893. Lectotype: *C. speciosum* Choisy (= *Ipomoea alba* Linn.).
- Exogonium* Choisy, Mem. Soc. Phys. Geneve 6:443.1833.Lectotype: *Ipomoea bracteata* Cav.

Vines, shrubs or trees, usually twining, sometimes prostrate or floating. Leaves variable in shape and size, entire, lobed, divided or rarely compound; petiole sometimes with pseudostipules. Flowers axillary, 1- few or many flowered cymose or paniculate clusters; bracts various; sepals 5, herbaceous or subcoriaceous, shape various, ovate to lanceolate, linear or elliptic, apically obtuse or acute to acuminate or shortly to long aristate, equal or unequal, glabrous or pubescent, persistent or sometimes enlarged in the fruit; corolla regular or slightly zygomorphic, campanulate, funnel-shaped, less often tubular or salverform, midpetaline bands well defined, white, purple, pink, red or yellow; stamens inserted or exserted; anthers ovate, oblong or linear; filaments filiform or dilated at the base with short to long ciliate, mostly unequal in length; pollen globular, spinulose; ovary usually 2 or 4-celled, rarely 3-celled, 4-ovuled, rarely 6-ovuled; style filiform, inserted or exserted, glabrous, slightly dilated at base; stigma capitate, entire or 2-3 globular. Fruits capsular, globose or ovoid, mostly 4 or rarely 6-valved, sometimes splitting irregularly or indehiscent; seeds 4(1-6) glabrous or pubescent.

Distribution and Ecology. *Ipomoea* is the largest genus complex in the family Convolvulaceae, with about 500 species, distributed throughout the tropics of the Old and New World. The genus is represented by 55 species in India (Johri, 1983), of which 31 species occur in the Southern Peninsular part. Most of them are herbaceous, shrubby and tree species and grow along roadsides,

wastelands, scrub jungles and forests. Several species have been introduced to India as ornamentals, a few have become naturalized.

Infrageneric classification

The basic element for an infrageneric classification of this genus began with the publications of Choisy (1838,1845). Several of the units proposed by Choisy have subsequently been altered (Grisebach, 1864; Meisner, 1869; Clarke, 1883).

Hallier (1893) was the first to make a comprehensive infrageneric classification of the genus *Ipomoea*. This was followed for more than fifteen years. He recognised 6 sections in the genus, such as *Calycanthemum* (Klotsch) Hall. f., *Dasychaetia* Hall. f., *Pharbitis* (Choisy) Hall.f., *Batatas* (Choisy) Hall.f., *Leiocalyx* Hall.f. and *Eriospermum* Hall. f., primarily based on the habit, inflorescence, flowers and even seed characters. In 1922 Hallier mentioned *Calonyction* and *Quamoclit* as subsections of the section *Leiocalyx i.e Ipomoea* sect. *Leiocalyx*, subsect. *Calonyction* (Choisy) Hall.f., and sect. *Leiocalyx*, subsect. *Quamoclit* (Moench) Hall.f.

Roberty (1952) had proposed five subgenera and renamed several groups superfluously (Verdcourt, 1957). Subsequently Peter (1891) proposed 18 sections based chiefly on those of Choisy (1845). Ooststroom (1953) and Verdcourt (1957, 1963) proposed most realistic interpretation of *Ipomoea* based on the Old World taxa. Austin(1975a,1979,1980b) and Austin & Huamar(1996) did the New World subdivision of *Ipomoea*. Austin (1980 a) grouped the 31 species of Ceylon into 7 sections. Most of the placements of these species are disagreed by Ooststroom and Verdcourt.

Here, we don't intend to discuss the circumscription and delimitation of all these sections. But our critical studies of live and herbarium specimens revealed that the sectional classification in this genus need a detailed revision of the Old World taxa especially the Indian taxa.

KEY TO THE SECTION

- 1a. Inflorescence few to several flowered scorpioid
or dichasial cymes; corolla salver- shaped;
stamens and style well exerted..... sect. **Mina**
- 1b. Inflorescence solitary, compound, paniculate or
capitate cymes; corolla funnel-shaped or tubular;
stamens and style inserted or subexserted..... 2
- 2a. Plants muricate. Flowers nocturnal; sepals long
aristate; corolla large, tube long..... sect. **Calonyction**
- 2b. Plants glabrous, pubescent, pilose or hirsute.
Flowers diurnal (except *l.pileata* and *l.macrantha*),
sepals vary; corolla small or medium size..... 3
- 3a. Sepals verrucose or cristate on the
back, glabrous..... sect. **Erpipomoea**
- 3b. Sepals smooth, glabrous to hirsute..... 4
- 4a. Plants glabrous or rarely pubescent.
Sepals mostly obtuse or orbicular, convex.
Seeds tomentose to villous..... sect. **Eriospermum**
- 4b. Plants pubescent to hispid. Sepals oblong,
ovate, lanceolate or linear..... 5
- 5a. Sepals oblong, mucronulate, subcoriaceous..... sect. **Batatas**
- 5b. Sepals ovate, lanceolate or linear-lanceolate..... 6
- 6a. Plants pilose. Flowers pedunculate or sessile
cymes; sepals ovate or linear,
apically acute, pilose..... sect. **Orthipomoea**
- 6b. Plants pubescent or hispid. Flowers pedunculate
cymes; sepals lanceolate or
linear-lanceolate, hirsute..... 7

- 7a. Flowers in dense capitate pedunculate heads;
 outer bracts large, involucrent..... sect **Ipomoea**
- 7b. Flowers not in capitate heads; bracts small,
 lanceolate or linear..... sect. **Pharbitis**

Table 5. Sectional placement of Southern Peninsular Indian species of *Ipomoea* by different authors

Species	Ooststroom (1953)	Verdcourt (1963)	Austin (1980a)	Present study (1996)
<i>Ipomoea alba</i>	<i>Calonyction</i>	<i>Calonyction</i>	<i>Calonyction</i>	<i>Calonyction</i>
<i>Ipomoea aquatica</i>	<i>Leiocalyx</i>	<i>Erpipomoea</i>	<i>Erpipomoea</i>	<i>Erpipomoea</i>
<i>Ipomoea asarifolia</i>	<i>Leiocalyx</i>	-	<i>Erpipomoea</i>	<i>Erpipomoea</i>
<i>Ipomoea barlerioides</i>	-	-	-	<i>Pharbitis</i>
<i>Ipomoea batatas</i>	<i>Batatas</i>	<i>Batatas</i>	<i>Batatas</i>	<i>Batatas</i>
<i>Ipomoea cairica</i>	<i>Leiocalyx</i>	<i>Erpipomoea</i>	<i>Orthipomoea</i>	<i>Erpipomoea</i>
<i>Ipomoea campanulata</i>	<i>Eriospermum</i>	-	*	<i>Eriospermum</i>
<i>Ipomoea carnea</i>				
ssp. <i>fistulosa</i>	-	-	<i>Eriospermum</i>	<i>Eriospermum</i>
<i>Ipomoea coptica</i>	<i>Leiocalyx</i>	<i>Erpipomoea</i>	<i>Orthipomoea</i>	<i>Erpipomoea</i>
<i>Ipomoea deccana</i>	-	-	*	<i>Ipomoea</i>
<i>Ipomoea dichroa</i>	-	-	-	<i>Ipomoea</i>
<i>Ipomoea eriocarpa</i>	<i>Calycanthemum</i>	<i>Orthipomoea</i>	<i>Ipomoea</i>	<i>Orthipomoea</i>
<i>Ipomoea hederifolia</i>	<i>Quamoclit</i>	<i>Quamoclit</i>	<i>Quamoclit</i>	<i>Mina</i>
<i>Ipomoea horsfalliae</i>	<i>Eriospermum</i>	-	<i>Eriospermum</i>	<i>Eriospermum</i>
<i>Ipomoea indica</i>	sect. <i>Pharbitis</i>	<i>Pharbitis</i>	<i>Ipomoea</i>	<i>Pharbitis</i>
	subsect. <i>Chrisanthae</i>			
<i>Ipomoea laciniata</i>	-	-	-	<i>Erpipomoea</i>
<i>Ipomoea macrantha</i>	<i>Eriospermum</i>	-	<i>Eriospermum</i>	<i>Eriospermum</i>
<i>Ipomoea marginata</i>	<i>Leiocalyx</i>	<i>Erpipomoea</i>	<i>Orthipomoea</i>	<i>Erpipomoea</i>

<i>Ipomoea mauritiana</i>	<i>Eriospermum</i>	<i>Eriospermum</i>	<i>Eriospermum</i>	<i>Eriospermum</i>
<i>Ipomoea mombassana</i>	-	<i>Orthipomoea</i>	-	<i>Orthipomoea</i>
<i>Ipomoea nil</i>	sect. <i>Pharbitis</i> subsect. <i>Chorisanthae</i>	<i>Pharbitis</i>	<i>Ipomoea</i>	<i>Pharbitis</i>
<i>Ipomoea obscura</i>	<i>Leiocalyx</i>	<i>Erpipomoea</i>	*	<i>Erpipomoea</i>
<i>Ipomoea parasitica</i>	-	-	-	<i>Pharbitis</i>
<i>Ipomoea pes-caprae</i>	<i>Leiocalyx</i>	<i>Erpipomoea</i>	<i>Erpipomoea</i>	<i>Erpipomoea</i>
<i>Ipomoea pes-tigridis</i>	sect. <i>Pharbitis</i> subsect. <i>Cephalanthae</i>	<i>Ipomoea</i>	<i>Ipomoea</i>	<i>Ipomoea</i>
<i>Ipomoea pileata</i>	sect. <i>Pharbitis</i> subsect. <i>Cephalanthae</i>	<i>Involucratae</i>	<i>Ipomoea</i>	<i>Ipomoea</i>
<i>Ipomoea quamoclit</i>	<i>Quamoclit</i>	-	<i>Quamoclit</i>	<i>Mina</i>
<i>Ipomoea staphylina</i>	-	-	<i>Orthipomoea</i>	<i>Eriospermum</i>
<i>Ipomoea triloba</i>	<i>Batatas</i>	-	<i>Batatas</i>	<i>Batatas</i>
<i>Ipomoea turbinata</i>	-	-	<i>Calonyction</i>	<i>Calonyction</i>
<i>Ipomoea wightii</i>	-	<i>Ipomoea</i>	<i>Ipomoea</i>	<i>Ipomoea</i>

*Austin (1980 a) described the species from Ceylon, but not included in the sectional classification.

Table 2. Species under different sections

sect. Ipomoea	<i>Ipomoea deccana</i> <i>Ipomoea dichroa</i> <i>Ipomoea pes-tigridis</i> <i>Ipomoea pileata</i> <i>Ipomoea wightii</i>
sect. Batatas	<i>Ipomoea batatas</i> <i>Ipomoea triloba</i>

sect. **Calonyction**

Ipomoea alba
Ipomoea turbinata

sect. **Eriospermum**

Ipomoea campanulata
Ipomoea carnea
Ipomoea horsfalliae
Ipomoea macrantha
Ipomoea mauritiana
Ipomoea staphylina

sect. **Erpipomoea**

Ipomoea aquatica
Ipomoea asarifolia
Ipomoea cairica
Ipomoea coptica
Ipomoea laciniata
Ipomoea marginata
Ipomoea pes-caprae
Ipomoea obscura

sect. **Orthipomoea**

Ipomoea eriocarpa
Ipomoea mombassana

sect. **Pharbitis**

Ipomoea barlerioides
Ipomoea indica
Ipomoea nil
Ipomoea parasitica

sect. **Mina**

Ipomoea hederifolia
Ipomoea quamoclit

Ipomoea sect. Ipomoea

Type Species : *I. pes-tigridis* Linn.

Ipomoea subsect. *Cephalanthae* (Choisy) Hall.f. in Engl., Bot.Jahrb.18:131.1893;
Ooststr., Blumea 3(3): 484,504.1940.

Ipomoea sect. *Strophipomoea* Choisy in DC., Prodr.9:363.1845.

Ipomoea sect. *Cephalanthae* Baker & Rendle in This.-Dyer., Fl. Trop. Africa
4 (2) : 131. 1905.

Ipomoea sect. *Involucratae* Baker & Rendle in This.-Dyer., Fl. Trop. Africa
4(2):130.1905; Verdc., Taxon 6:152.1957 & Fl.Trop.E.Africa 81.1963.

Annual herbaceous vines; stem twining or prostrate, pubescent to pilose. Leaves simple, entire or dentate to deeply lobed, 2-9 x 1-11 cm, pubescent, tomentose or hispid. Flowers axillary, capitate heads; bracts foliaceous or small, pubescent; sepals subequal, pubescent or hispid; corolla funnel-shaped or campanulate, upto 1.7 cm long, midpetaline bands pilose outside; stamens inserted; filaments unequal. Fruits capsular; seeds generally pubescent (rarely glabrous).

Notes. Hallier (1893 b) recognised two subsections in the section *Pharbitis* (Choisy) Griseb., namely subsect. *Chorisanthae* and subsect. *Cephalanthae*. Ooststroom (1940, 1953) in his revision of Malaysian Convolvulaceae, accepted Hallier's subsections and included *Ipomoea pes-tigridis* and *I. pileata* in subsect. *Cephalanthae*.

Baker and Rendle (1905) recognised a new section in the subgenus *Ipomoea* as sect. *Involucratae*, distinguished from the allied section *Ipomoea* by their involucre bracts. Verdcourt (1957,1963) in his revision of African Convolvulaceae followed Baker and Rendle's (1905) treatment. Austin (1979, 1980 b) found that section *Involucratae*, differ only in the size of the bracts, therefore united it to the section *Ipomoea* and gave a series status to it.

The present study follows Austin's interpretation of the section *Ipomoea*.

KEY TO THE SERIES

- 1a. Outer bracts large, 3-5.5 x 3-4 cm, foliaceous,
outer 2 enclosing the inflorescence..... series *Involucratae*
- 1b. Outer bracts small, 0.6-1.7 x 0.3 -0.7 cm, lanceolate
or linear- lanceolate, not enclosing
the inflorescence..... series *Ipomoea*

Ipomoea sect. Ipomoea series Ipomoea

Annual herbaceous vines; stem twining or prostrate, pubescent to hirsute. Leaves simple, lobed, cottony tomentose or strigose beneath. Flowers axillary, few flowered heads; outer bracts medium sized; corolla pink or white, upto 3 cm long, campanulate. Seeds glabrous to pubescent.

The series *Ipomoea* is represented by three species (*I. dichroa*, *I. pes-tigridis* and *I. wightii*) in Peninsular India.

KEY TO THE SPECIES

- 1a. Leaves pubescent to strigose beneath. Outer
bracts more than 5mm wide; flowers white.
Seeds greyish pubescent..... 2. ***I. pes-tigridis***
- 1b. Leaves cottony-tomentose beneath. Outer bracts
less than 5 mm wide; flowers magenta
or mauve. Seeds glabrous or pubescent..... 2
- 2a. Leaves membranaceous. Bracts less than
7 mm long. Seeds velvety, white-pubescent..... 1. ***I. dichroa***
- 2b. Leaves coriaceous. Bracts more than 7 mm long.
Seeds black, glabrous to pubescent..... 3. ***I. wightii***

1. ***Ipomoea dichroa*** (Roem. & Schultes) Choisy in DC., Prodr. 9: 364. 1845;
Rani & Matthew in Matthew, Fl. Tam. Carnatic 3:1026.1983.

Type: not found

Convolvulus dichrous Roemer. & Schultes in Linn., Syst. Veg. 4:263.1819.

Ipomoea pilosa Sweet, Hort. Brit. ed.2.372. 1830 non Hoult. 1777. nec Cav. 1791-1801; Wight, Icon.pl. Ind. or. t. 837.1844-1845; Clarke in Hook. f., Fl. Brit. India 4:213.1883; Gamble, Fl.Pres. Madras 2:914.1923.

Ipomoea arachnosperma Welw., Apont. 588. 1859; Verdc., Fl. Trop. E.Africa 112.1963; Vickery, Enum. Fl. Plants of Nepal 3: 106.1982.

(Fig. 51)

Annual herbs; stem twining or prostrate, terete, hirsute. Leaves simple, membranaceous, ovate, 4-7 x 5-8 cm, apically acute to acuminate, mucronulate, basally cordate, margin dentate or deeply 3 lobed, rarely entire, pubescent above, white cottony tomentose below; midrib and lateral veins not conspicuous; petiole upto 5 cm long, densely hirsute. Flowers axillary, few to many (1-4) flowered cymes; peduncle upto 3 cm long, velutinous; bracts linear-ovate, 6 x 2 mm, apically acuminate, pilose; pedicels short, upto 7 mm long; sepals subequal, outer 3 short, 1-1.3 x 0.2-0.3 cm, inner 2 long, 1.5-1.7 x 0.1-0.2, linear-ovate, apically long acuminate to aristate, densely yellowish pilose outside, sparsely pubescent inside; corolla pink, funnel shaped, tube upto 2 cm long, limb 5 lobed, mouth 1.5 cm across, pilose outside; stamens inserted; anthers upto 2.8 mm long; filaments subequal, 2 long, upto 8 mm, 3 short, upto 6.8 mm, attached 4.5 mm above the corolla base, ciliate at the slightly dilated base; ovary conical, 2-2.2 x 1-1.8 mm, glabrous; nectary disc small, 1 mm; style single, upto 1 cm long, glabrous, dilated at base; stigma biglobose, papillate. Fruits capsular, globose, 0.9-1.2 x 0.8-1 cm, valves papery, straw coloured, glabrous; seeds 4, ovoid, 5-5.5 x 3-4.2 mm, densely sericeous or white-cottony, often with long arachnoid hairs along the edges, attached each other.

Flowering : November- February

Fruiting : December-March

Distribution. *Ipomoea dichroa* is distributed in the tropical Africa and India. In Peninsular India, it is not common and collected only from semi-evergreen forests of Wayanad.

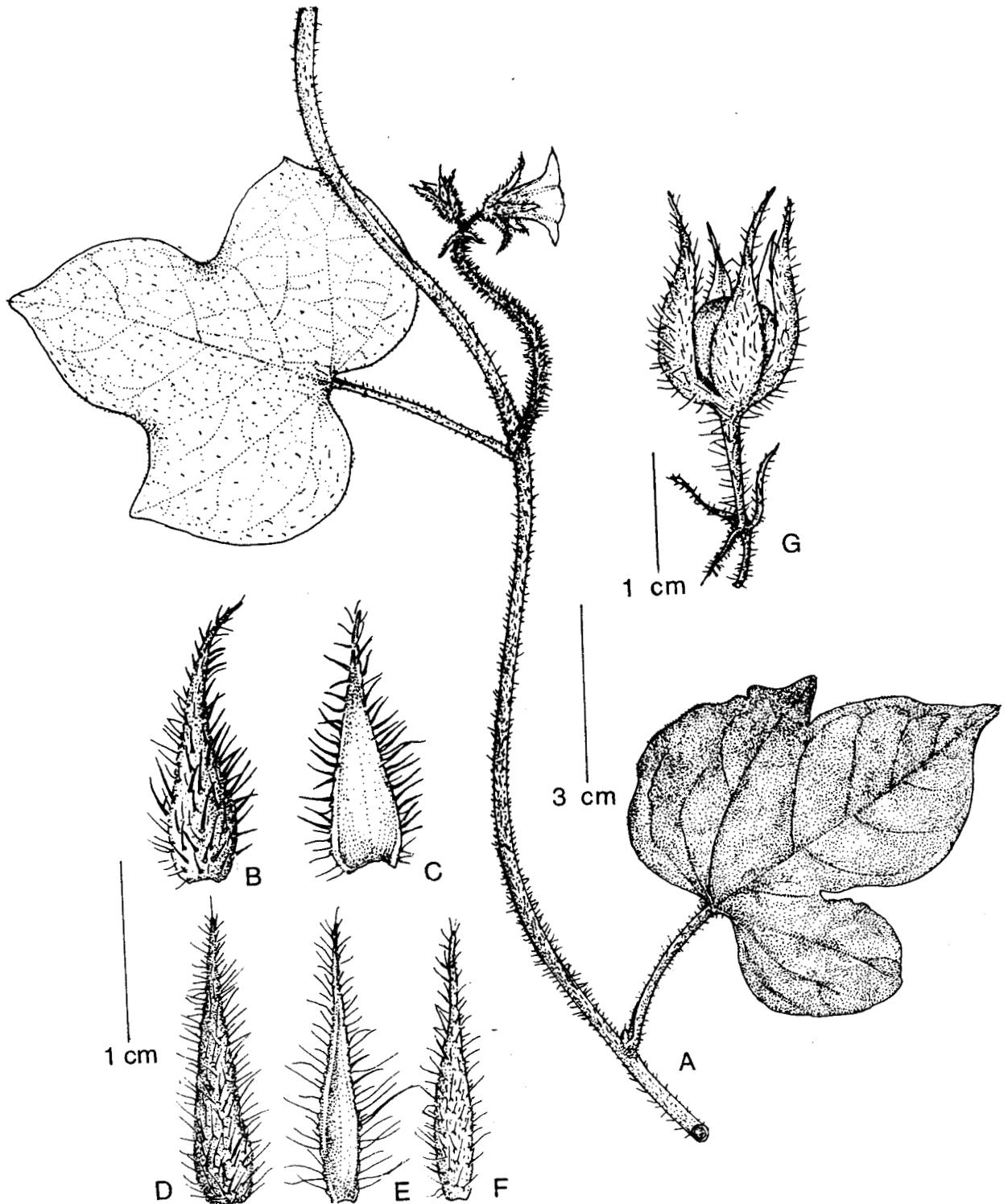


Fig. 51. *Ipomoea dichroa*. A. Flowering twig; B & C. Outer sepals; D-F. Inner sepals; G. Fruit (from Biju 44253 TBGT).

Ecology. In Southern Peninsular India, it usually occurs at higher elevation (300 -1250m) and prefers moist semi-shady situations along forest fringes and ghat roadsides.

Specimens examined : KERALA: Wayanad Dt.: on the way to Mananthavady, *Biju* 44253 (TBGT). TAMILNADU: Coimbatore Dt.: Aliyar, *Sebastine* 15331 (MH); Kuridimalai, *Subramanyam* 1747, 1602 (MH). Salem Dt.: Hogainakkal, *Vajravelu* 21943 (MH). Nilgiris Dt.: Thengumavada, *Subba Rao* 37463 (MH).

2. *Ipomoea pes-tigridis* Linn., Sp.Pl.162.1753; Roxb., Fl.India 2 :93. 1824; Wight, Icon.pl.Ind.or.t 836.1844 - 45; Choisy in DC., Prodr. 9:363. 1845; Thw., Enum.pl.zeyl.212.1860; Dalz. & Gibs., Bombay Fl.165. 1973; Clarke in Hook.f., Fl.Brit. India 4:204. 1883; Trimen, Handb. Fl. Ceylon 3:216.1895; Gamble, Fl. Pres. Madras 2:914.1923; Ooststr., Blumea 3 (3) : 504. 1940 & Fl. Mal., ser. 1, 4: 467. 1953; Verdc., Fl. Trop. E. Africa 108.1963; Austin in Nasir & Ali, Fl.W. Pakistan 46.1979; Austin in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1 : 336.1980; Mani. & Sivar., Fl. Calicut 184. 1982; Rani & Matthew in Matthew, Fl. Tam. Carnatic 3 : 1031. 1983; Chand. & Nair, Fl. Coimbatore 196.1887; Ramach. & Nair, Fl. Cannanore 304.1988; Vajravelu, Fl. Palghat Dist. 311. 1990 ; Mohan & Henry, Fl. Thiruvananthapuram 316.1994.

Type: Ceylon, *Hermann* herbarium 4:82 (BM, lectotype fide Verdcourt).

Convolvulus pes-tigridis (Linn.) Spreng., Syst. Veg. 1:502,1824.

-*Pulli-schovadui* Rheede, Hort.Malab. 11.121, t, 59.1692.

Vernacular names: Mal. *Pulichuvatu*; Tam. *Pulichuvadi*, *Punaikkairai*; Tel. *Chikunuvvu*, *Mekamadugu*.

(Fig. 52)

Annual, herbaceous vines; stem twining or sometimes prostrate, terete, hollow, covered with long spreading golden bristly trichomes. Leaves ovate, orbicular or transversely elliptic in outline, 3-9 x 4-11 cm, entire, dentate to deeply 3-9 lobed, lobes oblong-elliptic, elliptic or broadly elliptic, 3-5.5 x 2.5-6.5cm, apically acute to acuminate, mucronulate, basally attenuate,

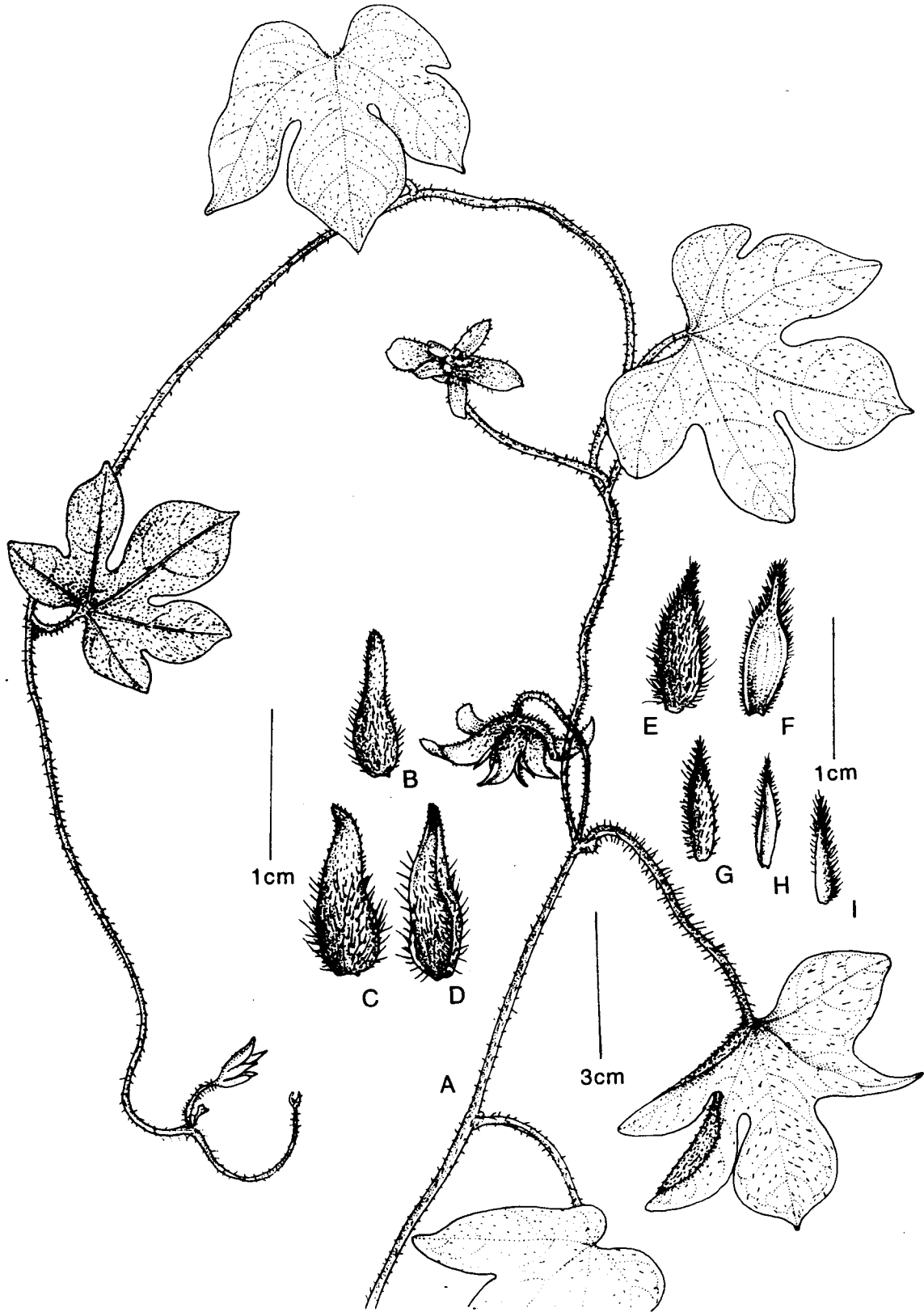


Fig. 52. *Ipomoea pes-tigridis*. A. Fruiting twig; B-D. Bracts; E & F. Outer sepals; G-I. Inner sepals (from Biju 16267 TBGT).

pubescent to strigose on both surfaces; midrib and lateral veins raised beneath; petiole upto 6 cm long, pubescent like stem. Flowers axillary, few to (1-4) flowered heads, enclosed with foliaceous bracts, outer 2 bracts large, oblong, 1.5-1.7 x 0.5-0.7 cm, inner 4 small, oblong - lanceolate, 1-1.4 x 0.3 -0.4 cm, all are apically acute, slightly obtuse, strigose on outside, long trichomes middle to below, inner side pubescent, ciliate at margins; peduncle 3-14 cm long; pedicels sessile or upto 2 mm long, pubescent like stem; sepals herbaceous, subequal, outer 2 lanceolate, 0.8-1 x 0.2-0.3 cm, apically long acuminate, long golden hairy outside, glabrous inside except the apex, inner 3 small, linear-lanceolate, 0.6-0.7 x 0.1-0.2 cm, apically acuminate, hairy outside, glabrous inside; corolla white, funnelform, tube upto 3 cm long, midpetaline bands pilose outside, upto 1.6 cm across, mouth slightly lobed; stamens inserted; anthers upto 1 mm long; filaments attached 2 mm above the corolla base, subequal, 5-6 mm long, ciliolate at slightly dilated base; ovary small, conical $\pm 1 \times 1$ mm, glabrous; disc small, slightly lobed; style upto 1 cm long, glabrous; stigma biglobose, $\pm 1 \times 1$ mm, papillate. Fruit capsular, ovoid, 7-8 x 6-7 mm, straw coloured, enclosed with enlarged bracts; seeds 4, black, 3 x 2.5 mm, grayish pubescent; seed germination epigeal, hypocotyl upto 2 cm long, bicotyledonary, apically obcordate, sinus upto 1 cm deep, basally truncate, glabrous, petiole upto 8 mm long.

Flowering : April - November

Fruiting : October - January

Distribution. *Ipomoea pes-tigridis*, popularly called 'tiger foot' is probably a native of Ceylon, now widely distributed in tropical Africa and Asia.

Ecology. It occurs almost throughout India in the plains, also extending to an elevation of 1000m, as an undergrowth in deciduous forests and disturbed sites such as grasslands and roadsides. Sen and Bhati (1980) reported it as a serious weed in the cultivated fields of arid zones.

Notes. This species appears to have great plasticity in the morphology of leaves and seeds in different populations or even in the same plant. It is a creeper but often climbs on any supports and when trailing on the ground it forms a dense mat. The species is autogamous (Sen & Bhati, 1980) and self -

compatible. The pollination and fertilisation takes place even before the flower opens (Sen & Bhati, 1980).

Specimens examined : KERALA: Thiruvananthapuram Dt.: Pattom, *Biju* 25951 (CALI). Kollam Dt.: S.N. College campus, *Biju* 16267 (TBGT). Kottayam Dt.: Manganam, *Antony* 852 (MH). Ernakulam Dt.: Cochin, *Lawson s.n.* (MH). Idukki Dt.: Chinnar, *Biju* 15383 (TBGT). Palakkad Dt.: Walayar Dam site, *Joseph* 17074 (MH). Kannur Dt.: Aralam farm, *Ramachandran* 58657 (MH). TAMIL NADU: Kamarajar Dt.: Senbagatope R.F., *Srinivasan* 79794 (MH); Srivilliputtur, *Balasubramaniam* 1240 (MH). Coimbatore Dt.: Maruthumalai, *Sebastine* 433 (MH). Salem Dt.: Narayanaswami 2990 (MH). S. Arcot Dt.: Pitchavaram, *Raju & Ranganath* 17840 (MH). N. Arcot Dt.: Vaniyambadi area, *Vajravelu* 52002 (MH). KARNATAKA: Bellary Dt.: Hagari, *s.n.* 13800 (MH). PONDICHERRY (U.T.): Auroville, *Rajan* 88071 (MH). ANDHRA PRADESH: Chittoor Dt.: Tirupati hills, *Sakharam Rao s.n.* (MH). Anantapur Dt.: Bukkapatnam, *Yesoda* 610 (MH). Kurnool Dt.: Nallamalais, *Ellis* 32395 (MH). Godavari Dt.: Sirivaka, *Barbar* 4993 (MH). Medak Dt.: Ooracheroo lake side, *Sebastine* 6777 (MH). Karimnagar Dt.: Aklasapur, *Rajendra Prasad* 89 (MH). Vishakhapatnam Dt.: Srungavarapukota, *Subba Rao* 21804 (MH).

3. *Ipomoea wightii* (Wall.) Choisy, Mem. Soc. Phys. Geneve 6: 470. 1834; Wight, Icon. pl. Ind. or. t. 1364. 1848; Thw., Enum. pl. zeyl. 212. 1860; Clarke in Hook. f, Fl. Brit. India 4:203. 1883; Trimen, Handb. Fl. Ceylon 3:216. 1895; Gamble, Fl. Pres. Madras 2:914. 1923; Verdc., Fl. Trop. E. Africa 110. 1963; Austin in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1:343. 1980; Rani & Matthew in Matthew, Fl. Tam. Carnatic 3:1033, 1983; Ramach. & Nair, Fl. Cannanore 304 - 305. 1988; Vajravelu, Fl. Palghat Dist. 312. 1990.

Type: India cultivated at Calcutta from seed from Nilgiri Hills, Wight in *Wallich* 1406 (holotype K; isotype G- DC).

Convolvulus wightii Wall., Pl. As. Rar. 2:55. 171. 1831.

(Fig. 53)

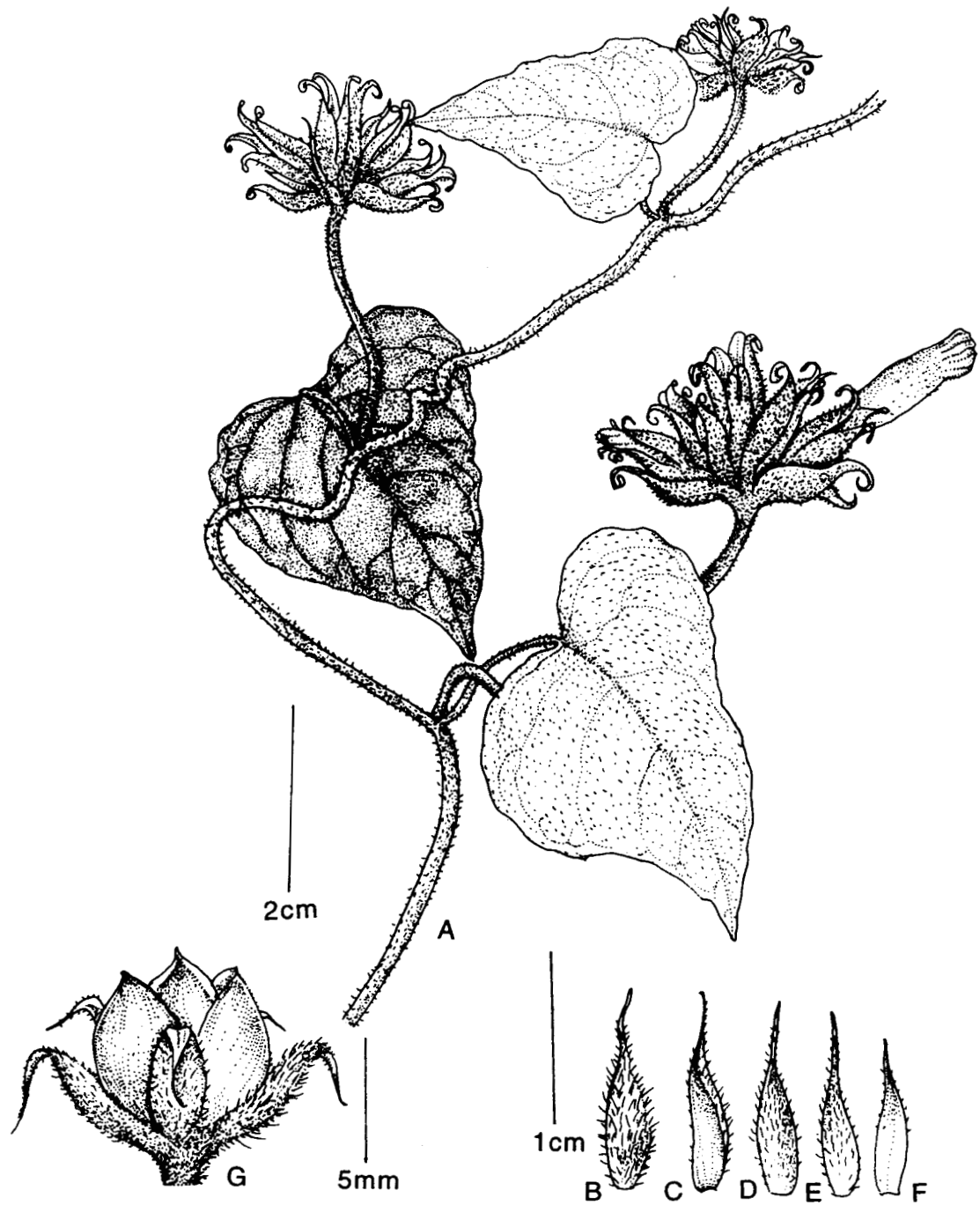


Fig. 53. *Ipomoea wightii*. A. Flowering twig; B & C. Outer sepals; D-F. Inner sepals (from Biju 23986 TBGT); G. Fruit (from Bhargavan 65655 MH).

Annual herbs; stem twining or prostrate, terete, yellowish velutinous. Leaves simple, ovate, 3-7 x 6-7.5cm, apically acute to acuminate, mucronulate, basally cordate to truncate, margin entire to obscurely lobed, pilose above, white cottony tomentose below, coriaceous; midrib and lateral veins not conspicuous on both sides, lateral veins 4-5 pairs; petiole upto 5 cm long, pubescent like stem. Flowers axillary, few to many (upto 4) flowered, dense to somewhat lax head-like cymose clusters; peduncle upto 4 cm long, velutinous; bracts ovate, upto 1.2 cm long, apically long, acuminate, pilose; pedicels short or absent, upto 3.2 mm long; sepals nearly equal, ovate-lanceolate, 10-12 x 2.5-4mm, apically long acuminate to aristate, densely sericeous, yellowish cottony; corolla magenta or mauve, funnellform, tube upto 2 cm long, limb slightly 5 lobed, mouth upto 2 mm across, midpetaline bands pilose; stamens inserted; anthers upto 2 mm long; filaments subequal, attached 3.5 mm above the corolla base, 2 long, upto 1.5 cm long, 3 short, upto 1 cm long, ciliate at the slightly dilated base; ovary conical, glabrous, 2 x 2 mm; nectary disc small; style single, upto 1.2 cm long, glabrous, dilated at base; stigma biglobose, papillate. Fruits capsular, globose, 8x8mm, valves papery, smooth, slightly pubescent; seeds ovoid, 4-4.5 x 3.5-4mm, black, glabrous.

Flowering : October - February

Fruiting : December - March

Distribution. *Ipomoea wightii* has been reported from tropical Africa, Madagascar, India and Ceylon. In Peninsular India it is collected from Wayanad and Idukki districts.

Ecology. Plants in the study area have been collected from forest fringes.

Specimens examined : KERALA: Kottayam Dt.: Devikulam, *Sebastine* 18476; Thekkadi, *Vivekananthan* 23056 (MH). Idukki Dt.: Kulamavu, *Mohanan* 76068 (MH). Palakkad Dt.: Punthenthode, *Bhargavan* 65655 (MH). Kannur Dt.: Begur R.F., *Ramachandran* 62207 (MH). Wayanad Dt.: Sultanbathery, *Biju* 23986, 23993 (CALI & TBGT). TAMIL NADU: Coimbatore Dt.: *Narayanaswamy* 19606, 1747; *Raju* 20267 (MH). Nilgiris Dt.: *Gamble* 15593; Kotagiri, *Subramanyam* 1045 (MH). N. Arcot Dt.: *Viswanathan* 746 (MH). ANDHRA PRADESH: Chittoor Dt.: *Rangacharyulu* 1090 (MH).

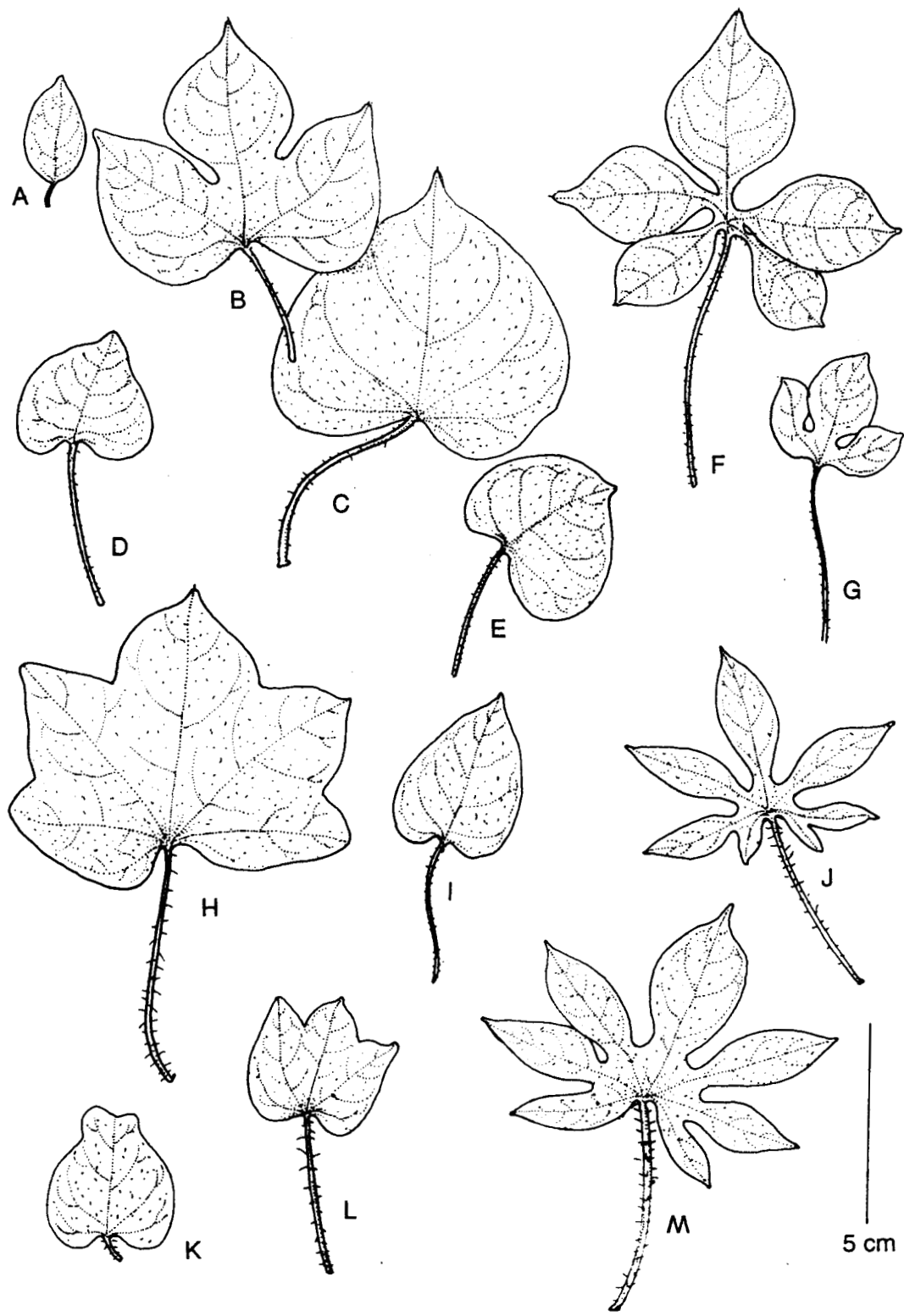


Fig. 54. Leaf variation in the genus *Ipomoea*. A-C. *I. dichroa*; D-G. *I. deccana*; H-M. *I. pes-tigridis*.

Ipomoea sect. **Ipomoea** series **Involucratae** (Baker & Rendle) Austin, *Taxon* 28 (4): 359 . 1979 & *Taxon* 29:501. 1980.

Ipomoea sect. *Involucratae* Baker & Rendle *This.-Dyer.*, *Fl. Trop. Afr.* 4 (2) 2:130. 1905.

Annual herbaceous twiner; stem pubescent. Leaves entire to deeply 3-7 lobed, softly to densely hirsute. Flowers axillary, few flowered heads, enclosed with alternate deltoid or boat-shaped involucre, pubescent to pilose; corolla pink or purplish, campanulate or funnel form, midpetaline bands pilose outside.

KEY TO THE SPECIES

- 1a. Outer bracts simple, alternate, pubescent above;
corolla purplish with a darker centre,
campanulate 1. ***I. deccana***
- 1b. Outer bracts boat-shaped, enclosing the flowers,
densely pilose above; corolla rose pink,
funnel form 2. ***I. pileata***

1. ***Ipomoea deccana*** Austin in Dassan. & Fosb., *Rev. Handb. Fl. Ceylon* 1:324. 1980; Mani., *Fl. Silent Valley* 188. 1988; Ramach. & Nair, *Fl. Cannanore* 302. 1988; Vajravelu, *Fl. Palghat Dist.* 310. 1990.

Type: India, S. Deccan Peninsula, Quilon, *Wight* (K).

Ipomoea deccana var. *lobata* (Clarke) Johri, *Journ. Econ. Tax. Bot.* 5 (2): 432. 1984.

Ipomoea bracteata Wight, *Icon. pl. Ind. or.* 4 (2): 14. t. 1374. 1850, non Cav. (1799); Clarke in Hook.f., *Fl. Brit. India* 4:203. 1883; Trimen, *Handb. Fl. Ceylon* 3:216. 1895; Gamble, *Fl. Pres. Madras* 2:918. 1923.

Ipomoea bracteata var. *lobata* Clarke in Hook.f., *Fl. Brit. India* 4:204. 1883.

Annual herbs; stem twining or prostrate, terete, hollow, pubescent with spreading trichomes. Leaves ovate - cordate in outline, entire to deeply 3-7

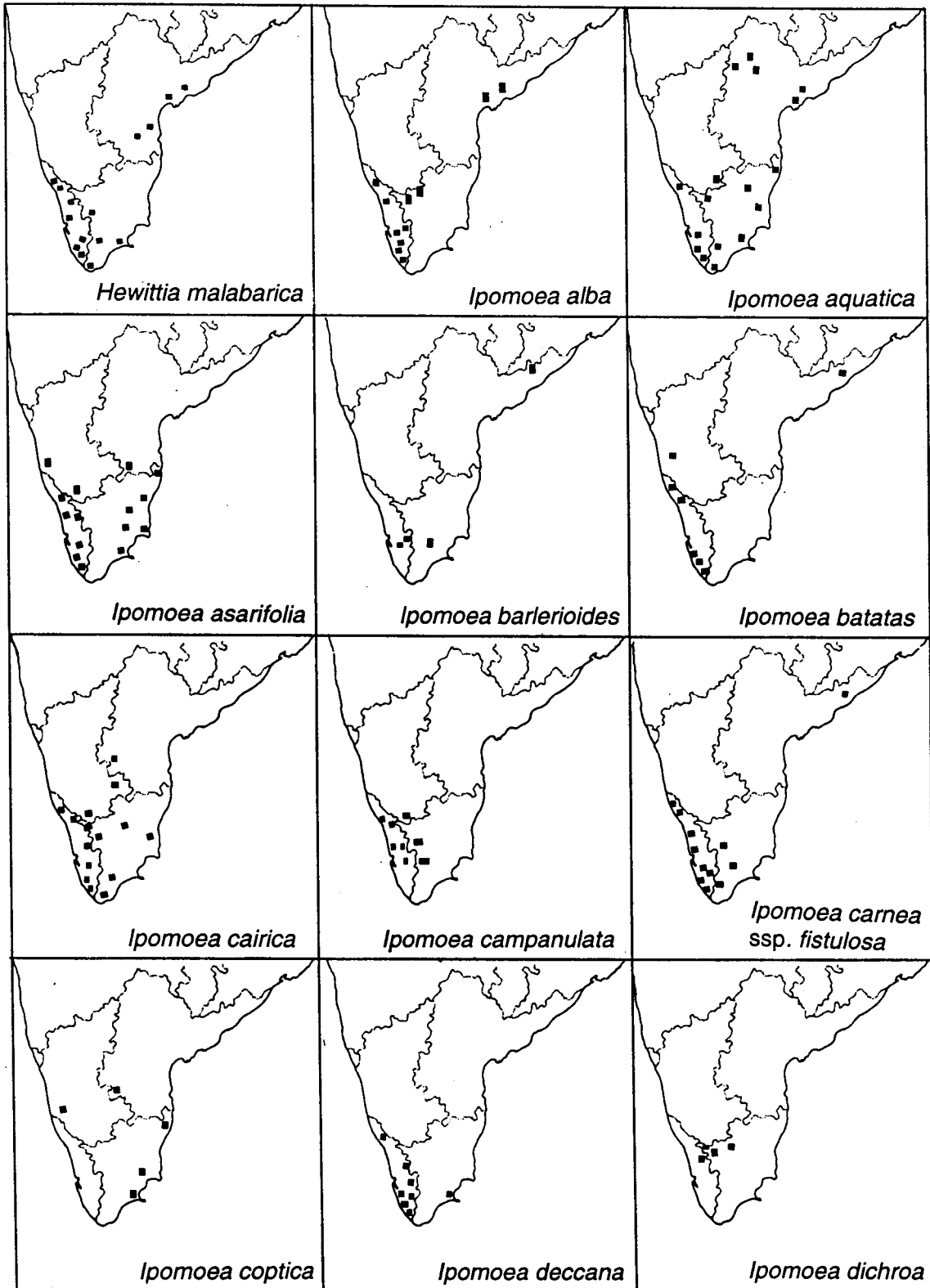


Fig. 55. Distribution maps of *Hewittia* and *Ipomoea*.

lobed, lobes elliptic to broadly elliptic, apically acute to acuminate, mucronulate, basally attenuate, terminal one larger than laterals, 2-4 x 1-2.5 cm, margin ciliate, softly hirsute on both sides; mid rib and lateral veins raised beneath, prominently hirsute; petiole upto 7 cm long, terete, hirsute. Flowers axillary, few (upto 3) flowered, enclosed with alternate deltoid bracts, 5-5.5 x 1-1.5 cm, apically acute, basally cordate, prominently nerved, pubescent above and below, ciliate at margins, inner 2 bracts small, nearly orbicular, 0.7 - 0.8 x 0.6 - 0.7 cm, prominently nerved and pubescent below, long trichomes at base, glabrescent above, ciliate at margins; peduncle upto 5 cm long; pedicels sessile or upto 2 mm long, pubescent like stem; sepals 4, unequal, outer 2 large, lanceolate, 8-8.5 x 2-2.5 mm, apically acute to acuminate, velutinous outside, glabrous inside, inner small, linear - lanceolate, 7-7.5 x 1 mm, acuminate, long trichomes along the middle portion of outside, glabrous inside; corolla purplish with a darker centre, campanulate, tube upto 1.7 cm long, 1.5 - 2 cm across, limb slightly lobed, midpetaline bands shortly pilose on the tip; stamens inserted; anthers upto 1 mm long; filaments attached 2 mm above the corolla base, subequal, 2 long, upto 4.5 mm, 3 short, upto 2 mm long, pale reddish ciliolate at dilated base; ovary conical, 1.5 x 1 mm, glabrous; disc small; style inserted, upto 5 mm long, glabrous; stigma biglobose, \pm 1 mm in diameter, papillate. Fruits capsular, subglobose; seeds glabrous to slightly pubescent, brown, \pm 2 mm long; seed germination epigeal, hypocotyl upto 6 cm long, bicotyledonary, apically emarginate, sinus upto 5 mm deep, basally truncate to cordate, glabrous, petiole upto 6 mm long.

Flowering : August - November

Fruiting : September - December

Distribution. *Ipomoea deccana* is distributed in India and Ceylon. In India, it is rare and endemic to Kerala. Austin (1980 a) could not locate it in Ceylon and considered it as very rare.

Ecology. In Peninsular India it occurs in the Western Ghats of Kerala along forest margins and also as a secondary vegetation in cleared area at an altitude upto 1200 m.

Notes. Clarke (1883) first recognized a variety *Ipomoea bracteata* var. *lobata* mainly on the basis of leaf lobation. Recently Johri (1984 a) made a combination, *I deccana* var. *lobata* (Clarke) Johri.

Population studies have shown that many members of the same population possess strongly heteromorphic foliage. After examination of materials throughout its range, it is convinced that var. *lobata* fall within the limits of *I. deccana* Austin in every aspects and hence it is reduced into the synonymy of *I. deccana*.

Specimens examined : KERALA: Thiruvananthapuram Dt.: Bonacad, Biju 44300 (TBGT & CALI). Kollam Dt.: Konni, Chandrabose 49006 (MH). Thrissur Dt.: Chikala, Sebastine 26682 (MH); Athirappally, Biju 23941 (TBGT). Idukki Dt. Kulamavu, Mohanan 74590 (MH); Kozhikannam, Vivekananthan 46632 (MH). Palakkad Dt.: Ayyappan Kovil area, Vajravelu 48842 (MH). Kannur Dt.: Begur R.F., Ramachandran 52308 (MH). TAMIL NADU: Ramanathapuram Dt.: Cholady river bank, Vajravelu 43114 (MH).

2. *Ipomoea pileata* Roxb., Fl. Ind. ed. Carey & Wall., 2:94. 1824; Thw., Enum. pl. zeyl. 212. 1860; Clarke in Hook. f., Fl. Brit. India 4:203. 1883; Trimen, Handb. Fl. Ceylon 3:215. 1895; Ooststr., Blumea 3: 507. 1940 & in Fl. Mal., ser. 1, 4:467. 1953; Verdc., Fl. Trop. E. Africa 105. 1963; Austin in Dassan. & Fosb. Rev. Handb. Fl. Ceylon 1:336. 1980.

Type: Plant cultivated at Calcutta from Chinese seed, Wallich 1376 (K. holotype; G-DC isotype).

(Fig. 56)

Annual herbs; stem twining, terete, shortly pilose, latex milky white. Leaves simple, ovate to broadly ovate, 2.5-5 x 1.5-6 cm, apically acuminate, mucronulate, basally cordate with rounded basal lobes, shortly pilose, slightly more densely beneath; midrib and lateral veins raised, lateral veins 6-7 pairs, more pilose; petiole upto 4.5 cm long, pilose. Flowers axillary, few, 1-3 flowered dense heads, enclosed in a pubescent boat - shaped involucre, 2-3 x 3-4 cm (open size), densely pilose inside, entire with long hairs, uniformly pilose outside; peduncle upto 7 cm long, terete, pilose; pedicels subsessile to sessile, \pm 2 mm long; inner bracts small, elliptic or elliptic - oblong, 0.6-1 x 0.2 - 0.6 cm, apically acute to acuminate, pilose; sepals subequal, outer 3 large,

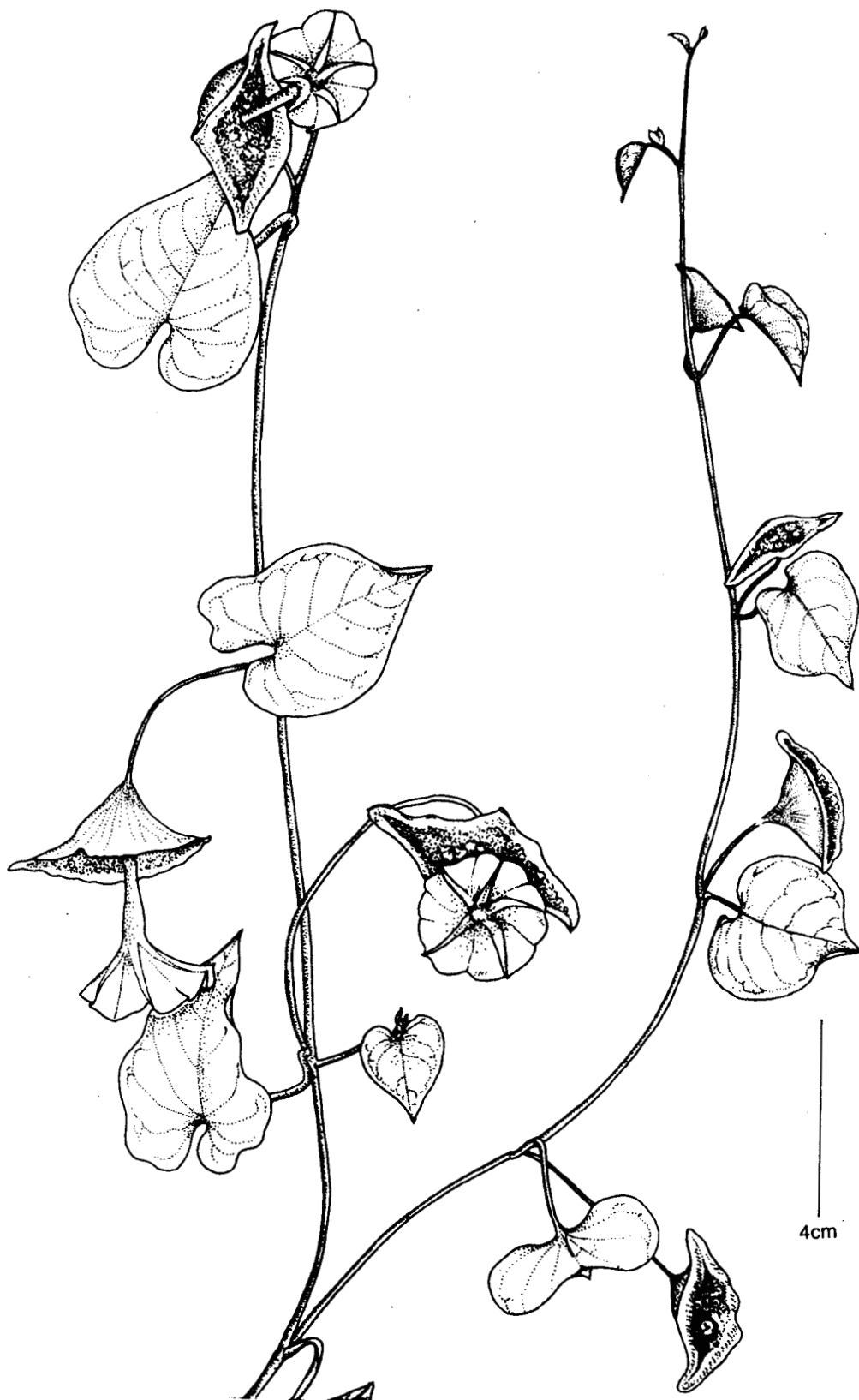


Fig. 56. *Ipomoea pileata*. Flowering and fruiting twig (from Biju 15343 TBGT).

oblong - spatulate, 0.9-1 x 0.6-0.7 cm, apically obtuse, inner 2 small, linear - lanceolate, 0.8 - 0.9 x 0.1 - 0.2 cm, apically acute, uniformly pilose outside and margins, inside pilose middle to above, glabrous below; corolla rose pink, funnellform, tube upto 1.4 cm long, mouth narrow, upto 1.7 cm across, 5 lobed, midpetaline bands sparsely pilose outside; stamens inserted; anthers 1-1.5 x 1 mm, white; filaments attached 8 mm above the corolla base, subequal, 2 long, upto 5 mm, 3 short, upto 3 mm long, white ciliolate at dilated base; ovary globose, 1 x 1 mm, glabrous; disc small, 5 lobed, glabrous; style inserted, upto 1.3 cm long, glabrous; stigma biglobose, 1 x 1.5-2 mm, papillate. Fruits capsular, widely ovate, 4-5 x 7-8 mm, apically obtuse with a persistent style base, valvular dehiscent; fruiting sepals slightly enlarged; seeds 4, ovoid, 5-6 x 3-4 mm, brownish black, glabrous except around the pubescent hilum.

Flowering : July - October

Flower opening : 5.00 pm to 6.00 pm

Fruiting : September - January

Distribution. *Ipomoea pileata* is widely distributed throughout Tropical Africa, India to China and Malaysia.

Ecology. In India it is not common. It occurs along roadsides, waste lands and also as an undergrowth in scrub jungles usually at an altitudinal range of 250-1500 m. The flowers open only after 5 pm and is probably pollinated by moths.

Specimens examined : KERALA: Thiruvananthapuram Dt.: Kallar, *Narayanaswamy* 1293 (MH). Idukki Dt.: Kaniyar, *Mohan* 76181 (MH). Palakkad Dt.: Karapara, *Bhargavan* 69727; Ayyapaankovil area, *Vajravelu* 48840 (MH). Malappuram Dt.: Chellary, *Biju* 15343 (TBGT & CALI). KARNATAKA: S. Canara Dt.: *s.n.* 15656 (MH); *Barber* 2502 (MH).

***Ipomoea* sect. *Batatas* (Choisy) Griseb., Fl. Br. W. Ind. Islands 469. 1869; Ooststr., Blumea 3:484 & 509. 1940 & Fl. Mal., ser. 1,4: 468. 1953; Verdc., Taxon 6:150 - 152. 1957; Austin, Taxon 28 (4): 360. 1979 & Taxon 29:501. 1980; Mc Donald & Austin, Brittonia 42 (2) : 116. 1990.**

Type species : *Ipomoea batatas* (Linn.) Lam.

Batatas Choisy, Mem. Soc. Phys. Geneve 6: 434. 1834.

Ipomoea ser. *Lobatae* Meisn. in Mart., Fl. Bras. 7:276. 1869.

Ipomoea subg. *Batatas* Clarke in Hook.f., Fl. Brit. India 4:201. 1883.

Ipomoea sect. *Batatas* subsect. *Acquisepalae* House, Ann. N.Y. Acad. Sci. 18:249. 1908.

Ipomoea group *Concavo - Mucronati - Sepalas* Matuda, An. Inst. Biol. Mex. 39:138. 1963.

Ipomoea sect. *Leiocalyx* Hall.f., *sensu* Baker and Rendle in This.-Dyer., Fl. Trop. Africa 4(2):132. 1905.

Annual or perennial vines; stem prostrate or twining, sparingly lignescent at base, herbaceous towards the tip. Leaves pandurate or 3-lobed or palmately 5-lobed, cordate, glabrous or appressed pubescent. Flowers small, axillary, in long or short peduncled umbellate cymes, rarely solitary; flower buds conical, often acute; sepal membranaceous and somewhat coriaceous in the middle regions, oblong or lanceolate, apically acute, acuminate, mucronulate, margins ciliate or glabrous, bearing a central main vein, with or without secondary veins; corolla funnel - shaped, corolla limb generally distinct, lavender, throat with dark purple pigmentation (absent in varieties of *Ipomoea batatas*); ovary often hirsute. Capsule brown, chartaceous, pubescent or glabrous; seeds dark brown to black, 3-5 mm long, glabrous or rarely pubescent.

The sect. *Batatas* (Choisy) Griseb is represented by two species, *I. batatas* and *I. triloba* in India.

KEY TO THE SPECIES

1a. Inflorescence few flowered cymes, flowers

3-7 cm long; corolla white or purplish,

hyaline hairs on the base of innerside.

Seeds glabrous or pubescent1. *I. batatas*

1b. Inflorescence umbelliform - cymose, flowers

1-2.5 cm long; corolla lavender, completely
glabrous inside (without hyaline hairs).

Seeds glabrous2. **I. triloba**

1. Ipomoea batatas (Linn.) Lamk., Tab. Encycl. Meth. Bot. 1:465. 1791; Clarke in Hook.f., Fl. Brit. India 4:202. 1883; Trimen, Handb. Fl. Ceylon 3:212. 1895; Gamble, Fl. Pres. Madras 2:919. 1923; Ooststr., Blumea 3:512. 1940 & Fl. Mal., ser. 1,4:469. 1953; Verdc., Fl. Trop. E. Africa 114.1963; Austin, Ann. Missouri Bot. Gard. 62:195. 1975; Austin in Nasir & Ali, Fl. W. Pakistan 39. 1979; Bull. Torrey Bot. Club 105:115-116. 1978 & in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1:320. 1980; Mani & Sivar. Fl. Calicut 183. 1988. Rani & Matthew in Matthew, Fl. Tam. Carnatic 3:1022. 1983; Chand. & Nair, Fl. Coimbatore 196. 1987.

Type: India, *anon.*, specimen 218.11 LINN (Lectotype designated here).

Convolvulus batatas Linn., Sp.Pl. 154. 1753.

Convolvulus edulis Thunb., Fl. Japan 84. 1784.

Batatas edulis (Thunb.) Choisy, Mem. Soc. Phys. Geneve 6:435. 1834.

Dioscorea cylindrica N. Burm., Fl. Ind. 215 ("315"). 1768.

- *Kapa - Kelengu* Rheede, Hort. Malab. 7:95, t. 50. 1688.

Vernacular names. Mal. *Chakkarakilangu*; Tam. *Sakkareivelleikilangu*; Kan. *Genasu*; Tel. *Chelagada*.

(Fig. 57, 58, 59, 60)

Annual or perennial vines; stem prostrate, ascending or twining, terete or angular, rooting at the nodes, glabrous or pubescent, green or tinged with purple, with subterranean fusiform, elongate or turbinate tubers. Leaves vary in size and degree of lobing, broadly ovate to orbicular in outline, entire to angular or deeply 3-7 lobed, the lobes broadly ovate to linear - oblong, 4-14 x 4-11 cm, apically acute, obtuse or acuminate, mucronulate, basally cordate to truncate, midrib and lateral veins raised beneath, glabrous or pubescent, anthocyanin pigmentation of the foliage is extremely variable in amount and distribution; petiole upto 17 cm long, canaliculate, glabrous to minutely

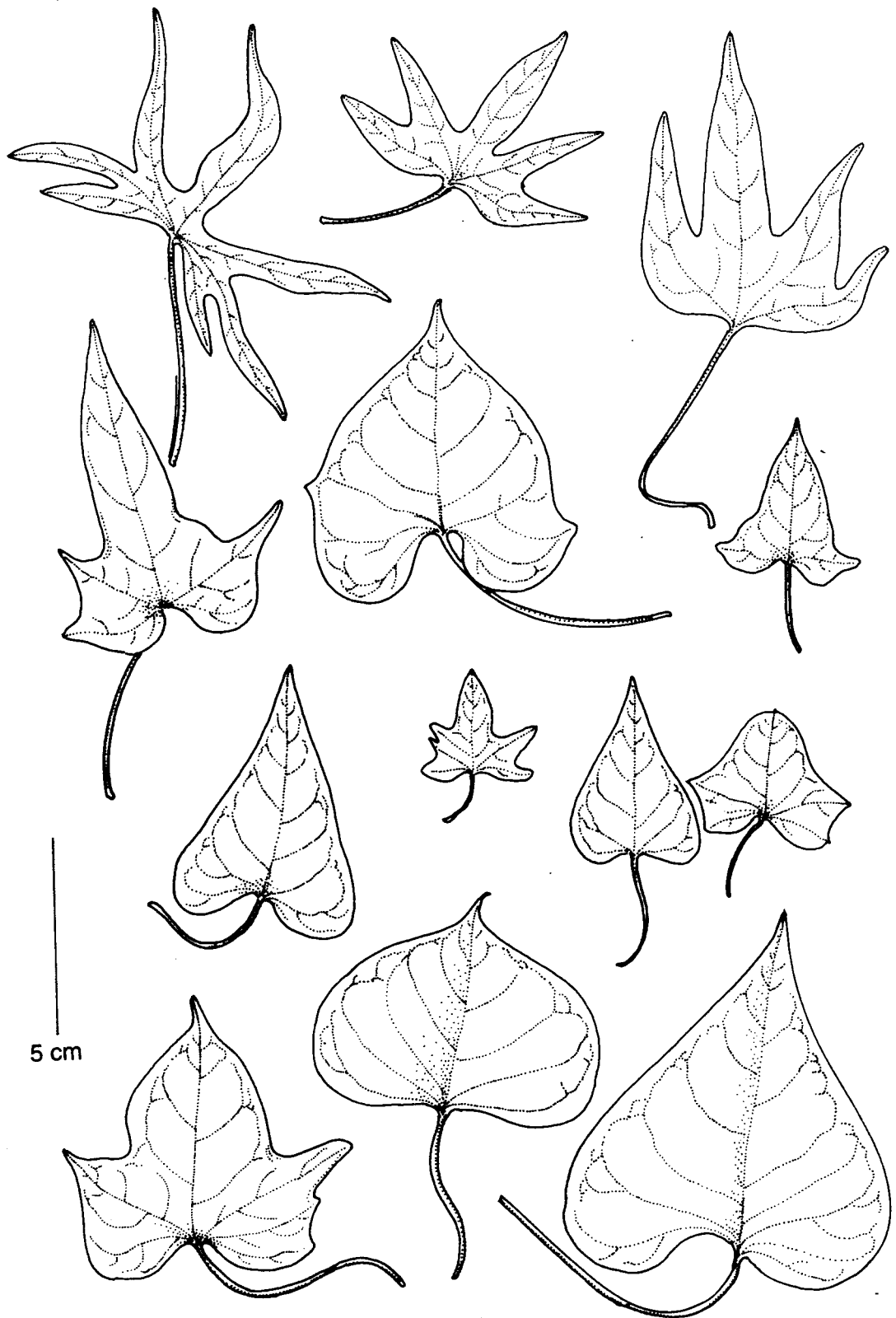


Fig. 57. Leaf variation in *Ipomoea batatas*.

pubescent; petiolar nectaries on either side of the petiole, basin type. Flowers axillary, solitary to few flowered cymes; peduncle upto 16 cm long, stout, terete or angular, shorter or longer than the petiole, glabrous or pubescent; bracts small, triangular, $2 \times \pm 1$ mm, glabrous or pubescent; pedicels upto 1 cm long, terete or angular; extrafloral nectaries 2 pairs on either side of the apex of dilated pedicel; sepals unequal, outer 2 short, 6-7 x 2-3 mm, oblong to elliptic - oblong, inner 3 long, 8-9 x 3-4 mm, elliptic - oblong to ovate - oblong, apically acute to obtuse, mucronulate caudate, subcoriaceous, glabrous or pilose on the back and fimbriate; corolla colour varies from white to deep pink, the colour of the interior of the tube is invariably darker than that of the tip, campanulate - funnel form, gradually attenuate towards the base, abruptly constricted just above the calyx, tube upto 5.8 cm long, mouth semi-stellate, pentagonal or rotate, slightly 5 lobed, 4-4.8 cm across, glabrous outside, hyaline hairs on the base of inner side; stamens inserted to subexserted; anthers 4 x 2 mm, white or purple; filaments white, or pink, attached 4 mm above the corolla base, equal to unequal, 1-1.8 cm long, purplish ciliolate at base; ovary globose, 1.5 x 2 mm long, bulbous based pilose; disc engulfing the ovary, slightly lobed, 1.5 x 3 mm, glabrous; style inserted to exserted, upto 2 cm long, glabrous, dilated at base; stigma white, biglobose, upto 3 mm in diameter, papillate. Fruits capsular, ovoid, 0.8-1 x 0.9 - 1.5 cm, with persistent style base, 2 - celled, 4 - valved, bristly long hairy, fruiting calyx slightly enlarged; seeds 1 to 4, subglobose, 4-5 x 3-4.2 mm, brown to dark brown, glabrous or pubescent; seed germination epigeal, hypocotyl upto 5 cm long, bicotyledonary, apically obcordate, sinus upto 2.3 cm deep, basally truncate to cordate, glabrous, petiole upto 1.8 cm long.

Flowering : October - February

Fruiting : December - April

Distribution. Sweet potato is widely grown in the tropics and some parts of the temperate areas of the world for its starchy tubers. It is believed to be a native of the Pacific and New Zealand (Martin & Jones, 1972) and later distributed to tropical Asia and Africa. Presently, *Ipomoea batatas* is widely grown in Africa, India, China, Japan, Malayan Archipelago, the South Pacific islands, Tropical America and the Southern U.S.A.



218.11

Fig. 58. Lectotype of *Convolvulus batatas* Linn. [= *Ipomoea batatas* (Linn.) Lamk.]:
218.11 LINN.

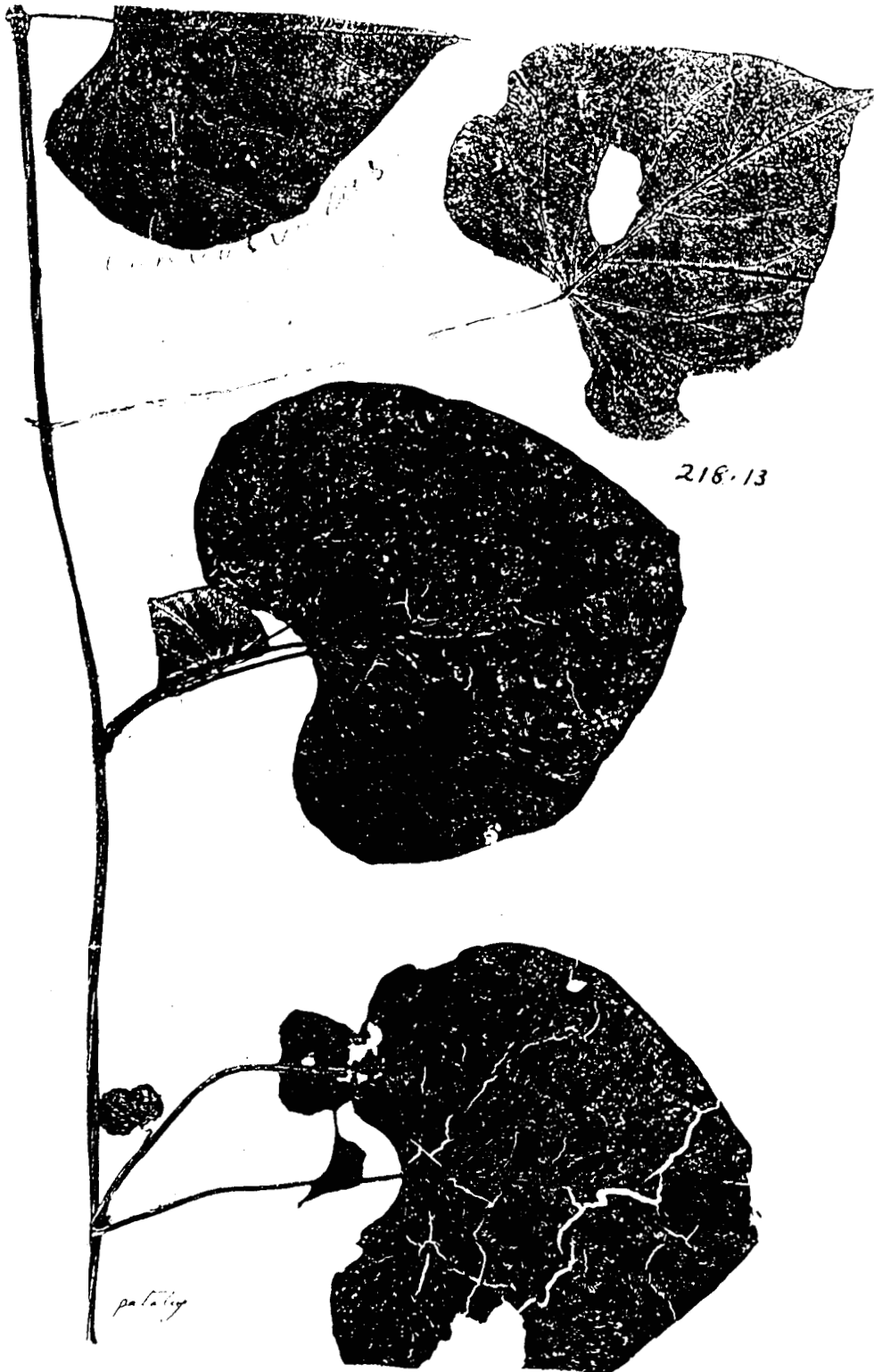


Fig. 59. *Convolvulus batatas* Linn.: 218.13 LINN.



Fig. 60. *Convolvulus batatas* Linn.: 218.12 LINN.

Ecology. In Peninsular India plants are cultivated in almost all States. Wild populations are seen in Shimoga of Karnataka State and Trichur District of Kerala.

Notes. There are about 28 varieties of this species being cultivated in Peninsular India. Many of these varieties have been introduced by Central Tuber Crops Research Institute, Thiruvananthapuram.

Nomenclatural notes. When Linnaeus published the name *Convolvulus batatas* in 1753, he cited several different publications and also gave a brief description of the plant. For *Convolvulus batatas* Linn., although 218.12 LINN has been widely treated as the lectotype (Verdcourt, 1963; Austin, 1979, 1980 a), this collection could be better considered as a later addition to the herbarium and cannot be the type (Jarvis, pers. comm. 1996). Nicolson *et al.* (1988) pointed out that, Verdcourt, 1963 and Austin, 1980 a both lectotypified the Linnaean name on 218.12 (LINN), probably a post 1753 addition. However, there are another two specimens in the Linnaean Herbarium in London (LINN) numbered 218.11 and 218.13. Unfortunately both specimens are sterile. The sheet no 218.13 is with entire leaves, but the 218.11 is the typical lobed leaf form of the taxon and do appear to be the original element for the name. But an effective lectotypification had not been done.

I am therefore designating the specimen 218.11 (LINN) as the lectotype of *Convolvulus batatas*, the basionym of *Ipomoea batatas* (Linn.) Lamk.

Lectotype (here designated): Specimen 218.11 in the Linnaean herbarium.

Medicinal use. Bactericidal and fungicidal substances have been isolated from the vines and tubers of sweet potato. The plant has been used as an antidiabetic in Philippines. The roots are considered as a laxative. In New Zealand, the whole plant or its infusion is reported to be used in the cases of low fever and skin diseases.

Specimens examined : KERALA: Thiruvananthapuram Dt.: CTCRI (Sreekariyam), Biju 16269, 16270, 16271, 16272, 16273, 16274, 16275 (TBGT); 16283, 16284 (CALI). Kollam Dt.: Kadakkal, Biju 23951 (TBGT). Alappuzha

Dt.: near KSRTC Bus Station, *Biju* 23982 (TBGT). Kannur Dt.: Kannothe, *Biju* 15346 (TBGT). Kasargod Dt.: Perdala, *Biju* 23928 (CALI). KARNATAKA: Shimoga Dt. on the way to Shimoga, *Biju* 44292 (TBGT & CALI). ANDHRA PRADESH: Visakhapatnam Dt.: *s.n.* 12539 (MH). (Many of the cultivated collections are excluded).

2. *Ipomoea triloba* Linn., Sp. Pl. 161. 1753; Ooststr., *Blumea* 3:509. 1940 & Fl. Mal., ser. 1,4:468. 1953; Fernandes *et al.*, Journ. Bombay Nat. Hist. Soc. 52: 661-663. 1954; Backer & Bakh., Fl. Java 2: 494. 1965; Fosb. & Sachet, Smithsonian Contr. Bot. No. 36:24. 1977; Chandra. *et al.*, Ind. Journ. Forst. 2(1): 23-24. 1979; Austin in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1:341. 1980.

Type: based on Sloane, t. 97. f.l. (Lectotype).

Convolvulus dentatus Blanco, Fl. Filip. ed. 1.89. 1837, non Vahl (1794).

Ipomoea blancoi Choisy in DC., Prodr. 9:389. 1845.

(Fig. 61)

Annual vines; stem twining or prostrate, glabrous to somewhat pubescent, slightly angled and strongly twisted. Leaves simple, broadly ovate to orbicular, 2.5 - 9.2 x 2-8 cm, entire, coarsely dentate to more or less deeply 3-lobed, apically acute to acuminate, mucronulate, basal lobes rounded or angular to lobed; midrib and lateral veins raised, lateral veins 6-8 pairs, glabrous or sparsely pilose on both sides; petiole 2-11 cm long, canaliculate, glabrous to minutely tuberculate; petiolar nectaries on either side of the petiole, basin type. Flowers axillary, few to several flowered (upto 16) umbellate cymes, rarely solitary; peduncle upto 5 cm long, angular, pubescent, slightly verruculose; bracts small, triangular, 1 x1 mm; pedicels upto 1.2 cm long, dilated and angled above; sepals subequal, outer 2 short, 7-7.5 x 2.5-3 mm, inner 3 long, 8-8.5 x 3-3.6 mm, elliptic - oblong, apically obtuse to acute, mucronulate, glabrous or sparsely hairy on the back, margins always ciliate; corolla pink or pale purple, throat darker, funnel - shaped, tube upto 5 cm long, mouth 5 lobed, 1.5 cm across, glabrous; stamens subexserted; anthers upto 1-1.2 x 0.5 mm, pinkish - purple; filaments white, attached 3-4 mm above

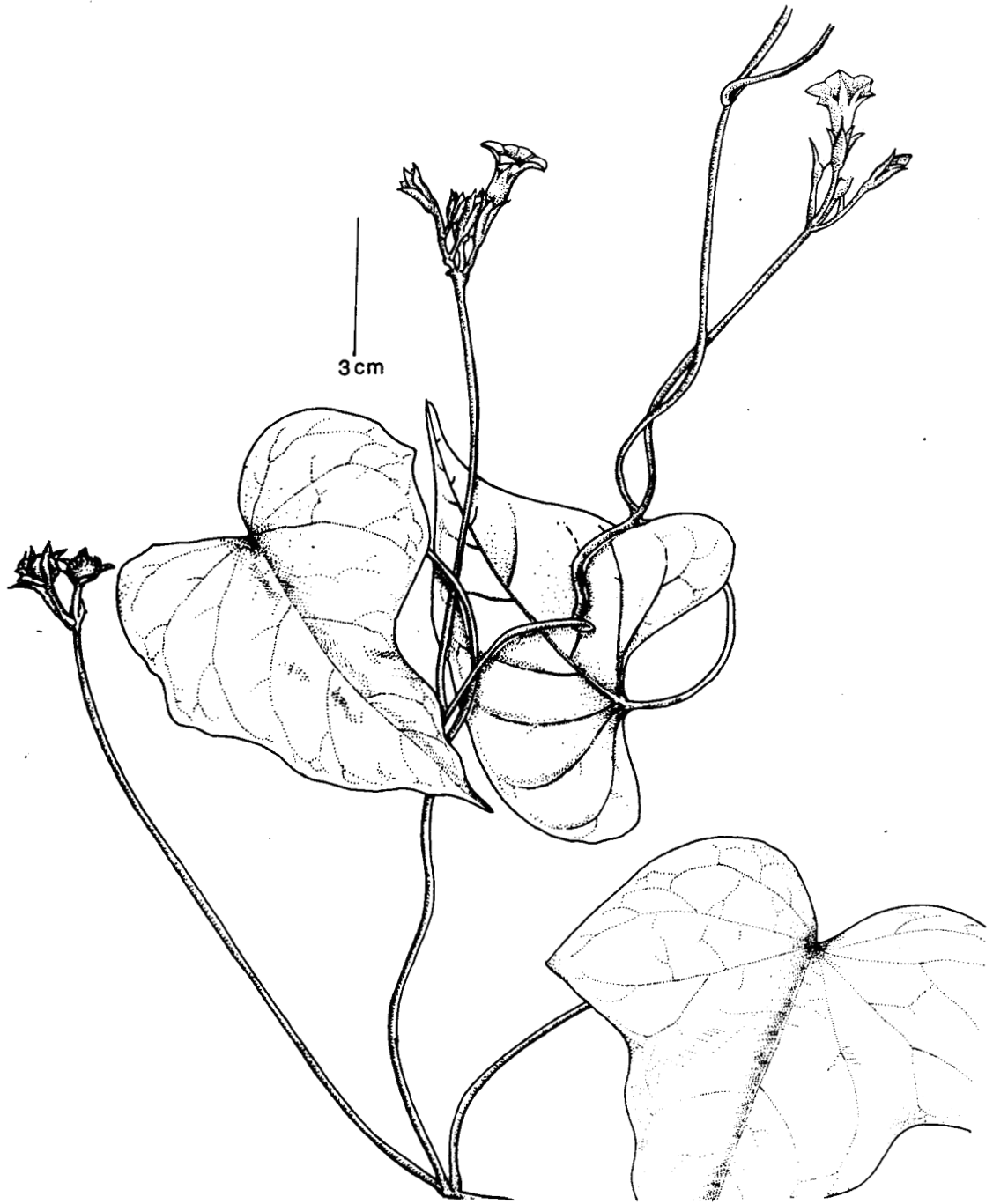


Fig. 61. *Ipomoea triloba*. Flowering and fruiting twig (from *Biju* 23905 TBGT).

the corolla base, 2 long, upto 8 mm, 3 short, upto 6 mm long, shortly white ciliolate at base; ovary conical, 1 x1 mm, pilose above; disc small, \pm 1 mm; style subexserted, upto 1 cm long, glabrous, slightly dilated at base; stigma white, biglobose upto 1 mm diameter, papillate. Fruits capsular, subglobose, 6.5 - 7.2 x 6.2 - 7 mm, with persistent style base, 4- valved, bristly hairy, fruiting calyx slightly enlarged; seeds 4, ovate, 5-5.2 x 4.8 - 5 mm, mature fresh seeds with black spots, turning entirely black when dry, glabrous; seed germination epigeal, hypocotyl upto 3.5 cm long, bicotyledonary, apically obcordate, sinus upto 1.2 cm deep, basally truncate to cordate, glabrous, petiole upto 8 mm long.

Flowering : August - January

Fruiting : October - February

Distribution. *Ipomoea triloba* is a native of tropical America and now widely distributed in the West Indian Islands, Malaysia, Pacific islands and Tropical Asia. Fernandes *et al.* (1954) have recorded the occurrence of the species from Mumbai for the first time in India. Now it is a common weed occurring throughout the Peninsular India.

Ecology. In India it is common in Southern Peninsular part, usually as a weed along wayside and wasteland, from sea - level to an elevation of about 1000 m. It also occurs in open scrub jungles, forest fringes and Ghat roadsides.

Specimens examined : KERALA: Thiruvananthapuram Dt.: Sreekariyam, Biju 23937 (CALI); Palode, Biju 23905 (TBGT). Kollam Dt.: Kadappakkada, Biju 23971(CALI & TBGT); Kulathupuzha, Biju 44285 (TBGT). Pathanamthitta Dt.: Neelimala, Anilkumar 945 (MH); Plappalli, Chandrabose 49217 (MH); Ponnambalamedu, Biju 255916 (CALI & TBGT). Malappuram Dt.: Ramanattukara, Biju 44255 (CALI). Kozhikodu Dt.: Meenchantha, Biju 44280 (CALI).

***Ipomoea* sect. *Calonyction* (Choisy) Griseb., Fl. Br. W. Ind. Islands 466. 1864; Ooststr., Fl. Mal., ser. 1,4:479. 1953; Verdc., Taxon 24:152. 1957 & Fl. Trop. E. Africa 81.1963; Austin, Taxon 28 (4):360. 1970; Taxon 29:501. 1980 &**

in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1:314.1980.

Type species : *Ipomoea alba* Linn.

Calonyction Choisy, Mem. Soc. Phys. Geneve 6:441. 1933 (genus).

Ipomoea subg. *Calonyction* (Choisy) Clarke in Hook.f., Fl. Brit. India 4:197. 1883.

Ipomoea sect. *Leiocalyx* subsect. *Calonyction* Hall. f., Med. Rijksherb. Leiden 46:19.1922; Ooststr., Blumea 3 (3):547. 1940.

Annual or perennial vines; stem often muricate. Leaves simple, cordate, sometimes angular, glabrous. Flowers nocturnal; pedicels dilated at apex; sepals subequal, long - aristate or rarely blunt, glabrous; corolla large, white, pink or lilac, glabrous, salver - shaped, the tube very long, narrow - cylindrical; stamens and style exerted; ovary 2-celled or rarely 4-celled, 4-ovuled. Capsule 4-valved; seeds large, glabrous.

The sect. *Calonyction* (Choisy) Griseb. is represented by two species in India, both occur in the Southern Peninsula.

KEY TO THE SPECIES

- 1a. Corolla white, tube 7-13 cm long,
midpetaline bands pale green outside1. *I. alba*
- 1b. Corolla purplish, tube 3-5.5 cm long,
midpetaline bands purplish on both sides.....2. *I. turbinata*

1. *Ipomoea alba* Linn., Sp. Pl. 161. 1753; Ooststr., Blumea 3:547. 1940 & Fl. Mal., ser. 1, 4:480. 1953; Verdc., Fl. Trop. E. Africa 130. 1963; Gunn, Brittonia 24:150 - 168. 1972; Gandhi in Sald. & Nicolson, Fl. Hassan Dist. 469. 1978; Austin in Nasir & Ali, Fl. W. Pakistan 37.1979 & in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1:317. 1980; Rani & Matthew in Matthew, Fl. Tam. Carnatic 3:1020. 1983; Mani., Fl. Silent Valley 188. 1988; Ramach. & Nair, Fl. Cannanore 301. 1988; Vajravelu, Fl. Palghat Dist. 309. 1990.

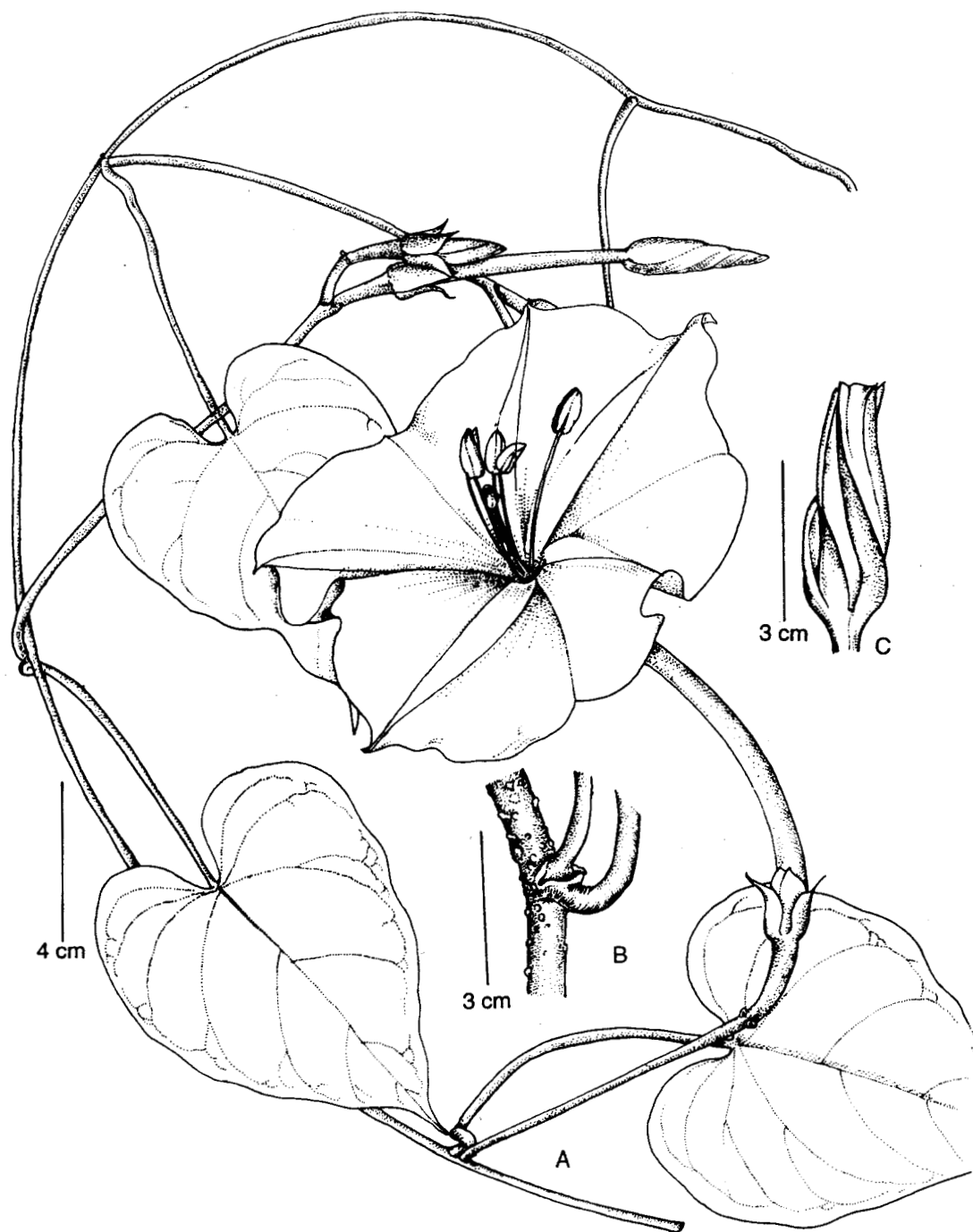


Fig. 62. *Ipomoea alba*. A. Flowering twig; B. Stem showing murication; C. Flower bud
(from Biju 25946 TBGT).

- Type : India, Malabar, illustration of *Convolvulus malabaricus flore amplo* etc., in Rheede, Hort. Malab. 11. t. 50. 1692.
- Convolvulus aculeatus* Linn., Sp. Pl. 155. 1753.
- ? *Convolvulus grandiflorus* Moon, Cat. 13. 1824.
- Calonyction speciosum* Choisy, Mem. Soc. Phys. Geneve 6:441. 1834; Thw., Enum. pl. zeyl. 211. 1860.
- Ipomoea bona - nox* Linn., Sp.Pl. 2:228. 1762; Clarke in Hook.f., Fl. Brit. India 4:197. 1883; Trimen, Handb. Fl. Ceylon 3:213. 1895.
- Calonyction bona-nox* (Linn.) Boj., Hort. Maurit. 227. 1837; Gamble, Fl. Pres. Madras 2:920. 1923.
- Calonyction rheedei* Colla, Mem. Nuova Sp. Calon. 15. 1840.
- Ipomoea roxburghii* Steud., Nom. 1:819. 1840.
- Ipomoea longiflora* Humboldt & Bonpland ex Willd., Enum. Pl. Berol. 207. 1809.
- Ipomoea grandiflora* Roxb. Hort. Beng. 14. 1814 & Fl. India 2:87. 1824.
- Ipomoea tubulosa* Willd.ex Roemer & Schultes, Linn. Syst.Veg. 4:789.1819.
- Convolvulus muricatus* Blanco, Fl.Filip.92. 1837.
- Calonyction macrantholeucum* Colla, Mem. Nuova Sp. Calon. 15.1840.
- Calonyction aculeatum* (Linn.) House, Bull. Torrey Bot. Club 31:590.1904.
- Munda-valli* Rheede, Hort. Malab. 11:103, t.50.1692.

(Fig. 62, 63)

Annual or perennial vines; stem twining or prostrate, rooting at nodes, woody at base, herbaceous towards the tip, glabrous or often with short fleshy prickles; juice milky white. Leaves simple, ovate, orbicular or ovate-oblong, entire or 3-5 lobed, 5-16 x 4-13 cm, apically acuminate to mucronulate, basally cordate; midrib and lateral veins raised beneath, lateral veins 6-8 pairs, glabrous; petiole upto 5-18cm long, glabrous or muricate, canaliculate. Flower axillary, few to several (upto 4) flowered ; peduncle upto 9cm long, terete, glabrous or muricate; bracts 2 , fugaceous, 1-3 x 1.5mm, glabrous; pedicels upto 3cm long, smooth, dilated towards the apex; 2 pair of nectaries on either sides, basin type; sepals 5, subequal, outer 2 small, bearing a long thick recurved or patent awn, 7-9 x 0.6-0.8 mm (excluding awn), awn 4-5 mm long, coriaceous, glabrous, inner 3 large, mucronulate or ill developed awn, 1-1.1

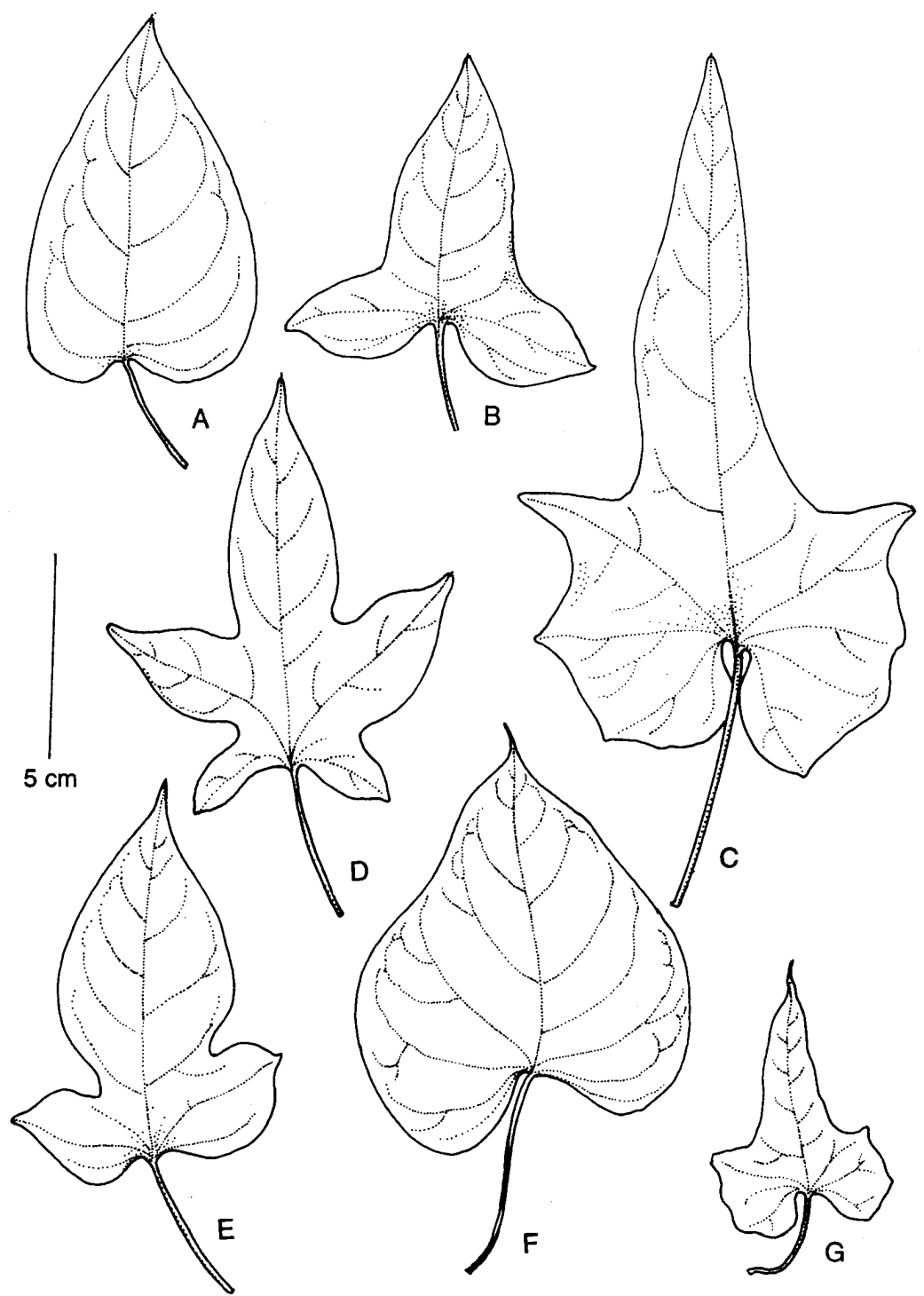


Fig. 63. Leaf variation in *Hewittia* and *Ipomoea*. A & B. *Hewittia malabarica*; C-G. *Ipomoea alba*.

x 1-1.3 cm, (outer one slightly awned, awn 2-3 mm long), innermost 2 membranaceous, glabrous; corolla white, fragrant, salver-form, midpetaline bands well marked, greenish white, tube upto 13 cm long, pubescent inside on the lower half, mouth 5 lobed, upto 8 cm across; stamens well exerted; anthers upto 8mm long, white; filaments white, attached just below the corolla mouth, subequal, 2 long, upto 2.2cm, 3 short, upto 1.9 cm, glabrous; ovary conical, 2 x 1 mm, glabrous; disc small, lobed, glabrous; style upto 11.5 cm long, glabrous; stigma white, biglobose, 1-1.2 x 2-2.1mm, papillate. Fruit capsular, ovoid to turbinate, 2.5-3 x 1.7-2.2cm, persistent style base at apex, thick-walled, valvular dehiscent, fruiting sepal enlarged, reflexed when dry, 2-celled; seeds 3-4, spheroidal, 0.8-1.3 x 0.7-1 cm, glabrous, minute hairs around hilum, black; seed germination epigeal, hypocotyl upto 3 cm long, bicotyledonary, apically emarginate to obcordate, sinus upto 1.6 cm deep, basally truncate to cordate, glabrous, petiole upto 1.5 cm long.

Flowering : August - November

Flower opening : 5.00 pm to 5.30 pm

Fruiting : October - February

Distribution. The origin of *Ipomoea alba* is a matter of controversy. Gunn (1972 a) mentioned that this species had its origin in Indo-Malaysian region of Old World. But Austin (1980' a) is of the opinion that it has a New World origin. Now it is widely distributed in Florida, Mexico, Bermuda, Puerto Rica, Colombia, Argentina, Liberia, South Africa, India (throughout), Thailand, Philippines, Australia, Tonga, Hawaiian Islands and Galapagos Islands.

Ecology. The seeds of *Ipomoea alba* float in sea water. They lack endosperm and the convoluted embryo may not completely fill the seed cavity (Gunn, 1972 a). Guppy (1906) mentioned that this species had been spread by ocean currents. Guppy (1906), Muir(1937), Gunn (1972 a) and others mentioned that the plants in the New World had its habitat in sea shore and river banks. But the present study in the Peninsular India finds that most of the wild populations are in uplands at an altitude above 1000m.

The flower opening time is strictly after 5 pm in Peninsular India, but

Gunn (1972 a) mentioned that in greenhouse, flowers open between 11 pm and midnight during April. The field plants open at dusk in June and July, by August and September the opening time changes to morning and afternoon. But the field study made in Peninsular Indian plants, revealed that the flower opening time is invariably between 5 to 6 pm at all conditions and seasons.

Taxonomic notes. *Ipomoea alba* is highly variable in leaf size and shape; muricate or smooth stem and black, white or tan seeds. But it can be easily identified from the allied species, *Ipomoea macrantha* and *I. turbinata* by its long narrow corolla tube, awned sepals and glabrous seeds.

Nomenclatural notes. The typification of *Ipomoea alba* has been highly controversial. Rheede's plate "*Munda-valli*" was cited in the protologue of *I. alba* Linn. and seems to be its sole basis. Verdcourt (1963) designated the illustration of *Convolvulus malabaricus* flore amplo etc. in Rheede, Hort. Malab. 11.t.50.1692 as holotype. Gunn (1972 a) discussed the nomenclatural history in detail and designated Rheede's plate as lectotype, without mentioning other candidates or references to Verdcourt (Nicolson *et al.*, 1988).

Economic potential. In Pacific Islands and Africa the leaves are used as soap for bathing and as a poultice to cure back-aches (Gunn, 1972 a). Sundararaj and Balasubramanyam (1969) reported that it is used as a snake bite remedy and the fleshy pedicels are used as a vegetable in India. But we suspect that the edibility mentioned is an error and should be referred to *Ipomoea turbinata*. Ooststroom (1953) noted in the Malaysian region the young leaves are eaten as vegetable and the dried flowers are used in pies and 'kimlo' (Chinese vegetable soup).

Horticultural potential. *Ipomoea alba* is popularly known as Moonflower or Ghost flower. Horticultural value of this vines is highly exploited in European countries (Gunn, 1972 a). But in India very little attention is being paid to this elegant plant. Many of the plant explorers admire the beauty of this flower (Stockes, 1889; Allard, 1945). The whole bloom is like the ghost of a flower, shimmering white in the twilight. The white colour of the corolla and its odour are enhanced as one watches the bud open, a process that takes

about 20 minutes (Stokes, 1889). A vigourously growing vine with large green leaves, this plant makes an excellent porch vine or screening vine. This can be easily propagated by seeds.

Specimens examined : KERALA: Thiruvananthapuram Dt.: Sasthamangalam, *Biju* 25925 (CALI); Vizhingam, *Biju* 25946 (TBGT). Kollam Dt.: Asramam, *Biju* 44251 (CALI). Pathanamthitta Dt.: Chalakkayam, *Chandrabose s.n.* (MH); Konni, *Bourdillon* 85, 465 (MH); *Bourdillon* 88 (TBGT). Kottayam Dt.: *Mooss s.n.* (MH). Idukki Dt.: Puyamkutty, *Pandurangan* 79279, *Bhargavan* 90086 (MH); Eravikulam, *Biju* 23922 (CALI & TBGT). Kozhikode Dt.: Feroke, *Biju* 231917 (CALI). Kannur Dt.: Tirunell R.F., *Ramachandran* 62090 (MH). Wayanad Dt.: Chunda, *Biju* 44281 (CALI). TAMIL NADU: Coimbatore Dt.: Periyar, *s.n* 161 (MH); Siruvani, *Subramanyam* 1797 (MH). Nilgiris Dt.: Cholady river bank, *Vajravelu* 4311 (MH); Devarshold, *Shetty* 11941 (MH). ANDHRA PRADESH: Godavari Dt.: *s.n.* 12704 (MH); *Biju* 15358 (TBGT). Vishakhapatnam Dt.: Araku Valley, *Subba Rao* 32893 (MH).

Ipomoea turbinata Lag., Gen. Sp.Pl.10. 1816; Gunn, Brittonia 24:163.1972; Austin in Dassan. and Fosb., Rev.Handb. F1.Ceylon 1:343. 1980.

Type : based on *Ipomoea muricata* (Linn.) Jacq. [India, Suratt, Braad, LINN 218.18 (LINN)]

Convolvulus muricatus Linn., Mant.Pl.44. 1767.

Convolvulus smilacifolius Salisb., Prodr. 124. 1796.

Ipomoea muricata (Linn.) Jacq., Hort. Schoenb. 3(2): 40.t.323. 1798 (1803), non Cav. 1799 (1794); Clarke in Hook.f., Fl.Brit.India 4:197. 1883; Trimen, Handb. F1. Ceylon 3:214. 1895; Ooststr., F1. Mal., ser.1, 4:481.1953; Gandhi in Sald. & Nicolson, F1.Hassan Dist. 421.1978; Mani.&Sivar., F1. Calicut 183.1972; Vajravelu, F1. Palghat Dist. 311.1990.

Ipomoea muricata (Linn.) Roxb. F1. India 2:89.1824.

Bonanox muricata (Linn.) Raf., F1.Tell.1:77. 1836.

Calonyction muricatum (Linn.) Don, Gen. Hist! 4:2647.1837.

Ipomoea bona-nox Linn. var. *purpurascens* Ker, Edward's Bot. Reg. 4: t. 290.1818.

Ipomoea carinata Endl., Prod.Pl.Norf. 53. 1833.

Calonyction macrantholeucum Colla, Mem. Nuova Sp. Calon. 15.1840.

Convolvulus colubrinus Blanco, Fl. Filip., Gran Ed. 2:t.315.1878.

Ipomoea spinulosa Brandegees, Zoe 5: 169.1903.

Vernacular name: Mal. *Nithyavazhuthana*.

(Fig. 64)

Annual vines; stem twining, trailing or prostrate, rooting at nodes in prostrate, woody at base, herbaceous towards tip, glabrous, usually muriculate, juice milky white. Leaves simple, broadly ovate to orbicular, entire, biternately or digitately 5-6 lobed, 6-13 x 5-11 cm, thin, apically acute to acuminate, mucronulate, basally cordate; midrib and lateral veins raised beneath, lateral veins 5-6 pairs, glabrous; petiole upto 12 cm long, smooth or muriculate. Flowers axillary, 1-3 flowered; peduncle upto 5 cm long, terete, glabrous or muriculate; bracts 2, fugaceous, oblong upto 8mm long; pedicels upto 1.5cm long, smooth or muriculate, dilated towards the apex; 2 pairs of nectaries on either sides, basin type; sepals 5, subequal, bearing a long thick recurved or patent awn, outer 2 small, 5.5-7 x 4-5 mm (excluding awn), awn 4-5 mm long, inner 3 long, 0.8-1 x 0.4-0.5 cm, ovate to oblong, awn 4-6 mm long, glabrous; corolla lavender to purplish, fragrant, salver-form, midpetaline bands well marked, purple with darker purple plaits, glabrous, tube upto 6.5 cm long, narrow, purple and pubescent within, mouth 5 lobed, upto 4.2 cm across; stamens subexserted; anthers upto 2mm long, white; filaments attached just below the mouth, subequal; 2 long, upto 1.2 cm, 3 short, upto 0.8cm long, pubescent at base; ovary conical, 1.5 x 1mm, glabrous; disc small, \pm 1mm; style upto 4 cm long, glabrous; stigma white, biglobose, 1 x 2 mm, papillate. Fruit capsular, ovoid, 2 x 1.7cm, thin-walled, valvular dehiscent, fruiting calyx enlarged, reflexed when dry, 2-celled; seeds ovoid, 3-4 x 1 cm, white, black, grayish-black or light yellowish black, glabrous.

Flowering : July - October

Flower opening : 5 pm - 6 pm

Fruiting : August-November

Distribution. *Ipomoea turbinata* is widely distributed from Mexico to Colombia and Brazil, the West Indies, tropical Africa and adjacent islands to India, China, Japan and Malaysia.

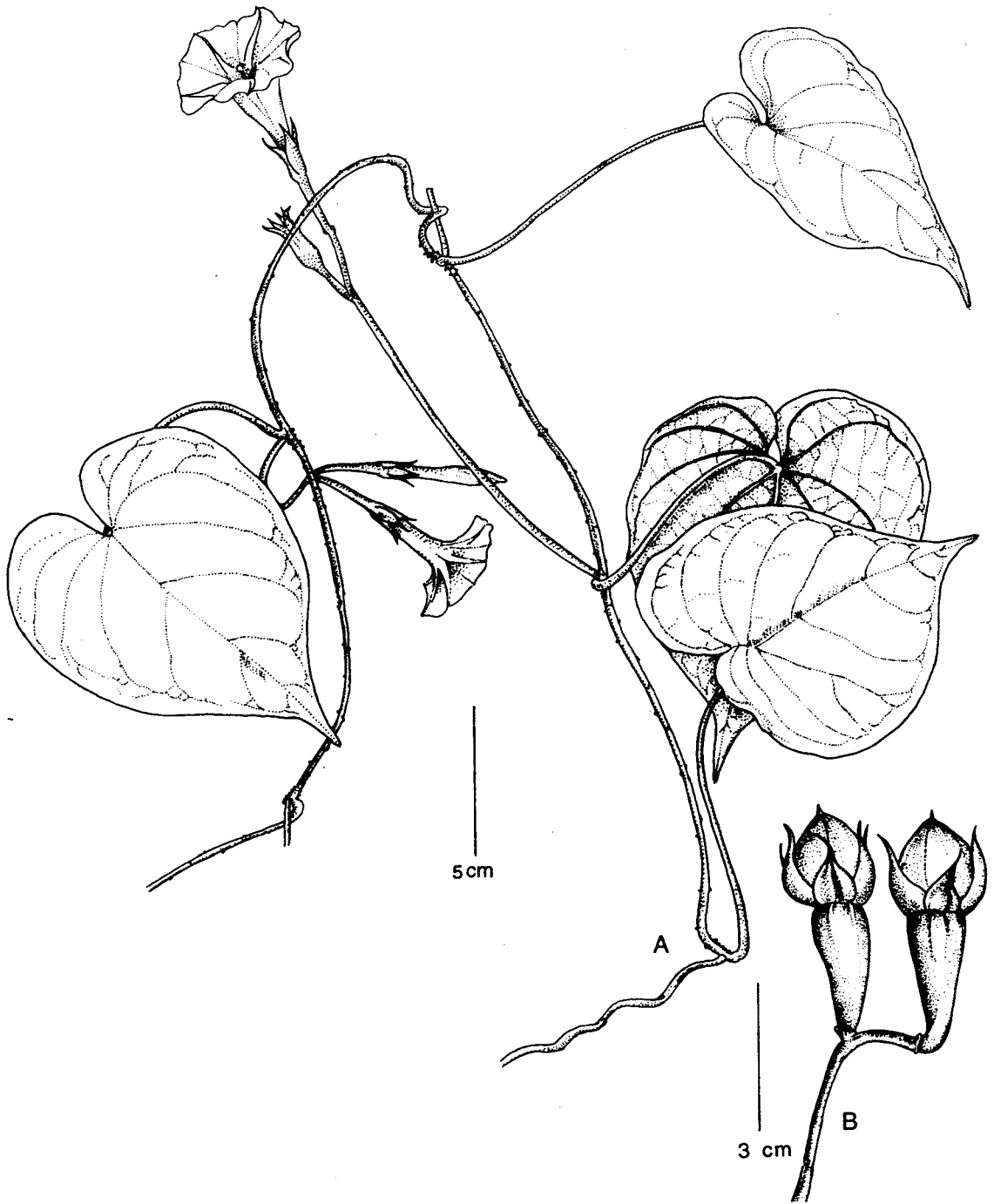


Fig. 64. *Ipomoea turbinata*. A. Flowering twig (from *Biju* 44297); B. Fruits (from *Biju* 15201 TBGT).

The problem of origin of this species had not been resolved. The Linnaean type came from Surat (Mumbai), India. Gunn (1972 a) is of the opinion that the species was native to Old World. Later authors, including Roxburgh (1832), Trimen (1895) and Austin (1980 a) questioned its origin in Old World. Austin suggests that this species had originated from New World, almost certainly from Mexico.

Ecology. In India the plants are mostly cultivated, often escaped and naturalized on dumps and other disturbed sites. The flowers have slight fragrance and deep purplish throat. Generally the flowers open between 5 pm and 5.30 pm and they appear to be adapted for moth pollination.

Economic potential. In India, China and Ceylon the plants are mostly cultivated for their swollen fleshy pedicel of the fruits and young seeds, which are used as vegetable.

In Kerala, two cultivated varieties have been found, one with linear elongated pedicels and white seeds and the other with thick dark green pedicels and black seeds. Both are locally known as '*Nithyavazuthana*' (Malayalam script), means *Nithya* = daily, *Vazhuthana* = big. The former one is found to be more tasty and palatable.

In Mexico the fruits are used as a source of hair tonic (Standley, 1924).

Horticultural potential. *Ipomoea turbinata* is popularly called purple Moonflower and was introduced to the United States as an ornamental vine for its elegance. It is suitable for fences and pergollas and could be raised easily by seeds.

Specimens examined : KERALA: Thiruvananthapuram Dt.: Palayam, *Biju* 15372 (CALI); Nedumangad, *Biju* 44297 (TBGT). Kollam Dt.: Chathanoor, *Biju* 15201 (TBGT). Kozhikode Dt.: Chelary, *Biju* 23926 (CALI & TBGT).

***Ipomoea* sect. *Eriospermum* Hall. f. in Engl., Bot. Jahrb. 18. 149. 1983; Ooststr., Blumea 3 (3): 484, 558. 1940 & Fl. Mal., ser. 1,4:483. 1953; Verdc., Taxon 6:152. 1957 & Fl. Trop. E. Africa 82. 1963; Austin, Taxon 28(4): 360. 1979; Taxon 29:502. 1980 & in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1:314. 1980.**

Type species : *Ipomoea digitata* Linn (= *I. mauritiana* Jacq.).



Plate 3. A & B. *Ipomoea alba* C. *Ipomoea aquatica* D. *Ipomoea asarifolia* E - G. *Ipomoea batatas* H. *Ipomoea barlerioides* I. *Ipomoea campanulata* J. *Ipomoea cairica* K & L. *Ipomoea carnea* ssp. *fistulosa*.

Perennial herbaceous or woody vines and erect shrubs; stem glabrous or pubescent. Flowers axillary, few to many flowered cymes or panicle, flower buds mostly obtuse, rarely acute, glabrous; sepals mostly orbicular (rarely elliptic to broadly elliptic), apically obtuse, convex, rarely flat or acute. Fruits capsular; seeds pubescent to villous.

Notes. Austin (1980 a) recognised 9 series in the section *Eriospermum*. Probably this is the largest and most complicated group within the genus *Ipomoea*. For the present study we followed only the sectional classification.

The sect. *Eriospermum* is represented by seven species and one variety from Southern Peninsular India.

KEY TO THE SPECIES

- 1a. Shrubs. Corolla finely tomentose outside;
style minutely pubescent.....2. **I. carnea**
- 1b. Herbaceous or woody vines. Corolla glabrous;
style glabrous..... 2
- 2a. Flowers red on both sides; outer sepal
reddish green, glabrous (cultivated)3. **I. horsfalliae**
- 2b. Flowers white or purple; outer sepals green,
glabrous or pubescent (wild) 3
- 3a. Flowers nocturnal, white, tube
upto 8 cm long4. **I. macrantha**
- 3b. Flowers diurnal, purplish, tube
upto 5.5 cm long 4
- 4a. Flowers upto 3 cm long; outer sepals
less than 5.5 mm long6. **I. staphylina**
- 4b. Flowers more than 5 cm long; outer sepals
more than 5.5 mm long5

5a. Vines with large underground tuber.

Leaves palmately compound; petiolar nectary on either side of the apex. Fruiting sepals reaching only upto the middle of the capsule5. **I. mauritiana**

5b. Woody vines. Leaves simple; petiolar nectary absent. Fruiting sepals nearly

enclosing the capsule1. **I. campanulata**

1. Ipomoea campanulata Linn., Sp. Pl. 160.1753; Moon, Cat. 14.1824; Wight, Icon. pl. Ind. or. 3: t.1375. 1850; Clarke in Hook.f., Fl. Brit. India 4: 211.1883; Trimen, Handb. Fl. Ceylon 3:211.1895; Gamble, Fl. Pres. Madras 2:913.1923; Austin *et al.*, Brittonia 30(2):195-198.1978 & in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1:327. 1980; Vajravelu, Fl. Palghat Dist. 310. 1990.

Type: *Adamboe*, Rheede, Hort. Mal. 16:115.t.56. 1695 (lectotype fide Austin).

Convolvulus campanulatus (Linn.) Spreng., Syst. Veg. 1: 608.1824.

Adamboe bicolor Raf., Fl. Tellur. 4:73.1838, nom. illeg. (incl. *Ipomoea campanulata* Linn. 1753).

Ipomoea campanulata var. *illustris* Clarke in Hook.f., Fl. Brit. India 4:211.1883.

Ipomoea illustris (Clarke) Prain, Beng. Pl.2:735.1908; Ooststr., Blumea 3:566.1940 & Fl. Mal., ser. 1,4:485. 1953; Gandhi in Sald. & Nicolson, Fl. Hassan Dist. 471. 1978.

- *Adamboe* Rheede, Hort. Malab. 11:115, t.56. 1962.

Perennial lianas; stem twining or scrabbling, woody at base, herbaceous towards tip, terete, hollow, glabrous or rarely pubescent; latex milky white. Leaves simple, ovate, 8-13 x 7-10cm, apically acuminate, mucronulate, basally truncate to cordate, glabrous above, very remotely pilose below; midrib and lateral veins raised beneath, glabrous, generally with galls beneath; petiole upto 6 cm long, pubescent, canaliculate. Flowers axillary or terminal, many (6-24) flowered paniculate cymes; peduncle upto 8 cm long (before branching), green, pubescent; bracts early caducous; pedicels upto 1.5 cm

dilated at apex, pubescent; 2 pairs of extrafloral nectaries on either side of the apex of dilated pedicel; sepals 4, subequal, outer 2 slightly small, orbicular 1-1.3 x 0.7-0.8 cm, apically rounded, coriaceous, with thinner margins, deeply concave, puberulous, inner 3 slightly large, orbicular, 1.4-1.6 x 1.2-1.5 cm, apically emarginate, mucronate, innermost one oblique, coriaceous, deeply concave, mottled inside, glabrous on both sides; corolla light purple to white, throat dark purple, campanulate, tube upto 4-4.5 cm long, deeply striate inside, mouth 5-lobed, 6-6.5 cm across; stamens subexserted; anthers upto 6 mm long, white; filaments attached 7mm above the corolla base, unequal, 2 long, upto 1.8cm, 3 short, upto 1 cm long, whitish long ciliolate at dilated base; ovary widely oblong, 1-1.5 x 2-2.5mm, glabrous; disc 2.5-3 x 3.5mm, 5-lobed, slightly engulfing the ovary; style subexserted, upto 4 cm long, glabrous, dilated at base; stigma biglobose, 2 x 4mm, papillate, white. Fruits capsular, widely ovate, 1.8-2x1.5-1.8cm, brown, glabrous, with a short persistent style base; fruiting sepal enlarged, slightly engulfing the capsule; seeds 4, elliptic - oblong, 1-1.1x0.6-0.8cm, blackish - brown, with silky long trichomes along the margins, upto 1.8 cm long.

Flowering : October - February

Fruiting : January - April

Distribution. *Ipomoea campanulata* may have originated from India and distributed to Ceylon, Indo - China, Siam, Andaman Islands and Malaysia (Austin, 1980 a)

Ecology. Ooststroom (1953) and Austin (1980 a) reported that the habitat of the plant was near the sea in thickets, along the margins of brackish rivers, in lagoon margins and on sea-shores. But in the present study the plant is found above the sea level upto 1000 m.

Nomenclatural notes. The typification and identity of *Ipomoea campanulata* and *Stictocardia tiliifolia* has been the subject of considerable discussion (Hallier, 1893 b; House, 1909; Merrill, 1914; Alston, 1931; Ooststroom, 1953; Verdcourt, 1963; Gunn, 1972 b; Austin *et al.* 1978; Nicolson *et al.*, 1988). Ooststroom points out that the type (syntype in Linnaean Herbarium) of *Ipomoea campanulata* is actually the Malvaceae member, *Thespesia populnea* (Linn.)

Soland. ex Corr. Merrill (1914) correctly interpreted the type by using Rheede's plate 'Adamboe' and Gunn (1972 b) and Austin (1980 a) agrees with this concept. If this is done then *Stictocardia campanulata* (Linn.) Merrill is the correct name for *Stictocardia tiliifolia*. Nicolson *et al.* (1988) in notes on *Ipomoea campanulata* refer to Austin *et al.* (1978) and Austin (1980 a), stating that 'Adamboe' is not 'tiliifolia' but is what Clarke called 'illustris'. So *Ipomoea campanulata* is the correct name for this plant (Verdcourt, pres. comm., 1996).

Specimens examined : KERALA: Kottayam Dt.: Vazhappally, Antony 243 (MH). Thrissur Dt.: near Vyasa college, Biju 23914 (K, CALI & TBGT). Palakkad Dt.: way to Kallamali, Bhargavan 65779; s.n. 14220 (MH). Kannur Dt.: Thaliparambu, Barber 8782 (MH). Wayanad Dt.: Manathavadi, Biju 44261 (TBGT & CALI). TAMIL NADU: Coimbatore Dt.: Hassanur, Jacob & David 148, Raju 357; Anakkathi, Raju 4775; Attakatti, Joseph 15606 (MH). Madurai Dt.: Paichalur, Chandrabose 54201 (MH). KARNATAKA: Mysore Dt.: Somanadhapur, Barber 6921 (MH).

***Ipomoea carnea* Jacq. subsp. *fistulosa* (Mart. ex Choisy) Austin, Taxon 26:237. 1977 & in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1:332.1980 ; Rani & Matthew in Matthew, Fl. Tam. Carnatic 3: 1024. 1983; Mohan & Henry, Fl. Thiruvananthapuram 315.1994; Frey, Trop. Eco. 36 (1):21-48. 1995.**
Type : Brasil, Martius 2398 (M, lectotype).

Ipomoea carnea Jacq., Enum. Pl. Carib. 13.1760; Gamble, Fl. Pres. Madras 2:919. 1923; Bhatta., Journ. Bombay Nat. Hist. Soc. 73:317-318. 1973; Chand. & Nair, Fl. Coimbatore 193.1987; Ramach. & Nair, Fl. Cannanore 302.1988 as a species, not sub species.

Ipomoea fistulosa Mart. ex Choisy in DC., Prodr. 9:349.1845; Bhatta., Journ. Bombay Nat. Hist. Soc. 73:318-319. 1973; Mani. & Sivar., Fl. Calicut 181.1982.

Batatas ? crassicaulis Benth., Voy. Sulphur 5:134. 1845.

Ipomoea crassicaulis (Benth.) Rob., Proc. Amer. Acad. Arts 51:530.1916; Ooststr., Blumea 3:569.1940 & Fl. Mal., ser. 1,4:485.1953.

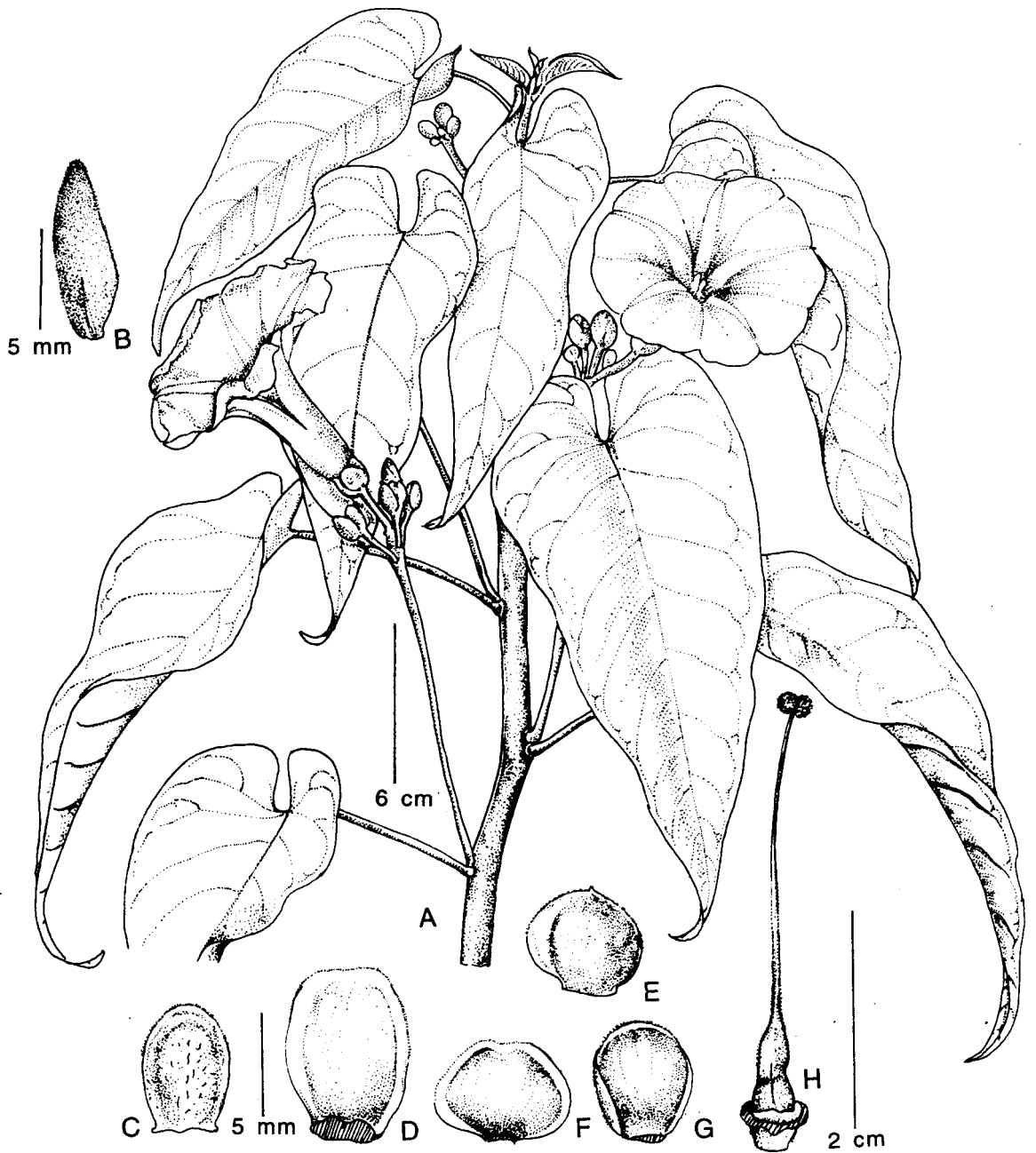


Fig. 65. *Ipomoea carnea* ssp. *fistulosa*. A. Flowering twig; B. Bract; C & D. Outer sepals; E-G. Inner sepals; H. Pistil (from *Biju* 15374 TBGT).

Perennial straggling shrubs, upto 18 feet high; stem woody at base and herbaceous towards tips, hollow, terete, glabrous or minutely pubescent above. Leaves simple, ovate, ovate - lanceolate, 3-11 x 2-7cm, apically acuminate or long acuminate, mucronulate, basally truncate to shallowly cordate, pubescent below, glabrous above; midrib and lateral veins raised beneath, lateral veins 8-10 pairs; petiole upto 10 cm long, canaliculate, pubescent; petiolar nectaries 2, located on either side of the distal end of the petiole, crypt type. Flowers axillary (generally more frequent at the branch tips), few to several flowered (upto 20) cymose - paniculate clusters; peduncle upto 7 cm long, terete, pubescent; bracts elliptic - oblong, 4-5 x 1-1.5 mm, apically acute to obtuse, pubescent outside, slightly muricate inside; pedicels upto 1.5 cm long, dilated at apex, pubescent; pedicellar nectaries 5 (2 + 2 + 1), located at the base of calyx lobes; sepals 5, subequal, outer 2 narrow, suborbicular, 7-8 x 5-6mm, subcoriaceous, puberulent, (sometimes with long curly soft hairs) glabrous inside, inner 3 broader, suborbicular 6-6.5 x 7-7.2mm, subcoriaceous, puberulent, glabrous inside, apically slightly emarginate (at least one); corolla deep pink to light rose purple, throat darker than the limb, tube upto 7 cm long, finely tomentose outside, 6-7 cm across, limb slightly 5 lobed; stamens inserted; anthers upto 8 mm long, white; filament attached upto 6 mm above the corolla base, unequal, 2 long, upto 2.5 cm, 3 short, upto 1.2 cm long, ciliolate at dilated and concave base; ovary conical, 4 x 2mm, glabrous; disc small, slightly lobed, glabrous; style inserted, upto 2.8 cm long, minutely pubescent, dilated at base; stigma biglobose, 1 x 2.5mm, papillate. Fruits capsular, ovate, 2 x 1.5cm, 4-valved, valves straw coloured inside, slightly grayish outside, glabrous; seeds 4, ovate, 1x0.6cm, covered with long woolly grayish brown trichomes.

Flowering : July - February

Fruiting : September - March

Distribution. *Ipomoea carnea* subsp. *fistulosa* is widely distributed in American tropics ranging from Argentina to the Southern states of USA (Austin, 1977). Frey (1995) reported its origin in the Pantanal of Bolivia, Brazil and Paraguay. Now this species is reported from East Africa, Egypt, India, Pakistan, Ceylon, Java, Malay archipelago, Taiwan and China.



Ipomoea fistulosa Mart. [Choisy]
 caule suffruticoso, tereti, fistuloso, erecto, foliis basi pedunculatis longe acuminate subtriangularibus multo pubescenti-caninis, petiolo basi apice triglanduloso, pedunculis bibracteatis axillaribus, calycibus rotundatis.
 Cor. magneae roseae.

HERBARIUM REGIUM MONACENSE
Ipomoea straminea (M. Robinson)
 fil. Martius, Herb. Mart. No. 2398
 Brasilia Provinc. Para. Bahia et Pernambuco.

Fig. 66. Type specimen of *Ipomoea carnea* Jacq. subsp. *fistulosa* (Mart. ex Choisy) Austin : Brasil, Martius 2398 (M, lectotype).

The present pantropical distribution is presumably the result of cultivation. *I. carnea* subsp. *fistulosa* today could be considered as a pantropical weed (Frey, 1995). Now in India, it occurs throughout the country and is considered as a serious weed (Cook, 1987 ; Chaudhuri *et al.*, 1994).

Ecology. The plants are found to grow in hydric and xeric conditions. Cook (1987) observed this plant growing on dry rocks as well as on the banks of lakes and rivers, in water upto 2 m deep. In aquatic habitat the plants are tall and erect. But in xeric conditions in Peninsular India the apical part of the young plants are twining.

Specimens examined : KERALA: Thiruvananthapuram Dt.: Peroorkada, *Biju* 15374 (TBGT). Kollam Dt.: Chathanoor, *Biju* 15349 (TBGT). Pathanamthitta Dt.: Tiruvalla, *Anilkumar* 1033 (MH). Alappuzha Dt.: Vadanam, *Biju* 23988 (TBGT). Malappuram Dt.: Kottakkal, *Biju* 442888 (CALI). Kozhikode Dt.: Feroke, *Biju* 15374 (CALI). TAMIL NADU: Kamarajar Dt.: Sivakasi, *Biju* 44254 (CALI & TBGT). ANDHRA PRADESH: Vishakhapatnam Dt.: Punyagiri hills, *Subba Rao* 19393 (MH).

***Ipomoea horsfalliae* Hook., Bot. Mag.t. 3315.1834; Ooststr., Blumea 3:564.1940 & Fl, Mal., ser. 1,4:484. 1953; Austin in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1:326.1980.**

Type: A specimen cultivated at Kew (K, not seen).

(Fig. 67, 68)

Perennial vines; stem twining, woody at base, lenticellate, herbaceous towards tip, glabrous. Leaves orbicular in outline, deeply palmately lobed to beyond the middle or to the base, lobes 3-5, ovate, elliptic or elliptic - oblong, apically acuminate with an acute or obtuse, mucronulate point, basally attenuate, terminal one larger than laterals, 2.5-14 × 2.5-5 cm, inner 2 pairs medium, 1.8-9 × 1.6-3cm, lateral lobes ovate - lanceolate to linear- lanceolate, margins crisped or coarsely dentate to crenate, glabrous on both sides; midrib raised beneath; petiole upto 7 cm long, glabrous. Flowers axillary, few to many (upto 20) flowered, cymosely branched panicles; peduncle upto 8 cm



Fig. 67. *Ipomoea horsfalliae*. Flowering twig (from *Biju* 25932 TBGT).



Ipomoea horsfalliae

Fig. 68. *Ipomoea horsfalliae* Hook. : Bot. Mag. t. 3315.

long, glabrous; bracts early caducous; pedicels upto 2-3 cm long, glabrous, dark greenish-black; sepals 4, subequal or the outer ones slightly shorter, elliptic or ovate-elliptic, 0.9-1.2 x 0.6-0.8cm, apically obtuse, deeply concave, glabrous, reddish in colour (especially outer 2), innerside mottled; corolla red or red-purple, salverform, tube upto 4.5 cm long, limb 5-lobed, mouth 3.4-3.6 cm across, glabrous; stamens exerted; anthers upto 3.5 mm, white; filaments more or less same length, attached upto 7 mm above the corolla base, 3-3.5 cm long, pale reddish ciliolate at dilated base; ovary conical, 2 x 1.5-2mm, light green, glabrous; disc small, 1 x 4mm, slightly lobed; style exerted, upto 4 cm long, white, glabrous, slightly dilated at base; stigma biglobose, 1 x 2mm, dark red, papillate. Fruit not seen.

Flowering : December - March

Fruiting : not seen

Distribution. *Ipomoea horsfalliae* is a native of Jamaica and supposedly also of Puerto Rico. This is now widely cultivated in the tropics of both hemispheres (Austin, 1980 a).

Ecology. It is cultivated as an ornamental climber in Peninsular India. The plants never produce fruits outside their home in Jamaica (Austin, 1980 a). In the study area also fruits were not found. Because of this the vines are encountered only in cultivation and have not escaped.

Horticultural potential. *Ipomoea horsfalliae* popularly known as Lady Doorly Morning Glory or Cardinal creeper, is originally from West Indian Islands.

The plant is cultivated for their eye-catching pink flowers in bunches and also for its beautiful foliage. It is suitable for walls, fences, arches, trellis etc.

Specimens examined : KERALA: Thiruvananthapuram Dt.: Nanthancode (Cult.), *Biju* 25932 (TBGT & CALI).

Ipomoea macrantha Roemer & Schultes in Linn. Syst. Veg. 4:251.1819; Gunn, Brittonia 24:158.1972; Sivar., Geobios 2:122-123.1975; Austin in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1:331.1980; Mani. & Sivar., Fl. Calicut 184.1982.

Type: Queensland, *Brown* 2741 (BM, not seen).

Ipomoea longiflora R. Br., Prod. 1:484. 1810, non Willd. (1809).

Convolvulus longiflorus (R.Br.) Sprengel, Linn. Syst. Veg. 1:594. 1824.

Convolvulus speciosum Choisy var. *laeve* Choisy in DC., Prodr. 9:345. 1845.

Convolvulus tuba Schlecht., Linnaea 6:735. 1831.

Ipomoea tuba (Schlecht.) G. Don, Gen. Hist. 4:271. 1837; Ooststr., Blumea 3:575. 1940 & Fl. Mal., ser. 1,4:487. 1953; Rao, Bull. Bot. Surv. India 6(24):307. 1964.

Calonyction tuba (Schlecht.) Colla, Mem. Nouva Sp. Calon. 15. 1840.

Ipomoea grandiflora sensu authors, e.g. Clarke in Hook. f., Fl. Brit. India 4:198.1883, pro parte; Trimen, Handb. Fl. Ceylon 3:214. 1895, non Lamk. (1791).

Annual or perennials; stem twining or trailing, woody at base, herbaceous towards the tip, often rooting at nodes, hollow, terete or slightly angular, juice milky white. Leaves simple, broadly ovate or orbicular, entire rarely few toothed, 4-14 x 3.5 - 10 cm, apically acuminate, mucronulate, basally cordate; midrib and lateral veins raised beneath, 7-9 pairs, thick, glabrous; petiole upto 13 cm long, petiolar nectaries 2, on each side at base of lamina, slightly canaliculate. Flowers axillary, generally solitary, occasionally 2 flowered; peduncle upto 7 cm long, terete, glabrous; bracts 2, fugaceous, 3-4 x 2-2.5 mm; pedicels upto 2 cm long, dilated at apex, glabrous; sepals 5, subequal, outer 2 small, broadly rounded, 1.5 - 1.8 x 1.4 - 1.6 cm, coriaceous, glabrous, usually rounded or blunt, occasionally deeply to shallowly emarginate at apex, inner 3 large, 2 - 2.2 x 1.5 - 1.7 cm, apically mucronulate; corolla white, salver-form, midpetaline bands well marked and greenish white, tube upto 7 cm long, mouth 5 lobed, 4.5 - 5.8 cm across; stamens inserted; anthers 7 - 7.5 mm long, white; filaments attached 8 mm above the corolla base, subequal, 2 long, upto 4 cm, 3 short, upto 3.4 cm, hairy at base; ovary conical, 2 x 1 mm, glabrous; disc small, \pm 1mm long, glabrous; style upto 6 cm long, glabrous; stigma white, biglobose, 1 x 2 mm, papillate. Fruits capsular, globose, 1.8 - 2.4 x 1.4 - 1.9 cm, thin walled, straw coloured, valvular; seeds, 3-4, spheroidal, 0.9 - 1 x 0.7 - 0.8 cm, dark brown, covered with minute pale hairs, marginal hairs long.

Flowering : June - December

Flower opening : 5.00 to 6.00 am

Fruiting : September - January

Distribution. *Ipomoea macrantha*, popularly called 'Moon flower' is a pantropical species, but its region of origin is not known. In Peninsular India the plant is reported from West coast of Bombay (Santapau & Patel, 1961) and from the coastal tidal areas of Rameswaram islands (Rao, 1964). Sivarajan (1975) reported this species from tidal areas of Kadalundi near Kozhikode, Kerala.

Ecology. *Ipomoea macrantha* is a member of the littoral, back - beach flora and thrives in both rocky and sandy habitats where it climbs or sprouts over the ground (Gunn, 1972 a). Experiments by Guppy (1917) indicated that seeds could float in salt water for several months without harming the embryo. This plant is a classical example for ocean current distribution and probably might have reached the coastal areas of Peninsular India through tidal water.

Specimens examined : KERALA: Kollam Dt.: Asramam, *Biju* 44257 (CALI); Backwater area, *Mohanam* 69343 (MH). Ernakulam Dt.: Paravoor, *Biju* 25974 (CALI & TBGT). Kozhikode Dt.: Feroke *Biju* 23979 (CALI & TBGT). TAMIL NADU: Ramanathapuram Dt.: Krusadai, *Parthasarathy & Ravikumar* 85339, *Balasubramaniam* 1436 (MH). ANDHRA PRADESH: E. Godavari Dt.: Coringa canal bank, *Subba Rao* 68687 (MH).

***Ipomoea mauritiana* Jacq.**, *Collect* .4: 216.1791 & *Hort.Schoenbr.* 2:39.t.200.1797; *Verdc.*, *Fl. Trop. E. Africa* 135. 1963; *Gandhi in Sald. & Nicolson*, *Fl. Hassan Dist.* 471-472. 1978 ; *Austin in Dassan.and Fosb.*, *Rev. Handb. Fl. Ceylon* 1: 331. 1980; *Mani. & Sivar.*, *Fl. Calicut* 183.1982; *Mohan & Henry*, *Fl. Thiruvananthapuram* 315-316.1994.

Type: *Austin* (1980 a) recognised *Jacquin's* 1797 illustration as lectotype (*Hort. Schoenbr.t.* 200).

Convolvulus paniculatus Linn. *Sp. Pl.* 156.1753.

Ipomoea paniculata (Linn.) R.Br., *Prodr.* 486.1810, non *N. Burm.* 1768 ; *Gamble*, *Fl. Pres. Madras* 2: 914.1915.

Ipomoea digitata sensu auctt., non Linn. 2.1759; Clarke in Hook.f., Fl. Brit. India 4:202. 1883; Trimen, Handb. Fl. Ceylon 3:212.1895; Ooststr., Blumea 3:558. 1940 & Fl. Mal., ser. 1, 4:483.1953.

Batatas paniculata (Linn.) Choisy, Mem. Soc. Phys. Geneve 6: 436.1834; Thw., Enum.pl. zeyl. 210.1860.

Calonyction muricatum (Linn.) G. Don, Gen. Syst. 4:264.1838.

Vernacular names : Mal. *Palmutakku* ; Tam. *Palmudangi*; Kan. *Bhumichekrigadde*; Tel. *Bhuchakaragadda*; Hindi. *Bilaikand* ; Sanskrit. *Vidari*.

(Fig. 69)

Large perennial twiner; stem woody at base with large underground tuber, herbaceous towards tips, green, reddish black in exposed parts, glabrous, twisted. Leaves palmately compound, orbicular in outline, leaflets 3-7 (rarely 9), rarely entire, 6-13 x 4-9 cm, basally cordate or truncate, leaflets lanceolate to ovate, apically acuminate with an acute or blunt, mucronulate tip, glabrous on both sides; midrib and lateral veins raised beneath; petiole upto 10 cm long, canaliculate, glabrous, 2 pairs of nectaries seen on either side of distal end. Flowers axillary, few to several flowered (upto 20) cymes; peduncle upto 14 cm long, terete, some times angular towards the tip, glabrous; bracts ovate, 5 x 3 mm, apically acute, early caducous, puberulent; pedicels upto 1.8 cm long, terete, dilated above, glabrous; extrafloral nectaries 2 pairs, on either side of the apex of dilated pedicel; sepals subequal, outer 2 small, 7 x 6 mm, inner 3 slightly large, 7-8 x 7-7.5 mm, orbicular, apically obtuse, markedly convex and clasping the corolla, coriaceous, pale green, glabrous, mottled inside; corolla reddish-purple to rose pink funnel-shaped, tube upto 4.5 cm long, darker and striate inside, narrow at base, mouth 5 lobed, upto 7 cm across; stamens inserted; anthers upto 5 mm long; filaments white, attached upto 7 mm above the corolla base, unequal, 2 long, upto 2.2 cm long, 3 short, upto 1.2 cm long, white ciliolate at dilated base; ovary ovoid, light green, glabrous; disc annular, \pm 1.5 mm long; style inserted, upto 2.5 cm long, glabrous, slightly dilated at base; stigma white, biglobose, 2 x 3 mm, papillate. Fruit capsular, ovoid, 1-1.5 x 0.9-1.3 cm, valvular dehiscent, pericarp thick, straw coloured, fruiting sepal persistent; seeds 2-4, usually 4,



Fig. 69. *Ipomoea mauritiana*. A. Flowering twig; B. Petiolar nectary; C. Pedicellar nectary; D-F. Sepals; G. Fruits; H. Seed (from Biju 25945 TBGT).

ovate to ovate-elliptic, 7-8.5 x 5-6 mm, long woolly-sericeous hairs attached at apex, easily detachable; seed germination epigeal, hypocotyl upto 2 cm long, bicotyledonary, apically cordate, sinus upto 1.3 cm deep, basally truncate to slightly cordate, glabrous, petiole upto 1.4 cm long.

Flowering : June-September

Flower opening : 8 am - 8.30 am

Fruiting : August-December

Floral visitors: Ants, Honeybee, Beetles, flies etc.

Extrafloral visitors : Ants, flies etc.

Distribution. A species of pantropical distribution; the region of origin is not known but its closest relatives are found in the West Indies and South America (Austin, 1980 a). Common from Bengal and Assam to Ceylon; Africa, America and Australia.

Ecology. This species is most likely to be seen in riverine forest and secondary bush often near the sea ; it requires a moist climate and wetsoil.

Numerous insects like ants, honey bees, beetles and different types of flies are found visiting the flower in the early morning. This will certainly cause effective pollination.

The insects are also attracted by the extrafloral nectaries found on either sides of pedicels and petiole.

Taxonomic notes. This plant was known by the name *Ipomoea digitata* Linn. for a long time. But now it has been proved that this name refers to a rare plant endemic to Haiti. The correct name of the Indian specimen is *Ipomoea mauritiana* Jacq.

Medicinal use. Medicinal part of this plant is the large tuberous root with yellowish brown coat. It is brittle, mucilaginous and bitter in taste and is considered aphrodisiac, demulcent, lactagogue and cholagogue (Wealth of India).

Powdered root is given for diseases of the spleen and liver , for menorrhagia and debility. It promotes strength and complexion, improves voice, promotes breast milk and semen (Sivarajan & Indira Balachandran, 1994). In Malaysia the crushed root is applied to swellings (Ooststroom, 1953).

In Sanskrit it is known as 'Vidari'. It is an important constituent of many Ayurvedic formulations like Vidaryadi ghrtam, Dasamoolarishtam, Chavanaprasam etc (Sivarajan & Indira Balachandran, 1994).

Horticultural potential. In many parts of world it is introduced as a garden plant. The reddish purple, lilac or pinkish funnel to bell-shaped flowers attracting many insects in the early morning is a very delightful sight. Propagation is through seeds and cuttings.

Specimens examined : KERALA: Thiruvananthapuram Dt.: Palode, *Biju* 25945 (TBGT & CALI); Veli, *Biju* 25956 (CALI). Kollam Dt.: Karunagappally, *Biju* 23949 (TBGT). Kottayam Dt.: Vaikam, *Biju* 16253 (CALI). Thrissur Dt.: Chevoor, *Biju* 16288 (CALI). Kannur Dt.: Thaliparambu, *Biju* 15373 (CALI). Kasargod Dt.: Kumbla, *Biju* 15380 (CALI). TAMILNADU: Coimbatore Dt.: Coimbatore, *s.coll. s.n.* (MH). Salem Dt.: Hogainakkal Forest, *Biju* 44290 (CALI). ANDHRA PRADESH: Chittoor Dt.: Mammandur valley, *Biju* 25966 (TBGT). Kurnool Dt.: Sunnipenta vagu, *Ellis* 22137 (MH). Guntur Dt.: Kordaveu Fort, *Barber* 4650 (MH). Krishna Dt.: *Venkanna* 5898 (MH).

***Ipomoea staphylina* Roemer & Schultes** in Linn. Syst. Veg. 4:249. 1819; Clarke in Hook.f., Fl. Brit. India 4:210. 1883; Trimen, Handb. Fl. Ceylon 3:219. 1895; Gamble, Fl. Pres. Madras 2:913. 1923; Gandhi in Sald. & Nicolson, Fl. Hassan Dist. 472. 1978; Chang, Fl. Taiwan 4:376. 1978; Austin in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1:340. 1980; Mani. & Sivar., Fl. Calicut 181. 1982; Rani & Matthew in Matthew, Fl. Tam. Carnatic 3:1033. 1983; Nair & Nayar, Fl. Courtallum 2:245. 1986; Chand. & Nair, Fl. Coimbatore 194. 1987; Vajravelu, Fl. Palghat Dist. 312. 1990.

Type: not found.

Ipomoea racemosa Roth, Nov. Sp. 115 not of Poir.; Wight Ill.t. 168. 1840-1850.

Perennial lianas; stem twining or scrambling, woody at base, herbaceous towards tip, terete, glabrous; latex milky white. Leaves simple, ovate to ovate-elliptic, 3 - 14.5 x 2.5 - 11.5 cm, apically acute to acuminate, basally cordate or truncate often with galls; petiole upto 9 cm long, canaliculate, glabrous.

Flowers axillary, many (upto 80) flowered paniculate - cymose; peduncle upto 15 cm long, green, glabrous; bracts small, caducous, 2 x 1.2 - 1.6 mm, apically acute to acuminate, glabrous; pedicels upto 1-1.3 cm long, terete, glabrous; sepals 4, subequal, outer 2 small, broadly ovate, 4.5 - 5 x 4.1 - 4.2 mm, apically obtuse, mottled, glabrous, inner 3 large, circular, 5-5.2 x 6-6.2 mm, apically retuse, mottled, glabrous; corolla whitish purple, throat deep purple, campanulate, tube upto 2.4 cm long, slightly 5 lobed, mouth upto 1.8 cm across, tube mottled outside, inner base foveolate; stamens inserted; anthers 2-3 x 1-1.5 mm; filaments attached 2 mm above the corolla base, more or less equal, 6-7 mm long, white, purplish ciliolate at dilated base; ovary subglobose, 2x3 mm, glabrous; disc lobed, upto 1.8 mm long; style inserted, upto 1.5 cm long, glabrous; stigma white, biglobose, 1 x 1.5-2 mm, papillate. Fruits capsular, ovate, 1.2 - 1.6 x 0.7 - 0.9 cm, valvular, straw coloured, persistent with style base; seeds 4, elliptic - oblong, 5 - 5.5 x 2.5 - 3.5 mm, light brown, white, comose, attached only at apex, 7-8 mm long.

Flowering : December - March

Fruiting : February - May

Distribution. *Ipomoea staphylina* is distributed in India, China (Ching, 1978) and Ceylon.

Ecology. In Peninsular India, it occurs in the semi - deciduous or deciduous forests, also as a secondary vegetation in cleared areas and waysides at an altitude upto 1000 m.

Specimens examined : KERALA: Malappuram Dt.: Chettipady, *Biju* 44293 (CALI). Kannur Dt.: Edakkad, *Biju* 15376 (CALI). Palakkad Dt.: Kottathora, *Vajravelu* 59132 (MH). TAMIL NADU: Tirunelveli Dt.: Palayan Kottai, *Biju* 25944 (CALI & TBGT). Ramanathapuram Dt.: Chittarau, *Nair* 60934 (MH). Coimbatore Dt.: Kurudimala, *Biju* 23980 (TBGT); Maruthamala, *Biju et al.* 23990 (TBGT & CALI); Aliyar, *Sebastine* 15635 (MH); Anamalais, *Joseph* 13577 (MH). Tiruchirappalli Dt.: Pachamalai, *Sebastine* 7885 (MH). Salem Dt.: Pennagaram, *Vajravelu* 22422 (MH). Nilgiris Dt.: *Gamble* 20431 (MH). S. Arcot Dt.: Sirupakkam R.F., *Ramamurthy* 90403 (MH). N. Arcort Dt.: Kottur, *Viswanathan* 574 (MH). Madurai Dt.: Alayar hills, *Subramanyam* 5282 (MH). ANDHRA

PRADESH: Chittoor Dt.: Nerabylu, *Subba Rao* 46981 (MH). Cuddapah Dt.: Balapalle, *Ellis* 15771 (MH). Kurnool Dt.: Nallamalais, *Ellis* 32622 (MH). Krishna Dt.: *Gamble* 18588 (MH). Vishakhapatnam Dt.: Vishakhapatnam, *Subba Rao* 22556 (MH).

Ipomoea sp.A.

Very similar to *Ipomoea staphylina* Roem. & Schultes but differs by its large size of flowers, circular outer sepals, corolla tube more than 5.5 cm long and non mottled inner surface. In *Ipomoea staphylina*, by contrast, the flower is smaller in size, outer sepal broadly ovate, corolla tube less than 2.5 cm long and mottled inner surface.

Perennial lianas; stem scrambling or twining, woody at base, herbaceous towards tip, terete, strongly twisted, glabrous; latex milky white. Leaves simple, ovate, 4-16 x 3-14 cm, apically acute to acuminate, basally truncate to cordate, glabrous; midrib and lateralveins raised beneath, lateral veins 12-13 pairs; petiole upto 11 cm long, canaliculate, glabrous. Flowers axillary, many (upto 50) flowered paniculate cymes; peduncle upto 30 cm long, green; glabrous; bracts caducous, 2-3 x 1.5-2 mm, apically acute, glabrous; pedicels 3 - 4 cm long, terete, glabrous; sepals 4, subequal, outer 2 slightly smaller, circular, 0.8 - 1 x 0.7 - 0.9 cm, apically obtuse, mottled inside, glabrous, inner 3 slightly larger, circular, 0.8 - 0.9 x 1-1.1 cm, apically retuse, oblique, mottled, glabrous; corolla white, deep purple inside, campanulate, tube upto 6 cm long, mouth upto 2.8 cm across, 5 lobed, tube outside glabrous, non mottled, inside striate; stamens inserted; anthers upto 6 mm long; filaments white, attached 6 mm above the corolla base, subequal, 2 long, upto 2 cm, 3 short, upto 1.2 cm long, purplish ciliolate at dilated base, slightly pubescent; ovary conical, 3 x 1-1.2 mm, glabrous; disc small, \pm 2, mm, glabrous; style inserted, upto 2.7 cm long, glabrous; stigma biglobose, 1 x 2-2.3 mm, white, papillate. Fruits not found.

Flowering : November - March

Fruiting : not found

Distribution. This was collected only from two localities in Kerala State; Ernakulam and Kozhikode Districts.

Ecology. This species is a woody climber growing along the disturbed sites of waste places and roadsides.

Notes. Detailed study is required for the confirmation of the identity. For the time being it is included as *Ipomoea* sp. A.

Specimens examined : KERALA: Ernakulam Dt.: by pass roadside, *Biju* 23938 (CALI & TBGT). Kozhikode Dt.: Ramanattukara, *Biju & Pushpangadan* 15353 (TBGT & CALI).

Ipomoea* sect. *Erpipomoea Choisy, Mem. Soc. Phys. Geneve 6:62.1838 & in DC., Prodr. 9:349.1845; Verdc., Taxon 6:151.1957 & Fl.Trop. E. Africa 81.1963; Austin, Taxon 24(1):108. 1975a; Taxon 28(4): 360.1979; Taxon 29:501.1980 & in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1:314.1980.

Type species : *I. pes-caprae* (Linn.) R. Br.

Leiocalyx Hall.f. in Engl., Bot. Jahrb. 18.139.1893; Ooststr., Fl. Mal., ser. 1,4:471.1953.

Leiocalyx Hall.f. subsect. *Eu-Leiocalyx* Ooststr., Blumea 3(3):519.1940.

Annual or perennial vines; stem trailing or twining, herbaceous, glabrous (rarely pubescent). Leaves simple or palmately compound, glabrous. Flowers pedunculate, axillary, solitary or in subumbellate dichasia; sepals very various, mostly oblong, elliptic or lanceolate, often verrucose or cristate on the back; corolla mostly purplish, rarely white, glabrous or very rarely farinose or pubescent outside; seeds glabrous, velutinous or with bearded edges.

KEY TO THE SPECIES

- 1a. Plants usually littoral. Leaves conspicuously bilobed at apex.....8. **I. pes-caprae**
- 1b. Plants aquatic or terrestrial. Leaves not conspicuously bilobed at apex..... 2
- 2a. Fruiting pedicels swollen. Seeds covered with white tomentose, long arachinoid hairs along the margin.....6. **I. marginata**
- 2b. Fruiting pedicels not swollen. Seeds pubescent...3.
- 3a. Semi-succulent swamp plants. Leaves mostly hastate (rarely cordate)..... 2. **I. aquatica**
- 3b. Herbaceous vines. Leaves not hastate..... 4
- 4a. Leaves coriaceous, rounded-cordate, apically obtuse or acuminate. Corolla lavender to purple..... 1. **I. asarifolia**
- 4b. Leaves membranaceous, cordate or palmately compound..... 5
- 5a. Leaves simple, entire, reniform apically acute to slightly apiculate. Flowers yellowish white with deep purplish throat..... 7. **I. obscura**
- 5b. Leaves palmately compound, pseudostipulate...6
- 6a. Bracts palmately laciniate like leaves. Flowers upto 1 cm long..... 4. **I. coptica**
- 6b. Bracts simple, entire. Flowers more than 5 cm long 7
- 7a. Leaflets entire. Flowers campanulate. Seeds tomentose with long silky trichomes along edges.....3. **I. cairica**

7b. Leaflets coarsely serrate. Flowers salverform.

Seeds shortly tomentose..... 5. *I. laciniata*

1. *Ipomoea asarifolia* (Desr.) Roemer & Schultes in Linn. Syst. Veg. 4:251.1819; Ooststr., Blumea 3:539.1940 & Fl. Mal., ser. 1,4:477.1953; Austin in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1:319.1990; Rani & Matthew in Matthew, Fl. Tam. Carnatic 3:1021,1983; Vajravelu, Fl. Palghat Dist. 309.1990; Mohan & Henry, Fl. Thiruvananthapuram 315.1994.

Type : Senegal. *Roussillon* (not seen).

Convolvulus asarifolius Desr. in Lam., Encycl. 3:562. 1789.

Ipomoea repens Lam., Tabl. Enc. 1:467.1791, non Roth (1821); Trimen, Handb. Fl. Ceylon 3:222.1895; Gamble, Fl. Pres. Madras 2:916.1923; Mani. & Sivar., Fl. Calicut 182.1982.

Ipomoea beladamboe Roemer & Schultes in Linn. Syst. Veg. 4:233.1819, nom. illeg. (incl. type of *Ipomoea repens* Lam. 1793); Clarke in Hook. f., Fl. Brit. India 4:209.1883.

Convolvulus rugosus Rottl., Ges. Naturf. Fr. Neue Schr. 4:196.1803.

Convolvulus flagelliformis Roxb., Fl. India 2:68.1824, (non *Convolvulus repens* Linn. 1753)

Convolvulus beladambu Spreng., Syst. Veg. 1:608.1824.

Ipomoea rugosa (Rottl.) Choisy, Mem. Soc. Phys. Geneve 6:446.1834; Wight, Icon. pl. Ind. or.t.887.1844-45; Thw., Enum. pl. zeyl. 211.1860.

-*Bel-adambu* Rheede, Hort. Malab. 11:119, t.58.1692.

Perennial herbs; stem prostrate and tips twining, rooting at the nodes, terete, hollow, reddish violet tinge, glabrous; latex milky white. Leaves simple, ovate or rounded - cordate to subreniform, 3-7 x 3-8 cm, apically obtuse or broadly rounded, sometimes slightly emarginate, mucronulate, basally truncate or cordate, with rounded lobes; midrib and lateral veins raised beneath, violet in colour, glabrous; petiole upto 9.5 cm long, canaliculate, smooth or minutely muricate; petiolar nectaries 2, one on either side near the point of blade attachment, basin type, red pigmentation around the rim. Flowers axillary, few to several (upto 20) flowered simple or compound cymes;

peduncle upto 3.5 cm long, terete below, angular above, glabrous or minutely muricate; bracts small, ovate, 3.5 x 2 mm, apically acute to acuminate; pedicels upto 1 cm long, dilated at apex, minutely muricate; extrafloral nectaries 2 pairs on either side of the dilated apex (just below the calyx lobes); sepals 5, subequal, outer 2 small, elliptic - oblong, 0.7-0.9 x 0.3-0.4 cm, apically acute to obtuse, slightly emarginate, mucronulate, 3-nerved and verrucose outside, glabrous inside, inner 3 large, elliptic - oblong, 1.1-1.2 x 0.5-0.7 cm, apically rounded, slightly emarginate, mucronulate, glabrous on both sides; corolla lavender to purple, funnel-shaped, tube upto 4 cm long, tube inside deep pink, 4.5-5 cm; stamens inserted; anthers 3-4mm long, light purplish - white; filaments attached 3 mm above the corolla base, unequal, 2 long, upto 1.5 cm, 3 short, upto 8 mm long, pinkish-white, ciliolate at dilated base; ovary small, conical 1 x 2 mm; disc small, slightly lobed; style inserted, upto 1.8 cm long, glabrous, dilated at base; stigma biglobose, 1 x 2 mm, white. Fruits capsular, subglobose, 0.7-0.8 x 1.2-1.4 cm, apically with persistent style base and surrounding region violet in colour, glabrous; seeds 4, ovate, 5-6 x 4-4.5 mm, brown to dark brown, minutely grey-pubescent.

Flowering : October - February

Fruiting : December - March

Distribution. *Ipomoea asarifolia* is an American species, presumably originated from Orinoco river basin of Venezuela. From there it probably spread to West Indies, from where it was carried in ballast by the early sailing ships to the Old World (Austin, 1980 a).

Ecology. In India it is found along the east and west coast, near backwater and bank of tidal streams and mangrooves. It also occurs in inlands upto an elevation of 800 m, generally by moist banks of ponds, streams and canals.

Specimens examined : KERALA: Thiruvananthapuram Dt.: Karatte, Mohanan 52614 (MH). Kollam Dt.: Kottarakara, Biju 44244 (TBGT); Adoor, Mohanan 63745 (MH). Thrissur Dt.: Kalady, Biju 15365 (CALI & TBGT), Ramamurthy 25966 (MH). Kozhikode Dt.: Kadalundy, Biju 25959 (CALI). Palakkad Dt.: Olavakkot, Vajravelu 19144 (MH). Kannur Dt.: Manjeshwar, Ansari 64889 (MH); Thaliparambu, Barber 8748 (MH). TAMIL NADU: Ramnad Dt.: Melamadam

Forest, *Ramamurthy* 25832 (MH). Pudukkottai Dt.: Kiranur, *Ramamurthy* 51343 (MH). Thanjavoor Dt.: Mannargudi, *Ramamurthy* 51203 (MH). Tiruchirappalli Dt.: Narthamalai, *Ramamurthy* 23670 (MH). N. Arcot Dt.: Thirupattur, *Subramanyam* 6574 (MH). Chengalpattu Dt.: Vandalur, *s.coll.* 11559, *Henry* 45551 (MH). KARNATAKA: S. Canara Dt.: Karkal, *s.coll.* 12015 (MH). Mysore Dt.: Thomson *s.n.* (MH). ANDHRA PRADESH: Chittoor Dt.: Kuppam, *s.n.* 10302 (MH).

2. *Ipomoea aquatica* Forsk., Fl. Aegypt.-Arab. 44.1775; Clarke in Hook. f., Fl. Brit. India 4.210.1883; Trimen, Handb. Fl. Ceylon 3:221.1895; Merrill in Philip. Journ. Sci. 59:452.1936; Ooststr., Blumea 3:528.1940 & Fl. Mal., ser. 1.4:473:1953; Verdc., Fl. Trop. E. Africa 120.1963; Gandhi in Sald. & Nicolson, Fl. Hassan Dist. 469.1978; Austin in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1:318.1980; Mani & Sivar., Fl. Calicut 182.1982; Rafi & Matthew in Matthew, Fl. Tam. Carnatic 3:1021.1983; Chand. & Nair, Fl. Coimbatore 194.1983.

Type : Yemen, Zebid, *Forsk.* (C, holotype, fide Verdcourt).

Ipomoea reptans Poiret in Lam. Encycl. (suppl. 3) :460.1814, non Linn.; Gamble, Fl. Pres. Madras 2:916.1923.

Ipomoea reptans sensu auct. mult., e.g. Moon, Cat. 14.1824; Thw., Enum. pl. zeyl. 211.1860, non *Convolvulus reptans* Linn. (1753).

- *Ballel* Rheede, Hort. Malab. 11:107-108, t.52.1692.

Vernacular names : Tam. *Vellaikeeri* ; Tel. *Tutikura*

(Fig. 70)

Annual or sometimes perennial herbs; stem trailing on moist soil or mud with twining tips, hollow, rooting at nodes when floating or procumbent, glabrous; latex milky white. Leaves simple, variable in shape and size, ovate, triangular, ovate-oblong, lanceolate or linear, 1-9 x 0.2-7 cm, apically acute, acuminate, obtuse, mucronulate, basally truncate, cordate to sagittate or hastate, glabrous; midrib and lateral veins raised beneath; petiole upto 9.3 cm long, thin, glabrous. Flowers axillary, solitary or in few flowered (upto 3) cymes; peduncle upto 8 cm long, terete, glabrous; bracts small, 1x-1mm;

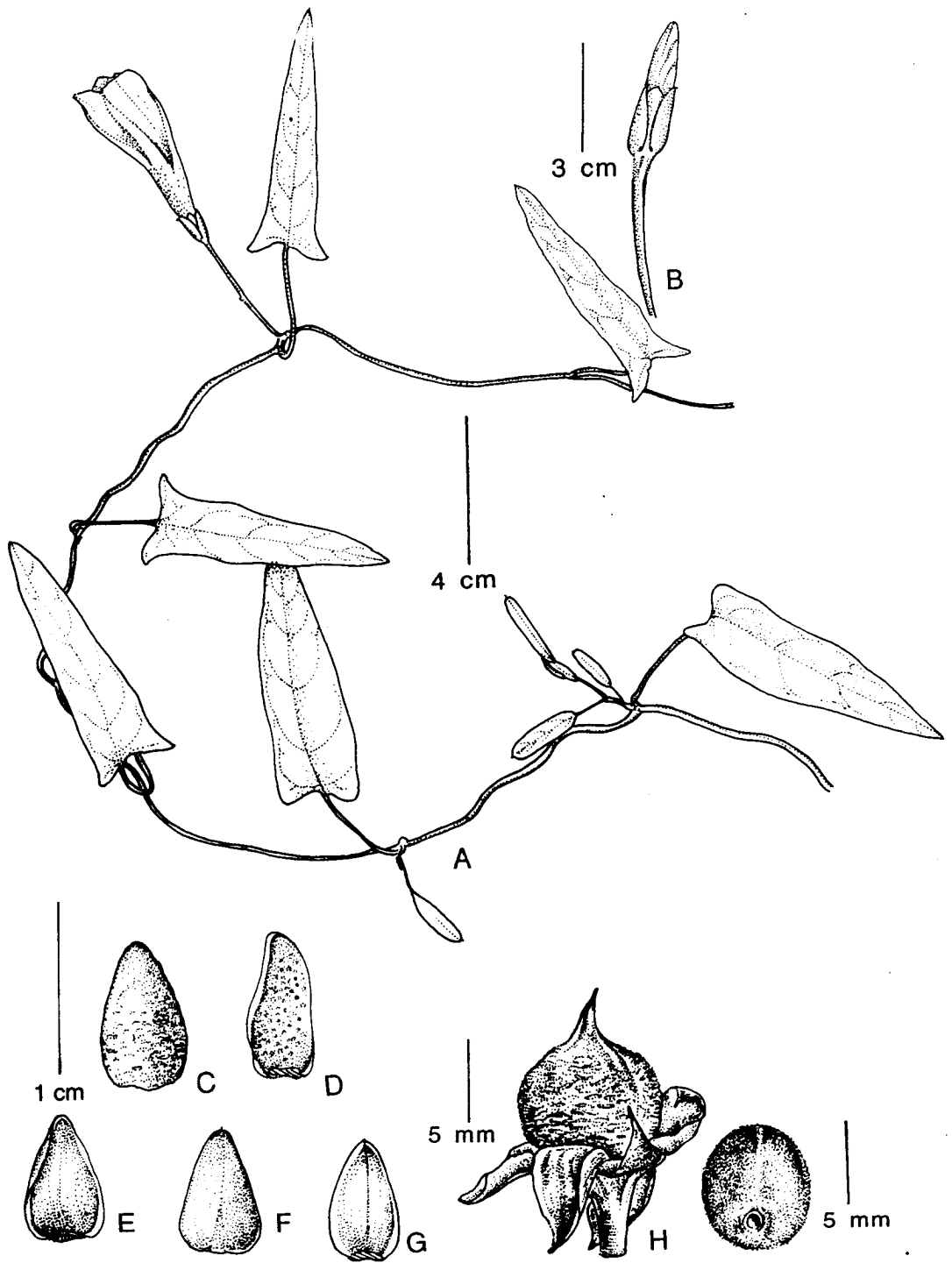


Fig. 70. *Ipomoea aquatica*. A. Flowering twig; B. Flower bud; C-G. Sepals; H. Fruit; I. Seed (from *Biju* 16235 TBGT).

pedicels upto 6 cm long, dilated at apex, glabrous; sepals 4, subequal, outer 2 short, ovate - oblong, 7-8.5 x 3-4 mm, apically acute to obtuse, minutely mucronulate or blunt, outer surface minutely verruculose, inner side mottled, glabrous, inner 3 slightly bigger, ovate, 8-9 x 5-5.1 mm, apically acute to slightly obtuse, mucronulate, glabrous; corolla light purple or rarely white, often with purple centre, funnel-form, tube upto 3 cm long, slightly 5 lobed, 3-3.5cm across; stamens inserted; anthers upto 4 mm long, white; filaments attached 4 mm above the corolla base, unequal, 2 long, upto 1.4 cm, 3 short, upto 0.9 cm long, ciliolate at dilated base; ovary small, conical, \pm 1-1.5 x 1-1.5mm, glabrous; disc small, \pm 1 x 2.5mm, slightly lobed, glabrous; style inserted, upto 1.5 cm long, glabrous, slightly dilated at base; stigma biglobose, 1 x 2 mm, papillate, white. Fruits capsular, ovoid to globose, 7.5-8.5 x 7-8mm, deeply irregularly rugose, not valvular, leathery coat rupture irregularly, apically long acuminate; fruiting sepal reflexed; seeds 1 or 2 (very rarely 3), orbicular, 6 x 5-6mm, densely soft pilose, grayish-black; seed germination epigeal, hypocotyl upto 3 cm long, bicotyledonary, apically deep obcordate, sinus upto 2.4 cm deep, basally truncate to obtuse, glabrous, petiole upto 1.5 cm long.

Flowering : October - March

Flower opening : 8.30 am to 9.00 am

Fruiting : December - April

Distribution. *Ipomoea aquatica* is a native of Old World tropics and now widely naturalised in several countries in the New World.

Ecology. In India it is found restricted to wet sites particularly canals, paddy field margins, stream banks and ponds.

Economic potential. Young shoot and leaf of *Ipomoea aquatica* are nutritive and palatable vegetable in many parts of the world (Ooststroom, 1953; Austin, 1980 a). Sharma (1992) in his survey of wild vegetable plants in the markets of Shahjahanpur (Uttar Pradesh) found the young twigs and leaves of *I. aquatica* being used as vegetable. In Malaysia it is used as food for fish and pig (Ooststroom, 1953).

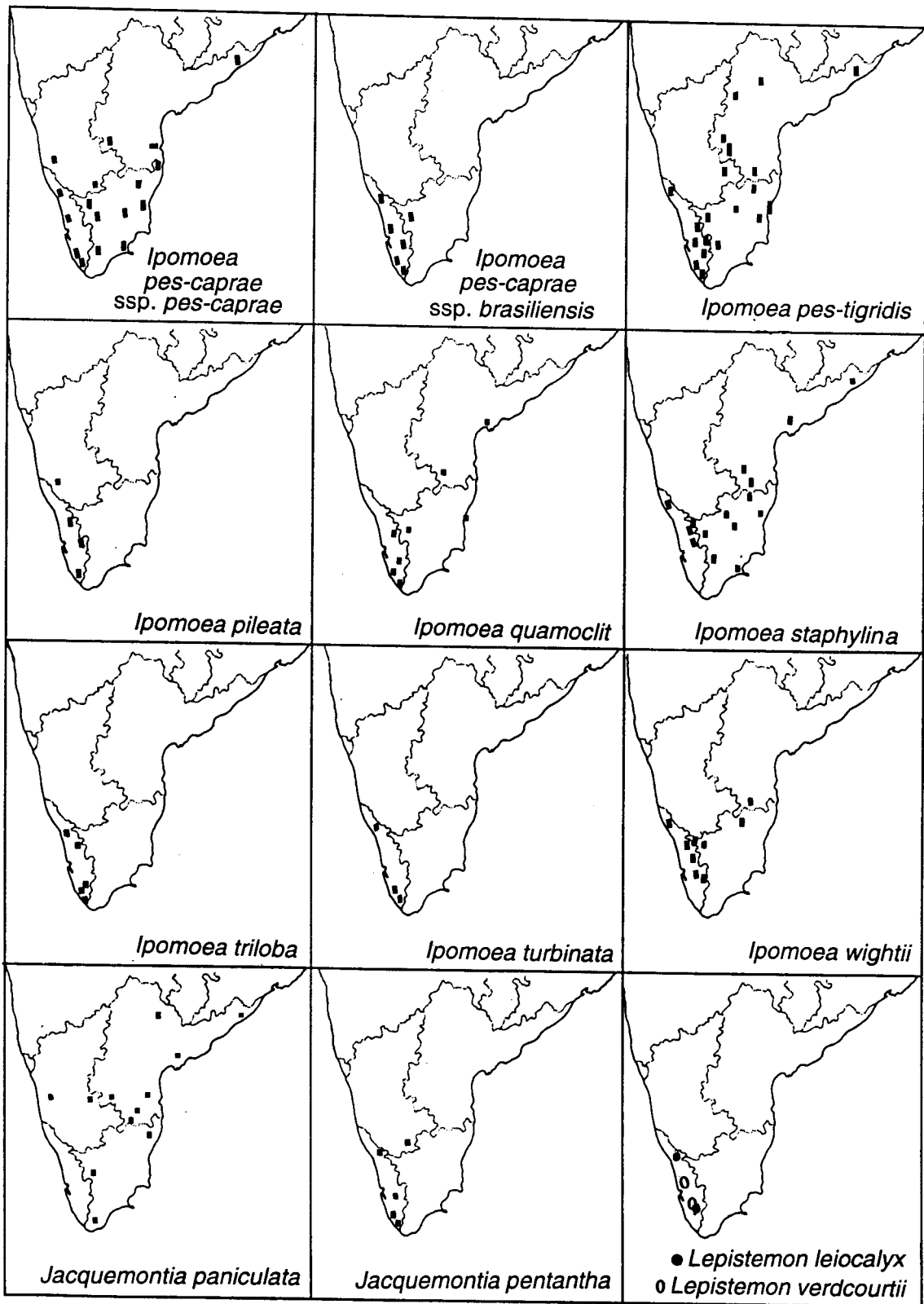


Fig. 71. Distribution maps of *Ipomoea*, *Jacquemontia* and *Lepistemon*.

Specimens examined: KERALA: Thiruvananthapuram Dt.: Karamana, *Biju* 16235 (TBGT & CALI). Kollam Dt.: Arippal, *Biju* 44274 (CALI). Allapuzha Dt.: Near KSRTC Bus Station, *Biju* 23927 (TBGT); Punnamada, *Swaminathan* 88299 (MH). Thrissur Dt.: Chalakudy, *Ramamurthy* 74819 (MH). Malappuram Dt.: Parappanagandi, *Biju* 15342 (TBGT). TAMIL NADU: Kanniyakumari Dt.: Thamarikulam, *Henry* 4950 (MH). Tirunelveli Dt.: Vasudevanallur R.F., *Vajravelu* 34004 (MH). Ramanathapuram Dt.: Sethupathinagar, *Biju* 25933 (TBGT); Thiruvadana, *Balasubramaniam* 1693 (MH). Thanjavur Dt.: Thiruppugulur, *Ramamurthy* 53611 (MH). Coimbatore Dt.: Perur Dam, *Subramanyam* 2316 (MH). S. Arcot Dt.: Annamalinager, *Sebastine* 5257; Veeranum Bund, *Ramamurthy* 53552 (MH). Chengalpattu Dt.: Vedanthangal, *Henry* 47098 (MH). KARNATAKA: Bangalore Dt.: *s.coll.* 265 (MH). ANDHRA PRADESH: Krishna Dt.: Masulipatam, *s.coll.* 83104 (MH). W. Godavari Dt.: Samalkota, *s.coll.* 14028; Kolleru, *Subramanyam* 5069 (MH). Medak Dt.: Narasapur, *Sebastine* 6805 (MH). Warangal Dt.: Pakhal, *Henry* 15903 (MH). Karimnagar Dt.: Kodimial, *Subba Rao* 21864 (MH).

***Ipomoea cairica* (Linn.) Sweet, Hort. Br. 287. 1827; Gamble, Fl. Pres. Madras 2:915.1921; Ooststr., Blumea 3:542.1940 & Fl. Mal., ser. 1,4.478.1953; Verdc., Fl. Trop. E. Africa 125. 1963; Austin in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1:322.1980; Gandhi in Sald. & Nicolson, Fl. Hassan Dist. 470.1978; Mani. & Sivar., Fl. Calicut 183.1982; Rani & Matthew in Matthew, Fl. Tam. Carnatic 3:1024.1983; Nair & Nayar, Fl. Courtallum 2:243.1986; Chand. & Nair, Fl. Coimbatore 195.1987; Ramach. & Nair, Fl. Cannanore 301.1988.**

Type : Illustration of *Convolvulus aegyptius* Vesling, Obs. in Prosp., Alp. Pl. Aegypt. 75. fig. 1638 (Syntype).

Convolvulus cairicus Linn., Syst. Nat. ed. 10.922.1759.

Ipomoea pulchella Wight, Icon. pl. Ind. or.t. 156:1839, non Roth, 1821.

Ipomoea palmata Forssk., Fl. Aegypt. - Arab. 43.1775; Thw., Enum. pl. zeyl. 212.1860; Clarke in Hook. f., Fl. Brit. India 4:214.1883; Trimen, Handb. Fl. Ceylon 3: 225.1895.



Plate 4. A. *Ipomoea eriocarpa* B. *Ipomoea hederifolia* C. *Ipomoea horsfalliae* D. *Ipomoea indica* E & F. *Ipomoea mauritiana* G. *Ipomoea macrantha* H. *Ipomoea marginata* I. *Ipomoea nil* J. *Ipomoea turbinata*.

(Fig. 72)

Perennial tuberous vines; stem twining or sometimes prostrate, woody at base, herbaceous towards tip, smooth or muricate, glabrous, terete; latex milky white. Leaves ovate to orbicular in outline, palmately divided to the base into 5-7 lobes, elliptic, ovate-elliptic to ovate, apically acuminate, acute or obtusish mucronulate, basally acuminate, terminal one larger than the laterals, 3-5 x 2-3 cm, lateral lobes slightly smaller, 2-4 x 1-2.2 cm, outer lobes sometimes bifid, glabrous on both sides; midrib raised beneath; petiole upto 7 cm long, basally muricate, glabrous; pseudostipules 1 or 2, miniature of leaf, glabrous. Flowers axillary, few to several (upto 14) flowered cymose panicle; peduncle upto 2.5 cm long, terete; bracts small, \pm 1 mm, glabrous; pedicels upto 1.8 cm long, terete, glabrous, dilated at base; sepals 4, subequal, outer 2 slightly smaller, ovate or ovate to elliptic, 5-6 x 3-4.1 cm, apically obtuse to acutish, mucronulate, outer surface minutely verruculose, with pellucid dots, glabrous, innerside mottled, glabrous, inner 3 larger, broadly ovate to deltoid, 4.8-5.8 x 5-6.2 cm, apically obtuse or slightly retuse with mucronulate, glabrous, mottled inside; corolla purplish tinge on both surfaces, throat dark purple, campanulate, tube upto 4.5 cm long, limb slightly 5-lobed, mouth 6.2 cm across; stamens inserted; anthers upto 6 mm long, white; filaments attached 6 mm above the corolla base, unequal, 2 long, upto 1 cm long, 3 short, upto 0.6 cm long, ciliolate at dilated base; ovary small, subglobose, 1 x 1-1.5 mm, glabrous; disc small, 1 x 2-2.5 mm, slightly lobed, glabrous; style inserted, 1.8-2 cm long, glabrous, slightly dilated at base; stigma bilobed, lobes elliptic, 1 x 3 mm, apically acute, papillate. Fruits capsular, subglobose, 1.3-1.5 x 0.8-1 cm, valvular, glabrous; seeds 3-4, subglobose to ovoid, 4-6.5 x 2-4 mm, long silky trichomes along the edges.

Flowering : Throughout the year, peak during February to May

Fruiting : March-June

Distribution. The precise native locality of this perennial is unknown. It appears that the plants are originally from the Western Hemisphere (Austin, 1980 a). Now it is found in tropical Africa, from eastern Mediterranean region through Asia to Formosa and Malaysia, also in the New World tropics. In



Fig. 72. *Ipomoea cairica*. Flowering twig (from Biju 15366 TBGT).

Peninsular India, it is widely distributed in Kerala State as a wayside plant, probably escaped from cultivation.

Ecology. In Peninsular India this is found widely in waste places, thickets, hedges etc. Fruit setting is not common in the present study area.

Taxonomic notes. Verdcourt (1963) mentioned two varieties of *I. cairica*, i.e. var. *cairica* and var. *indica* Hall.f. In the distribution notes of the var. *indica* its occurrence in India is mentioned. But we couldn't collect *I. cairica* var. *indica* Hall. from Southern Peninsular India during the course of the study.

Bhandari (1978) made a new combination of the var. *semine-glabro* of *I. palmata* Forsk. [= *I. cairica* (Linn.) Sweet] This is the third variety of *I. cairica* and is strictly restricted to the Jaisalmer district of Rajasthan. These two varieties are mainly distinguished by the seed pubescence. In *I. cairica* seed pubescence varies widely from puberulent (nearly glabrous) to pubescent. Detailed study is required to finalise the taxonomic identity of these varieties.

Horticultural potential. *Ipomoea cairica* is popularly known as Railway creeper. This plant has numerous large showy flowers with purple colour on both sides and deep purple throat. It is suitable for fences.

Specimens examined : KERALA: Thiruvananthapuram Dt.: Palayam, Biju 15366 (TBGT). Kollam Dt.: Mayanad, Biju 44246 (TBGT). Pathanamthitta Dt.: Tiruvalla, Anilkumar 1030 (MH). Kottayam Dt.: Angady, Antony 238 (MH). Palakkad Dt.: Olavakkot, Joseph 17791 (MH). Wayanad Dt.: Maananthavaadi, s.coll. s.n.; Kannur Dt.: Tellichery, Ramachandran 62241 (MH). TAMIL NADU: Madurai Dt.: Surimalai, Biju 23987 (TBGT). Coimbatore Dt.: Coimbatore, Chandrabose 28743 (MH). Nilgiris Dt.: Segur, Subba Rao 37309 (MH). Salem Dt.: Pennagaram, Vajravelu 22461 (MH). S. Arcot Dt.: Gingee, Sebastine 12365 (MH). KARNATAKA: Mysore Dt.: s.coll. s.n. (MH); Nandi Droog Rudolph 60 (MH). Bellary Dt.: s.coll. s.n. (MH) ANDHRA PRADESH: Anantapur Dt.: Penakacherla, Yesoda 599 (MH).

***Ipomoea optica* (Linn.) Roemer & Schultes** in Linn. Syst. Veg. 4:208. 1819; Ooststr., Blumea 3:544. 1940 & Fl. Mal., ser. 1,4 : 479. 1953; Verdc., Fl. Trop. E. Africa 128. 1963; Austin in Dassan. & Fosb., Rev. Handb. Fl.

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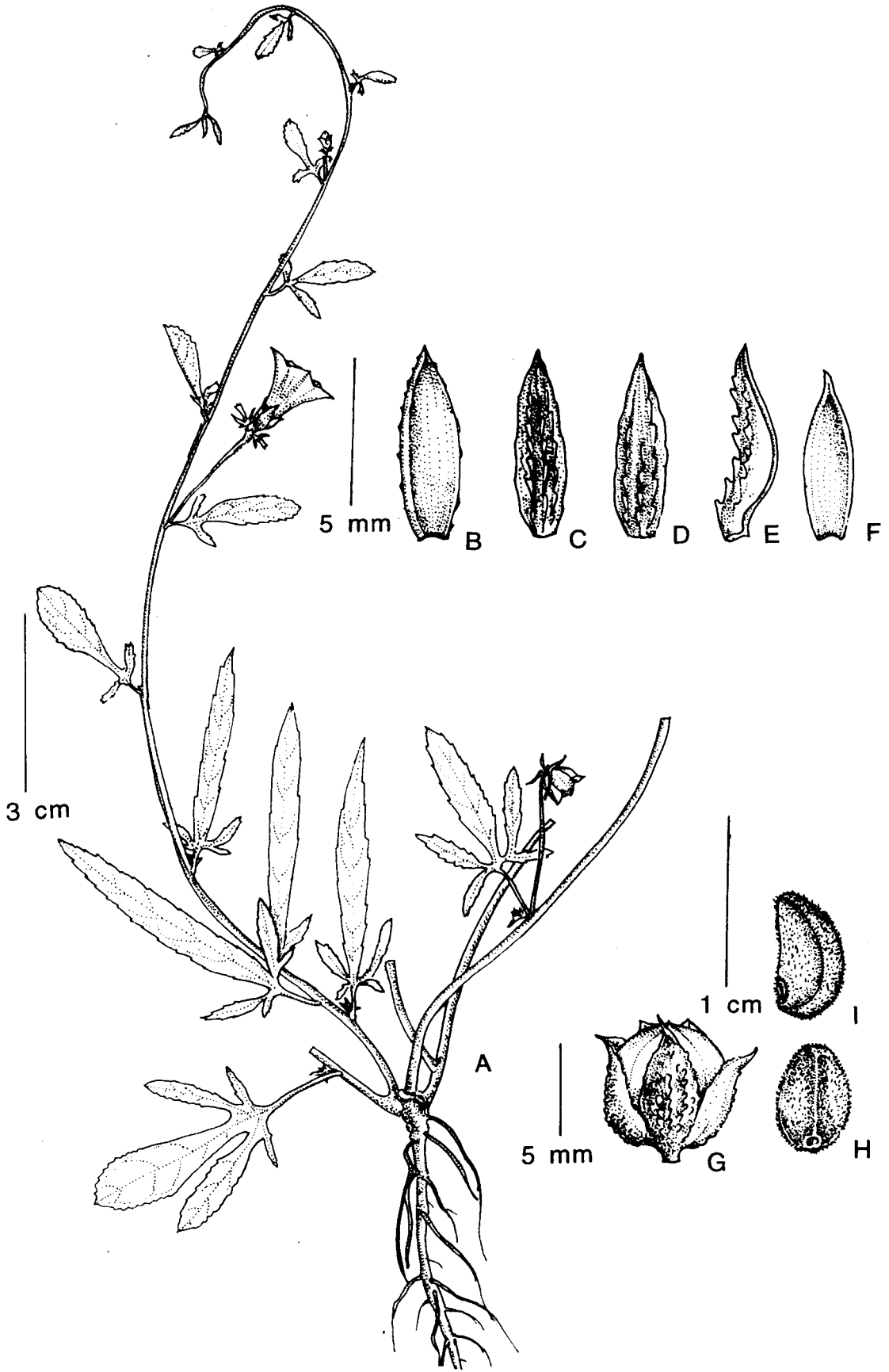


Fig. 73. *Ipomoea coptica*. A. Flowering and fruiting twig; B & C. Outer sepals; D-F. Inner sepals; G. Fruit; H & I. Seeds (from Balasubramanian 1561 MH).

Ceylon 1: 323. 1980; Rani & Matthew in Matthew, Fl. Tam. Carnatic 3:1025. 1983.

Type : Orient, specimen 218. 32 (LINN, not seen; microfiche seen).

Convolvulus copticus Linn., Mant. 2:559. 1771.

Ipomoea dissecta Willd., Phytogr. 5.t.2. 1794; Thw., Enum. pl. zeyl. 212. 1860; Clarke in Hook. f., Fl. Brit. India 4:200. 1883; Trimen, Handb. Fl. Ceylon 3:213. 1895; Gamble, Fl. Pres. Madras 2:918. 1923.

(Fig. 73)

Annual herbs; stem twining or prostrate, slender, glabrous, terete, slightly grooved when dry, hollow. Leaves orbicular in outline, digitately 3-5 lobed, terminal one larger, oblanceolate, 3-4 x 0.8-1.5 cm, inner pair medium sized, obliquely oblanceolate, 1-2.5 x 0.4 - 0.7 cm, outer most pair very small, linear, 0.5 - 0.8 x 0.1 - 0.2 cm, coarsely or deeply dentate except outermost pair, apically acute to acuminate, glabrous on both sides; midrib and lateral veins raised beneath, 5-6 pairs; petiole upto 1 cm long, glabrous; pseudostipulate, deeply digitate, 2 x 3 mm. Flowers axillary, 1-3 flowered cymes; peduncle upto 3.5 cm long, terete, glabrous; bracts palmately laciniate like leaves, 2 x 3 mm; pedicels upto 4 mm long, glabrous to puberulent; sepals subequal, outer 3 large, 5-6 x 1-2.2 mm, apically acuminate or undulating crests, inner 2 small, elliptic - oblong, 4-5 x 1 mm, apically obtuse, mucronulate, glabrous or slightly verruculose on the back; corolla white with a whitish purple throat, funnellform, tube upto 9 mm long, mouth slightly 5 lobed, 0.8 - 1 cm across; stamens inserted; anthers upto 1.2 mm long; filaments attached 2 mm above the corolla base, subequal, 2 long, upto 5 mm, 3 short, upto 3 mm long, ciliolate at dilated base; ovary conical, 1x1mm, glabrous; disc small, \pm 1 mm; style inserted, upto 5 mm long, glabrous, slightly dilated at base; stigma white, biglobose, papillate. Fruits capsular, ovoid, 8-9 x 7-8 mm, valvate dehiscent, glabrous, fruiting sepals slightly enlarged; seeds 4, 3 x 2.5 mm, densely graeyish tomentose.

Flowering : November - February

Fruiting : December - April

Distribution. *Ipomoea coptica* is known from South India, Ceylon, Malaysia, tropical Africa and Australia. In Southern Peninsular India it is very rare.

Ecology. In the study area it is found in semi - arid sandy or rocky terrain in the plains and hills upto an altitude of 800 m.

Specimens examined : TAMIL NADU: Ramanathapuram Dt.: Ananthur cut road, *Balasubramaniam* 1561 (MH) . Pudukkottai Dt.: Sithannavatsal, *Arulappan* 246 (MH). Chengalpattu Dt.: *Lawson s.n.*; Madras Christian college campus, *Narasimhan* 970; Karikili, *Henry* 47085 (MH). KARNATAKA: S.Canara Dt.: Palicode, *s.coll.* 15345 (MH). ANDHRA PRADESH: Kurnool Dt.: Nallamalais, *Ellis* 32730 (MH).

***Ipomoea laciniata* (Dalz.) Clarke** in Hook.f., Fl. Brit. India 4:200. 1883; Gamble, Fl. Pres. Madras 2:915. 1923.

Type: *Ipomoea* n. 40, *Herb. Ind. Or. H.f. & T.*

Pharbitis laciniata Dalz. in Hook., Kew Journ. 3:178; Dalz. & Gibs., Bomb. Fl. 167. 1861.

(Fig. 74)

Annual herbs; stem twining, herbaceous towards tips, terete, hollow, glabrous. Leaves pedately compound, leaflets 5-7, mid lobe larger, ovate, 3 cm x 1.2 mm, the side lobes similar but rather smaller, 2-2.5 x 0.8 - 1 cm, all coarsely serrate, apically acute to acuminate, glabrous on bothsides; pseudostipulate, 3-5 armed, 3-5 mm long. Flowers axillary, 1-3 flowered cymes; peduncle upto 5 mm long, terete, glabrous; bracts 2, lanceolate, \pm 2 mm long, glabrous; pedicels upto 1 cm long, glabrous, slightly dilated at apex; sepals subequal, elliptic, 7-9 x 3-4 mm, apically mucronulate, slightly rugose outside, glandular mottled, glabrous; corolla white, purple within the limb and centre, salverform, tube upto 5.5 cm long, mouth slightly 5 lobed, 3 cm across, glabrous; stamens subexserted; anthers upto 5 mm long, white; filaments attached 5 mm above the corolla base, subequal, 3.8 - 4.2 cm long, white ciliolate at dilated base; ovary conical, 2 x 1 mm, glabrous; disc small, 5 lobed, \pm 1mm; style subexserted, upto 4 cm long, glabrous; stigma biglobose, papillate. Fruits capsular, subglobose, 1-1.2 x 0.9 - 1 cm, fruiting calyx slightly enlarged, 1 x 0.6 - 0.7 cm, valvular; seeds usually 4, ovate, 0.7 - 0.8 x 0.4 - 0.5 cm, apically obtuse, shortly but densely tomentose.

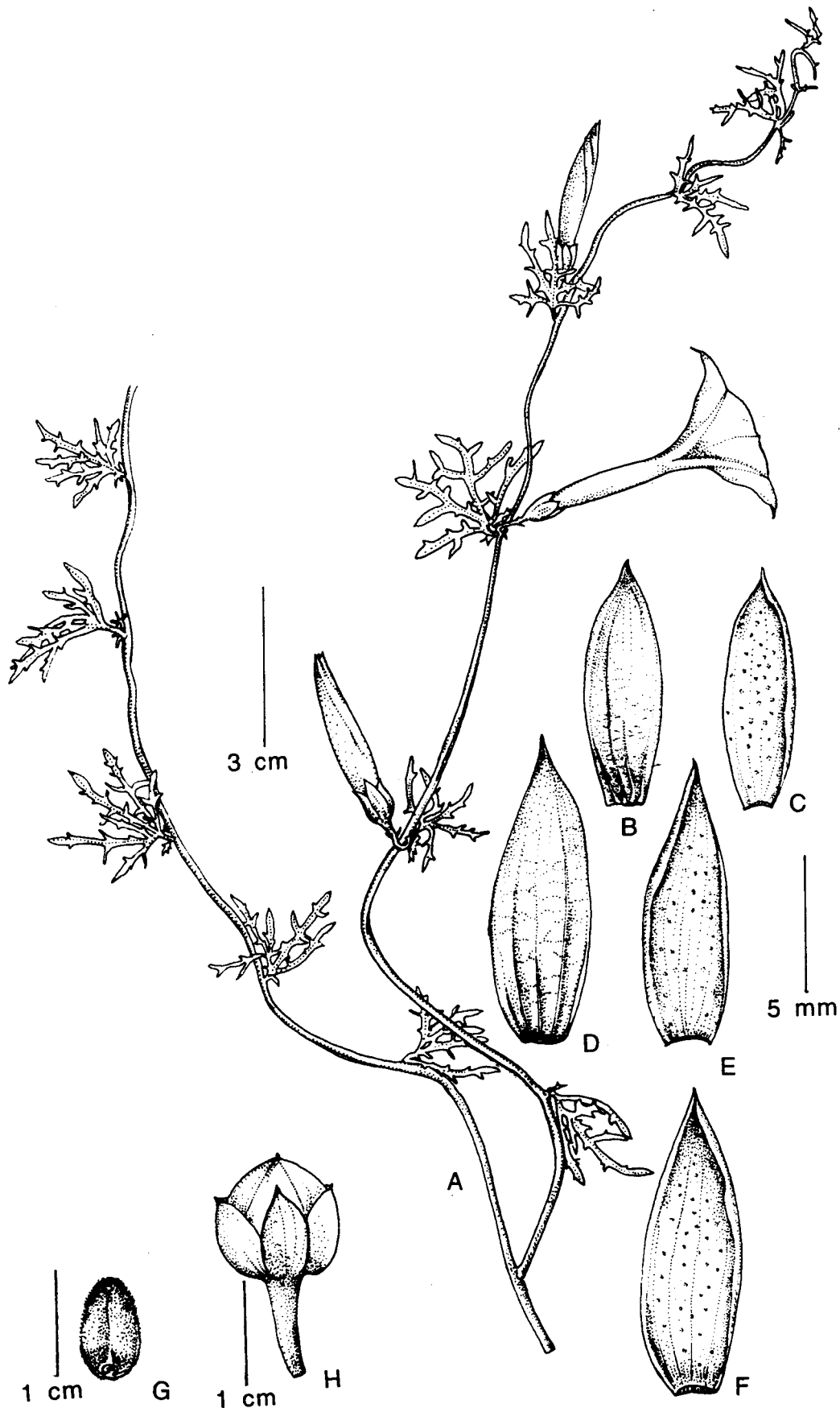


Fig. 74. *Ipomoea laciniata*. A. Flowering twig; B-F. Sepals; G. Fruit; H. Seed (from *Karthikeyan* 40084 MH).

Flowering : September - November

Fruiting : October - December

Distribution. *I. laciniata* is distributed throughout the Deccan Peninsula (Clarke, 1883). But we couldn't locate the plant from anywhere in the study area and for the study we consulted the herbarium specimens from MH.

Ecology. Not known.

Specimens examined : TAMIL NADU: Tirunelveli Dt.: *s.coll.* 13140 (MH). Kanniyakumari Dt.: Kudiraikatti, *Karthikeyan* 40084 (MH). ANDHRA PRADESH: Kurnool Dt.: Nallamalais, *Ellis* 32681 (MH).

Ipomoea marginata (Desr.) Mantiz, Fedd. Repet. 83:638. 1974.

Type : not seen

Convolvulus marginatus Desr. in Lam., Encycl. 3:558. 1792.

Ipomoea sepiaria Koenig ex Roxb., Fl. Ind. ed. Carey & Wall., 2:90. 1824; Wight, Icon. pl. Ind. ori. t. 838. 1844-45; Clarke in Hook.f., Fl. Brit. India 4:209. 1883; Trimen, Handb. Fl. Ceylon 3:220. 1895; Gamble, Fl. Pres. Madras 2:916. 1923; Verdc., Fl. Trop. E. Africa 117. 1963; Austin in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1:338. 1980; Mani. & Sivar., Fl. Calicut 181. 1982; Rani & Matthew in Matthew, Fl. Tam. Carnatic 3:1032. 1983; Chand. & Nair, Fl. Coimbatore 194. 1987; Ramach. & Nair, Fl. Cannanore 304. 1988; Vajravelu, Fl. Palghat Dist. 312. 1990; Mohan & Henry, Fl. Thiruvananthapuram 317. 1994.

Convolvulus diversifolius Schumach. & Thonn., Beskr. Guin. Pl. 94. 1827.

Batatas abyssinica Rich., Tent. Fl. Abyss. 2:64. 1851, non *Ipomoea abyssinica* Schweinf. 1867.

Ipomoea diversifolia (Schumach. & Thonn.) F. Didr. in Kjoeb. Vidensk. Meddel. 221. 1854.

Ipomoea britteniana Rendle in J.B. 34:38. 1896.

Ipomoea homblei Willd. in Bull. Jard. Bot. Brux. 5:38. 1915.

Ipomoea maxima (Linn.) Sweet. var. *sagittata* Verdc., Kew Bull. 13:209. 1958.

Convolvulus maximus of authors, non Linn. (1981).

Ipomoea maxima sensu auctt. mult. e.g. Ooststr., Fl. Mal., ser. 1,4:472. 1953, non (Linn.) Sweet.

Ipomoea marginata (Desr.) Verdc., Kew Bull. 42:658. 1987; Nicolson *et al.*, Inter. Hort. Malab. 91. 1988.

-*Tiru-tali* Rheede, Hort. Malab. 11:109-110, t. 53. 1692.

Vernacular names : Mal. *Tirutali*; Tam. *Manjigai*, *Talikkirai*; Tel. *Mettatut*.

(Fig. 75)

Annual vines; stem prostrate or twining, terete, patently hirsute to glabrous, prostrate ones rooting at the nodes, green, reddish pink where exposed to sunlight; latex milky white. Leaves simple, highly variable, ovate or broadly ovate, orbicular, triangular, oblong - triangular or lanceolate, 2.5-10 x 1.8-12 cm, apically acute to acuminate, mucronulate, basally truncate, sagittate, hastate or deeply cordate, both sides glabrous, often with purple colouration in the above midrib region, changing into green in mature leaves; petiole upto 6 cm long, canaliculate, glabrous to pubescent; petiolar nectaries on either side of the distal end, basin type. Flowers axillary, few to many flowered (3-10), subumbellate cymes; peduncle upto 20 cm long, light purplish violet, glabrous; bracts 2, small, early caducous, 2 x 1.2 mm, apically acute to acuminate, glabrous; pedicels upto 1.2 cm long, minutely verrucose towards the tip; pedicellar nectaries 2, on either side of the dilated pedicels; sepals equal in length, elliptic - oblong to ovate, 5.5-6.2 x 3.8-4.2 mm, apically obtuse to acute, mucronulate, glabrous, but verrucose at least on the outer two; corolla lavender to pink or completely milky white, in pink flowers throat become deep purplish, subsalver form to salver form, tube upto 4 cm long, deep purple inside, mouth upto 2.8 cm across, slightly 5 lobed, glabrous; stamens subexserted; anthers purple, upto 3 mm long, anthesis between 7-8 am; filaments, white, attached 4.5 mm above the corolla base; subequal, 2 long, upto 1.8 cm, 3 short, upto 1.4 cm long, white ciliolate at dilated base; ovary conical, 1 x 2mm, glabrous; disc 5 lobed; style subexserted, upto 2.3 cm long, glabrous, white, slightly dilated at base; stigma biglobose, \pm 1 mm, papillate. Fruits, capsular, globose, 0.5 - 0.7 x 0.8 - 1 cm, valvular dehiscent, light purplish - brown above with persistent style base, pedicels enlarging in fruits; seeds 4, broadly ovate, 3.5 - 4.2 x 3.2 - 4.3 mm, covered with dense short white tomentum, often with long arachinoid hairs along the margins;

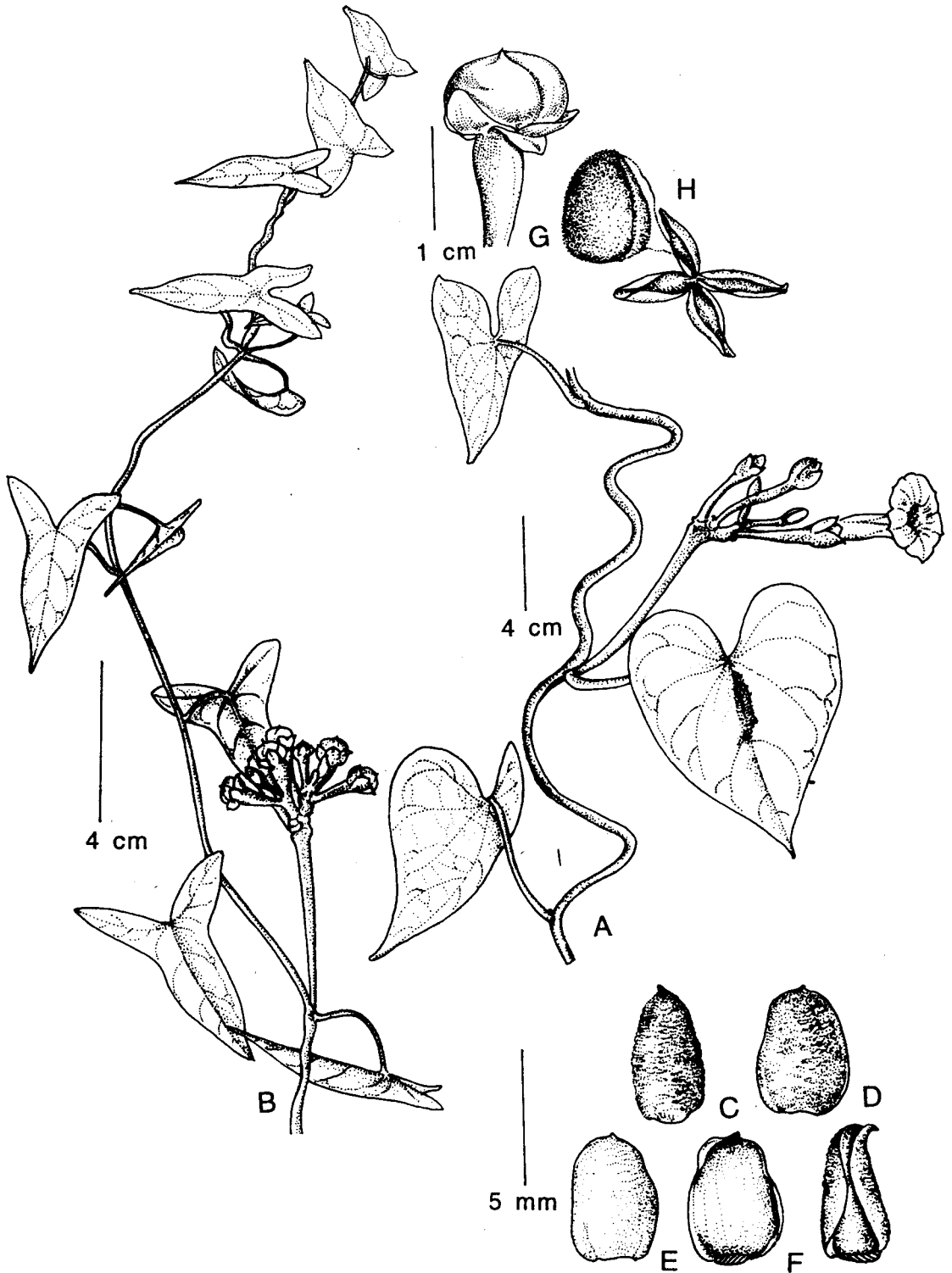


Fig. 75. *Ipomoea marginata*. A. Flowering twig (from Biju 44289 TBGT); B. Fruiting twig; C & D. Outer sepals; E & F. Inner sepals; G. Fruit; H. Seed (from Biju 15315 TBGT).

seed germination epigeal, hypocotyl upto 2.2 cm long, bicotyledonary, apically obcordate, sinus upto 1 cm deep, basally obtuse to cordate, glabrous, petiole upto 1.8 cm long.

Flowering : July - January

Fruiting : September - February

Distribution. *I. marginata* occurs throughout India and also distributed in tropical Africa, tropical Asia, Malaysia, Formosa, Queensland and Australia.

Ecology. In Peninsular India it is a weedy species and occurs in plains, especially on the banks of streams and rivers, growing over hedges and thickets.

Taxonomic notes. Leaves have high level of plasticity and show high range of variability from entire to sagittate.

Two variants occur in Kerala, one with completely white flower and other with lilac - pink or with a deep maroon centre.

Medicinal use. In Sanskrit *Ipomoea marginata* is called *Lakshmana*, meaning the one having lucky signs or marks. The leaves have reddish mark on the centre on upperside.

In Ayurvedic practice, *Lakshmana* is a reputed single drug which claims to cure sterility in women (Aiyer *et al.*, 1957). Root which is the officinal part, is an ingredient of *Manasamitra vatakam* (Sivarajan & Indira Balachandran, 1994).

It may be recollected that according to ancient Indian scriptures, the sex of the child can be chosen by diet and medication (Sivarajan & Indira Balachandran, 1994). The synonyms like *Putrada*, *Putrajanani* etc. also indicate the property of the drug to bestow a male child.

Specimens examined : KERALA: Thiruvananthapuram Dt.: Medical college Jn., *Biju* 16220 (CALI); Pattom, *Biju* 16221 (TBGT); Kilimanoor, *Biju* 44289 (TBGT & CALI); Kovalam, *Biju* 15315 (TBGT); *Mohan* 63891 (MH). Kollam Dt.: Parippally, *Biju* 29965 (TBGT). Thrissur Dt.: Kunnankulam, *Biju* 23929. (TBGT). Malappuram Dt.: Chemad, *Biju* 23978 (CALI). Palakkad Dt.: Walayar, *Joseph* 17073 (MH). Kannur Dt.: Nileswar, *Ramachandran* 60039, *Nair* 59988 (MH). TAMIL NADU: Kanniyakumari Dt.: Colachal, *Swaminathan* 68961 (MH).

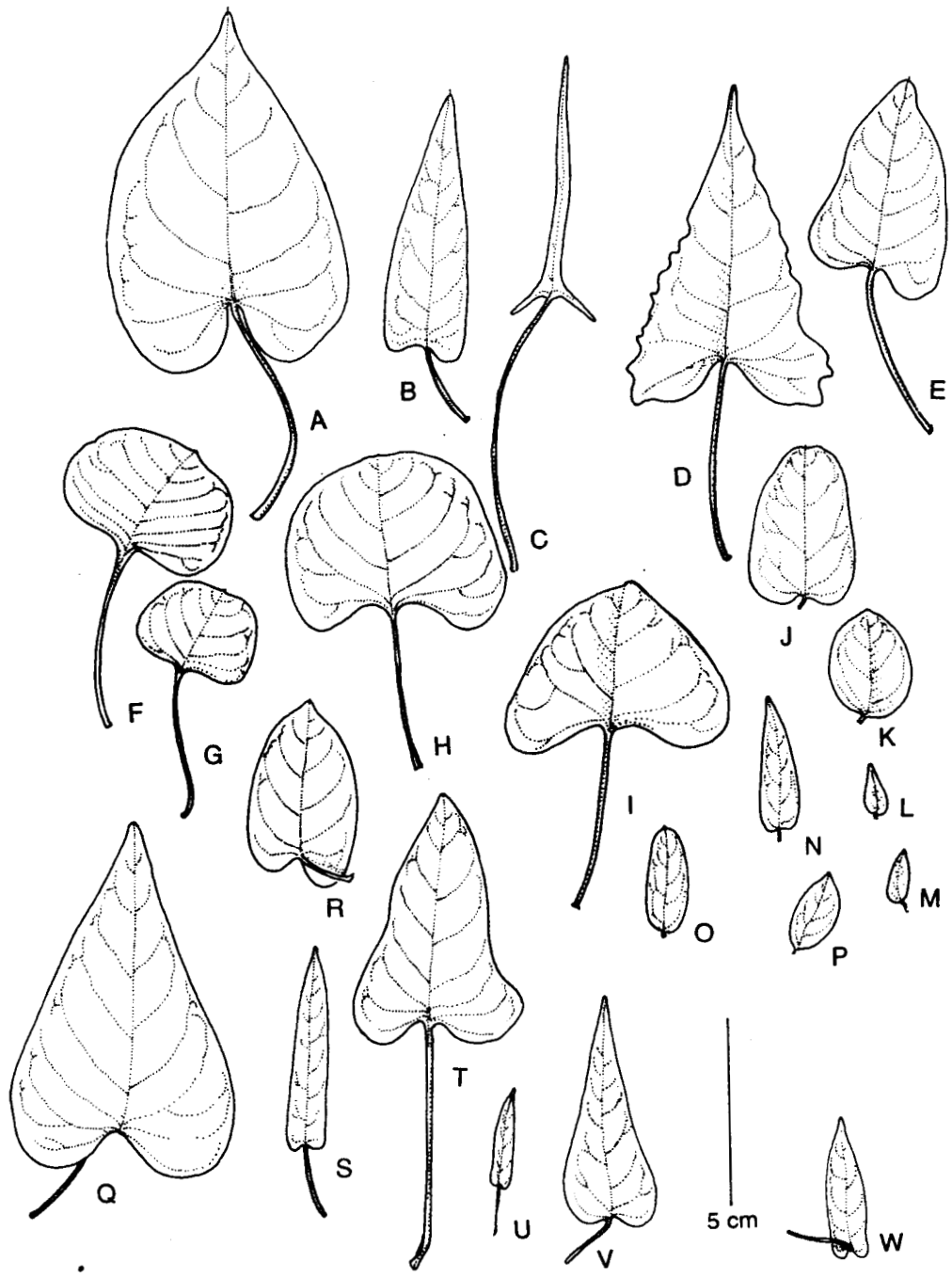


Fig. 76. Leaf variation in the genus *Ipomoea*. A-E. *I. aquatica*; F-I. *I. asarifolia*; J-P. *I. barlerioides*; Q-W. *I. eriocarpa*.

Tinnevelly Dt.: Kajamoli, *Sebastine* 13639 (MH). Ramanathapuram Dt.: Sundaranadappu, *Nair* 57441 (MH). Pudukkottai Dt.: Onankudi, *Arulappan* 795 (MH). Thanjavur Dt.: Thiruthurapandi, *Nair* 56593 (MH). Coimbatore Dt.: Forest Inst. campus, *Biju* 15375 (TBGT); *Gamble* 13019; *Chandrabose* 28517; Chinnathadayam, *Sebastine* 517 (MH). KARNATAKA: Mysore Dt.: *Thomson s.n.* (MH). Chikmagalur Dt.: Santaveri, *Biju* 25968 (TBGT). Shimoga Dt.: Terekera, *Biju* 44284 (CALI). ANDHRA PRADESH: Ananthapur Dt.: Tadpatri, *Pulliah* 415 (MH). Kurnool Dt.: Nallamalai, *Biju* 15317 (TBGT). Guntur Dt.: Kondavedu forest, *Barber* 4654 (MH). Warangal Dt.: Kanapur, *Sebastine* 11584 (MH). Vishakhapatnam Dt.: Nattavaram, *Barber* 1854 (MH).

Ipomoea obscura (Linn.) Ker-Gawl, Bot. Reg. 3:t. 239. 1817; Clarke in Hook.f., Fl. Brit. India 4:207. 1883; Trimen, Handb. Fl. Ceylon 3:220. 1895; Gamble, Fl. Pres. Madras 2:913. 1923; Ooststr., Blumea 4:519. 1940 & Fl. Mal., ser. 1, 4:471. 1953; Verdc., Fl. Trop. E. Africa 116. 1963; Gandhi in Sald. & Nicolson, Fl. Hassan Dist. 477. 1978; Austin in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1:333. 1980; Mani. & Sivar., Fl. Calicut 183. 1982; Rani & Matthew in Matthew, Fl. Tam. Carnatic 3:1030. 1983; Nair & Nayyar, Fl. Courtallum 2:244. 1986; Chand. & Nair, Fl. Coimbatore 195. 1987; Ramach. & Nair, Fl. Cannanore 303. 1988.

Type: Java, Batavia : illustration of *Convolvulus flore minore lacteo*
Dill., Hort. Elth. t. 83, fig. 95. 1732 (syntype).

Convolvulus obscurus Linn., Sp. Pl. ed. 2.220. 1762; Moon, Cat. 13. 1824; Thw., Enum. pl. zeyl. 212. 1860.

Ipomoea obscura var. *indica* Hall.f. in Engl., Bot. Jahrb. 28:39. 1899.

Vernacular names : Mal. *Cherutali*; Tam. *Chirudali*, *Siruttali*; Tel. *Nallkokkita*

Annual vines; stem twining or prostrate, herbaceous, thin and slender, terete, glabrous or patently hairy (very rarely long hirsute), older parts lignescent; latex milky white. Leaves simple; ovate to broadly ovate, or kidney-shaped, 1-8 x 1.2-7 cm, apically acute, acuminate or apiculate, mucronulate, basally cordate or deeply cordate, glabrous or sparsely pilose on both sides, margins often ciliate; midrib and lateral veins raised beneath,

lateral veins 6-8 pairs; petiole upto 7 cm long, glabrous or sparsely hairy, slender. Flowers axillary, 1 to few flowered (upto 3) cymes; peduncle upto 5 cm long, slender, terete, glabrous or sparsely pilose; bracts narrow, 2-2.5 x 1 mm, apically acute, glabrous; pedicels upto 1.8 cm long, thin, glabrous or sparsely pilose, dilated at apex, slightly verrucose; 2 pairs of extrafloral nectaries on either sides of the dilated pedicel; sepals 4, subequal, outer 2 slightly smaller, ovate, 3-4 x 2-3 mm, apically acutish or apiculate, apex purplish violet in colour, middle portion thicker and verrucose, inner 3 slightly bigger, broadly ovate, 2.8-3.5 x 3-3.2 mm, apically apiculate, apex purplish violet, third one vertically half verrucose, inner 2 glabrous, thin; corolla cream, yellow or white, throat deep purplish, campanulate, tube upto 1.5 cm long, mouth slightly 5-lobed, 1.5 - 1.8 cm across; stamens subexserted; anthers upto 2 mm long, white; filaments attached upto 3 cm above the corolla base, unequal, 2 long, upto 1 cm long, 3 short, upto 6 mm long, white, ciliolate at slightly dilated base; ovary small, conical, $\pm 1 \times 1$ mm, glabrous; disc small, $\pm 1 \times 1.5$ mm, glabrous, entire; style subexserted, upto 1 cm long, glabrous, dilated at base; stigma biglobose, 0.5 - 1 x 1 mm, papillate, white. Fruit capsular, globose, 1-1.3 x 0.7 - 1 cm, fruiting sepal slightly enlarged, often reflexed when dry, straw coloured, persistent with small style base; seeds 4, ovoid, 5-6 x 3-4 mm, black, appressed pubescent or velvety; seed germination epigeal, hypocotyl upto 3 cm long, bicotyledonary, apically deeply divided into two, sinus upto 2.5 cm deep, basally obtuse, glabrous, petiole upto 1.4 cm long.

Flowering : Throughout the year, peak on October - March.

Fruiting : Throughout the year.

Distribution. *Ipomoea obscura* is widely spread from tropical Africa to South Africa, Madagascar, Mascarene islands, the Seychelles and through tropical Asia to Queensland and Fiji; also found in China, Formosa and Polynesia (Verdcourt, 1963).

Ecology. It occurs almost throughout India and is frequent along roadsides, wastelands, sandy sea-coast and also found as a weed in upland cultivation.

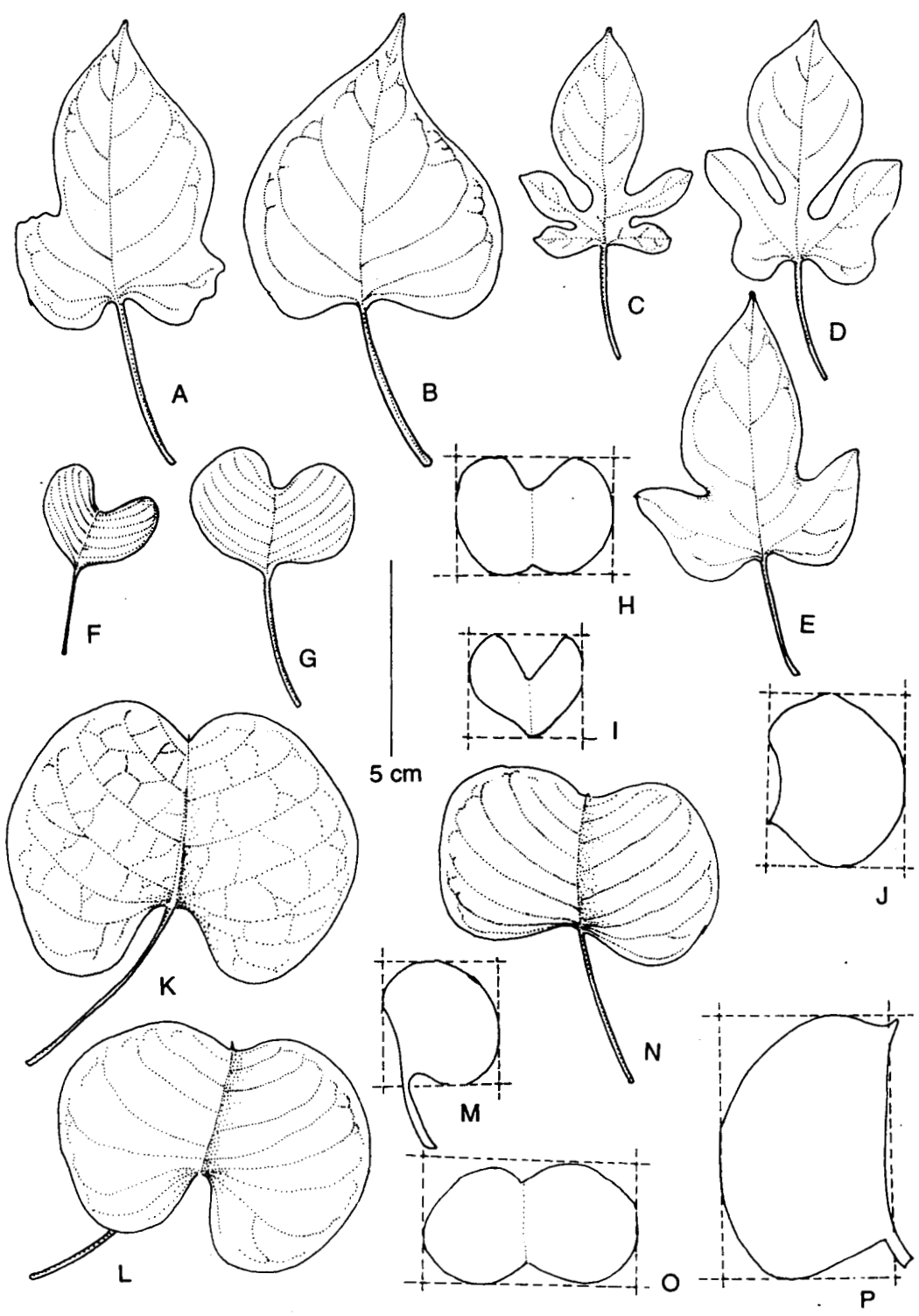


Fig. 77. Leaf variation in the genus *Ipomoea*. A-E. *I. triloba*; F-J. *I. pes-caprae* ssp. *pes-caprae*; K-P. *I. pes-caprae* ssp. *brasiliensis*.

Specimens examined : KERALA: Thiruvananthapuram Dt.: Kowdiyar, *Biju* 25964 (TBGT & CALI). Kollam Dt.: Kadakkavoor, *Biju* 23957 (CALI). Alapuzha Dt.: Punnamada, *Biju* 23969 (TBGT). Kottayam Dt.: Changanassery, *Antony* 156 (MH). Idukki Dt.: Eravikulam N.P., *Biju* 16245 (TBGT); Thenkanchi, *Sharma* 40880 (MH). Wayanad Dt.: Mananthavady, *Ramachandran* 53911 (MH). Kasaragod Dt.: Banthudukka, *Biju* 16278 (TBGT) TAMIL NADU.: Kanniyakumari Dt.: Alagiyapandipuram, *Henry* 49462 (MH). Tirunelveli Dt.: Thirukurungudi, *Shetty* 32241 (MH). Madurai Dt.: Suriliyar area, *Nair s.n.*; Kumili, *Subramanyam* 9459 (MH). Ramnad Dt.: Melamadam, *Ramamurthy* 22812 (MH). Pudukkottai Dt.: Viralimalai, *Arulappan* 318 (MH). Salem Dt.: Woddapatti R.F., *Vajravelu* 20700 (MH). Nilgiris Dt.: Marappalam, *Sharma* 40365 (MH). Chengalpattu Dt.: Ghayiru, *Narasimhan* 606 (MH). KARNATAKA: Mysore Dt.: Nandi Droog, *Rudolph* 135; Gundlupet, *Naithani* 21311 (MH). Bangalore Dt.: R.D.A. 1916 (MH). S. Canara Dt.: Jahlsur, *Barber* 2501 (MH). ANDHRA PRADESH: Anantapur Dt.: Choragiri, *Pullaiah* 767 (MH). Kurnool Dt.: Railroad side, *Ellis* 18021 (MH). E. Godavari Dt.: Maredumilli, *Subba Rao* 24297 (MH). Karimnagar Dt.: Rechapalli, *Subba Rao* 22282 (MH).

- Ipomoea pes-caprae* (Linn.) R. Br. in Tuckey, Narr. Exped. R. Zaire 477. 1818; Sweet, Hort. Suburb. Lond. 35. 1818, redundant combination; Gamble, Fl. Pres. Madras 2:917. 1923; Ooststr., Blumea 3:532. 1940 & Fl. Mal., ser. 1,4:475. 1953; Verdc., Fl. Trop. E. Africa 121. 1963; Austin in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1:334. 1980; Mani. & Sivar., Fl. Calicut 182. 1982; Rani & Matthew in Matthew, Fl. Tam. Carnatic 3: 1030. 1983; Nair & Nayar, Fl. Courtallum 2:244. 1986; Chand. & Nair, Fl. Coimbatore 195. 1987; Mohan & Henry, Fl. Thiruvananthapuram 316. 1994.
- Convolvulus pes-caprae* Linn., Sp. Pl. 159. 1753; Moon, Cat. 14. 1824; Thw., Enum. pl. zeyl. 211. 1860.
- Ipomoea biloba* Forsk., Fl. Aegypt. - Arab. 44. 1775; Clarke in Hook.f., Fl. Brit. India 4:212. 1883; Trimen, Handb. Fl. Ceylon 3:224. 1895.
- Convolvulus maritimus* Desr. in Lam., Encycl. 3:550. 1792.
- Ipomoea maritimus* (Desr.) R. Br., Prodr. 486. 1810.
- *Schovanna - adamboe* Rheede, Hort. Malab. 11:117, t. 57. 1692.

Vernacular names : Mal. *Adumby-valli, Atampa*; Tam. *Adambu, Attukkal*; Kan. *Adumbaballi, Bangadaballi*; Tel. *Balabanditiga, Bedatige*.

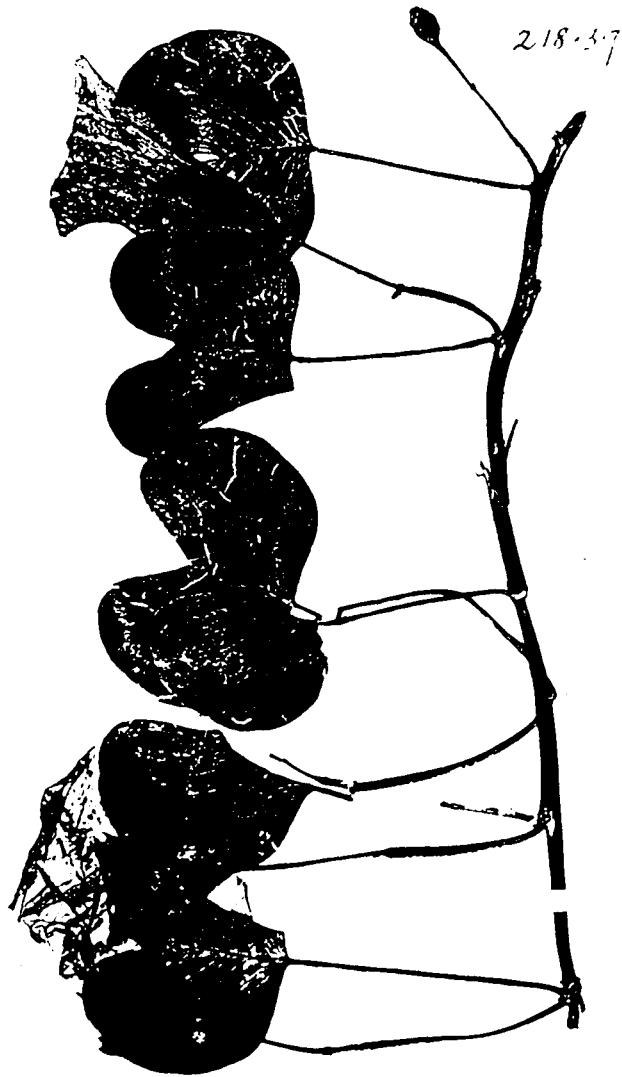
Perennial vines; prostrate; latex milky white. Leaves simple. Flowers axillary, few flowered cymes; peduncle upto 6 cm long, terete, glabrous; sepals subequal, apically acute to obtuse, glabrous; corolla pink magenta, or white; filaments subequal. Fruits globular; seeds 4, pubescent or densely brownish tomentose.

Taxonomic notes. Taxonomy of the *Ipomoea pes-caprae* group (*I. pes-caprae* subsp. *pes-caprae* and subsp. *brasiliensis*) is a matter of dispute. Recently this group was studied by St. John (1970) and he reached the conclusion that, it is better interpreted as a pair of distinct species. An equally plausible view is that it is a single species, but is formed of two discrete subspecies, subsp. *pes-caprae* (L.) R. Br. and subsp. *brasiliensis* (L.) Ooststr. The present study agrees with the subspecific status recognised by Ooststroom (1940) and Verdcourt (1963).

KEY TO THE SUBSPECIES

- Ia. Leaves deeply lobed at the apex. Outer sepals smooth to slightly wrinkled; corolla purplish red or magenta. Seeds with thick long tomentum subsp. **pes-caprae**
- Ib. Leaves emarginate at apex. Outer sepals prominently wrinkled; corolla purplish red or white. Seeds with very short tomentum subsp. **brasiliensis**

Ipomoea pes-caprae (Linn.) R.Br. in Tuckey, Narr. Exped. R. Zaire 477. 1818; Ooststr., *Blumea* 3:538. 1940 & *Fl. Mal.*, ser. 1,4:477. 1953; Stone, *Malay. Nat. Journ.* 27: 17-19. 1974; Ravi, *Bull. Bot. Surv. India* 17 (1-4): 197-198. 1975.
Type: India, specimen 218.59 (LINN, Lectotype).



30 *Ip. caprae*

Fig. 78. Type specimen of *Ipomoea pes-caprae* subsp. *pes-caprae* : India, 218. 59 (LINN, Lectotype).

Convolvulus pes-caprae Linn., Sp.Pl. 159. 1753.

Ipomoea biloba Forsk., Fl. Aegypt. - Arab. 44.1775.

Ipomoea pes-caprae Sweet var. *biloba* (Forsk.) Hall.f., Ann. R. Istit. Bot. Roma 7:231. 1898.

(Fig. 78)

Perennial vines; stem long, trailing, often rooting at nodes or at least a rudimentary projection on either side of the basal end of petiole, terete, glabrous throughout, green or light purple; latex milky white. Leaves simple, often secund, obovate, orbicular or transverse - elliptic to reniform, 1.5 - 8 x 2-8 cm, apically emarginate or obcordate, mucronate, basally cuneate to truncate or cordate, fleshy, glabrous; midrib raised beneath, lateral veins conspicuous but not raised, lateral veins 7-8 pairs, straight (seems parallel); petiole upto 5 cm long, canaliculate, glabrous; petiolar nectaries 2, one on either side, near the point of blade attachment, basin type, red pigmentation around the rim. Flowers axillary, mostly solitary, rarely 2 or even 3 flowered cymes; peduncle upto 6 cm long, terete, glabrous; bracts small, ovate, 4-4.2 x 2-2.8 mm, apically acute to acuminate, glabrous; pedicels upto 4.5 cm long, dilated at apex, prominently angled, glabrous; extrafloral nectaries 2 pairs, on either side of dilated extreme apex (just below the calyx lobes); sepals 5, subequal, outer 2 slightly small, ovate to elliptic, 1-1.2 x 0.6-0.7 cm, apically acute to obtuse and mucronulate, glabrous, longitudinally 3 ridged outside and slightly wrinkled, coriaceous, inner 3 slightly larger, broadly elliptic, 1.3-1.4 x 0.8-0.9 cm, concave, obtuse, mucronulate, glabrous, third one longitudinally half, wrinkled, mottled inside, subcoriaceous; corolla pink or magenta - pink, throat darker, funnel - shaped, tube upto 4 cm long, limb slightly 5-lobed, 4-4.5 cm across; stamens inserted; anthers upto 5 cm long, white; filaments attached upto 4 mm above the corolla base, unequal, 2 long, upto 1.3 cm, 3 short, upto 0.6cm long, long hyaline hairy at dilated base; ovary conical, 2x2 mm, glabrous; disc small, 1x3 mm, slightly lobed; style inserted, upto 1.8 cm, glabrous, white; stigma biglobose, 1x2.5 mm, papillate. Fruits capsular, globular, 1.2-1.4x1.6-1.8 cm, fruiting sepals slightly enlarged and reflexed, persistent style base at apex; seeds 4, ovoid 0.7-0.8 x 0.6-0.7 cm,

black, appressed pubescent or velvety, long pubescent at hilum; seed germination epigeal, hypocotyl upto 5 cm long, bicotyledonary, apically obcordate, sinus upto 1.3 cm deep, basally obtuse to attenuate, glabrous, petiole upto 2.8 cm long.

Flowering : October - March

Fruiting : December - May

Distribution. *Ipomoea pes-caprae* subsp. *pes - caprae* is a pantropical one of sandy beaches with seeds dispersed by ocean currents. The population is found as a mat on the open beach extending upto 1sq. km.

Ecology. Popularly called 'beach morning glory' or 'Goat's - foot' it is a perennial vine, often forms long mats just above the high tide line on coastal beaches and dunes.

Specimens examined : KERALA: Thiruvananthapuram Dt.: Kovalam, *Biju* 16244 (TBGT & CALI). Kollam Dt.: Asramam, *Biju* 23955 (TBGT). Thrissur Dt.: Kandasamkadavu, *Ramamoorthy* 47685 (MH). Kannur Dt.: *Srinivasan* 72345 (MH); Kannothe, *Ramachandran* 64016 (MH). TAMIL NADU: Tinnevely Dt.: Manimuthor, *Sebastine* 5468 (MH). Ramanathapuram Dt.: Valantharavi, *Balasubramaniam* 1047 (MH). Madurai Dt.: Parali, *Subramanyam* 5300 (MH). Pudukkottai Dt.: Altankudi, *Arulappan* 164 (MH). Thanjavur Dt.: Kodiakkarai, *Ramamurthy* 86462 (MH). Coimbatore Dt.: Kallimadai, *Subramanyam* 2520 (MH). S. Arcot Dt.: Annamalinagar, *Sebastine* 1047 (MH). Chengalpattu Dt.: Ennore, *Narasimham* 1000 (MH). KARNATAKA: Mysore Dt.: Chamundi hills, *Barber* 6931 (MH). S. Canara Dt.: Byndoor, *Raju* 498 (MH). PONDICHERY (U.T): Auroville, *Rajan* 89793 (MH). ANDHRA PRADESH: Nellore Dt.: Sriharikota, *Rao* 553 (MH), *Biju* 15354 (TBGT). Anantapur Dt.: Reddypalli farm, *Yesoda* 274 (MH). Vishakhapatnam Dt.: *Subba Rao* 22549 (MH).

***Ipomoea pes-caprae* subsp. *brasiliensis* (Linn.) Ooststr.**, *Blumea* 3:533. 1940 & *Fl. Mal.*, ser. 1,4:475. 1953; Verdc., *Fl. Trop. E. Africa* 121. 1963; Stone, *Malay. Nat. Journ.* 27:17-19. 1974; Ravi, *Bull. Bot. Surv. India* 17 (1-4): 197-198. 1975; Ramach. & Nair, *Fl. Cannanore* 303. 1988.

Type: Brazil : illustration of *Convolvulus marinus catharticus*.....in Plumier, Descr. Pl. Amer. t. 104. 1693.

Convolvulus brasiliensis Linn., Sp. Pl. 159. 1753.

Ipomoea brasiliensis (Linn.) Mey., Prim. Fl. Esseq. 97. 1818; St. John, Bot. Jahrb. 89 (4); 563-583. 1970.

Convolvulus bilobatus Roxb., Fl. Ind. ed. Carey & Wall. 2:73. 1824.

Ipomoea pes-caprae (Linn.) Sweet var. *emarginata* Hall.f., Bull. Soc. Roy. Bot. Belg. 37:98. 1898.

Ipomoea brasiliensis (Linn.) St. John, Bot. Jahrb. 89(4) : 563 - 583. 1970.

Ipomoea pes-caprae ssp. *brasiliensis* forma *albiflora* Stone, Malay. Nat. Journ. 27:17-19. 1974.

(Fig. 79)

Perennial vines; stem long, trailing, rooting at nodes, terete or angular, glabrescent, or tuberculate on younger parts, green or light purple; latex milky white. Leaves simple, often secund, widely ovate, obovate, orbicular, 2-6.5 x 2.5-9.5 cm, apically emarginate or sometimes truncate, mucronulate, basally truncate, widely or deeply cordate, fleshy, glabrescent below; midrib and lateral veins raised beneath, lateral veins 7-8 pairs, slightly pubescent and tuberculate below, glabrous above; petiole upto 4cm long, canaliculate; glabrous, to glabrescent, sharply tuberculate above; extrafloral nectaries 2, one on either side, near the point of blade attachment, basin type, red pigmentation absent, often the EFN s absent. Flowers axillary, mostly solitary, or 2-4 flowered cymes; peduncle upto 3 cm long, terete; bracts small, ovate, 3-4 x 2-3 mm, apically acute to acuminate, glabrous; pedicels upto 3 cm long, dilated at apex, terete, tuberculate; extrafloral nectaries 2 pairs, on either side of dilated extreme end (just below the calyx base); sepals 4, subequal, outer 2 small, ovate or ovate-elliptic, 0.7 - 0.8 x 0.5 - 0.6 cm, apically acute to obtuse, mucronulate, longitudinally 3-5 ridged, bullate, coriaceous, mottled inside, inner 3 slightly bigger, broadly elliptic - oblong, 1-1.2 x 0.6 - 0.7 cm, apically obtuse or slightly retuse and mucronulate, third inner longitudinally half bullate, mottled inside, subcoriaceous; corolla pink or reddish purple or even completely white, throat darker, funnel-shaped, tube upto 3 cm long, limb slightly lobed, 6 cm across; stamens inserted; anthers upto 5 mm long, white;



Fig. 79. Type specimen of *Ipomoea pes-caprae* subsp. *brasiliensis* (Linn.) Ooststr.: Brazil: illustration of *Convolvulus marinus catharticus*.... in Plumier, Descr. Pl. Amer. t. 104 (Lectotype).

filaments attached upto 4 mm above the corolla base, unequal, 2 long, upto 1.8 cm, 3 short, upto 0.9 cm long, long hyaline hairy at dilated base; ovary conical, 2x1.5 mm, glabrous; disc small, \pm 1x3 mm, slightly lobed; style inserted, upto 2.8 cm long, glabrous; stigma biglobose, 1x2 mm, papillate. Fruits capsular, depressed globose, 8-9 x 1.7-1.9 cm, fruiting sepals slightly enlarged, and reflexed, persistent style base at apex; seeds 4, ovate in fresh, orbicular when dry, 7-9 x 7-8 mm, black, densely brownish tomentose, long hairs on hilum and ridges; seed germination epigeal, hypocotyl upto 7 cm long, bicotyledonary, apically obcordate, sinus upto 1 cm deep, basally obtuse to cordate, glabrous, petiole upto 2 cm long.

Flowering : October - February

Fruiting : December - March

Distribution. *Ipomoea pes-caprae* subsp. *brasiliensis* is widely distributed in tropical parts of both hemispheres. It occurs throughout Kerala in Peninsular India. St. John (1970) stated that this may occur in the shores of Arabia, Pakistan, Western and Southern India and Ceylon, Bay of Bengal and Krakatau (Stone, 1974). During the present study, this plant is collected from many parts of India, Lakshadweep and Andamans.

Ecology. This is found invariably in the inlands of Kerala along roadsides, in semi arid sandy banks of rivers and ponds upto an altitude of 800 m.

Taxonomic notes. Stone (1974) recognised a forma of *Ipomoea pes-caprae* subsp. *brasiliensis* (Linn.) Ooststr., forma *albiflora* Stone. He mainly based on the flower colour supported with the pigmentation characters of stem and leaves and the size and shape of the corolla. But the present study revealed that the pigmentation characters and the size of the flower is highly variable. The only differentiating character is the flower colour. White flowered forms is frequent in other member of the genus *Ipomoea*, for example *Ipomoea marginata*, *I. quamoclit* etc.

Medicinal use. *Ipomoea pes-caprae* subsp. *brasiliensis* is locally called Velladambu. The pounded leaves and stems along with cow's milk are used as an anti-fertility agent.

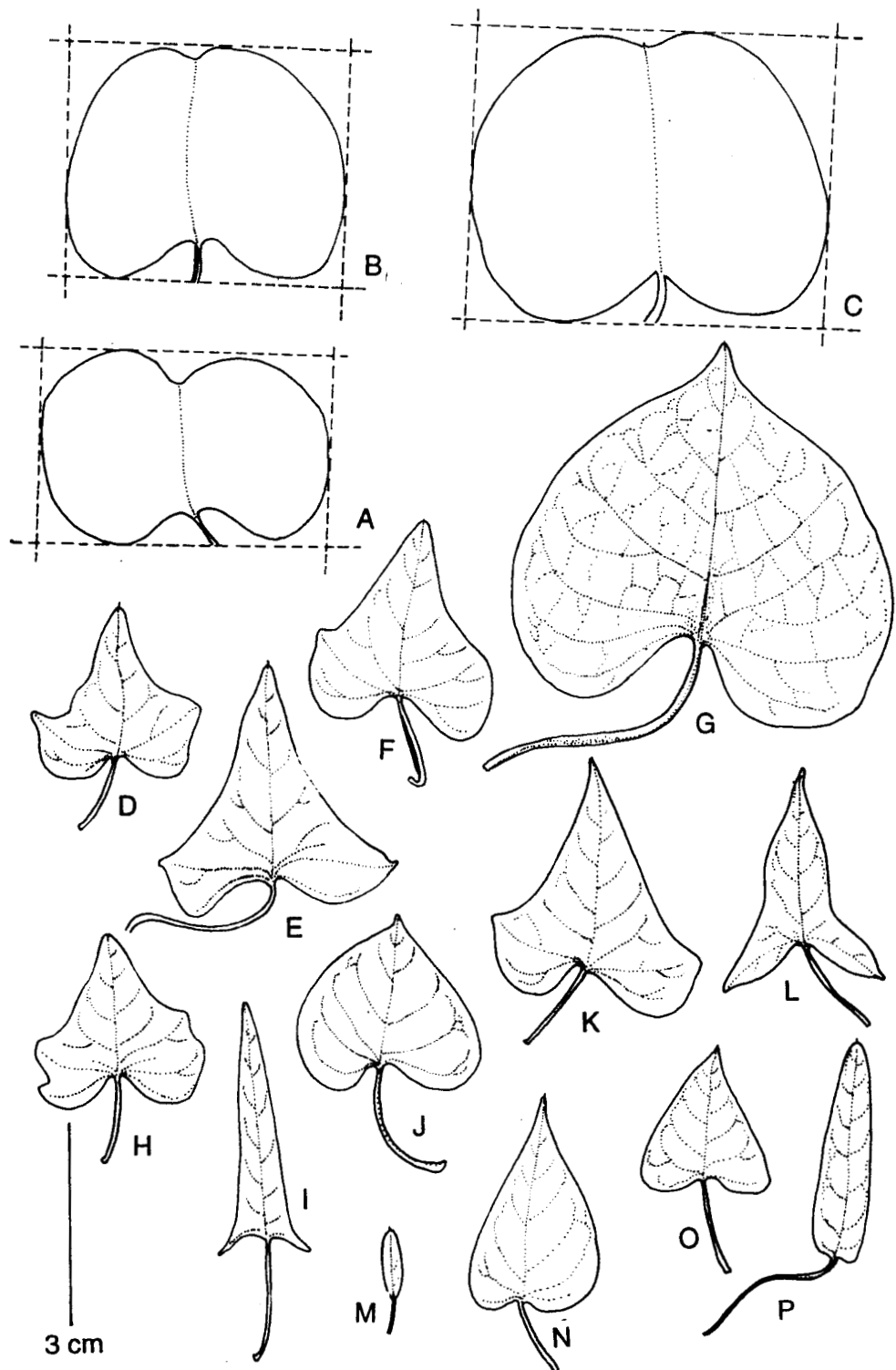


Fig. 80. Leaf variation in the genus *Ipomoea*. A-C. *I. pes-caprae* ssp. *brasiliensis*; D-P. *I. marginata*.

Specimens examined : KERALA: Thiruvananthapuram Dt.: Palode, *Biju* 15338 (white fl.) (TBGT). Kollam Dt.: Kottarakkara, *Biju* 25926 (white fl.) (TBGT). Kottayam Dt.: on the way to Munnar, *Biju* 16263 (red fl.) (CALI); Changanassery, *Antony* 59 (red. fl.) (MH). Thrissur Dt.: Kaladi, *Ramamoorthy* 25965 (white fl.) (MH). Kozhikode Dt.: Feroke, *Biju* 24000 (white fl.) (TBGT). TAMIL NADU: Coimbatore Dt.: Siruvani, *Biju* 25963 (white fl.) (TBGT).

Ipomoea sect. Pharbitis (Choisy) Griseb., Fl. Br. W. Ind. Islands 473.1864; Hall.f.in Engl., Bot. Jahrb. 19:131.1893; Verdc., Taxon 6:152.1957 & Fl. Trop. E. Africa 81.1963; Austin, Taxon 28(4):360.1979 & Taxon 29:501.1980.

Type species: *I. purpurea* (Linn.) Roth.

Pharbitis Choisy, Mem. Soc. Phys. Geneve 6:438.1833.

Ipomoea subgenus *Pharbitis* (Choisy) Clarke in Hook.f., Fl. Brit. India 4:199.1883.

Ipomoea subsect. *Chorisanthae* Hall. f. in Engl., Bot. Jahrb. 18:135. 1893; Ooststr., Blumea 3(3): 484 and 495.1940 & Fl. Mal., ser. 1,4:464.1957.

Annual or perennial twining vines; stem hispid or lanate, rarely glabrous. Leaves simple or lobed, cordate, hispid, villous or rarely glabrous. Flowers showy, sepals lanceolate or linear, hirsute or nearly glabrous; corolla campanulate; anthers and style inserted or subexserted. Seeds glabrous to pubescent.

The sect. *Pharbitis* (Choisy) Griseb. is represented by seven species in Southern Peninsular India.

KEY TO THE SPECIES

- 1a. Leaves upto 5 cm long. Few flowered; corolla salverform, midpetaline bands pilose..... 1. ***I. barlerioides***

- 1b. Leaves more than 5 cm long. Corolla campanulate, midpetaline bands glabrous or pilose 2
- 2a. Stem muricate. Leaves simple. Many flowered cymes. Fruiting pedicels enlarged and recurved..... 4. **I. parasitica**
- 2b. Stem smooth. Leaves entire shallowly to deeply lobed. Fruiting pedicels not recurved..... 3
- 3a. Sepals broadly lanceolate, pilose outside; corolla flax blue. Fruiting sepal reflexed when dry; seeds pubescent 3. **I. nil**
- 3b. Sepals lanceolate (broadly lanceolate in cultivated), glabrous to pubescent; corolla blue changing to purple. Fruiting sepals not reflexed when dry; seed glabrous (remotely pubescent at hilum) 2. **I. indica**

Ipomoea barlerioides (Choisy) Benth. ex Clarke in Hook.f., Fl. Brit. India 4:201.1883; Gamble, Fl. Pres. Madras 915.1923; Gandhi in Sald. & Nicolson Fl. Hassan Dist. 470.1978.

Type : India, Wallich 2256.

Anisea barlerioides Choisy, Mem. Soc. Phys. Geneve 6:484.1834 & in DC., Prodr. 9:432.1845.

(Fig. 81)

Annual vines; stem twining or prostrate, slender, terete, yellowish hirsute, upto 3 mm long. Leaves simple, variable in shape and size. Linear oblong to oblong, ovate or elliptic to broadly elliptic, 1-5 x 0.4-2.8 cm, apically obtuse to acute, mucronulate, basally truncate to cordate, margins entire, hirsute on both sides; midrib and lateral veins not raised, lateral veins 6-7 pairs; petiole

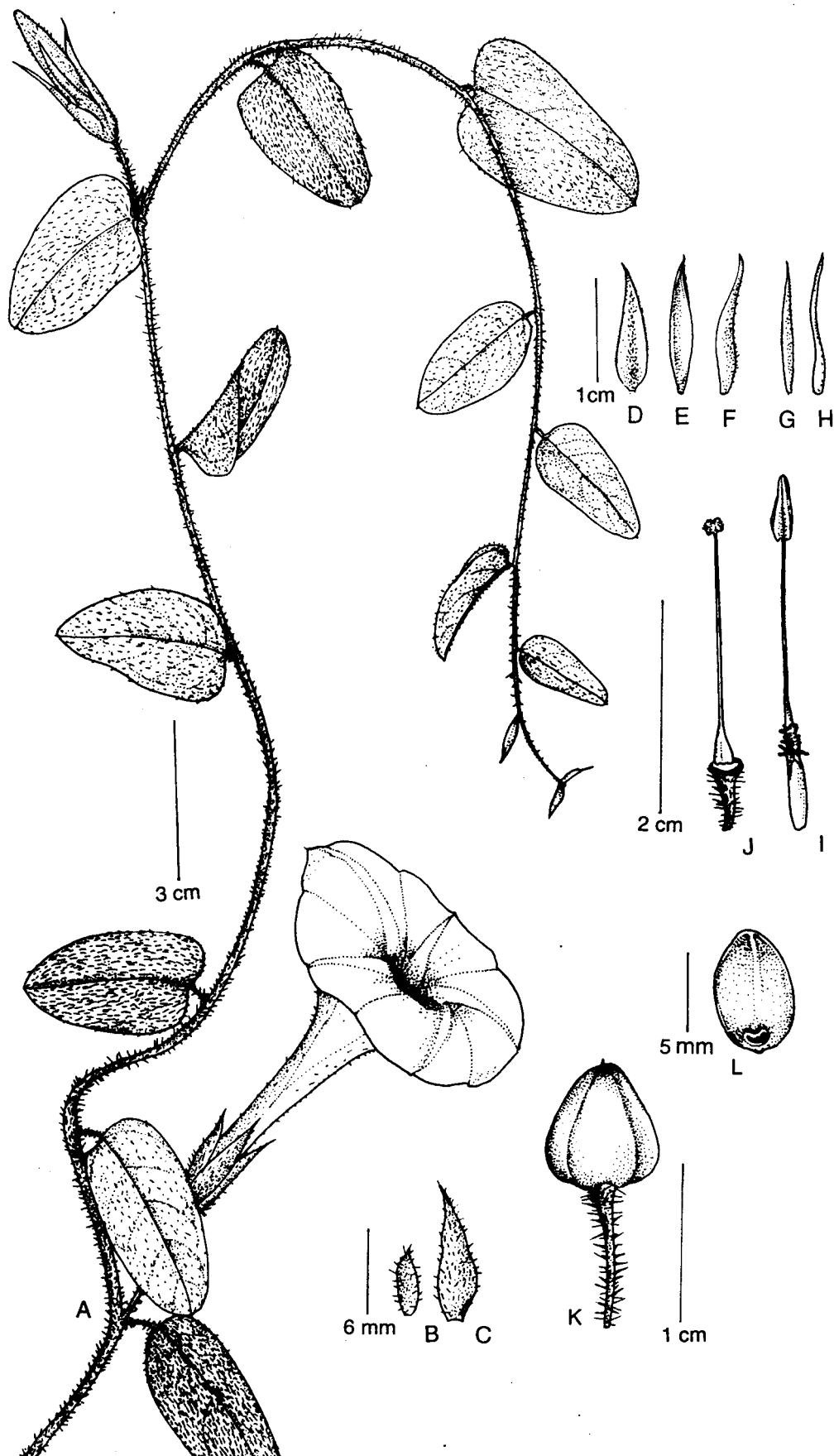


Fig. 81. *Ipomoea barlerioides*. A. Flowering twig; B & C. Bracts; D & E. Outer sepals; F-H. Inner sepals; I. Stamen; J. Pistil; K. Capsule; L. Seed (from Biju 15356 TBGT).

sessile to subsessile, upto 4 mm long, hirsute. Flowers axillary, solitary to few flowered (upto 3) cymes; peduncle upto 4 cm long, terete, pubescent like stem; bracts 2, one long, 1-1.2 x 0.4-0.6 mm, 1 small, 0.4-0.6 x 0.1-0.3 mm, hirsute like leaves; pedicels upto 4 mm long, hirsute; sepals sub equal, outer 3 slightly broader than inner 2, ovate - lanceolate, 1.8-2.2 x 0.4-0.6 cm, inner 2 small, lanceolate, 1.8-2.2 x 0.1-0.2 cm, oblique, apically acuminate to aristate, pilose out side, glabrous inside; corolla pink, salver form, tube upto 4 cm long, mouth five lobed, 4 cm across, sparsely pilose on outside; stamens inserted; anthers upto 2.5-3 mm long; filaments attached 2 cm above the corolla base, equal or subequal, 2-2.8 cm long, ciliolate at base; ovary conical, 2-2.5 x 1-1.5 mm, glabrous; disc small, annular; style inserted, upto 4.5 cm long, glabrous; stigma biglobose, papillate. Fruit capsular, ovate to broadly ovate, 1.3-1.6 x 1-1.3 cm, mucronulate by the style base, 4 valved, valves thin, fruiting sepals persistent and enlarged upto 1.5-1.8 x 0.9-1.2 cm; seeds usually 4, ovate or ovate elliptic, 7 x 5 mm, black, glabrous.

Flowering : August - December

Fruiting : October - January

Distribution. *Ipomoea barlerioides* is distributed in India and upper Burma.

Ecology. In India, it is rare in the peninsular part and found particularly in semi-arid sandy or rocky terrain in the plains and hills upto an altitude of 850m.

Specimens examined : KERALA: Kottayam Dt.: Thekkady, *Biju & Suresh Elamon* 15356 (TBGT & CALI). Idukki Dt.: Kulamavu, *Mohanan* 82015; Uppupara, *Sharma* 41690; *Vivekananthan* 48640 (MH). TAMIL NADU: Tinnevely Dt.: *s.coll. s.n.* 10902; Kuthiraivetti, *Henry* 16410 (MH). ANDHRA PRADESH: Vishakhapatnam, Galikonda, *Subba Rao* 44363 (MH). LOCALITY UNKNOWN: Malabar Concan, Stocks Law & Co. *sn.* (MH).

Ipomoea indica (Burm.f.) Merr., Int. Rumph. Herb. Amb. 445. 1917; Fosb., Micronesia 2:151. 1967 & Bot. Notiser 129: 35-38. 1976; Austin in Nasir & Ali, Fl. W. Pakistan 44. 1979; in Dassan. & Fosb., Rev. Handb. Fl. Ceylon

1: 325-326. 1980 & *Taxon* 35. 357. 1986; Rani & Matthew in Matthew, *Fl. Tam. Carnatic* 3: 1028. 1983.

Type : Based on *Convolvulus indicus flore violaceo* Besler, *Hort. Eyst. Aest.* Ord. 13. vol. 8, fig. 2. 1613 (Lectotype chosen by Fosberg).

Convolvulus indicus Burm.f. *Index Univ. Herb. Amb.* 7:6. 1755.

Ipomoea acuminata (Vahl) Roemer & Schultes in *Linn. Syst. Veg.* 4:228. 1819; *Verdc. Fl. Trop. E. Africa* 113. 1963; Austin, *Ann. Missouri Bot. Gard.* 62:192. 1975.

Ipomoea leari Paxton, *Bot. Mag.* 6:267. 1839; Gamble, *Fl. Pres. Madras* 2:919. 1923.

Ipomoea congesta R.Br., *Prod.* 485. 1810; Ooststr., *Fl. Mal., ser. 1,4:* 465. 1953.

Ipomoea cathartica Poir., in Lamk. *Enc. Suppl.* 4:633. 1816.

Pharbitis cathartica (Poir.) Choisy in DC., *Prodr.* 9:342. 1845.

(Fig. 82, 83, 84)

Annual or perennial vines; stem twining, woody at base, herbaceous towards the tip, terete, hollow, purplish green colour, glabrous, pubescent, dense or scattered long trichomes or retrorsely hirsute; latex milky white. Leaves simple, broadly ovate or suborbicular in outline, entire or shallowly to deeply 3 lobed, 2-14 x 3-14.5 cm, apically acuminate, mucronulate, basally deep cordate, glabrous to shortly pilose below, pubescent to remotely pilose above; midrib and lateral veins raised beneath; petiole upto 14 cm long, canaliculate, purplish red, prominently hirsute. Flowers axillary, few to many (1-6) flowered cymose clusters; peduncle upto 9-11 cm long, terete, glabrous to pubescent, or even hirsute; bracts linear-lanceolate, 5 x 1-1.5mm, hirsute like stem, glabrous inside; pedicels upto 1.5 cm long, pubescent to hirsute, slightly dilated at apex; sepals 5, more or less equal in length, outer 3 lanceolate to broadly lanceolate, 2-2.5 x 0.3-0.8 cm, apically long acuminate, pubescent to long bulbous based hirsute outside, glabrous inside, inner 2 narrow lanceolate, oblique, 1.8-2.1 x 2-2.5 cm, apically long acuminate, glabrous to long hirsute on vertical half of outer side; corolla blue or purple, campanulate, tube upto 4.5 cm, mouth slightly 5-lobed, 3-8 cm across; stamens subexserted; anthers upto 4 mm long, white; filaments attached upto 1 cm

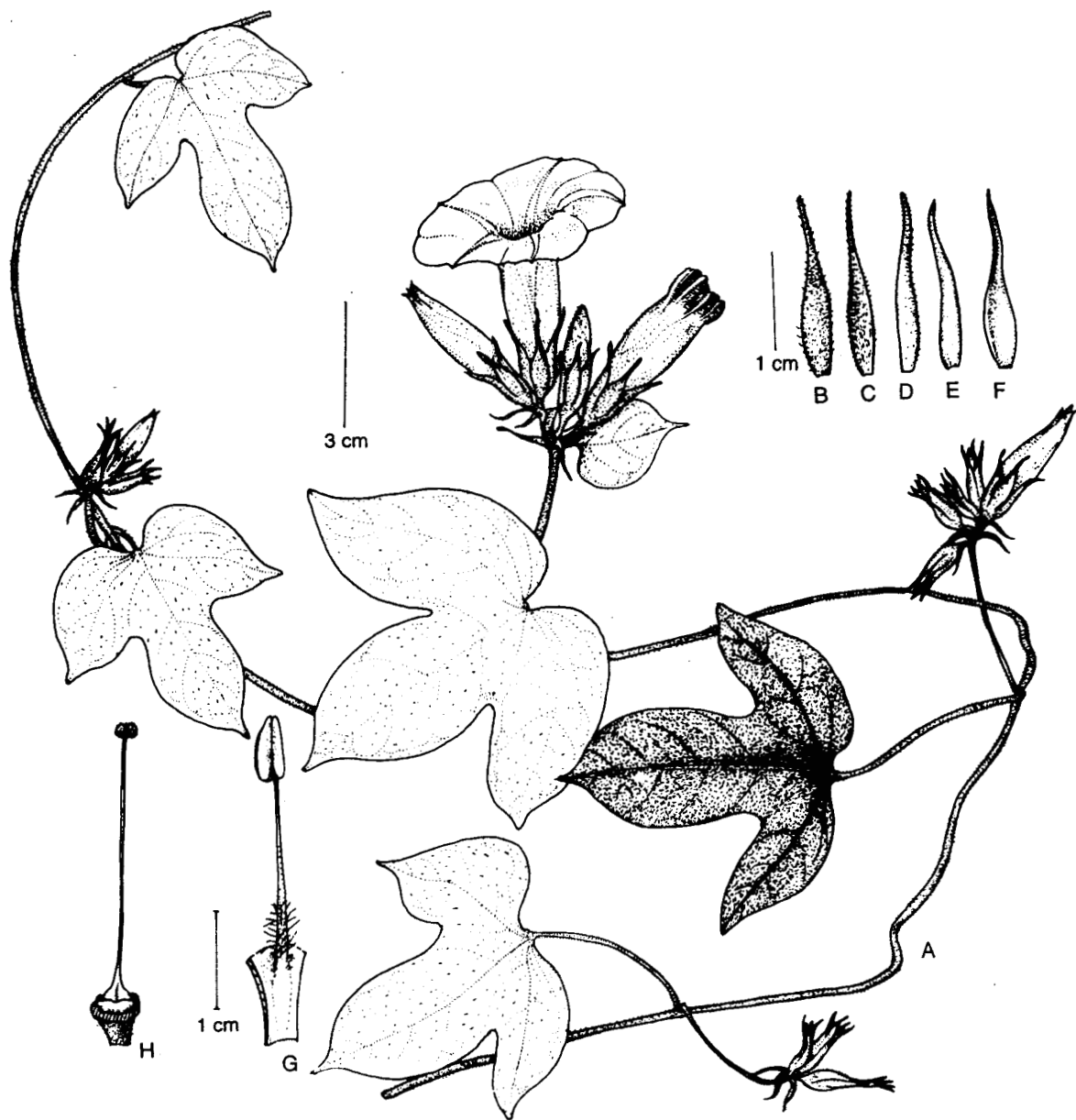


Fig. 82. *Ipomoea indica*. A. Flowering twig; B-F. Calyx (B & C outer, D-F inner); G. Stamen; H. Pistil (from Biju 15337 K)

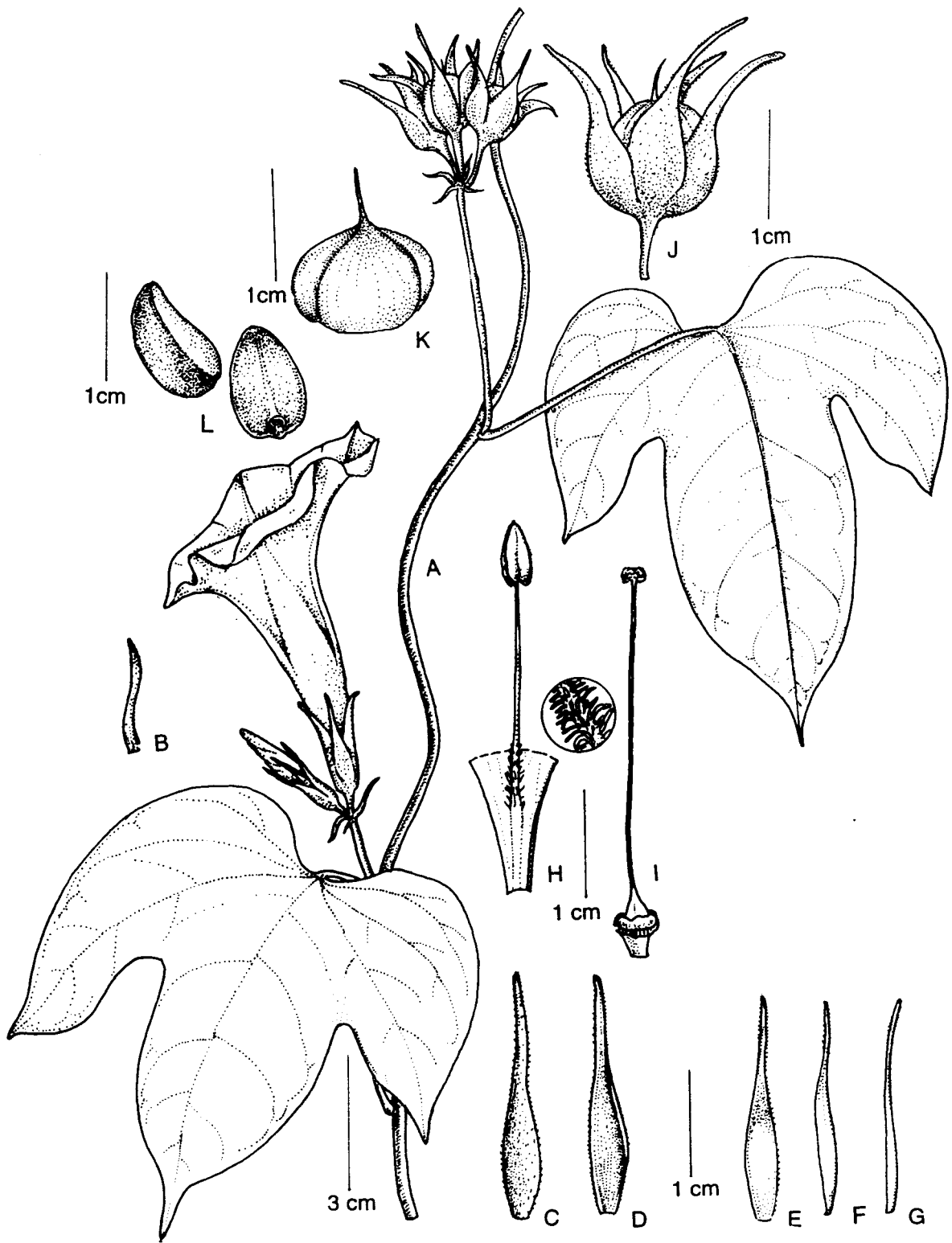


Fig. 83. *Ipomoea indica*. A. Flowering and fruit twig; B. Bract; C-G. Calyx (C & D outer, E-G inner); H. Stamen; I. Pistil; J. Capsule; K-L. Seeds (from Biju 4713 K)

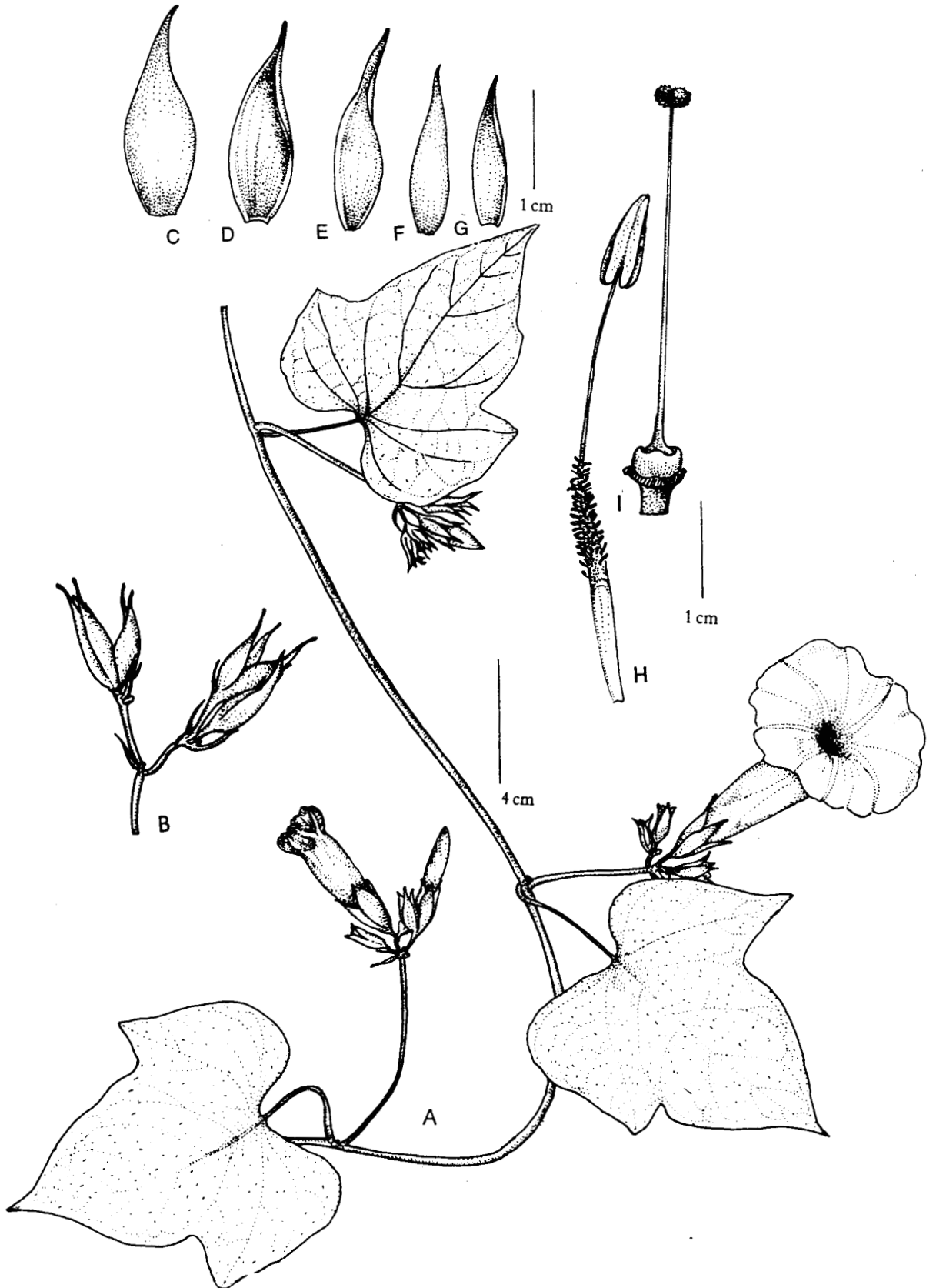


Fig. 84. *Ipomoea indica*. A. Flowering twig; B. Inflorescence showing bracts; C-G Calyx (C & D outer, E-G inner); H. Stamen; I. Pistil (from *Biju* 44249 K).

above the corolla base, unequal, 1.5-2.3 cm long, whitish long ciliolate at base; ovary small, conical, 1x2 mm; disc small, 1x1 mm, slightly lobed; style subexserted, upto 2.5-3.5 cm long, glabrous, white; stigma biglobose, 1x2mm, white. Fruits capsular, globose, 0.7 x 1.3 cm, fruiting sepal slightly enlarged, 0.9-1 x 0.5-0.7 cm, valvular, straw coloured, style base persistent; seeds 4, elliptic-oblong, 5-7 x 4-8 mm, blackish brown, glabrous, pubescent on hilum region.

Flowering : July - November

Fruiting : August - January

Distribution. *I. indica* is a native of Tropical America and now is Pantropical.

Ecology. This pretty plant is found in a variety of disturbed sites and waste places.

Taxonomic notes. Fosberg, 1976 gave a detailed discussion about the variability in *Ipomoea nil* complex. Five different population forms were collected during the course of the study. All the collections seemed to be very distinct. For the identity confirmation the materials were referred to Dr. B. Verdcourt (K). According to him three of the specimens were *I. indica* (Biju 15377, Biju 47713, Biju 44249) and two were *I. nil* (Sivarajan 12102, Biju 23902).

Detailed study is needed to conclude the identity and range of variability and for this study we followed Verdcourt's view.

Horticultural potentials. *I. indica* is an annual and bee pollinated vine, possessing large showy flowers that opens dawn but close and wither in the late morning of the same day. When flowers open the colour is light blue which changes to purplish blue and then to dark purple by the time of wilting. It is suitable for arches and fences. In Southern Peninsular India, this is a common plant in gardens.

Specimens examined : KERALA: Thiruvananthapuram Dt.: Biju 16259 (CALI), 44249 (K, CALI & TBGT); Bonaccad, Mohanan 54730 (MH). Kottayam Dt.: Fr. Kadavil 1305 (MH). Idukki Dt.: Rajamala, Biju & Suresh Elamon 15337 (K & TBGT), Biju et al. 25958 (CALI); Erattayar, Mohanan & Ramanujam 72161 (MH). TAMIL NADU: Coimbatore Dt.: R.S. Puram, Chandrabose 28987 (MH); Maruthamalai, Sebastine 1864 (MH), Viswanathan 234 (MH); Kuridimalai,

Subramanyam 1752 (MH). Salem Dt.: *s.coll. s.n.* 11284 (MH). Nilgiris Dt.: Marappalam, *Radhakrishnan* 38126 (MH); Kalhatti, *Sharma* 35652 (MH). KARNATAKA: Bangalore Dt.: Bangalore, Bellary, *s.coll.* 14374 (MH). Shimoga Dt.: Shimoga Forest, *Biju* 47713 (K, CALI & TBGT). ANDHRA PRADESH: Guntur Dt.: *Barber* 4655 (MH). Karimnagar Dt.: *Subba Rao* 25709 (MH). Vishakhapatnam Dt.: *Subba Rao* 21774 (MH).

Ipomoea nil (Linn.) Roth, Cat. Bot. 36. 1797; Ooststr., *Blumea* 3(2) 479. 1940 & Fl. Mal., ser. 1,4:465. 1953; Verdc., *Taxon* 6:231. 1957; *Taxon* 7:48. 1958 & Fl. Trop. E. Africa 113. 1963; Fosb., Bot. Notiser 129:36. 1976; Austin in Nasir & Ali, Fl. W. Pakistan 45. 1979 & in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1:332. 1980; Mani & Sivar., Fl. Calicut 182. 1982; Rani & Matthew in Matthew, Fl. Tam. Carnatic 3:1028. 1983; Nair & Nayar, Fl. Courtallum 2:244. 1986; Chand. & Nair, Fl. Coimbatore 196. 1987; Mohan & Henry, Fl. Thiruvananthapuram 316. 1994.

Type : Illustration of *Convolvulus caeruleus hederaceo*..... in Dill., Hort. Elth. t.80,f.91. 1732.

Convolvulus nil Linn., Sp. Pl. ed. 2.219. 1762.

Convolvulus hederaceus Linn., Sp. Pl. 154. 1753.

Ipomoea hederacea of authors, e.g., Clarke in Hook.f. Fl. Brit. India 4:199. 1883; Trimen, Handb. Fl. Ceylon 3:1895; Gamble, Fl. Pres. Madras 2:913. 1923, non Jacq. (1786).

Ipomoea scabra Forsk., Fl. Aegypt. -Arab. 44. 1775.

Ipomoea cuspidata Ruiz & Pavon, Fl. Peru. Chili 2:11, tab. 119, fig. a. 1799.

Pharbitis nil (Linn.) Choisy, Mem. Soc. Phys. Geneve 6:439. 1834; Thw; Enum. pl. zeyl. 210. 1860.

Vernacular names : Mal. *Kolampi puve*; Tam. *Kakkattan*; Kan. *Ganribija*; Tel. *Jirika*, *Kolli*.

Common name : Scarlet O'Hara and Imperial Japanese morning glory.

(Fig. 85, 86)

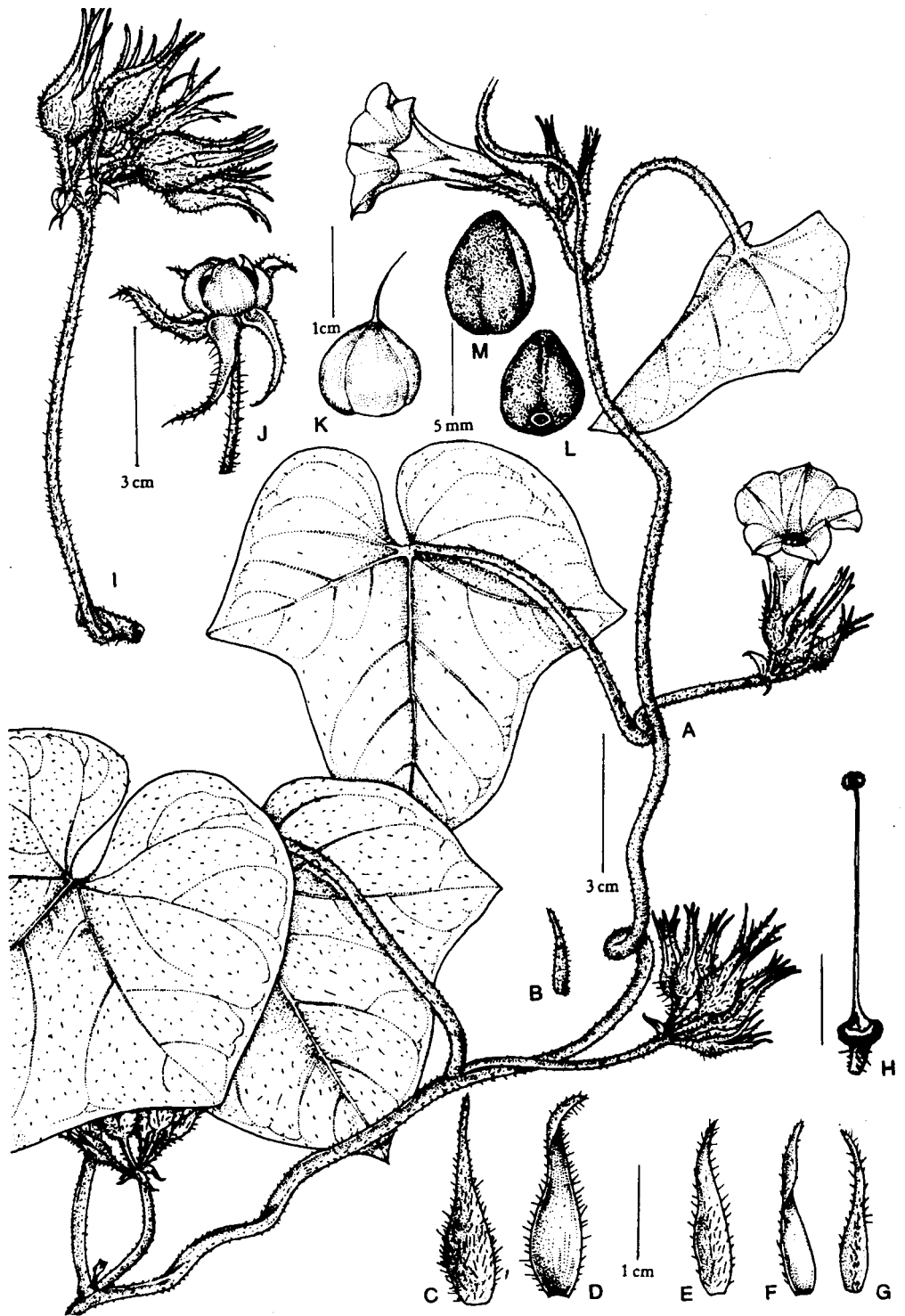


Fig. 85. *Ipomoea nil*. A. Flowering and fruiting twig; B. Bract; C-G. Calyx (C & D outer, E-G inner); H. Pistil; I-J. Fruits; K. Capsule; L-M. Seeds (from Biju 23902 K)

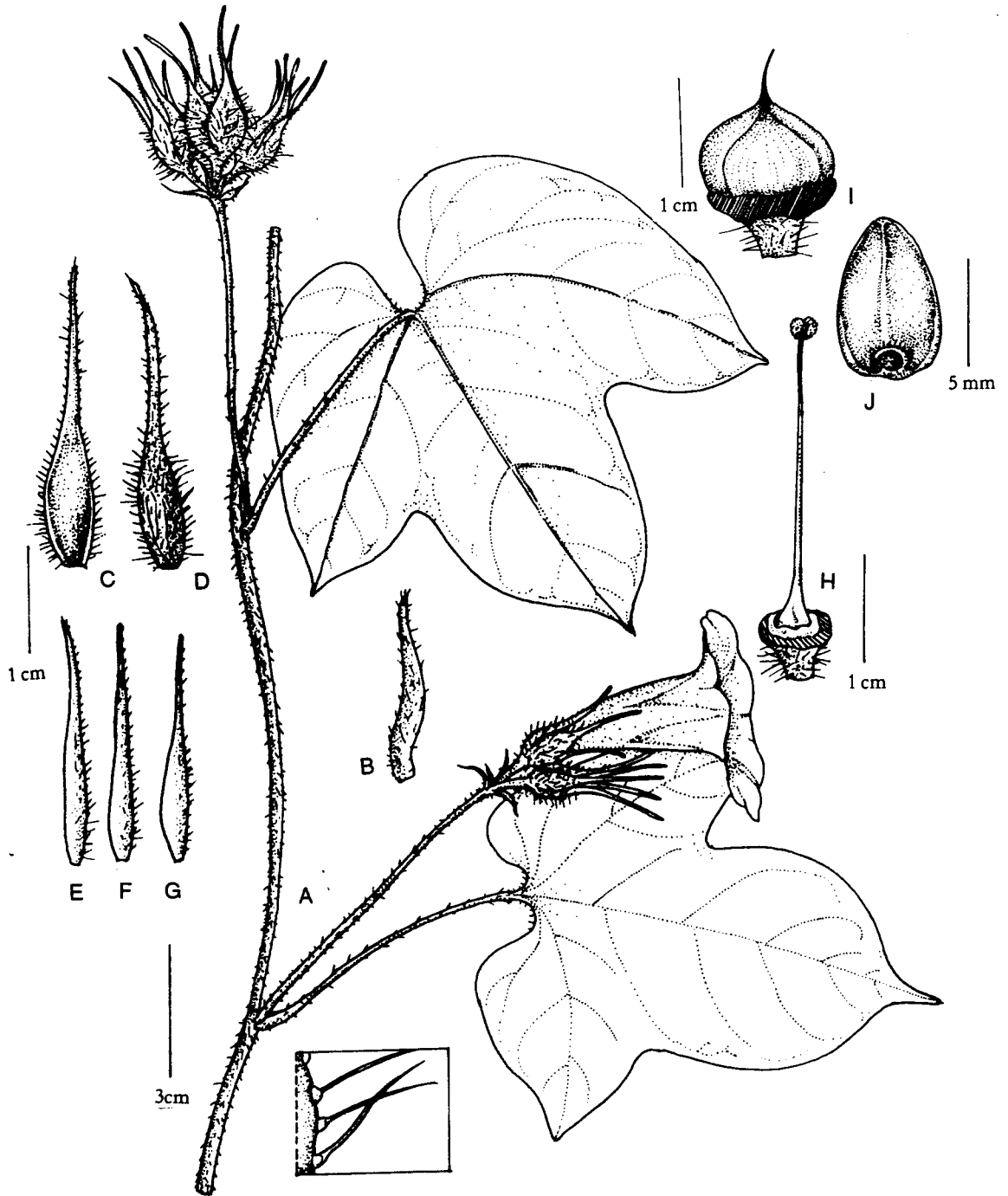


Fig. 86. *Ipomoea nil*. A. Flowering twig; B. Bract; C-G. Calyx (C-D outer, E-G inner); H. Pistil; I. Capsule; J. Seed (from Sivarajan 12102 K)

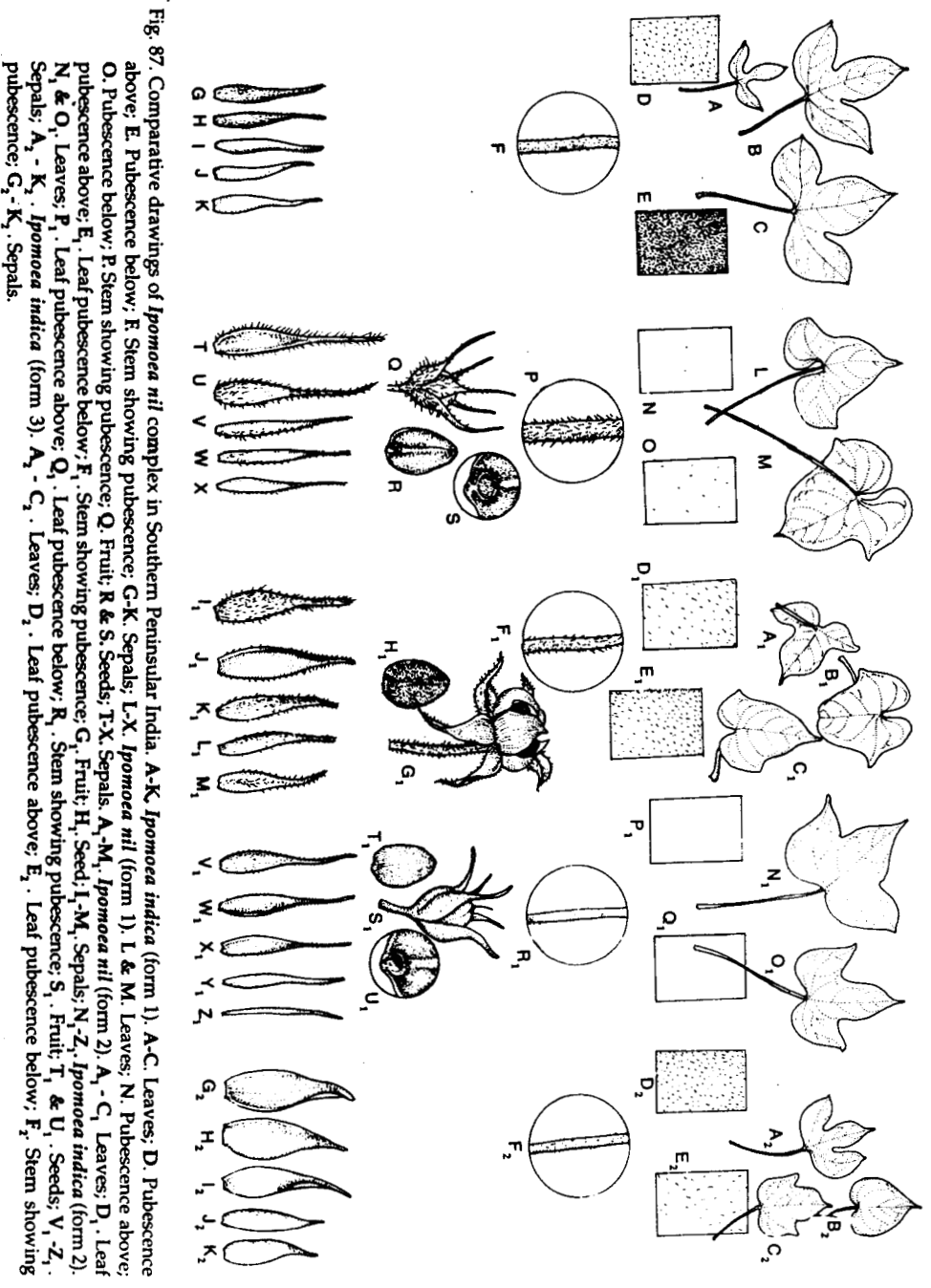
Annual herbs; stem twining, or sometimes prostrate, woody at base, herbaceous towards tip, terete, short hairs intermingled with long retrorse, reddish hairs purple to green ; latex milky white. Leaves simple, broadly ovate in outline, shallowly 3 lobed, 2-7.5 x 3-8.5 cm, apically acuminate, mucronate, basally deeply cordate, sparsely above pilose, more pilose below, margins ciliate, more prominently at the basal cordate region; midrib and lateral veins raised beneath, prominently hirsute; petiole upto 5 cm long, canaliculate, light purplish, prominently hirsute. Flowers axillary, few to many (upto 5) flowered cymose clusters; peduncle \pm 2.3 cm long, hirsute, elongated in fruits, upto 8.5 cm long; bracts small, lanceolate, 6x1 mm, hirsute outside, glabrous inside; pedicels upto 1 cm long, hirsute; sepals 5, subequal, outer 2 long, broadly lanceolate, 2-2.2 x 0.3-0.4 cm, apically long acuminate, pilose outside, glabrous inside, inner 3 small, lanceolate, 1.7 - 1.8 x 0.2 - 0.3 cm, sparsely pilose, apically long acuminate; corolla flax blue, throat white, campanulate, tube upto 3.4 cm long, white, mouth slightly 5 lobed, 2.5 - 3cm across; stamens subexserted; anthers upto 2.8 mm long, white; filaments attached upto 7 mm above the corolla base, unequal, 1.4, 1.6, 1.8 and 2 cm long, whitish long ciliolate at base; ovary small, subglobose, 1.5 x 1 mm, white; disc small, 1x1 mm, slightly lobed; style subexserted, upto 2.5 cm long, glabrous, white; stigma biglobose, 1.5 x 2 mm, white, papillate. Fruits capsular, globular, 1-1.2 x 0.9-1.1 cm, fruiting sepals slightly enlarged, reflexed when dry, valvular, straw coloured, persistent with style base; seeds 5-6, broadly ovate, 5-6 x 4-5 mm, black, puberulent; seed germination epigeal, hypocotyl upto 5 cm long, bicotyledonary, apically obcordate, sinus upto 1.8 cm deep, basally cordate, glabrous, petiole upto 2 cm long.

Flowering : July - October

Fruiting : September - January

Distribution. Originally from America and introduced into Asia by the early Portuguese visitors in the first decades of the 1500's (Austin, 1986).

Ecology. This species is frequent in both dry and wet zones. In Peninsular India it is found commonly on waste ground and secondary thickets.



Medicinal use. The seeds of *Ipomoea nil* are commonly known as Kaladana (meaning black seeds) and is much used in India, where they are regarded as an official, quickly operating, safe cathartic, closely resembling true jalap. It is considered a good purgative, drastic laxative (Austin, 1980 a), anthelmintic, and blood purifier, in the cases of gastric disorders, flatulence, odema, fever, headache and worms (Sivarajan & Indira Balachandran, 1994). Seed paste is a good application to cure skin diseases (Dey, 1980).

Horticultural potential. Many varieties has been developed and cultivated in various names in several countries. The most famous is the 'Japanese Morning Glory'.

Specimens examined : KERALA: Thiruvananthapuram Dt.: Perurkkada, *Biju* 23902 (K, TBGT & CALI). Kollam Dt.: Madathara, *Biju* 25913 (CALI). Thrissur Dt.: Vazhachal Forest, *Biju* 15347 (CALI). Kottayam Dt.: Thekkady, *Biju* 16226 (TBGT). TAMIL NADU: Coimbatore Dt.: on the way to Bharathi Dasan college, *Biju* 23925 (CALI); Palayamkotta, *Biju et al.* 44259 (CALI). ANDHRA PRADESH: Kurnool Dt.: Bogada, *Ellis* 32539 (MH).

Ipomoea parasitica (Kunth) G.Don, Gen. Syst. 4. 275. 1837.

Type : not found.

(Fig. 88)

Annual vines; stem twining, woody at base, herbaceous towards base, usually mucronate, glabrous, terete, hollow. Leaves simple, ovate to deltoid, 4-22 x 3-20 cm, apically acuminate, mucronulate, basally cordate (rarely truncate), glabrous below, sparsely pilose above; midrib and lateral veins raised beneath; petiole upto 30 cm long (generally longer than the blade), slightly pubescent. Flowers axillary, few to (upto 30) several flowered cymes; peduncle upto 25 cm long, pubescent, terete; bracts small, linear-lanceolate, 1-1.5 x 1 mm; pedicels short, 2-2.5 cm long, pubescent, slightly dilated above; sepals 5, more or less same size, outer 2 elliptic, 4-5.1 x 3-3.2 mm, apically apiculate, pilose outside, glabrous inside, scarious, inner 3 elliptic - oblong to widely ovate, 5-5.1 x 3-3.6 mm, apically apiculate, pilose only on outer

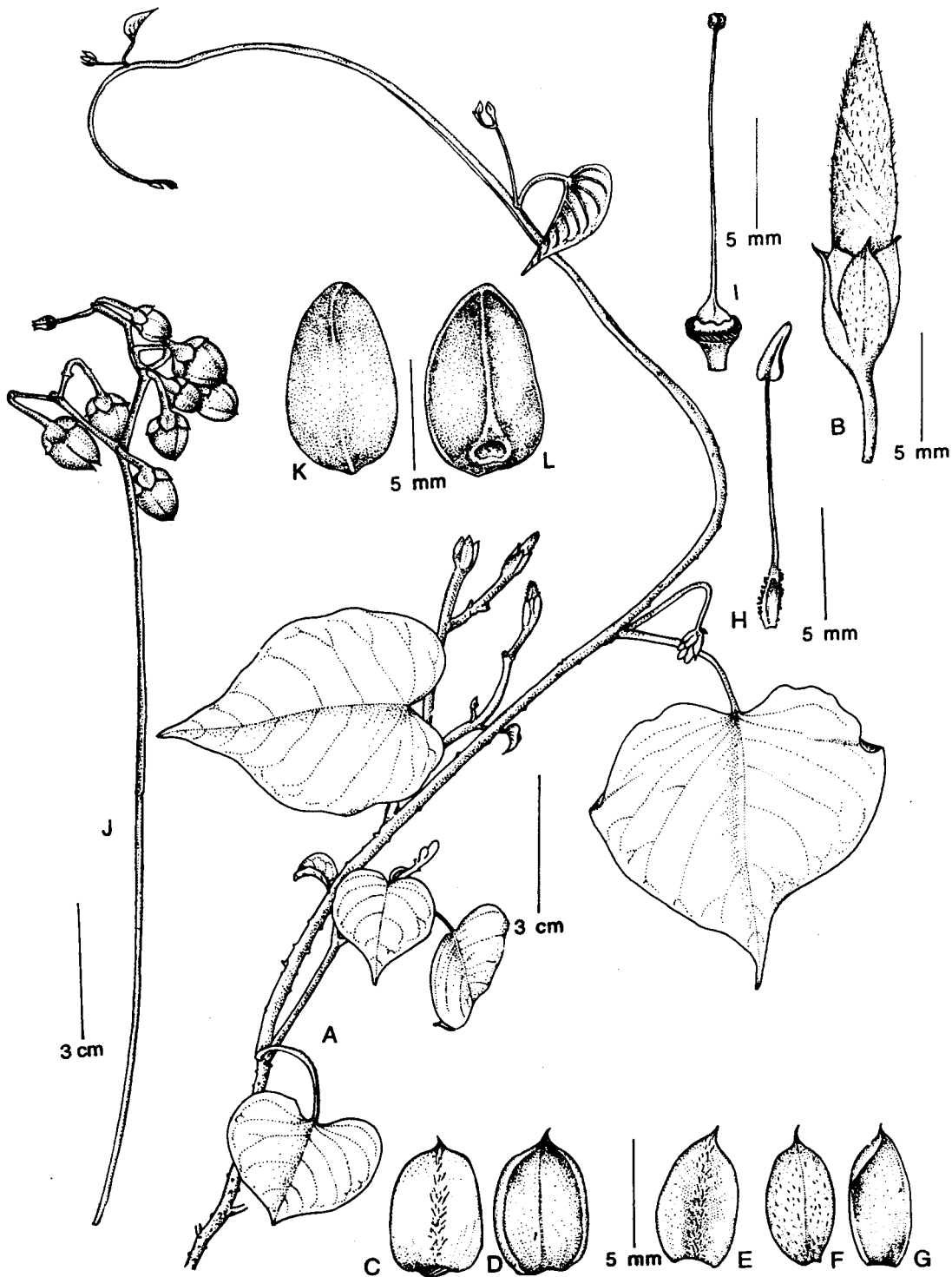


Fig. 88. *Ipomoea parasitica*. A. Flowering twig; B. Flower bud; C & D. Outer sepals; E-G. Inner sepals; H. Stamen; I. Pistil; J. Fruits; K & L. Seeds (from Biju 15345 K).

side of midrib, glabrous inside, scarious; corolla purple, throat whitish, campanulate, tube upto 3 cm long, white, mouth upto 3.5 cm across, slightly 5 lobed, midpetaline bands pilose; stamens inserted; anthers upto 3 mm long; filaments white, attached 7 mm above the corolla base, subequal, 2 long, upto 1.1 cm, 3 short, upto 0.9 cm long, white ciliolate at base; ovary conical, 1 x 1 mm, glabrous; disc small, annular; style inserted, upto 1.3 cm long, glabrous; stigma biglobose, 1 x 2 mm, papillate. Fruits capsular, broadly ovate to globular, 1.8-2 x 1.5 - 1.9 cm, apically with persistent style base, pedicels enlarged and recurved, fruiting sepals slightly enlarged and reflexed; seeds 4, ovate to elliptic, 8-9 x 6-7 mm, glabrous to pubescent, black.

Flowering : September - December

Fruiting : October - January

Distribution. *Ipomoea parasitica* is a New World species. This is the first report of this species from India.

Ecology. In Southern Peninsular India the plant has been collected from waysides of Shimoga district, Karnataka.

Specimens examined : KARNATAKA: Shimoga Dt.: Shimoga, *Biju* 15345 (K), *Biju* 15347 (CALI), *Biju* 15357 (TBGT).

Ipomoea sect. **Orthipomoea** Choisy in DC., Prodr. 9:353.1845; Verdc., Taxon 6:151.1957 & Fl. Trop. E. Africa 81:1963; Austin, Taxon 28(4):360.1979; Taxon 29:501.1980 & in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1:314.1980.

Type species : *I. heterophylla* R. Br.

Ipomoea sect. *Calycanthemum* (Klotsch) Hall. f. in Engl., Bot. Jahrb. 17:123.1893; Ooststr., Blumea 3(3):483, 490.1940 & Fl. Mal., ser. 1,4:462.1953.

Calycanthemum Klotsch in Peters, Reise Mossamb., Bot. 1:243,t. 40.1861.

Annual vines; stem prostrate or twining, pilose. Leaves entire, cordate, subhastate, oblong, elliptic or rarely pinnately lobed. Flowers few to several, capitate sessile heads or simple cymes, small in size; sepals ovate, oblong-

spathulate or linear-lanceolate, acute to acuminate, pubescent to hispid or setose; corolla campanulate; stamens and style inserted. Fruits capsular; seeds mostly shortly tomentose.

Sect. *Orthipomoea* is represented by two species in Southern Peninsular India.

KEY TO THE SPECIES

- 1a. Flowers in pedunculate cymes (more than 6 cm long); sepals linear - lanceolate, hastate at base, long setose..... **2. I. mombassana**
- 1b. Flowers in subsessile capitate clusters (upto 7 mm long); sepals oblong - spathulate, basally not hastate, hispid or pilose except innerside (middle to above) **1. I. eriocarpa**

Ipomoea eriocarpa R. Br., Prod. 484.1810; Clarke in Hook. f., Fl. Brit. India 4:204.1883; Trimen, Handb. Fl. Ceylon 3:217.1895; Ooststr., Blumea 3:490.1940 & Fl. Mal., ser. 1,4:462.1953; Verdc., Fl. Trop. E. Africa 91. 1963; Gandhi in Sald. & Nicolson, Fl. Hassan Dist. 470.1978; Austin in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1:325. 1980; Rani & Matthew in Matthew, Fl. Tam. Carnatic 3:1026.1983; Chand. & Nair, Fl. Coimbatore 193.1987; Mani., Fl. Silent Valley 188. 1988; Ramach. & Nair, Fl. Cannanore 302.1988; Vajravelu, Fl. Palghat Dist. 310.1990.

Type : Australia, "New Holland", *Banks & Solander* (BM, holotype fide Verdcourt.)

Convolvulus hispidus Vahl, Symb. Bot. 3:29,1794.

Ipomoea hispida (Vahl) Roemer & Schultes in Linn. Syst. Veg. 4:238.1819, non Zucc. (1806); Gamble, Fl. Pres. Madras 2:915.1923.

Ipomoea sessiliflora Roth, Nov. Pl. Sp. 116. 1860; Thw., Enum. pl. zeyl. 212. 1821; Wight, Icon. pl. Ind. or. t. 169.1839.

Ipomoea horsfieldiana Miq., Fl. Ned. 2:611.1857.



Fig. 89. Type specimen of *Ipomoea eriocarpa* R. Br. : Australia, 'New Holland', Banks and Solander (BM).

Vernacular name : Tel. Purititige.

(Fig. 89)

Herbaceous twiner; stem pubescent or hispid, trichomes upto 1.5mm long. Leaves simple, oblong, linear-oblong, hastate, 4-8 x 1.5-3cm, apically acute, apiculate, basally obtuse, glabrescent to pilose on both sides, midrib and lateral veins raised on both sides, prominently pilose; petiole upto 6.8 cm long, pubescent like stem. Flowers axillary, few to many flowered (upto 7) cymes; peduncle very short, upto 7 mm long, hirsute like stem; bracts 2, elliptic - lanceolate, 3x1-1.2 mm, apically acute to acuminate, hirsute; pedicels absent or very short, less than 1 mm long, hirsute; sepals subequal, outer 2 long, 5-6.2 x 2.8-3.1mm, inner 1 medium sized, 5-5.5 x 2mm, innermost 2 small, 5-5.2 x 1-1.5 mm, ovate, oblong-spathulate, apically acute to acuminate, hispid pilose except in inner surface middle to below; corolla lavender or pink with darker throat, funnel-form, tube upto 5 mm long, mouth very shallowly lobed, upto 1 cm across, midpetaline bands hirsute; stamens subexserted; anthers upto 1 mm long; filaments white, attached upto 1 mm above the corolla base, subequal, 2 long, upto 5 mm, 3 short, upto 3.4 mm long, sparsely ciliolate at base; ovary oblong, upto 1 mm long, sericeous; disc small, annular, \pm 1mm long; style subexserted, simple, upto 4 mm long, glabrous, slightly dilated at base, stigma white, biglobose, 1x1.3 mm, papillate. Fruit capsular, subglobose, 6-7 x 6-6.8 mm, valvular dehiscent, long pubescent middle to above; seeds 4, ovate - orbicular, 3 x 3 mm, glabrous except the hilum, finely punctate; seed germination epigeal, hypocotyl upto 1.5 cm long, bicotyledonary, apically obcordate, sinus upto 5 mm deep, basally truncate, glabrous, petiole upto 1 cm long.

Flowering : August - September

Flower opening : 7.30 am - 8.00 am

Fruiting : October - February

Description. *Ipomoea eriocarpa* is known from Africa to Transvaal, Madagascar, Egypt, Pakistan, Tropical Asia and Northern Australia.

Ecology. It occurs nearly throughout India at an altitude ranging from sea-level to 600 m. Generally found in open dry lands and is adapted to extreme xeric conditions.



Plate 5. A. *Ipomoea obscura* B & C. *Ipomoea pes-caprae* subsp. *pes-caprae* D & E. *Ipomoea pes-caprae* subsp. *brasiliensis* (Red flower & White flower) F. *Ipomoea pes-tigridis* G. *Ipomoea quamoclit* H & I. *Ipomoea staphylina* (H. petiolar nectary with ant, I. flowers) J. *Ipomoea* sp. A. K. *Ipomoea triloba*.

Specimens examined : KERALA: Thiruvananthapuram Dt.: Palode, *Biju* 16236 (CALI & TBGT). Idukki Dt.: Panamkutti, *Mohanan* 76200 (MH). Palakkad Dt.: Aruvampara slopes, *Nair* 69140 (MH); *s.coll.* 14214 (MH); Silent valley, Poochappara, *Biju* 15344 (TBGT). Kannur Dt.: Tolpetty Forest, *Ramachandran* 52228 (MH). TAMIL NADU: Coimbatore Dt.: Vadakumali, *Viswanathan* 853 (MH); Kurudimala, *Biju et al* 23944 (TBGT). Nilgiris Dt.: Northern Hag, *Rathakrishnan* 38965 (MH); *Thomson s.n.* (MH). S. Arcot Dt.: Vellimalai, *Ramamurthy* 77379 (MH). Salem Dt.: Morappuri, *s.coll.* 11639 (MH). KARNATAKA : Bangalore Dt.: *s.coll.* 309 (MH). Bellary Dt.: *s.coll. s.n.* (MH). ANDHRA PRADESH: Chittoor Dt.: Komativari cheruvu, *Subba Rao* 46809 (MH). Cuddapah Dt.: Balapalle, *Ellis* 15736 (MH). Kurnool Dt.: Sunnipenta Colony, *Ellis* 22124; Nallamalais, *Ellis* 32386 (MH). Krishna Dt.: Kondapalle R.F., *Venkanna* 5930 (MH). Godavari Dt.: Bison hills, *Barber* 5079 (MH); *Gamble* 15884 (MH). Medak Dt.: Narsapur, *Sebastine* 6737 (MH). Karimnagar Dt.: Kodimial, *Subba Rao* 21871 (MH). Vishakhapatnam Dt.: S. Kota, *Subba Rao* 32806 (MH). LOCALITY UNKNOWN : Malabar Concan, Stocks Law & Co *s.n.* (MH).

Ipomoea mombassana Vatke in *Linnaea* 43:515.1882; Baker & Rendle in *This.*-
Dyer., *Fl. Trop. Africa* 4(2): 184.1905; *Verdc.*, *Fl. Trop. E. Africa* 98.1963.
 Type : Kenya, Mombasa, *Hildebrandt* 2048 (B, holotype ; K. isotype).

(Fig. 90)

Herbaceous twiner; stem sparsely hirsute to bulbous-based hairs. Leaves simple, triangular-ovate, 7-8 x 5-6 cm, apically acute, shortly aristate, basally deep cordate to sagittate, glabrous to pubescent; midrib and lateral veins raised beneath; petiole upto 10 cm long, narrowly winged. Flowers axillary, few flowered cymes; peduncle upto 10 cm long; bracts 2, linear-elliptic to lanceolate, pubescent; pedicels upto 5 cm long, sparsely to prominently pubescent; sepals subequal, linear, acute, from a hastate base, pubescent or margins setose (upto 12 mm long hairs); corolla whitish mauve with purplish tube (inside), funnel-shaped, tube upto 4 cm long, mouth shallowly 5 lobed, upto 3.5 cm across, midpetaline bands hirsute; stamens subexserted; anthers 3-4.2 x 1.4-2 mm; filaments white, attached upto \pm 2 mm above the corolla

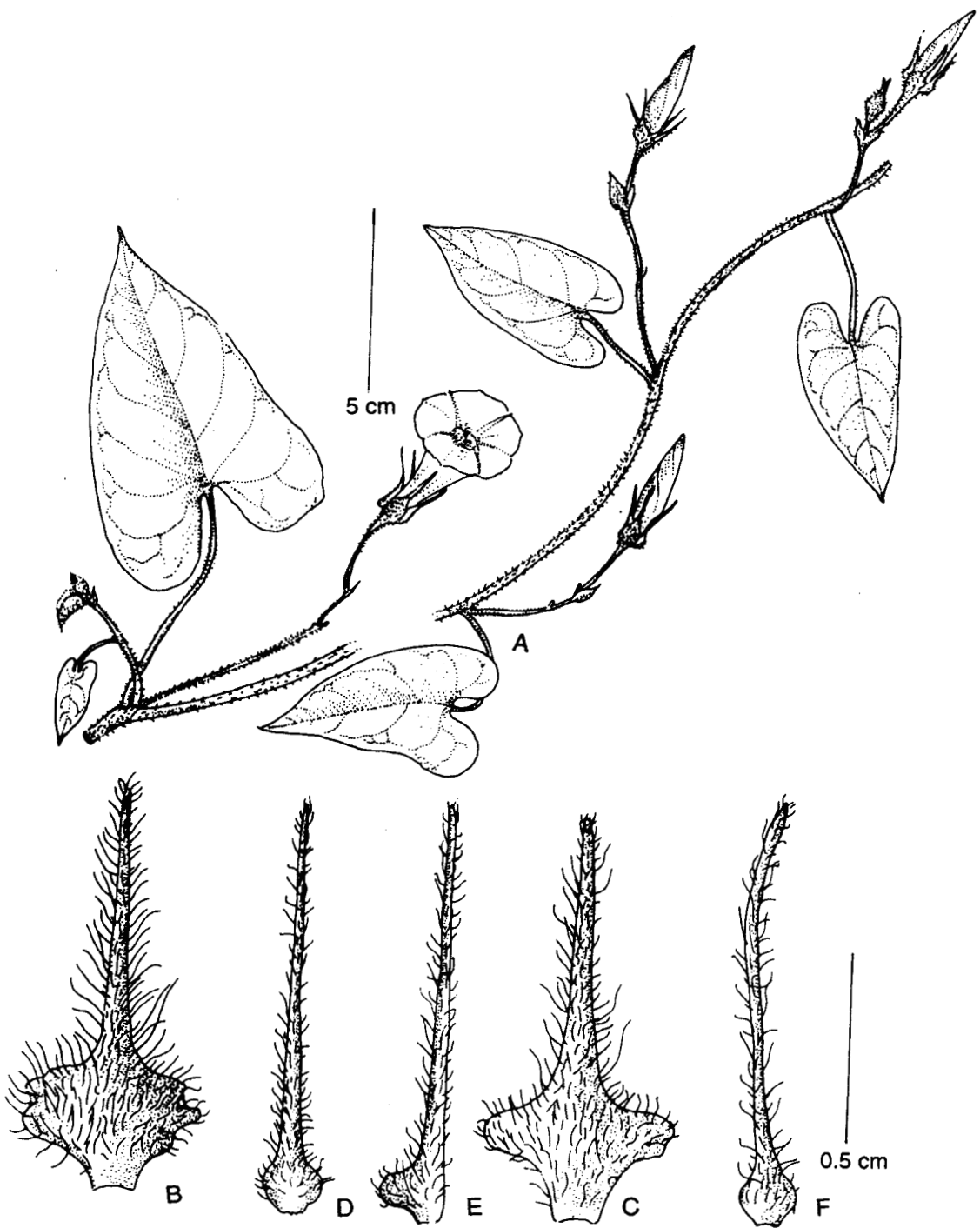


Fig. 90. *Ipomoea mombassana*. A. Flowering twig; B & C. Outer sepals; D-F. Inner sepals (from Rajagopal 4087 S.N. College).

base, subequal, 1.5-2.8 cm long; ovary conical, upto 2 mm long, glabrous; disc annular; style subexserted, glabrous, slightly dilated at base. Fruits not seen.

Flowering : August - December

Fruiting : not found

Distribution. According to Verdcourt (1963), this plant is very common along the coastal regions of East African states like Kenya, Tanganyika and Zanzibar. Recently Rajagopal (1996) collected this plant from Batlagunda of the Tamil Nadu State.

Ecology. Along the wayside of Ghat road.

Specimens examined : TAMIL NADU: Batlagunda, Ghat road, Rajagopal 4087 (S.N. college, Kollam).

Ipomoea sect. *Mina* (Cerv.) Griseb., Fl. Br. W. Ind. Islands 472.1864; Austin, Taxon 29: 501.1980.

Type species : *M. lobata* Cerv

Mina Cert. in La Llave & Lev., Nov. Veg. Descr. 1:3.1824.

Ipomoea sect. *Quamoclit* (Moench.) Griseb., Fl. Br. Ind. Islands 472.1864; Ooststr., Fl. Mal., ser. 1,4:481.1953; Verdc., Taxon 6:152.1957 & Fl. Trop. E. Africa 81.1963; Austin, Taxon 28(4):360.1979.

Quamoclit Moench. Meth. 453.1794 (*Quamoelit*).

Ipomoea sect. *Leiocalyx* subsect. *Quamoclit* Hall. f. Med. Rijksherb. Leiden no 46:20.1922; Ooststr., Blumea 3(3):552.1940.

Annual herbaceous twiners, mostly glabrous; leaves cordate, often angular, palmately 3-5 lobed or deeply pinnately divided. Flowers axillary, often in a dichasium consisting of two scorpioid cymes or in a real dichasium; sepals subequal, obtuse, with awn like appendage, at the apex; corolla small or medium-sized, often slightly zygomorphic, bright red or yellow, glabrous, salver-shaped, or urceolate above, the tube cylindrical or thickened upwards; stamens and style well exserted; ovary glabrous, 4-celled, 4-ovuled. Fruits capsular; seeds glabrous or pubescent.

KEY TO THE SPECIES

- 1a. Leaves ovate to orbicular, entire, angular or slightly to deeply 3-7 lobed. Many flowered helicoid cymes; corolla scarlet red, tube inside yellowish orange1. **I. hederifolia**
- 1b. Leaves ovate to elliptic in outline, deeply pinnatisect to the midrib. Few flowered simple cymes; corolla red or white, tube inside red..... 2. **I. quamoclit**

1. *Ipomoea hederifolia* Linn., Syst. Nat. ed. 10.925.1759; Verdc., Fl. Trop. E. Africa 132.1963; Gandhi in Sald. & Nicolson, Fl. Hassan Dist. 471.1978; Austin in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1:325.1980; Mani. & Sivar., Fl. Calicut 184.1982; Rani & Matthew in Matthew, Fl. Tam. Carnatic 3:1027.1983; Nair & Nayar, Fl. Courtallum 2:243.1986; Mani., Fl. Silent Valley 189.1988; Vajravelu, Fl. Palghat Dist. 311.1990; Mohan & Henry, Fl. Thiruvananthapuram 315.1994.

Type : West Indies, illustration of *Ipomoea foliis cordatis* Plumier, Pl. Amer. t. 93.f.2. (lectotype).

Ipomoea coccinea auctt. : Clarke in Hook. f., Fl. Brit. India 4:199.1883; Trimen, Handb. Fl. Ceylon 3:215.1895, non Linn. (1753).

Ipomoea angulata Lamk., Tabl. Encyl. 1:464.1793; Ooststr., Blumea 3:553.1940 & Fl. Mal., ser. 1,4.481.1953.

Ipomoea phoenicea Roxb., Fl. Ind., ed. Carey & Wall. 2:92.1824.

Quamoclit phoenicea (Roxb.) Choisy, Mem. Soc. Phys. Geneve 6:433.1834; Gamble, Fl. Pres. Madras 2:919.1923.

Quamoclit angulata (Lamk.) Bojer, Hort. Maurit. 224.1837.

Annual herbs; stem twining, woody at base, herbaceous towards tip, angular to slightly winged, strongly twisted, hollow, green, glabrous or sparsely pubescent. Leaves simple, ovate or broadly ovate to orbicular, 3-12 x 2.5-11 cm, entire, angular, coarsely dentate, slightly to deeply 3,5 or 7 lobed, apically acuminate, mucronulate, basally cordate; midrib and lateral veins raised on both sides; petiole upto 14 cm long, deeply canaliculate, glabrous

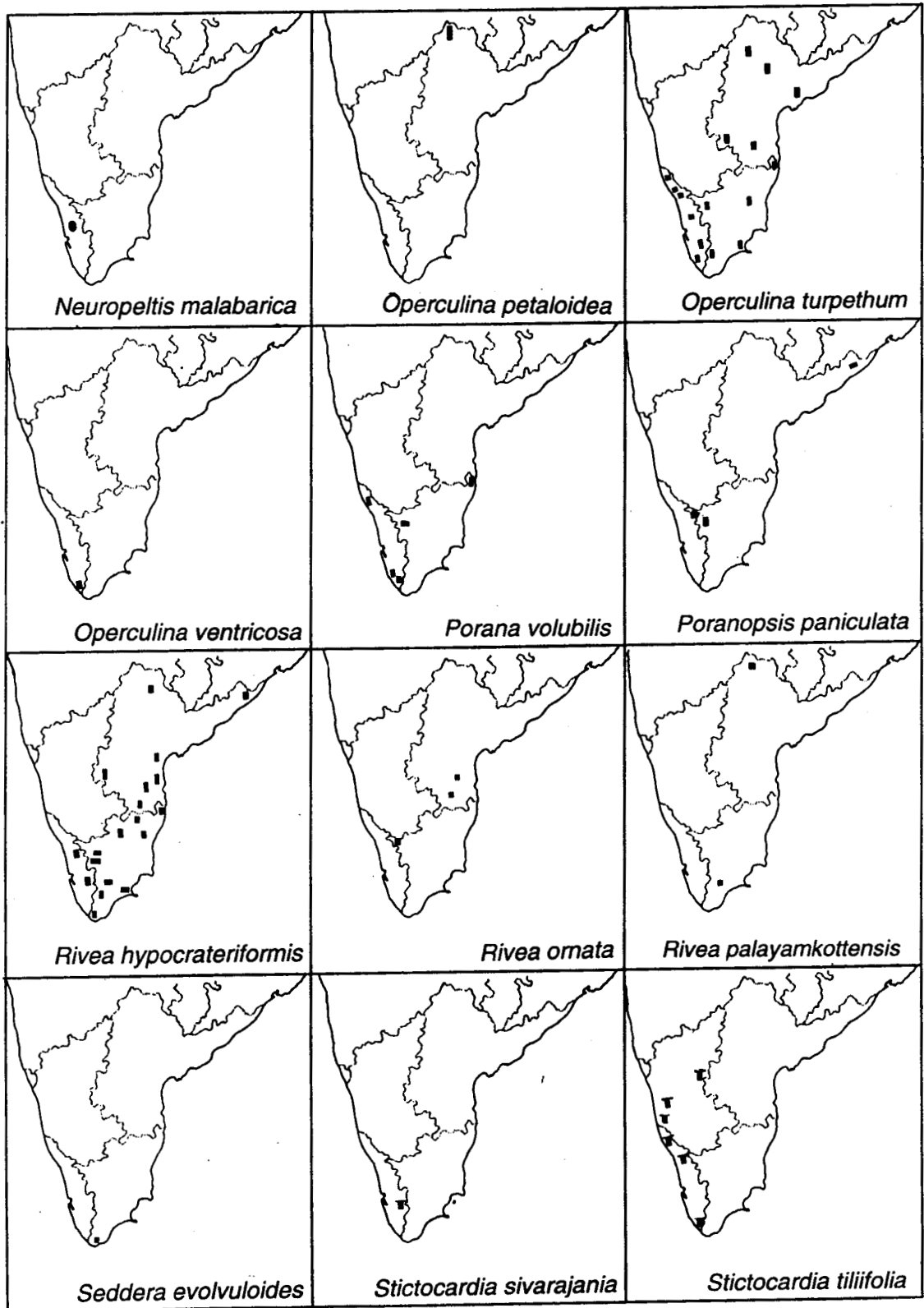


Fig. 91. Distribution maps of *Neuropeltis*, *Operculina*, *Porana*, *Poranopsis*, *Rivea*, *Seddera* and *Stictocardia*.

or sparsely pilose, densely pilose on the apex. Flowers axillary, few to several (4-20) flowered cymes, branched, branchlets helicoid; peduncle upto 12 cm long, slightly angled, green, glabrous to remotely pubescent; bracts small, 1x1mm in diameter, triangular, mucronulate; pedicels angular, dilated at apex, glabrous; sepals subequal, outer 2 small, 5-5.1 x 2-2.1 mm (with awn), inner 3 large, 5.8-6 x 2.5-3 (with awn), awn 2.5-3 mm long, oblong - elliptic, apically broadly obtuse or truncate, subterminal arista inserted immediately below the top, glabrous; corolla scarlet red, salver-shaped, tube upto 3.5cm long, slightly curved, inside yellowish orange, mouth 2.5 cm across, 5-lobed, mid petaline bands light red outside, glabrous; stamens exerted; anthers upto 2 mm long; filaments whitish orange, subequal, 3.5-4 cm long, shortly white ciliolate at base; ovary conical, 1-1.5x1mm, glabrous; disc small, \pm 1mm; style well exerted, upto 4.5cm long, white, glabrous; stigma white, biglobose, 2 mm in diameter, papillate. Fruits capsular, globular, 8 x 8mm, crowned with a circular depression (style scar), 4 valved, glabrous; seeds 4, pyriform, pubescent, usually 2 lines of slightly long dark trichomes on the dorsal surface; seed germination epigeal, hypocotyl upto 7 cm long, bicotyledonary, apically emarginate, sinus upto 5 mm deep, basally truncate to cordate, glabrous, petiole upto 1.3 cm long.

Flowering : October - March

Fruiting : December - April

Distribution. *Ipomoea hederifolia* is a native of Southern United States. Now it is distributed throughout the Neotropics and has been introduced worldwide by cultivation and has become naturalized in the paleotropics (O'Donell, 1959 a,c).

Ecology. It is widely cultivated as an ornamental vine in Southern Peninsular India. It also persists as a weed in many parts along waysides and wastelands, probably escaped from cultivation.

Horticultural potential. This beautiful vine is popularly known as Star Ipomoea.

Specimens examined : KERALA: Thiruvananthapuram Dt.: Kovalam, Biju & Suresh Elamon 15368 (TBGT); Palode, Biju 23931 (CALI & TBGT). Kollam Dt.:

Nilamel, *Biju* 25960 (TBGT). Idukki Dt.: *Mohanan* 74624 (MH). Kozhikode Dt.: *Narayana* 6299 (MH); Meenchantha, *Biju* 16243 (TBGT). Palakkad Dt.: Olavakkot, *Joseph* 17781 (MH). Kannur Dt.: Payanur, *Ansari* 69935 (MH). TAMIL NADU: Kanniyakumari Dt.: Keeriparai, *Henry* 53222 (MH). Madurai Dt.: *s.coll.* 9047 (MH). Coimbatore Dt.: Mount Stouert, *Joseph* 13340 (MH); *Barber* 194 (MH). Nilgiris Dt.: Gudalur, *Sebastine* 7329 (MH), *Biju* 14283 (CALI). N. Arcot Dt.: Kavalur, *Viswanathan* 843 (MH). Chengalpattu Dt.: *Narasimhan* 929 (MH). ANDHRA PRADESH: Kurnool Dt.: Chelama, *Ellis* 17960 (MH). Vishakhapatnam Dt.: S. Kota, *Subba Rao* 32773 (MH). Karimnagar Dt.: Aklasapur, *Subba Rao* 22518 (MH).

Ipomoea quamoclit Linn., Sp. Pl. 159.1753; Roxb., Fl. India 2:93.1824; Clarke in Hook.f., Fl. Brit. India 4:199.1883; Trimen, Handb. Fl. Ceylon 3:215.1895; Ooststr., Blumea 3:555.1950 & Fl. Mal., ser. 1,4: 482.1953; Austin in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1:338.1980; Mani. & Sivar., Fl. Calicut 184.1982; Rani & Matthew in Matthew, Fl. Tam. Carnatic 3:1031.1983; Vajravelu, Fl. Palghat Dist. 312. 1990; Mohan & Henry, Fl. Thiruvananthapuram 317.1994.

Type : Herb. Burser xxii : 53 (UPS).

Convolvulus pennatus Desr. in Lamk., Encyl. Meth. 3:567.1789.

Quamoclit vulgaris Choisy, Mem. Soc. Phys. Geneve 6:434.1834.

Quamoclit pinnata Bojer, Hort. Maurit.224.1837; Gamble, Fl. Pres. Madras 2:919.1923.

- *Tsjuria - cranti* Rheede, Hort. Malab. 11:123, t. 60.1692.

Vernacular names : Mal. *Suryakanthi* (?); Tam. *Kembumalligai*; Kan. *Kamalate*; Tel. *Kasiratnamu*.

(Fig. 92)

Annual herbaceous vines; stem twining, slender, terete or slightly grooved, glabrous. Leaves ovate elliptic to broadly elliptic in outline, 1-8 x 1-6 cm, deeply pinnatisect to the midrib, with 8-21 alternate or opposite pairs of linear to filiform lobes, lobes 2-3.5 x ± 1mm, glabrous on both sides; petiole upto

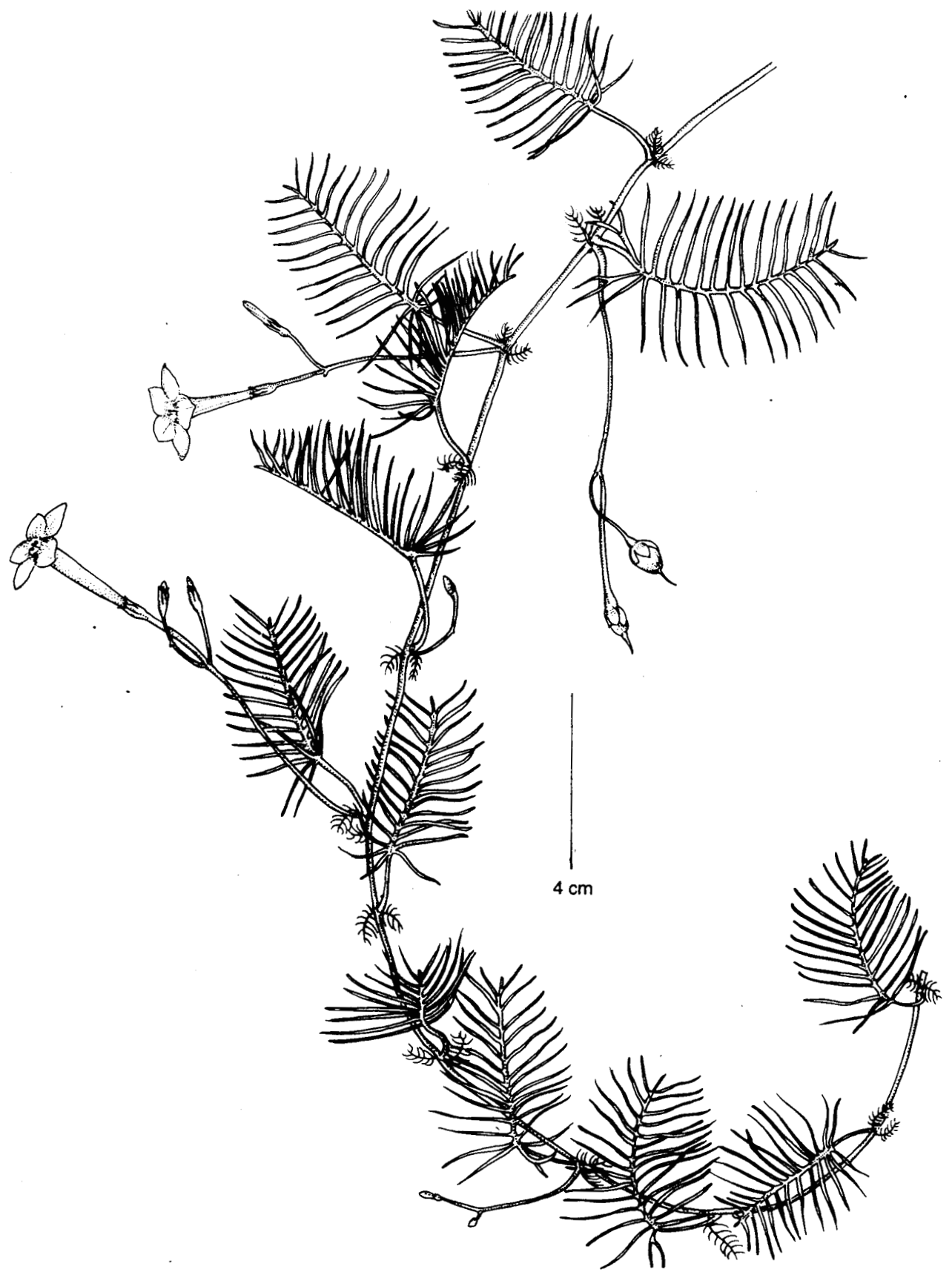


Fig. 92. *Ipomea quamoclit*. Flowering and fruiting twig (from Biju 25934 CALI).

2-3.8 cm long, glabrous, pseudostipule 1 or 2 at the base, upto 2 cm long, segmentation like leaf. Flowers axillary, 1-to few (upto 3) flowered cymes; peduncle upto 7 cm long, glabrous; bracts small, deltoid, 1x1 mm, apically acute, glabrous; pedicels upto 2.8 cm long, dilated at apex; sepals slightly subequal, outer pair short, 4-5 x 2-2.5 mm, inner three 5-5.5 x 2.5-3.2 mm, all are elliptic to elliptic-oblong, apically obtuse, mucronulate, glabrous; corolla red or white, salver shaped, tube upto 4 cm long, slightly narrowed towards the base, tube inside white, 2.6 cm across, 5 lobed, lobes acutish, mucronulate; stamens well exerted; anthers upto 3 mm long; filaments attached 6 mm above the corolla base, subequal, 2-2.7 cm long, reddish ciliolated at base; ovary small, 1x2 mm, conical, glabrous; disc small, slightly wavy; style exerted, 2.3 - 2.6 cm long, light reddish, glabrous, dilated at base; stigma biglobose, 1x2 mm, papillate. Fruits capsular, ovoid, 1x0.7 cm, apically obtuse, apex with a thickened style base, 4-valved, fruiting pedicels thickened and clavate; seeds 4, ovoid - oblong, 5.5-6.4 x 2.8-3.2 mm, blackish-brown, grayish white patches of short trichomes scattered irregularly; seed germination epigeal, hypocotyl upto 7 cm long, bicotyledonary, apically dissected into two lobes, sinus upto 3.5 cm deep, basally truncate, glabrous, petiole upto 2.3 cm long.

Flowering : July - October

Fruiting : September - January

Distribution. *Ipomoea quamoclit*, originated from tropical America, is now widely cultivated and naturalised in the Old World tropics.

Ecology. It is cultivated throughout India as an ornamental; naturalised in thickets and other sites.

Nomenclatural notes. When Linnaeus published *Ipomoea quamoclit* in 1753, he gave a brief description of the plant and no numbered specimens were mentioned. There is a sheet at LINN (Herb. Linn. No. 219.1) which has been widely treated as the lectotype of *I. quamoclit* (Austin 1979 & 1980 a). However it cannot be regarded as the original material and it is a later addition to the herbarium (Jarvis, pers. comm. 1996), which means that it was certainly not

in Linnaeu's possession until after the completion of the *Species Plantarum*. The original element for the name appear to be Herb. Burser XXII : 53 (UPS), a sheet in the Linnaean herbarium in Helsinki (H), a sheet in the Clifford herbarium (BM) and a cited plate from Colonna.

I am therefore designating Herb. Burser XXII : 53 (UPS) as the lectotype of *Ipomoea quamoclit*.

Lectotype : (Here designated) Herb. Burser XXII : 53 (UPS).

Economic potential. In Philippines the leaves are prepared in poultices and employed as a remedy for bleeding haemorrhoids (Ooststroom, 1950).

Specimens examined : KERALA: Thiruvananthapuram Dt.: Karamana, *Biju & Suresh Elamon* 44252 (TBGT). Kollam Dt.: Araneeswaram, *Mohanan* 63476 (MH). Kottayam Dt.: Nalukodi, *Antony* 362 (MH). Palakkad Dt.: Olavakkot, *Joseph* 17769 (MH). TAMILNADU: Coimbatore Dt.: Suger cane breeding station campus, *Biju* 25934 (CALI). PONDICHERRY (U.T.): *Rajan* 89753 (MH). ANDHRA PRADESH: Krishna Dt.: *Venkanna* 5935 (MH). Anantapur Dt.: S.K. University campus, *Yesoda* 381 (MH).

JACQUEMONTIA Choisy

The genus *Jacquemontia*, named after Victor Jacquement (1801 -1832), was originally established by Choisy in 1834. Many of the subsequent authors Clarke (1883), Trimen (1895) and others had not recognised *Jacquemontia* as a distinct genus. However Cooke (1905), Gamble (1923), Ooststroom (1939, 1953), Austin (1980 a) and many others shared Choisy's concept and considered it as a distinct genus, closely related to *Convolvulus* Linn. Verdcourt (1963) stated that this genus is very close to *Convolvulus* and there is no universal distinguishing character. However, he did not want to disturb the status quo and hence retained *Convolvulus* and *Jacquemontia* separately. The present taxonomic opinion is in favour of accepting *Jacquemontia* as a distinct genus, and easily separable from *Convolvulus* by stigma shape, filiform in *Convolvulus* and ellipsoid or oblong in *Jacquemontia*.

No recent studies of all the species in this genus except Roberston's (Ph.D. thesis, 1971) study of American species from Panama and West Indies have been done. Only two species are seen in India, *J. paniculata* and *J. pentantha*, the former is indigenous and the latter from America for cultivation.

Jacquemontia Choisy, Mem. Soc. Phys. Geneve 6:476. 1834; Prain, Journ. As. Soc. Bengal 124:301. 1906; Ooststr., Blumea 3(2):267. 1939 & Fl. Mal., ser. 1. 4:431. 1953; Verdc., Fl. Trop. E. Africa 33.1963; Robertson, Ph.D. thesis, Washington Uni. 1971.

Lectotype species : *Convolvulus pentanthus* Jacq. [= *Jacquemontia pentantha* (Jacq.) G. Don].

Thyella Raf., Fl. Tell. 4:84. 1838.

Annual or perennial herbs or procumbent shrubs, rarely erect; stem glabrous or densely pubescent, herbaceous or woody at base. Leaves simple, entire, rarely dentate or lobed, often cordate at base. Flowers axillary, solitary, in scorpioid cymes or in umbelliform or head like cymes; bracts small, linear to lanceolate, larger, foliaceous; sepals 5, subequal, outer 1 large; corolla medium sized, campanulate or funnel form, blue, lilac, white or red, obscurely lobed; stamens and style inserted, rarely exserted; ovary 2-locular, 4-ovuled; style 1, filiform; stigma 2, ellipsoid or oblong. Fruits capsular, globose to subglobose, 2-celled, 4-seeded; seeds smooth or minutely papillose, glabrous or velutinous, the edges often with a scarious wings.

Distribution and Ecology. The genus *Jacquemontia* with about 120 species, primarily of the American tropics and subtropics, but also with a few species in the Old World. Only two species are available in India. (Ecology see under species).

KEY TO THE SPECIES

- 1a. Stem pubescent to tomentose. Leaves pubescent
below. Bracts small, upto 6 mm long..... 1. *J. paniculata*
- 1b. Stem glabrous. Leaves glabrous on both sides.
Bracts large, upto 13 mm long 2. *J. pentantha*

Jacquemontia paniculata (Burm.f.) Hall.f. in Engl., Bot. Jahrb. 16:541. 1893; Cooke, Fl. Pres. Bombay 2:87. 1905; Gamble, Fl. Pres. Madras 2:926. 1923; Ooststr., Blumea 3(2): 269. 1939 & Fl. Mal., ser. 1, 4:432. 1953; Verdc., Fl. Trop. E. Africa 34. 1963; Austin in Nasir & Ali., Fl. W. Pakistan 51. 1979 & in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1:345. 1980; Rani & Matthew in Matthew, Fl. Tam. Carnatic 3:1034. 1983.

Type : Java, Batavia, *Kleynhoff* in *Burmann* 413 (88) (G, Holotype, fide Verdcourt).

Ipomoea paniculata Burm. f., Fl. India 50. t. 21. f. 3. 1768.

Convolvulus parviflorus Vahl, Symb. Bot. 3:29, 1794, non Dest. (1791), nom. illegit.; Roxb., Fl. India 2:51 1824; Clarke in Hook.f., Fl. Brit. India 4:220. 1883; Trimen, Handb. Fl. Ceylon 3:226. 1895.

Convolvulus multivalvis R. Br., Prod. 483. 1810, var. B.

Jacquemontia umbellata Bojer, Hort. Maurit. 229. 1837.

Convolvulus valerianoides Blanco, Fl. Filip. 90. 1837.

Breweria valerianoides F.Vill. Nov. App. 143. 1880.

Convolvulus paniculatus O.K., Rev. Gen. Pl. 440. 1891.

(Fig. 93)

Perennial herbs; stem herbaceous, twiner, young plant decumbent or erect, terete, pubescent with whitish tomentum. Leaves simple, ovate - cordate or ovate - oblong, 3-7 x 1.5-3.8 cm, apically acuminate with mucronulate tip, basally cordate or truncate, glabrescent above, sparsely pubescent below; midrib and lateral veins raised beneath, lateral veins 6-8 pairs, densely tomentose below, sparsely tomentose above; petiole upto 4 cm long, finely pilose. Flowers axillary, few to many flowered umbelliform cymes; peduncle upto 7.5 cm long, terete, pubescent like stem; bracts small, subulate; pedicels filiform, upto 5 mm long, pubescent like peduncle; sepals unequal, outer 2 large, ovate - lanceolate, 4.5-5.2 x 2-3 mm, apically acute to acuminate, softly pilose outside, apically pilose inside, third medium sized, more or less oblique, lanceolate, 4-4.8 x 2-2.5 mm, apically acute to acuminate, softly pilose outside, apically soft pilose inside, inner most two small, broad - ovate to orbicular base, apically long acuminate, 4-4.5 x 2-2.5 mm, base with scarious

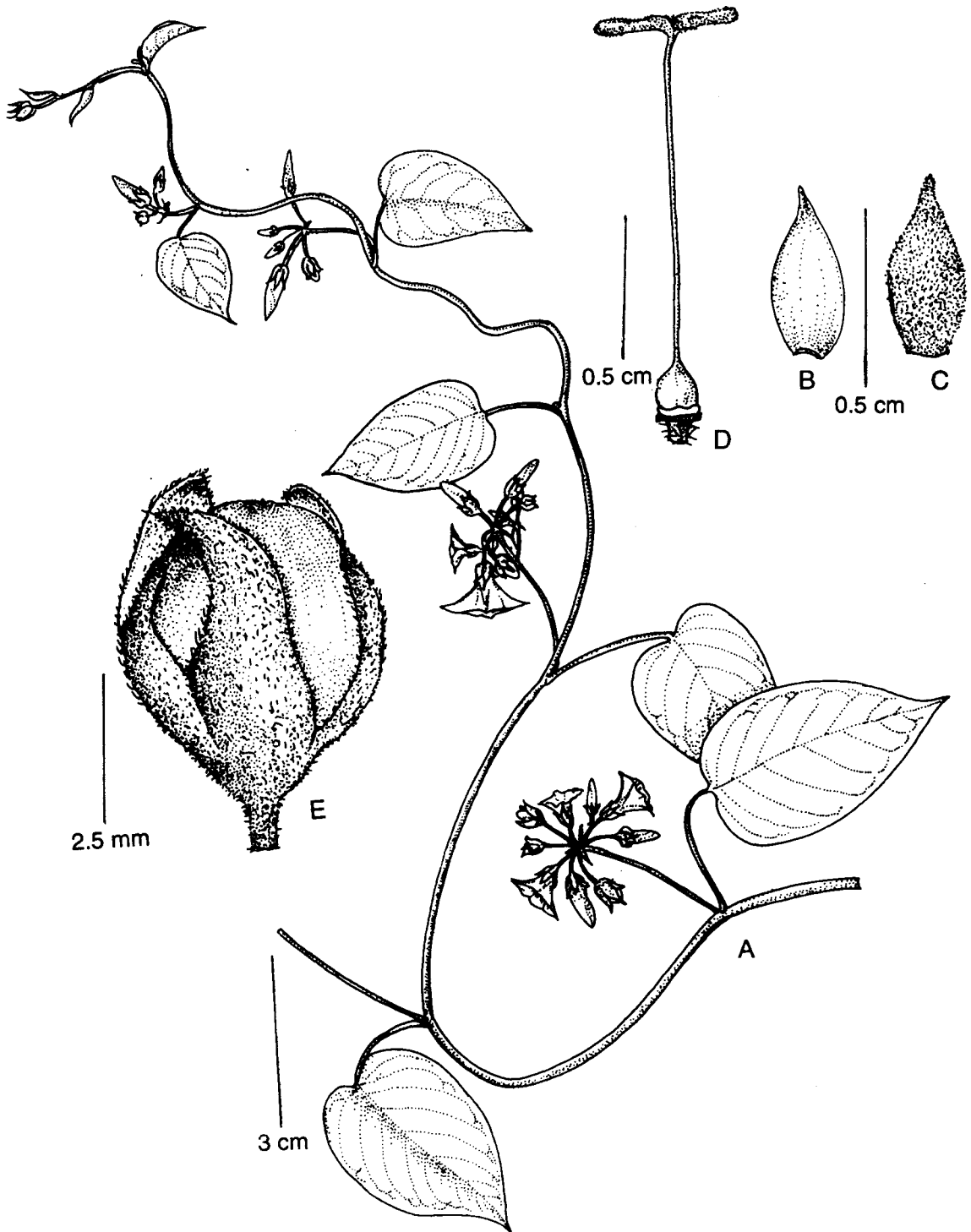


Fig. 93. *Jacquemontia paniculata*. A. Flowering twig; B & C. Sepals; D. Pistil; E. Fruit (from *Biju* 16223 TBGT).

margin, sparsely pubescent outside, apically pubescent; corolla white, campanulate, tube upto 6 mm long, mouth slightly 5 lobed, 5-6 mm across; midpetaline bands glabrous; stamens subexserted; anthers upto 2.2 mm long, straight; filaments attached 1.5 mm above the corolla base, subequal, upto 8 mm long, glabrous, hyaline hairs at dilated base; ovary ovoid, glabrous, 1.5-2 × 0.5-1 mm; disc circular, not lobed, 0.8-1 × 0.5-0.8 mm, glabrous; style single, subexserted, upto 9 mm long, glabrous; stigma bifid, 1.5-2 mm each, papillose. Fruit capsular, globular, 5-7 × 4-6 mm, straw coloured, glabrous, 4 valved; seeds 4 or less, subtrigonal, 1.5-2.5 × 2-2.5 mm, minutely verrucose, glabrous, angles with a very narrow scarious wing, brownish or purplish black.

Flowering : October - February

Fruiting : November - April

Distribution. *Jacquemontia paniculata* is reported from Africa, Madagascar to Southeastern Asia, Malaysia, Tropical Australia, New Caledonia and Polynesia.

Ecology. This species occurs in the scrub jungles among bushes, hill slopes and as an undergrowth in dry deciduous forests.

Specimens examined : TAMIL NADU: Tinnevely Dt.: *s.coll. s.n.* (MH). Coimbatore Dt.: Aliyar, *Sebastine* 15391 (MH). Chengalpattu Dt.: Vandalur R.F., *Henry* 47132 (MH). KARNATAKA: Shimoga Dt.: way to Bababoodan hills, *Biju* 16222, 16223 (K, CALI & TBGT). Bellary Dt.: *scoll. s.n.* (MH). ANDHRA PRADESH: Chittoor Dt.: Brahmagundam, *Subba Rao* 46932 (MH). Cuddapah Dt.: Balapalle, *Ellis* 15735 (MH). Kurnool Dt.: Chelama, *Ellis* 18043 (MH). Guntur Dt.: Kondavedu fort, *Barber* 4676 (MH). Godavari Dt.: Polavaram, *Barber* 4781 (MH). Warangal Dt.: Pakhal, *Sebastine* 11627 (MH). Vishakhapatnam Dt.: Chinagora, *Jacob* 17187 (MH). LOCALITY UNKNOWN : Malabar Concan, Stocks Law & Co. *s.n.* (MH).

2. *Jacquemontia pentantha* (Jacq.) G. Don, Gen. Syst. 4:283. 1838; Ooststr., *Blumea* 3 (2) : 278. 1939 & Fl. Mal., ser.1.4:435. 1953; Austin, Ann. Missouri Bot. Gard. 62:172. 1975 & in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1:346. 1980.

Type : *Jacquin* herbarium (W, lectotype).

Convolvulus pentanthus Jacq., Coll. Bot. 4:210. 1780.

Convolvulus violaceus Vahl, Symb. Bot. 3:29. 1794, non Spreng. (1824).

Jacquemontia azurea (Desr.) Choisy, Mem. Soc. Phys. Geneve 6:467. 1834.

Jacquemontia violacea (Vahl) Choisy, Mem. Soc. Phys. Geneve 8:139. 1839.

(Fig. 94)

Perennial herbs; stem herbaceous, woody at base, terete, glabrous, brownish green. Leaves simple, ovate to broad - ovate, 8-10 x 4-6 cm, apically acute to slightly acuminate, basally cordate to truncate, both sides glabrous; midrib and lateral veins 5-7 pairs; petiole upto 6.5 cm long, glabrous. Flowers axillary, few to many (5-20) flowered umbelliform cymes; peduncle upto 14 cm long, terete, softly pilose; bracts 2-4, leaf like, narrowly elliptic or subulate, 0.5-1.3 x 0.1-0.2 cm, glabrous or puberulent; pedicels filiform, upto \pm 6mm long, puberulent; sepals unequal, outer 2 large, ovate, 6-8 x 3-4.3 mm, apically acute to long acuminate, glabrous, third medium sized, oblique, semi-ovate, 6-7 x 2.5 - 3 mm, apically acuminate, inner 2 small, ovate or ovate - lanceolate, 3.5-4.2 x 2-2.5 mm, apically acuminate, glabrous; corolla blue, white at the throat, campanulate to subrotate, tube upto 2.5 mm long, mouth slightly 5 lobed, 2.8 cm across, midpetalinebands white outside, glabrous; stamens exserted; anthers upto 1.8 mm long, straight; filaments attached upto 2.5 mm above the corolla base, white, dilated at base, hyaline hairy, curved inwards; ovary ovoid, 3-3.2 x 1-1.4 mm, glabrous, greenish white; disc circular, not lobed, 1-1.2 x 1-1.3 mm; style single, exserted, upto 1 cm long, white, glabrous, stigma bifid, 1.5-2 mm each, papillose. Fruit not seen.

Flowering : September - January

Fruiting : not known

Distribution. *Jacquemontia pentantha* is a New World species occurring from Florida to South America.

Ecology. The plant is cultivated almost throughout the world as an ornamental. It is very common in the gardens of Southern Peninsular India.

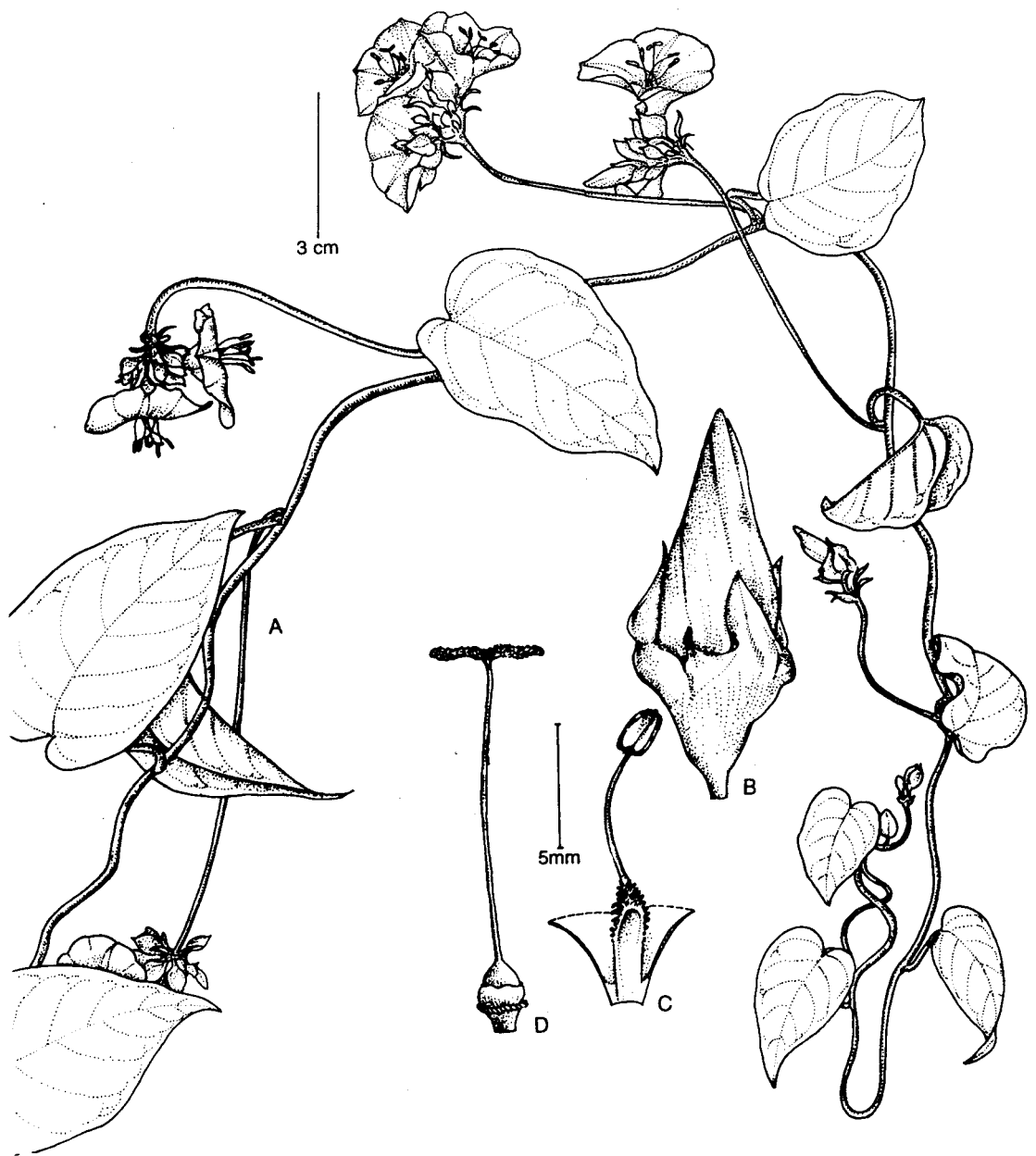


Fig. 94. *Jacquemontia pentantha*. A. Flowering twig; B. Flower bud; C. Stamen; D. Pistil (from Biju 25909 TBCT).

Specimens examined : KERALA: Thiruvananthapuram Dt.: Kowdiyar, *Biju* 25909 (TBGT). Kollam Dt.: Kadakkal, *Anitha* 23945 (CALI). Kottayam Dt.: Kumarakam, *Biju* 15393 (CALI). Malappuram Dt.: C.U. campus, *Biju* 14256 (TBGT). KARNATAKA: Bangalore Dt.: *Biju* 23995 (CALI).

LEPISTEMON Blume

The name *Lepistemon* is derived from the Greek '*lepis*' meaning 'scale' and '*stemon*' meaning 'stamen', in allusion to the scale like stamens of the genus.

The genus *Lepistemon*, with about ten species in tropical Africa, Asia, Australia and Malaysia (Ooststroom, 1953) is also reported to have three species in India, viz., *L. binectariferum* (Wall.) O. Kuntze (syn. *L. wallichii* Choisy and *L. flavescens* Blume), *L. leiocalyx* Stapf and *L. verdcourtii* Mathew & Biju.

Wallich (1824) described *Convolvulus binectariferum* (= *L. binectariferum*) as having 'calyx campanulate, very hairy without, leaves lanceolate, acuminate' based on Smith's collection from Sylhet (Wall. Cat. 1402, microfiche seen), while Stapf (1895) described *L. leiocalyx* as 'sepals rotundo-ovatis, obtusis glaberrimis.....' based on Bourdillon's collection from Konni in Kerala. Recently Mathew and Biju (1991) discovered and described the third species from Western Ghats of Kerala.

Most of the classifications were mainly based on the size, shape and pubescence of sepals (Hooker, 1883; Ooststroom, 1953), which were highly misleading. The sepals, indeed, provide an useful character for the identification, but we have now found that they also have very distinctive fruits, so that these species could be distinguished on the basis of fruit and seed characters.

Lepistemon Blume, Bijdr. 722. 1825; Choisy, Mem. Soc. Phys. Geneve 6:443. 1834 & in DC., Prodr. 9:347. 1845; Benth. & Hook., Gen. Pl. 2:873. 1876; Clarke in Hook.f., Fl. Brit. India 4:216. 1883; Baker & Rendle in This. - Dyer, Fl. Trop. Africa 4(2): 115. 1905; Gamble, Fl. Pres. Madras 2:920. 1923; Ridley, Fl. Malay Penins. 2:462. 1923; Ooststr., Blumea 5(2): 340. 1943 & Fl. Mal., ser. 1,4:489. 1953; Mathew & Biju, Kew Bull. 46(3):559. 1991.

Type species: Not found.

Lepidostemon Hassk., Cat. Hort. Bog. alt. 140.1844.

Nemodon Griff., Notul 4:286.1854.

Ipomoea Linn. series *Urceolatae* Benth., Fl. Australia 4:427.1869.

Annual or biennial vines; stem twining, hairy, woody at base. Leaves ovate to orbicular, 3.5-8.2 x 2.8-6.3 cm, apically acuminate, basally cordate, entire or lobed, hairy on both sides. Flowers axillary, few to several flowered dense cymes; bracts small, deciduous; sepals 5, subequal, herbaceous or subcoriaceous, hairy or glabrous, apically acute or obtuse; corolla small, upto 2.3 cm long, urceolate, mouth 5-lobed; stamens and style inserted; scales 5, concave, attached near the base of corolla tube; filaments attached to the outer side of scales, pollen globular, spinulose; ovary glabrous or hairy, 2-celled, each cells with 2 ovules; style 1, very short; stigma 2, capitate. Fruits capsular, 4 valved; seeds 4, glabrous or puberulous.

Distribution and Ecology. The genus *Lepistemon* is reported from South East Asia (Assam, Burma, Indo-China, Malay Peninsula), Malay Archipelago (Sumatra, Java), Australia and Africa (Ooststroom, 1953). It is found on the edges of secondary forests and waysides.

KEY TO THE SPECIES

- 1a. Sepals minutely hairy at the base and along the margins; staminal disc ovate-elliptic; filaments attached at the middle of the scale.
Seeds glabrous..... 1. *L. leiocalyx*
- 1b. Sepals completely glabrous, mottled; staminal disc sub orbicular; filaments attached at the base of the scale. Seeds hairy..... 2. *L. verdcourtii*

Lepistemon leiocalyx Stapf, Kew Bull. 113.1895; Gamble, Fl. Pres. Madras 2:646.1923; Mathew & Biju, Kew Bull. 46(3) : 559.1991; Pandu. & Nair, Journ. Econ. Tax. Bot. 17(1):178.1993.

Type : Lectotype (here designate). South Travancore, Koni (Konni?)
Bourdillon 88 (K).

(Fig. 95, 96, 97)

Annual or biennial vines; stem twining, terete, villous. Leave simple, ovate, 2.5-9 x 2-8 cm, apically acuminate, mucronulate, basally cordate or slightly trilobed or hastate, strigose; petiole upto 4 cm long, terete, hirsute like stem. Flowers axillary, few to several flowered (upto 20) cymes; peduncle upto 3.5 cm long, terete, hirsute; bracts small, early caducous; pedicels upto 1 cm long, thin, glabrous or slightly pubescent above; sepals 5, subequal, ovate to narrow ovate, outer 2 slightly shorter, 3 x 2.5 mm, inner 3 larger, 3.5 x 2.8 mm, apically obtuse, nonmottled, minutely hairy at base and along margins (at least outer 2); corolla yellow, urceolate, tube upto 1.2 cm long, mouth upto 0.8 cm wide, 5 lobed; staminal scales 5, ovate-elliptic, 3x2 mm, apically subacute, concave, outside densely simple hairy; stamens 5, inserted; anthers upto 1.2 mm long; filaments equal, attached at the middle of the disc, much exceed, upto 4 mm long, glabrous; ovary conical, 2-celled, 4-ovuled, glabrous; style inserted, upto 1.8 mm long, glabrous; stigma biglobular, papillose. Fruit capsular, dorsiventrally compressed, almost rectangular in outline, 1.8-3x5-7 mm, 4-lobed; seeds 4, ovoid, 3x3 mm, strictly glabrous.

Flowering : February - June

Fruiting : March - August

Distribution. Stapf (1895) described *L. leiocalyx* based on Bourdillon's collection from Koni in Kerala. Gamble collected this species from Chittagong in 1880 and from Wyanad in 1884. Discovery of Gamble's specimens from Chittagong is interesting as it expands the known distribution of this species to the southernmost tip of Peninsular India and in the Chittagong hill tracts of Bangladesh.

Ecology. Plants are reported to occur in disturbed sites of secondary forests.

Nomenclatural notes. Stapf, 1895 described *Lepistemon leiocalyx* as 'sepalis rotundo-ovatis, oftusis glaberrimis.....' based on Bourdillon's collection from Koni in Kerala.

Lepistemon leicalyx Stapf
Coll. Bourdillon, K. S. 88.



Yellow flowered vine.
abundant in the woods,
near Keri
Feb. 4. 94

172. *Lepistemon leicalyx* Stapf [L. leicalyx?] caule volubili
interstitio. Folia ovata, basi cuneata, interstitia basin versus
obovata, reticulata, nervis subangulatis, ut postinca, fimbri-
latis, nervis marginibus undulatis ciliatis, nervis reticulato-
ovatis obtusis glaberrimis, corolla favae coloris, lobis breviter
filamentis glabris, squamis basilaribus papillis, ovario disco alto circiter
2 lobato, loculis 2 ovulatis.

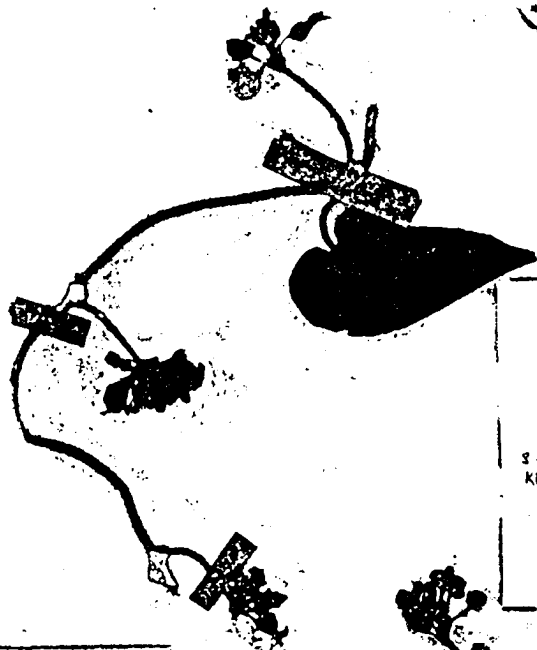
Habitat.—Frequent in the secondary forest near Keri, South
Travancore, T. F. Bourdillon, 88.

Edna ad 2 ped. longa, 1½-2½ ped. lata, petiolis 1-1½ ped. longis.
Pedunculis 1-2½ ped. longis. *Pedicellis* ad 3 lin. longis. *Calycis* 2 lin.
longis. *Corollae* 6 lin. longis.

The discovery of a representative of the genus in the South of the
Deccan Peninsula is very interesting, as it is a link between the African
and the Indo-Malayan area of the genus. There is only one species
known from Africa, ranging almost over the whole tropical portion of
the continent, whilst *Lepistemon Wallichii*, Choisy, is distributed from
the Khasia Hills and Assam to Borneo and the Philippines; *L. asteris-
tatum*, K. Schum., is limited to New Guinea, and *L. Fendleri*, F.
Muell. [Syn. *L. acedatar*, F. Muell., and probably also *L. Loese-
r*, F. Muell.] to North Queensland. The species do not differ much, but
it seems that *L. leicalyx* approaches closer to the Indo-Malayan than
to the African species. *Revis. Bot. Beecheyi*, 113.

Fig. 95. Lectotype of *Lepistemon leicalyx* Stapf.: South Travancore, Keri,
Bourdillon 88 (K), collected on 4th February 1894.

HERBARIUM NATIONAL MUSEUM
310802
CALCUTTA



L. leiocalyx Stapf
No. 88
T. F. Bourdillon
only one male form
Collected from the West,
(see the label) and
examined,
by
S. D. Biju, Calicut University
KERALA.

310802



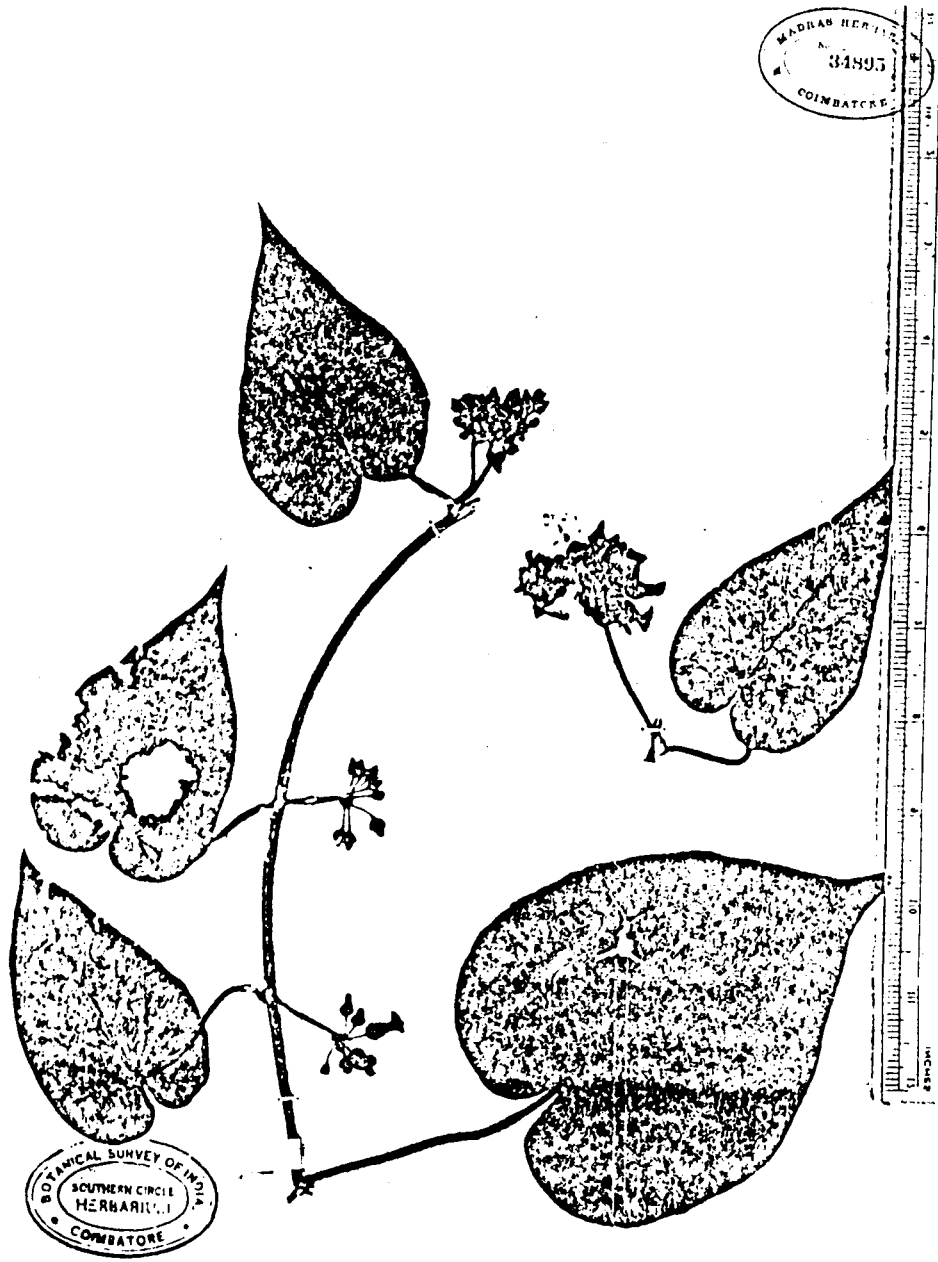
Lepistemon leiocalyx Stapf

Lepistemon leiocalyx Stapf
FLORA OF MADRAS
Col. J. B. Gamble
1892

TRAVANCORE
No. 88

T. F. Bourdillon
88
C. ... - w yellow flowers ...
194

Fig. 96. *Lepistemon leiocalyx* Stapf.: Keni, Bourdillon 88 (CAL), collected on 1st February 1894.



No. 88 Madras Herb. Transpore.
Lepistemon leiocalyx Stapf
11th Feb 1894

Fig. 97. *Lepistemon leiocalyx* Stapf. : Keni, Bourdillon 88 (MH), collected on 1st February 1894.

In the protologue of *L.leiocalyx*, Stapf mentioned 'Habitat.-frequent in the secondary forests near Keni, South Travancore, T.F. Bourdillon 88'. There are three sheets labelled *Bourdillon 88*. Of these the K specimen was collected in 4th February 1894 and is clearly written 'in the secondary forests near Keni'. But the other two sheets (MH and CAL) were collected on 1st February 1894 and simply written 'near Koni'. It is clearly indicating that the type specimens mentioned in the protologue were collected during different period. The Kew specimen is probably the original material which may be consulted by the author because in the upper left hand corner, was written *L.leiocalyx* Stapf in his own handwriting. But the other two specimens in MH and CAL were labelled by different handwriting. Probably Stapf may not have seen the MH and CAL materials.

Lectotype (designated here) : Travancore, T.F. *Bourdillon 88*, 4th February 1894 (K).

Specimens examined : KERALA: Pathanamthitta Dt.: Konni, *Bourdillon 88* (K, CAL & MH); *Bourdillon 760* (University college Herbarium, TVM); Wayanad Dt.: Nadugani, *s.coll. s.n.* (MH).

Lepistemon verdcourtii Mathew & Biju, Kew Bull. 46 (3) : 559. 1991; Sasi. & Sivar., Flowering Pl. Thrissur Forest 311. 1996.

Type : Kerala, Sabarimala, *Biju 42198* (Holotype K, isotype L. CALI).

(Fig. 98)

Annual vines; stem twining, terete, velutinous. Leaves simple, ovate-acuminate, 4-9 x 2.5-5 cm, apically acuminate, basally cordate or hastate, margin ciliate, sericeous above, tomentose below; midrib raised beneath; petiole upto 7.5 cm long, hirsute like stem. Flowers axillary, many flowered (upto 24 flowers) dense cymes; peduncle upto 2.5-3.7 cm long, densely hairy; bracts small, deciduous; pedicels upto 0.8 cm long, glabrous; sepals 5, subequal, ovate, outer 2 slightly shorter, 3 x 3 mm, inner 3.5 x 3 mm, apically obtuse, mottled, glabrous; corolla pale yellow or whitish, urceolate, tube upto 1.6 cm long, inflated at base, lobes 5, strongly plaited, glabrous; staminal scale 5, obovoid or suborbicular, 2.8 x 2.4 mm, apically obtuse, concave,

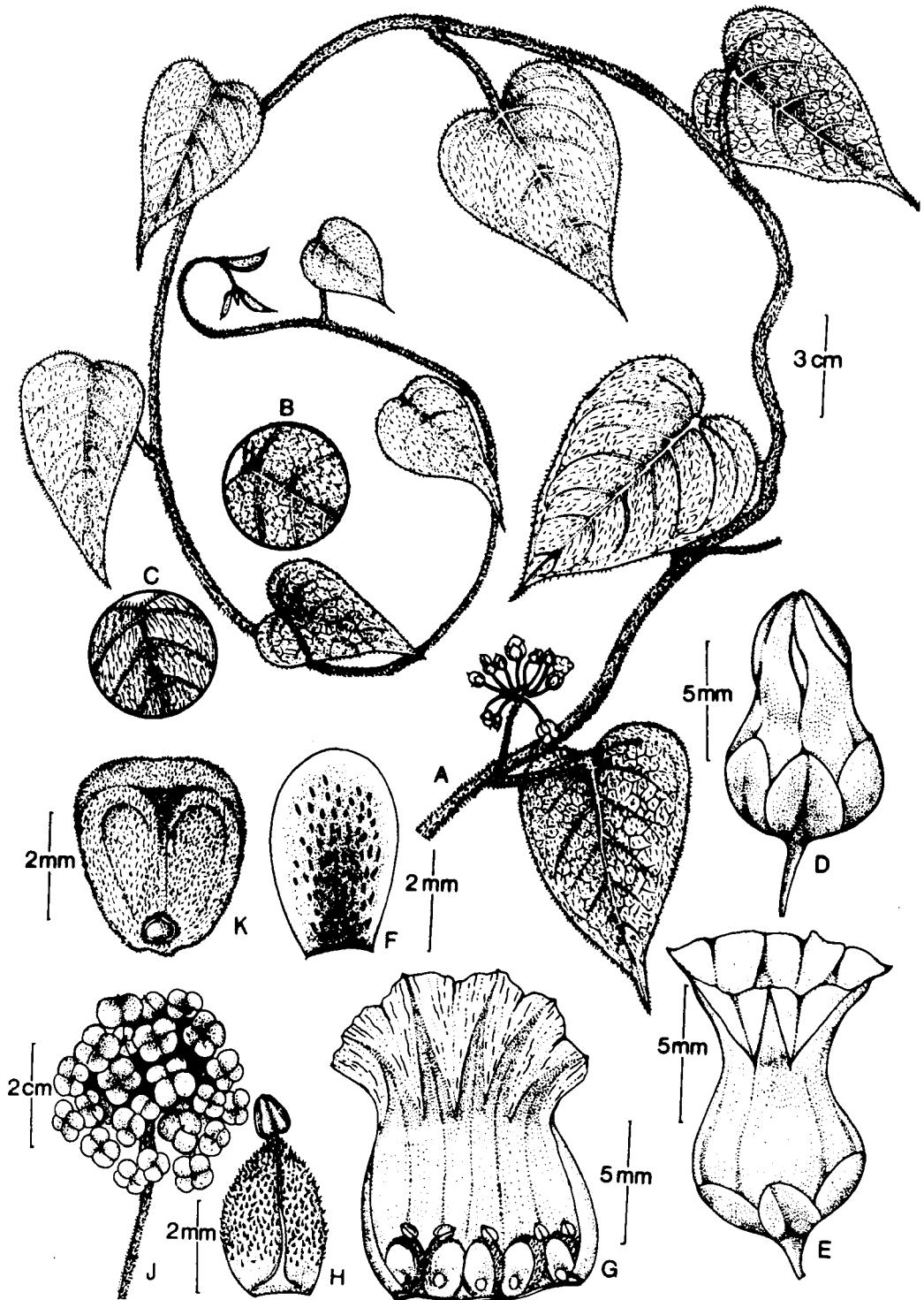


Fig. 98. *Lepistemon verdcourtii*. A. Flowering branch; B. Lower surface of leaf; C. Upper surface of leaf; D. Flower bud; E. Flower; F. Inner side of mottled calyx; G. Corolla split open; H. Outer side of disc; I. Fruits; J. Seed (dorsal view) (from Biju 42198 TBGT).

densely bulbous-based hairs outside; stamen 5, inserted; anthers upto 1.5 mm long; filaments equal, dilated base, attached at the base of the staminal scale on the convex side, upto 3.3 mm long, glabrous; ovary conical, 2-celled, 4-ovuled, glabrous; style inserted, upto 1.2 mm long, glabrous; stigma biglobose, papillose. Fruit capsular, dorsiventrally compressed, roughly rectangular in outline, 2-3.5 x 5.8-6.8 mm, deeply 4-lobed at the tip and along sides; glabrous; seeds 4, ovoid, 3 x 2.8mm, greyish brown-tomentose, funicular scar deep with a tuft of long white hairs.

Flowering : March - May

Fruiting : May - July

Distribution. Endemic to Kerala.

Ecology. This species is a climber, growing near stream banks in semi-evergreen forests along the lower hills of the Western Ghats.

Specimens examined : KERALA: Pathanamthitta Dt.: Sabarimala, Biju 42198 (K, L, & CALI); Muzhiyar, Biju 15398 (CALI & TBGT). Thrissur Dt.: Poringulkuth, Sasidharan 1490 (KFRI).

MERREMIA Dennst. ex Endl., nom. cons

The concept of the genus *Merremia* has been a matter of debate since long. The name was first published by Dennstedt (1818) in *Schluss. Hort. Malab.* in combination *Merremia convolvulacea*, a nomen nudum. Dennstedt based the species on a plate of Rheede's *Hortus Malabaricus* [*Kudici - valli* Rheede, 8:52 ('5'), t. 27. 1688]. Choisy (1833) and Bojer (1837) unaware of Dennstedt's rather obscure publication, renamed it as *Skinneria* and *Spiranthera* respectively. Both names are however, illegitimate and must be rejected, as there exists already *Skinneria* Forst. (1776), a genus of Onagraceae and *Spiranthera* St. Hil. (1823), a genus of Rutaceae (Ooststroom, 1939). Endlicher (1841) was the first who validated the name given by Dennstedt, based on *Evolvulus hederaceus* Burm. f. [= *M. hederacea* (Burm. f.) Hall.f.], including several other species.

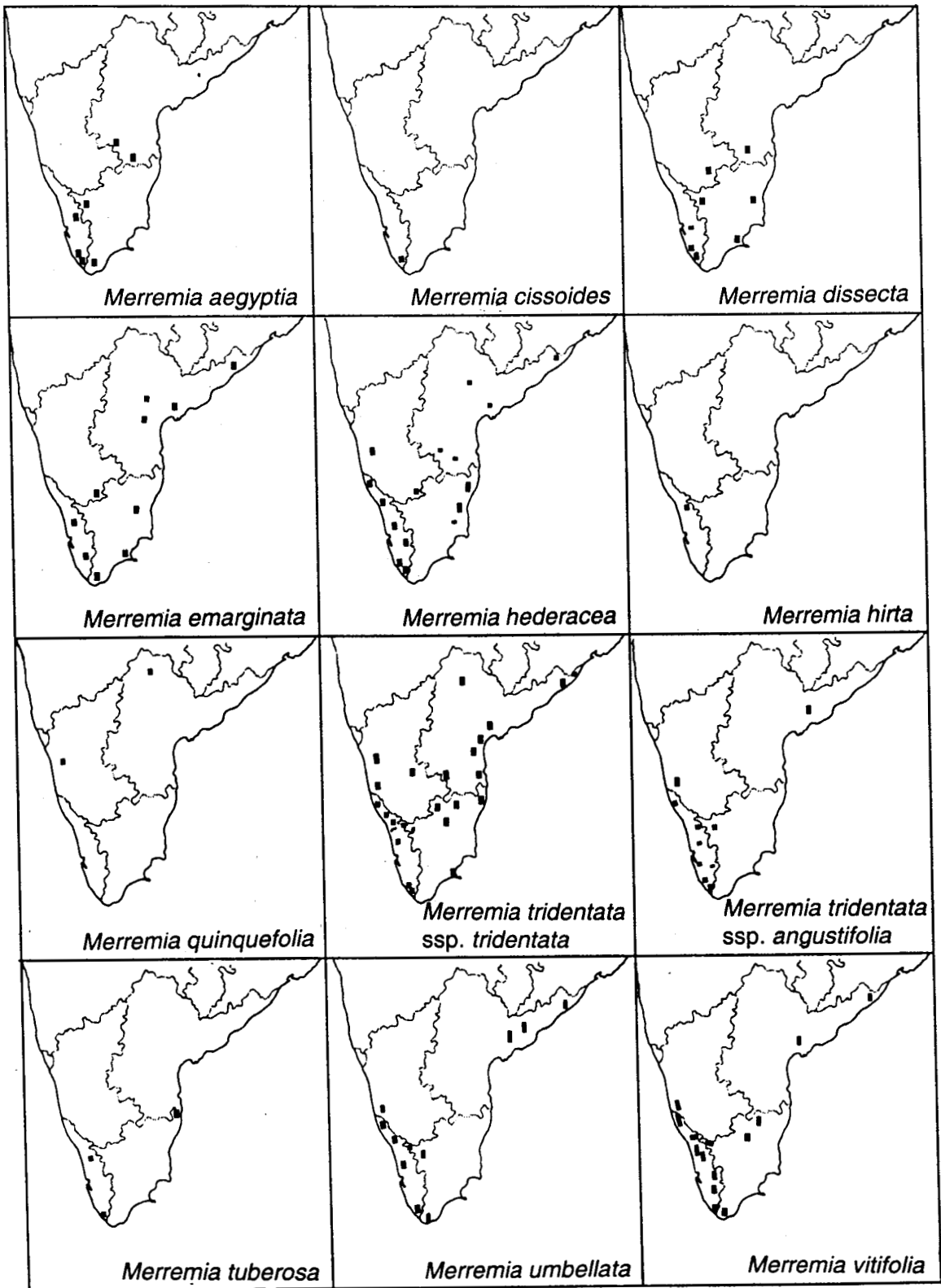


Fig. 99. Distribution maps of the genus *Merremia*.

The genus *Merremia* is commonly known as 'Wood-Rose'. The genus name *Merremia* commemorates a German naturalist, Blasius Merrem, who died in 1824.

The confusion in generic delimitation and nomenclature of *Merremia* and *Ipomoea* persisted for well over one century. Many authors (Clarke, 1883; Trimen, 1895 and others) had either included it in *Ipomoea* or suggested that it was not distinct. Hallier f. (1893a,b.) recognized this genus from *Ipomoea* solely based on its non-spinulose pollen grains. Ferguson *et al.* (1977) pointed out that the preponderance of yellow flowers compared with their 'rarity' in *Ipomoea*, could be taken as a differentiating character. Austin (1980 a) supported Ferguson *et al.* pointing out other characters with notable exceptions like shape of corolla and flower opening time. Other distinguishing characters, like calyx forms are best seen in living materials but lost in herbarium. The observation made in the present studies agrees with Ferguson *et al.* (1977) that the form and texture of the calyx is suitable for distinguishing *Merremia* from *Ipomoea*, which can be appreciated with experience but is impossible to convey in words and therefore of no value as a key character. Since the above mentioned characters are not subtle, it could be considered that this genus is separable from *Ipomoea* only on the basis of its non-spinulose pollen grains (for more details see notes under *Ipomoea*). Currently the two genera are widely in use and a regional study is not sufficient to draw a conclusion in combining both *Merremia* and *Ipomoea*.

Recently Austin and Staples (1980) separated *Merremia tridentata* Linn. and *M. medium* (Linn.) Hall., which occurs in India and Africa, and established a new genus *Xenostegia* Austin and Staples, as a distinct genus from *Merremia*. But from the present study of the genus in Southern Peninsular India, it was found that the distinction of the new taxa recognized by Austin and Staples to be weak and justifiably recognizable only at the intergeneric level.

Austin and Staples (1980) distinguished *Xenostegia* from *Merremia* by straight anthers when dehisce, apically obtuse to rounded seeds, pentaporate pollen, stigma anatomy and cotyledon structure.

Ooststroom (1939) pointed out that the anthers are straight in *M. umbellata* and *M. boisiana*. The present work provided a new insight on the anther

spiralling after dehiscence. It was found that anthers are straight in *M. tridentata*, *M. umbellata* and *M. emarginata*, tip curved in *M. cissoides*, *M. hederacea* and *M. tuberosa* and spirally twisted in *M. aegyptia*, *M. dissecta* and *M. hirta*.

The seed character emphasised by Austin and Staples (1980), is the seed shape, which is apically rounded to truncate in *Merremia*, but apically obtuse to rounded in *Xenostegia*. The present study shows the different apical shape like emarginate, obtuse, acute and acuminate in the genus *Merremia*. (The seed shown in the Fig. 3 of Austin and Staples (1980) do not match with the Indian *M. tridentata*). The third character chosen by Austin and Staples is the pollen type; in *Xenostegia* the pollens are porate but in *Merremia* they are colpate. Ferguson *et al.* (1977) pointed out three types of pollens like colpate, porate and rugate in *Merremia* indicating that there are different pollen types within the genus. *Merremia* was separated from *Ipomoea* entirely on the basis of non-spinulose pollen grains, which has been questioned by many botanists during the past 80 years (Ferguson *et al.* 1977). Another character pointed out by Austin and Staples is the seedlings; in *Xenostegia* and *Merremia* the seed germination is epigeal, but the cotyledons are remarkably well different in the species *M. tridentata* (= *Xenostegia tridentata*). But the interesting observation made in the seedling study is that in *M. tuberosa*, the seed germination is hypogeal. This indicates the wide range of variations in seedling characters within the genus.

The occurrence of these various types of anther, seed shape, pollen type, stigma and seedlings in different species groups of *Merremia* suggest that *Xenostegia* should not be maintained as a distinct genus and would be better recognized as a species within the genus *Merremia*. In keeping them apart, several species which are doubtlessly very nearly related should have to be inserted in different new genera.

Merremia Dennst. ex Endl., Gen. Pl. 1403. 1841; Hall.f. in Engl., Bot. Jahrb. 16: 581. 1893; Peter in Engl. & Prantl, Nat. Pfl. fam. 4 (3a):377. 1895; Ooststr., Blumea 3:292. 1939 & Fl. Mal., ser.1, 4:439. 1953.

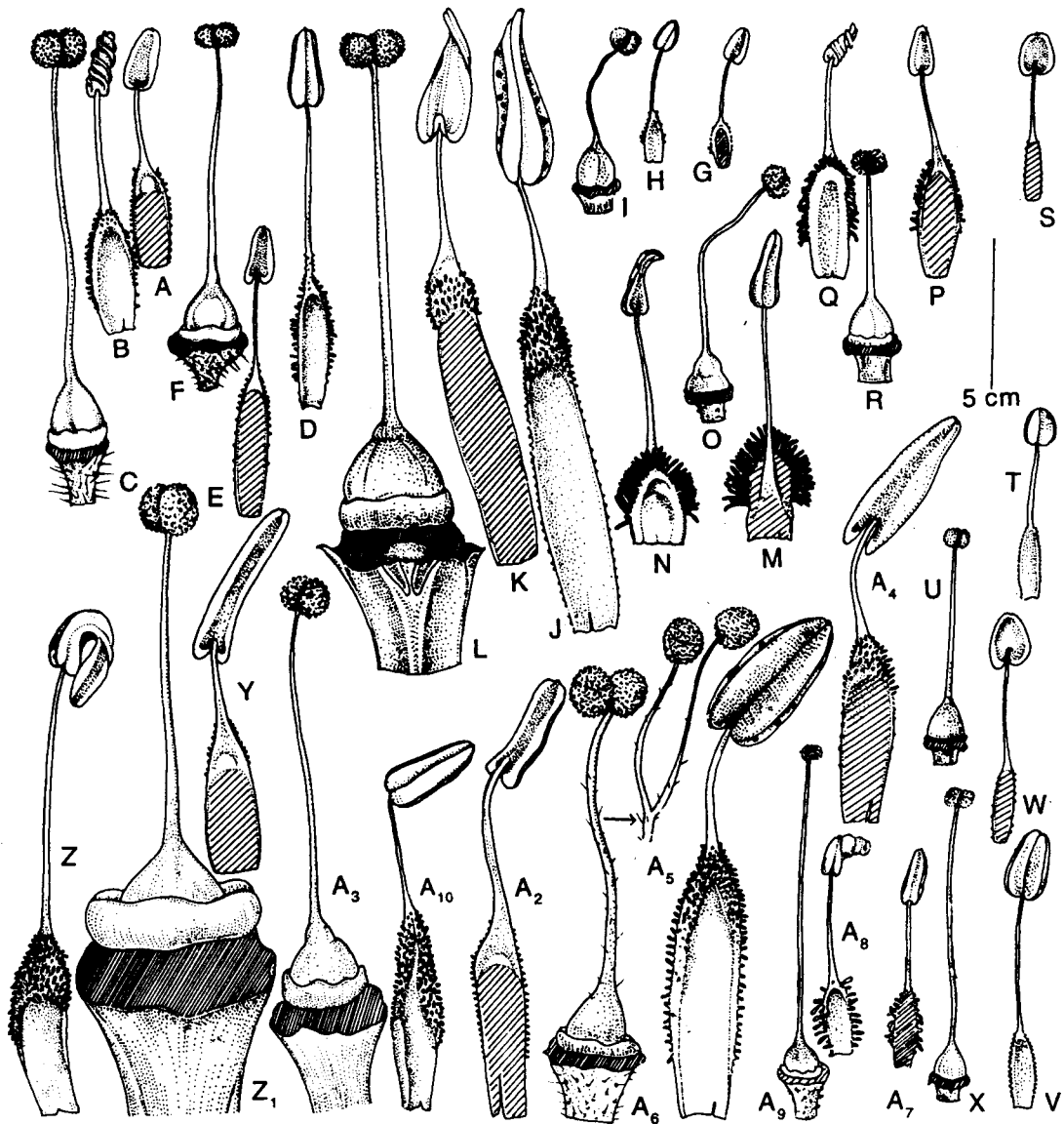


Fig. 100. Stamens (before and after anthesis) and Pistil in the genus *Merremia*. A-C. *M. aegyptia* (A. stamen before anthesis (ba), B. after anthesis (aa), C. pistil); D-F. *M. cissoides* (D. stamen ba, E. stamen aa, F. pistil); G-I. *M. emarginata* (G. stamen ba, H. stamen aa, I. pistil); J-L. *M. dissecta* (J. stamen ba, K. stamen aa, L. pistil); M-O. *M. hederacea* (M. stamen ba, N. stamen aa, O. pistil); P-R. *M. hirta* (P. stamen ba, Q. stamen aa, R. pistil); S-U. *M. tridentata* ssp. *tridentata* (S. stamen ba, T. stamen aa, U. pistil); V-X. *M. tridentata* ssp. *angustifolia* (V. stamen ba, W. stamen aa, X. pistil); Y, Z, Z₁. *M. tuberosa* (Y. stamen ba, Z. stamen aa, Z₁ pistil); A₁-A₃. *M. umbellata* (A₁. stamen ba, A₂. stamen aa, A₃. pistil); A₄-A₆. *M. vitifolia* (A₄. stamen ba, A₅. stamen aa, A₆. pistil); A₇-A₉. *M. quinquefolia* (A₇. stamen ba, A₈. stamen aa, A₉. pistil).

Type species: *M. hederacea* (Burm.f.) Hall.f. (= *Evolvulus hederaceus* Burm.f.).

Skinneria Choisy, Mem. Soc. Phys. Geneve 6:487. 1834, non Forst. (1776).

Spiranthera Bojer, Hort. Maurit. 226. 1837, nomen nudum, non St. Hil. (1823).

Annual, biennial or perennial twiners, prostrate or repent, rarely erect herbs or low erect shrubs (not in India); stem usually herbaceous, sometimes lignescent, small or large. Leaves very variable, entire, dentate, lobed, palmately or pedately partite or compound with 3-7 leaflets, binely multipinnatifid. Flowers axillary, solitary or in few to many flowered variously ramified inflorescence; bracts small, linear or lanceolate; sepals 5, subequal, oblong to elliptic, acute, acuminate or ovate to orbicular, obtuse to emarginate, concave, persistent, sometimes enlarged in fruit; corolla campanulate, small or large, white, yellow or purple, 5 distinctly nerved midpetaline bands; stamens and style inserted or exserted; anthers straight, curved or spirally twisted after anthesis; filaments equal or subequal, mostly with white ciliolate at the base; pollen smooth, colpate, porate, or rugate; ovary usually glabrous, 2-4 celled, 4-ovuled; style filiform; stigma biglobose. Fruits capsular, usually dehiscent by 4 valves or more or less irregularly dehiscent, pericarp thin or thick; seeds 2-4, glabrous, pubescent or villous, especially along the margins.

Distribution and Ecology. About 55 species, widely distributed in the tropical countries of both hemispheres. Most of them are weedy species growing in exposed waste lands. But occasionally they do occur also as undergrowth in semi deciduous forests. In Southern Peninsular India *M.aegyptia* is confined to drier habitat, while others can thrive under a variety of habitat conditions. The species like *M.tridentata* subsp.*tridentata*, *M.aegyptia*, *M.cissoides* and *M.vitifolia* are aggressive weeds found nearly throughout the range of distribution of this genus, while *M.hirta* and *M.hederacea* are of restricted distribution. Most species thrive from sea-level to an altitude of 2000 m.

Infrageneric classification. The infrageneric classification of the genus has been a matter of considerable disagreement. Hallier (1893 a, b & 1913) was

the first to make a comprehensive sectional classification of the genus *Merremia*. He recognised 4 sections in the genus [Sect. *Skinneria* (Choisy) Hall.f., *Xanthips* (Griseb.) Hall.f., *Streptandra* Hall.f. and *Hailale* Hall.f.] mainly based on size and shape of flowerbuds and flowers. Ooststroom (1939 a, & 1953) followed the Hallier's classification, with little modifications, replacing the name *Skinneria* (Choisy) Hall.f. by *Eumerremia* and established a new section *Wavula*. Ferguson *et al.* (1977) had questioned the validity of the section *Eumerremia* and suggested that it must be known as sect. *Merremia*.

There has been considerable confusion regarding the circumscription and delimitation of *Merremia* sect. *Skinneria* (Choisy) Hall.f. and sect. *Halliera* Hall.f. The nomenclature problems relating to these sections have been discussed in detail by Ferguson *et al.* (1977).

Roberty (1952) in his *Genera Convolvulacearum* segregated the genus into subgenera. Ferguson *et al.* (1977) consider his classification to be based on idealistic, preconceived concepts and it adds nothing meaningful to the classification. O'Donell (1941 b) supports Ooststroom's sectional classification viz., *Eumerremia*, *Xanthips*, *Streptandra*, *Hailale* and *Wavula*. Although at the beginning of his paper he accepts Ooststroom's lectotypification of sect. *Streptandra* [chose *M. tridentata* (Linn.) Hall.f. as the type] later in the same paper he set it aside and divides this section into sect. *Schizips* (Griseb.) O'Donell, sect. *Cissoides* (House) O'Donell and sect. *Halliera* O'Donell. Ferguson *et al.* (1977) pointed out that the sect. *Halliera* O'Donell is illegitimate since its type *M. tridentata* (Linn.) Hall.f. is the species chosen by Ooststroom to be the type of sect. *Streptandra*, which name must be accepted.

The present study also shares the view of Ooststroom (1939), Verdcourt (1963) and Ferguson *et al.* (1977), that the intergeneric classification requires a detailed taxonomic revision. The section into which the genus has been divided primarily by Hallier (1893 a,b), Ooststroom (1939) and O'Donell (1941 a, b) serve little purpose in identification and are not used here.

KEY TO THE SPECIES

- 1a. Leaves simple, entire or lobed 7
- 1b. Leaves palmately compound or lobed..... 2
- 2a. Leaves palmately lobed, leaflets 5-7,
branchlets hirsute 6
- 2b. Leaves palmately compound, leaflets 7,
branchlets glabrous or hirsute 3
- 3a. Branchlets glabrous. Corolla yellow. Fruiting
calyx more than 4 cm long; capsule irregularly
dehiscent; seeds tomentose 9. *M. tuberosa*
- 3b. Branchlets simple or glandular hairy. Fruiting
calyx less than 3 cm long; capsule valvular;
seeds glabrous or pubescent 4
- 4a. Leaf margins entire, densely bulbous based
hairy. Seeds glabrous, brown 1. *M. aegyptia*
- 4b. Leaf margins dentate, leaflets 5, pubescent or
glandular hairy. Seeds pubescent or
stellately hairy, black 5
- 5a. Sepals oblong, obtuse, branchlets pubescent.
Seeds glabrous or pubescent 7. *M. quinquefolia*
- 5b. Sepals rhomboid, acuminate, branchlets
glandular hairy. Seeds stellately hairy 2. *M. cissoides*
- 6a. Leaves divided nearly to the base. Flowers
creamy white with purple throat. Fruiting
calyx recurved on drying 3. *M. dissecta*
- 6b. Leaves divided from the above to the middle.
Flowers sulphur yellow without throat colour.
Fruiting calyx not recurved on drying 11. *M. vitifolia*

- 7a. Leaves entire or trilobed, branchlets turbinate.
 Inflorescence dichasial or monochasial cyme.
 Capsule coarsely wrinkled 5. **M. hederacea**
- 7b. Leaves entire, branchlets smooth, glabrous to
 sparsely hirsute. Capsule smooth 8
- 8a. Corolla white, pilose at the upper midpetaline
 bands. Capsule valves hardy; seeds hairy 10. **M. umbellata**
- 8b. Corolla yellow, glabrous. Capsule valves
 papery; seeds glabrous 6. **M. hirta**
- 9a. Leaves broader than long, petiolate, reniform to
 broadly ovate, basal lobe entire. Peduncle
 very short or absent 4. **M. emarginata**
- 9b. Leaves longer than broad, petiole short or
 absent, linear - oblong to oblanceolate, basal
 lobes toothed. Peduncle long 8. **M. tridentata**

1. **Merremia aegyptia** (Linn.) Urban, Symb. Antill. 4:505. 1910; Gamble, Fl. Pres. Madras 2: 927. 1923; Ooststr., Blumea 3(2): 327-328. 1939 & Fl. Mal., ser. 1, 4:448. 1953; Austin, Fl. Ecuador no.15. 85. 1982; Rani & Matthew in Matthew, Fl. Tam. Carnatic 3:1036. 1983.
 Lectotype : Sheet 218.35 in the Linnaean Herbarium (LINN, designated here).

Ipomoea aegyptia Linn., Sp. Pl. 162. 1753.

Operculina aegyptia (Linn.) House, Bull. Torrey Bot. Club 33:502. 1906.

Ipomoea pentaphylla (Linn.) Jacq., Coll. Bot. 2: 297. 1788; Clarke in Hook.f., Fl. Brit. India 4:202. 1883.

Batatas pentaphylla (Linn.) Choisy, Mem. Soc. Phys. Geneve 4:436. 1833; Wight, Icon. pl. Ind. or. t. 834. 1844.

Merremia pentaphylla (Linn.) Hall.f., in Engl., Bot. Jahrb. 16:552. 1893; Cooke, Fl. Pres. Bombay 2:239. 1905.

(Fig. 101, 102)

Annual herbs, sometimes perennial from the woody root stock; stem twining, herbaceous towards the tip, terete, green or slightly wine red, densely hirsute, strigose, upto 4 mm long, arising from swollen red base; latex gummy, milky white. Leaves palmately compound, leaflets 5, elliptic or elliptic-oblong, apically acuminate to mucronulate, terminal one larger, 1-8 x 0.8-3 cm, inner pair 0.8-7 x 0.6-2.5 cm, outermost pair 0.5-5 x 0.3-2 cm, margin entire or nearly so, hirsute on both faces with stramineous forward pointing hairs, 2-3 mm long; midrib raised beneath, lateral veins 7-10 pairs, slightly raised beneath, prominently hirsute like stem; petiole upto 7 cm long, hirsute. Flowers axillary, 1-6 flowered cymes; peduncle upto 1.5-3.5 cm long, terete, hirsute like stem; bracts lanceolate, upto 5 mm long, apically acuminate, densely hirsute on outside, caducous; pedicels upto 2.5 cm long, hirsute, terete, slightly dilated at apex; sepals unequal, outermost 2 larger, ovate - lanceolate, 2.5-2.8 x 0.5-0.8 cm, apically acute or acuminate to mucronulate, densely hirsute from base to middle on the outer surface, hairs upto 5 mm long, bulbous based, glabrous within, pale green or with purplish tinge, third single medium sized, nearly ovate, 1.2-1.5 x 0.5-0.8 cm, apically obtuse, chartaceous, hirsute only at base, hairs upto 4-5 mm long, bulbous based, inner most pair small, ovate, 1-1.3 x 0.7-0.8 cm, apically acute to obtuse, glabrous; corolla waxy white, without a coloured throat, campanulate, tube 1.8-2 cm long, mouth slightly 5 lobed, 1.8-2 cm across; stamens inserted; anthers upto 2-4 mm long, white, spirally twisted after dehiscence, anthesis between 8.30 am to 9 am; filaments white, attached 3-5 mm above the corolla base, subequal, 3 large, \pm 8mm long, 2 small, \pm 5mm long, white ciliolate at dilated base; ovary ovoid, 1.5-1.8 x 1.8-2 mm, glabrous; nectary disc annular, \pm 1mm long; style inserted, upto 12 mm long, glabrous, slightly dilated at base; stigma white, biglobose, papillate. Fruits capsular, subglobose, 1.1-1.3 x 1.2 -1.4 cm, outer layer (epicarp) splits septifragally, valves wither off, inner layer (endocarp) splits loculicidally, endocarp thin, transparent, septa straw coloured, fruiting calyx persistent and enlarged, 1.5-2 x 0.9-1.3 cm, stramineous trichomes on the base of outer calyx, pedicels narrowly rhombic, thickened above, articulate; seeds usually 4, very rarely less, different shape and size, ovate or

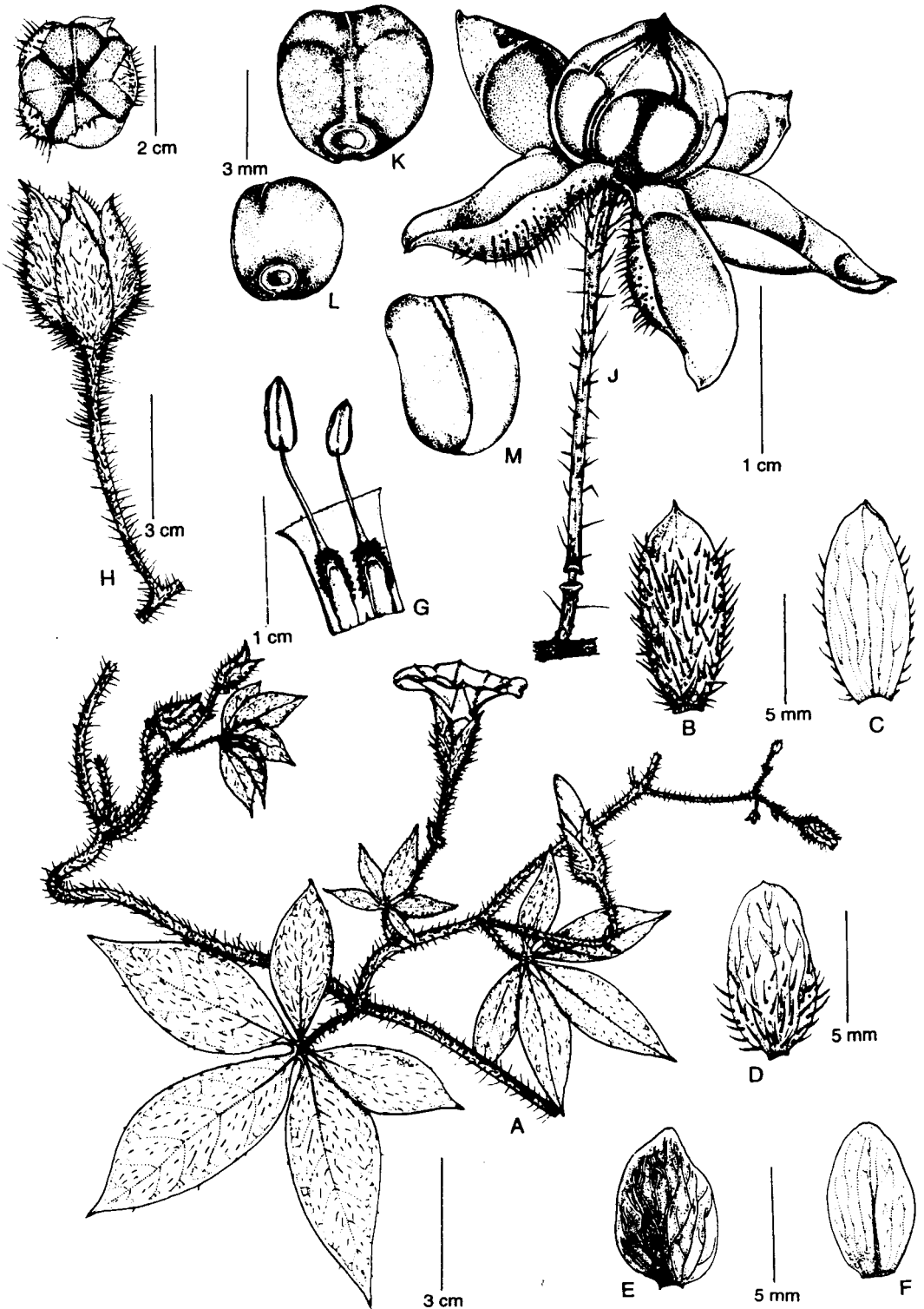


Fig. 101. *Merremia aegyptia*. A. Flowering twig; B&C. Outer sepals (B. outside, C. inside); D-F. Inner sepals (D & E. outside, F. inside); G. Stamen; H. Young fruit; I. Fruit front view; J. Dry fruit; K-M. Seeds (from Biju 16234 TBGT).

orbicular, 3-5 x 4-5 mm, apically retuse, basally truncate, glabrous, shiny light brown, dorsal surface with a longitudinal groove; seed germination epigeal, hypocotyl upto 1 cm long, usually bicotyledonary, apically emarginate, basally rounded, glabrous, petiole \pm 3mm.

Flowering : October - December

Fruiting : December - January

Flower opening : 9 am to 10 am

Floral visitors : Ants and bees

Distribution. Probably originated from America and naturalised in Tropical Africa, India, Pakistan and Pacific Islands. In India it has been naturalised in the arid region. In the recent past it has spread to Kerala as a severe weed along the road sides and cultivated lands especially in Palakkad and Thiruvananthapuram districts.

Ecology. All the populations so far studied in Southern Peninsular India are growing in disturbed sites such as roadsides, fence rows, cultivated fields and forest margins.

Use. Seeds are considered edible (Wealth of India).

Horticultural potential. This species with beautiful white flowers and green leaves are attractive in early summer mornings. It is an elegant creeper for fences and garden walls. Fruits are used for dry flower arrangements.

Nomenclatural notes. Austin (1982 a) designated 218.35 LINN as the holotype, which is incorrect as there are other original elements associated with the name. In the Linnaean herbarium (LINN) there are three specimens annotated as belonging to this taxon (microfiche seen). The specimens 218.35 LINN and 218.38 LINN represent *M. aegyptia* (Linn.) Urban, but the specimen 218.36 LINN labelled as '*Convolvulus pentaphyllus*' is not an element of this taxa. Sheet 218.35 LINN has been labelled '16' and '*pentaphyllos*' in Linnaeus' hand writing. The specimen labelled '16' is the species number of *Ipomoea aegyptiaca* Linn. and '*pentaphyllos*' is the epithet for *Convolvulus pentaphyllus* Linn., the name Linnaeus applied to this taxa in the *Species Plantarum*, ed. 2 (1762) (F.R. Barrie, pers. comm., 1991). When Linnaeus transferred the name



Fig. 102. Lectotype of *Merremia aegyptia* (Linn.) Urban; sheet 218. 35 LINN.

Ipomoea to *Convolvulus* the specimens apparently moved to the *Convolvulus* folder (Smith catalogue no. 218). The specimen agrees with Linnaeus diagnosis, and belongs to the taxa to which the name *M. aegyptia* is usually applied, and therefore designates this specimen 218.35 Linn. as the lectotype here. **Lectotypus:** Sheet 218.35 in the Linnaean Herbarium (LINN, designated here).

Specimens examined : KERALA : Thiruvananthapuram Dt.: Poojappura, *Biju* 16234 (TBGT); Pattom, *Biju* 16239 (CALI); Thirumala, *Biju* 16246 (TBGT). Kollam Dt.: *Lawson s.n.* (MH). Palakkad Dt.: Chittur, *Biju* 15318 (CALI). TAMIL NADU: Tinnevely Dt.: Udankudi, *Sebastine* 13703 (MH). Coimbatore Dt.: TNAU Campus, *Biju* 44266 (CALI). ANDHRA PRADESH : Chittoor Dt.: Nagari, *Rangacharyulu* 1882 (MH). Kurnool Dt.: Nallamalais, *Ellis* 32289 (MH). Diguvametta Dt.: *Ellis* 32389 (MH).

2. *Merremia cissoides* (Lamk.) Hall.f., in Engl., Bot. Jahrb. 16:552. 1893; Ooststr., Fl. Surinam 84. 1932; Austin in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1:348. 1980; *Biju* & Mathew, Journ. Bombay Nat. Hist. Soc. 90:(1) 121-122. 1993.

Type: French Guiana, Cayenne (P not seen).

Convolvulus cissoides Lamk., Tabl. Enc. 1:462.1791.

Ipomoea cissoides (Lamk.) Griseb., Fl. Br. W. Ind. Islands 473. 1861; Trimen, Handb. Fl. Ceylon 6:202.1931.

(Fig. 103)

Annual herbs; stem twining, slender, terete, green, glandular hairs intermingled with white trichomes, upto 3 mm long; latex gummy white. Leaves palmately compound, leaflets 5, sessile to subsessile, ovate to ovate-elliptic, apically long acuminate to mucronate, basally acute to acuminate, terminal one larger, 3-5.5 x 1-1.5 cm, inner pair 2.5-3 x 1-1.5 cm, outermost pair 1.8-2.5 x 1-1.2 cm, dentate, puberulent on both sides; midrib raised beneath, inconspicuous above, lateral veins 6-10 pairs, slightly raised beneath; petiole upto 4.5 cm long, hirsute like stem. Flowers axillary, solitary or in

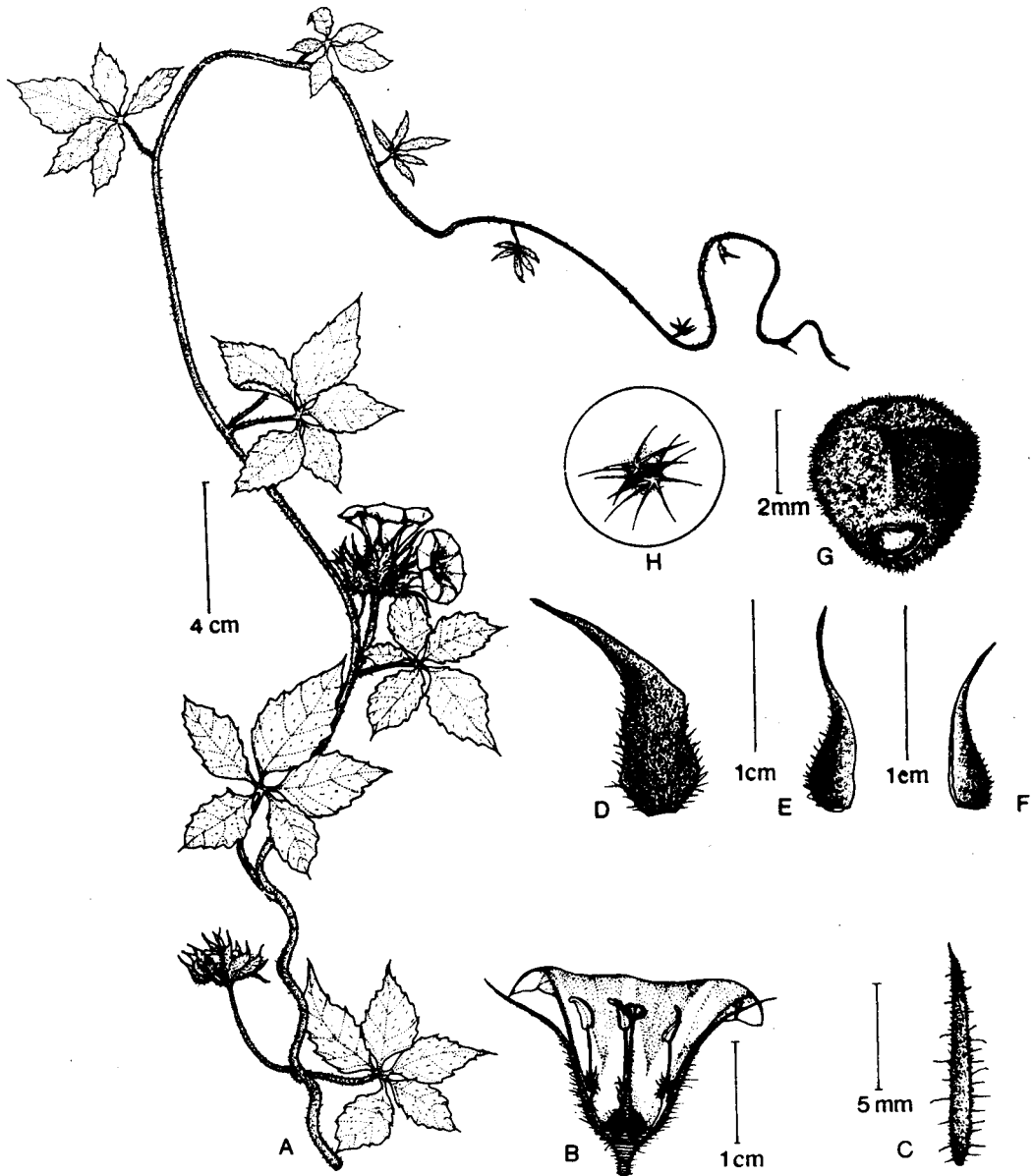


Fig. 103. *Merremia cissoides*. A. Flowering and fruiting twig; B. Flower L.S.; C. Bract; D. Outer sepals; E-F. Inner sepals; G. Seed; H. Stellate hairs of seed surface (from Biju 20428 K).

2-4 flowered cymes; peduncle upto 3.5 cm long, terete, glandular hairy; bracts linear, 1.2-5 x 2-3 mm, apically acuminate, glandular pubescent with white trichomes, marginal hairs long, \pm 4 mm long, persistent; pedicels short, upto 5 mm long, terete, pubescent like peduncle; sepals unequal, outer most 2 large, broadly rhomboid to ovate, 1.8-2 x 0.5-0.7 cm, apically long acuminate, margin wavy, densely hirsute with white trichomes and glandular indument from base to middle on the outer surface, glabrous within, third single medium sized, rhomboid to ovate, 1.6-1.7 x 0.3-0.4 cm, apically long acuminate, hairiness same as outer pair, innermost pair small, rhomboid to narrowly ovate, 1.2-1.5 x 0.2-0.3 cm, apically long acuminate, hirsute; corolla milky white, without a coloured throat, campanulate, tube 8-16 mm long, mouth slightly 5 lobed, 2-2.5 cm across; stamens subexserted; anthers whitish yellow, upto 3 mm long, anthesis between 7 am to 8 am, tip curved after dehiscence; pollen colpate; filaments white, attached 4 mm above the corolla base, subequal, 3 large, \pm 7mm long, 2 small, \pm 5mm long, white ciliolate at dilated base; ovary ovoid, upto 1 x 1mm, whitish yellow, glabrous, 4-celled; disc annular, small; style subexserted, upto 12 mm, glabrous, slightly dilated at base; stigma white, biglobose, 0.5-1 mm in diameter, papillate. Fruit capsular, compressed globose, 4-5 x 8 mm, valvular dehiscent, light brown, fruiting sepal slightly enlarged, white trichomes turn to yellowish white; seeds usually 4, very rarely less, subrotund, 4 x 3 mm, apically rounded, basally broadly obtuse, stellately appressed hairy, light brown; seed germination epigeal, hypocotyl upto 1.5 cm long, usually bicotyledonary, tricotyledonary seedlings frequent, sinus deep, 2.5-4 mm, basally cordate, glandular hairy, margin wavy, petiole upto 1cm long.

Flowering : August - December

Fruiting : December - January

Flower opening : 7 am to 7.30 am

Floral visitors : Bees (*Apis gossypii*) and *Hymenoptera* members like *Anoplolepis longipes* (Jerdon) and *Camponotus* sp. are the important visitors.

Distribution. A species originally from the tropics of New World, is now reported from Africa, Ceylon, and Burma. Biju & Mathew (1993) reported this species from India for the first time.

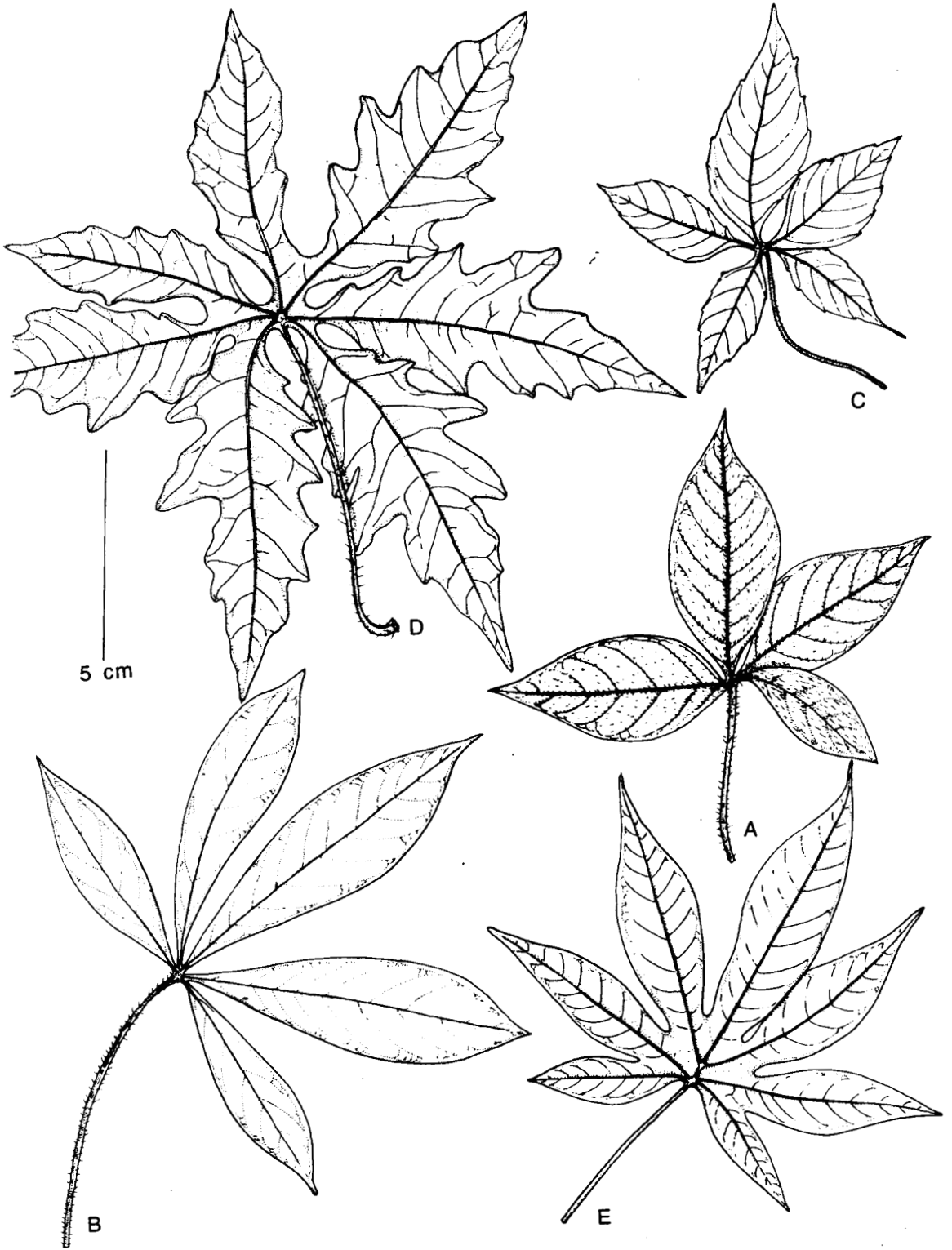


Fig. 104. Leaf variation in the genus *Merremia*. A & B. *M. aegyptia*; C. *M. cissoides*; D. *M. dissecta*; E. *M. tuberosa*.

Ecology. The plants have been reported only from Thiruvananthapuram in India and collections have been made from arid waste places and disturbed sites, such as roadsides and cultivated lands.

Specimens examined : KERALA : Thiruvananthapuram Dt.: Pattom, *Biju* 20428 (CALI & K); Kesavadasapuram, *Biju* 20422 (CALI & TBGT).

3. *Merremia dissecta* (Jacq.) Hall.f.in Engl., Bot. Jahrb. 16: 552. 1893; Cooke, Fl. Pres. Bombay 2: 240. 1905; Gamble, Fl. Pres. Madras 2 : 927.1923; Ooststr., *Blumea* 3(2): 328. 1939 & Fl.Mal., ser. 1, 4: 448 . 1953 ; Austin in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 3:349. 1980; Rani & Matthew in Matthew, Fl. Tam. Carnatic 1:1036.1983; Chand. & Nair, Fl.Coimbatore 198.1987; Mohan & Henry, Fl. Thiruvananthapuram 317.1994.

Type : grown in Vienna from seeds collected by Jacquin in "America" (no specimen found).

Convolvulus dissectus Jacq., Obs.Bot.2: 4 .t. 28. 1767.

Ipomoea dissecta (Jacq.) Pers.in Linn., Syst.ed. 15: 207. 1797.

Ipomoea sinuata Ortega, Hort. Matr. Dec. 7:84. 1798; Choisy in D C., Prodr. 9: 362.1845; Clarke in Hook. f., Fl. Brit.India 4 : 214 . 1883.

Operculina dissecta (Jacq.) House, Bull. Torrey Bot. Club 33 : 500 . 1906.

Common name : Noon flower

(Fig. 105)

Annual herbs; stem twining, herbaceous towards tip, basally robust, terete, younger parts green, older parts violet green, densely hirsute, black glandular hairs intermingled with stramineous trichomes, upto 8mm long; latex milky white. Leaves palmately lobed, leaflets 7, elliptic - lanceolate, apically long acuminate to mucronate, gradually narrow towards base, terminal one larger, 3-7.5 x 1-2.5 cm, inner 2 pairs more or less same size, 2.5-7 x 1-2 cm, outer most pair 2-5 x 1-2 cm, margin dentate, glabrous or puberulent; midrib raised beneath, hairy, lateral veins 4-8 pairs; petiole upto 10 cm long, reddish purple, hirsute like stem. Flowers axillary, in 2-6 flowered cymes; peduncle upto

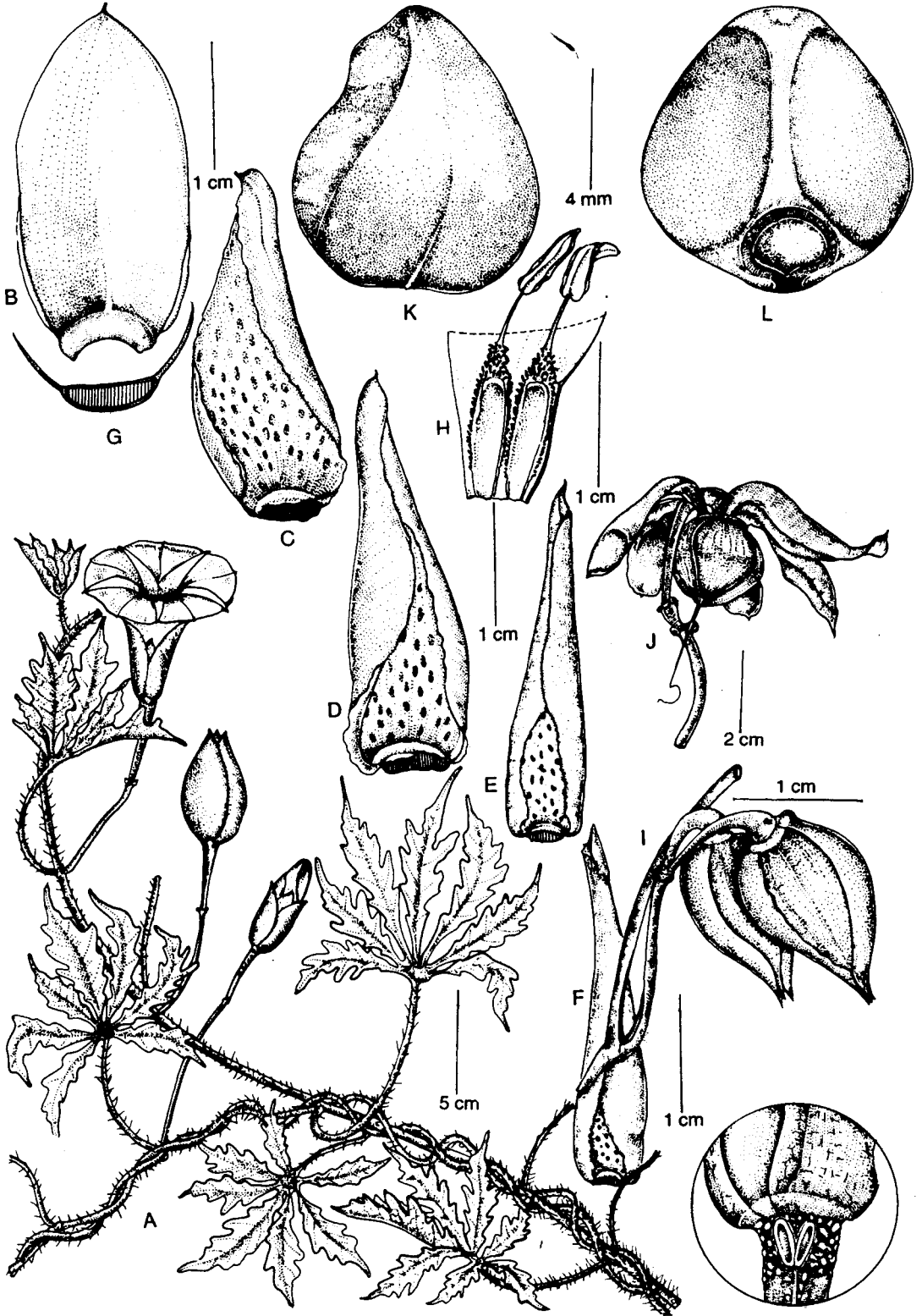


Fig. 105. *Merremia dissecta*. A. Flowering twig; B. Pedicellar nectary; C & D. Outer sepals; E-F. Inner sepals; G. Sepals L.S.; H. Stamens; I. Young fruit; J. Dry fruit; K & L. Seeds (from *Biju* 25903 TBGT).

20 cm long, terete, hirsute like stem; bracts linear, upto 3 mm, caducous; pedicels upto 2.5 cm long, terete, dilated towards the calyx, dilation 3-4 mm in diameter, transversely elliptic with grooves on both faces in cross section, tuberculate; pedicellar nectaries 4 or 5 (2 + 2 + 1 or 2 + 2) on extreme top of the dilated pedicels, 1.5-2 x 0.5-0.6 mm, oblanceolate; sepals equal or subequal, ovate - lanceolate, 2-2.3 x 1-1.4 cm, apically acute or acuminate to mucronate, glabrous, purplish black mottled within ; corolla creamy white with rose purple throat, funnel shaped, tube upto 1 cm long, mouth slightly 5 lobed, 3.5 cm across; stamens inserted to subexserted; anthers whitish yellow, upto 6 mm long, anthesis between 8 am to 8.15 am, tip curved after dehiscence; filaments white, attached 7 mm above the corolla base, equal, upto 7 mm long, white ciliolate at dilated base; ovary conical, 1 x 2.5mm, glabrous; disc annular, white, upto 1 mm long, glabrous; style inserted, upto 1.7 cm long, glabrous, slightly dilated at base; stigma subexserted white, biglobose, 0.2 x 3-4 mm, papillate. Fruits capsular, depressed, globose, 1-1.5 x 1.5-1.7 cm, valvular dehiscent, light brownish, pedicels recurved, fruiting sepals persistent, enlarged, 3-3.5 x 1.5 cm, recurved on drying, brownish black in colour; seeds usually 4, very rarely less, widely ovate, 5-7 x 6-8 mm, glabrous or puberulent, dull black; seed germination epigeal, hypocotyl absent, bicotyledonary, sinus 8 mm deep, basally cordate, glabrous, petiole upto 4 cm long.

Flowering : November - February

Flower opening : 8.00 am - 10.00 am

Fruiting : December - March

Floral visitors : *Lasioglossum* sp., *Monomorium destructor* (Jerdon) *Macrourea* sp. etc

Insect visitors on extra floral nectary : Ants

Distribution. Probably indigenous to America, now introduced elsewhere in Africa, Australia, India, Ceylon and Malaysia.

Ecology. Found in dry zones. Throughout its range the species has been collected from open grasslands, roadsides, cultivated grounds and waste places.

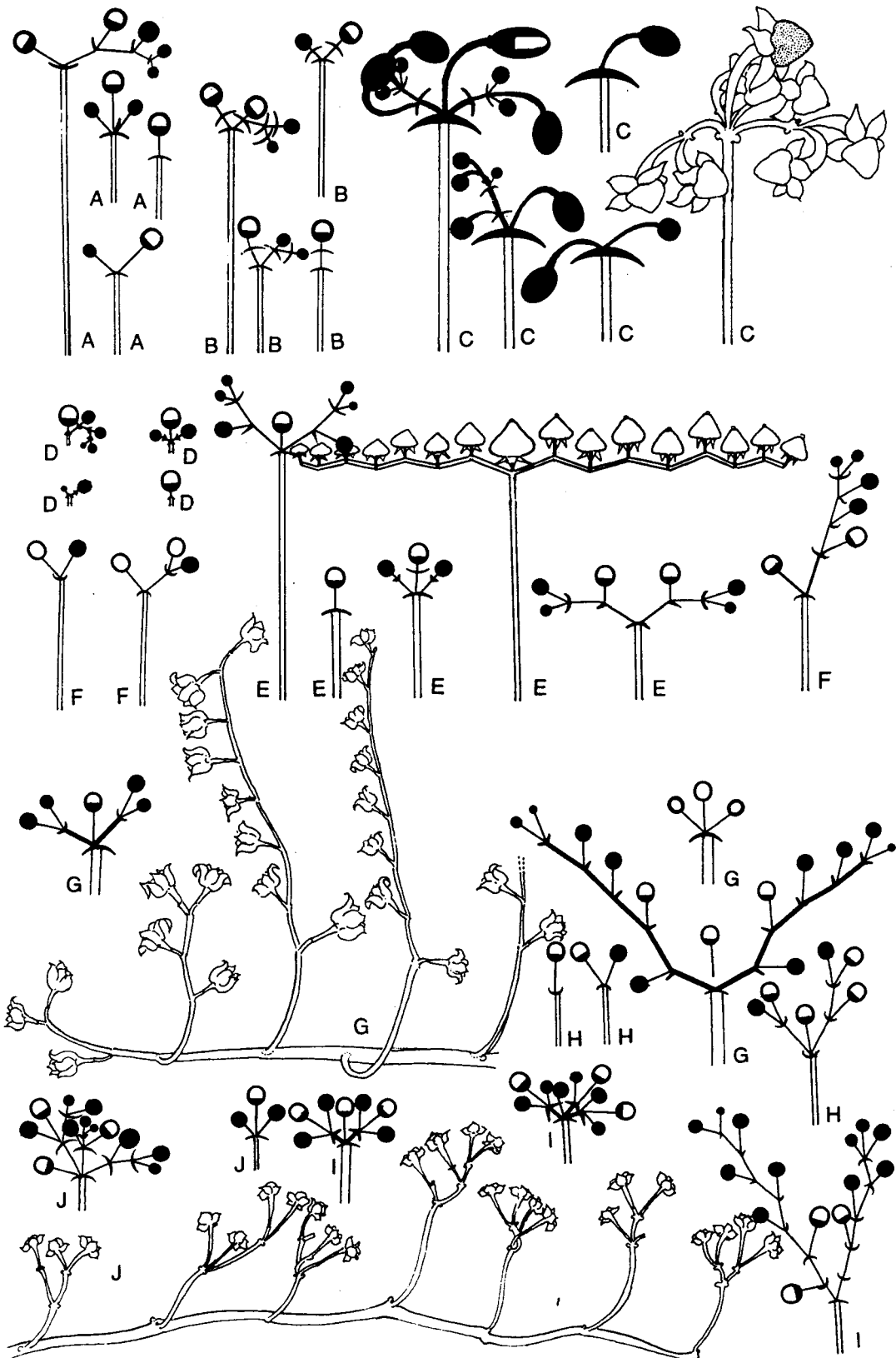


Fig. 106. Inflorescence types in the genus *Merremia*. A. *M. aegyptia*; B. *M. cissoides*; C. *M. dissecta*; D. *M. emarginata*; E. *M. hederacea*; F. *M. hirta*; G. *M. tuberosa*; H. *M. tridentata*; J. *M. vitifolia*.

Use. The leaves possess the odour of bitter almond oil and is used in the preparation of liquor (Wealth of India). The plant is reported to contain hydrocyanic acid and is poisonous to cattle.

Horticultural potential. This plant popularly known as 'Alamo vine' is a native of South America. It is a fast growing creeper bearing funnel shaped cream flowers with deep purple colour at the throat. It is worth growing for its elegant foliage alone and deserves more popularity. Oostroom (1953), Verdcourt (1970), Bor and Rhizada (1954) and others mentioned it as "noon-flower". It is not known whether the flowering time of this plant is correlated with the vernacular name. In fact all the flowers of these plants are found to open between 8.00 am to 10.30 am in Indian conditions.

This is also used for dry flower arrangement due to its enlarged recurved sepals and large capsule. It can be propagated through seeds grown in early rain or by layering of the stem.

Orthographic notes. Two different spellings occurred from the beginning, after Jacquin (1767) named the species as *Convolvulus dissectus* Jacq. in *Observationum botanicarum* 2:4. Hallier f. (1893 a) transferred the species from the genus *Convolvulus* to *Merremia* with the spelling *M. disecta* (Jacq.) Hall.f., in which there was a deletion of a single 's'. Subsequent workers followed the name with 'ss' in the species epithet.

Specimens examined : KERALA : Thiruvananthapuram Dt.: Palayam, *Biju* 25902 (CALI); Thampanoor, *Biju* 25903 (TBGT). Kollam Dt.: Thankasseri, *Biju* 23923 (TBGT); Chavara *Biju* 23924 (CALI); *Barber* 6700 (MH). Alapuzha Dt.: Kumarakam, *Biju* 16224 (CALI). Thrissur Dt.: *Barber s.n.* (MH). TAMIL NADU: Ramanathapuram Dt.: Thondi, *Balasubramaniam* 1892 (MH). Coimbatore Dt.: Valankulam, *Chandrabose* 28935 (MH). S.Arcot Dist.: *coll.sn.* (MH). KARNATAKA : Bangalore Dt.: R.D.A 201 (MH). ANDHRA PRADESH : Cuddapah Dt.: *Gamble* 15053 (MH), *Gamble* 20852 (MH).

4. *Merremia emarginata* (Burm.f.) Hall.f., in Engl., Bot. Jahrb. 16:552. 1893; Cooke, Fl. Pres. Bombay 2:236. 1905; Gamble, Fl. Pres. Madras 2:927.1923;

Ooststr., *Blumea* 3(2): 312. 1939 & *Fl. Mal.*, ser. 1,4:444. 1953; Verdcourt, *Fl. Trop. E. Africa* 55. 1963; Austin in Dassan. and Fosb., *Rev. Handb. Fl. Ceylon* 1:349. 1980; Rani & Matthew in Matthew, *Fl. Tam. Carnatic* 3:1037. 1983.

Type: India, *Klein 85* (G holotype); photo (BM & TBGT).

Evolvulus emarginatus Burm. f., *Fl. India* 77. t. 30. fig.1. 1768.

Convolvulus reniformis Roxb., *Fl. India* ed. Carey & Wall., 2:67. 1824; Wall., *Cat. n.* 1398. 1828; Roxb., *Fl. India* 1:481. 1832.

Ipomoea reniformis (Roxb.) Choisy, *Mem. Soc. Phys. Geneve* 6:446. 1834; Clarke in Hook. f., *Fl. Brit. India* 4: 206. 1883; Trimen, *Handb. Fl. Ceylon* 3:218. 1895.

Lepistemon reniformis (Roxb.) Hassk., *Pl. Jav. Rar.* 524. 1848; Miq., *Fl. Ned. Ind.* 2:629. 1857.

Merremia aungetica (Linn.) Cufid., *Bull. Jard. Bot. Etat.* 31:748. 1961; Mahes., *Bull. Bot. Surv. India* 5:133. 1963; Gandhi in Sald. & Nicolson, *Fl. Hassan Dist.* 473:1978; Mani. & Sivar., *Fl. Calicut* 185. 1982.

Vernacular names : Mal. *Elichevi*; means that the leaves resemble the ear of a rat or mouse; Tel. *Elika jemuda*; Tam. *Elikathu Keerai*; Sanskrit. *Akukarri*.

(Fig. 107, 108)

Annual herb in wild, biennial or perennial in cultivation; stem prostrate, repent, slender, terete, younger parts violet red, sparsely white, pubescent, 1-2 mm long, rarely glabrescent; latex white. Leaves simple, reniform to broadly ovate, 0.4-3 x 0.6 - 3.2 mm, apically obtuse to retuse or emarginate and mucronate, basally broadly cordate, margins coarsely crenate or nearly entire, glabrous or glabrescent above, sparsely pilose on the veins beneath; midrib and lateral veins slightly raised beneath, the lateral veins 3-5 pairs; petiole upto 3.8 cm long, violet green or green, sulcate above, shortly hairy and minutely muricate at base, bulbous based setose or hirtellous hairy above. Flowers axillary, solitary or in 2-4 flowered cincinnus cyme; peduncle very short or absent; bracts small, linear, \pm 2 mm long, apically acute to acuminate, hairy along the margin, sparsely pubescent on the outer surface, persistent; pedicels absent; sepals subequal, outer 2 small, obovate to orbicular, ovate to

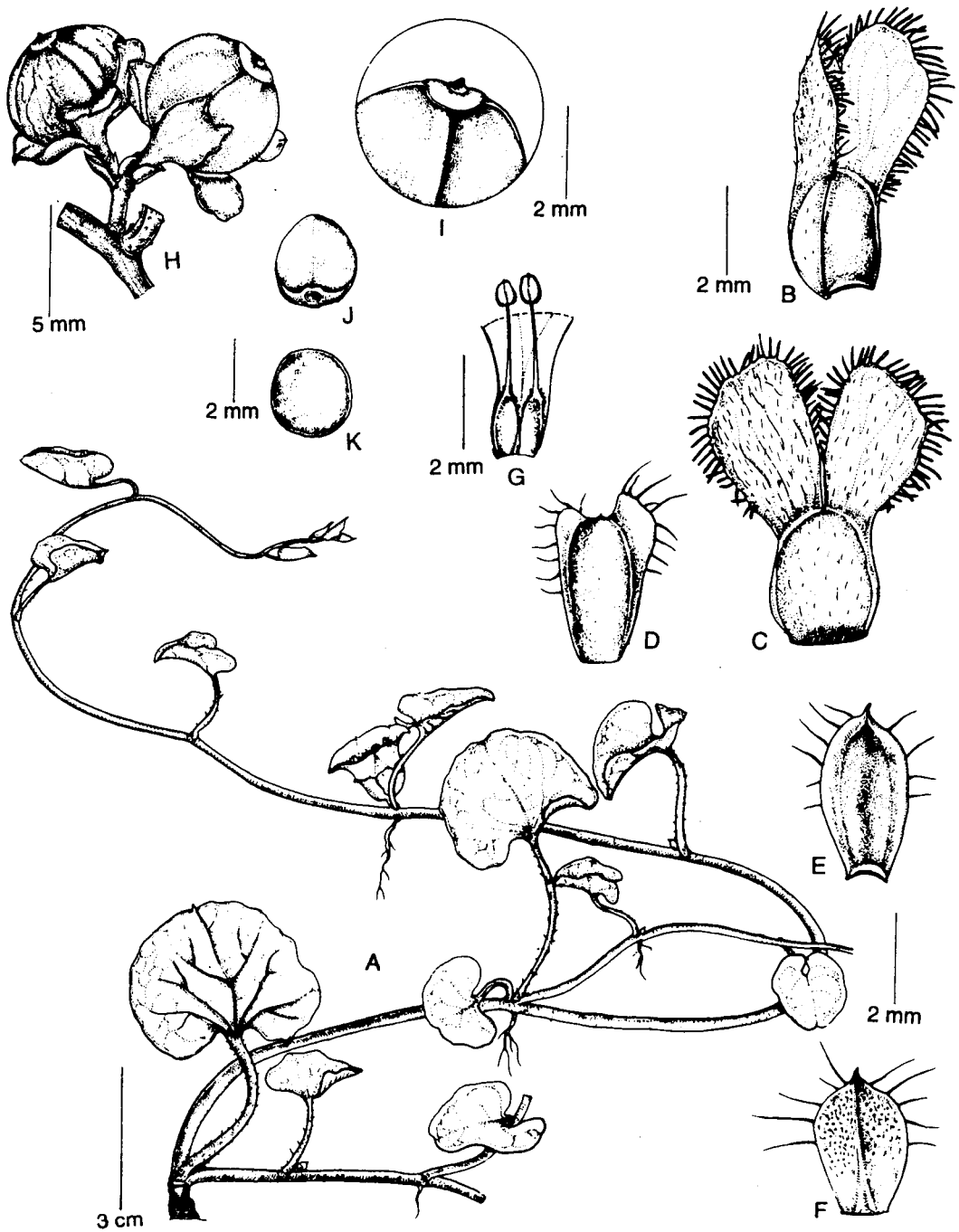


Fig. 107. *Merremia emarginata*. A. Flowering twig; B & C. Outer sepals; D-F. Inner sepals; G. Stamens; H. Fruits; I. Capsule apex; J & K. Seeds (from Biju 44299 TBGT).

elliptic or subquadrate, 3 x 1-2 mm, apically obtuse with a cucullate and distinctly mucronate apex, inner single medium sized, obovate to orbicular, 3 - 3.2 x 2-2.5 mm, apically deeply emarginate, innermost two larger, obovate-orbicular, 4.5-5 x 3.5-4 mm, apically emarginate, long ciliate at margin, more or less hairy on the outer surface, glabrous within; corolla yellowish white, tubular - campanulate, 4-8 mm long, limb 5 lobed, upto 2 cm across; stamens subexserted; anthers \pm 1 mm long, straight after dehiscence; filaments attached 2 mm above the corolla base, 4-5 mm long, ciliolate at dilated base; ovary conical, 1x1mm; disc very small, -1mm long, yellowish in colour; style subexserted, upto 3.5 mm long, glabrous; stigma biglobose, papillate. Fruits capsular, subglobose, 4 x 6 mm in diameter, longitudinally sulcate, valvular dehiscent, glabrous, crowned by the style base, accrescent, sometimes recurved; seeds usually 2, 3x4 mm in diameter, glabrous, greyish brown; germination epigeal, hypocotyl upto 2 cm long, usually bicotyledonary, tricotyledonary seedlings frequent, sinus 2 mm, basally rounded, glabrous, petiole \pm 1 mm long.

Flowering : December - February

Flower opening : 8.30 am to 9.00 am

Fruiting : January - March

Floral visitors : Ants

Distribution. Reported from Tropical Africa, Tropical Asia and Malaysia.

Ecology. The plant has been collected from river banks, grasslands and is found in both wet and dry zones. It has preference for soils where there is a tendency towards water logging in the wet season and yet also has a long dry season.

Medicinal use. According to the Ayurvedic manuscripts Charaka included this among anthelmintics. This is used to overcome urinary afflictions, worms, fever and gastric problems. The leaf juice is given for migraine and head ache and also useful treating rat and snake bites (Sivarajan & Indira Balachandran, 1994). An infusion of the leaves is used in cases of 'burning motions' and the decoction is used as a cough medicine (Ooststroom, 1939).

The decoction is also useful for the treatment of rheumatism, neuralgia and head ache. It is used as ear drops in ulcers, abscesses etc. (Nadkarni, 1954; Aiyer & Kolammal, 1962). The plant is an ingredient in the preparation of *Surasadi tailam*.

Taxonomic notes. The typical seed number in this genus is four. Usually there is a tendency for reduction in the number due to the abortion of ovules. But in this species the number of seeds is invariably two in fruits collected from different populations from different localities.

Nomenclatural notes. *Evolvulus emarginata* Burm. f. [= *M. emarginata* (Burm.f.) Hall.f.] was first published by Burman (1768) as "*foliis cordatis emarginatis repandis, floribus foliataris*" and the phrase 'Habitat in India'. There is no direct indication of a numbered specimen other than an Indonesian vernacular name "*Paschanga-utau kitsjil*" along with the name 'D. Kleinhof'. Verdcourt (1963) mentioned a specimen in the Linnean herbarium (BM) 'might be' the isotype of the taxa. Austin's (1980 a) treatment of the genus in the *Flora of Ceylon* follows the Verdcourt's statement. It is possible that 393.4 LINN, the specimen annotated '*emarginatus*', is an isotype for this name, but there is no concrete evidence that Burman ever had the specimen in his possession. Although Linnaeus may have acquired the sheet from Burman, as it is not annotated as such it cannot be unequivocally accepted as the original material (F.R. Barrie, per. comm., 1992).

Besides the material mentioned above, there is one sheet in the Burman herbarium (G), No. 85 annotated '*Paschanga-utan Kitsjil*' and *Evolvulus emarginata*. This material was collected by Kleinhof, and Burman based it for this taxa in *Flora India*. It could be considered as the original material for this name. In personal communications, Dan. H. Nicolson (US) and F.R. Barrie (US) supported this conclusion and Nicolson wrote back.....'In this case there is no doubt that the G photos are the original Kleinhof material cited in Burman's protologue with vernacular (Indonesian) name '*Paschanga Utan kitchil*'. The name means the little (*Kitjil*) wild (*Utan*) paschanga. This is probably the holotype.



Fig. 108. Holotype of *Evolvulus emarginatus* Burm.f. [= *Merremia emarginata* (Burm. f.) Hall.f.] : India, Klein, 85 (G).



Plate 6. A. *Jacquemontia pentantha* B. *Merremia aegyptia* C. *Merremia cissoides*
 D. *Merremia dissecta* E. *Merremia emarginata* F. *Merremia hederacea* G & H. *Merremia*
tridentata subsp. *tridentata* I & J. *Merremia tridentata* subsp. *angustifolia*.

Specimens examined : KERALA : Pathanamthitta Dt. : Achankovil, *Biju* 25930 (CALI). Malappuram Dt.: Kottakkal, *Biju* 44299 (TBGT). TAMIL NADU : Kanniyakumari Dt.: Pothayadi, *Henry* 53273 (MH). Ramanathapuram Dt.: Kovilankulam, *Nair* 57362; Uttarakosamangai, *Balasubramaniam* 1214 (MH). E. Godavari Dt.: Kovvur, *Ellis* 37202 (MH). KARNATAKA : Mysore Dist.: Thomson *s.n.* (MH). ANDHRA PRADESH : Guntur Dt.: *Jacob s.n.* (MH). Krishna Dt.: Nunna, *Venkanna* 5911 (MH). South Arcot Dt.: Annamalai Nagar, *Sebastine* 5241 (MH). Vishakhapatnam Dt.: Chilakalayedda, *Subba Rao* 32794 (MH).

5. *Merremia hederacea* (Burm.f.) Hall.f., in Engl. Bot. Jahrb. 18:118. 1893; Ooststr. Blumea, 3(2): 302. 1939 & Fl. Mal., ser. 1.4:441. 1953; Verdc., Fl. Trop. E. Africa 54.1963; Austin in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1:350. 1980; Mani. & Sivar., Fl. Calicut 186. 1982; Rani & Matthew in Matthew, Fl. Tam. Carnatic 3:1036. 1983; Ramach. & Nair, Fl. Cannanore 305. 1988.

Lectotype (here designates) : Burm.f., Fl. India t.30. fig.2.

Evolvulus hederaceus Burm.f., Fl. Ind. 77.t.30. fig. 2. 1768.

Convolvulus acetosellaefolius Desr. in Lamk., Encycl. 3:564. 1789.

Convolvulus dentatus Vahl., Symb. Bot. 3:25. 1794; Wall. Cat. n. 1349. 1828; Roxb., Fl. India 1:477.1832.

Convolvulus flavus Moon, Cat. 13. 1824, non Willd. 1797.

Ipomoea chryseides Ker-Gawl., Bot. Reg. 4.t. 270. 1818; Wight, Icon. pl. Ind. or. t. 157. 1840; Clarke in Hook. f., Fl. Brit. India 4:206. 1883; Trimen, Handb. Fl. Ceylon 3:219. 1895.

Merremia convolvulacea Hall.f., in Engl. Bot. Jahrb. 16:552. 1893.

Ipomoea dentata Willd. ex R.et S., Syst. 4:789. 1819.

Convolvulus chryseides (Ker-Gawl.) Spreng. Syst. 1:598. 1825.

Convolvulus lapathifolius Spreng. Syst. 1:604. 1825.

Lepistemon muricatum Spanoghe in Linnaea 15:339. 1841.

Ipomoea zebrina Choisy in DC., Prodr. 9:382. 1845.

Ipomoea acetosellaefolia (Desr.) Choisy in DC., Prodr. 9:383. 1845.

Ipomoea subtriflora Zoll. et Mor. in Mor., Syst. Verz. Zoll. 51. 1846.

Merremia chryseides (Ker-Gawl.) Hall.f., in Engl. Bot. Jahrb. 16:552 1893; Cooke, Fl. Pres. Bomb. 2: 238. 1905; Gamble, Fl. Pres. Madras 2:927. 1923.

Merremia gemella of authors, non (Burm.f.) Hall.f. 1893.

-*Kudici - valli* Rheede, Hort. Malab. 8:52 ('51'), t.27. 1688.

Vernacular name: Mal. *Kurichi-valli*. The meaning of this name is unknown, although *Kurichi* is a place name and *valli* means climber.

(Fig. 109, 110)

Annual herbs; stem twining or prostrate, prostrate ones rooting at the nodes or even at the internodes, slender, terete, younger parts green, older parts straw coloured, minutely tuberculate, glabrous or hirsute at nodes; latex gummy, milky white. Leaves simple, ovate or cordate, 1.2-5 x 1-3.5 cm, apically acuminate, obtuse, mucronulate, basally cordate, hastate or truncate, margin entire or crenate to obscurely or deeply 3-lobed, glabrous on both surfaces; midrib and lateral veins raised beneath, lateral veins 4-6 pairs; petiole upto 5 cm long, slightly furrowed, small tubercles on the basal half. Flowers axillary, 1 to several flowered (upto 20) dichasial or monochasial cymes; peduncle upto 8 cm long, thicker than the petiole, minutely tuberculate; bracts, ovate, minute, upto 1 mm long, apically acuminate, caducous; pedicel small, 2-3 mm long, smooth or minutely tuberculate, glabrous; sepals subequal, outer 2 small, broadly obovate, concave, 2.5-3 x 1.5-2 mm, apically notched, distinctly mucronate, slightly pilose on the back and along the margins, inner 3 large, broadly obovate to spatulate, concave, 3-4 x 2.5-3 mm, apically mucronate, notched, glabrous or occasionally somewhat pilose on the back; extrafloral nectary sepaliferous, 4 or 5 (2 + 2 or 2 + 2 + 1); corolla yellow, with pale yellow or white throat, campanulate, tube 8-9 mm long, limb slightly 5 lobed, 1-1.3 cm across; stamens subexserted; anthers 1-2 mm long, tip curved after dehiscence; filaments white, attached 1 mm above the corolla base; ovary conical, glabrous, 1-1.5mm long, disc small; style single, exserted, 8-10 mm long, tip curved downwards, glabrous; stigma biglobose, papillate. Fruits capsular, broadly conical to depressed - globose, somewhat 4 angled, 5-6 x 8-9 mm, valvular dehiscent, valves transversely or reticulately wrinkled, light brown, crowned by the style scar at top; fruiting sepal directed downwards; seeds 4, elliptic - ovate, 2-2.2 x 2-3 mm, reddish brown, short pubescent or nearly glabrous over the whole surface or short pubescent and with long

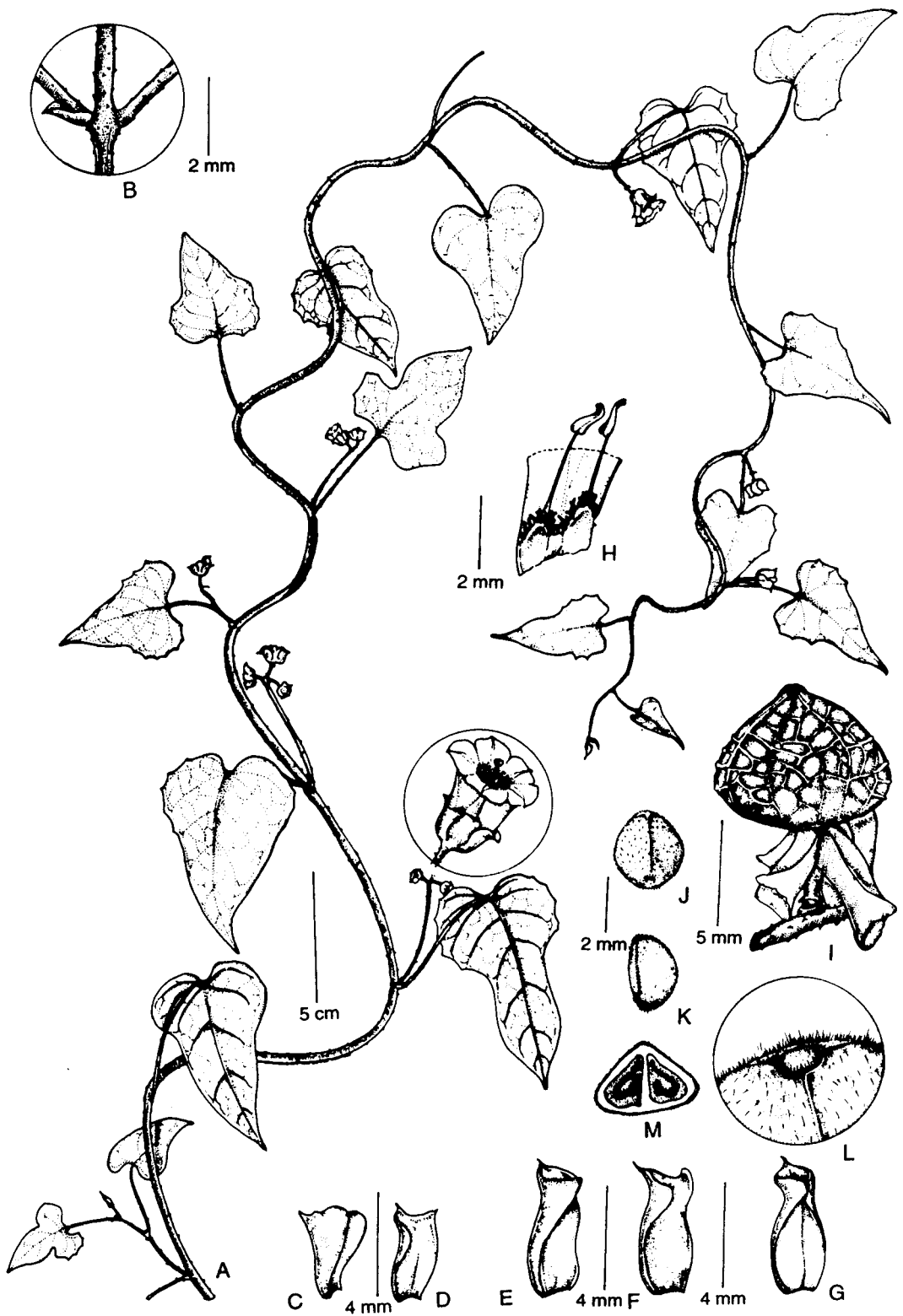


Fig. 109. *Merremia hederacea*. A. Flowering twig; B. Node enlarged; C-G. Sepals; H. Stamens; I. Fruit; J & K. Seeds; L. Seed enlarged; M. Seed C.S. (from Biju 16240 CALI).

reddish brown or fulvous hairs at the hilum and along the margins, dorsal surface with a longitudinal groove; seed germination epigeal, hypocotyl upto 1.2 cm, bicotyledonary, sinus \pm 2mm, basally emarginate, glabrous, petiole upto 2 mm long, raised beneath.

Flowering : November - January

Flower opening : 8 am to 9 am

Fruiting : January - March

Insect visitors : Ants, bees etc.

Distribution. Tropical Africa, Madagascar, Tropical Asia to China, Malaysia, Queensland and Pacific islands (Austin, 1980a).

Ecology. This species is frequent in both dry and wet zones. This has been collected from open grasslands, river banks and sandy places near streams.

Medicinal use. A poultice of the leaves with turmeric and broken rice is used to heal chapped hands and feet. (Ooststroom, 1953).

Horticultural value. The fruit clusters are used for dry flower arrangements.

Notes. Ooststroom (1939) segregated two forms on the basis of the pubescence of seeds, var. *pubescens* and var. *barbata*. Only the former is present in India.

Nomenclature notes. *Evolvulus hederaceus* Burm. f. [now *Merremia hederacea* (Burm.f.) Hall.f.] was published with a new diagnostic phrase name '*E. hederaceus foliis cordatis rependis, pedunaulis subtrifloris*' and the phrase 'Habitat in Java'. In this protologue Burmann mentioned the Pryon's material without any number.

Verdcourt (1963) and Austin (1980 a) cited the Pryon collection as being in Geneva (G), but they had not found this material. A search for this material at the Geneve Herbarium through Dr. A. Charpin had been made, but he failed to locate it. In its absence the possible original element would appear to be the plate published in *Flora India*. Dr. Verdcourt (K) agrees with this observation and wrote back "..... in the case of *E. hederaceus* only the Pryon specimen is mentioned. The drawing must have been made from it. The drawing, in my view would be a perfectly good choice for a lectotype" (Pers. comm., 1992). Burmann's plate can be taken as one of the original

P. 77.

T. 30



1. *EVOLVULUS marginatus*.
 2. *EVOLVULUS hederaceus*.
 3. *POLYGONUM chinense*.

Fig. 110. Lectotype of *Evolvulus hederaceus* Burm. f. [= *Merremia hederacea* (Burm. f.) Hall. f.] : Burm. f., Fl. India t. 30. fig. 2.

elements, so the term lectotype is correct. If the Pryon specimen were accepted as a holotype then the problem would be different. Dr. Verdcourt contacted Dr. Brummitt (K) for this matter. Brummitt's opinion is that it could be termed 'lectotype', and there are all sorts of difficulties in semantics when it comes to the old type.

The description of *Merremia hederacea* is a good match for the drawing. I here designate the figure accompanying the description on page 77 as the lectotype. Lectotype (here designates) Burm.f., Fl. India Page 77. t 30. Fig.2.

Specimens examined : KERALA : Thiruvananthapuram Dt.: Karamana, *Biju & Suresh Elamon* 25962 (TBGT). Kollam Dt.: Kallar, *Chandrabose* 49037 (MH). Idukki Dt.: Pooyamkuttty, *Bhargavan* 90058 (MH). Thrissur Dt.: Chevoor, *Biju* 15350 (CALI); Chalakkudi, *Sebastine* 26698 (MH). Kozhikode Dt.: Ramanattukara, *Biju* 16240 (CALI). Kannur Dt.: Payyanur, *Ansari* 69927 (MH). TAMIL NADU: Tanjavur Dt.: Vadakal, *Narayanaswamy* 5207 (MH). S.Arcot Dt.: Gingee R.F., *Sebastine* 12200 (MH). Chengalpattu Dt.: Karikili, *Henry* 47072 (MH). Madras D.t.: *Barber* 122 (MH). KARNATAKA : Mysore Dt.: Bandipur, *Naithani* 23174 (MH). Shimoga Dt.: Bababoodan, *Biju* 23954 (CALI). ANDHRA PRADESH : Cuddapah Dt.: Balapalle, *Ellis* 15753 (MH). Kurnool Dt.: Balugram, *Ellis* 32589 (MH). Godavari Dt.: *Gamble* 15870 (MH). *Barber* 5307 (MH). Warangal Dt.: Pakhal, *Henry* 15971 (MH). Vishakhapatnam Dt.: Golugonda, *s.coll.* 11757 (MH). Waltair Dt.:Loya, *Venkanna* 5992 (MH).

6. *Merremia hirta* (Linn.) Merrill in Philipp. Journ. Sc.7, Bot. 244. 1912; Merrill in Philipp. Journ. Sc. 59:452. 1936; Ooststr., *Blumea* 3(2):307. 1939 & Fl. Mal., ser. 1.4: 442-443. 1953; *Biju & Mathew*, Journ. Econ. Tax. Bot. 18 (1): 181 - 183. 1994.

Type : *Convolvulus reptans* Linn. Herb. Linn. 218.55 (LINN.)

Convolvulus reptans Linn., Sp. Pl.ed.1, 158. 1753.

Convolvulus hirtus Linn., Sp.Pl. ed. 1, 159. 1753.

Convolvulus caespitosus Roxb., Fl. India 2:70. 1824.

Ipomoea linifolia Blume, Bijdr. 721. 1825; Clarke in Hook.f., Fl. Brit. India 4:205. 1883.

Merremia caespitosa (Roxb.) Hall.f., in Engl., Bot. Jahrb. 16:552.1893.

(Fig. 111)

Annual herbs, stem prostrate or twining, terete, sparsely patently hirsute or glabrous, prostrate ones rooting at the nodes or sometimes at the internodes; latex milky white. Leaves simple, highly variable, oblong - lanceolate or oblong, ovate or ovate-oblong, linear, linear-oblong or orbicular to subquadrate, 0.5-3 x 0.4-1.8 cm, apically obtuse to slightly emarginate and mucronulate, basally rounded, truncate, more or less cordate or nearly hastate, with few hairs near base and along margins, entire, shortly pilose. Flowers axillary, solitary to few flowered cymes; peduncles upto 5 mm long, terete, glabrous or shortly pilose near base; bracts small, ovate, apically acute, glabrous, dilated at apex; sepals subequal, outer 2 small, elliptic, 2.5-2.8 x 2mm, apically acuminate or obtuse, glabrous on both sides, mottled inside, inner 3 large, elliptic-oblong, 3.4 x 2-2.5 mm, apically acute or slightly acuminate, glabrous; corolla yellow, campanulate to broadly funnel shaped, tube 1-1.5 cm long, shallowly five lobed, 0.8-1.2 cm across; stamens inserted; anthers 1 mm long, yellowish white, spirally twisted after dehiscence; filaments white, attached 1 mm above the corolla base, unequal, 3 long, upto 5 mm, 2 short, upto 3.5 mm, ciliate at the dilated base; ovary conical, glabrous, 0.8-1 x 0.6-0.8 mm; disc small; style single, upto 4 mm long, glabrous, dilated at base; stigma biglobose, white, papillate. Fruits capsular, globular to broad ovoid, 7x7 mm, with thin papery wall, smooth, glabrous, crowned with persistent style base, fruiting sepal inflexed above; seeds 4, rarely 3 or less, orbicular, 2.3-2.5 x 2.4-2.8 mm, glabrous, brownish - black.

Flowering : August - October

Flower opening : 8.30 am to 9 am

Fruiting : October - December

Distribution. India to Southern China, Siam and Tropical Australia, throughout Malaysia.

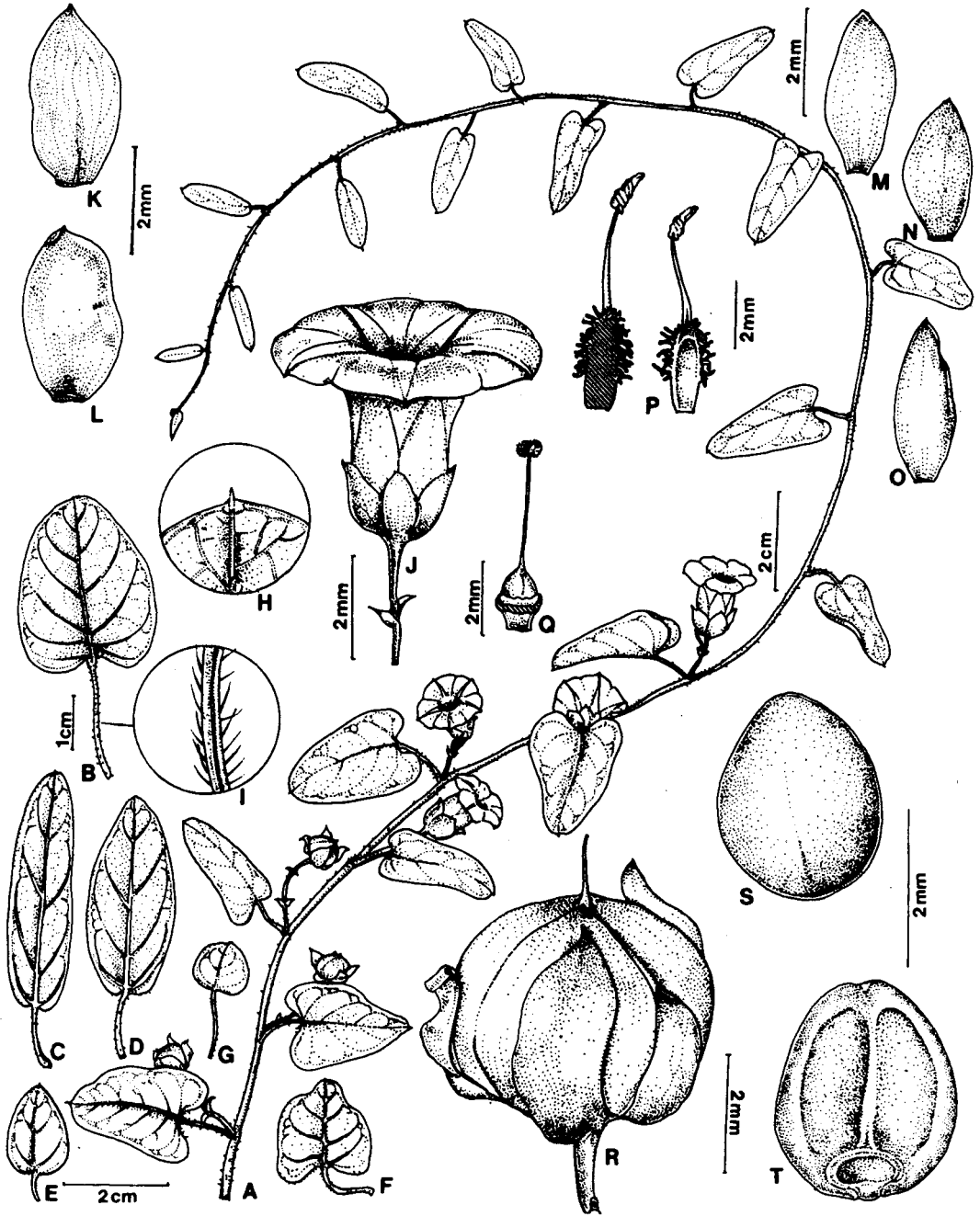


Fig. 111. *Merremia hirta*. A. Flowering twig; B-G. Leaf variation; H. Leaf apex enlarged; I. Petiole enlarged; J. Single flower; K & L. Outer sepals; M-O. Inner sepals; P. Stamens; Q. Pistil; R. Fruit; S & T. Seeds (from Biju 41208 TBGT).

Ecology. It occurs at low elevation, along way-sides and open grasslands.

Notes. Ooststroom (1939, 1953) segregated this taxa into two varieties - var. *hirta* and var. *retusa* on the basis of the sepal characters. Of the two forms, the former is present in India and var. *retusa* only in Malaysia.

Specimens examined : KERALA : Malappuram Dt.: Panambra, *Biju* 41208 (MH, CALI & K); University campus, *Ratnam* 3547 (CALI). LOCALITY UNKNOWN: *Swarupananthan* 24012 (CALI).

7. *Merremia quinquefolia* (Linn.) Hall.f. in Engl., Bot. Jahrb.16 : 552. 1893;
Ooststr., *Blumea* 3:324. 1939; Austin, Fl.Ecuador no.15:86. 1982.

Type : Based on Plukenet, Alm.t. 167. f. 6 1696 (Lectotype).

Ipomoea quinquefolia Linn., Sp. Pl. 162 . 1753.

Convolvulus quinquefolius (Linn.) Linn., Syst.Veg. ed. 10.923. 1759.

Batatas quinquefolia (Linn.) Choisy, Mem. Soc. Phys. Geneve 8:49. 1837.

Merremia parviflora Pittier, Bol. Soc. Venez. Ci. Nat. 8:143. 1943.

(Fig. 112)

Annual herbs; stem twining, herbaceous towards tip, terete, green, glabrous or sparsely hirsute with patent hairs. Leaves palmately compound, leaflets 5, sessile, lanceolate to oblanceolate, apically acute to acuminate, mucronulate, basally acuminate, terminal one larger, 4-7 x 1-1.5 cm, inner pair 2-4 x 0.8-1.2 cm, outermost pair 1.5-2x0.5-1 cm, dentate, glabrous to pubescent on both sides; midrib raised beneath, inconspicuous above, lateral veins 5-8 pairs, slightly raised beneath; petiole upto 3 cm long, glabrous or with few patent hairs. Flowers axillary, solitary or in simple cyme, rarely compound cyme; peduncle upto 7 cm long, terete, glandular towards tip; bracts linear, 2-3 x 1-2 mm; pedicels short, upto 5 mm long, terete, pubescent like peduncle; sepals unequal, outer most 2 small, broadly elliptic, 5.5-6 x 3-3.5 mm, apically obtuse, apiculate, margin entire, glabrous on both sides, inner 3 6.5-7 x 3.5mm, apically obtuse, apiculate; corolla white or pale yellow, without a coloured

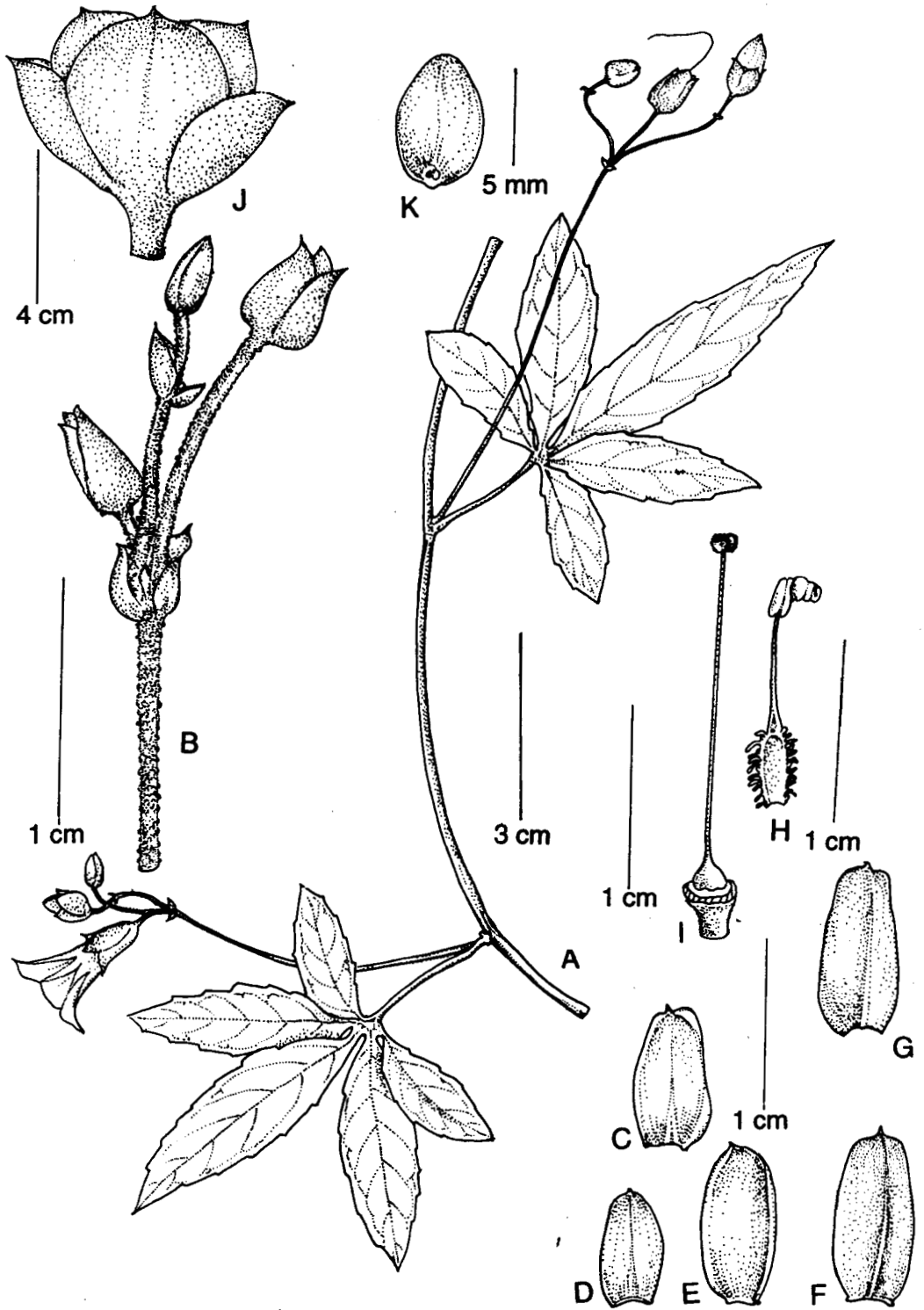


Fig. 112. *Merremia quinquefolia*. A. Flowering twig; B. Inflorescence; C-F. Sepals; G. Stamens; H. Pistil; I. Fruit; J. Seed (from Biju 20218 TBGT).

throat, funnel shaped, 1.5-1.8 cm long, glabrous, shallowly five lobed, 1.5 cm across; stamens inserted; anthers upto 2.5 mm long, white, spirally twisted after dehiscence; filaments white, attached 2.5 mm above the corolla base, equal, upto 4.2 mm long, ciliate at dilated base; ovary conical, glabrous, $\pm 1 \times 1$ mm, disc small, annular; style single, upto 1.2 cm long, subexserted, glabrous, dilated at base; stigma biglobose, white, papillate. Fruit capsular, globular to broad ovoid, 9x6 mm, smooth, glabrous, crowned with persistent style base, fruiting sepals slightly enlarged, reflexed; seeds 4, rarely 3 or less, orbicular, 7 x 4 mm, glabrous to pubescent black.

Flowering : October-December

Flower opening : Not known

Fruiting : November-January

Distribution. Tropical America, Malay Archipelago, in India escaped from cultivation.

Ecology. In Southern Peninsular India, the plant was reported only from Andhra Pradesh in Warangal district on disturbed sites.

Specimens examined : ANDHRA PRADESH : Warangal Dt.: *Thomson* 30221 (MH). KARNATAKA : Hassan Dt.: (Cult.) *Biju* 20218 (TBGT).

8. *Merremia tridentata* (Linn.) Hall.f. in Engl., Bot. Jahrb. 16:552. 1893; Cooke, Fl. Pres. Bombay 2:237. 1905; Gamble, Fl. Pres. Madras 2:927. 1923; Verdc., Fl. Trop. E. Africa 51. 1963; Austin in Dassan. & Fosb., Rev. Handh. Fl. Ceylon 1:351. 1980; Rani & Matthew in Matthew, Fl. Tam. Carntatic 3:1038. 1983; Chand.& Nair, Fl. Coimbatore 198. 1987; Vajravelu, Fl. Palghat Dist. 313. 1990; Mohan & Henry, Fl. Thiruvananthapuram 318. 1994.

Type : Rheede, Hort. Malab. 11:133. t.65 (Lectotype).

Convolvulus tridentatus Linn., Sp. Pl. 157. 1753; Roxb., Fl. India 2:56. 1824; Wall., Cat. n. 1347. 1828; Roxb., Fl. India 1:475. 1832 (*C. tridentatus* Willd.); Thw., Enum. pl. zeyl. 211. 1860.

Evolvulus tridentatus (Linn.) Linn., Sp.Pl. 2:392. 1762; Burm. f., Fl. India 77. t. 16. f.3. 1768.

Ipomoea tridentata (Linn.) Roth. in Roem., Arch. Bot. 1(2):38. 1798 & Cat. 2:19. 1800; Choisy, Mem. Soc. Phys. Geneve 6:447. 1833 & in DC., Prodr. 9:353. 1845; Miq., Fl. Ned. India 2:603. 1857 & Suppl. 235, 561. 1860; Clarke in Hook.f., Fl. Brit. India 4:205. 1883; Trimen, Handb. Fl. Ceylon 3:218. 1895; Gagnep. et. Courch. in Lec. Fl. Indo - Chine 4:265. 1915.

-*Tala - neli* Rheede, Hort. Malab. 11:113, t. 55. 1692.

KEY TO THE SUBSPECIES

- 1a. Pedicels tetra or penta angled, outersepals mostly obtuse to emarginate, inner 1 attenuate to acuminate with an acute apex, fruiting sepal not exceeding the capsule.....subsp. **tridentata**
- 1b. Pedicels terete, all sepals long acuminate, fruiting sepal exceeding the capsule and directed downwards after dryingsubsp. **angustifolia**

subsp. **tridentata**. *Merremia tridentata* Hall.f. subsp. *genuina* (Hall.f.) Ooststr., Blumea 3:315. 1939; *M. tridentata* Hall. f. var. *genuina* Hall.f. ex Ooststr. *I.c.* 315, *pro syn.*; Mani & Sivar. Fl. Calicut 186. 1982; Ramach. & Nair. Fl. Cannanore 305. 1988.

(Fig. 113)

Annual herb in wild, perennial in cultivation, root stout and spreading parallel to ground; stem twining or occasionally prostrate, slender, angular, green, glabrous; latex white. Leaves simple, linear, filiform, linear - oblong, oblong to oblanceolate, spatulate or pandurate, 0.5-5 x 0.1-1.2 cm, apically emarginate, mucronulate, mucronate to obtuse or acute, basally truncate to hastate, lobes often 2 to several toothed, margins entire, glabrous; lateral veins

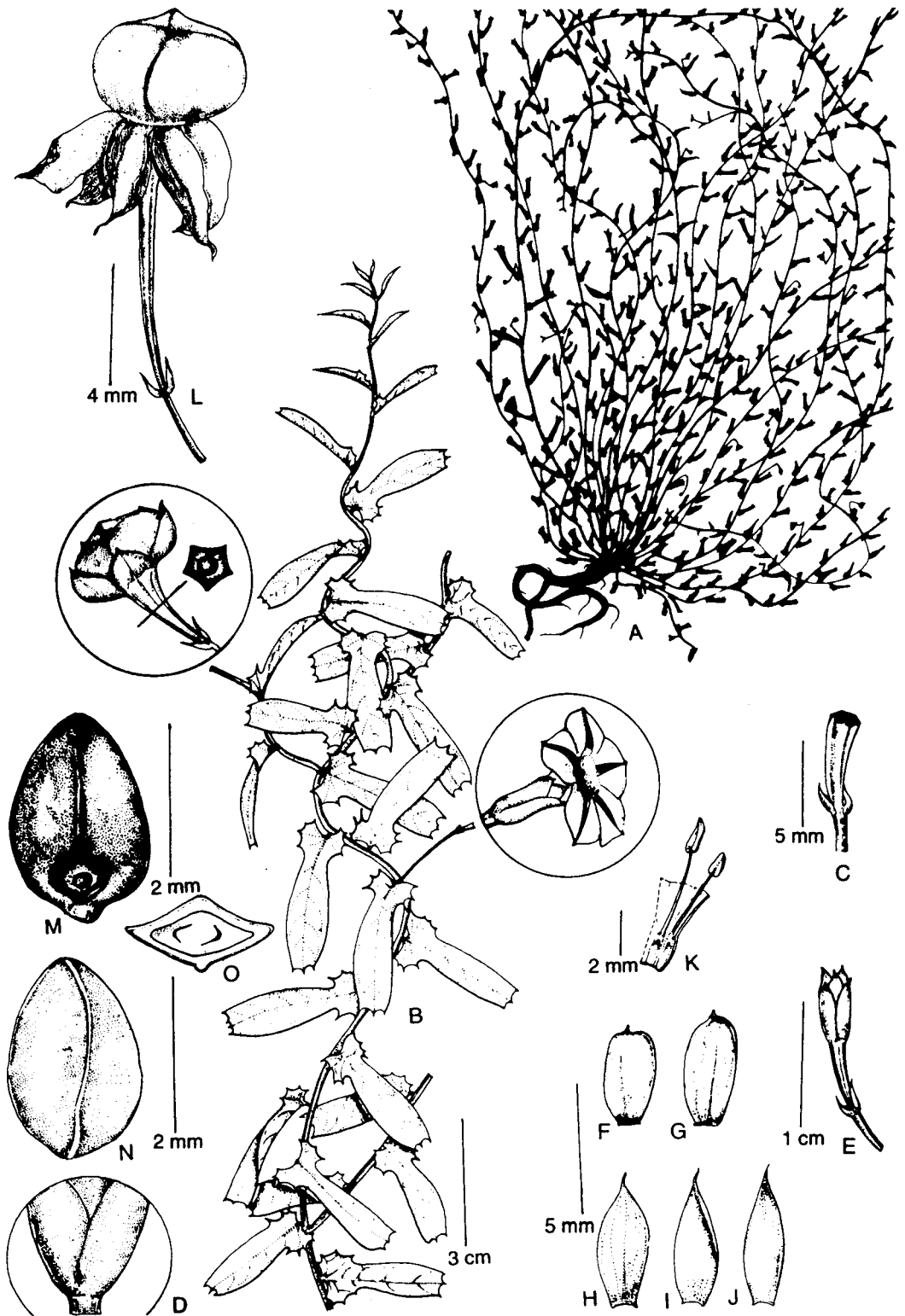


Fig. 113. *Merremia tridentata* ssp. *tridentata*. A. Habit; B. Flowering and fruiting twig; C. Bracts; D. Petiolar nectary; E. Calyx; F & G. Outer sepals; H-J. Inner sepals; K. Stamens; L. Fruit; M&N. Seeds; O. Seed L.S. (from Biju 23936 TBGT).

4-10 pairs, slightly raised beneath; petiole short or nearly absent, \pm 1mm long. Flowers axillary, solitary or in 2-3 flowered cymes; peduncle upto 3.5 mm long, thin, terete or slightly angled, glabrous; bracts very small, \pm 2 mm long, subulate; pedicels 3-10 mm long, tetra or penta angled; sepals subequal, outer 2 small, ovate - oblong, 2.8-3.2 x 2-2.2mm, apically obtuse, mucronate, glabrous, pale green, inner 3 large, lanceolate, 5-6 x 2-2.5 mm, apically acuminate to mucronulate or mucronate, glabrous, pale green; extrafloral nectary on the base of calyx, 4-5 small pore like structures; corolla pale yellow or white with a purple throat, funnel shaped, 6-7 mm long, mouth slightly 5 lobed, 0.7 - 1.1 cm across; stamens inserted; anthers upto 1 mm long, not contorted; filaments attached 2mm above the corolla base, more or less same length, 3-4 mm long, sparsely hairy at the slightly dilated base; pollen smooth, porate; ovary 4 celled, \pm 1mm long, glabrous; disc small, annular;. style inserted, upto 5mm long, glabrous, dilated at the base; stigma biglobose. Fruit capsular, ovoid, 5-6 x 4-5 mm, 4 valved, glabrous, sepal shorter or as much as the fruit (not exceeding), pedicels thickened above, not articulate, fruiting sepals directed downwards on drying, pericarp thin, straw coloured; seeds 4 or less, globose to ovoid, 2.5-3 x 2.5 mm long, basally acute, dorsal surface with a longitudinal ridge, glabrous, dull black; seed germination epigeal, hypocotyl upto 1mm, usually bicotyledonary, cotyledons deeply divided, sinus 1.8 cm long, linear, glabrous, petiole upto 3mm long.

Flowering : Throughout the year, peak during December - January

Flower opening : 8 am to 8.30 am

Fruiting : Throughout the year

Distribution. Tropical and South Africa, Mascarene Islands, Tropical Asia to Formosa, Malaysia, Australia and Micronesia.

Ecology. Found in a variety of disturbed sites - roadsides, cultivated fields, grasslands and rocky land, very common in the dry region including sea shore.

Specimens examined : KERALA : Thiruvananthapuram Dt.: Palode, Biju 23936 (TBGT); Veli, Biju 23968 (CALI). Kollam Dt.: Kadakkal, Biju 16242

(CALI); Chithara, *Biju* 16249 (TBGT). Thrissur Dt.: Sholayar, *Ramachandran* 80839 (MH). Palakkad Dt.: Olavakkot *Joseph* 17758 (MH). Kannur Dt.: Nileshwar, *Ansari* 71020 (MH). Wayanad Dt.: Beddome *s.n.* (MH); Sultan Bathery, *Biju* 15339 (CALI). TAMIL NADU : N.Arcot Dt.: Vazhiyur, *Vajravelu* 55601 (MH). S.Arcot Dt.: Marakkanam, *Ramamurthy* 60261 (MH); Guddalore, *Barber* 698 (MH). Chingleput Dt.: *Gamble* 17570 (MH). Madras Dt.: *Barber* 50. Coimbatore Dt.: Palayakottai, *Narayana & Naganath* 6113 (MH); Kuridimalai, *Subramanyam* 1819 (MH). Dharmapuri Dt.: Anchetty Kunthukottai, *Vajravelu* 57906 (MH). Nilgiri Dt.: Kunukkumadavu, *Vajravelu* 36710 (MH). Ramanad Dt.: Melakadu forest, *Ramamurthy* 22738 (MH). Ramanathapuram Dt.: Karaikkudi, *Biju* 2082 (TBGT), *Nair* 51796 (MH). KARNATAKA : S.Canara Dt.: Kasargode, *Narayanan* 6321 (MH). Shimoga Dt.: Shimoga Forest, *Biju* 25936 (CALI). N.Carnatic, *Thomson s.n.* (MH). Bellary Dt.: *Lawson s.n.* (MH). ANDHRA PRADESH : Anantapur Dt.: S.K.Uni.Campus, *Puilaiah* 130 (MH). Nellore Dt.: Inukurti, *Walkar s.n.* (MH). Guntur Dt.: Bapatla, *Divakaran* 94203 (MH). Krishna Dt.: Digavalli, *Venkanna* 5496 (MH). Godavari Dt.: Ellore, *Narayanaswamy* 4509 (MH); *Barber* 8251 (MH). Vishakhapatnam Dt.: Nattavaram, *Barber* 1832 (MH). Karimnagar Dt.: Kodimial, *Subbarao* 20145 (MH). Srikakulam Dt.: Parlakimedi Palace, *Subba Rao* 62368 (MH).

subsp. *angustifolia* (Jacq.) Ooststr., *Blumea* 3 : 323. 1939; Verdc., *Fl.Trop. E.Africa* 51.1963.

Type : Guinea, Jacq., *Ic. Pl. Rar.* t.317 (Lectotype).

Ipomoea angustifolia Jacq., *Ic.Pl. Rar.* 2: 10. t.317.1786 - 93; Clarke in *Hook.f., Fl.Brit. India* 4 : 205.1883; Trimen, *Handb.Fl.Ceylon* 3: 217.1895.

Convolvulus hastatus Desr. in *Lamk. Encycl.*3: 542 . 1791, non *Forsk.* (1775).

Convolvulus filicaulis Vahl, *Symb . Bot.*3: 24 . 1794.

Ipomoea denticulata R.Br., *Prodr.*485.1810.

Ipomoea filicaulis (Vahl) *Blume, Bijdr.* 721.1826.

Merremia hastata (Desr.) *Hall.f.in Engl., Bot.Jahrb.* 16:552 . 1893; *Cooke, Fl. Pres. Bombay* 2: 238 . 1905; *Gamble, Fl.Pres. Madras* 2: 929 . 1923.

Merremia angustifolia (Jacq.) *Hall.f. in Engl., Bot. Jahrb.* 18: 117 . 1893.

Merremia angustifolia (Jacq.) *Hall.f. var. ambigua* *Hall.f. in Engl., Bot. Jahrb.* 18:117.1893.

Merremia tridentata (Linn.) Hall.f. subsp. *hastata* (Desr.) Ooststr., *Blumea* 3: 317. 1939 & *Fl. Mal.*, ser. I, 4:445. 1953; Fosb., *Taxon* 24:541.1945; Gandhi in Sald. & Nicolson., *Fl. Hassan Dist.* 473.1978; Mani. & Sivar., *Fl. Calicut* 187.1982; Mani., *Fl. Silent Valley*, 189.1988; Ramach. & Nair, *Fl. Cannanore* 306.1988.

Vernacular names : Mal. *Prasarini, Talanili*; Tam. *Mudiya Kunthal, Thiripan pullu*; Sanskrit. *Prasarini*.

(Fig. 114)

Annual herb in wild, perennial or biennial in cultivation, roots stout and perpendicular to stem; stem twining, slender, more or less angular to terete, green or violet, glabrous; latex white. Leaves simple, linear, linear - oblong or lanceolate to oblong, 1 - 8.5 x 0.4 - 2.5 cm, apically acuminate to distinctly mucronate, basally hastate, cordate or amplexicaul, lobes often 2 to several toothed, margin entire, glabrous; lateral veins 8 -12 pairs, slightly raised beneath; petiole short, 1-3 mm long, or nearly absent. Flowers axillary, solitary or in 2 - 3 flowered cymes; peduncle upto 0.8-5 cm long, thin, terete, glabrous, very rarely pubescent near the base; bracts very small, \pm 2 mm long, subulate; pedicels 4 - 12 mm long, terete, glabrous; sepals subequal, outer 2 small, 5 - 6 x 3 -3.5 mm, inner 3 large, 7 - 8 x 3 mm, lanceolate to ovate-lanceolate, apically long acuminate, tip more or less curved outwards, pale green; extrafloral nectary on the base of the calyx, 4 - 5 small pore like structures; corolla pale yellow or white with purple to brown throat, funnel shaped, 1.5 - 2.2 cm long, mouth slightly 5 lobed, 2 - 2.3 cm across, glabrous; stamens inserted to subexserted; anthers upto 3 mm long, not contorted; filaments attached 2 mm above the corolla base, more or less same length, 8-10 mm long, sparsely hairy at slightly dilated base; pollen smooth, porate; ovary 4 celled, \pm 1 x 1 mm, glabrous; disc small, less than 1 mm long, annular; style inserted or subexserted, upto 10 mm long, glabrous, dilated at base; stigma biglobose. Fruit capsular, globose to ovoid, 6 - 7 x 5 - 6 mm, 4 valved, glabrous, fruiting sepals exceeding the fruit, pedicels thickened above, articulate at the junction of peduncle, pericarp thin, straw coloured; seeds 4 or less, ovate, 2.5 - 3 x 4 - 4.2 mm, basally rounded, dorsal surface with a longitudinal ridge, glabrous,

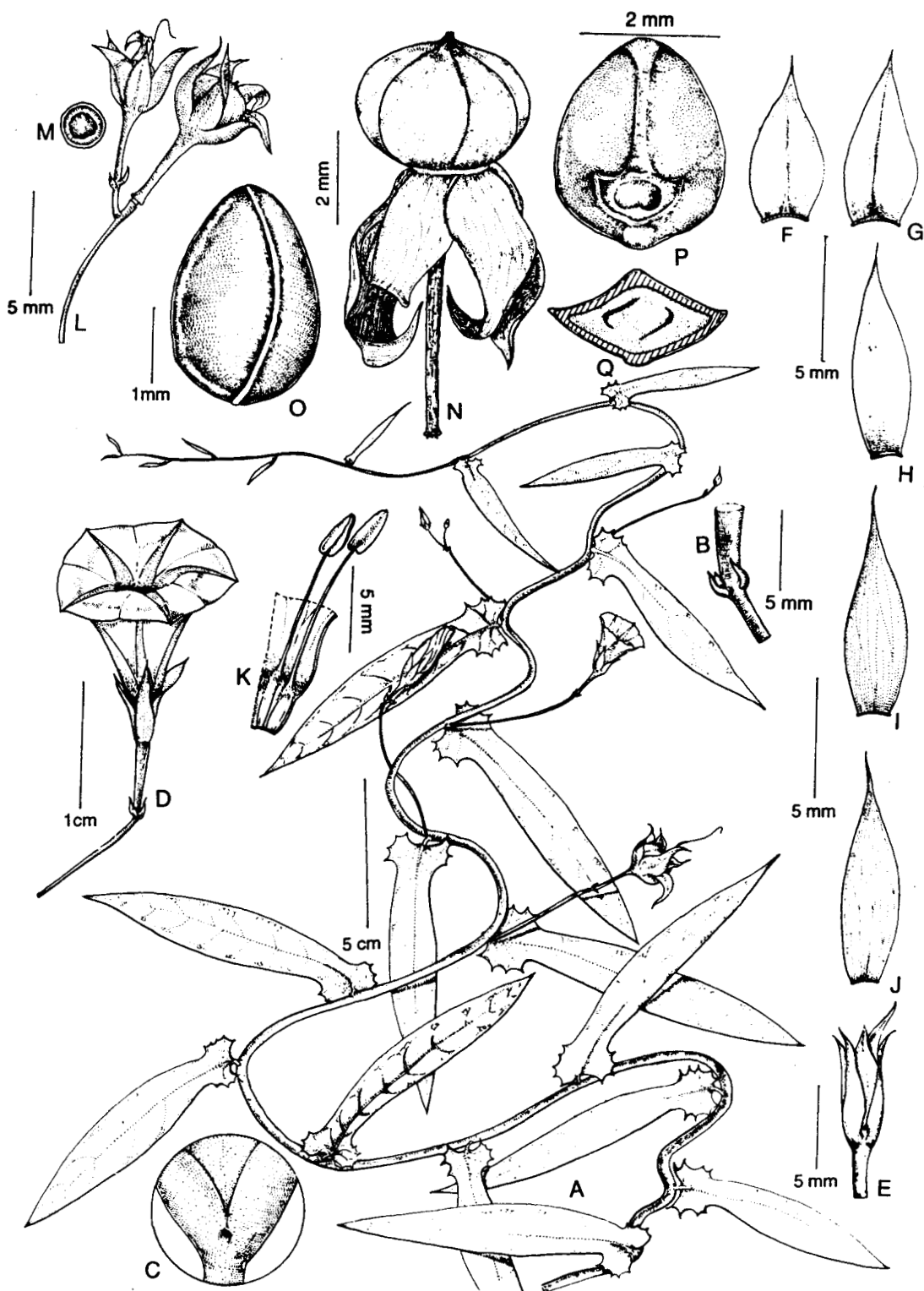


Fig. 114. *Merremia tridentata* ssp. *angustifolia*. A. Flowering and fruiting twig; B. Bract; C. Pedicellar nectary; D. Flower; E. Calyx; F & G. Outer sepals; H - J. Inner sepals; K. Stamens; L. Young fruits; M. Pedicel C.S; N. Fruit; O & P. Seeds; Q. Seed C.S. (from Biju 25957 TBGT).

black; seed germination epigeal, hypocotyl upto 1 cm long, bicotyledonary, cotyledons deeply divided, sinus 1.9 cm long, linear, glabrous, petiole upto 2mm.

Flowering : Throughout the year, peak during December - January

Flower opening : 9 am to 9.30 am

Fruiting : Throughout the year

Distribution. Tropical East Africa, Tropical Asia from the Khasia Hills and Bengal southwards to Ceylon, eastwards and southwards to China, the Malay Peninsula, the Malay Archipelago and Tropical Australia.

Ecology. Found almost every where, along roadsides in cultivated land, edges of forest, in grasslands, from sea - level upto 1000 m.

Medicinal use. Both subspecies, *tridentata* and *angustifolia* have same medicinal properties. Van Rheedee (1688) has recorded that this plant has been in use with the local name '*Talaneli*' (Rheedee, Hort. Malab. 11: 133.t.55) and '*Sendera - clanti*' (Rheedee, Hort. Malab. 11:133.t.65). The plant is known today by the name *Thalaneli* (Mal.), while '*Sendera-clanti*' is not in practise (Nicolson *et al.*, 1993). This is known as 'Prasarani' in Sanskrit indicating the spreading habit of the plant or the property of the drug for stretching parts of the body, suffering from paralysis. It is used as a specific remedy in rheumatic afflictions with contraction and stiffness of the joints (Sivarajan & Indira Balachandran, 1994). It is considered to promote sexual vigour, increase semen, give body strength and youthful glow. It is used in curing piles and oedema (Aiyer & Kolammal, 1963).

The entire plant is used for medicinal purpose and the important preparations are *Prasaranyadi kasayam*, *Prasaranyadi tailam*, *Prabhanjanam kulambu*, *Balaristm* etc.

Notes. The interspecific classification of the species is a matter of dispute. Many authors divided this polymorphic complex into sub species and varieties. Clarke (1883), Hallier (1893 a,b), Trimen (1895), Cooke (1905), Gamble (1923), Ridley (1923) and others considered *Merremia tridentata* and *M.hastata* (= *Ipomoea angustifolia*) as distinct species. Ooststroom (1953) and

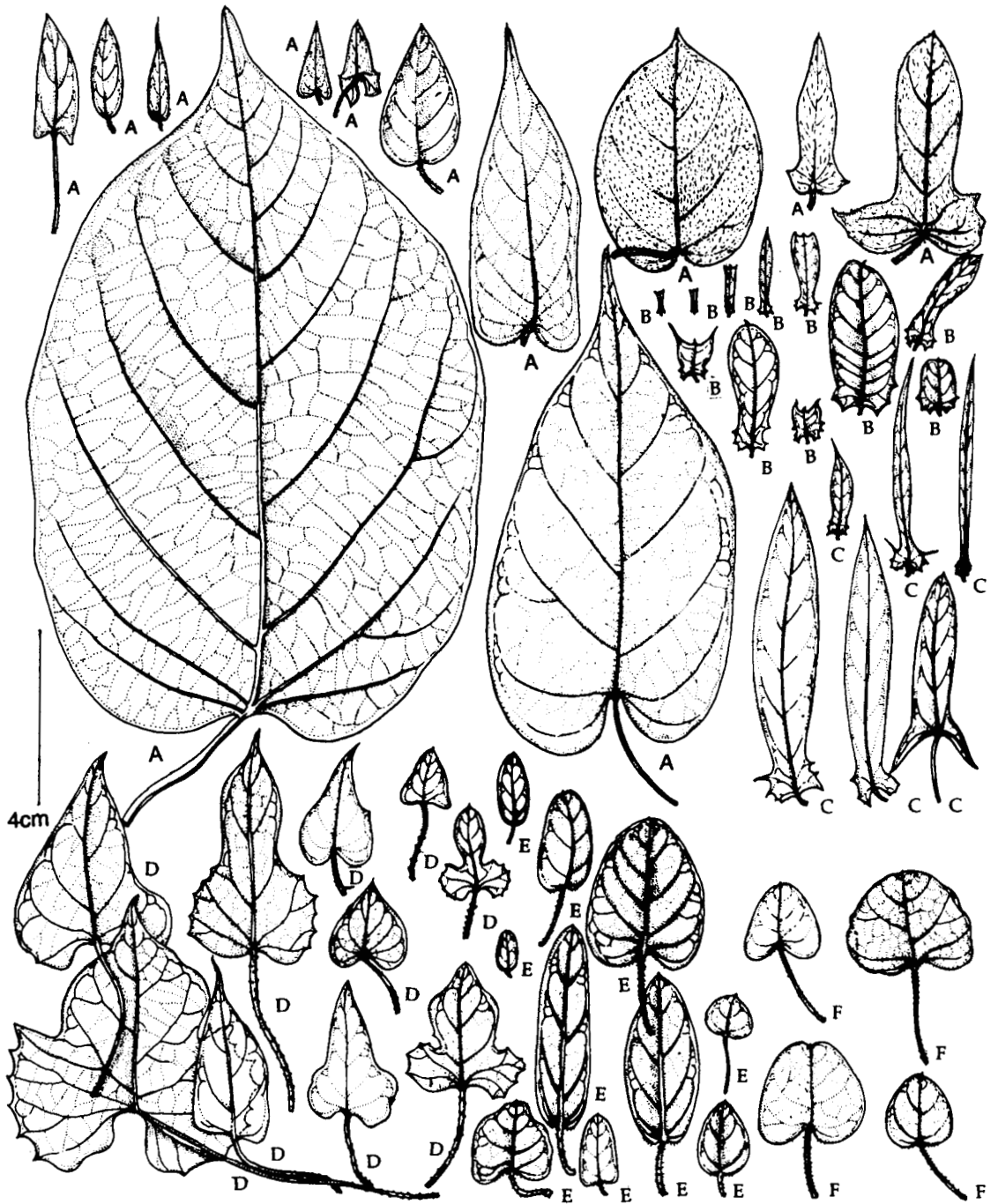


Fig. 115. Leaf variation in the genus *Merremia*. A. *M. umbellata*; B. *M. tridentata* ssp. *tridentata*; C. *M. tridentata* ssp. *angustifolia*; D. *M. hederaceae*; E. *M. hirta*; F. *M. emarginata*.

Verdcourt (1963) had attempted to divide this polymorphic complex into subspecies and varieties; their interpretations being different. Austin (1980 a) after studying this species from Ceylon considered it in a broader sense and stated that the small flowered, narrow leaf forms are the ecophenotypes and are adapted to sea-shore conditions, while the large flowered, broad leaf forms are common in inlands. Most of the authors used to distinguish the interspecific taxa by using leaf size and shape, corolla size etc. The present study highlights certain other constant morphological characters for distinguishing the taxon and for framing a trustworthy interspecific key. The seeds of sea - shore plants of subsp. *tridentata* (small, obtuse, truncate or emarginate leaf with small flowers) were collected and planted in experimental plots in inlands (Botanical Garden, Calicut University). The morphological characters of the progeny were found to be same as that of the parents. The subspecies *tridentata* and *angustifolia* are found both in inlands and lowlands. This reveals the fact that both of them are not 'ecophenotypes' but they are distinct entities.

In addition to the existing distinguishing characters of the two subspecies of *M. tridentata* viz. subsp. *tridentata* and subsp. *angustifolia*, certain other reliable characters for their identification were also observed from the present study. Pedicels are tetra or penta angled in *M. tridentata* subsp. *tridentata*, while it is terete in subsp. *angustifolia*. In subsp. *tridentata* the sepals are obtuse to emarginate and not exceeding in the capsule. But in subsp. *angustifolia*, the sepals are long acuminate and exceeding the capsule.

Austin and Staples (1980) recognized a new genus *Xenostegia* as a distinct genus from *Merremia*. The present study of this genus revealed that the discrimination between the new genus and *Merremia* is very weak and justifiably recognizable only at the intergeneric level. So the new genus *Xenostegia* Austin and Staples is united to the genus *Merremia* (see the generic discussion also).

Specimens examined : KERALA : Thiruvananthapuram Dt.: Ponmudi, Biju 25931 (CALI). Kollam Dt.: Kulathupuzha, Biju 25950 (CALI). Pathanamthitta Dt.: Konni, Bourdillon 442 (MH). Alappuzha Dt.: Vembanad, Swaminathan 88259 (MH); Kuttanadu, Biju 25957 (TBGT). Thrissur Dt.: Kandasankadavu,

Ramamurthy 47679 (MH); Kodungallor, *Biju* 44282 (CALI). Idukki Dt.: Vallakkadavu, *Vivekananthan* 48592 (MH). Palakkad Dt.: Shola Near Ayapan Kovil, *Vajravelu* 48719 (MH). Kannur Dt.: Aralam, *Ramachandran* 61626 (MH); Kalliasseri, *Ansari* 70954 (MH). TAMIL NADU : Coimbatore Dt.: *s. coll.* 35188 (MH). KARNATAKA : S.Canara Dt.: Jahsur, *Barber* 2423 (MH). ANDHRA PRADESH : Godavari Dt.: Srivaka, *Barber* 5246 (MH), *Barber* 4995 (MH).

9. *Merremia tuberosa* (Linn.) Rendle, Fl.Trop. Africa 4 (2): 104.1905; Ooststr., Blumea 3 (2): 325-326. 1939 & Fl.Mal., ser.1,4: 447.1953; Verdc., Fl. Trop.E. Africa 60.1963; Austin in Dassan. & Fosb., Rev. Handb.Fl. Ceylon 1 : 353.1980.

Type : Jamaica ?, specimen 219.4 (LINN), syntype! (not seen; microfiche seen).

Ipomoea tuberosa Linn., Sp. Pl.160.1753; Choisy in DC., Prodr. 9 : 362 .1845; Clarke in Hook. f.,Fl. Brit. India 4 : 213 . 1883; Trimen, Handb.Fl. Ceylon 3 : 224 . 1895.

Convolvulus tuberosus (Linn.) Spreng., Syst. 1 : 591 . 1825.

Convolvulus paniculatus Blanco, Fl.Filip. 96. 1837.

Operculina tuberosa (Linn.) Meisn. in Mart., Fl. Bras. 7 : 212 .1869.

Ipomoea nuda Peter in Engl.-Prantl, Nat. Pfl. fam. 4(3a):31.1891.

Ipomoea glaziovii Dammer in Engl., Bot. Jahrb. 23:40. 1897.

(Fig. 116)

Perennial herbaceous twiner; stem suffrutescent with large underground tuber, terete, robust, green, red where exposed to direct sun light, glabrous; latex gummy, white. Leaves palmately compound, leaflets 7, ovate to ovate elliptic, apically acuminate, gradually narrowed to the base, terminal one larger, 6 - 8 x 1.8 - 2.6 cm, inner 2 pairs medium, 4 - 6 x 1.8 - 3 cm , outermost pair small, 2.5 - 4 x 1 - 1.3 cm, entire, glabrous on both sides; midrib and lateral veins slightly raised beneath, lateral veins 5 - 10 pairs; petiole upto 6 cm long, canaliculate, glabrous, green. Flowers axillary, few to several flowered (2-10) cymes; peduncle upto 15 cm long, terete, glabrous; bracts

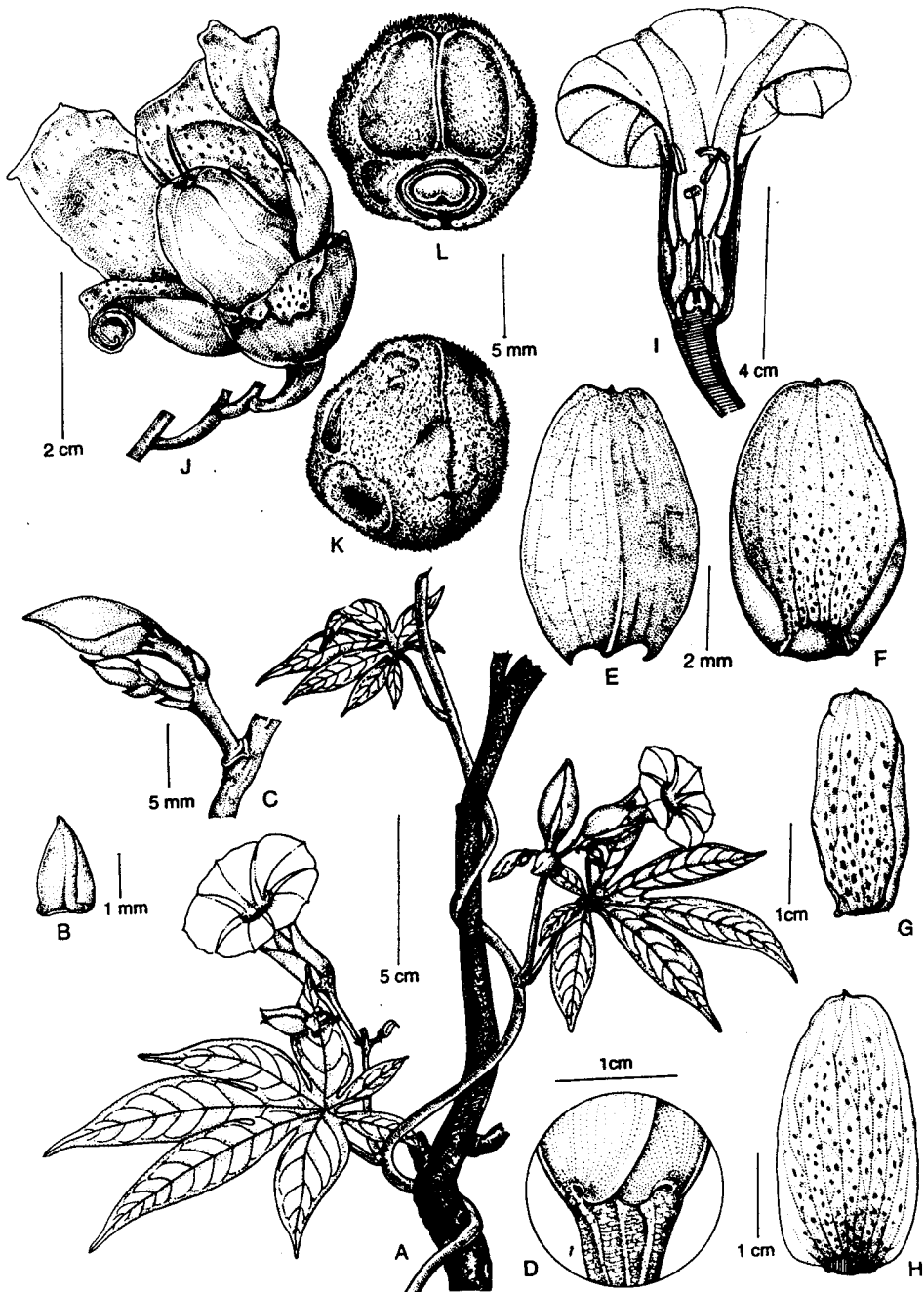


Fig. 116. *Merremia tuberosa*. A. Flowering twig; B. Bract; C. Young buds; D. Pedicellar nectary; E & F. Outer sepals (E. outside; F. inside) G & H. Inner sepals (inside); I. Flower L.S.; J. Capsule; K & L. Seeds (from Biju 20201 TBGT).

ovate-triangular, 2x1 mm, apically acute to acuminate, early caducous (seen only in very young buds); pedicels long, upto 5 cm long, terete, dilated at base, 4 - 5 angled, glabrous; sepals unequal, outer 2 larger, broadly oblong to obtuse, 3.5 - 4x2 - 2.8 cm, apically retuse - mucronate, third single medium sized, 3 x 2 cm, apically mucronate, mottled, innermost pair small, 2.6 x 1.5 cm, apically acute to acuminate, glabrous; extrafloral nectary on the base of the calyx, 4 - 5 small pores; corolla yellow, without a coloured throat, campanulate, tube 5 -6 cm long, mouth slightly 5 lobed, 6 - 6.5 cm across; stamens inserted; anthers upto 6 mm long, tip curved after dehiscence; pollen colpate; filaments white, attached 4 - 5 mm above the corolla base, subequal, 3 large, \pm 1.5 cm long, 2 small, \pm 7 mm long, white ciliolate at dilated base; ovary ovoid, whitish yellow, glabrous; disc annular, small upto 2mm long, lobed; style inserted, upto 1.2 cm long, glabrous, slightly dilated at base; stigma white, biglobose, papillate. Fruit capsular, subglobose, 2.5 - 3 x 2 - 2.5 cm, irregularly dehiscent, pericarp thin, straw coloured, fruiting sepal accrescent and subtending the capsule, 4 - 5 x 3 - 3.5 cm, the tip recurved, brownish black in colour; seeds 1 - 4, usually 2, suborbicular, 1.7 - 2 x 1 - 1.3 cm, black short tomentose, some what longer black shining hairs along the margin, ; seed germination hypogeal.

Flowering : November - January

Flower opening : 7.30 am to 8.30 am

Fruiting : January - March

Floral visitors : *Apis cerana* Fabricius, *Lasioglossum* sp.

Extra floral visitors : *Anoplolepis longipes* (Jerdon)

Distribution. Originated from tropical America, now distributed throughout tropical Africa, Mascarene Islands, India, Ceylon and Malaysia.

Ecology. It is cultivated in garden for ornamental purpose. In India it is rarely found outside cultivation. But one wild population of this plant was found in Kerala.

Ooststroom (1953) stated that the flower opening of this species is in the morning, while Austin (1980 a) contradicted this statement. Austin's study of Ceylon material revealed that in all plants, flowers opened between 11 am

and noon. But from the present study it is found that the flower opening is between 7.30 am and 9.00 am.

Use. Tuberous root known as Brazilian Jalap is a drastic purgative and used as an adulterant in Jalap (Wealth of India).

Horticultural potential. The plant commonly known as Wood Rose, is widely used in dry flower arrangement. The dried fruit is varnished or painted to give it a lustrous look. If there is ample space for it to develop, the wood rose could be used as a screening vine in tropical gardens. Different species of bees and beetles could be found hovering over the eye-catching bright yellow flowers in the early morning hours.

Specimens examined : KERALA: Thiruvananthapuram Dt.: Palode (Cult.), *Biju* 20201 (TBGT). Malappuram Dt.: Kottakkal, *Biju* 20821 (CALI), TAMIL NADU: Madras Dt.: Bidie *s.n.* (MH).

10. ***Merremia umbellata*** (Linn.) Hall.f., Bot . Jahrb. 16 : 552 . 1893; Cooke, Fl. Pres. Bombay 2 : 237.1905; Gamble, Fl.Pres. Madras, 2:926 .1923; Ooststr., Blumea 3: 333.1939 & Fl.Mal.ser. 1,4:449 . 1953; Verdc., Fl. Trop. E. Africa 54. 1963; Gandhi in Sald. & Nicolson, Fl. Hassan Dist.473.1978; Austin in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1 : 354 . 1980; Mani. & Sivar., Fl. Calicut.186.1982; Rani & Matthew in Matthew, Fl.Tam. Carnatic 3 : 1012. 1983; Mani., Fl.Silent Valley 190. 1988; Ramach. & Nair, Fl. Cannanore 306.1988; Vajravelu, Fl. Palghat Dist. 313.1990; Mohan & Henry, Fl. Thiruvananthapuram 318.1994.

Type : West Indies, Martinique, Hispaniola & Jamaica (not seen).

Convolvulus umbellatus Linn., Sp. Pl. 155.1753.

Convolvulus cymosus Desr. in Lamk., Enycl. 3 : 556.1791.

Ipomoea umbellata G. F. W. Mey., Prim. Fl. Esseq. 99. 1818; Choisy in DC., Prodr. 9 :377 . 1845.

Ipomoea cymosa (Desr.) Roem. & Schultes, Syst. Nat. 4:241. 1819; Choisy in DC., Prodr. 9:371. 1845; Clarke in Hook.f.,Fl. Brit.India 4: 211. 1883; Trimen, Handb. Fl. Ceylon 3: 219. 1895; Gagnep. et Courch in Lec., Fl. Indo - Chine 4 : 251.1915.

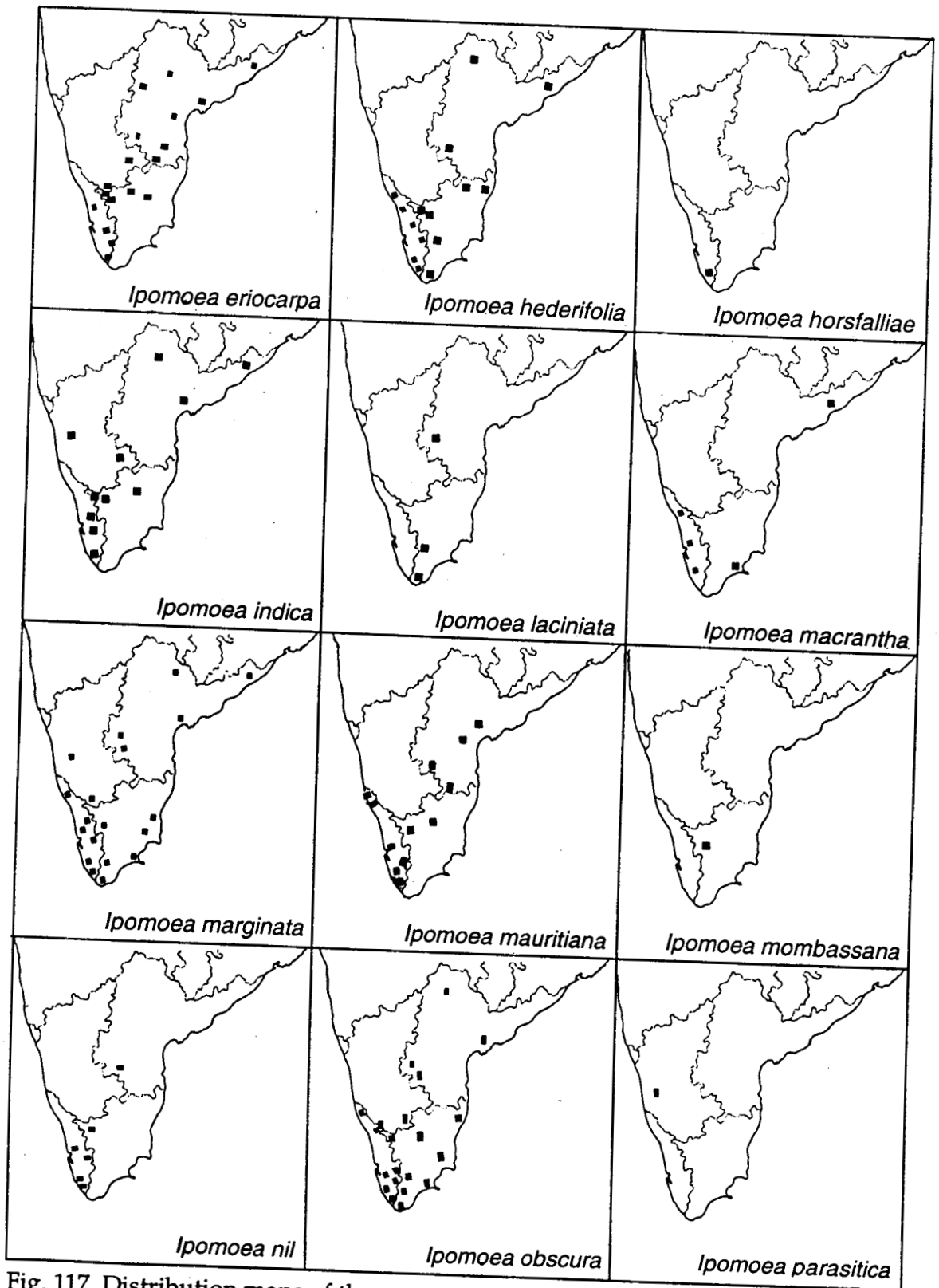


Fig. 117. Distribution maps of the genus *Ipomoea*.

Convolvulus bifidus sensu Moon, Cat.13.1824; Thw., Enum. pl.zeyl.212. 1860.

Convolvulus blandus Roxb., Fl.India 2:70. 1824; Wall., Cat. n. 1342. 1828;
Roxb.,Fl.India 1: 470 . 1832.

Convolvulus pentagonus Roxb., Fl.India 2 :72. 1824.

Merremia umbellata var. *orientalis* Hall.f. in Versl. 'sLands Pl. t. 1895 : 132. 1896.

Merremia umbellata subsp. *orientalis* (Hall.f.) Ooststr., Fl. Mal., ser. 1,4 : 449.
1953; Verdc., Fl. Trop. E. Africa 54.1963.

Vernacular names: Mal. *Kolavara valli*; Tam. *Kolavar valli*; Tel. *Catukattutivva*,
Kappativva.

(Fig. 118)

Annual or biennial herbs; stem twining or prostrate, terete or slightly striate, younger parts blackish purple, older parts green and woody, softly pubescent or glabrescent to glabrous, rooting at nodes; latex milky white. Leaves simple, variable in shape and size, ovate - oblong or oblong, 1.5 - 16 x 0.5 - 10 cm, apically long acuminate, mucronate, basally cordate, truncate, auriculate or somewhat hastate, margins entire, lower surface sparsely to densely covered with white hairs, upper surface pubescent or glabrous; mid rib and lateral veins prominently raised beneath, prominently hairy, lateral veins 5-8 pairs, tertiary veins subparallel; petiole length highly variable, 0.3-4 cm, pubescent. Flowers axillary, solitary, few to several flowered umbellate cymes; peduncle short, 0.5 -1 cm long, terete, pubescent base to glabrous above; bracts minute, caducous; pedicels upto 2 cm long, hirsute like stem, dilated at tip, a pair of extrafloral nectary on either sides; sepals more or less equal, broadly elliptic, orbicular or ovate, 8 - 10 x 6 - 7 mm, apically acuminate or mucronate, slightly emarginate, very concave, sparsely pilose on base or glabrous; corolla white, without a coloured throat, funnel-shaped, tube 2 - 2.5 cm long, mouth slightly 5 lobed, 2.8 cm across; stamens sub exserted; anthers upto 3 mm long, white, tip curved after dehiscence, anthesis between 10.40 am to 11.00 am; filament white, attached 2 - 3 mm above the corolla base, equal or subequal, 8 - 10 mm long, white ciliolate at dilated base; ovary conical, 1.5 - 2 x 1.5 -1.6 mm, glabrous; disc small, upto 1.5 mm long, annular; style subexserted, upto 2 cm long, glabrous, slightly dilated at base; stigma

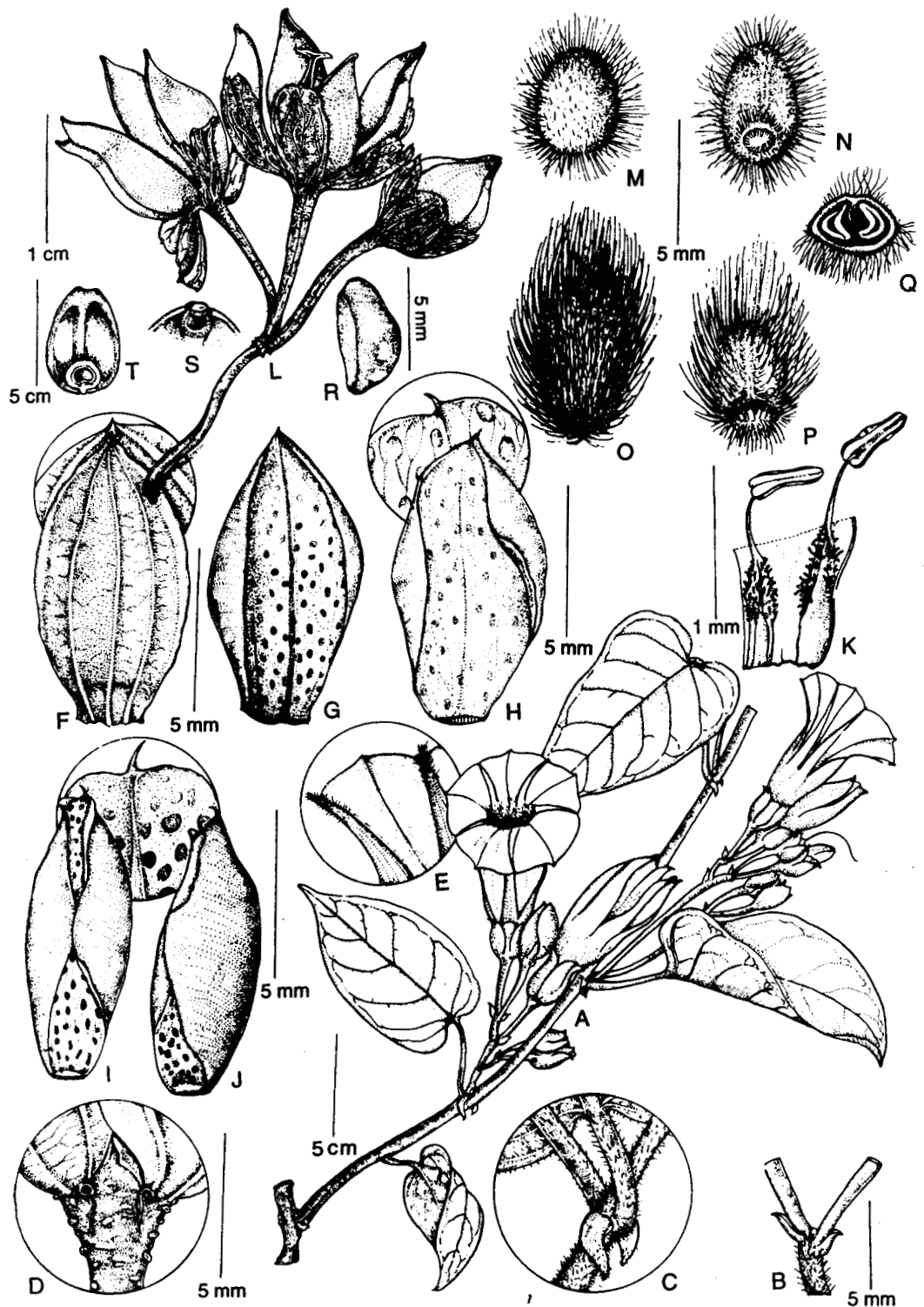


Fig. 118. *Merremia umbellata*. A. Flowering twig; B. Bracts; C. Nodes showing hook like appendage; D. Pedicellar nectary; E. Midpetaline bands showing hairiness; F-J. Sepals; K. Stamens; L. Fruits; M-P. Seeds; Q. Seed L.S.; R-T. Seeds (after removing hairs) (from Biju 25973 TBGT).

white, biglobose, papillate. Fruit capsular, ovoid to conical, 8-14 x 6-10 mm, mucronate by style base, 4 valved, valves thick, lanceolate to ovate, splitting from the tip, fruiting calyx persistent and slightly enlarged; seeds usually 4, ovate to elliptic, 6-7 x 4-5 mm, densely hairy with long and soft hairs, upto 2-3 mm long, black or brown in colour; seed germination epigeal, hypocotyl upto 1.5 cm, usually bicotyledonary, sinus upto 4 mm, petiole \pm 3 mm long.

Flowering : December - March

Flower opening : 11 am to 11.30 am

Fruiting : January - April

Floral visitors : Ants, beetles and bees.

Distribution. From India, Ceylon, Tropical E. Africa, eastwards to China and Indo-China, throughout Malaysia, Philippines, New Guinea, Queensland, in the West Indies and the tropical West Africa.

Ecology. Found in thickets, along edges of forest, grasslands, cultivated fields, along other disturbed sites from sealevel to 2000 m.

Use. Young leaves could be used as a leaf vegetable. The pounded leaves may be used as a poultice for burns and scalds (Ooststroom, 1953). It is considered useful for curing fistulae, pustules and tumours in Indonesia. Seeds yeild a mucilage which is used as a aperient and alternative in cutaneous diseases (Wealth of India).

Notes. Hallier (1897) and Ooststroom (1939, 1953) had pointed out two distinctive populations. A population in tropical America is known as subsp. *umbellata* (the var. *occidentalis* Hall.f.). Plants in tropical East Africa, India, Ceylon to China and Malaysia belong to subsp. *orientalis*. The present study pointed out the fact that in the main land of India, only the white flowered ones could be observed (subsp. *orientalis*). But certain populations in Andamans and Java with yellow flowers, subglobose fruits and pubescent seeds could also be observed. Critical study of these two populations revealed that due to the presence of distinct flower and fruit characters, both the taxa could be raised to species level. Ooststroom (1939) mentioned that the flower colour varies from white, yellow to orange. But in the mainland of India only

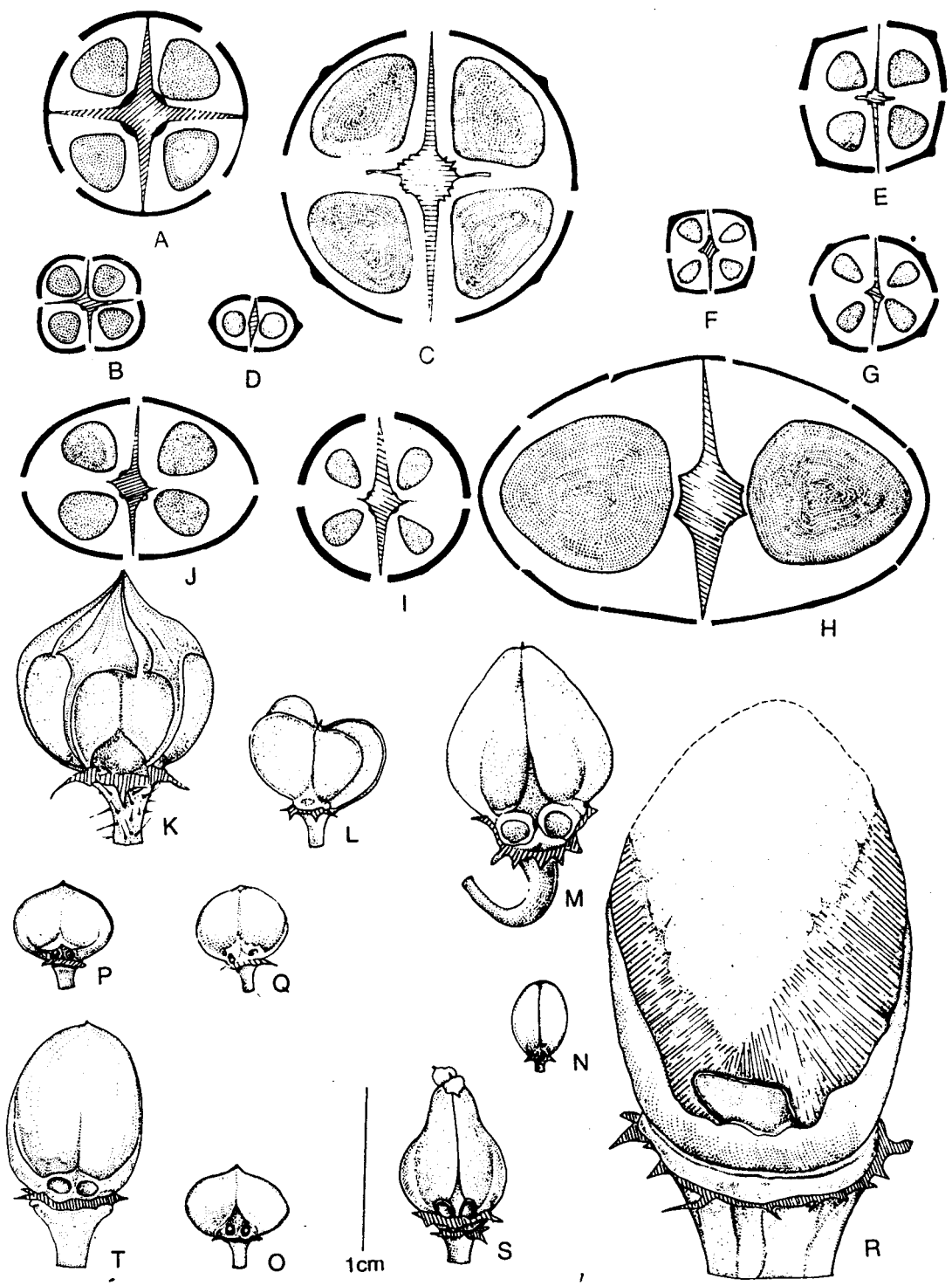


Fig. 119. Diagrammatic representation of fruit dehiscence and morphology of septum of the species of *Merremia*. A & K. *M. aegyptica*; B & L. *M. cissoides*; C & M. *M. dissecta*; D & N. *M. emarginata*; E & O. *M. hederacea*; F & P. *M. tridentata* ssp. *tridentata*; G & Q. *M. tridentata* ssp. *angustifolia*; H & R. *M. tuberosa*; J & S. *M. umbellata*; I & T. *M. vitifolia*.

the white flowered plants could be found and yellow flowered populations are seen in Andamans.

Specimens examined : KERALA : Ernakulam Dt.: Malayattor, *Biju* 25973 (TBGT), *Shetty* 33474 (MH). Kannur Dt.: Thalipparamba, *Barber* 8733 (MH); Karimbam, *Ansari* 69990 (MH). Wayanad Dt.: Chunda, *Biju* 44276 (CALI). TAMIL NADU : Kanniyakumari Dt.: Maramallai, *Henry* 53225 (MH). Coimbatore Dt.: Pundi, *Raju* 326; Anaipadi, *Raju* 20266; Vellingiri, *Sebastine* 2283 (MH). Nilgiris Dt.: Gudalur, *Deb* 31668 (MH); Devala, *Vajravelu* 43663 (MH). KARNATAKA : S.Canara Dt.: Byndoor, s. coll.s.n. (MH); *Raju* 560 (MH). ANDHRA PRADESH : W. Godavari Dt.: Rajavommangi, s, coll..s.n. (MH); *Gamble* 16081 (MH). E.Godavari Dt.: Mangapadu, *Subba Rao* 29697 (MH). Vishakhapatnam Dt.: Adapavalasa, *Subba Rao* 22624 (MH).

11. *Merremia vitifolia* (Burm.f.) Hall.f.in Engl., Bot.Jahrb.16:552. 1893; Cooke, Fl. Pres. Bombay 2 : 239. 1905; *Gamble*, Fl.Pres. Madras 2: 927.1923; Ooststr., *Blumea* 3(2): 329.1939 & Fl. Mal., ser. 1,4:448.1953; Gandhi in Sald. & Nicolson, Fl.Hassan. Dist.474.1978; *Mani.& Sivar.*, Fl. Calicut 185.1982; *Rani & Matthew* in Matthew, Fl. Tam. Carnatic 3 : 1082. 1983; *Mani.*, Fl. Silent Valley 190 . 1988; *Ramach. & Nair*, Fl. Cannanore 307.1988; *Vajravelu*, Fl.Palghat Dist. 314 . 1990.

Type : Plukenet . Phyt. 115.t. 25.f.3 (Lectotype designates here).

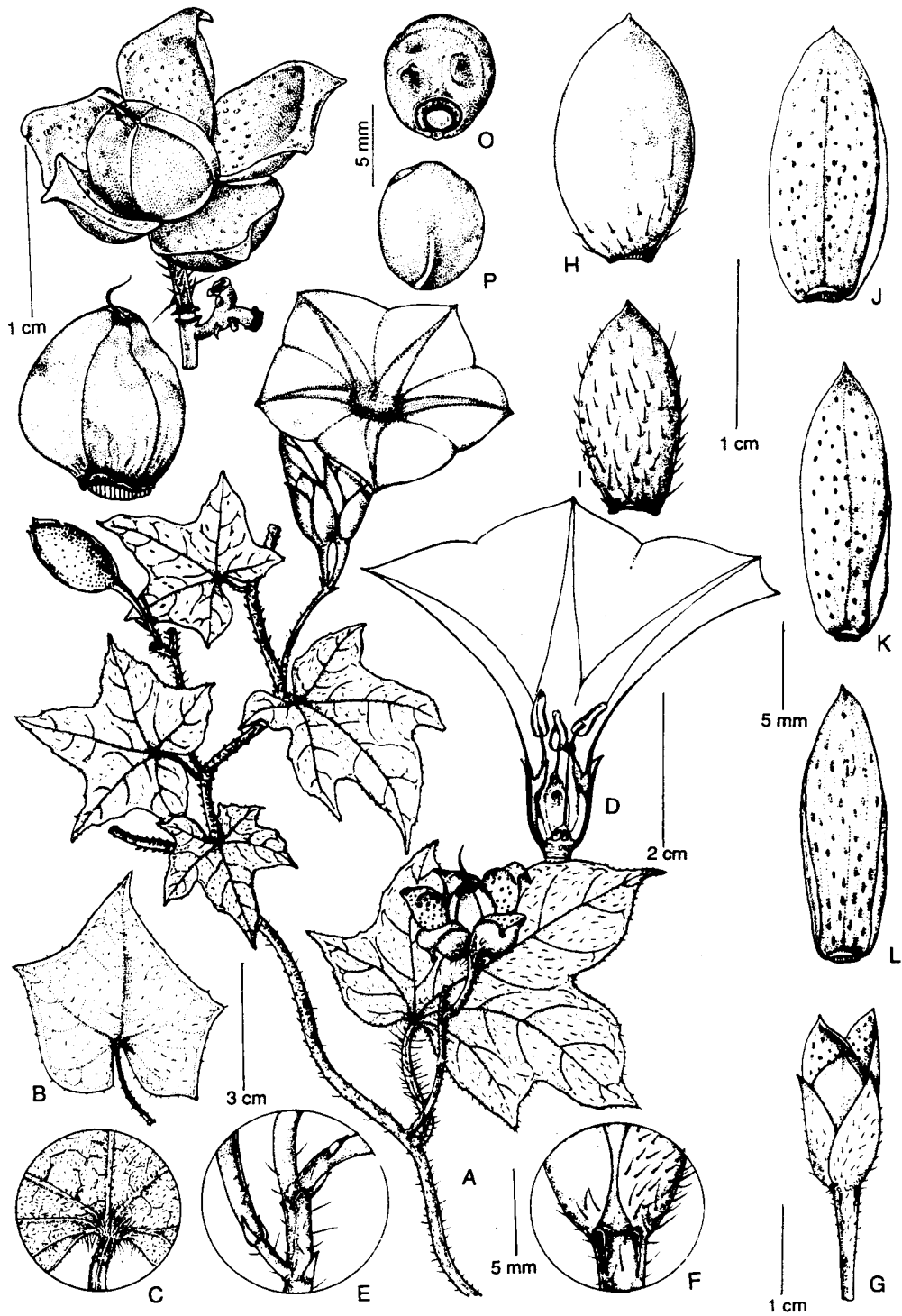
Convolvulus vitifolius Burm.f., Fl. India 45 t. 18. f.l.1768; *Roxb.*, Fl. India 2:61 . 1824; *Wall*, Cat.n. 1348. 1828; *Roxb.*, Fl. India 1 : 476 . 1832 (*C. vitifolius* Willd.).

Convolvulus angularis Burm.f., Fl. India 46, t.19, f.2. 1768.

Ipomoea vitifolia (Burm.f.) *Blume*, Bijdr.709 . 1825; *Choisy*, Mem. Soc. Phys. Geneve 6 : 454 1833; *Clarke* in Hook.f., Fl. Brit. India 4 : 213. 1883; *Trimen*, Handb. Fl. Ceylon 3. 224 . 1895.

Ipomoea vitifolia (Burm.f.) *Blume* var. *angularis*, (Burm.f.) *Choisy* in DC., Prodr. 9 : 361. 1845.

(Fig. 120, 121)



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 Fig. 105. *Merremia vitifolia*. A. Flowering and fruiting twig; B. Leaf; C. Leaf base enlarged; D. Flower L.S.; E. Pedicel and Peduncle showing bracts; F. Pedicellar nectaries; G. Calyx; H & I. Outer sepals; J-L. Inner sepals; M. Fruit; N. Capsule; O & P. Seeds (from Biju 44273 CALI).

Perennial herbs; stem twining, suffrutescent, terete, younger parts wine red, older parts green, glabrous or patently hirsute with long white or fulvous hairs, upto 6 mm long; latex milky white. Leaves simple, palmately lobed, 5-7 lobed, orbicular or shallowly deltate, 2 - 19 x 1.5 - 21 cm, apically acute or acuminate to obtuse and mucronulate, basally cordate, green, younger ones wine red, margin entire to subentire, coarsely dentate to crenate or minutely ciliolate, long ciliolate at base, sparsely to densely pubescent at both sides, sometimes glabrous above, densely long hirsute at cordate base; midrib and lateral veins raised beneath, glabrous or long hirsute; petiole highly variable, 1 - 20 cm long, green or wine red, glabrous or hirsute like stem, canaliculate, muricate at base. Flowers axillary, 1 - 4 flowered cymes; peduncle 1.5 - 10 cm long, terete, patently hirsute; bracts lanceolate, 2 x 1 mm, apically acute to acuminate, hirsute, caducous; pedicels upto 2.2 cm long, hirsute, dilated at base; extrafloral nectary above the pedicel and just below the calyx lobes, 3 or 4 in number; sepals unequal, outer 1 small, oblong to ovate, 1.2 - 2 x 0.3 - 1.2 cm, apically obtuse or acutish, hirsute on the outer surface, hairs upto 5 mm long, bulbous base, glabrous within, second slightly longer, oblong to ovate - oblong, 2.2 - 2.3 x 0.9 - 1.5 cm, apically obtuse or acutish, hirsute from base to middle on the outer surface, glabrous within, mottled, inner 3 small, ovate - oblong, 1.5 - 2.5 x 0.6 - 1 cm, apically acutish, mucronulate, glabrous, mottled within; corolla yellow, pale towards the base, campanulate, tube 4-5 cm long, mouth slightly 5 lobed, 5 - 6 cm across; stamens inserted; anthers upto 6 mm long, tip curved after dehiscence, anthesis between 10 - 10.30 am; filaments white, attached 5 - 7 mm above the corolla base, subequal, 3 large, 7 - 8 mm long, 2 small, 5 - 6 mm long, white ciliolate at the dilated base; ovary ovoid, 1.5 - 2 x 1 - 1.5 mm, glabrous; disc annular, slightly 5 lobed; style inserted, upto 1.5 cm long, usually simple, rarely bifid, sparsely long white hirsute, upto 4 mm long; stigma white, biglobose, papillate. Fruits capsular, subglobose or widely ovate, 0.9 - 1.5 x 1 - 1.3 cm, persistent style base, pericarp papery, straw coloured, valvular dehiscent, endocarp thin, transparent, fruiting calyx persistent and slightly enlarged, upto 2.2 x 0.7 cm, tip recurved, brownish black in colour; seeds usually 4, sometimes reduced to 3 or 2, suborbicular, 7 - 9 x 5 - 7 mm, glabrous; seed germination epigeal, hypocotyl upto 6 mm, usually bicotyledonary, sinus 4 mm, glabrous, petiole \pm 3 mm.

Flowering : November - March

Flower opening : 8 am to 9 am

Fruiting : December - April

Floral visitors : Bees and ants

Distribution. From India and Ceylon to Indo - China and Andamans, throughout Malaysia.

Ecology. It is a common species found throughout South India. Plants have been reported from grasslands, thickets and hedges along the fields, in forests, river banks and waysides, from sea level to 2000 m.

Use. It is used for poulticing and an infusion is drunk for high fever (Ooststroom, 1953.) The plant is used as a cure for strangury and urethral discharges. The juice of the plant is considered a cooling and diuretic agent (Wealth of India).

Horticultural potential . It is a fast growing plant and is suitable for covering walls, trellises and pergolas. The young leaves which are wine red in colour and the gorgeous yellow flowers make the plant truly beautiful. Fruits are the miniature form of Woodrose (*M.tuberosa*) and could be used in dry flower arrangement.

Nomenclatural note. *Convolvulus vitifolius* [= *Merremia vitifolia* (Burm.f.) Hall.f.] was first reported by Burman (1768), who described and illustrated it as "*foliis palmatis quinquelobis glabris dentatis, caule piloso*". In this protologue he mentioned the D. Garzin's specimen and also a citation of Plukenet illustration (*Plukn.phyt.115.t. 25.f.3.*) apart from the plate appeared in *Flora India*. He also described another species *Convolvulus angularis* Burm.f. with a new diagnostic phrase name "*Convolvulus angularis caule volubili, foliis cordatis quinquangularibus tomentosiss, pedunculis trifloris*" and he mentioned the D.Pryon's specimen.

Taxonomic status of *Convolvulus angularis* Burm.f. has been interpreted in different manners by different authors. Choisy (1845) considered it as a variety of *Ipomoea vitifolia* (Burm.f.) Blume[=*Merremia vitifolia* (Burm.f.) Hall.f.]. Ooststroom (1939) included it in *Merremia vitifolia*. The present study

supported Ooststroom, as this species is highly variable especially the leaf shape, size, hairiness, inflorescence nature and size and shape of the capsule. For solving this problem a study of the type material was found essential. For this matter, we contacted the Geneva herbarium (G) seeking for the type material. Dr. A. Charpin, kindly informed that their herbarium has no 'type' (Garzin) specimen of *Convolvulus vitifolius* Burm.f. In its absence the only possible original element would appear to be the figure published by Plukenet (t.25.f.3). So it is accepted as the syntype and the plate would be a reasonable choice. Dr. B. Verdcourt (K) agrees with this observation and wrote back ".... in the case of *C.vitifolius* there is the Garzin specimen and also a citation of Plukenet.....It is also possible that the specimen of this Plukenet plate is drawn from Sloane's herbarium at the BM. Most of the Plukenet herbarium was bought by Sloane and it was a very large collection. The searching out of Sloane's herbarium for a particular specimen is a very difficult task."

The description of *Convolvulus vitifolius* (= *Merremia vitifolia*) is a good match for the illustration. We here designate the 'plate' appeared in Plukenet, Phyt. 115.t.25.f.3. as the lectotype.

Lectotype (here designates). Plukenet, Phyt.115.t.25.f.3 (K. Photo!).

Specimens examined : KERALA : Thiruvananthapuram Dt.: Ponmudi, Biju 44273 (CALI). Pathanamthitta Dt.: Konni, Biju 25920 (CALI). Idukki Dt.: Meenmutti, Mohan 73282 (MH). Ernakulam Dt.: Malayattor, Shetty 33475 (MH). Thrissur Dt.: Adirapalli, Subramanyan 26728 (MH). Palakkad Dt.: Kalkkupadi, Vajravelu 59176 (MH). Kannur Dt.: Kuthuparamba, Biju 15327 (CALI); Thaliparambu, Barber 8734 (MH). TAMIL NADU : Kanniyakumari Dt.: Balamore, Henry 52478 (MH). Salem Dt.: Yercaud, Deb 31454 (MH). Nilgiris Dt.: Poolakkapara, Ellis 37721 (MH). N.Arcot Dt.: Mangalam R. F., Viswanathan 923 (MH). KARNATAKA : S.Canara Dt.: Subramanyan s.n. (MH). ANDHRA PRADESH : E.Godavari Dt.: Dorkarayi, Subba Rao 29694 (MH). Vishakhapatnam Dt.: Adapavalasa, Subba Rao 22622 (MH).

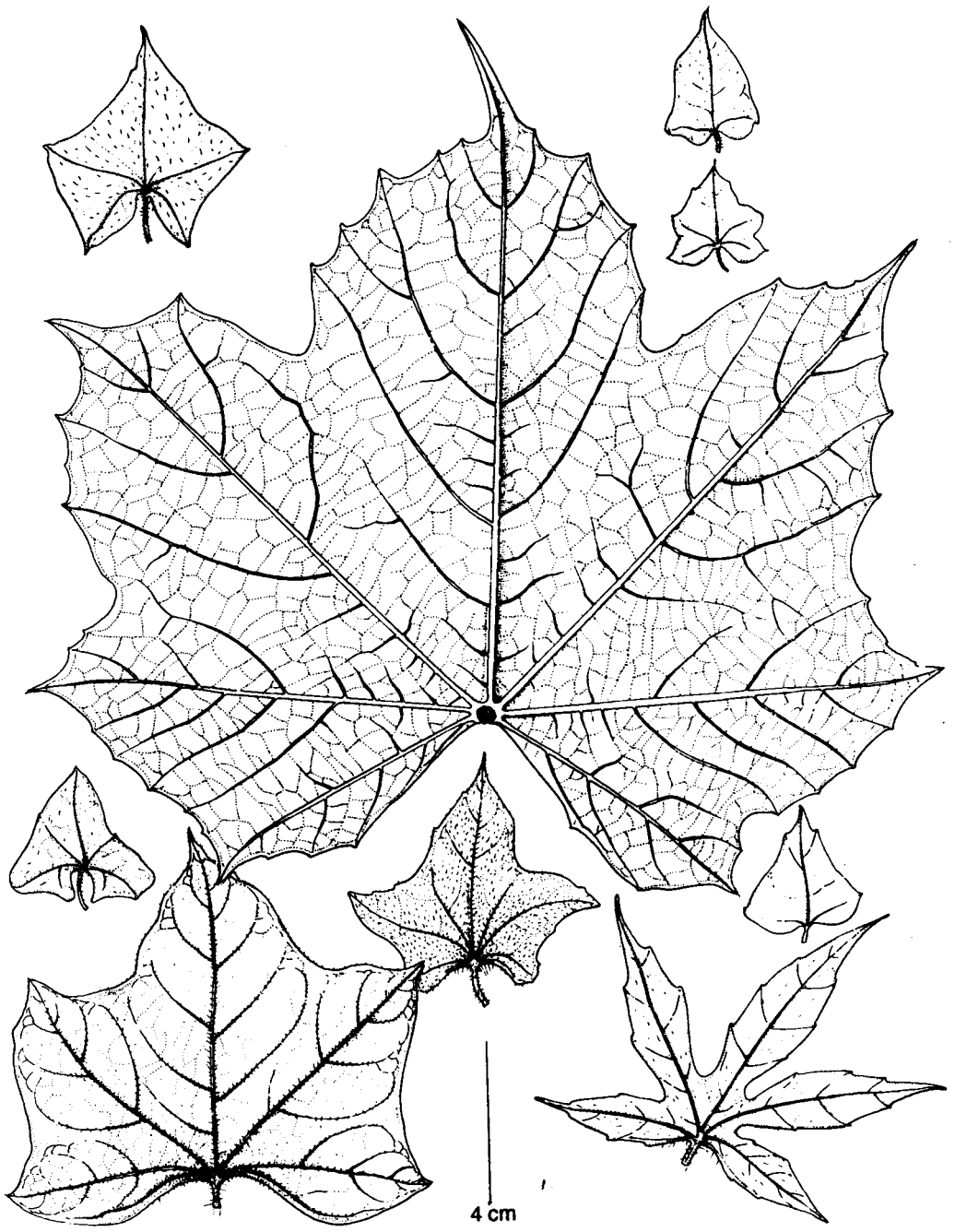


Fig. 121. Leaf variation in *Merremia vitifolia*.

NEUROPELTIS Wall.

Neuropeltis is a small genus of about 7 species. Wallich (1824) established this genus with a single species, *N. racemosa*.

Beddome (1874), Clarke (1883), Cooke (1905) and Gamble (1923) included this species in their respective floras. Ooststroom (1942) made a detailed study of Asiatic members of this genus and stated that "species from the west coast of British India (Kanara, Malabar) also appeared to be different from *N. racemosa*, under which name they are mentioned by Beddome, Clarke, Cooke and Gamble." He attributed a new name for the Indian material as *N. malabarica* based on Beddome 326 from Malabar.

Neuropeltis malabarica is easily distinguished from *N. racemosa* by its glabrous filament base, much longer style and large flowering bracts. According to Ooststroom (1942) the distribution of *N. racemosa* is restricted to Ternasserim, Malay Peninsula and Borneo. Unfortunately, during the present study we could not collect the species and for this work we are depending on the observation and concept of Ooststroom (1942) and Sasi. & Sivar. (1996) for the time being. Detailed study is required to reach an authentic conclusion.

The name *Neuropeltis* is derived from the greek '*Neuro*' meaning nerve and '*peltis*' meaning shield, indicating the conspicuously veined shield shaped bracts.

Neuropeltis Wall. in Roxb. Fl. Ind. ed. Carey & Wall. 2:43.1824; Clarke in Hook, f. Fl. Brit. India 4:224. 1883; Cooke, Fl. Pres. Bombay 2:227. 1905; Gamble, Fl. Pres. Madras 2:921. 1923; Ooststr., Blumea 3: 80. 1938; Blumea 5:268.1942 & Fl.Mal., ser. 1,4:400.1953.

Type species: *Neuropeltis racemosa* Wall.

Perennial large twiners; stem woody, glabrous or rufous-tomentose. Leaves simple, coriaceous, elliptic, ovate or oblong. Flowers axillary, few to several flowered racemes or subpaniculate towards the end of branches; bracts under the calyx inconspicuous in flower, much enlarged in fruit, reticulately nerved; sepals 5, suborbicular, subequal, enlarged in fruit; corolla broadly

campanulate, deeply 5-lobed, lobes induplicate-valvate in bud; stamens exerted, adnate to the base of corolla; filaments filiform; anthers oblong; pollen smooth; ovary 2-celled, 4-ovuled, hairy; style 2, free, short; stigma large, globose. Fruits capsular, glabrous, 1-celled, 4-valved; seeds globose, glabrous, dull black.

Distribution and Ecology. A small genus of about 11 species, of which 7 species occur in West tropical Africa from Upper Guinea to Portuguese Congo and 4 in tropical Asia on the West coast of India, and in South East Asia from Siam, Tenasserim, Indo-China and Hainan to Malaysia (Ooststroom, 1953). Ecology not known.

Neuropeltis malabarica Ooststr., *Blumea* 5(1) : 272-273.1942; Sasi & Sivar. Flo. Pl. Thrissor Forest 313.1996.

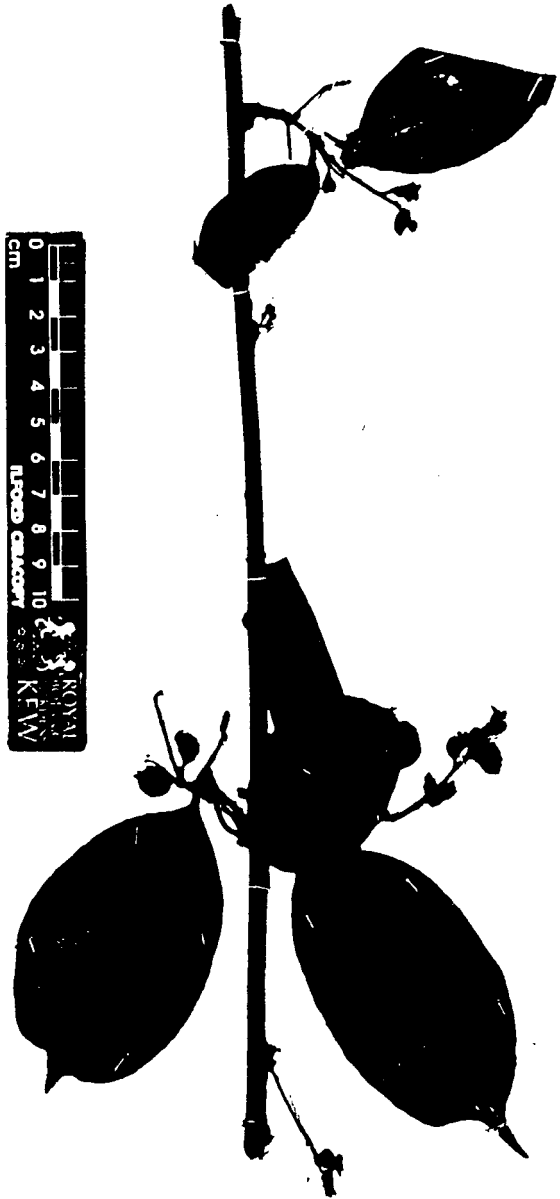
Type : India, Malabar, *Beddome* 326 (holotype, K).

Neuropeltis racemosa auct.; *Beddome*, Ic. Plant. India Orient. I :68, t.291. 1874; Clarke in Hook.f., Fl. Brit. India 4:225.1883; Cooke, Fl. Pres. Bombay 2:227. 1905; Gamble. Fl. Pres. Madras 2:922.1923, non Wall.

(Fig. 122)

Perennial woody twiner; stem terete, shortly tomentose or pubescent, glabrous in age. Leaves simple, elliptic or oblong, 7-10 x 3.5-6 cm, apically acute to acuminate, younger ones more or less rusty pubescent, glabrous in age, basally acute, coriaceous; midrib and lateral veins raised beneath, lateral veins 6-9 pairs; petiole upto 3 cm long. Flowers axillary or from the scars of fallen leaves, solitary to few flowered racemes; pedicels short, upto 5 mm long, densely rufous-hairy; bracts small, upto 5 mm long at flowering time, ovate, apically acute, mucronulate, densely rufous-hairy, ultimately glabrous, veined, enlarged in fruit; sepals 5, suborbicular to elliptic, 2-3 mm long, ciliate; corolla campanulate, tube upto 3-4 mm long, lobes deeply divided below the middle, lobes oblong, outside rufous-villous, veined; stamens 5, exerted; anthers oblong, sagittate; filaments filiform, glabrous; ovary subglobose, hairy; style 2, filiform, 2-3 mm long; stigma subglobose, glabrous; seeds subglobose, glabrous, black.

P



V. Kanaria
 2-35
Neuropeltis parvifolia, Oost.
 Herb. Kew.

HERBARIUM KEWENSE
 HERBARIUM OF THE ROYAL BOTANIC GARDENS KEW
 Presented July, 1925

Fig. 122. Type specimen of *Neuropeltis malabarica* Ooststr. : India, Malabar, *Beddome* 326 (K).

Flowering : January - February (Cooke), October (Beddome)

Fruiting : February (Talbot)

Distribution. *Neuropeltis malabarica* is endemic and the rarest member of the family in Peninsular India. It was reported only from Malabar and S.Kanara.

Ecology. It is said to be occurring in evergreen forests of N.Kanara (Talbot).

Specimens examined : INDIA: Malabar, *Beddome* 326 (K).

OPERCULINA S. Manso

The generic status of this genus is a matter of discussion. The initial genus concept of *Merremia* and its delimitation from the genus *Operculina* was not clear. Rendle ((1905) found that *Operculina* was not worthy of recognition and he included it in the genus *Merremia*. Shah *et al.* (1977) and Rani and Matthew (1983) included this genus under *Merremia* without mentioning any reason. Austin (1980 a, 1982 a) states that only the flowering specimens of this genus are difficult to distinguish from *Merremia*, but he agrees that the fruit morphology is very characteristic for the separation of both genera. Nevertheless he emphasizes that the entire assemblage has the same facies as *Merremia* and perhaps should be considered as a subdivision of the genus. Ooststroom (1939, 1953) distinguished the genus *Operculina* from *Merremia*, on the basis of fruit morphology. The genus *Operculina*, has fruits with 2 distinct layers. The outer one, the epicarp is more or less fleshy in the upper part which is the lid or operculum and is circumscissile, while the endocarp which is scarious, remains at first entire and splits at length irregularly. This explanation is clear and there is no reason to unite the genera, *Merremia* and *Operculina* as has been done by some authors. Verdcourt (1963) and Ferguson *et al.* (1977) agrees with the generic concept of Ooststroom. The present study also supports the view of Ooststroom (1939), Verdcourt (1963) and Ferguson *et al.* (1977), that this genus is well characterized from *Merremia* for its remarkable fruit characters.

Peter (1891) divided the genus into 3 sections - *Pteropodae*, *Apterae* and *Digitatae*, based on leaf shape and winged nature of peduncle. But the winged nature of the stem and peduncle are not found constant and highly variable.

Operculina S.Manso, Enum. Subst.Bras.16. 1836; Hall.f., Engl., Bot.Jahrb. 16:582.1893; Ooststr., Blumea 3:361. 1939 & Fl. Mal., ser.1, 4:454 1953; Verdc., Fl.Trop. E.Africa 61.1963; Austin in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1:356.1980.

Type species: *Operculina convolvulus* S. Manso

Spiranthera Boj., Hort. Maurit.226.1837.

Piptostegia Reichb., Nom. 113.1841.

Small to large perennial vines; stem woody, often winged. Leaves entire, angular, digitate or lobed, often cordate. Flowers axillary, solitary to few flowered cymes; bracts often large, caducous; sepals 5, subequal, pergameneous to coriaceous, brown, sometimes mottled, enlarged in fruit and becoming coriaceous, often irregularly arose on the margins; corolla large, broadly campanulate, funnelform or salverform, white or yellowish white; stamens and style inserted; anthers large, spirally twisted; filaments subequal, mostly with white ciliolate at base; pollen smooth, 3-colpate; ovary glabrous, bilocular, each locule biovulate; disc annular; style filiform; stigma biglobose. Fruit large, capsule, epicarp circumscissile, upperpart (lid or operculum) more or less fleshy, endocarp scarious, splits irregularly; seeds 4 or less, large, trigonous or globular, glabrous or pubescent, black.

Distribution and Ecology . About 15 species are found throughout the tropics.

KEY TO THE SPECIES

- 1a. Outer sepals apically emarginate; midpetaline
bands of corolla pilose.1. *O. petaloidea*
- 1b. Outer sepals apically acute to acuminate;
midpetaline bands glabrous.....2



Plate 7. A & B. *Merremia tuberosa* C. *Merremia umbellata* D. *Merremia vitifolia* E & F. *Operculina turpethum* G & H. *Operculina ventricosa*.

- 2a. Stem hollow, always terete. Flowers white; sepals green, mottled only inside; operculum covering upper half of mature fruit.....3. **O. ventricosa**
- 2b. Stem not hollow, often winged. Flowers cream or whitish yellow; sepals greenish purple, mottled on both sides; operculum covers only the upper part of mature fruit.....2. **O. turpethum**

1. Operculina petaloidea (Choisy) Ooststr., Blumea, 3(2):369.1939.

Type : not found.

Convolvulus crispatus Wall., Cat.n.1403. 1828 (nomen nudum).

Ipomoea petaloidea Choisy, Mem.Soc.Phys. Geneve 6:451.1833.; Clarke in Hook. f., Fl. Brit. India 4:212. 1883.

Merremia petaloidea (Choisy) Boerl., Handl. Fl.Ned. Ind. 2:509.1899.

Merremia crispatula (Wall.) Prain, Bengal Pl. 2:730.

Perennial vines; stem robust, herbaceous towards tips, twining, terete, reddish brown when dry, glabrous; latex gummy. Leaves simple, ovate, 5-7 x 2-4 cm, apically acute, apiculate or mucronulate, basally truncate, margin entire, glabrous on both sides; midrib and lateral veins prominently raised beneath, primary veins 7-8 pairs; petiole upto 2cm long, glabrous. Flowers axillary, 1-few flowered cymes; peduncle upto 4 cm long, terete, glabrous; bracts small, lanceolate, concave, 4-5 x 1-2 mm, apically mucronulate, glabrous; pedicels upto 3 cm long, terete; sepals unequal, outer 3 large, orbicular, apically retuse, shortly emarginate and minutely mucronate at the apex, glabrous, inner 2 small, broadly elliptic, 1-1.5 x 0.7-0.9 cm, apically obtuse, mucronulate; corolla white, broadly funnel shaped, corolla tube upto 3.5 cm long, mouth five lobed, 2-2.8 cm across, midpetaline bands pilose; stamens inserted; anthers upto 6 mm long, yellowish white, spirally twisted after dehiscence; filaments attached 6 mm above the corolla base, subequal, upto 1.9 cm long, dilated base papillose; ovary conical, 2.5 x 1.5 mm, sparsely long hairy above; disc small, \pm 1 mm; style single, inserted, upto 1.8 cm long, glabrous, dilated at base; stigma white, biglobose, \pm 1 x 2mm, papillate. Fruit not seen.

Flowering : January - March

Fruiting : not known

Distribution. In Peninsular India this species is distributed in Andhra Pradesh.

Ecology. *Operculina petaloidea* is collected from the scrub jungle of Adilabad district.

Specimen examined : ANDHRA PRADESH: Adilabad Dt.: Sirpur, *Joshi* 16265 (TBGT).

2. *Operculina turpethum* (Linn.) S. Manso, Enum. Subst. Bras. 16. 1836; Hall. f. in Engl., Bot. Jahrb. 18:120.1894; Cooke, Fl. Bombay 2: 240. 1905; Gamble, Fl. Pres. Madras 2:929. 1923; Ooststr., Blumea 3: 362.1939 & Fl.Mal., ser. 1,4 : 456. 1953; Verdc., Fl.Trop. E. Africa 61.1963; Ferguson *et al.*, Kew Bull. 31(4):763.1977; Austin in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1:356. 1980.

Type : Ceylon, *Hermann* Herb.2:68 (BM lectotype fide Verdcourt), *Hermann* Herb. 2: 135 (L isolectotype)

Convolvulus turpethum Linn., Sp. Pl.155.1753; Roxb., Fl.Ind.ed. Carey and Wall.2:57. 1824.

Convolvulus anceps Linn., Mant. 1:43.1767; Vahl, Symb.3:31.1794.

Ipomoea turpethum (Linn.) R.Br., Prodr. 1:485.1810; Choisy, Mem. Soc. Phys. Geneve 6:450. 1833; Clarke in Hook.f., Fl.Brit.India 4: 212. 1883; Trimen, Handb. Fl.Ceylon 3:222.1895.

Ipomoea anceps (Linn.) Roem. & Schultes, Syst. Nat. 4: 231. 1819; Choisy, Mem. Soc.Phys.Geneve 6:450.1833.

Ipomoea triquetra (Vahl) Roem.& Schultes, Syst.Nat. 4:231.1819; Choisy in DC., Prodr.9:360. 1845.

Spiranthera turpethum (Linn.) Boj., Hort. Maurit. 226. 1837.

Convolvulus maximus Blanco, Fl.Filip. 1:91. 1837.

Ipomoea reptans Llanos, Fragm. Pl. Filip. 55. 1851.

Ipomoea ventricosa Llanos, Fragm. Pl. Filip. 56. 1851.

Argyreia alulata Miq., Fl. Ned.Ind. 2: 587. 1857.

Argyreia alata Montr. Mem. Acad. Lyon 10: 236. 1860.

Operculina turpethum (Linn.) Peter in Engl. - Prantl, Nat.Pfl. fam. 4(3a): 32. 1891.

Ipomoea diplocalyx Baker, Kew Bull. 71. 1894.

Merremia turpethum (Linn.) Rendle in This.-Dyer, Fl. Trop. Africa 4(2): 102. 1905.

Merremia turpethum (Linn.) Shah & Bhatt, Journ. Bombay Nat. Hist. Soc. , 74(3): 567. 1977; Rani & Matthew in Matthew, Fl. Tam. Carnatic, 3: 1039.1983.

Vernacular names : Mal. *Chivaka, Trikolpakonna, Tribhandi*;
Tam. *Shivadi, Kumbam*; Tel. *Tellateghda*; Sanskrit. *Trivrit*

(Fig. 123, 124, 125)

Perennial herb; stem robust, herbaceous towards tip, twining, generally winged (rarely terete), 3-5 angled, wings purplish, stem green, sulcate or 3-5 angular, often strongly contorted, upto 3 cm in diameter, glabrous or sparsely pilose; latex gummy. Leaves simple or rarely lobed, variable in form, orbicular, broad-ovate to ovate-lanceolate or lanceolate, 3-10 x 2.5 - 12 cm, apically acute to acuminate or obtuse, mucronulate, basally cordate, margin entire, dentate or slightly lobed, glabrous or pilose above, pubescent beneath; midrib and lateral veins prominent beneath, prominently pilose, primary veins 8-10 pairs; petiole 1.5 to 10.5 cm long, pubescent. Flowers axillary, 1- few flowered cymes; peduncle upto 9 cm long, terete, glabrous or pubescent; bracts large, oblong or elliptic oblong, concave, 1.5- 2.2 x 0.3 - 0.5cm, apically mucronulate, pubescent, short ciliate at the margin; pedicels upto 2 cm long, 4 angled, pubescent; sepals unequal, outer 3 large, broadly ovate, 2.3 - 2.5 x 1-1.5 cm, apically acute to short acuminate, mucronulate, purplish green, bothsides mottled, pubescent, inner 2 small, ovate, 1.8 - 2 x 1-1.3 cm, widely acute to acuminate, pale green, mottled, glabrous; corolla white to cream or yellowish white, broadly funnel shaped, corolla tube upto 3.2 cm long, mouth slightly five lobed, 4-4.3 cm, across; stamens inserted; anthers upto 6 mm long, yellowish white, spirally twisted after dehiscence; filaments attached 1 cm

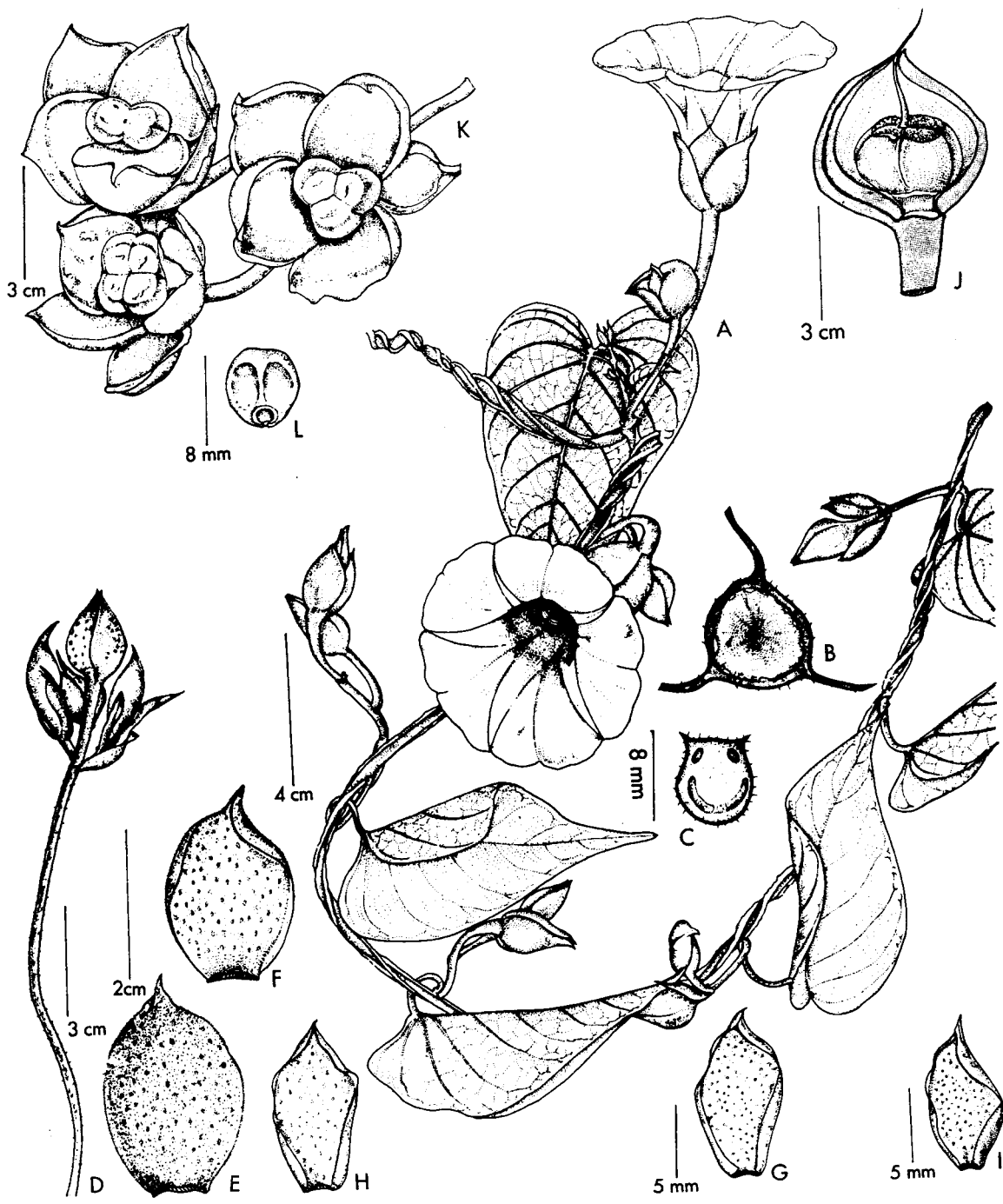


Fig. 123. *Operculina turpethum*. A. Flowering twig; B. Stem C.S.; C. Petiole C.S.; D. Flower buds in peduncle; E & F. Outer sepals; G-I. Inner sepals; J. Fruit L.S.; K. Dry fruits; L. Seed (from *Biju* 25935 TBGT)

above the corolla base, equal, upto 1.3 cm long, dilated base papillose; ovary globular, 1-1.3 x 1.8-2.1 mm, glabrous, disc slightly lobed, yellowish white, 1.5-2 mm long; style single, inserted, upto 1.8 cm long, glabrous, dilated at base; stigma white, biglobose, 1-1.3 x 2-2.2 mm, papillate. Fruits capsular, depressed globose, 1-1.8 x 1.8-2 cm, the epicarp circumscissile, operculum yellowish green in fresh, 5 x 10 mm, turns to grey when dry, 3-4 x 7 - 8 mm, splits around the middle of the capsule, crowned with a persistent style base, upto 7 mm long ; endocarp scarious, transparent, irregularly dehiscent; peduncle and pedicles enlarged, fruiting sepal accrescent and subtending the capsule, 2 - 2.5 x 1.2 - 1.5 cm, the tip recurved, straw coloured; seeds 4, rarely 2 or 3, orbicular, 5-7 x 4-6 mm, glabrous, black; seed germination epigeal, hypocotyl upto 1.5 cm long, bicotyledonary, petiole \pm 1.2 cm, sinus upto 2 cm deep, basally cordate, glabrous, midvein and lateral veins raised beneath.

Flowering : November - January

Flower opening : 10 am - 10.30 am

Fruiting : January - March

Floral visitors : Bees and Ants. Bees are seen very frequently and are supposed to be effective pollinators.

Distribution. Tropical East Africa, Mascarenes, Seychelles, India, Ceylon, Burma, Indo - China, Malaysia, tropical Australia, Polynesia; introduced in many countries like West Indian islands etc.

The high demand for this plant in the Ayurvedic system of medicine paved the way to its depletion due to over exploitation. The fast development of Urban areas disturbed the natural habitat of the plant. Hence certain cultivation measures have to be taken to preserve this highly medicinal plant.

Ecology. Found in waste sites of disturbed areas.

Medicinal use. Indian Ayurvedic physicians used this plant in the name of *Trivrti*, *Tribhandi*, *Trivrita* or *Triputa*, indicative of probably the 3 layered bark (Sivarajan & Indira Balachandran, 1994). Austin (1982 b) mentioned 5 names in Sanskrit for this plant - *Trivrit* or *Trivrita*, *Triputa*, *Tribhundee*, *Puripakinee* and *Nisrita*; but commonly refer to *Trivrit* or *Trivrittha*. *Trivrit* is composed of

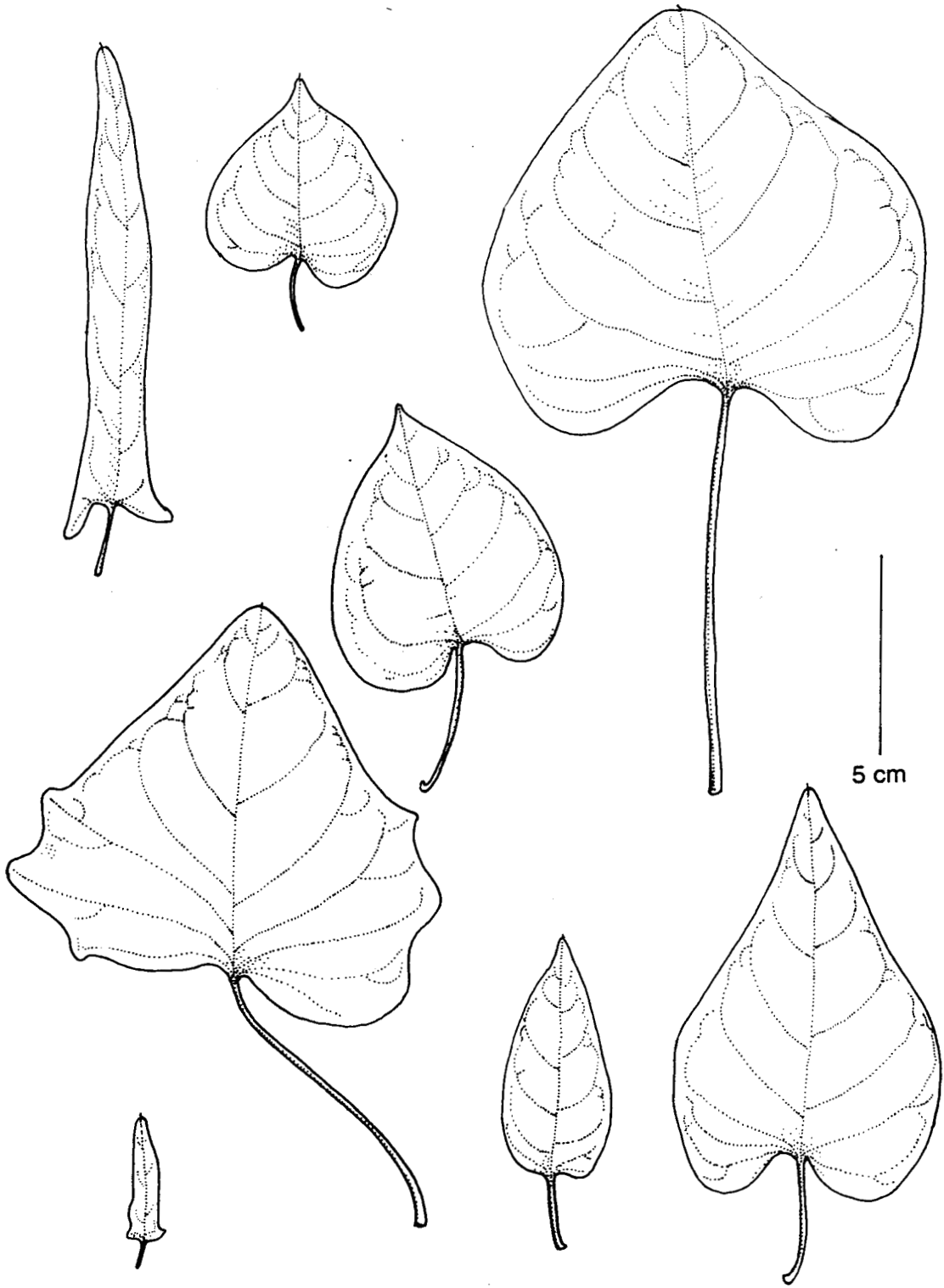


Fig. 124. Leaf variation in *Operculina turpethum*.

'tri' means 3 and 'vir' means to cherish or vritti activity; hence a cherishing action on the 3 humors. Extracts of *Operculina turpethum* have been used to achieve two types of results: as a purgative to reduce or balance humors and reduce fevers (Austin, 1982 b). Root and root bark are cathartic, purgative and are particularly useful in rheumatic and paralytic affections (Nadkarni, 1954). The plant is useful in treating dropsy, eye diseases, oedema, hepatic, haemophilic disorders, jaundice, enlarged spleen etc. Traditionally, it is administered against dropsy due to heart, kidney or liver diseases (Kurup *et al.*, 1979; Nesamony, 1985). In Malabar (North Kerala) it is often used with ginger against various kinds of inflammations (Sivarajan & Indira Balachandran, 1994). The drug is an important ingredient in certain Ayurvedic preparations like *Tripurteham*, *Avipatti curnam*, *Aragvadhariyam* and *Kaisoragulguluvatakam*.

According to past studies, the active compounds are the glycosides turpethin, alpha - turpethin and beta - turpethin. These ingredients are extracted by both water (Roxburg, 1820) and alcohol (Watt, 1889) and seem to present as 4 - 10% of the root (Austin, 1982 b).

Horticultural potential. This plant with large showy cream flowers is best grown over walls, trellises, and arches in the gardens. Flowers are numerous and attractive with their violet tinged calyx. Fruits are eye-catching due to the enlarged persistent calyx and transparent capsule, and hence the name 'transparent wood rose'. Fruit of the plant forms an important component in dry flower arrangements.

Taxonomic notes. Ooststroom (1939) notices that the petiole is much shorter than the blade. From the present study it is found that the petiole and leaf blade are variable and petiole is same as or sometimes larger than the blade.

Gamble (1923), Ooststroom (1939, 1953) and others took the winged nature of the stem and petiole as the key character. Meantime, Verdcourt (1963), Austin (1980 a) and others considered that the winged nature of the stem is the character of this taxa. The studies made on different population of *Operculina* in Southern Peninsular India, revealed that this character is highly variable and terete stem is found in some population.

Nomenclatural notes. When Linnaeus published the name *Convolvulus turpethum* in 1753, he gave the brief description of the plant and mentioned 'Fl.zeyl.74, Mat.med. 84. Verdcourt (1963) designated the specimen - Hermann Herb. 2:68 BM as the lectotype of *Operculina turpethum*. Austin (1980 a) mentioned a specimen which was probably an isolectotype in the Hermann Herb. Leiden. The study of these materials revealed that specimen in Hermann Herb. 2: 135 (L) is the fruiting material and the characters are found matching with *O.turpethum*. So the specimen is designated here as isolectotype.

Rendle (1905) made a new combination for *Convolvulus turpethum* and established *Merremia tuberosa* (Linn.) Rendle. Without knowing the combination of Rendle, Shah and Bhatt (1977) made the same combination and Rani and Matthew (1983) followed this.

Notes. The species epithet of *Operculina turpethum* was proposed by Linnaeus (1753) from Asiatic sources. Turpethum was a Latinised version of the Greek *tourpeth* which came from the Arabic word *Turbad*, which, in turn was taken from Western Indian languages that evolved from Sanskrit.

Specimens examined : KERALA: Kollam Dt.: Kulathupuzha, *Biju* 25935 (CALI, TBGT & MH). Pathanamthitta Dt.: Lower Muzhiyar, *Anilkumar* 14 (MH); Pandalam, *Biju* 44298 (CALI). Palakkad Dt.: Mukkali, *Vajravelu* 48940 (MH); Puchappara, *Biju & Suresh Elamon* (CALI & TBGT). Malappuram Dt.: Kottakkal, *Biju* 15367 (CALI). Kozhikode Dt.: Ramanattukara, *Biju* 23932 (CALI), Feroke, *Biju* 15323 (TBGT). Kannur Dt.: Begur R.F., *Ramachandran* 62211 (MH). TAMIL NADU: Tinnevely Dt.: Thirumalai Temple, *Subramanyam* 2979 (MH). Ramanathapuram Dt.: Tiruvadani, *Biju* 23930 (CALI). Coimbatore Dt.: *Jacob* 249; Sanjivi hills, *Sebastine* 2315; Vellingiri hills, *Sebastine* 3121 (MH). S. Arcot Dt.: Lalpet, *Ramamurthy* 53562; Karuppur, *Ramamurthy* 60167 (MH). Chingalpattu Dt.: Vedanthangal, *Henry* 47030 (MH). ANDHRA PRADESH: Cuddapah Dt.: Balapalle, *Ellis* 15728 (MH). Kurnool Dt.: Nallamalai, *Ellis* 32727 (MH). Godavari Dt.: Samalkol, *Narayana* 16819; Sirivaka, *Barber* 4991 (MH). Warnangal Dt.: Pakhal, *Henry* 15931 (MH). Karimnagar Dt.: Rechapalli, *Subba Rao* 21895 (MH).



3. H. tum - neg 2

Operculina turpethum
Hermin. Vegetabilis

Fig. 125. Isolectotype of *Operculina turpethum* (Linn.) Manso : Hermann Herb. 2 : 135 (L).

Operculina ventricosa (Bertero) Peter in Engl. & Prantl, Nat. Pfl. fam. 4:32. 1891; Fosberg & Sacht, Smith. Contrib. Bot. 36 : 29. 1977; Powell *et al.*, Brittonia 30 (2) : 201. 1978.

Type: not seen

Convolvulus ventricosus Bertero in Colla, Hort. Ripal. 37. 1824.

Ipomoea ventricosa (Bertero) G. Don, Gen. Syst. 4 : 274. 1838.

Operculina grandiflora sensu House, Muhlenbergia 5:69. 1909, pro part, non Jacq. (1777).

(Fig. 126)

Perennial herb; stem robust herbaceous towards tip, twining suffrutescent, hollow, terete, nearly sulcate, contorted, glabrous sparsely tomentose, latex milky white, gummy. Leaves simple, ovate to widely ovate or deltoid, 6 - 15 x 4 - 13 cm, apically acute to acuminate, mucronulate, basally cordate, entire, glabrous on both sides; midrib and lateral veins raised beneath, appressed pilose, lateral veins 8 - 11 pairs, secondary veins parallel; petiole upto 12 cm long, terete, glabrous or short pilose. Flowers axillary, solitary to several flowered cymes (1-4 flowers); peduncle upto 9 cm long, terete, short pilose; bracts large, lanceolate, concave, 3 - 3.3 x 0.8 - 1.2 cm, apically acuminate to mucronulate, scarious, pubescent, shortly ciliate, deciduous; pedicels upto 3 cm long, puberulous, basally terete, dilated at apex and angled; extrafloral nectaries 3, around the apex of the pedicels; sepals subequal, outer most pair large, ovate to broadly ovate, 3.5 - 4.2 x 2.1 - 2.5 cm, apically acute or acuminate, mucronulate, tomentose outside, mottled inside, inner 3 small, ovate or ovate elliptic, 3.2 - 3.8 x 1.8 - 2.2 cm, completely or partly glabrous, innermost two completely glabrous; corolla white, greenish tinge on inner side, campanulate to broadly funnel shaped, tube 3.6-4 cm long, shallowly 5 lobed, 6.8 - 7.5 cm across, glabrous; stamens inserted; anthers upto 1 cm long, yellowish white, straight after dehiscence; filaments equal, upto 2.3 cm long, attached 1 cm above the corolla base, with glandular pubescent; ovary globular, 2-2.5 x 2-2.3 mm, white, glabrous; nectary disc annular, 1 x 5 mm, yellowish white, slightly lobed; style single, upto 4 cm long, glabrous, slightly dilated at base; stigma biglobose, 1x1.6 mm, white, papillate. Fruit capsular, depressed globose, 1.8 - 2 x 2.5 - 3.8 cm, the epicarp circumscissile, operculum yellowish green, turns to black when dries, in fresh 5 - 8 x 11-15 mm, when dried 4 - 6 x 9 - 11 mm, splits around the middle of the capsule when dries, crowned with persistent style base, 1 cm long, endocarp scarious, transparent, irregularly dehiscent, peduncle and pedicels elongated, peduncle upto

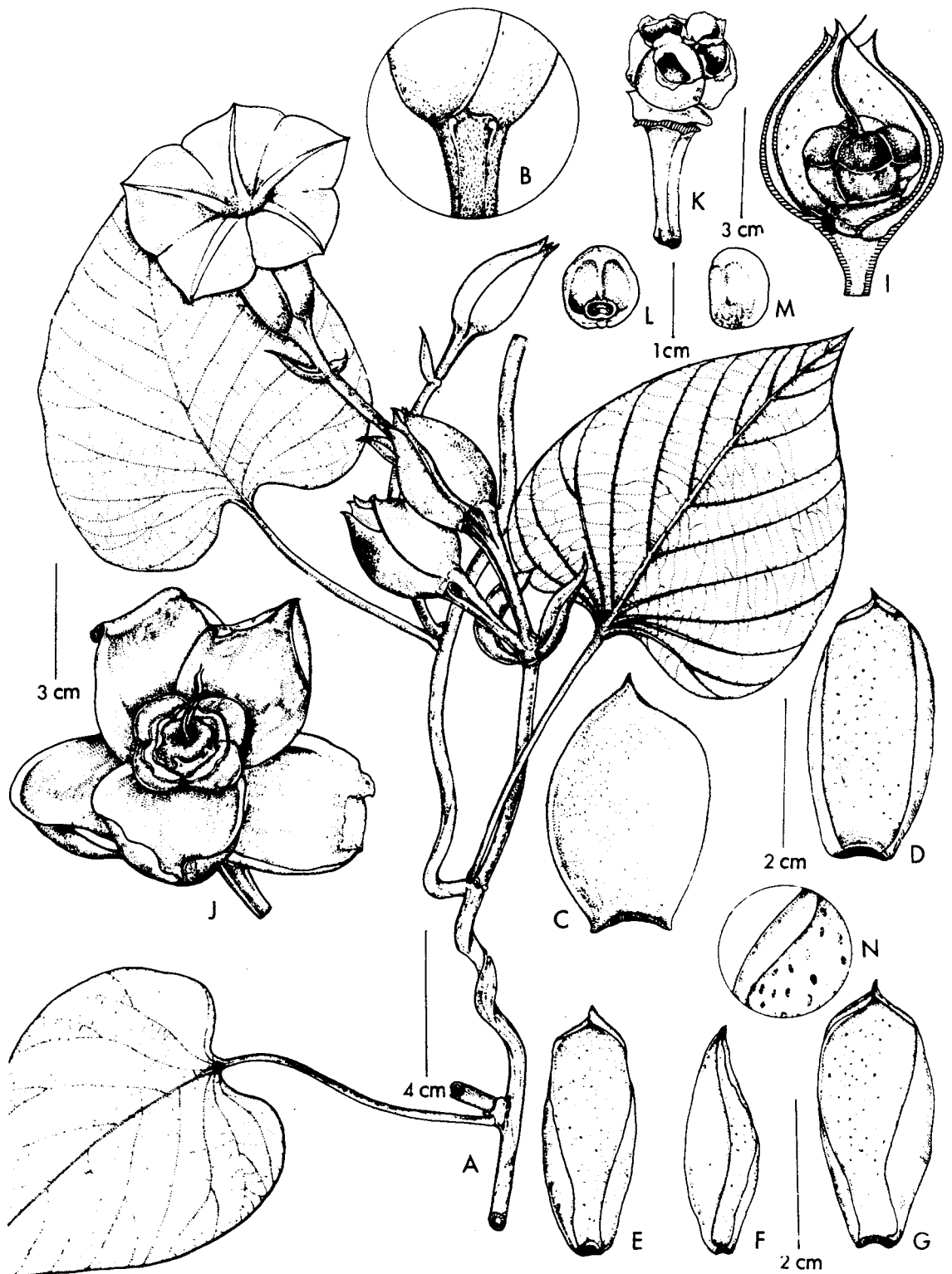


Fig. 126. *Operculina ventricosa*. A. Flowering and fruiting branch; B. Extrafloralnectary; C-G. Calyx (C outside; D-G. innerside); H. Mottled gland enlarged; I. Young fruit (cut opened); J. Fruit; K. Capsule (opened); L & M. Seeds (from Biju 22021 K).

15 cm long, pedicel upto 7 cm and articulate at base, fruiting sepal accrescent and subtending the capsule, 4 - 5.2 x 3 - 4.6 cm, the tip recurved, straw coloured; seeds 4 rarely 3, orbicular, 9- 12 x 8 - 10 mm, smooth, black, seed germination epigeal, hypocotyl upto 0.8 cm, usually bicotyledonary, 4 x 5 cm, sinus 2 - 2.3 cm deep, basally cordate, petiole \pm 1 cm long, glabrous, midrib and lateral veins raised beneath.

Flowering : February - April

Flower opening : 11.30 am - 12.30 pm

Fruiting : March - June

Floral visitors : Bees

Distribution. *Operculina ventricosa* was first reported in 1887 or 1888 in the Marianas Islands of Micronesia from Pagan and still spreading rapidly through the archipelago (Powell *et al.*, 1978). The plants occur in the Dutch and French Islands of Lesser Antilles and are cultivated in Hispaniola, Puerto Rico, Virgin Islands, Surinam and India.

Ecology. In India this species is used as a garden plant. But in the recent past wild populations are also found in the arid zones, probably escaped from cultivation.

Specimens examined : KERALA: Thiruvananthapuram Dt.: Karamana *Biju* 23967 (CALI & TBGT); Sasthamangalam, *Biju* 42121 (K, CALI).

PORANA Burm.f.

The genus *Porana* Burm. f. comprises of 57 species, the majority of them distributed in mainland tropical Asia (Staples, 1993). Now the genus concept of *Porana* Burm. f. has been narrowed and only three species are now accepted in it (Staples, 1987). Three distinctive species groups have been segregated from *Porana* at generic rank under the name *Tridynamia* Gagnepain (1950), *Poranopsis* Roberty (1952) and *Dinetus* Sweet (1825). Staples (1987) evaluated the tribe *Poraneae*, and recognized nine genera under this tribe.

Porana Burm.f., Fl. India 51.t. 21.f.l. 1768; Ooststr., Blumea 3 : 85. 1938 & Fl. Mal., ser. 1, 4:402. 1953.

Type species: *Porana volubilis* Burm.f.

Large perennial climbers; stem woody, herbaceous towards tip. Leaves simple, entire, ovate, often cordate, penninerved. Flowers axillary or terminal, many flowered racemose or panicle; bracts small, linear - lanceolate; sepals 5, equal, sparsely pilose outside; corolla small, white, campanulate; calyx about half as long as the corolla; stamens and style inserted; anthers straight; filaments equal, mostly glandular pubescent at the base; pollen smooth; ovary glabrous, disc annular; style bifid with unequal branches; stigma globose. Fruit capsular, indehiscent; seed 1, subglobose, glabrous, all sepals in fruit much accrescent and persistent.

Distribution and Ecology. Distributed in tropical and subtropical Asia.

Porana volubilis Burm. f., Fl. India 51, t. 21. f. 1. 1768; Gamble, Fl. Pres. Madras 2:921. 1923 Ooststr., Blumea 3 : 87. 1938 & Fl. Mal., ser. 1, 4:402. 1983.

Type: not found.

Porana volubilis Burm. f. var. *burmanniana* Blume, Bijdr. 723. 1825.

Porana volubilis Burm. f. var. *microcarpa* Engl. Bot. Jahrb. 7 : 472. 1886.

Common name. Snow creeper

Perennial woody climber, stem herbaceous towards tip, terete, minutely verrucose, glabrous, young parts puberulous. Leaves simple, ovate, 3 - 6 x 2 - 4 cm, apically acuminate, basally obtuse or slightly cordate, glabrous or sparsely hairy; midrib raised beneath, lateral veins 5 - 7 pairs, originating from one point; petiole upto 3 cm long, shorter than blade, glabrous. Flowers axillary or terminal, many flowered panicle; peduncle upto 25 cm long, terete, pilose; bracts small, linear-lanceolate, \pm 1 mm long, pubescent; pedicels short, upto 7 mm long; sepals oblong to obovate, obtuse, 5 - 6 x 2 - 2.5 mm, apically acute to acuminate, sparsely pilose outside, glabrous inside; corolla white, fragrant, funnel shaped, tube upto 5 mm, deeply 5-lobed, lobes obtuse, midpetaline bands glabrous; stamens inserted; anthers upto 1.8 mm long, straight; filaments white, attached 2 mm above corolla base, 7 mm long; ovary

globose, hairy at top; style bifid, dividing unequally from 2 mm from the base, branches 2 - 4 mm long, glabrous; stigma globose, white, papillate. Fruit capsular, indehiscent, ovoid to globose, 4 - 5 x 3 - 3.5 mm, glabrous, fruiting calyx persistent, all enlarged oblong to spatulate, 6 - 7 x 3 - 4 mm, apically mucronulate; seed one, globose, 4 x 3 mm, glabrous, black.

Flowering : October - December

Flower opening : 9 am - 10 am

Fruiting : November - January

Distribution. Burma and Indochina to Malaysia, Java, Borneo, Philippines, Moluccas and India.

Ecology. Commonly used as an ornamental; also found in way-sides, naturally escaped from cultivation.

Medicinal use. The decoction of this plant is used in stimulating the after birth. A decoction of the plant is given after child birth as a purifying medicine. The leaves are eaten to remove nasty taste from mouth and the juice is as an ingredient of a tonic (Wealth of India).

Horticultural potential. The plant with bunches of cream coloured fragrant flowers is ideal for pergolas and trellis in gardens.

Specimens examined : KERALA: Thiruvananthapuram Dt.: Museum garden, *Biju* 15386 (CALI & TBGT); *s.coll.* 149 (MH). Kollam Dt.: Kadapakada, *Biju* 25961 (TBGT). Kannur Dt.: *s.coll.* *s.n.* (MH). TAMIL NADU: Coimbatore Dt.: Central Farm (Agri. college), *Saroja* 9689 (MH). Chengalpattu Dt.: *s.coll.* 1856 (MH).

PORANOPSIS Roberty

Roberty (1952) separated this genus from *Porana* and included two species in it. Staples (1993) justified the genus concept of Roberty by including small flowered taxa with an accrescent fruiting calyx in which the three outer sepals are enlarged and each sepal with a single prominent midvein. Now this genus

includes three species, of which *P. paniculata* occur in India and the other two species only in China.

Poranopsis Roberty, *Candollea* 14 : 26. 1952; Roberty, *Boissiera* 10 : 152. 1964; Staples, *Novon* 3 : 198 - 201. 1993.

Type species: *Porana paniculata* Roxb.

Perennial climbing herbs; stem woody, herbaceous towards tip. Leaves simple, entire, cordate, palmately nerved. Flowers axillary or terminal, many flowered panicle; bracts small, linear-lanceolate; sepals 5, subequal, densely tomentulose outside; corolla small, white, funnel shaped, calyx lobes shorter than the corolla tube, midpetaline bands pilose; stamens and style inserted; anthers straight, subequal; pollen smooth; ovary widely ovate, glabrous; disc annular; style single, short; stigma biglobose. Fruit capsular, indehiscent; seed 1, pubescent, 3 outer sepals enlarged, accrescent and persistent with a single prominent midvein.

Distribution and Ecology. This is widely distributed in China, India, Burma, Pakistan, Java and Malaysia.

Poranopsis paniculata (Roxb.) Roberty; Staples, *Novon* 3: 198- 201. 1993.

Type: Java. *Kleinhof* (Suggested by Austin (1980), but not found).

Porana paniculata Roxb., *Pl. Corom.* 3 : 1819; Clarke in Hook .f., *Fl. Br.India* 4: 222. 1883; Trimen, *Handb. Fl. Ceylon* 3 : 227. 1895; Gamble, *Fl. Pres. Madras* 2:921.1923; Ooststr., *Blumea*, 3 : 93. 1938 & *Fl. Mal. ser.1*, 4 : 404. 1953; Austin in Dassan. & Fosb., *Rev. Handb. Fl. Ceylon* 1: 358. 1980; Rani & Matthew in Matthew, *Fl. Tam. Carnatic* 3:1941. 1983.

Perennial lianas; stem twining, herbaceous towards tip, woody at base, greyish tomentulose throughout. Leaves simple, ovate, 5 - 10 x 1 - 8 cm, apically acuminate or shortly cuspidate, basally cordate, pubescent on both surfaces especially beneath; midrib raised beneath and prominently hairy, lateral veins 3 - 4 pairs, originated from one point; petiole upto 0.5 - 6 cm long terete, shorter than blade, greyish tomentose. Flowers axillary or terminal, many flowered panicle; peduncle upto 17 cm long, terete, pubescent

like stem; bracts linear- lanceolate, less than 1 mm long, deciduous, apically acuminate, pubescent; pedicels short, upto 5 mm long; sepals subequal, oblong-obovate, 2 - 3 x 1 mm, apically acute to acuminate, densely tomentulose outside, glabrous within; corolla white, funnel shaped, tube upto 4 mm long, mouth slightly 5 lobed, 3 - 6 mm across, midpetaline bands pilose outside; stamens inserted; anthers upto ± 1 mm long, straight; filaments white, attached 1 mm above the corolla base, subequal, 1 mm long, as long as the anther or a little shorter; style single, less than 1 mm long, glabrous; stigma white, biglobose, papillate; ovary widely ovate, 1 x 5 mm, 2 celled. Fruit capsular, indehiscent, ovate, 5 - 6 x 2.5 - 3.5 mm, pubescent, fruiting calyx persistent, 3 enlarged, obtuse, 1.8 - 2.2 x 0.7 - 0.9 cm, apically mucronulate, one longitudinal and several lateral veins, 2 not enlarged, linear, 4 - 5 x -1 mm, pubescent; seed one, globose, 3 - 4 x 2 mm, glabrous, black.

Flowering : September - December

Fruiting : November - January

Distribution. This species is a native of India and upper Burma, cultivated as an ornamental plant in tropical New and Old World. It is widely distributed in Indian subcontinent from Pakistan to Myanmar (Staples, 1993).

Ecology. Mostly cultivated but even some of them escaped from cultivation and are found in waysides and forest edges.

Notes. In Southern Peninsular India the collection is only from cultivation.

Horticultural potential. Commonly cultivated in gardens for its dense mass of fragrant cream flowers and accrescent dry calyx.

Specimens examined : TAMILNADU: Coimbatore Dt.: *Raju s.n.* (MH). Nilgiris Dt.: Kallar garden, *Narayana & Raju s.n.* (MH). ANDHRA PRADESH: Vishakhapatnam Dt.: Salur Railway Station, *s.coll. s.n.* (MH).

RIVEA Choisy

The genus *Rivea* is popularly known as Midnapor creeper, with about 6 species of climbing lianas. The genus name *Rivea* commemorates Auguste de la Rive, a Swiss physiologist.

Choisy (1833) established the genus *Rivea*, based on the species of *Lettsomia* mainly distinguished by its linear to oblong stigma. Nevertheless in 1845 Choisy added several American species of *Ipomoea* into it, all with biglobular stigma. But most of the authors (Bentham & Hooker, 1876; Clarke, 1883; Hallier, 1893 a, b; Trimen, 1895) have maintained the original limits of the genus and did not want to disturb the genus status with some hesitation. Ofcourse the genera *Rivea* Choisy, *Argyreia* Lour. and *Ipomoea* Linn. are closely allied with a remarkable degree of similarity in habit, often leading to confusion in their generic recognition.

The genus *Rivea* is distinct from *Argyreia* mainly by its flower shape and linear to oblong stigma and from *Ipomoea* by the same characters and also by the indehiscent instead of valvate fruit (Ooststroom, 1943). Perhaps the genus is most closely related to *Argyreia* and have diverged from that group by its flower opening time at night and adaptation to moth pollination.

This ill defined genus has about 6 species in the tropics of Asia (Austin, 1980 a). Peninsular India has now three species, including the new species described here from Palayamkotta, Tamil Nadu.

Rivea Choisy, Mem.Soc. Phy. Geneve 6:407.1834; Clarke in Hook. f., Fl. Brit. India 4:183. 1883.

Type species: *Rivea hypocrateriformis* (Desr.)Choisy

Biennial or perennial twiners; stem with a silvery whitish appressed indument, at least when young, terete, hollow. Leaves simple, entire, cordate to ovate-cordate, petiolate, silky-whitish pubescent or glabrescent below. Flowers axillary, solitary or in few flowered cymes; bracts small, narrow, shorter than sepals; sepals 5, subequal, ovate to oblong; corolla salverform, white, 5 distinctly nerved midpetaline bands; stamens inserted; anthers

straight; filaments subequal; ovary glabrous, 4-celled, 4-ovulate; style filiform; stigma with two lobes, linear-oblong. Fruits capsular, indehiscent, sometimes dehiscent and breaking irregularly; seeds 2-4, glabrous, enclosed in pulp.

Distribution and Ecology. *Rivea* is a native of Asia. In India it occurs as an undergrowth in dry deciduous forests, scrub jungles and adjoining grasslands at an altitudinal range 250-1000 m. In Southern Peninsular India the flower opens only after 5.30 pm. They are sweet-scented and must be pollinated by moths.

KEY TO THE SPECIES

- 1a. All sepals acuminate; filaments attached above the upper half of corolla tube.....2. **R.ornata**
- 1b. Outer 3 sepals acuminate, inner obtuse; petioles longer than leaf blade.....2
- 2a. Leaf thick, white-silky tomentose below; sepals more than 1 cm long; filaments attached above the half of corolla tube1. **R. hypocrateriformis**
- 2b. Leaf membranous, velutinous below; sepals short, less than 1 cm long; filaments attached below the half of corolla tube..... 3. **R. palayamkottensis**

1. **Rivea hypocrateriformis** (Desr.) Choisy, Mem. Soc. Phys. Geneve 6:408. 1834 & in DC., Prodr. 9:326. 1845; Dalz. & Gibs., Bombay Fl. 168.1861; Clarke in Hook. f., Fl. Brit. India 4:184. 1883; Cooke, Fl. Pres. Bombay 2:254. 1905; Gamble, Fl. Pres. Madras 2:903. 1923; Gandhi in Sald.& Nicolson, Fl. Hassan Dist. 474. 1978; Austin in Nasir & Ali, Fl. W. Pakistan 60. 1979; Rani & Matthew in Matthew, Fl. Tam. Carnatic 3 : 1042. 1983; Vajravelu, Fl. Palghat Dist. 314.1990.

Type: Indes, Orientales. herb. *Jussieu* (P).

Convovulus hypocrateriformis Desr. in Lamk. Encycl. 3:561. 1792.

Rivea bona-nox Choisy, Mem.Soc.Phys. Geneve 6: 409. 1834; Dalz. & Gibs., Bombay Fl. 168.1861.

Vernacular names : Tam. *Budthi kiry*; Tel. *Boddikura*, *Niru boddi*.

(Fig. 127)

Biennial or perennial lianas; stem twining, woody at base, herbaceous towards tip, terete, white tomentose; latex milky white. Leaves simple, entire, broadly ovate to deltoid, 4.5-5 x 2-4.5 cm, apically apiculate, basally truncate to cordate, glabrous above, white tomentose beneath; midrib and lateral veins raised beneath, lateral veins 3-4 pairs; petiole upto 5 cm long, a pair of petiolar nectary on both sides, pubescent like stem. Flowers axillary or in 1-2 flowered cymes; peduncle upto 1.8 cm long, terete, pubescent like stem; bracts 2, linear-lanceolate, 6 x 2 mm, pubescent outside; pedicels 3-4 mm long, terete, pubescent like stem; sepals more or less same size, lanceolate to elliptic, 1.4-1.5 x 0.6-0.7 cm, outer 3 apically acute, inner 2 apically obtuse to retuse, white tomentose outside, glabrous within; corolla white, fragrant, salverform, 3.5-4 cm long, mouth 5 lobed, upto 5 cm across, midpetaline bands sparsely pubescent outside; stamens inserted to subexserted; anthers upto 6 mm long, straight; filaments attached 0.8 cm below the half of corolla tube, subequal, 3 long, upto 1.2 cm, 2 short, upto 0.9 cm long, sparsely hairy at slightly dilated base and surrounding portion of mouth; ovary conical, 1 x 1 mm, glabrous; style subexserted, upto 4.5 cm long, glabrous; stigma with 2 lobes, linear-oblong, \pm 1.5 mm, papillose. Fruit capsular, laterally compressed globose, 1-1.5 x 0.8 - 1.2 cm, brown, opening from the middle like a cup, inside white pulpy in young, articulate at the junction of peduncle; seeds 1-2, ovate, 6 x 4 mm, glabrous to pubescent, brown, covered with white dry pulp; seed germination epigeal, hypocotyl upto 1.2 cm long, usually bicotyledonary, sinus 1 cm deep, basally truncate to slightly cordate, petiole upto 4.5 cm long.

Flowering : September - January

Fruiting : November - March

Distribution. *Rivea hypocrateriformis* is endemic to Peninsular India; does not occur in Ceylon as reported by Choisy in 1845 (Austin, 1980 a).

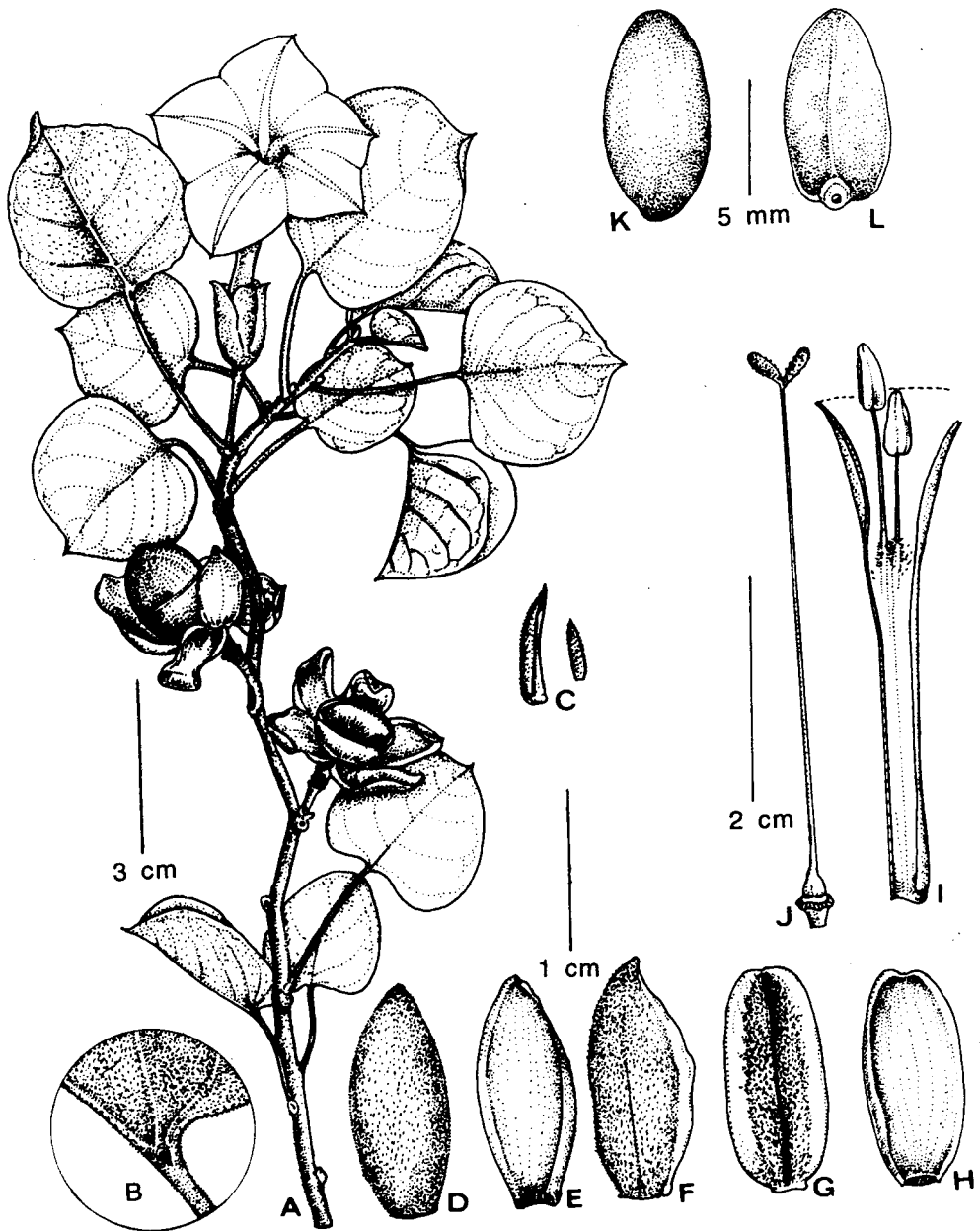


Fig. 127. *Rivea hypocrateriformis*. A. Flowering & fruiting twig; B. Petiolar nectary; C. Bracts; D & E. Outer sepals; F-H. Inner sepals; I. Stamens; J. Pistil; K & L. Seeds.

Ecology. This attractive large woody vine with sweet-scented white to creamy-white flowers occurs as an undergrowth in open dry deciduous forests and adjoining grasslands and often in scrub jungles.

Specimens examined : KERALA: Idukki Dt.: Chinnar, *Biju* 23943 (TBGT). Palakkad Dt.: Attapady block, *Vajravelu* 33188 (MH). TAMIL NADU: Kanniyakumari Dt.: Vivekananthapuram Cape, *Henry* 53305 (MH). Tinnevely Dt.: Sivanaperi, *Joseph* 15135 (MH). Kamarajar Dt.: *Srinivasan* 86929. Senbagatope R.F. *Srinivasan* 79791 (MH). Ramanathapuram Dt.: Valantharavai, *Balasubramanniam* 1074 (MH). Madurai Dt.: Alagarhills, *Subramanyam* 5339 (MH); Andipatti, *Chandrabose* 51678 (MH). Ramnad Dt.: Ayyanarkoil Forest, *Vajravelu* 38679 (MH). Coimbatore Dt.: Maruthamalai, *Biju* 44291 (K, CALI & TBGT), *Deb* 31368 (MH); *Narayanaswami* 3347 (MH); Kuridimalai, *Subramanyam* 698 (MH). Chengalpattu Dt.: Vandalur R.F., *Henry* 47118 (MH). Salem Dt.: *Vajravelu* 21934 (MH). N. Arcot Dt.: Chandragiri *s.n.* (MH). S. Arcot Dt.: *Rajan* 17924 (MH). ANDHRA PRADESH: Chittoor Dt.: Komati Cheruva, *Subba Rao* 45871 (MH). Cuddapah Dt.: Balapalle, *Ellis* 14914 (MH). Nellore Dt.: Udayagiri 12757 (MH). Kurnool Dt.: Bhavanasivank river side, *Ellis* 32608; *Ellis* 25494 (MH). Parkasam Dt.: Nallasuntia, *Rama Rao & Hosagoudar* 83948 (MH). Vishakhapatnam Dt.: S. Kota, *Subba Rao* 32804 (MH). Karimnagar Dt.: Aklarpur, *Subba Rao* 25638, *Subba Rao* 20060 (MH).

2. *Rivea ornata* Choisy, Mem. Soc. Phys. Geneve 6:409.1834; Wight, Icon. pl. Ind. or. 2:t 1356. 1848; Thw., Enum. pl. zeyl. 209. 1860; Dalz. & Gibs., Bombay Fl. 168.1861; Clarke in Hook. f., Fl. Brit. India 4:183. 1883; Trimen, Handb. Fl. Ceylon 3:205. 1895; Cooke, Fl. Pres. Bombay 2:254.1905; Gamble, Fl. Pres. Madras 2:904.1923; Austin in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1:358. 1980.

Type: India, Wallich 1369 (G-DC, holotype).

Lettsomia ornata Roxb., Fl. Ind. ed. Carey & Wall., 2:85. 1832.

Argyreia ornata Sweet, Hort. Brit. 3:2.373.

Vernacular names : Tam. *Muchuddai*; Tel. *Bodditige*

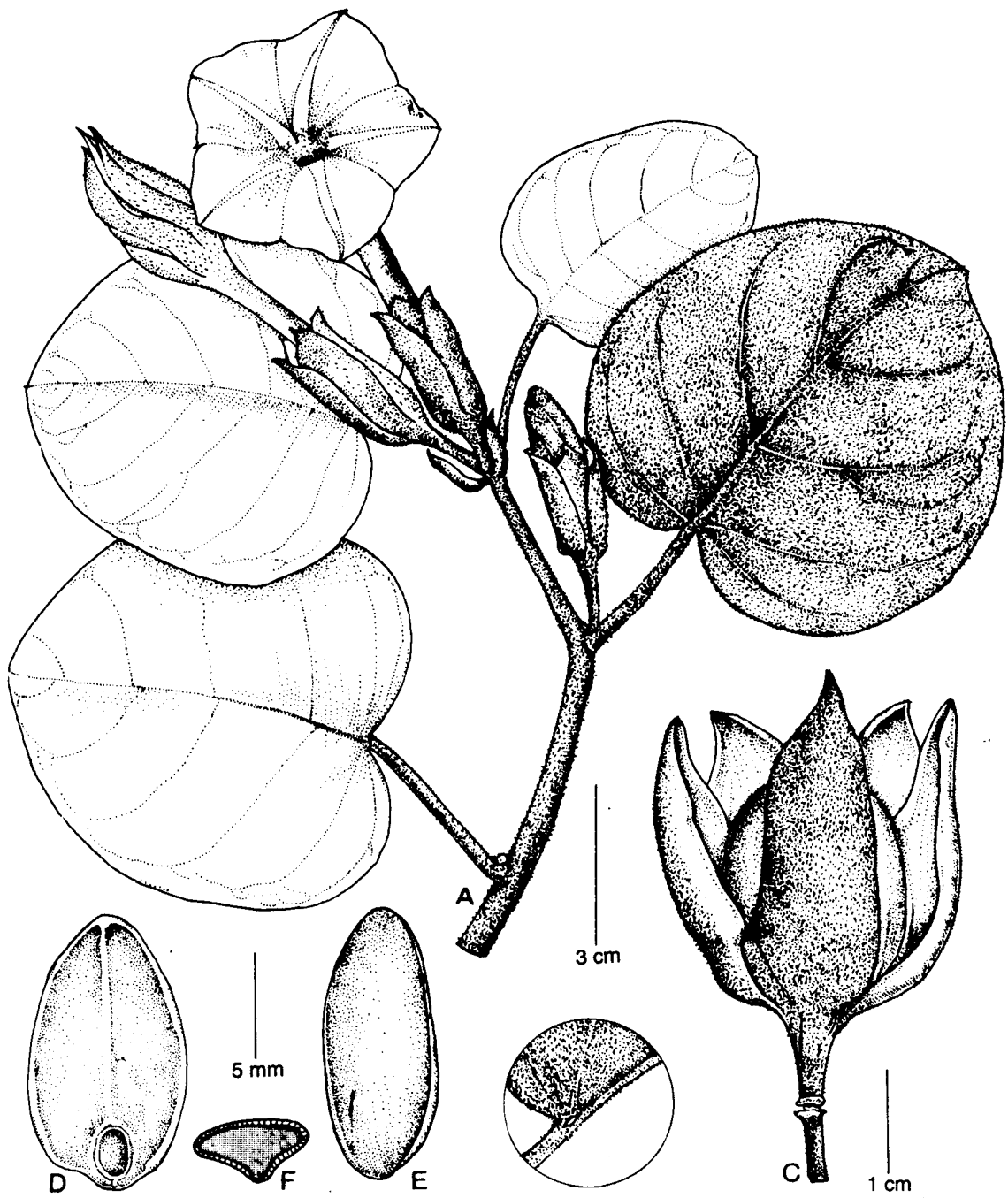


Fig. 128. *Rivea ornata*. A. Flowering branch; B. Petiolar nectary; C. Fruit; D & E. Seeds; F. Seed C.S.(from Jacob 441 MH).

Perennial or biennial lianas; stem woody at base, herbaceous towards tip, terete, covered with appressed silky-white indument; latex milky white. Leaves simple, broadly ovate to reniform, 3-6 x 3-7cm, apically obtuse to very abruptly and shortly acuminate, basally cordate, glabrous above, densely white - silky pubescent below; midrib raised beneath, lateral veins 5-6 pairs; petiole upto 4.5 cm long, pubescent. Flowers axillary or terminal, solitary or two flowered cymes; peduncle upto 1 cm long, terete, pubescent like stem; bracts small, caducous; pedicels upto 1 cm long, terete, articulate, slightly dilated at apex; sepals subequal, outer 3 large, ovate, 2-2.5 x 1-1.3 cm, apically acute to acuminate, densely whitish - tomentose outside, inner 2 small, oblong-ovate, 2.1-2.5x0.6-0.8 cm, apically acuminate to cuspidate, whitish - tomentose only on middle portion of outer side, glabrous within; corolla white, salverform, 5-7 cm long, limb 5 lobed, upto 5.8 cm across; stamens subexserted; anthers 7 x 1-2 mm, straight after dehiscence; filaments attached 5 cm above the corolla base, subequal, 2 long, upto 1.3 cm, 3 short, upto 1 cm long, ciliolate at dilated base; ovary conical, 2.5x1.5 mm, glabrous; disc small, \pm 2 mm long; style subexserted, upto 5.8 cm long, glabrous; stigma bilobed, upto 4.5 mm long. Fruits indehiscent capsule (sometimes open from the middle region like a cup), 2-2.8x1.8-2.3 cm, glabrous, sepals accrescent, 3x1-1.3 cm, articulate; seeds usually 2 or (2-3) narrowly, ovate, 1x0.6 cm, glabrous to puberulous, black.

Flowering : September - January

Fruiting : October - February

Distribution. *Rivea ornata* occurs in South India and Ceylon.

Ecology. The plant prefers dry situations and usually occurs along waysides and wastelands and occasionally as an undergrowth in deciduous forests. The flowers are nocturnal and sweet scented, probably they must be pollinated by moths (Trimen, 1895) although none have been seen visiting. But beetles are very frequently seen in the flowers and inside the corolla tube. Sometimes they even destroy (eat) the corolla. Flowers open only in the late evening, apparently between 5.30 pm and 7.00 pm, and remain open till at about 8.30 am.

Specimens examined : TAMIL NADU: Nilgiris Dt.: Mayar R.F., *Rathakrishnan* 39000 (MH). ANDHRA PRADESH: Cuddapah Dt.: Ghaltoo, *Gamble* 15768 (MH). Chittoor Dt.: Palmaner R.F. *Jacob* 441 (MH).

3. *Rivea palayamkottensis* Biju & Mathew *sp. nov.*

Typus: *Biju* 20021 (holotypus K; isotypi (TBGT)).

(Fig. 129)

Very similar to *Rivea hypocrateriformis* (Desr.) Choisy but easily distinguished by its membranous and puberulent leaves, inner sepals oblong to widely oblong with retuse apex and puberulent outside. The stamens are attached below the half of corolla tube. *R. hypocrateriformis* (Desr.) Choisy, in contrast, has thick leaves with white tomentose indumentum; inner sepals, elliptic lanceolate, with acute to obtuse apex and tomentose outside.

Perennial or biennial lianas; stem woody at base, herbaceous towards tip, glabrous to shortly tomentose (mainly on the tip), terete, hollow. Leaves simple, entire, membranous, broadly ovate to deltoid, 3-4 x 4.5-5.3 cm, apex obtusely acute, mucronulate, basally truncate to cordate, glabrous above, sparsely pubescent below; midrib raised beneath, lateral veins 3-4 pairs; petiole upto 7 cm long, shortly pubescent, linear. Flowers axillary or terminal, 1-2 flowered; peduncle upto 1 cm long, terete, pubescent; bracts small, linear, 7 x 2 mm; pedicel short, upto 7 mm long; sepals subequal, outer 2 small, ovate-elliptic, 8 x 5 mm, apically obtuse, puberulose outside; inner 3 large, oblong to widely oblong, 8-9 x 6-9 mm, apically retuse, sparsely pubescent only in the middle, glabrous within; corolla white, salverform, tube upto 3.5 cm, limb 5 lobed, upto 5 cm across; stamens subexserted; anthers 3-5 x 2 mm, straight; filaments attached 1.8 cm above the corolla base, subequal, 2 long, 7-9 mm, 3 short, 5-7 mm long, ciliolate at dilated base; ovary conical, 1.5-2 x 1-1.5 mm, glabrous; disc small, \pm 1 mm slightly lobed; style subexserted, upto 3 cm long, glabrous; stigma bilobed, \pm 2 mm long; fruit not seen.

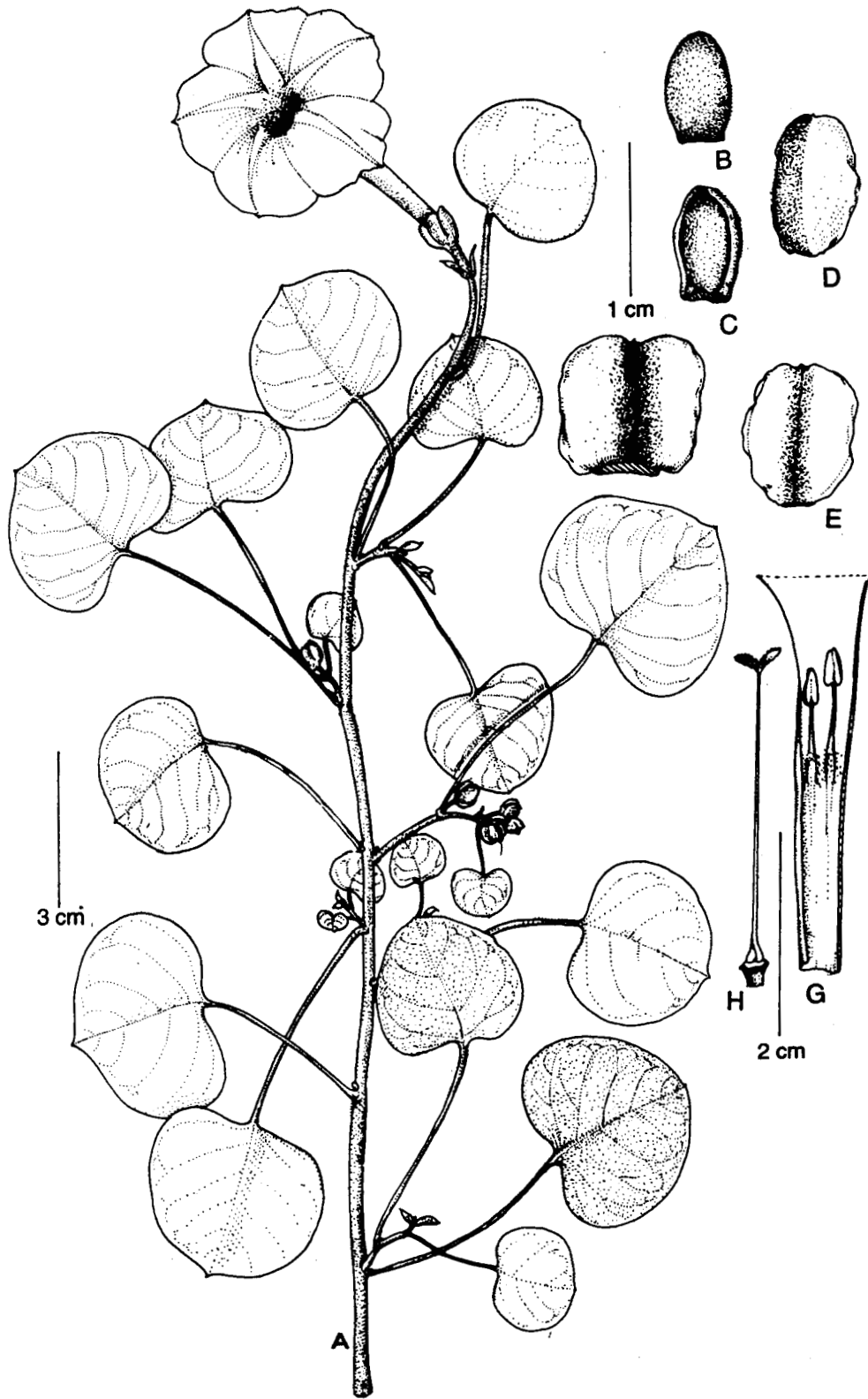


Fig. 129. *Rivea palayamkottensis*. A. Flowering twig; B & C. Outer sepals; D-F. Inner sepals; G. Stamens; H. Pistil (from *Biju* 23998 TBGT).

Flowering : October - February

Fruiting : not known

Distribution. Restricted to Palayamkotta District of Tamil Nadu.

Ecology. The new species occurs in disturbed habitats, generally below 500m. The flowers are white and sweet-scented and it will open only after 6.00 p m and close in the early morning.

Specimens examined : TAMIL NADU: Palayamkotta, *Biju* 23998 (K & TBGT). Adilabad Dt.: Gummadi lodhi, *Ravisankar* 83147 (MH).

SEDDERA Hochst

The genus *Seddera* was established by Hochst (1844) primarily based on the habit. The later authors like Clarke (1883), Cooke (1905), Gamble (1923) and others did not consider it to be a distinct genus, instead included it in a broad *Breweria* (= *Bonamia*). However, the current taxonomic consensus is in favour of treating *Seddera* as a distinct genus. This genus does not seem to be clearly separable from *Bonamia*. A detailed study of the genus *Bonamia* s.l. would be highly desirable.

The genus is represented by a single species in the study area.

Seddera Hochst, in *Flora* 27, Beil.; 7, t.5. 1844; *Verdc., Fl. Trop. E. Africa* 25. 1963; Austin in Nasir & Ali, *Fl. W. Pakistan* 61.1979.

Type species: *Seddera virgata* Hochst & Stend. ex Hochst.

Perennial herbs or subshrubs; stem prostrate or erect branches, older branches sometimes becoming spinescent. Leaves small, variable, usually with medifixed hairs. Flowers 5-merous, axillary or in terminal spikes or few flowered cymes; sepals subequal, acute or obtuse; corolla small, funnel-shaped, lobes short; ovary 2-locular, 4-ovuled, hairy above; style bifid, usually to the base, more or less peltate, rarely bilobed. Fruits capsular, 4-valved; seeds 4, (2-4), glabrous.

Distribution and Ecology. The genus *Seddera* with about 20 species occurs mostly in Africa but extends to Arabia and India (Verdcourt 1963). There is a single species in Southern Peninsular India.

***Seddera evolvuloides* Wight, Icon. pl. Ind. or. 4. t. 1369 (1848).**

Type: not found.

Breweria evolvuloides Choisy, Mem. Soc. Phys. Geneve 112. 1834 & in DC., Prodr. 9:439. 1845; Clarke in Hook. f., Fl. Brit. India 4:224. 1883; Gamble, Fl. Pres. Madras 2:923. 1923.

Bonamia evolvuloides (Choisy) Raiz., Ind. Forester 103:754. 1967.

(Fig. 130)

Perennial erect herbs; stem woody, terete, villous. Leaves simple, elliptic, elliptic-oblong, small, 4-6 x 1.5-2.8 mm, apically acute, mucronulate, basally acute, villous on both sides; midrib and lateral veins inconspicuous on both sides; petiole short or absent, \pm 2mm long. Flowers axillary, solitary or in 2-3 flowered cymes; peduncle upto 7 mm long, terete, glabrous or pubescent; bracts small, upto 1 mm long pubescent; pedicels upto 2.8 mm long; sepals subequal, outer 2 slightly larger than inner 3, 4-5 x 1-2 mm, ovate - elliptic or orbicular, inner three 3.5-4 x 1-3 mm, apically obtuse, mucronulate or apiculate, hairy along the margin, sparsely pubescent on the outer surface of outer 2; corolla white, campanulate, tube 3-4 x \pm 2mm, limb deeply 5 lobed, upto 2 mm deep, 5-6 mm across, midpetaline - bands pilose; stamens exerted; anthers upto \pm 1mm long, straight after dehiscence; filaments attached 1-1.8 mm above the corolla base, equal, upto 6mm long; pollen smooth; style 2, exerted, bifid, each upto 6 mm long, united at the base or free, glabrous; stigma globose, \pm 1 x 1mm; disc absent. Fruit capsular, ovate, 6-7 x 4-5 mm, glabrous, hairy at the apex; seeds 4 or less, ovate-elliptic, 2-2.5 x 2-2.5 mm, glabrous, black.

Flowering : October - February

Fruiting : November - March

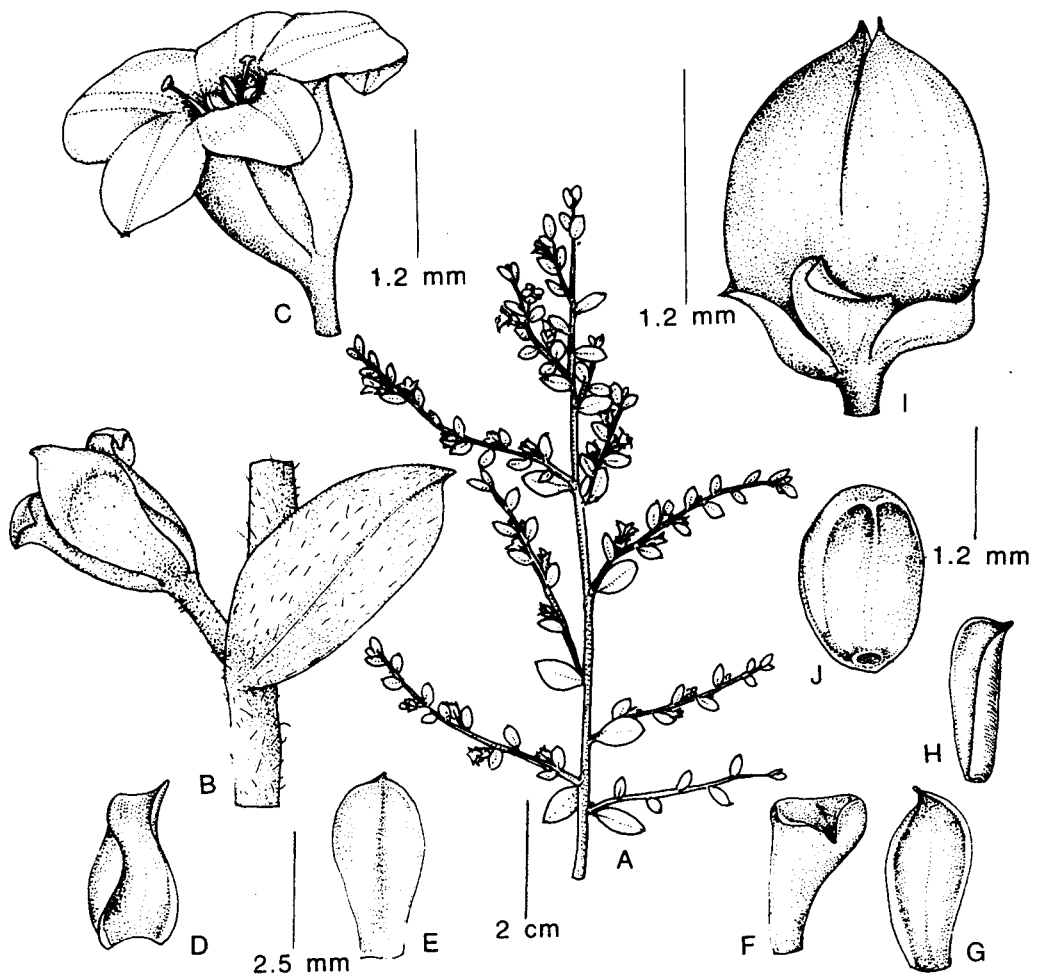


Fig. 130. *Seddera evolvuloides*. A. Flowering twig; B. Node enlarged; C. Flower; D & E. Outer sepals; F-H. Inner sepals; I. Fruit; J. Seed (from s. coll. 309 MH).

Distribution. *S. evolvuloides* is endemic to Southern Peninsular India.

Ecology. In Southern Peninsular India it occurs vary rarely in dry habitat of Kanniyakumari district of Tamil Nadu. No recent collections have been done.

Specimens examined: TAMIL NADU: Kanniyakumari Dt.: Nagercoil. *s.coll.* 306 (MH).

STICTOCARDIA Hall.f.

The genus name *Stictocardia* is derived from the greek, *Stiktos* = spotted and *Kardia* = heart, meaning 'spotted heart', referring to the black glands on the heart shaped leaves. Hallier described the genus *Stictocardia* in Bot. Jahrb. Syst. (1893 b) and distinguished it, on the basis of black glands on the lower surface of the leaves, indehiscent fruits and pubescent seeds. He included only three species, *viz.* *S. tiliifolia*, *S. bevaviensis* and *S. multiflora*. House (1909) did not consider it to be a distinct genus when he made the new combination *Rivea campanulata* (Linn.) House. He pointed out that the type of *Rivea* is *Convolvulus tiliaefolius* Desr., which Hallier designated as the type of *Stictocardia*. (see Gunn, 1972 b for detailed nomenclatural discussion). However, the current taxonomic consensus is in favour of treating *Stictocardia* as a distinct genus, which can easily be recognised from other related genera by its shape and texture of the calyx, opening and closing time of flowers, characteristic fruit, indehiscent nature of the capsule and seed characters. No comprehensive work has been made on them except the regional work by Ooststroom, 1953; Verdcourt, 1963 and Austin, 1980 a.

Verdcourt (1990) recognised two subgenera in *Stictocardia* namely, subg. *Stictocardia* (stem and foliage glabrous to densely pubescent or velvety; sepals blunt, truncate or emarginate, glabrous to pubescent but without filaments) and subg. *Madoadou* Verdc. (stem and foliage very densely velvety; sepals acuminate or subacute and apiculate, densely shaggy with long pubescent filamentous outgrowth towards the base).

In India the genus is represented by two species, *S. tiliifolia* (Desr.) Hall.f. and the new species, described here *S. sivarajania* Biju *et al.*

Stictocardia Hall.f., Bot. Jahrb. Syst. 18:159. 1894; Merrill, Enum. Philipp. Fl.Pl. 3:372. 1923; Ooststr., Fl.Mal., ser. 1,4:491. 1953; Verdc., Fl. Trop. E. Africa 68.1963; Austin in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1:359. 1980.

Type species: *Convolvulus tiliifolia* Desr.

Argyreia Sect. *Pomifera* Clarke in Hook.f., Fl. Brit. India 4:184. 1883.

Perennial twiners; stem herbaceous towards tip, basally robust, white appressed indument, at least when young. Leaves simple, entire, cordate, pubescent, lower surface with minute glands (black dots when dry). Flowers axillary, 1-5 flowered cymes; bracts small, deciduous; sepals 5, subequal, orbicular with black glandular trichomes, concave, persistent, clasping in fruit; corolla funnel shaped, scarlet, purplish - red or mauve, the midpetaline bands glabrous outside and with minute glands; stamens and style inserted; anthers straight after anthesis; filaments glandular pubescent at base, filiform above; pollen spinulose; ovary glabrous, 4-celled, each cell with 1 ovule; style filiform, glabrous; stigma biglobose. Fruit enclosed by the much enlarged calyx, indehiscent; seeds 1-4, minutely pubescent.

Distribution and Ecology. The genus *Stictocardia* contains about nine (Gunn, 1972 b) or twelve (Verdcourt, 1963) species. Several workers considered its distribution as circumtropical on the basis of a single species introduced into the New World. Perhaps the genus originated in Asia or Africa (Austin, 1980 a). Most of the species are seen along road sides and waste lands, while few are found as undergrowth in semi-evergreen and deciduous forests from sealevel to 4000 m. Flowers have crimson or red coloured corolla, probably adapted for bird pollination. Austin (1980 a) found the Sri Lankan species, *S. macalusoi* being visited by sun birds, and piercing holes at the base of the corolla tube for nectar.

KEY TO THE SPECIES

- la. Leaves green on dorsal side ; peduncle shorter than leaves, upto 7 cm long. Fruiting sepal engulfing the capsule, capsule globose and 4-lobed; seeds greyish - brown, long hirsute at hilum.....2. **S.tiliifolia**
- 1b. Leaves purplish violet on dorsal side ; peduncle long, upto 15 cm long. Fruiting sepals not engulfing the capsule, capsule depressed globose, and entire; seeds pale black, shortly hirsute at hilum.....1. **S.sivarajania**

1. **Stictocardia sivarajania** S. D. Biju, P. Pushpangadan & P. Mathew sp nov.
 Typus: Biju 40182 (holotypus K; isotypi US, CALI, TBGT & MH; Paratypus Biju 22013 US & TBGT).

(Fig. 132, 133)

The new species *Stictocardia sivarajania* is allied to *S. tiliifolia* (Desr.) Hall.f., but can easily be distinguished by its purple violet dorsal side of leaves and long pedicels, non ciliate widely ovate sepals, capsule depressed globose, and fruiting calyx being not engulfed in the capsule. Seeds orbicular and black.

Stictocardia sivarajania sp.nov. affinis *S.tiliifloa* (Desr.) Hall.f. seed capsula depresso globosa laevis, calycis lobis fructiferis capsulam haud involventibus, pedicellis longioribus, foliis subtus purpureo - violaceis facile distinguenda.

Perennial; stem woody at base, trailing or twining, terete, herbaceous towards tip, pubescent; latex colourless, gummy. Leaves simple, deltoid to ovate- deltoid, 4-20 x 3-17 cm apically acuminate and shortly mucronulate, basally cordate, sparsely pubescent above, young leaf with dorsal side purplish violet, pubescent or tomentose below, covered with minute black glands; midrib and lateral veins raised beneath, prominently tomentose in

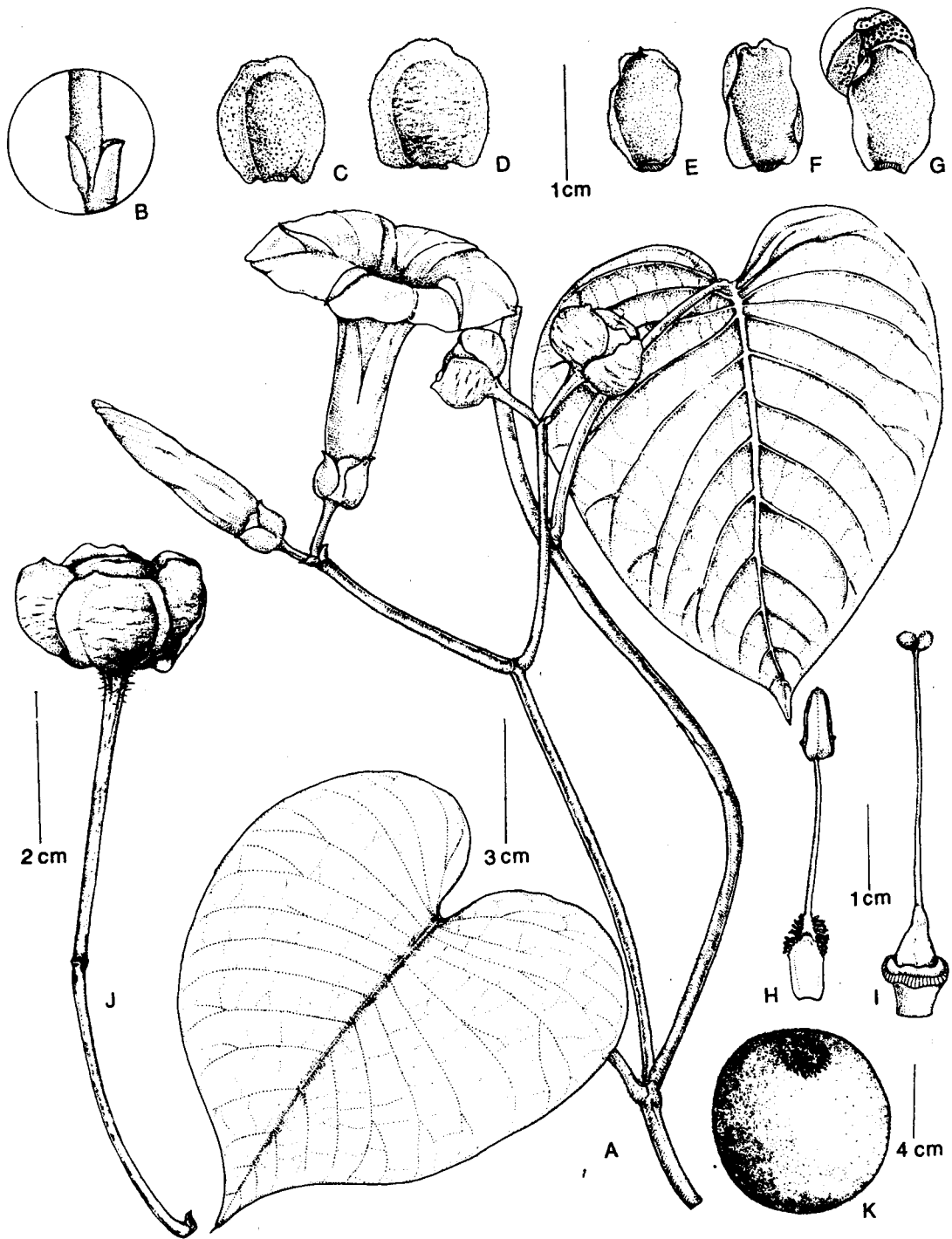


Fig. 132. *Stictocardia sivarajania*. A. Flowering and fruiting twig; B. Bracts; C & D. Outer sepals; E-G. Inner sepals; H. Stamen; I. Pistil; J. Fruit; K. Seed (from *Biju* 22013 US).

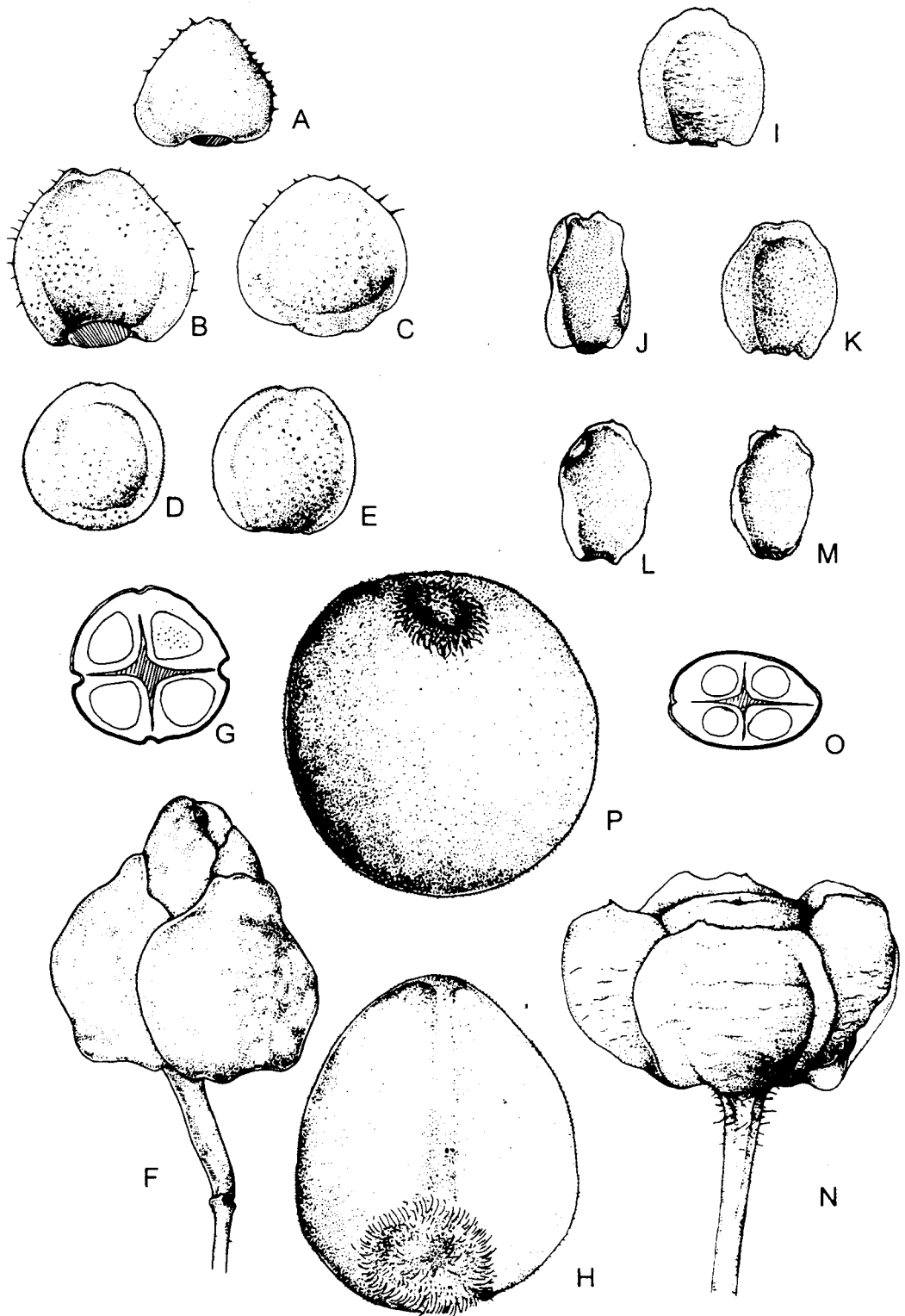


Fig. 133. A-H. *Stictocardia tiliifolia*; I-P. *Stictocardia sivarajania*.
 A & B. Outer sepals; C-E. Inner sepals; F. Fruit; G. Fruit C.S.; H.
 Seed (from Biju 15344 US); I & J. Outer sepals; K-M. Inner sepals; N.
 Fruit; O. Fruit C.S.; P. Seed (from Biju 16216 K).



Plate 8. A. *Porana volubilis* B & C. *Rivea hypocrateriformis* D. *Rivea palayamkottensis* E & F. *Stictocardia tiliifolia* (E. Fruit, F. Seeds) G-K. *Stictocardia sivarajania* (G. leaf dorsal side, H. flowers, I. young fruits, J. dry fruit, K. seeds).

young leaves, lateral veins 8-11 pairs; petiole upto 10 cm long, pubescent, younger ones tomentose. Flowers axillary, solitary or in 2-3 flowered cymes; peduncle upto 15 cm long, terete to angular, pubescent, mostly longer than petiole; bracts 2, small, ovate - elliptic, 5-8 x 2-3 mm, apically acute to acuminate, pubescent outside, glabrous within; pedicels upto 2-4 cm long, pubescent, angled and enlarged in fruits; sepals 5, subequal, outer 2 large, widely ovate to orbicular, 1-1.2 x 0.7-0.9 cm, apically obtuse to emarginate, densely black glands on both sides, sparsely pubescent, inner 2 medium sized, broadly ovate - elliptic, 0.8-1 x 0.5-0.6 cm, apically emarginate and shortly apiculate, glandular dotted, glabrous to puberulent outside, innermost one small, sub orbicular, 0.6-0.8 x 0.3-0.4 cm, apically emarginate and shortly apiculate, glandular dotted, glabrous; corolla reddish purple with a darker centre, funnel shaped, tube upto 3.5 cm long, limb slightly 5 lobed, 5-7 cm across, mid petaline bands glabrous and with minute black glands; stamens inserted; anthers upto 7 mm long, straight after dehiscence; filaments attached upto 5 mm above the corolla base, 2 long, upto 2.5 cm, 3 short, upto 2.1 cm long, filiform, purplish red ciliolate at dilated base; style subexserted, upto 3.5-3.7 cm long, glabrous, filiform; stigma biglobose, papillose; ovary conical, 1.2 x 2 mm, glabrous, 4 celled; disc small, ± 1 mm long, slightly lobed. Fruits capsular, indehiscent, depressed globose, 1-1.8 x 0.8-1.2 cm, not four lobed, glabrous, not engulfed by the enlarged sepals, striate cartilaginous, 1-1.6 x 1-1.4 cm; seeds 1-4, orbicular, 6-8 x 6-7 mm, covered with minute hairs, sparsely pubescent at hilum, pale black; seed germination epigeal, hypocotyl upto 6.5 cm long, glabrous, apically deeply cordate, sinus upto 3.5 cm deep, basally truncate to slightly cordate, petiole upto 1 cm long.

Table 5. Distinction between *Stictocardia tiliifolia* & *S.sivarajania* sp.nov.

	<i>Stictocardia tiliifolia</i>	<i>Stictocardia sivarajania</i>
Leaves	Lowerside pale green apically acute to short acuminate	Lowerside purplish violet apically acuminate and mucronulate
Peduncle	Short, upto 7 cm long	Long, upto 15 cm long
Sepals	Sub orbicular to orbicular and scarious to shortly ciliate along the margins	Widely ovate and non ciliate margins



Stictocardia tiliifolia (Desr.) Hall.f.

det. S. J. VAN OOSTSTROOM
(Rijksherbarium, Londen)

1970

HERB. MUS. PARIS.

Lisbon de l'Isle de France

Miscra tiliifolia (Desr.) Hall.f.

*Recueilli sur les bords de la Grande Rivière
 au fort de la Plaine par le Sr. de la Rivière
 le 15 Mars 1768. Les fleurs purpurines
 & les fruits verts. Les feuilles
 ovales, 50 grains de diamètre
 l'arbre fruste. Composé de 12*

TYPE

Fig. 131. Type specimen of *Stictocardia tiliifolia* (Desr.) Hall.f.: Mauritius : Comerson (P).

Capsule	Globose, 4 lobed	Depressed globose, entire (smooth)
Fruiting sepal	Engulfing the capsule, 2.5 x 4.2 cm (outer) smooth	Not engulfing the capsule 1.5 x 2 cm, striate
Seed	Obscurely angled, obovoid prominently hairy at hilum, greyish brown.	Orbicular, cerecular, sparsely pubescent at hilum, pale black to black.

Flowering : August-October

Flower opening : 5 am - 6.30 am, closing after 5 pm

Fruiting : November-January

Distribution. *Stictocardia sivarajania* is known only from two localities of Western Ghats such as Eravikulam National Park and Kallar near Munnar, Kerala.

Ecology. The new species is found near stream banks in the semi-evergreen forests and Ghat roadsides generally above 4000ft.

Notes. During the course of the study in Munnar on the Western Ghats of Idukki district in Kerala, we collected an interesting specimen, which did not match with any of the known species. After a careful study, we concluded that it is a new species and this was endorsed also by Dr. B. Verdcourt (K) and Dr. D. F. Austin (US). This is described here as a new species, and is named after Late Dr. V.V. Sivarajan in appreciation of his contribution to plant taxonomy and in grateful acknowledgment of his valuable help in completion of this work.

Horticultural potential. The purple violet younger leaves and reddish purple flowers with a darker center make this plant elegant for gardens.

Specimens examined: KERALA: Idukki Dt.: Rajamala, Biju 40182 (K, TBGT, CALI & MH); Munnar, Biju 16216 (K & TBGT); Kallar, Biju & Suresh Elamon 16101 (CALI & TBGT), Biju 25924 (K & CALI), Biju 22013 (US, TBGT & CALI).

2. *Stictocardia tiliifolia* (Desr.) Hall.f., Bot. Jahrb. Syst. 18:159. 1894 (*tiliaefolia*); Merrill, Philipp. Journ. Sci. 3:429. 1908 & Fl. Manila 385. 1912; Gamble, Fl.Pres. Madras 2:904. 1923; Ooststr., Blumea 5(2): 346. 1943 & Fl.Mal., ser. 1, 4:491. 1953; Austin *et al.*, Brittonia 30:196. 1978; Austin in Dassan. & Fosb., Rev. Handb. Fl: Ceylon 1:360. 1980; Rani & Matthew in Matthew, Fl. Tam. Carnatic 3:1042. 1983.

Type: Mauritius: *Comerson* (P).

Ipomoea gangetica Sweet, Hort. Brit.2: 288.1830.

Convolvulus tiliaefolius Desr. in Lamk., Encyl. 3:544. 1792.

Convolvulus melanostictus Schlecht. in Linnaea 6:737. 1831.

Rivea tiliaefolia (Desr.) Choisy, Mem. Soc. Phys. Geneve 6:407. 1834 & in DC., Prodr. 9:325. 1845; Thw., Enum. p1. zeyl. 209. 1860.

Argyreia tiliaefolia (Desr.) Wight, Ic. pl. Ind. or. 4:12.t. 1358. 1848; Clarke in Hook.f., Fl.Brit.India 4.184. 1883; Trimen, Handb. Fl. Ceylon 3:206.1895.

Rivea campanulata sensu House, Muhlenbergia 5:72.1909.

Stictocardia campanulata sensu Merrill, Philipp. Journ. Sci.9:133.1914; Gunn, Brittonia 24:169.1972.

Argyreia campanulata sensu Alston in Trimen, Handb. Fl. Ceylon 6:201.1931.

(Fig. 131, 133, 134)

Perennial; stem woody at base, trailing or twining, terete, covered with brown exfoliating bark, herbaceous towards tip pubescent; latex colourless. Leaves simple, cordate to cordate-ovate, 6-20 x 4-18 cm, apically acute to short acuminate, basally cordate, glabrous above, pubescent and covered with minute black glands below; midrib and lateral veins raised beneath, prominently pubescent, lateral veins 7-10 pairs; petiole upto 5-13 cm long, slender, pubescent. Flowers axillary, solitary or in 2-6 flowered cymes; peduncle upto 7 cm long, terete, pubescent, mostly shorter than petiole; bracts 2, small, fugaceous; pedicels upto 1-3 cm long, terete to angular, pubescent, thickened and enlarged in fruits; sepals 5, subequal, outer 3 large, orbicular, 1.5-1.8 x 1.5-2 cm, apically rounded to emarginate, densely black-glandular dotted, scarious to shortly ciliate along margins, pubescent, inner 2 short, 1.2-1.3 x 1.3-1.5 cm, suborbicular to orbicular, apically emarginate, shortly,

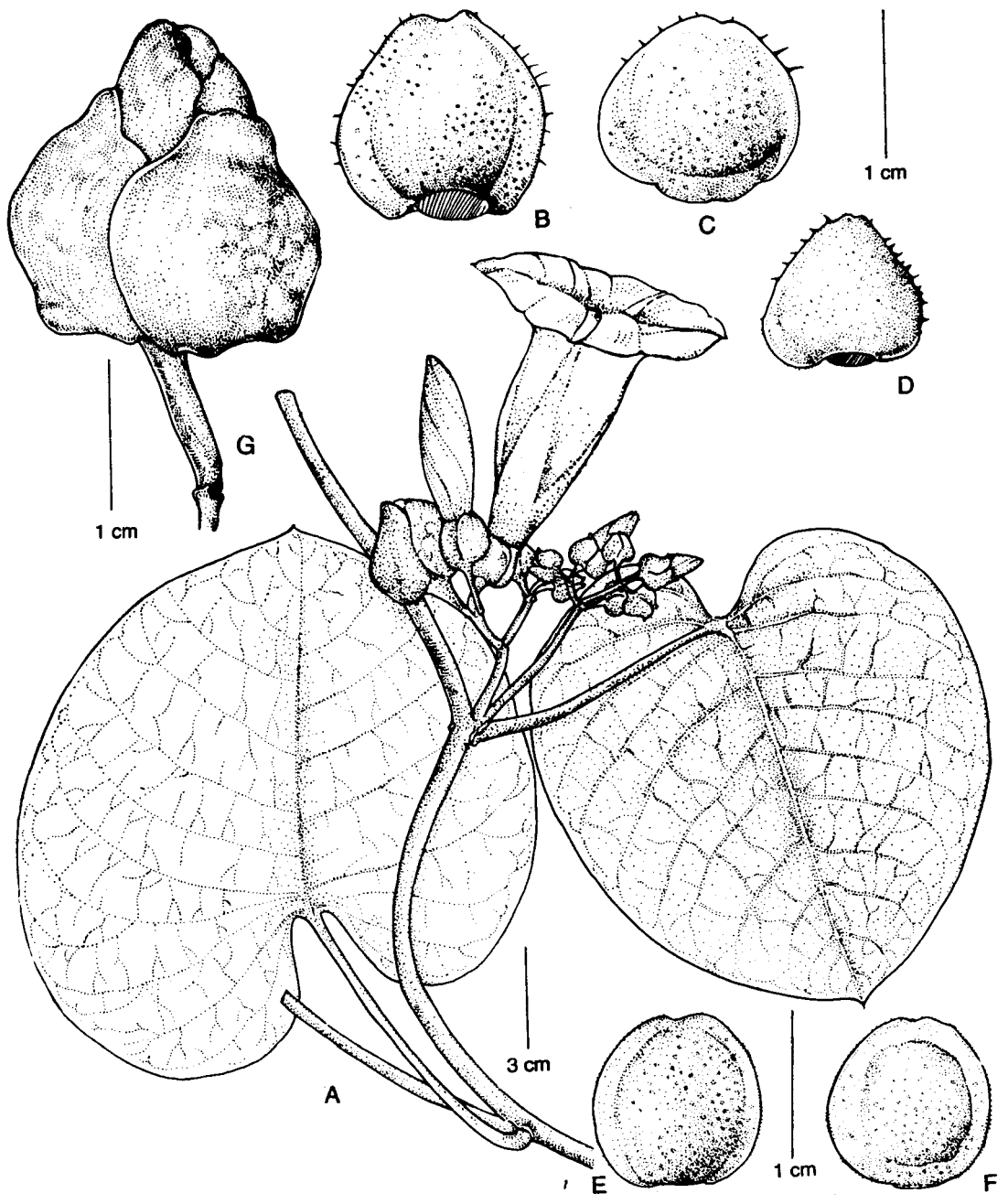


Fig. 134. *Stictocardia tiliifolia*. A. Flowering twig; B & C. Outer sepals; D-F. Inner sepals; G. Fruit (from Biju & Anitha 16250).

scarious along margins, coriaceous; corolla purple with a darker centre, funnel form, tube upto 7-8 cm long, limb slightly 5 lobed, 5-6 cm across, midpetaline bands glabrous with minute black glands, scattered hairs at apex of midpetaline bands especially in bud; stamens inserted; anthers upto 6 mm long, straight after dehiscence; filaments attached upto 1 cm above the corolla base, upto 4 cm long, 3 short upto 3.2 cm long, filiform, purplish red ciliolate at dilated base; style inserted, upto 5.5 cm long, glabrous, filiform; stigma biglobose, papillose; ovary conical, 2 x 2 mm, glabrous, 4-celled; disc small, ± 1 mm, slightly lobed. Fruits capsular, indehiscent globose, 2-2.8 x 1.1.5 cm, 4 lobed, glabrous, engulfed by enlarged fleshy sepals, subspherical and obscurely pointed, 3.5 -3.8 x 3 - 3.5 cm; seeds 1-4, obovoid, 1-1.2 x 0.5 - 0.9 cm, obscurely angular, covered with minute hairs, long pubescent at hilum, greyish brown.

Flowering : July-October

Flower opening : 6 am to 6.30 am

Fruiting : October-December

Distribution. *S. tiliifolia* is a native of Asia or Africa. It is known from Australia, Central America, Burma, Ceylon, Malay Peninsula and Archipelago. Now it has been introduced into cultivation in many New World Tropics. In Peninsular India, it occurs along the coastal belt of Kerala, Tamil Nadu and Karnataka.

Ecology. It is usually found on or near to the sea shore, in thickets, hedges and secondary forests, sometimes also in more elevated areas between sea level to 500 m.

Specimens exained : KERALA: Thiruvananthapuram Dt.: Chakkai, *s.coll. s.n.* (University college herbarium, TVM). Malappuram Dt.: Kottakkal, *Biju* 25971 (TBGT). Kozhikode Dt.: Prappanagadi, *Biju & Anitha* 16250 (CALI & TBGT) KARNATAKA : Shimoga Dt.: *Biju* 15344 (K, US & CALI). Bellari Dt.: *s.coll. s.n.* (MH). S. Canara Dt.: *Barber* 2512 (MH).

3078

Reference

Reference

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