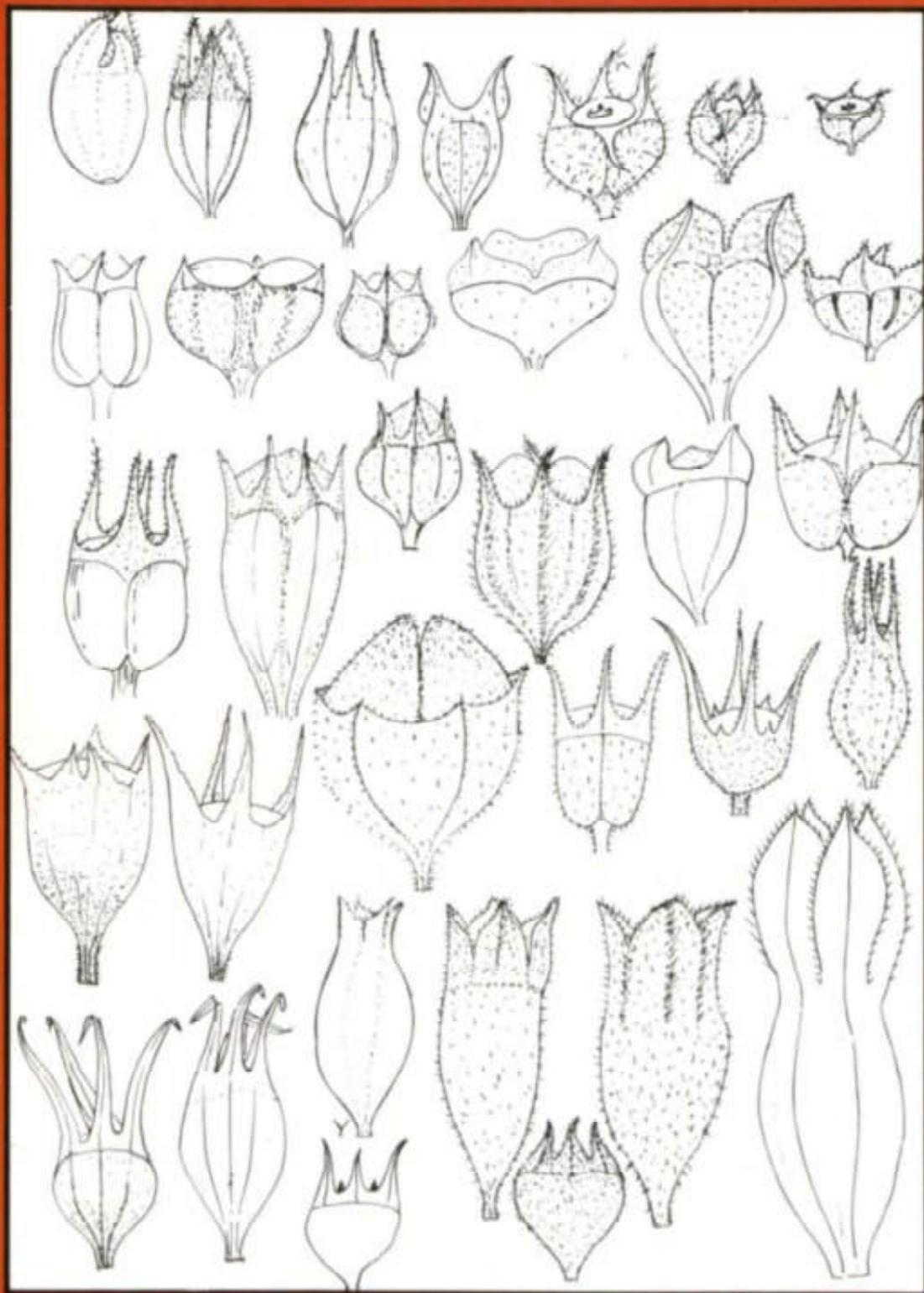


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# TAXONOMIC REVISION OF HEDYOTIS L. (RUBIACEAE) IN INDIAN SUBCONTINENT

RATNA DUTTA  
D. B. DEB



BOTANICAL SURVEY OF INDIA

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**TAXONOMIC REVISION OF *HEDYOTIS* L.  
(RUBIACEAE)  
IN INDIAN SUB-CONTINENT**

**RATNA DUTTA AND D. B. DEB**



**उत्तराखण्डस्य वनस्पति सर्वेक्षण  
BOTANICAL SURVEY OF INDIA**

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## FOREWORD

Botanical Survey of India publishes results of its scientific activities under four series. The first series deals with Flora of India publications in the form of volumes of Flora of India and Fascicles; the second series deals with State Floras and the third with District Floras. In addition to these, critical taxonomic revisions, monographic accounts and miscellaneous works are published under series-4.

The present book "Taxonomic revision of *Hedyotis* L. (Rubiaceae) in Indian sub-continent" by Drs. Ratna Dutta & D. B. Deb is one such work published under Series-4. The present investigation of genus *Hedyotis* L. is a result of extensive studies of herbarium specimens housed in major herbaria of India. Out of 515 species found in the world, the book deals with 74 species occurring in the sub-continent. Taxonomists all over the world are not unanimous on the generic limits of *Hedyotis* L. The range of vegetative and reproductive characteristics presented by authors in introductory chapter show the range of variability and difficulties in generic delimitation. In the present study, the generic circumscription of *Hedyotis* L. has been enlarged on reassessment of characters used by earlier workers, and *Oldenlandia* L. and *Kohautia* Cham. & Schlecht. have been merged under it. The genus has been treated under 7 sections namely sect. *Hedyotis* represented by 8 species, sect. *Oldenlandia* by 18 species, sect. *Kohautia* and sect. *Scleromitron* by 5 species each, sect. *Involucrella* by single species, sect. *Diplophragma* by 35 species and sect. *Antidopsis* represented by 2 species. Authors have taken support from pollen studies and seed morphology to substantiate their taxonomic decisions. This comprehensive taxonomic revision is written and presented in complete form and should serve as a useful manual to facilitate the identification of this highly specialised group of plants not only in India, but also in neighbouring countries of the sub-continent. Authors have examined all the types or their photographs for all the names involved. A number of line drawings showing important diagnostic details for almost all the taxa included in this work will be of special interest to botanists in general and taxonomists in particular. Elaborate notes and lists of specimens examined are additional features of this book.

I hope this book will be useful to all those interested in Indian Plants and will generate further interest in revisionary studies in India.

Place : Kolkata  
Dated : June, 2004



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(M. Sanjappa)  
Director

## PREFACE

The genera *Hedyotis* L. and *Oldenlandia* L. were postulated by C. Linnaeus in his Sp. Pl. 119.1753 and Gen. Pl. ed. 5,35.1754. Schreder (1789) expressed doubts as to the distinctness of these two genera and suggested their union in Gen. Pl. 2 : 280.1791. Lamarck, Illustr. des genres 1:269.1792 united them selecting *Hedyotis* for the enlarged genus. Willdenow (1798) maintained them as distinct genera. J. E. Smith (1811) accepted Lamarck's reduction of *Oldenlandia* L. to *Hedyotis* L. but unfortunately applied the name *Oldenlandia* to a wholly different plant, *O. pentandra* Retz. a plant of Saxifragaceae having calyx and corolla 5-lobed, style 2-lobed and capsule bilocular. This treatment was followed by Sprengel (1815), Roemer & Schult. (1818), Steudel (1821) and Blume (1826-27). Roxburgh (1826) maintained both the genera as distinct but observed that except the attachment of the respective receptacles, there is no other mark by which the two genera are distinguishable and this is too minute and inconspicuous.

At that time International Code of Botanical Nomenclature was not universally binding. However, D. Don (1825), Kuntze, O. (1891-1898) and Gamble J. S. (1921) treated *Hedyotis* L. as a synonym of *Oldenlandia* L.

Bremekamp (1952) proposed many segregate genera besides recognizing *Hedyotis*, *Oldenlandia* and *Kohautia*. Hooker f. Fl. Brit. India recognized *Hedyotis* and *Oldenlandia* but reduced *Kohautia* to a subgeneric status under *Oldenlandia* L.

Following Bremekamp's (1952) generic concept in the tribe Hedyotideae, *Gonotheca* is treated as a distinct genus by Santapau & Wagh (1969). It is distinguished from *Oldenlandia* L. as the capsule is 4-angled or 4-winged, seeds are globose or subglobose and leaves are usually broader. Bakhuizen f. (1965) did not recognize this as distinct from *Hedyotis* L. Babu (1969) proposed a new generic name *Thecagonum* treating *Gonotheca* Bl. ex DC. as illegitimate, being a later homonym of *Gonotheca* Rafin (1808) and *Thecagonum pteritum* (Bl.) Babu as the type of the genus, which does not deserve to be treated as distinct because it differs from others in angular to winged capsule and globose or subglobose seeds with deeply pitted testa. Thus critical morphological studies of *Exallage* Bremek., *Pleincraterium* Bremek., *Kohautia* Cham. & Schlecht., *Thecagonum* Babu etc. clearly show that major characteristics of such taxa exhibit continuous range of variation and various generic realignments made by Bremekamp (1952) do not seem to be tenable at all. Hence some of those are merged with *Hedyotis* L.

Lewis (1959, 1961) merged *Houstonia* L. with *Hedyotis* but continued to use the genus *Oldenlandia* in *Grana Palynologia* 5 : 330-341 (1964) and in *Cytopalynological study of African Hedyotideae* in *Ann. Missouri. Bot. Gard* 52:182-211 (1965). He upheld many of Bremekamp's segregate genera as well as *Oldenlandia*. If all the genera closely related to *Hedyotis* are sunk into it then it forms an unwieldy unit covering a very wide range of structure and habit.

Hooker f. (1880 : 64) observed that *Hedyotis andamanica* Kurz (1872) is an anomalous species resembling an *Oldenlandia* near *Oldenlandia nudicaulis* but the calyx teeth are close together in fruit and the seeds though not ripe have no appearance of pitting; the corolla too, resembles that of *Hedyotis* and the stamens have linear anthers. His observation tends to suggest continuity of characteristics of broadly *Hedyotis* and *Oldenlandia* are not strictly distinguishable.

At that time second author(DBD) was working on *Rubia* L. and *Mycetia* Reinw. and was not in a position to decide on the matter. When first author(RD) was posted in the Industrial Section, Indian Museum, under Botanical Survey of India, and intended to work out a Ph. D. Thesis, second author availed of this opportunity to assign this problem to her. She worked on this problem for many years and investigated on palynology of the available taxa also. Such a large problem is not generally worked out in Ph. D. Thesis. The present book is based on her thesis for Ph. D. Degree of the University of Calcutta awarded in 1991. The present book, does not contain the final say on the delimitation of all the genera included.

Dr. Paramjit Singh, taking over as Incharge, Publication Section took interest to get it published properly and worked for its release for which the authors record their gratitude to him. The authors are also thankful to Dr. M. Sanjappa, Director, Botanical Survey of India for prompt action.

RATNA DUTTA  
D. B. DEB  
Kolkata

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## INTRODUCTION

The genera *Hedyotis* and *Oldenlandia* were described by C. Linnaeus. K. Schumann united them under the name *Oldenlandia*. Workers all over the world are not yet unanimous on the delimitation of these two and some other allied ones. The present workers were initially bewildered with the problem. To bring the point home it is considered essential to present the range of vegetative and reproductive characteristics of different parts as to how they change and differ in different plants in various aspects tending to approximation implying synonymy of the relevant generic names under sectional distinction of one genus as presented here.

## MORPHOLOGICAL CHARACTERS

*Habit* : The species of *Hedyotis* vary in habit from small herbs to undershrubs or shrubs, sometimes climbing, frequently with perennial rootstock. Sect. *Diplophragma* are mostly bushy shrubs, branches leafy above, with fallen leaf and stipular scars below. *H. capitellata*, *H. scandens* are climbing shrubs, *H. kurzii*, *H. trimenii*, and *H. verticillaris* under sect. *Diplophragma* are with perennial root stocks. The sect. *Oldenlandia* are slender herbs. sects. *Kohautia*, *Oldenlandia*, *Hedyotis*, *Scleromitron*, *Involucrella* and *Anotidopsis* are mostly herbs with perennial root stocks. When dry, they are yellowish, yellowish green, purple-black, black or whitish.

The stem is terete or quadrangular, often with prominent grooves and ridges, rarely winged, glabrous, pubescent, villous, pilose or scabrid along ridges or throughout. It is often winged in *H. uncinella*, *H. acutangula*, *H. tetrandra* and *H. articularis* subsp. *santapauli* in sect. *Diplophragma* and often slender with prominent grooves and ridges in *H. pinifolia*, *H. verticillata*, *H. angustifolia* in sect. *Scleromitron*, obtusely angular, terete or fistular mostly in sect. *Hedyotis*. Stems are generally glabrous in sect. *Diplophragma*, but pubescent in *H. bourdillonii*, scabrid along ridges in *H. griffithii* and *H. srilankensis*, hispid in *H. nodulosa*, yellowish pubescent in *H. lineata*, *H. fulva*, retrorsely villous in *H. vestita*, puberulous in *H. auricularia* in sect. *Hedyotis*; setaceous in *H. andamanica* in sect. *Anotidopsis*; setaceous or minutely scabrid in *H. linoides* and *H. puberula* in sect. *Oldenlandia*, *H. cyanantha* in sect. *Scleromitron* and *H. aspera* in sect. *Kohautia*, but retrorsely hispid in *H. retrorsa*, scabridulous or spinous in *H. coccinea* and flaccid, winged and pilose in *H. trinervia* in sect. *Oldenlandia*. Nodes are very close and often sheathed with stipules in sect. *Diplophragma* as in *H. articularis*, *H. hirsutissima*, *H. lessertiana*, *H. quinquenervia*, *H. barberi* and *H. buxifolia*. Nodes are often swollen in sect. *Hedyotis*.

*Leaves* : Leaves are mostly opposite, decussate, rarely whorled, sessile or petiolate, broadly elliptic, ovate-lanceolate, elliptic-lanceolate, orbicular, oblong-lanceolate, lanceolate, linear-lanceolate or linear, acute, acuminate or obtuse.

rarely apiculate or aristate at apex, sometimes undulate at margin, cuneate, attenuate or obtuse at base. Leaves are sessile or subsessile, linear-lanceolate to narrowly elliptic-lanceolate, 1-nerved in sect. Kohautia and mostly in sect. Oldenlandia. They are elliptic-oblong or ovate-oblong with obscure lateral nerves in *H. pterita*, *H. racemosa*, and *H. ovatifolia* and sagittate in *H. linoides*, sect. Oldenlandia. Leaves are ovate, elliptic-lanceolate, oblong-lanceolate, ovate-lanceolate, linear-lanceolate or linear in sects. Hedyotis, Scleromitron and Involucrella, ovate, mostly 1-nerved in *H. barberi*, *H. buxifolia* and *H. travancorica*. Leaf nerves are plaited in most species in sect. Hedyotis and only midrib is prominent in sects. Scleromitron and Involucrella. Leaves are with 3-8 pairs of nerves in *H. leschenaultiana*, *H. viscida*, *H. devicolamensis*, *H. pruinosa*, *H. purpurascens*, *H. albonervia*, *H. gamblei*, *H. eualata* etc. with 6-12 pairs, oblique, very fine nerves in *H. fruticosa* or nerves deeply sunk in upper surface and raised on lower surface in *H. leschenaultiana*. Leaves are usually coriaceous, punctate in most species in sects. Diplophragma, Oldenlandia and Scleromitron. Leaves are mostly squarrose in sect. Scleromitron and *H. puberula*, *H. graminicola*, and *H. attenuata* in sect. Oldenlandia. When dry, leaves are usually pale green or yellowish green in *H. eualata*, *H. ramarowii*, *H. villosostipulata* and *H. viscida*, dark-green in *H. andamanica* and *H. fruticosa* yellowish in *H. scandens*, blackish in *H. griffithii*. They are glabrous in most species in sect. Diplophragma but hirsute above and along the nerves beneath in *H. hirsutissima*, puberulous in *H. ovatifolia*, *H. ramarowii* and *H. tetrandra*, pilose in *H. trinervia*, hispid in *H. linoides*, pubescent in *H. bourdillonii*, mostly puberulous or pubescent in *H. fulva*, *H. auricularia*, *H. lineata*, villous in *H. vestita* in sect. Hedyotis, scabrid in *H. griffithii*, spinous in *H. coccinea*, retrorsely hispid in *H. retrorsa* in sect. Kohautia, sparse to densely hispid in *H. pinifolia* and *H. verticillata* in sect. Scleromitron. (Plate 1).

**Stomata** : The stomata are not taxonomically significant at generic or specific level.

**Stipules** : Stipules are of various forms. They are short pectinate or with 2-5 fimbriae or bristles in sect. Kohautia and mostly in sect. Oldenlandia, but truncate in *H. graminifolia* or with short teeth like projections in *H. herbacea*, *H. affinis* and *H. ovatifolia*. Stipules are broad, connate, cuspidate or acute in *H. scandens*, *H. trimenii*, *H. acutangula* and *H. capitellata* in sect. Diplophragma as well as in *H. racemosa* in sect. Oldenlandia. They are cupular with stiff bristles in most of the species in sects. Scleromitron and Involucrella and *H. paradoxa* in sect. Hedyotis. In sect. Diplophragma stipules are of various forms and deciduous, leaving scars in most species. They are free or connate at base, triangular or orbicular, with glandular or viscid margin or shortly pectinate in *H. fruticosa*, *H. cymosa*, *H. gamblei*, *H. purpurascens*, *H. pruinosa* and *H. viscida*, pectinate in *H. leschenaultiana*, *H. swertioides*, *H. eualata* and *H. devicolamensis* in sect. Diplophragma and in *H. scabra* and *H. congesta* in sect. Hedyotis. Stipular bristles are pubescent in *H. leschenaultiana* and *H. devicolamensis*, glabrous in *H. swertioides* and *H. eualata* but pubescent in early stage but subsequently glabrous in *H. congesta*; stipular base is often fleshy in *H. swertioides*, *H. eualata* and *H. acutangula*. Stipules are shortly pectinate and densely silky hairy in *H.*

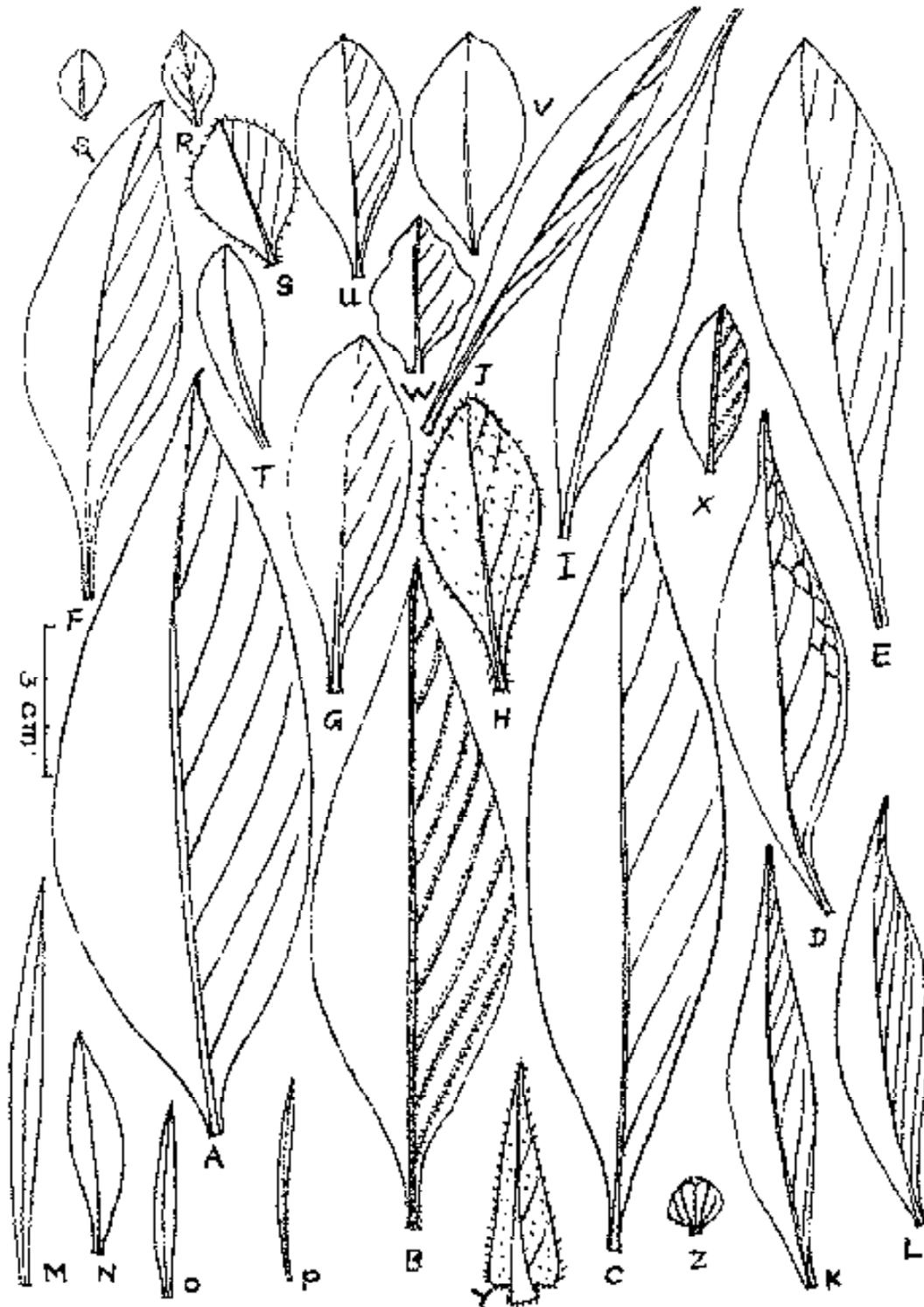


Plate 1. (A - Z) Variation of Leaves : A. *Hedyotis congesta*; B. *H. ramatowii*; C. *H. enulata*; D. *H. viscida*; E. *H. paradoxa*; F. *H. gamblei*; G. *H. villosaxipulata*; H. *H. hirsutissima*; I. *H. scandens*; J. *H. pruinosa*; K. *H. insularis*; L. *H. fruticosa*; M. *H. gracilis*; N. *H. neesiana*; O. *H. corymbosa*; P. *H. pinifolia*; Q. *H. buxifolia*; R. *H. barberi*; S. *H. beddomei*; T. *H. racemosa*; U. *H. ovatifolia*; V. *H. andanunica*; W. *H. swertioides*; X. *H. articulata*; Y. *H. linoides*; Z. *H. quinquenervia*.

*travancorica* and deeply pectinate, glabrous in *H. albonervia*, villous in *H. villosostipulata* and *H. hirsutissima*. Stipules are interfoliar, long, linear lanceolate with few glandular bristle-shaped teeth along margin, and are often united with the adjacent leaves to form a wide amplexicaul cap in *H. verticillaris*. Stipules are short triangular with pilose bristles in *H. nodulosa*; and puberulous in *H. ramarowii*. They are white and scarious in *H. barberi*, ovate, sharply toothed and strigose in *H. beddomei*, often forming a loose sheath in *H. quinquenervia*, *H. lessertiana*, *H. flavescens* and are often long awn like in *H. auricularia*, *H. vestita* and *H. lineata* (Plate 2.).

**Rhaphides** : Bremekamp (1952) proposed the suprageneric classification of the Rubiaceae, treating the presence or absence of raphide crystals as an important character defining subfamilies and tribes, Verdcourt (1958) and Kirkbride (1985) followed him but Robbrecht (1988) rightly did not consider this single character as the basis for a subfamilial character. Rhaphides are present in the genus without any exception. They are present in stem, leaves, stipules, hypanthium, corolla, anther connectives, capsule walls and seed-coats. They are more on lower surface of leaves, than on the upper. Many tiny raphides are present in the placenta, enlarging with maturity of the seed.

**Inflorescence** : Inflorescence ranges from terminal short cyme to paniculate corymbose or umbellate cymes or sometimes reduced to sub-capitate, capitate or globose heads or axillary sessile or pedunculate cyme or solitary flower.

In sect. *Diplophragma*, it is dichotomous, trichotomous or whorled and paniculate, corymbose, umbellate, or much reduced capitate cymes. It is 3-flowered in *H. buxifolia* and *H. barberi* but dense flowered in *H. articularis*, terminal peduncled, cymes in *H. leschenaultiana* and whorled panicles in *H. eualata*, *H. swertioides*, and *H. devicolamensis*. Panicles are fairly long and often drooping in *H. eualata* and *H. swertioides*, short, close and leafy in *H. devicolamensis*. Cymes are dichotomously branching in *H. bourdillonii*, trichotomous or dichotomous below, branches reduced to dichasial or monochasial cymes in *H. pruinosa* and *H. purpurascens*, long peduncled, 2-3 chotomously branched umbellate in *H. acutangula*. Cymes are umbellate in *H. scandens*, loosely arranged in *H. trimenii*; corymbose pyramidal cymose heads in *H. viscida*, slender, lax panicle in *H. kurzii*, involucrate, capitate in *H. beddomei*, *H. griffithii*, *H. gamblei* in sect. *Diplophragma*; in *H. scabra* in sect. *Hedyotis* and *H. brunonis* in sect. *Anotidopsis*. Inflorescence is capitate but hidden within the base of 2-4 involucreal leaves in *H. merguensis* in sect. *Involucrella*, axillary long peduncled subcapitate cymes in *H. verticillaris* and densely aggregated in small globose heads in *H. uncinella* in sect. *Diplophragma*. Flowers are axillary 1-3 together or terminal, 3-8 in umbels or heads (not involucrate) in *H. pterita* in sect. *Oldenlandia*, lax subcapitate cymes in *H. andamanica* in sect. *Anotidopsis*, dense cymose clusters in *H. tetrandra*, *H. nodulosa* and *H. ramarowii* in sect. *Diplophragma* and in *H. congesta*, *H. paradoxa* in sect. *Hedyotis*; pedunculate cyme in *H. albonervia* and *H. hirsutissima* in sect. *Diplophragma*, peduncle is very short but pedicels are long and slender in *H. albonervia*. Flowers are few to many in dense axillary cymes in most species in sect. *Scleromitron*. Cyme is mostly sessile or short pedunculate in

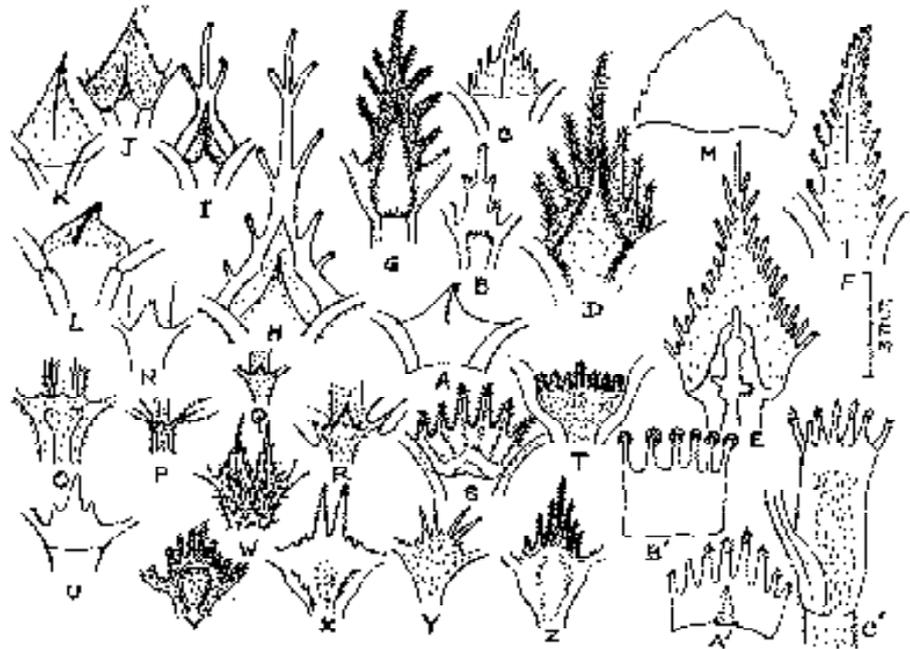


Plate 2. (A - Z) Variation in siphon: A. *Helicoverpa scabra*; B. *H. telegonia*; C. *H. graminea*; D. *H. arctularia*; E. *H. antiochensis*; F. *H. vulgata*; G. *H. cingalis*; H. *H. muscardina*; I. *H. ruficornis*; J. *H. scabra*; K. *H. jacobata*; L. *H. zozana*; M. *H. bohemica*; N. *H. caryocarpa*; O. *H. caryocarpa*; P. *H. graminea*; Q. *H. leucophaea*; R. *H. leucophaea*; S. *H. antiochensis*; T. *H. quinquemaculata*; U. *H. biflora*; V. *H. caryocarpa*; W. *H. caryocarpa*; X. *H. caryocarpa*; Y. *H. caryocarpa*; Z. *H. caryocarpa*; A'. *H. caryocarpa*; B'. *H. caryocarpa*; C'. *H. caryocarpa*

*H. auricularia* and distinctly pedunculate in *H. lineata*, *H. fulva*, *H. insularis* in sect. Hedyotis. Flowers are axillary solitary on long pedicel in *H. travancorica*. *H. villosostipulata* in sect. Diplophragma as well as *H. herbacea*, *H. pumila* (sometimes 2-flowered) in sect. Oldenlandia. Pedicels are axillary, solitary or geminate in *H. herbacea*, clusters of 2-6 in *H. travancorica* and 10-20 in *H. villosostipulata*. Pedicels are often stout and short, in *H. diffusa*, axillary cluster in *H. trinervia* in sect. Oldenlandia; axillary, peduncled 2-several-flowered cymes in *H. corymbosa*, *H. diffusa* and *H. puberula* sect. Oldenlandia. Cymes are terminal, 2-4 flowered or the flower is axillary, solitary in *H. linoides*, *H. stocksii*, *H. graminicola* in sect. Oldenlandia. Flowers are in corymbose cymes in *H. ovatifolia* and few to many-flowered paniculate cymes in *H. racemosa*. Inflorescence is mostly raceme like or monochasial or dichasial, rarely 2-flowered in sect. Kohautia and some species under sect. Oldenlandia. Cyme-branches are long and slender with distant flowers in *H. graminifolia* in sect. Oldenlandia, or loose panicles of cymes or axillary 2-flowered in *H. affinis* in sect. Oldenlandia and *H. nagporensis* in sect. Kohautia. Inflorescence is mostly monochasial or dichasial, and flowers are solitary or 3, rarely 2 in *H. coccinea* and *H. retrorsa*, *H. aspera*, *H. gracilis*, *H. nagporensis* in sect. Kohautia.

Inflorescence is glabrous, puberulous, pubescent or hirsute often scaberulous or setaceous. It is usually glabrous in most species in sect. Diplophragma, but pruinose all over in *H. pruinosa*, pubescent in *H. swertioides*, *H. bourdillonii*, and *H. capitellata* var. *pubescens*, puberulous in *H. scandens*, *H. ramarowii* and *H. tetrandra*, hirsute in *H. hirsutissima*. Peduncle is setaceous or minutely scabrid in *H. aspera*, spinous in *H. coccinea* in sect. Kohautia. In sect. Hedyotis, cymes are pubescent in *H. lineata*, puberulous in *H. auricularia* subsp. *venosa*, villous in *H. fulva* and *H. vestita*. (Plate 3.).

**Flowers :** Flowers are mostly 4-merous, rarely 5-merous. It is usually 2-4 mm in length, sometimes up to 20 mm. It is 15-18 mm in sect. Involucrella, 8-20 mm in sect. Kohautia, 2-4 mm in most species in sect. Oldenlandia, 4.5-11(-18) mm in sects. Diplophragma, Hedyotis, Scleromitron, Antidopsis and few species in sect. Oldenlandia. Flowers are both monomorphic and dimorphic in sects. Diplophragma, Oldenlandia, Hedyotis and Antidopsis and only monomorphic in sects. Kohautia, Scleromitron and Involucrella. (Plate 4.).

Flowers are sessile, subsessile or pedicelled. Pedicel varies from 0.2 to 2.5 (-3) mm in most species in sects. Diplophragma, Scleromitron and Hedyotis, 1-2 cm long, slender in *H. albonervia*, *H. travancorica*, *H. villosostipulata*, *H. ramarowii* in Diplophragma, *H. herbacea*, *H. stocksii*, *H. graminicola* in sect. Oldenlandia. Both peduncle and pedicels are often capillary. Peduncle 0.7-2.5 cm long and pedicel 1-1.6 cm long in *H. affinis*, *H. linoides*. Peduncles and pedicels are short and rigid in *H. attenuata*. Pedicels are mostly short, nearly equal to petiole in *H. diffusa*. Peduncles are mostly stout in sect. Diplophragma except *H. kurzii* where both peduncle and pedicel are capillary.

Bracts and bracteoles are usually present but sometimes absent. Bracts are mostly small, ovate-oblong or shortly pectinate, 0.7-1.2 mm long in *H. retrorsa*, *H.*



Plate 3. (A - C) Variation in inflorescence : A. *Hedyotis pumila*; B. *H. diffusa*; C. *H. diffusa* var. *extensa*; D. *H. herbacea*; E. *H. stockii*; F. *H. llnoides*; G. *H. kurzii*; H. *H. ovatifolia*; I. *H. affinis*; J. *H. gracilis*; K. *H. naggorensis*; L. *H. retrorsa*; M. *H. racemosa*; N. *H. verticillaris*; O. *H. pterita*; P. *H. merguensis*; Q. *H. griffithii*; R. *H. beddomei*; S. *H. gamblei*; T. *H. flavescens*; U. *H. capitellata*; V. *H. fruticosa*; W. *H. viscida*; X. *H. eulata*; Y. *H. villosostipulata*; Z. *H. fulva*; A'. *H. puberula*; B'. *H. congesta*; C. *H. ramarowii*.

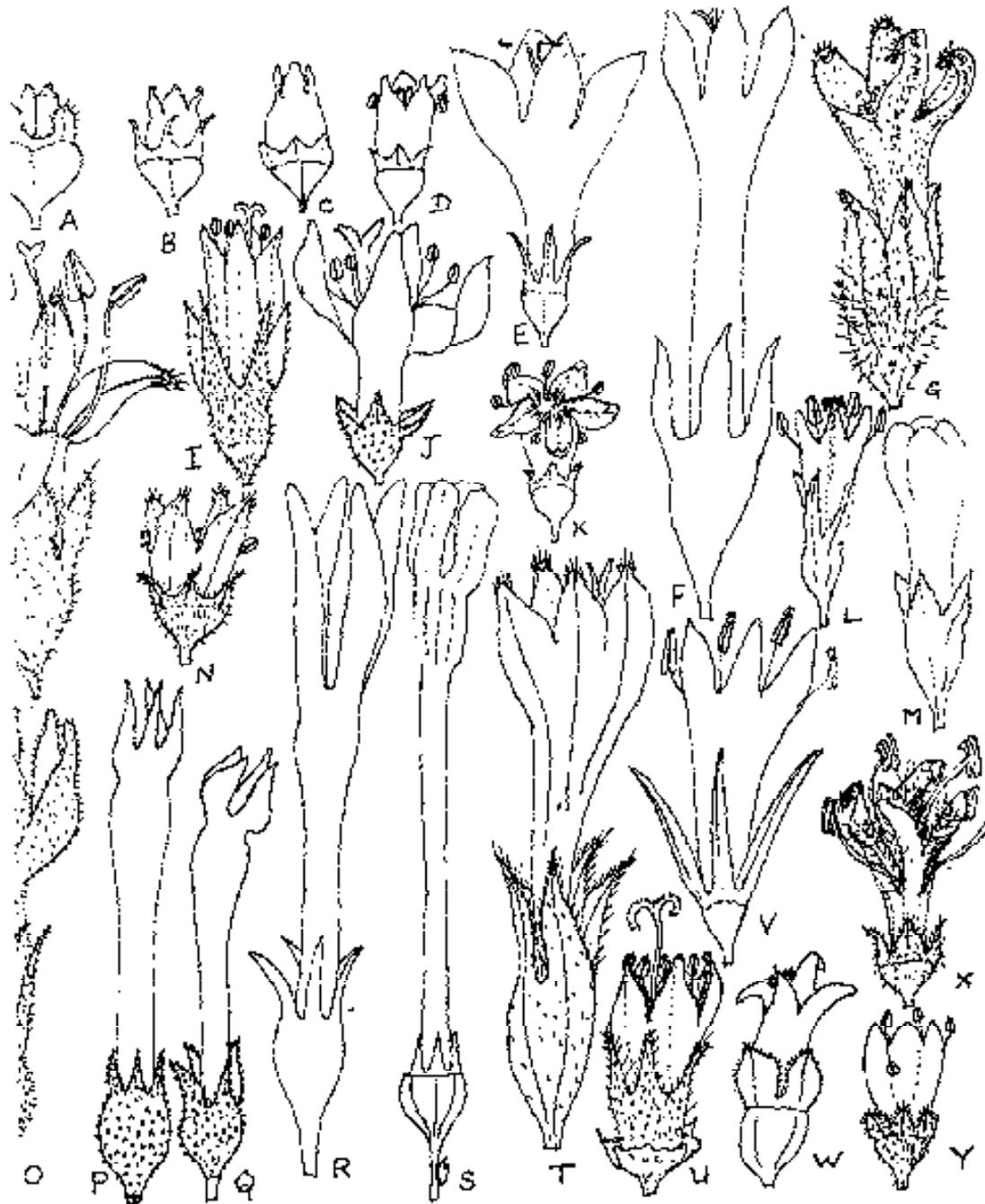


Plate 4. (A - Y) Variation in flowers : A. *Hedysotis trinervia*; B. *H. corymbosa*; C. *H. hermanniana*; D. *H. pseudocorymbosa*; E. *H. affinis*; F. *H. purpurascens*; G. *H. bourdillonii*; H. *H. verticillata*; I. *H. cyanantha*; J. *H. ovalifolia*; K. *H. fulva*; L. *H. linoides*; M. *H. pumila*; N. *H. vestita*; O. *H. coccinea*; P. *H. nagporensis*; Q. *H. aspera*; R. *H. gracilis*; S. *H. retrorsa*; T. *H. merquensis*; U. *H. pinifolia*; V. *H. gambelii*; W. *H. congesta*; X. *H. capitellata*; Y. *H. insularis*.



*coccinea*, *H. aspera* in sect. *Kohautia*, 1-2 mm long with fimbriate margin often enclosing the calyx at base in *H. verticillata*, *H. neesiana* in sect. *Scleromitron*. Both bracts and bracteoles are present in most species in sect. *Diplophragma*. Bracts are involucrate, foliaceous in *H. beddomei*, filiform in *H. buxifolia*; foliaceous in *H. eualata*, *H. gamblei*, *H. purpurascens*, *H. leschenaultiana*, *H. pruinosa*, *H. articularis*. Bracteoles are mostly linear, 1-3 mm long, glabrous, puberulous, or pubescent. Bracts are numerous, stipule like with long bristles almost enclosing the calyx in *H. merguensis* (sect. *Involucrella*); small, scarious in *H. congesta*, mostly linear or shortly pectinate in *H. auricularia*, *H. vestita*, *H. fulva* in sect. *Hedyotis* and usually small, often very conspicuous in most species in sect. *Oldenlandia*.

**Calyx** : Calyx lobes 4, rarely 5, triangular, triangular - lanceolate, lanceolate or linear-lanceolate, often keeled, 0.5 - 4 mm long. They are persistent to the fruit, rarely with intermediate teeth in-between the calyx lobes.

Hypanthium is globose, subglobose, ovoid, ellipsoid, terete or angular, rarely winged. The part above the hypanthium is the calyx limb, very short in most of the sections except *Diplophragma* and *Involucrella* where it is up to 2 mm in *H. bourdillonii*, *H. purpurascens*, *H. articularis*, *H. lessertiana*, *H. leschenaultiana* and *H. merguensis*.

Hypanthium is globose, subglobose or ovoid, 1- 2 mm long in sect. *Scleromitron* with calyx lobes triangular, ovate, ovate-lanceolate, prominently mid-veined; calyx lobes are triangular aristate in *H. cyanantha*, ciliate at margin in *H. neesiana* and hispid all over in *H. verticillata*. Calyx lobes are linear-lanceolate or lanceolate, ciliate along margin, much longer than the ovoid hypanthium in *H. merguensis*. Hypanthium is globose or ellipsoid, and calyx-lobes subulate in *H. aspera*, *H. nagporensis*, *H. retrorsa*, triangular or linear-lanceolate in *H. coccinea* and *H. gracilis* in sect. *Kohautia*. Calyx lobes are spinulose in *H. coccinea*, minutely scabridulous in *H. aspera*. Accessory calyx teeth are present in *H. gracilis*, *H. scandens* in sect. *Diplophragma*, *H. lineata*, *H. auricularia*, *H. fulva* in sect. *Hedyotis* and *H. stocksii*, *H. pumila* in sect. *Oldenlandia*.

Calyx lobes are triangular or triangular-lanceolate, setulose, dentate or minutely serrulate often at the margin, mid-vein prominent in sect. *Oldenlandia*; triangular-lanceolate in *H. puberula*, ovate-lanceolate, acicular in *H. stocksii*, linear-lanceolate in *H. tinoides*. Calyx lobes are very short, nearly as long as or longer than corolla tube in *H. trinervis* and subulate, shorter than corolla tube in *H. attenuata*; triangular, minutely serrated at margin nearly as long as the corolla tube in *H. corymbosa*, but lobes are much shorter than the corolla tube in *H. herbacea*, *H. affinis*. Calyx lobes are broadly triangular, acute in *H. ovatifolia*, *H. racemosa*, *H. pterita*. Hypanthium in above species is globose or subglobose or ellipsoid, narrowly to broadly winged in *H. pterita*, 4-angled in *H. racemosa* and *H. ovatifolia*, subglobose or ovoid in *H. andamanica* and *H. brunonis* in sect. *Anotidopsis*, lobes are triangular lanceolate, recurved in fruit. (Plate 5).

**Corolla** : Corolla is often variously coloured. It is white, purplish white, violet, yellowish, brownish, greenish, pale blue or purple. *H. coccinea* in sect. *Kohautia* is often variously coloured, the limb is pink, scarlet-pink or crimson-purple, pale

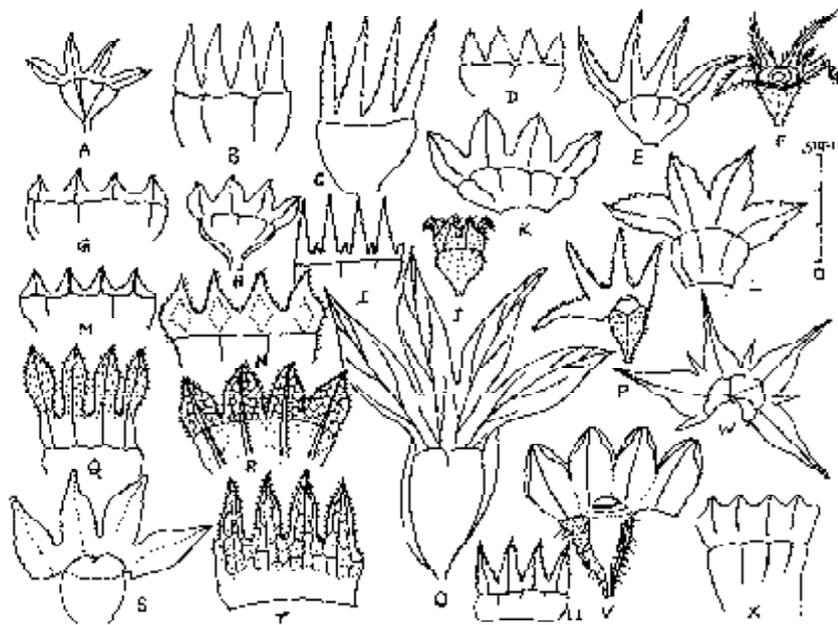


Plate 5. (A - X) Variation in *Heliotropium* nod calyx lobes. A. *Heliotropium affinis*, B. *H. graminifolium*, C. *H. cucullatum*, D. *H. serotinum*, E. *H. laevigatum*, F. *H. lineare*, G. *H. acutangulum*, H. *H. kureti*, I. *H. savoyense*, J. *H. fulvum*, K. *H. hermannianum*, L. *H. pusillum*, M. *H. minervia*, N. *H. pinnifolium*, O. *H. moquense*, P. *H. sumatranum*, Q. *H. angustifolium*, R. *H. pteridifolium*, S. *H. flavescens*, T. *H. cyanantha*, U. *H. kashanum*, V. *H. laurifolium*, W. *H. stockii*, X. *H. jeshenauianum*.

beneath, mostly white at throat, tube greenish or yellowish. Flowers are purple, violet, pale blue or pinkish in *H. leschenaultiana*, *H. uncinella*, *H. purpurascens*, *H. swertioides*, *H. pruinosa* etc. in sect. Diplophragma and *H. corymbosa* var. *linearis*. Other species under the genus are mostly white. Flower is fragrant in *H. leschenaultiana* and *H. scandens*. Corolla is rotate, funnel shaped, campanulate, or cylindrical. It is broadly campanulate and usually enclosed by calyx teeth in *H. stocksii* (sect. Oldenlandia); short, often gibbous, hardly longer than the calyx in *H. trinervia*, *H. corymbosa*, *H. attenuata*, *H. racemosa*, *H. pterita* in sect. Oldenlandia, and much longer than the calyx in *H. herbacea*, *H. affinis*, *H. graminicola* and *H. graminifolia*; funnel-shaped in most species under sect. Diplophragma. Corolla tube is as long as the lobes in all the species except *H. purpurascens* where the tube is 3-4 times longer than the lobes. Corolla tubes in *H. scandens*, *H. capitellata* and *H. kurzii* are very short and lobes 2-4 times longer than tube. In sect. Kohautia corolla tube is narrowly cylindrical and 4-5 times longer than the lobes in *H. nagporensis*, *H. aspera*, *H. retrorsa* and about double the lobes or shorter in *H. coccinea* and *H. gracilis*. Corolla is mostly spinulose in *H. coccinea*; tube is broadening above, usually 4-5 times longer than the lobes in *H. merguensis* in sect. Involucrella; tube is mostly enclosed within calyx in sects. Hedyotis and Scleromitron; lobes are oblong, densely bearded, in *H. scandens* and *H. capitellata*. Corolla throat is densely pubescent or woolly inside in most species under sect. Kohautia and Scleromitron. Corolla tube is swollen above with or without distinct notch in most species under sect. Kohautia. Corolla lobes are minutely pubescent inside, often setulose and mostly incurved at apex and beaked in most species of the genus. Margin of the corolla lobe is setulose finely and very minutely dentate. Venation of corolla lobes is often prominent in most species under sect. Diplophragma. (Plate 6.)

**Androecium** : Stamens are usually 4, rarely 5, adnate with the corolla at or just below the throat or rarely much lower inside the tube. Anther is 0.2-2 mm long, globose, subglobose, oblong or linear, bilocular, dorsifixed, dehiscent longitudinally, sessile or with short filament, 0.5-2.5 mm long. Anther is 0.5-1.5 mm long, linear, sessile or with short filament arising from swollen part of the corolla tube in sect. Kohautia; 0.5-0.8 mm, subglobose or oblong-linear, with slender filament, 1.5-2mm long in sect. Scleromitron, filament adnate at sinus of the corolla lobe or at throat; 0.2-1 mm, globose or subglobose, sessile or with filament in most species in sect. Oldenlandia. Anthers are enclosed within corolla tube by a ring of pubescent hairs in *H. racemosa*, *H. pterita*, *H. corymbosa*, *H. attenuata*, *H. affinis*. Anthers are globose, nearly sessile, arising from corolla tube in *H. racemosa*, *H. attenuata* and from near the base in *H. pterita*; subglobose in *H. corymbosa*, *H. diffusa*. Filament mostly short, enclosed within or exerted. Stamens are included or exerted in sect. Diplophragma. Anther is 0.5-2.5 mm oblong-linear or linear, filament 0.5-2.5 mm long, arising mostly from throat or sinus of the corolla lobes. Filament is slender, rarely flattened in *H. scandens*, *H. capitellata* in sect. Diplophragma and *H. auricularia* in sect. Hedyotis. Anthers are globose in *H. vestita* in sect. Hedyotis. Anther lobes are often ciliate along margin in most of the species in sect. Diplophragma and *H. paradoxa* in sect. Hedyotis. Stamens are included within long corolla tube in *H. merguensis* in sect. Involucrella. Stamens and styles are both

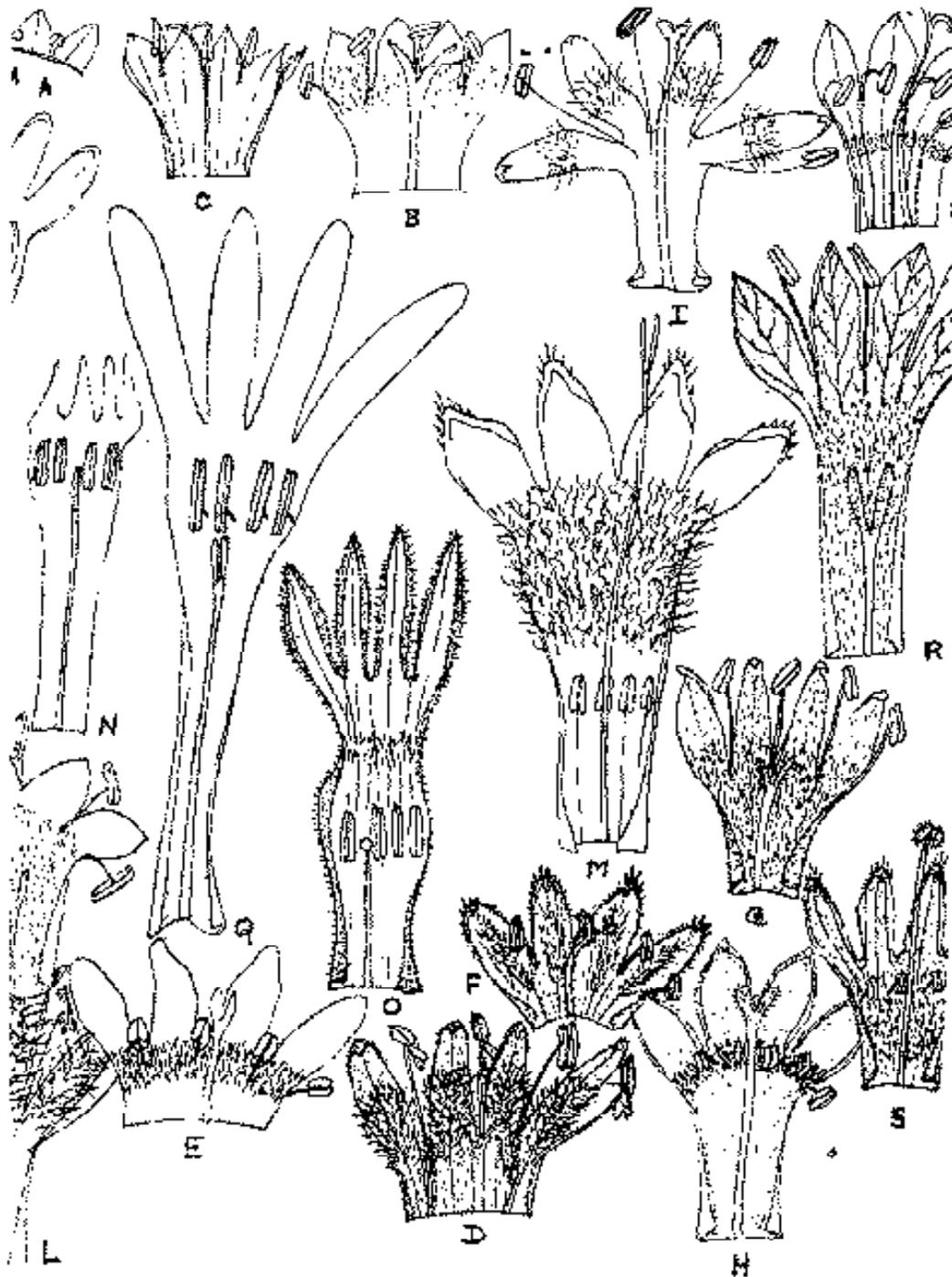


Plate 6. (A - S) Variation in corolla with stamens : A. *Hedyotis trinervia*; B. *H. kurzii*; C. *H. lindoides*; D. *H. scandens*; E. *H. biflora*; F. *H. auricularia*; G. *H. gambleri*; H. *H. pumila*; I. *H. ovatifolia*; J. *H. ramarowii*; K. *H. plinifolia*; L. *H. andamanica*; M. *H. merguensis*; N. *H. aspera*; O. *H. coccinea*; P. *H. retrorsa*; Q. *H. gracilis*; R. *H. purpurascens*; S. *H. sualata*.

exserted in *H. ovatifolia*, *H. stocksii*, *H. graminifolia*, *H. linoides* in sect. Oldenlandia *H. kurzii* in sect. Diplophragma and *H. andamanica* in sect. Anotidopsis.

**Pollen** : The pollens are prolate or subprolate to subspheroidal or spheroidal. In most species they are both prolate or subprolate as in *H. villosostipulata* (sect. Diplophragma), *H. merguensis* (sect. Involucrella), *H. puberula* (sect. Oldenlandia), prolate spheroidal in *H. brunonis* and *H. andamanica*, (sect. Anotidopsis), spheroidal or subspheroidal in *H. corymbosa* (sect. Oldenlandia), prolate spheroidal in *H. gracilis* (sect. Kohautia).

The size of the grain varies from  $20 \times 17 \mu\text{m}$  to  $50 \times 40 \mu\text{m}$ . It is largest i.e.  $50 \times 40 \mu\text{m}$  in sect. Diplophragma and smallest in sect. Kohautia and Oldenlandia. In sec. Oldenlandia the size varies from  $20.1 \times 19 \mu\text{m}$  to  $22.9 \times 23.2 \mu\text{m}$  or  $25.3 \times 24 \mu\text{m}$  to  $32 \times 28 \mu\text{m}$  and  $21 \times 17 \mu\text{m}$  to  $25 \times 22 \mu\text{m}$  in Kohautia. The aperture number also varies in species under different sections. Most species in sects. Diplophragma, Oldenlandia, Anotidopsis, Involucrella and Scleromitron are 3 aperturate, 4 aperturate in *H. scandens*, *H. capitellata* (sect. Diplophragma), in *H. coccinea* (sect. Kohautia) and 5-6 aperturate in sect. Kohautia and also in *H. graminicola* (sect. Oldenlandia), *H. verticillata* (sect. Scleromitron) and multiaperturate condition is found in *H. stocksii* (sect. Oldenlandia). The apertures are 3 in the largest grains in sect. Diplophragma, whereas apertures are 7-8 in smaller grains in *H. stocksii* (sect. Oldenlandia). Thus the size of the grain is not linked with the number of apertures. Ora is circular,  $2 \mu\text{m}$  or  $5-6 \mu\text{m}$  in diameter and free in sect. Kohautia and *H. graminicola* (sect. Oldenlandia). Ora is lalongate with obscure margin present in *H. puberula* (sect. Oldenlandia) and *H. merguensis* (sect. Involucrella), ora is lalongate with distinct margin in *H. travancorica*, *H. articularis*, *H. devicolamensis*, *H. leschenaultiana*, *H. pruinosa* (sect. Diplophragma), *H. herbacea*, *H. graminicola* (sect. Oldenlandia), *H. andamanica* (sect. Anotidopsis), *H. neesiana* (sect. Scleromitron) and synozonorate in *H. cyanantha* (sect. Scleromitron), *H. brunonis* (sect. Anotidopsis and species of sect. Hedyotis. In exine sculpturing, fine to medium or coarse reticulation is noted in all the sections.

**Gynoecium** : The ovary is small, globose, ovoid or ellipsoid, 2-loculed rarely 3-loculed, 0.5 -1.5 mm long. Septum is very thin with dense raphides. Ovary wall contains raphides. Each locule contains many ovules, sunk or embedded in the globose or ellipsoid placenta. The ovary is crowned with disc, around the base of the style.

**Style and stigma** : Style is short or long included or exserted. It is enclosed within corolla in sect. Kohautia and some species in sect. Oldenlandia. In sect. Kohautia style is slender, 3-8 mm long, overtopped by anther and stigma bilobed, except *H. coccinea* where stigma is capitate. Styles are very close to anther except *H. retrorsa* where style is short and far below the anther. Stamens and styles are both exserted, in species like *H. graminicola*, *H. stocksii*, sect. Oldenlandia and most species in sect. Scleromitron. Style is slender, stigma bilobed, linear and recurved in *H. stocksii*, and *H. graminifolia* in sect. Oldenlandia and *H. pinifolia*

and *H. cyanantha* in sect. Scleromitron. Style is swollen above and stigma bilobed, swollen in *H. neesiana* and *H. verticillata*. Style is stout, pubescent, 0.3-3 mm long, in most species in sect. Hedyotis and often swollen in *H. auricularia*, *H. vestita*, *H. insularis*. Stigma is mostly bilobed, fleshy and papillose. In sects. Diplophragma and Anotidopsis flowers are mostly heterostylous, the style ranges from 2 to 9 mm in length depending upon exerted and included stamens. Short style is flat, glabrous, rarely pubescent in *H. beddomei*, *H. barberi*, *H. articularis*, *H. scandens*, stigma is bilobed, linear, fleshy, papillose. Long styles slender, glabrous, puberulous or pubescent, stigma bilobed, globose, subglobose or linear. Style is long, stout, pubescent in *H. brunonis* (sect. Anotidopsis), nearly as long as the filament in *H. kurzii* in sect. diplophragma, *H. linoidea*, *H. stocksii*, *H. ovatifolia*, *H. graminifolia*, *H. graminicola* in sect. Oldenlandia. Stigma is bilobed, linear or fleshy, rarely swollen below. Style is slender, long and stigma bilobed in *H. merguensis*.

**Capsule :** Shape, size and texture of the capsule are of diagnostic significance in different sections. Capsule is globose, ellipsoid terete or angular, rarely winged, truncate, hemispheric, pyramidal or 4-lobed at tip, thinly cartilaginous, coriaceous, sclerified or crustaceous and hard. Capsule dehisces septicidally in sect. Diplophragma, loculicidally in sect. Oldenlandia, Kohautia, Scleromitron and Anotidopsis, late dehiscent in sect. Hedyotis and irregularly dehiscent in sect. Involucrella. In sect. Hedyotis, capsules are small, 1-2 × 1-2 mm, globose, not like didymous rarely ellipsoid (in *H. congesta*); often muricate, hard or crustaceous, top truncate and with persistent base of style and spreading calyx teeth in most species except *H. congesta* and *H. fulva* where top is raised and enclosed within converging calyx teeth. In sect. Scleromitron they are mostly globose or ovoid, crustaceous, rarely coriaceous, punctate, top raised and enclosed within calyx teeth. In sect. Involucrella they are thin-walled, apparently indehiscent, with converging calyx teeth which are much longer than the capsule. In sect. Diplophragma capsules are 2-8 mm long, globose, ellipsoid or oblong, crustaceous, top raised and protruded between the calyx lobes. Capsules are small globose, hemispheric with distant calyx teeth in *H. kurzii* in sect. Diplophragma. Capsules open first loculicidally then divide septicidally in *H. scandens*, *H. capitellata*, *H. trimenii* and *H. griffithii*, often capsule top is raised above calyx teeth except *H. griffithii*, *H. viscida* and others where capsule top is far below the calyx teeth. Calyx teeth are shorter than the capsule in *H. leschenaultiana*, *H. fruticosa*, *H. pruinosa* and longer than the capsule in *H. albonervia*, *H. membranacea*, and *H. srilankensis*. Capsule is mostly globose, didymous, with truncate or hemispheric top in sects. Kohautia, Oldenlandia and Anotidopsis. Calyx teeth are triangular, ovate-lanceolate, or lanceolate, recurved and crown low and capsule usually membranous or coriaceous, prominently keeled or narrowly 4-winged in sect. Anotidopsis. Capsule is mostly with distant calyx teeth in fruit in sect. Kohautia and Oldenlandia (except *H. pumila*). Capsule is thin-walled or coriaceous, terete in sections mentioned above except *H. racemosa*, and *H. pterita* where capsules are with 2 broad and 2 narrow wings from calyx lobes to pedicel in *H. pterita*. It is with 4 prominent ridges in *H. racemosa*, often saccate at base and narrowed above, top pyramidal in *H. herbacea* (sect. Oldenlandia, mostly broader in *H. corymbosa*, broader than long in *H. attenuata*, *H. trinervia*, longer than broad in *H. graminifolia*. Capsule top is truncate in *H.*

*diffusa*, *H. corymbosa*, *H. puberula*, *H. pumila*, *H. attenuata*, *H. trinervia* and hemispheric in *H. graminifolia*, *H. affinis*, *H. nagporensis*, *H. coccinea*, *H. aspera* (sect. *Kohautia*). Capsule top is low and calyx teeth triangular-lanceolate, erect on *H. stocksii* in sect. *Oldenlandia* and *H. gracilis* in sect. *Kohautia*, *H. scandens* in sect. *Diplophragma* and *H. auricularia* in sect. *Hedyotis*, *H. brunonis* in sect. *Anotidopsis*. Capsule is straw coloured with black calyx teeth in *H. herbacea* and green and 2-horned in *H. aspera* in sect. *Kohautia*. Capsule is very soft in *H. trinervia* in sect. *Oldenlandia* (Plate 7).

**Seeds :** The number, form and size of seeds vary from few, large, flattened to numerous, minute, angled, subglobose or globose. Seeds are affixed to globose or ellipsoid placenta. The placenta may be globose or ellipsoid depending on number and form of the seed. The seeds vary from  $0.18 \times 0.12$  mm to  $0.18 - 1.2$  mm in size, orange, brownish, rusty red or chocolate to black in colour, and are often narrowly winged.

In most species in sect. *diplophragma* and *H. fulva* and *H. parviflora* (sect. *Hedyotis*) the capsules are few-seeded (2-18) while in sects. *Kohautia*, *Oldenlandia*, *Scleromitrium*, *Involucella* and *Anotidopsis*, the seeds are numerous (20-60). The size of the seed ranges from  $0.18 \times 0.5$  mm to  $1.8 \times 1.2$  mm in sect. *Diplophragma*,  $0.4 \times 0.3$  to  $0.5 \times 0.4$  mm in sect. *Involucella*,  $0.3 \times 0.2$  mm to  $0.5 \times 0.5$  mm in sect. *Hedyotis*,  $0.3 \times 0.2$  mm to  $0.5 \times 0.5$  mm in sect. *Kohautia*,  $0.7 \times 0.8$  mm to  $1 \times 0.9$  mm in *Scleromitrium* and  $0.2 \times 0.3$  mm to  $1 \times 0.7$  mm in sect. *Diplophragma* and smallest seed ( $0.1 \times 0.12$  mm) in sect. *Oldenlandia*. The seeds are planoconvex or angular, often narrowly winged in most species of sect. *Diplophragma* and also in species like *H. fulva*, *H. congesta*, *H. insularis* (sect. *Hedyotis*); *H. gracilis* (sect. *Kohautia*) and *H. brunonis* (sect. *Anotidopsis*). Seeds are mostly subglobose in *H. pterita*, *H. racemosa*, *H. ovatifolia* (sect. *Oldenlandia*). The seeds often become viscid when moistened.

Seed coat is exotestal in *Hedyotis*. The outer epidermis forms exotesta which is one cell layer thick and inner cell layer-parenchyma like is the endotesta. Exotestal cells are tubular palisade-like with tannin contents. Epidermal cells along the margin are very prominent in *H. purpurascens*, *H. pruinosa*, and *H. articularis* (sect. *Diplophragma*).

Seed testa cells are thin-walled, penta or hexa-gonal or subglobose in surface view. The cell wall surface is either smooth, reticulate, granulate, perforated, punctate, striated, tuberculate or verrucate.

Light microscopic study shows that cell with wavy boundary wall is found in several species under different sections of *Hedyotis* namely, *H. pterita*, *H. ovatifolia* in (sect. *Oldenlandia*), *H. auricularia* in sect. *Hedyotis*, *H. verticellaris* in sect. *Diplophragma*, *H. brunonis* in sect. *Anotidopsis* whereas species like *H. congesta* in sect. *Hedyotis*, *H. merguensis* in sect. *Involucella*, *H. gambiei* in sect. *Diplophragma*, *H. aspera* in sect. *Kohautia* shows straight boundary wall.

It is evident from L.M. study that the cell wall surface is granulate in most

species under different sects, namely, *H. griffithii*, *H. uncinella*, *H. pruinosa*, *H. tetrandra* (sect. *Diplophragma*), *H. merguensis* (sect. *Involucrella*), *H. congesta*, *H. auricularia* (sect. *Hedyotis*), and *H. ovatifolia* (sect. *Oldenlandia*), they are reticulate and granulate in *H. verticillata*, *H. cyanantha* in sect. *Scleromitron* and finely granulate in *H. pumila* (sect. *Oldenlandia*). L.M. study also shows thickly granulate cell surface in *H. purpurascens* (sect. *Diplophragma*). The cell surface of *H. corymbosa* (sect. *Oldenlandia*), *H. andamanica* (sect. *Anotidopsis*), *H. lineata* and *H. vestita* (sect. *Hedyotis*), *H. coccinea* (sect. *Kohautia*) appear smooth but cell wall surface finely striated in *H. neesiana* (sect. *Scleromitron*) and *H. aspera* (sect. *Kohautia*), cell surface punctate in *H. brunonis* (sect. *Anotidopsis*), perforated in *H. gamblei*, verrucate in *H. pruinosa* and granulate in *H. kurzii* (sect. *Diplophragma*). The cell wall surface granulate is also found in *H. paradoxa* (sect. *Hedyotis*), *H. herbacea* (sect. *Oldenlandia*), and *H. cyanantha* (sect. *Scleromitron*).

Capsule is straw coloured with black calyx teeth in *H. herbacea* and green and 2-horned in *H. aspera* in sect. *Kohautia*. Capsule is very soft in *H. trinervis*. (Plate. 7).

*Heterostyly* : Heterostyly in the genus *Hedyotis* was first reported by Darwin (1877) from Brazilian and Indian specimens sent to him by F. Miller and J. Scott (of Hort. Bot. Cal.) respectively. Then Birtck (1833, 1884), Stevens (1912), Bremekamp (1952) and Lewis (1962) reported it in various species. Lewis (1962) studied 39 American species of the genus and reported heterostyly in 9 species. Bremekamp (1952) regarded it as a character of taxonomic significance and observed heterostyly in 35 species out of 61 investigated. Baker (1958), however, was the first to show that *O. affinis* (= *H. affinis*) in addition to being heterostyled, was self-incompatible. Bahadur (1963, 1964) observed that both long and short styled plants of *H. puberula* are self-incompatible and having pollen dimorphism. Long-styled plants are more in number than short-styled ones in a natural population. In short-styled plants pollen grains are larger than those in long-styled ones.

In course of the present study it is observed that 39 species under sects. *Diplophragma*, *Oldenlandia*, *Hedyotis*, and *Anotidopsis* are heterostylous with two distinct floral forms, "Pin" and "Thrum" on separate plants. The species are *H. puberula*, *H. affinis* (sect. *Oldenlandia*), *H. brunonis* (sect. *Anotidopsis*), *H. auricularia*, *H. insularis*, *H. vestita*, *H. lineata*, *H. paradoxa* (sect. *Hedyotis*) and *H. fruticosa*, *H. purpurascens*, *H. leschenaultiana*, *H. pruinosa*, *H. articularis*, *H. swertioides*, *H. eulata*, *H. bourdillonii*, *H. uncinella*, *H. viscida*, *H. griffithii*, *H. gamblei*, *H. albonervis*, *H. tetrandra*, *H. capitellata* etc. (sect. *Diplophragma*).

In *H. verticillaris* (sect. *Diplophragma*) both homostylous and heterostylous flowers are present. Nilgiri specimens are heterostylous, and Sri Lankan ones are homostylous. Flowers are 7-10 mm long in long-styled flower and filaments arising from corolla tube are very short (0.5 mm long) style exserted, 8 mm long; stigma bilobed, clavate or cylindrical. In short-styled flowers, filaments are 1-1.5 mm long, exserted, anther is about 1 mm long, style 1 mm long. Flowers are usually much smaller than the long-styled ones. Homostylous flowers in Sri Lanka



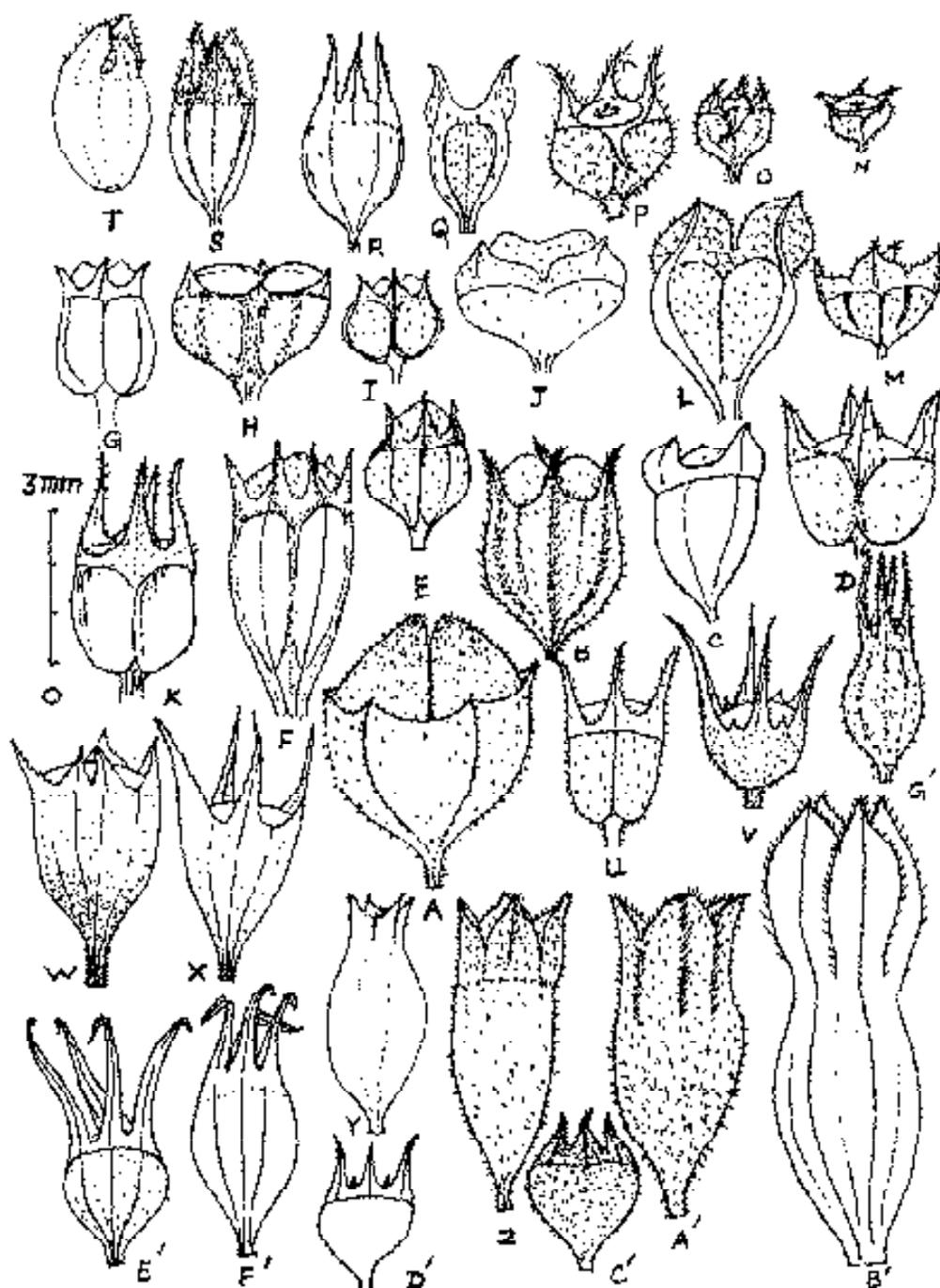


Plate 7. (A - G') Variation in capsules. A. *Hedysotis scandens*; B. *H. capitellata*; C. *H. travancorica*; D. *H. puberula*; E. *H. herbacea*; F. *H. gracilis*; G. *H. graminifolia*; H. *H. ovatifolia*; I. *H. confusa*; J. *H. racemosa*; K. *H. coccinea*; L. *H. pterita*; M. *H. andamanica*; N. *H. vestita*; O. *H. fulva*; P. *H. lineata*; Q. *H. tenelliflora*; R. *H. neesiana*; S. *H. angustifolia*; T. *H. congesta*; U. *H. griffithii*; V. *H. stocksii*; W. *H. pumila*; X. *H. linoides*; Y. *H. leschenaultiana*; Z. *H. beddomei*; A'. *H. bourdillonii*; B'. *H. merguensis*; C'. *H. swertiaoides*; D'. *H. tavyensis*; E'. *H. gamblei*; F'. *H. uncinella*; G'. *H. tamarawli*.

are 5 - 6 mm long; filaments exserted, 1-1.5 mm long; anther 1-1.5 mm long; styles exserted, 4-4.5 mm long; stigma capitate. (Plate 8A & B).

In true heterostylous flowers anthers are well included and styles are well exserted in one form and exactly the opposite in the other form, but in some species the differences are far less marked, so they are not truly heterostylous. *H. capitellata*, *H. scandens*, *H. griffithii* and *H. hirsutissima* (sect. *Diplophragma*) are not truly heterostylous where stamens are not well included within corolla tube in long-styled flower or styles are not very short in other form. In *H. capitellata* and *H. scandens*, filaments are 0.2-0.5 (1-1.5) mm long in long styled flower, usually adnate to the short corolla tube, rarely at sinus, shortly exserted, anthers 0.5-2 mm long, corolla is sparse to dense pubescent along throat or corolla lobes, styles 4-10 mm long, exserted, stigma clavate, subglobose or linear, papillose. In short-styled flowers, filaments are 1-2 mm long exserted, anthers 1-1.5 mm long, style 2-2.5 mm long. Filaments are 3 mm long, exserted in *H. hirsutissima* where short style is much elongated, 8-9 mm long (flowers 18-20 mm long). Filaments are shortly exserted in *H. griffithii* in long-styled flowers. Species in sect. *Hedyotis* are not truly heterostylous. In *H. auricularia* and *H. insularis* styles range from 0.8 to 3 mm, swollen above, pubescent, filaments are 0.5-1.5 mm and anthers 0.4-0.5 mm long. In *H. vestita* style ranges from 1 to 1.5 mm long, stigma subglobose, but filaments are 0.2-0.5 mm in all the flowers. Similarly in *H. fulva*, *H. paradoxa*, *H. lineata*, long-styled flowers are with exserted styles but anthers are slightly exserted. In *H. insularis*, anthers are exserted, filaments 1 mm long, style 1-3 mm long, swollen above, pubescent. Style in sect. *Hedyotis* develops at a later stage.

*H. pumila* and *H. merguensis* with exserted styles and included anthers are homostylous. Similarly, flowers showing long exserted anthers in *H. buxifolia*, *H. barberi*, *H. ramarowii*, *H. travancorica* (sect. *Diplophragma*) are heterostylous.

The homostyly is characterized by styles and anthers being of the same height and is generally regarded as derived from normal heterostylous state as a result of reversal of the stamens and style height (Crosby 1949; Dowrick 1956). The homostyles are of two types, long and short. The long homostyle has the style of a 'pin' flower and stamens of a 'thrum' flower and the short homostyle has the style of a 'thrum' flower and stamens of a 'pin' flower. Long homostyly seems to be more common than short ones.

26 species under sects. *Oldenlandia*, *Kohautia* and *Scleromitron* and *Involucrella* bear homostylous flowers. Homostylous flowers having both stamens and styles well exserted are present in *H. linoides*, *H. stocksii*, *H. graminicola*, *H. ovatifolia*, *H. graminifolia* (sect. *Oldenlandia*) and *H. verticillata*, *H. neesiana*, *H. pinifolia*, *H. cyanantha*, *H. angustifolia* (sect. *Scleromitron*), *H. kurzii* (sect. *Diplophragma*). Stigma is bilobed, in most of the species above, but in *H. verticillata*, *H. neesiana* (= *H. nitida*), it is clavate.

Homostylous flowers having both stamens and styles included are found in *H. attenuata*, *H. corymbosa*, *H. trinervia*, *H. pterita*, *H. racemosa*, *H. herbacea* (sect.

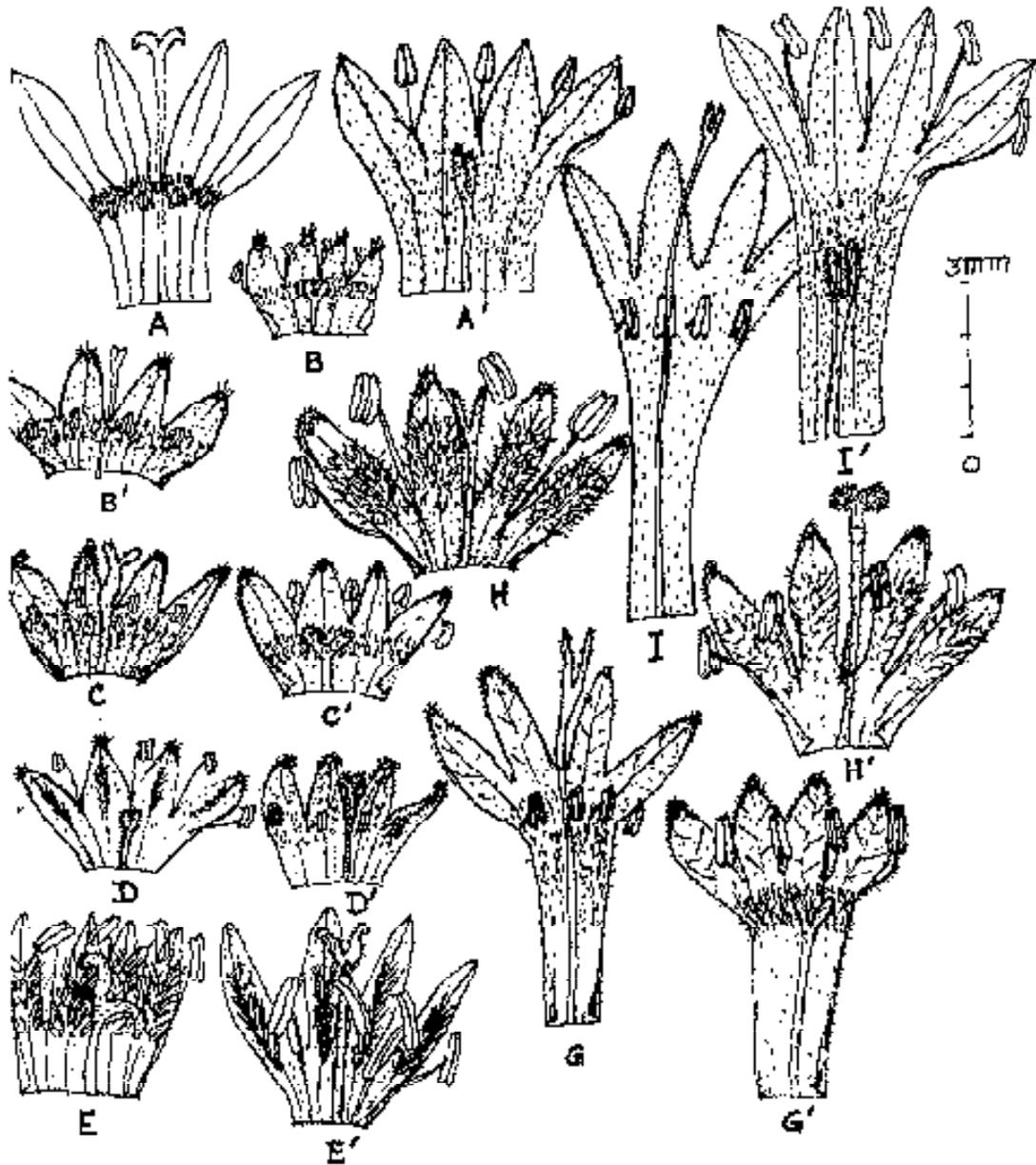


Plate 8A. (AA' - EE') Heterostyly : A & A' : *Hedyotis puberula*; B & B' : *H. lineata*; C & C' : *H. vestita*; D & D' : *H. auricularia*; E & E' : *H. capitellata*.

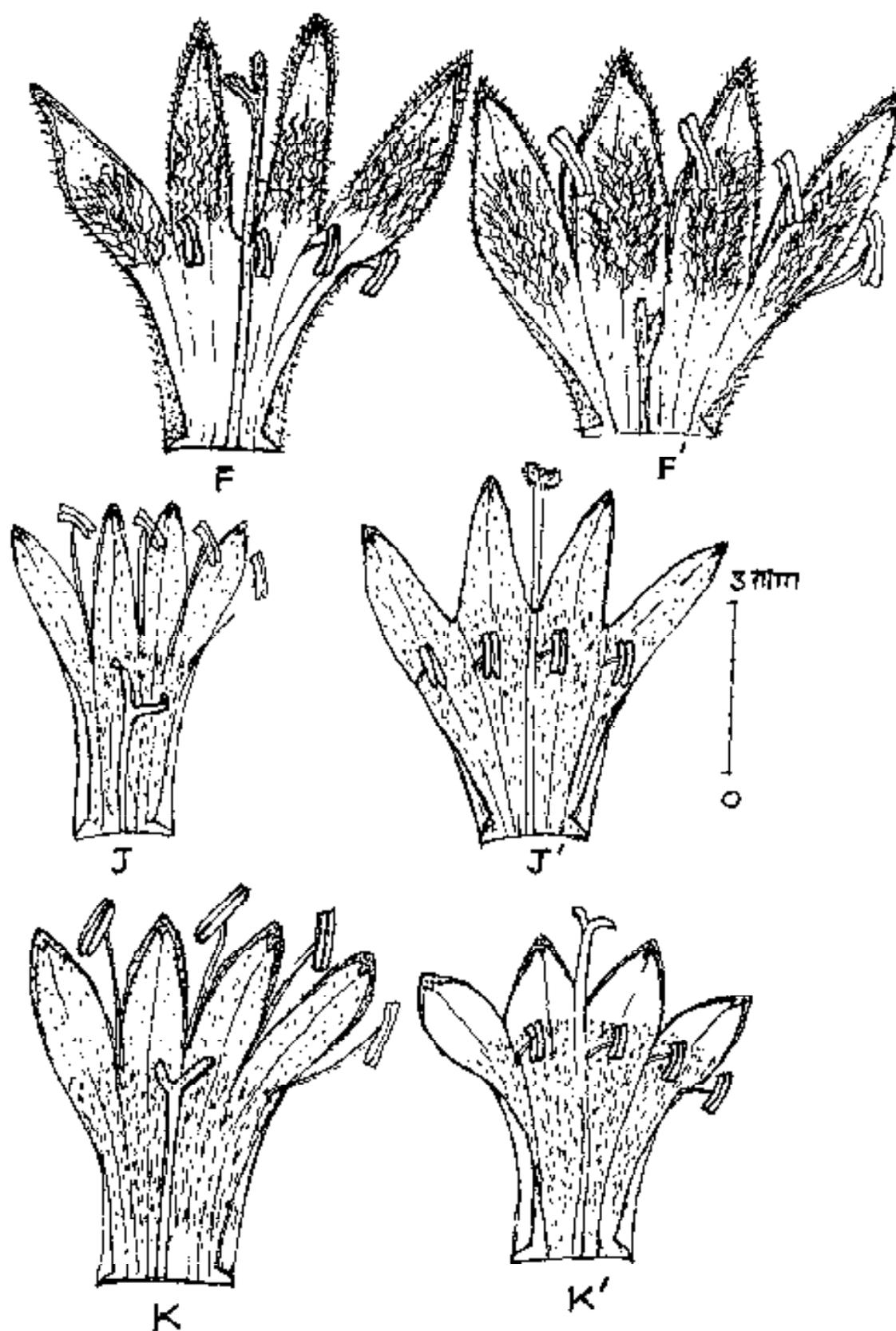


Plate 8B. (FF' KK') Heterostyly F & F' *H. articulata*; G & G' : *H. viscida*; H & H' : *H. scandens*; I & I' : *H. purpurascens*; J & J' : *H. pruinosa*; K & K' : *H. teschenaultiana*.

Oldenlandia) where styles are 0.2-0.3 mm long and filaments, 0.2-0.5 mm long, arise from the corolla tube. Both anthers and stigma are in close contact and enclosed by ring of pubescent hairs on the corolla lobes, except *H. herbacea* and *H. trinervia*, which are glabrous inside. In *H. herbacea*, stigma lies just below the anthers in early stage but later stigma overtops anthers.

*H. diffusa* (sect. Oldenlandia) is homostylous, where stamens and styles are slightly exerted. Filaments short, 0.3-0.5 mm long, are placed on the sinus of the corolla lobe, styles short, 1.5-2 mm long; both anthers and stigma are close or the latter is encircled by anthers in early stage, later by styles when filaments elongate and are exerted.

*H. puberula* and *H. affinis* are the two heterostylous species under the sect. Oldenlandia where styles are 2-4.5 mm long and filaments, 0.5-1.5 mm long.

In sect. Kohautia both stamens and styles are included and stigma is overtopped by anthers. In most species anthers are with very short filaments i.e. 0.5 mm long, included in the swollen part of the corolla and style in the cylindrical corolla tube. In most species, stigma is at the same level as the lower part of the anthers as in *H. gracilis*, *H. coccinea*, *H. aspera* and *H. nagporensis*. But in *H. retrorsa* style is so short that stigma remains at some distance from the anthers.

### HEDYOTIS

L. [Fl. Zeyl. 26.1747] Sp. Pl. 101. 1753 & Gen. Pl. ed. 5.44. 1754; Sp. Pl. ed. 2.147. 1762; Retz. Obs. Bot. 23.1786; Swartz, Nov. Gen. 29. 1788; Gaertn. Fruct. 1 : 148. t. 30. f. 4. 1788; Schreber, Gen. Pl. ed. 8.1:66. 1789; Jussieu, Gen. Pl. 198. 1789; Haenke, Gen. Pl. ed. 8. 1: 115. 1791; Lamk. Illustr. 1 : 269. 1792; Willd. Sp. Pl. 1 : 564. 1798; Cav. Icones 6:52. t. 573. f. 1.1801; Pers. Syst. 122. 1805; Syst. Veg. 3 : 189. 1818; Smith in Rees, Cycl. 17. 1811; Roxb. Fl. Ind. 1:368. 1820 & 1:363. 1832; Spreng. Syst. Veg. ed. 16. 1:411. 1825 & Gen. Pl. 1:96.1830; D. Don, Prodr. Fl. Nep. 134. 1825 (in syn. *Oldenlandia*); Bl. Bijdr. 970. 1826; Reich. Cons. Reg. Veg. 1:95. 1828; Cham. & Schachtld. in Linnæa 4:153. 1829; DC. Prodr. 4:419. 1830; Wt. & Arn. Prodr. 405. 1834 (excl. *Anotis*); G. Don. Gen. Syst. Gard. Bot. 3:524. 1834; Endl. Gen. Pl. 548. 1838; Steud. Nom. Bot 726. 1840; Walp. Rep. 2.491. 1843 & Ann. Bot. Syst. 1:376. 1848; Miq. Fl. Ind. Bat. 2:177. 1857; Benth. Fl Hongk. 147. 1861; Thwaites, Enum. Pl. Zeyl. 140. 1859; Benth. & Muller, Fl. Auster. 3:403. 1866; Kurz in Journ. Asiat. Soc. Beng. 42:311. 1872 & 45:135. 1876 & 46:239. 1877; Hook. f. in Benth. & Hook. f. Gen. Pl. 2:56. 1873 & Fl. Brit. Ind. 3:49. 1880; King & Gamble in Journ. Asiat. Soc. Beng. 72(2) : 133. 1903; Ridley, Fl. Malay Penin. 2:44. 1923; Craib, Fl. Siam, Enum. 50.1932; Fosberg in Journ. Sc. 2:106. 1941 & Castanea 19:25.1954; Shinnars in Field & Lab. 17: 166. 1949; Lewis in Rhodora 63:216. 1961; Bakh. f. in Backer & Bakh. f. Fl. Java 2:284. 1965; Yamazaki in Hara, Fl. E. Himal. 309. 1966. *Oldenlandia* [Plumier, Nov. Pl. Am. Gen. 42, t. 35.1703; L. Gen. Pl. ed. 1. 154. 1737] L. Sp. Pl. 119. 1753; Gen. Pl. ed. 5:55. 1754; Sp. Pl. ed. 2:1.174. 1762; 2:1667. 1763; Syst. Nat. ed. 10. 2:890. 1759 & ed. 12. 1:1786; Gaertn. Fruct. 1:147. t. 30. f. 3. 1788; Schreber, Gen. Pl. ed. 8.1:83. 1789; Jussieu, Gen. Pl. 198. 1789; Lamk. Encycl. 4:533. 1798; Willd. Sp. Pl. 1 : 674. 1798;

Pers. Syst. 122. 1805; Roxb. Fl. Ind. 1:442. 1820 & 1:421. 1832; Reich. Cons. Reg. Veg. 1:95. 1828; DC. Prodr. 4:428. 1830; G. Don, Gen. Syst. Gard. Bot. 3:527. 1834; Miq. Fl. Ind. Bat. 2:187. 1857; Benth. Fl. Hongk. 150. 1861; Hook. f. in Benth. & Hook. f. Gen. Pl. 2:58. 1873 & Fl. Brit. Ind. 3:64. 1880; Hiern in Oliver, Fl. Trop. Afr. 3:51. 1877; Schumann in Engl. & Prantl., Pflanzenfam. 4(4): 24. 1891; O. Ktze. Rev. Gen. Pl. 1:291. 1891; Ridley, Fl. Malay Penin. 2:52. 1923; Moore in Fawcett & Rendle, Fl. Jamaica 7: 31. 1936; Bremek. in Verh. Kon. Nederl. Akad. Wet. Afd. Natuurk. Ser. 2, 48(2): 183. 1952; Hepper in Hutchinson & Dalz. Fl. W. Trop. Afr. ed. 2. 2:210. 1963; Verdc. Fl. Trop. Afr. Rubiac. (I) 268. 1976. *Gerontogea* Cham & Schlecht. in Linnæa 4:153. 1829. *Thecagonum* Babu in Bull. Bot. Surv. Ind. 11:214. 1969. *Gonothecca* Bl. ex DC. Prodr. 4:429. 1830, non Rafin. 1808. *Pleiocraterium* Bremek. in Rec. d. Trav. Bot. Neerl. 36:438. 1939. *Exallage* Bremek. in Verh. Kon. Nederl. Akad. Wet. Afd. Natuurk. Ser. 2, 43(2): 142. 1952. *Metabolos* Bl. Bijdr. 990. 1826.

*Type* : *H. auricularia* L. (Linn. 123.2 LINN).

Shrubs or undershrubs, erect, decumbent or climbing or herbs slender, erect, ascending or creeping; root system often long, stout; adventitious roots often produced from stem bases or nodes; stem usually branching dichotomously, often branches are crowded with leaves above and leafless below; terete or angular, often with prominent ridges and grooves, rarely winged, glabrous, pubescent, puberulous, villous, pilose, scabrid or setaceous along the ridges or throughout, often corrugated with stipular scars and fallen leafbases. Leaves sessile or petiolate, opposite, decussate, rarely whorled, 1-17 (-40) × 0.3-6 cm, elliptic or ovate-lanceolate, orbicular, oblong-lanceolate, lanceolate, linear-lanceolate or linear, acute, acuminate or obtuse at apex, rarely apiculate or aristate, entire at margin, rarely undulate, cuneate, attenuate or rarely obtuse at base, coriaceous or membranous, usually glabrous above, puberulous, pubescent, villous, pilose, or hirsute along the nerves 3-12 pair, oblique or 3.5-7 palmately veined from base to apex; petiole 0.5-3 cm long, usually dilated at base, often winged, glabrous, pubescent or puberulous; stipules opposite, free or adherent with petiole, usually persistent, rarely deciduous, 1-15 × 1-5 mm, entire or with glandular margin or pectinately elongating or truncate with 7-11 marginal bristles. Inflorescence terminal or axillary, peduncled or sessile, paniced, corymbose, umbellate or condensed capitate cymes or globose heads, 1-10 (-14) cm long, 1-15 (-20) cm across, branches long or short, di-trichotomous or 4-6 in a whorl; bracteate, bracteolate or not. Flowers sessile or pedicelled, 2-20 mm, isostylous or heterostylous. Hypanthium globose, ovoid ellipsoid, terete or angular, rarely winged, calyx limb 0.3-2 mm, long; lobes 4, rarely 5, 0.5-3.5 (-4) mm long, triangular, lanceolate or linear, accessory calyx teeth often present. Corolla white, purplish white, violet, yellowish, or pink, brownish, green, pale blue or purple in colour, rotate, campanulate, funnel or salver-shaped; tube swollen above with or without any constriction, sometimes swollen below, throat glabrous, densely pubescent or woolly inside, to various extent; lobes 4, rarely 5, valvate, straight or reflexed, incurved, beaked at apex, often setulose outside, glabrous, minute pubescent or puberulous inside. Stamens 4, rarely 5,

inserted or exerted; filaments adnate below the throat or at the sinus of the corolla lobes, broad or slender; anthers 0.5-1.5 mm long, oblong, linear-oblong, globose or subglobose, 2-celled, dorsifixed, opening longitudinally. Pollen prolate, subprolate, prolate-spheroidal, oblate spheroidal or subspheroidal, semicircular or circular in polar outline, polar axis (P)  $\times$  equatorial axis (E) = 20-53  $\mu$ m  $\times$  17-38  $\mu$ m, commonly 3-colporate, rarely 4 or 5-6 or 7-8 colporate, colpi long and narrow, ora circular, 2-5  $\mu$ m in diam. or lalongate, 2-6  $\mu$ m in diam., with or without defined margin, free or synzonorate. Exine 1-3.5  $\mu$ m thick, sexine 1-3  $\mu$ m thick, finely or coarsely reticulate, columellate, columella pilate, 1  $\mu$ m thick, lumina 0.5-3  $\mu$ m, muri psillate or undulate or verrucate, mesocolpium 7-14  $\mu$ m. Ovary inferior or half inferior, 2-loculed; ovules few to numerous on axile, median globose or ellipsoid, peltate placenta; style inserted or exerted, stout or slender, pubescent or glabrous; stigma bilobed, subglobose, oblong or linear, papillose. Disc annular, fleshy, smooth, shallow or grooved. Fruits sessile or shortly stalked capsules, crowned with persistent, close or distant calyx lobes, sometimes with persistent base of style, 1-6 mm (-9)  $\times$  1.5-5 mm, globose, ovoid, ellipsoid, cylindrical or oblong, hemispheric or truncate, sometimes raised above, rounded or cuneate at base, terete, keeled or angular with prominent ridges, rarely winged, dehiscent septically, loculicidally or dehiscence late or obscure; pericarp thin, cartilaginous or fleshy. Seeds few to many, small, 0.2-1.5  $\times$  0.1-1.2 mm, half or fully immersed in the pits or grooves on the placenta, plano-convex, angular, globose or subglobose, often narrowly winged. They are orange, brownish, rusty red or chocolate to black in colour. Seed coat is thin, composed of pentagonal, hexagonal or globose cells with straight or wavy wall in surface view. The cell wall surface is rather smooth, reticulate, granulate, perforated, punctate, striated or verrucose. Embryo small, clavate, 0.7-1.5 mm with horny or fleshy albumen; radicle terete; cotyledons 2, foliaceous.

*Distrib.* : About 515 species in warmer parts of the world, chiefly in Australia, Africa, Eastern and South-East Asia, America.

74 species mostly distributed throughout India. Some species are restricted to the hilly places of Southern India. (Plate 9, 10, 11, 12A & 12B).

*Chr. no.* : Chromosome numbers of 13 species of *Hedyotis* were studied by various workers and were reported as  $2n = 18, 36, 54, 72$  (Raghavan & Rangaswamy 1941; Lewis 1958, 1959, 1962, 1965, 1966; Khoshoo & Bhatia 1963; Baguar *et al.* 1965) Harvey 1966, HSU, CC, 1968; Philipo. & Mathew PM 1976; Mazumder L. 1971, 1973; Sarker, A. K., Datta, N & U. Chatterjee 1980).

In the present study *Oldenlandia* L. and *Kohautia* are merged with *Hedyotis* and the generic delimitation is enlarged. On review of the characters used by the earlier workers for subgenera and sections the genus is subdivided into 7 sections : (1) *Hedyotis*, (2) *Oldenlandia*, (3) *Kohautia*, (4) *Scleromitron*, (5) *Involucrella*, (6) *Diplophragma* and (7) *Anotidopsis*.

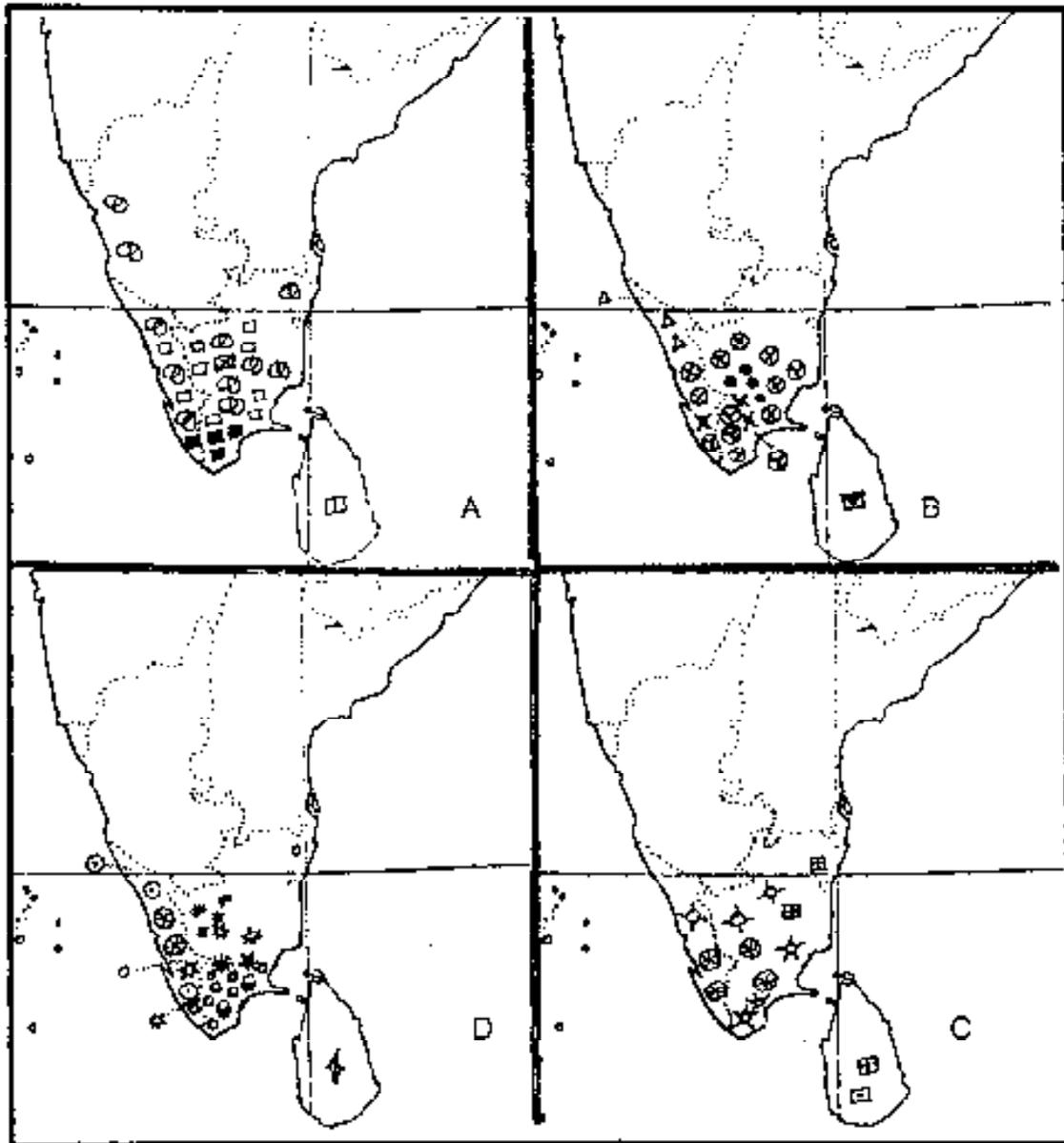


Plate 9 (A - D). Distribution of the species of the sections *Diplophragma* restricted to Southern India showing in the maps (ABCD).

- A. *H. albionevia* ■ ; *H. articulata* ⊙ ; *H. hirsutissima* ⊠ ; *H. leschenaultiana* □ ;  
*H. flavescens* ◻.
- B. *H. pruinosa* △ ; *H. swertiioides* ⊙ ; *H. ramarowii* ✕ ; *H. purpurascens* ⊙ ;  
*H. viscida* ● ; *H. nodulosa* ⊠.
- C. *H. fruticosa* ⊠ ; *H. verticillaris* ⊙ ; *H. villosostipulata* ✕ ; *H. travancorica* ⊙ ;  
*H. quinquenervia* ⊠.
- D. *H. bourdillonii* ⊙ ; *H. heddonii* ● ; *H. barberi* ✕ ; *H. buxifolia* ☆ ;  
*H. devicolumensis* ☆ ; *H. gamblesi* ⊙ ; *H. ovalata* ⊙ ; *H. lasertiana* ⊙.



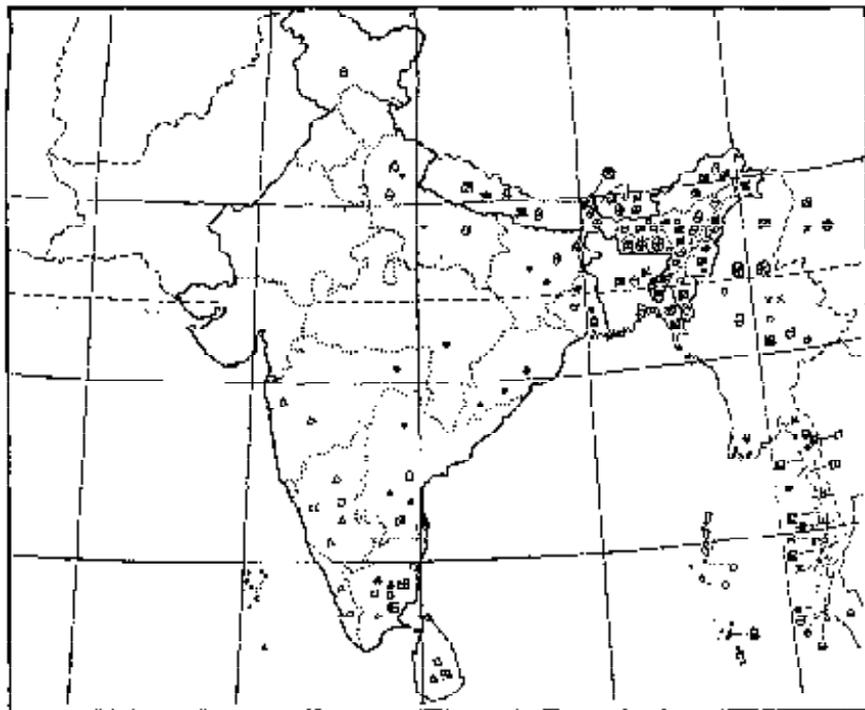


Plate 10. Distribution of the species of the sections *Diplophragma* restricted to Eastern India & species of the section *seleouitica* showing in the map.  
*H. acunigula* x; *H. griffithii* ⊗; *H. kurzii* ⊙; *H. uncinella* ⊕; *H. javayensis* ⊠; *H. scandens* ⊡; *H. capitellata* ⊣; *H. tetrandra* ⊞;  
*H. nigrescens* ⊛; *H. neesiana* ⊤; *H. purifolia* ⊥; *H. rymantiana* ⊕; *H. verticillata* ⊙.

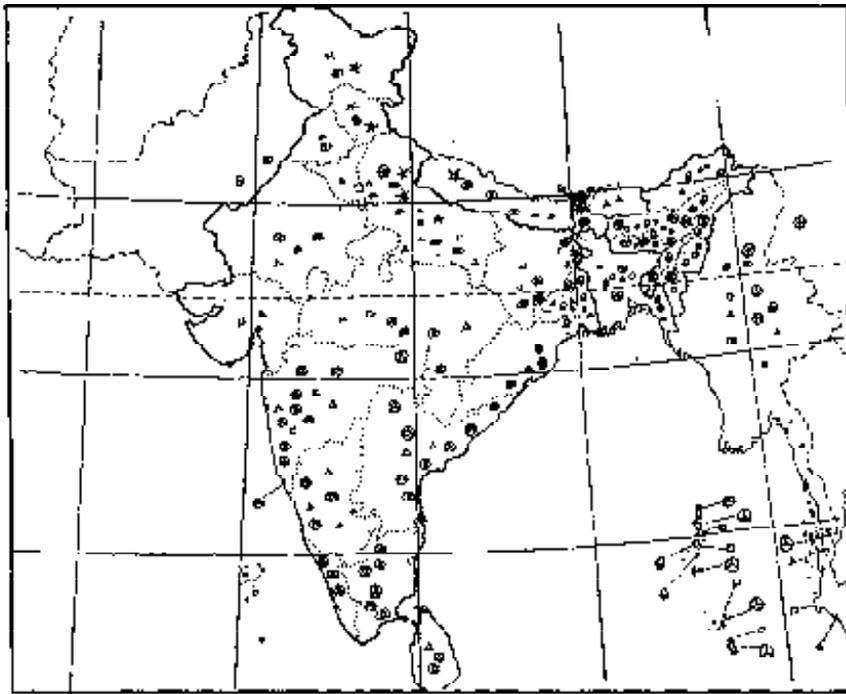


Plate 11. Distribution of the species of the sections *Heliopsis* and *Kolnata* showing in the map.

*H. auricularia* ☉; *H. auricularia* subsp. *venosa* ●; *H. scabra* ●; *H. congesta* ☐; *H. fulva* ●; *H. parviflora* ☉; *H. lineata* ●; *H. insularis* ○; *H. vestita* ☉; *H. nagorensis* ☐; *H. caerulea* ✕; *H. grandis* ☉; *H. uspera* ▲; *H. retrorsa* ●.

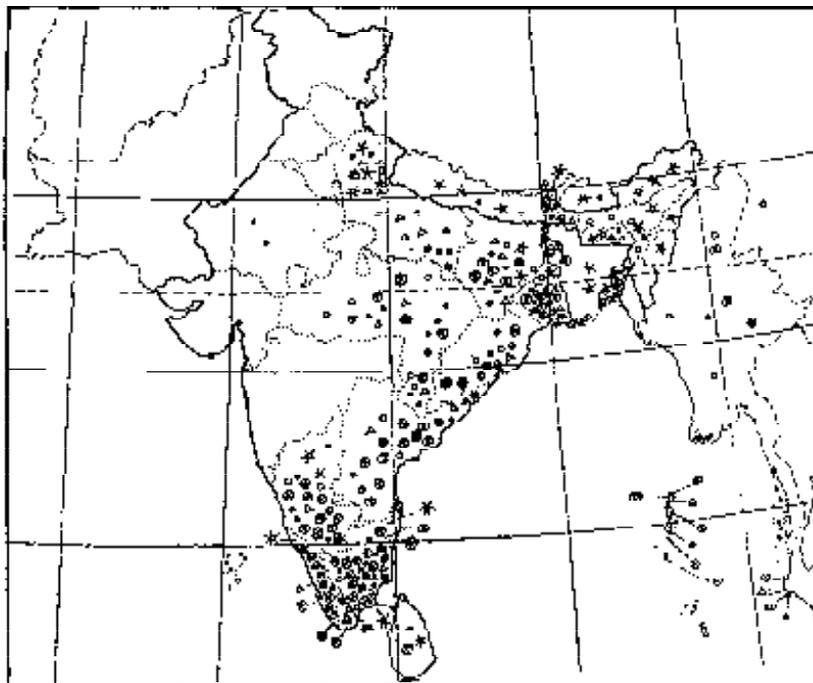


Plate 12 A. Distribution of the species of the section *Oldenlandia* showing in the map  
*H. confusa* ●; *H. corymbosa* ⊙; *H. corymbosa* var. *linearis* △; *H. puberula* ⊕; *H. diffusa* ✕; *H. diffusa* var. *extensa* ⊚; *H. herbacea* ⊗;  
*H. ovatifolia* ⊖

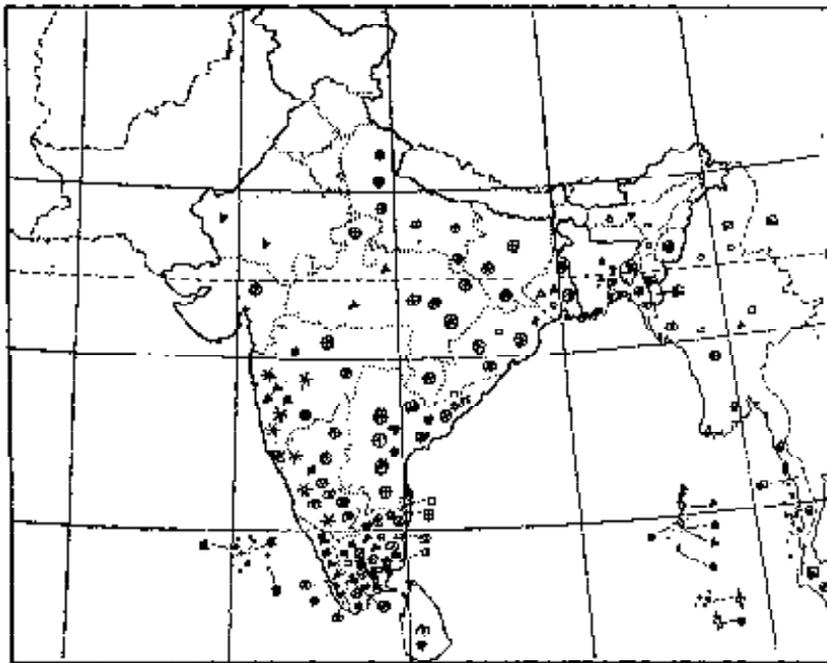


Plate 12 B. Distribution of the species of the sections *Oldenlandia*, *Luvulocella* and *Anacardos* are showing in the map.

*H. graminicola* ○; *H. linoides* ⊕; *H. affinis* ●; *H. attenuata* ⊙; *H. kyriophylla* ■; *H. hermanniana* ⊛; *H. pterita* □; *H. trinervis* ⊞; *H. stocksii* ⊠; *H. pumila* ▲; *H. graminifolia* ⊗; *H. graminifolia* var. *shuteri* ⊕; *H. graminifolia* subsp. *arenaria* ▲; *H. andamanica* ■; *H. brunonis* ⊙; *H. merguensis* ⊠

KEY TO THE SECTIONS AND SPECIES

(Key is based on division of the genus into sections and similarities among species.)

- |     |  |                                |    |
|-----|--|--------------------------------|----|
| 1a. | Capsule dehiscence, septicidal or loculicidal  | ...                            | 2  |
| 1b. | Capsule indehiscent, late dehiscent or obscurely or irregularly dehiscent  | ...                            | 3  |
| 2a. | Shrubs or herbs; capsule dehiscing septicidally<br>sect. DIPLOPHRAGMA  | ...                            | 7  |
| 2b. | Herbs, annual or perennial; capsule dehiscing loculicidally  | ...                            | 4  |
| 3a. | Flowers in terminal capitate cyme, partially included within the involucriform bases of upper leaves; capsule membranous, dehiscence irregular<br>sect. INVOLUCRELLA                           | ...                            | 41 |
| 3b. | Flowers in axillary cymes, rarely terminal capitate; capsule hard, crustaceous, late dehiscent<br>sect. HEDYOTIS   | ...                            | 42 |
| 4a. | Calyx teeth erect and distant in fruit   | ...                            | 5  |
| 4b. | Calyx teeth erect, recurved, not distant in fruit  | ...                            | 6  |
| 5a. | Flowers isostylous or heterostylous; corolla tube not slender, anthers not included in the swollen part of the corolla tube<br>sect. OLDENLANDIA   | ...                            | 49 |
| 5b. | Flowers isostylous; corolla tube slender, anthers included in the swollen part of the corolla tube<br>sect. KOHAUTIA   | ...                            | 66 |
| 6a. | Inflorescence axillary cymes; capsule ovoid, crustaceous, with converging, erect, rigid calyx teeth<br>sect. SCLEROMITREON   | ...                            | 71 |
| 6b. | Inflorescence terminal capitate or subcapitate, pedunculate cymes; capsule globose, narrowly winged, membranous, with lanceolate or ovate-lanceolate recurved calyx-teeth<br>sect. ANOTIDOPSIS | ...                            | 74 |
| 7a. | Shrubs or herbs, erect or decumbent; leaves neither radical nor parallel nerved  | ...                            | 8  |
| 7b. | Stoloniferous herbs; leaves radical, parallel nerved   | ... 1. <i>H. verticillaris</i> |    |

8a.	Shrubs erect or climbing or decumbent herbs; peduncles and pedicels usually stout; capsules 2-6 mm long, globose or ellipsoid	...	9
8b.	Herbs annual or perennial from a woody rootstock; peduncles and pedicels capillary; capsules 1-1.5 mm long, globose	...	2. <i>H. kurzii</i>
9a.	Capsules enclosed within calyx; shrubs	...	10
9b.	Capsules raised above calyx limb; climbing shrubs	...	11
10a.	Inflorescence terminal or axillary	...	12
10b.	Inflorescence axillary	...	13
11a.	Flowers in terminal and axillary peduncled, paniculate cymes; corolla divided more than half way down; capsules 2-3 mm long	...	14
11b.	Flowers in axillary peduncled umbellate cymes; capsules 4-5 mm long	...	3. <i>H. trimenii</i>
12a.	Flowers in simple or capitate cymes	...	15
12b.	Flowers in panicles, corymbose or umbellate cymes	...	16
13a.	Flowers solitary or cymose	...	17
13b.	Flowers in capitate cymes on long slender peduncles	...	4. <i>H. tavoyensis</i>
14a.	Lateral nerves of leaves obscure; cymes umbellate; capsule top pubescent	...	5. <i>H. scandens</i>
14b.	Lateral nerves of leaves prominent; cymes capitate; capsule top glabrous	...	6. <i>H. capitellata</i>
15a.	Leaves 1-2 cm long; cymes 2-3-flowered in upper axils	...	18
15b.	Leaves 3-13 cm long; cymes capitate, subcapitate or globose heads	...	19
16a.	Branches of inflorescence tri- or dichotomous, rarely whorled; lateral nerves 4-10 pairs	...	20
16b.	Branches of inflorescence whorled; lateral nerves 6-12 pairs, very fine and distinct	...	7. <i>H. fruticosa</i>
17a.	Flowers solitary on long pedicels in pair or many in clusters	...	21

- 17b. Flowers in cymes sessile or peduncled ... 22
- 18a. Stem corrugated with stipular scars;  
stipules small, orbicular, white, scarious  
... 8. *H. barberi*
- 18b. Stem not corrugated with stipular scars;  
stipules sharply toothed  
... 9. *H. huxifolia*
- 19a. Flowers few to many in capitate, subcapitate  
or subumbellate cymes ... 23
- 19b. Flowers densely aggregated in globose heads  
... 10. *H. uncinella*
- 20a. Stipules pectinately elongating, with 3-11 bristles ... 24
- 20b. Stipules triangular, entire, gland-serrated,  
pectinate or loose sheathing ... 25
- 21a. Leaves ovate, acute; stipules shortly divided,  
dense silky pubescent, pedicels 2-4  
... 11. *H. travancorica*
- 21b. Leaves elliptic, obtuse; stipules deeply divided,  
hirsute; pedicels 10-20 in fascicles  
... 12. *H. villostipulata*
- 22a. Cymes sessile or subsessile; flowers densely aggregated... 26
- 22b. Cymes peduncled, paniculate ... 27
- 23a. Leaves contracted at base to short, flattened  
petiole; stipules sheathing ... 28
- 23b. Leaves subsessile or petiolate, lanceolate or  
ovate-lanceolate; stipules free, triangular  
with glandular or viscid margin ... 29
- 24a. Panicles glabrous; leaves sessile or petiolate,  
ovate, elliptic or oblong-lanceolate ... 30
- 24b. Panicles pubescent; leaves sessile, elliptic-ovate, acute  
... 13. *H. swertioides*
- 25a. Stipules small, triangular or ovate-lanceolate,  
entire or pectinate ... 31
- 25b. Stipules large, loose sheathing  
... 14. *H. lessertiana*
- 26a. Flowers sessile to shortly pedicelled; stipules  
triangular, pectinate, usually sheathing ... 32

- 26b. Flowers slender pedicelled; stipules triangular, pectinate, with recurvd teeth ... 15. *H. ramarowii*
- 27a. Stipules glabrous; peduncles short; calyx lobes lanceolate, much longer than capsules ... 16. *H. albonervia*
- 27b. Stipules hirsute; peduncles long, slender; calyx lobes ovate-lanceolate, equalling hirsute capsules ... 17. *H. hirsutissima*
- 28a. Stipules large, forming loose sheath, becoming white in age ... 33
- 28b. Stipules broad, sheathing, with 6-7 ciliate bristles; leaves orbicular, 6-7 nerved ... 18. *H. beddomei*
- 29a. Leaves petioled, 10-13.5 cm long, ovate or elliptic-lanceolate, glabrous, acuminate at apex ... 19. *H. gamblei*
- 29b. Leaves sessile or short petioled, 3-4 cm long, lanceolate, acute, scabrid above along the nerves beneath ... 20. *H. griffithii*
- 30a. Stipules with 7-11 bristles, pubescent; panicles with short rhachis ... 34
- 30b. Stipules with 3-5 bristles; panicles with elongating rhachis, mostly pendulous ... 21. *H. eualata*
- 31a. Capsules 2-6 mm long, globose or ellipsoid; leaves with 4-10 pairs of lateral nerves ... 35
- 31b. Capsules 1-1.5 mm long, globose; leaves with obscure lateral nerves ... 22. *H. acutangula*
- 32a. Stem, leaves, inflorescence glabrous or puberulous ... 36
- 32b. Stem, leaves, inflorescence pilose hairy ... 23. *H. nodulosa*
- 33a. Leaves elliptic, with prominent midrib ciliate along margin ... 24. *H. flavescens*
- 33b. Leaves orbicular, glabrous, recurved at margin; lateral nerves 5 arising from the base ... 25. *H. quinquenervia*



- 34a. Branches of the inflorescence trichotomous; corolla tube slender, much longer than the calyx lobes ... 26. *H. leschenaultiana*
- 34b. Branches of the inflorescence whorled; corolla tube nearly as long as the calyx lobes ... 27. *H. devicolamensis*
- 35a. Calyx lobes not elongating in fruit ... 37
- 35b. Calyx lobes elongating in fruit ... 28. *H. purpurascens*
- 36a. Stem acutely angular to winged; calyx lobes nearly as long as capsules ... 29. *H. tetrandra*
- 36b. Stem obtusely angular; calyx lobes much longer than capsules ... 30. *H. membranacea*
- 37a. Stipules triangular or ovate-lanceolate, acuminate, gland-toothed or gland-serrated ... 38
- 37b. Stipules pectinate with short or long, subulate segments ... 39
- 38a. Leaves sessile, lanceolate; lateral nerves very obscure ... 31. *H. srilankensis*
- 38b. Leaves petioled, ovate, acuminate; lateral nerves not obscure. ... 32. *H. viscida*
- 39a. Cymes spreading, many-flowered, pruinose or pubescent ... 40
- 39b. Cymes short; flowers crowded, glabrous ... 33. *H. articularis*
- 40a. Cymes pruinose; capsules 2-3 mm long, globose or subglobose, pruinose ... 34. *H. pruinosa*
- 40b. Cymes pubescent; capsules 5-6 mm long, ellipsoid, pubescent ... 35. *H. bourdillonii*
- 41a. Flowers sessile or pedicelled, 3-5 mm long ... 42
- 41b. Flowers sessile, 15-18 mm long ... 36. *H. merguensis*
- 42a. Leaves mostly plaited longitudinally; cymes axillary ... 43
- 42b. Leaves mostly plaited longitudinally; cymes terminal capitate with involucral leaves at base ... 37. *H. scabra*
- 43a. Herbs; capsule globose, usually broader at base; calyx lobes ovate, acute or narrowly triangular-lanceolate ... 44

43b.	Shrubs; capsule ovoid, cuneate at base, glabrous; calyx lobes broadly triangular-lanceolate	... 38.	<i>H. congesta</i>
44a.	Cymes peduncled; few-flowered	...	45
44b.	Cymes sessile or subpeduncled, many-flowered	...	46
45a.	Flowers pedicelled, loosely arranged in pedunculate cymes	...	47
45b.	Flowers sessile or shortly pedicelled, crowded in trichotomously branched pedunculate cymes	...	48
46a.	Leaves oblong-lanceolate, nerves faint; stipules with rigid bristles	... 39.	<i>H. paradoxa</i>
46b.	Leaves ovate-lanceolate, nerves prominent; stipules with slender awn-like cilia	... 40.	<i>H. auricularia</i>
47a.	Leaves lanceolate, acuminate, glabrous; calyx lobes much shorter than glabrous fruit	... 41.	<i>H. insularis</i>
47b.	Leaves elliptic-lanceolate, pubescent; calyx lobes much longer than pubescent fruit	... 42.	<i>H. lineata</i>
48a.	Flowers 2-3 mm long, sessile or subsessile; capsule less than 1 mm long, with spreading calyx lobes	... 43.	<i>H. vestita</i>
48b.	Flowers 3-4 mm long, shortly pedicelled; capsule more than 1 mm long, with converging calyx lobes	... 44.	<i>H. fulva</i>
49a.	Leaves less than 1 cm broad, linear to narrowly elliptic, lanceolate or orbicular; capsule terete with narrowly triangular calyx teeth	...	50
49b.	Leaves more than 1 cm broad, elliptic-oblong or ovate-oblong, obtuse or rounded; capsule 4 angular with broadly triangular calyx teeth	...	51
50a.	Flowers usually axillary, solitary or 2-5 in corymb or several in umbel	...	52
50b.	Flowers in terminal and axillary panicles	...	53
51a.	Inflorescence not loose corymbose cyme; stamens and styles both inserted; capsule ovoid or ellipsoid, angular to winged; testa deeply pitted	...	54
51b.	Inflorescence terminal loose corymbose panicles, stamens and style both exserted; capsule ovoid, obtusely angular; testa smooth, reticulate	... 45.	<i>H. ovatifolia</i>

- 52a. Flowers isostylous; stamens and style inserted or exerted ... 55
- 52b. Flowers heterostylous, sessile or shortly pedicelled in trichotomously branched umbellate cyme ... 46. *H. puberula*
- 53a. Flowers in terminal or axillary laxly dichasial cymes, isostylous or heterostylous ... 56
- 53b. Flowers in terminal, 2-4 flowered cymes or axillary, solitary, isostylous; stamens and style both exerted ... 57
- 54a. Inflorescence subcapitate or paniculate cyme; capsule ellipsoid, narrowly to broadly 4-winged; calyx teeth longer than hemispheric crown ... 58
- 54b. Inflorescence racemose cymes; capsule ovoid, 4-ribbed; calyx teeth shorter than the hemispheric crown ... 47. *H. racemosa*
- 55a. Peduncle 2-8 flowered cyme or flower solitary ... 59
- 55b. Peduncle solitary or in pair, 1-flowered; capsule globose, rounded with conical top ... 48. *H. herbacea*
- 56a. Flowers isostylous or heterostylous; capsule globose, usually broader than long ... 60
- 56b. Flowers isostylous; stamens and styles both exerted; capsule obovoid or ellipsoid, twice as long as broad ... 49. *H. graminifolia*
- 57a. Corolla tubular; calyx lobes much shorter than the corolla tube, accessory calyx teeth absent ... 61
- 57b. Corolla campanulate; calyx lobes as long as or longer than corolla, accessory calyx teeth present ... 50. *H. stocksii*
- 58a. Inflorescence subcapitate cyme; calyx teeth broadly triangular; capsule 4-winged ... 51. *H. pterita*
- 58b. Inflorescence paniculate cyme; calyx teeth triangular-lanceolate; capsule narrowly 4-winged ... 52. *H. hermanniana*
- 59a. Leaves orbicular; flowers sessile, solitary or clustered; capsule globose, didymous ... 53. *H. trinervia*

- 59b. Leaves linear or narrowly elliptic; flowers pedicelled, solitary or in pedunculate cyme; capsule globose or ellipsoid ... 62
- 60a. Flowers heterostylous; corolla funnel-shaped; capsule globose ... 54. *H. affinis*
- 60b. Flowers isostylous; corolla short tubular; capsule globose, much broader than long ... 55. *H. attenuata*
- 61a. Leaves less than 5 mm broad, linear or triangular-lanceolate; stem rigid, terete or angular ... 63
- 61b. Leaves more than 5 mm broad, elliptic, acute; stem delicate, angular and winged ... 56. *H. hygrophilla*
- 62a. Leaves linear-lanceolate or elliptic-lanceolate; calyx teeth narrowly triangular, distant in fruit; flower solitary or 2-8 in peduncled cymes ... 64
- 62b. Leaves narrowly elliptic; calyx teeth triangular, close in fruit; peduncle usually 2-flowered ... 57. *H. pumila*
- 63a. Capsule 1.5-2 mm broad, globose; peduncle and pedicel not stout ... 65
- 63b. Capsule 3-3.5 mm broad, roundish, widening upward from base; peduncle and pedicel stout ... 58. *H. diffusa*
- 64a. Flowers in corymbs or 2-3 in cymes; stamens and style inserted; capsule ovoid, crown truncate above ... 59. *H. corymbosa*
- 64b. Flowers 2-4 in cymes; stamens and style exserted; capsule globose or subglobose, narrowed below the calyx-teeth, crown hemispheric ... 60. *H. pseudocorymbosa*
- 65a. Stem terete, setaceous; leaves triangular-lanceolate, hispid ... 61. *H. linoides*
- 65b. Stem angular, ridges scabrid; leaves linear-lanceolate, glabrous ... 62. *H. graminicola*
- 66a. Style ending in 2 filiform stigma lobes; flowers glabrous outside; corolla tube much longer than calyx lobe ... 67
- 66b. Style ending in an unlobed, ovoid or cylindrical stigma; flowers scabrid outside; corolla tube slightly longer than calyx lobe ... 63. *H. coccinea*

- 67a. Corolla tube 2-5 times longer than the lobe; style long; stigma just below the anther ... 68
- 67b. Corolla tube 5-6 times longer than the lobe; style long; stigma just below the anther ... 64. *H. retrorsa*
- 68a. Corolla tube 4-5 times longer than the corolla lobe; capsule globose ... 69
- 68b. Corolla tube twice the corolla-lobe; capsule ellipsoid or oblong-ellipsoid ... 65. *H. gracilis*
- 69a. Leaves whorled; flowers sessile or short pedicelled; capsule scabrid ... 66 *H. aspera*
- 69b. Leaves opposite; flowers with capillary pedicel; capsule minutely scabrid ... 67. *H. nagporensis*
- 70a. Leaves narrowly lanceolate to elliptic lanceolate, 0.5-0.7 cm broad ... 71
- 70b. Leaves linear, 0.2-0.3 cm broad ... 72
- 71a. Stem robust; leaves elliptic-lanceolate; flowers 4-6 at an axil; corolla tube glabrous ... 73
- 71b. Stem wiry; leaves elliptic-lanceolate; flowers 2-4 at an axil; corolla tube with a ring of hairs inside ... 68. *H. angustifolia*
- 72a. Stiff herbs, stem terete, setaceous; leaves aristate at apex ... 69. *H. cyanantha*
- 72b. Slender diffuse herbs, stem angular or winged, laxly hispid; leaves acuminate at apex ... 70. *H. pinifolia*
- 73a. Leaves hispid on both the surfaces; capsule globose, hispid ... 71. *H. verticillata*
- 73b. Leaves glabrous, glossy on lower surface; capsule ovoid, glabrous ... 72. *H. neesiana*
- 74a. Leaves elliptic-lanceolate, acuminate; inflorescence terminal capitate cyme, dense flowered, accessory calyx teeth present ... 73. *H. brunonis*
- 74b. Leaves ovate-oblong, obtuse; inflorescence terminal or axillary subcapitate or less flowered cyme, accessory calyx teeth absent ... 74. *H. andamanica*

### HEDYOTIS L. SECT. DIPLOPHRAGMA

Wt. & Arn. Prodr. 409. 1834; Miquel, Fl. Ind. Bat. 2 : 177. 1857; Benth. Fl. Hongk. 147. 1861; Hook. f. in Benth. & Hook. f. Gen. Pl. 2 : 57. 1873 & Fl. Brit. Ind. 3 : 49. 1880. *Oldenlandia* L. sect. *Diplophragma* (Wt. & Arn.) K. Schum. in Engl. & Prantl. Pflanzenfam. 4(4) : 26. 1891. *Diplophragma* (Wt. & Arn.) Meissn. Fl. Vas. Gen. 1 : 160. 1838; Korthals in Nederl. Kruidk. Arch. 2(2) : 149. 1851. *Hedyotis* L. sect. *Dimetia* Wt. & Arn. Prodr. 409. 1834; Hook. f. in Benth. & Hook. f. Gen. Pl. 2 : 57. 1873 & Fl. Brit. Ind. 3 : 56. 1880. *Oldenlandia* L. sect. *Dimetia* (Wt. & Arn.) K. Schum. in Engl. & Prantl. Pflanzenfam. 4(4) : 26. 1891. *Dimetia* (Wt. & Arn.) Meissn. Fl. Vas. Gen. 1 : 160. 1838; Korthals in Nederl. Kruidk. Arch. 2(2) : 154. 1851. *Hedyotis* L. sect. *Macrandria* Wt. & Arn. Prodr. 409. 1834; Benth. Fl. Hongk. 149. 1861. *Macrandria* (Wt. & Arn.) Meissn. Fl. Vas. Gen. 1 : 160. 1838. *Pleiocraterium* Bremek. in Rec. d. Trav. Bot. Nederl. 36 : 438. 1939.

*Type* : *H. fruticosa* L.

Shrubs, undershrubs or herbs, erect or decumbent. Leaves sessile or petiolate, ovate, elliptic-lanceolate or lanceolate. Inflorescence terminal or axillary, trichotomously branched corymbose, paniculate or capitate cymes or axillary sessile or pedunculate cymes or solitary flowered. Flowers mostly heterostylous. Calyx mostly campanulate, usually hypanthium much produced above ovary. Corolla infundibuliform, throat densely hairy inside. Anthers oblong-linear or linear. Capsule globose or ellipsoid, top slightly or much produced within calyx limb, sclerified, crustaceous, rarely coriaceous, opening by a short slit at apex, which divides septically and releases seeds ventrally. Seeds few to many, angular or planoconvex, often narrowly winged, exotesta thin, reticulate, rarely punctate.

*Pollen morphology* : Pollen grains sub spheroidal,  $P \times E = 25-65 \mu\text{m} \times 16-45 \mu\text{m}$  3 colporate, rarely 4 colporate; colpi,  $18-40 \mu\text{m} \times 2-6 \mu\text{m}$ , OS lalongate,  $5-7 \mu\text{m} \times 10-13 \mu\text{m}$ , margin distinct, free  $A_2$  or synzonorate  $A_1$ . Exine  $1.5-3 \mu\text{m}$  thick, fine to coarse reticulate or honeycomb like reticulation, tectum  $0.5-1 \mu\text{m}$  thick, psilate, or lumina  $0.5-2 \mu\text{m}$ .

*Distrib.* : About 150 species in Tropical Asia. 35 species in India, distributed chiefly on the mountains of southern India, Eastern India, Andaman & Nicobar Islands, Sri Lanka, Nepal, Bhutan, China, Myanmar and Malaysia. (Plate 9 & 10 partly).

1. *H. verticillaris* Wt. & Arn. Prodr. 409. 1834 (*Type* : *Wight Cat.* 1366 K! CAL!); Walp. Rep. 2 : 493. 1843; Wt. Icon t. 1029. 1845; Hook. f. Fl. Brit. Ind. 3 : 56. 1880; Trimen, Handb. Fl. Ceylon 2 : 311. 1894. *H. plantaginifolia* Arn. Pugill. Pl. Ind. Or. 22 : 340. 1836. *Oldenlandia verticillaris* (Wt. & Arn.) O. Ktze. Rev. Gen. Pl. 1 : 293. 1891; Gamble, Fl. Pres. Madras 600. 1921; Fyson, Fl. S. Ind. Hill Station 1 : 273. t. 220. 1932. *Pleiocraterium verticillare* (Wt. & Arn.) Bremek. in Rec. d. Trav. Bot. Neerl. 36 : 440. 1939. *P. plantaginifolium* (Arn.) Bremek. *l.c.* (Plate 13).

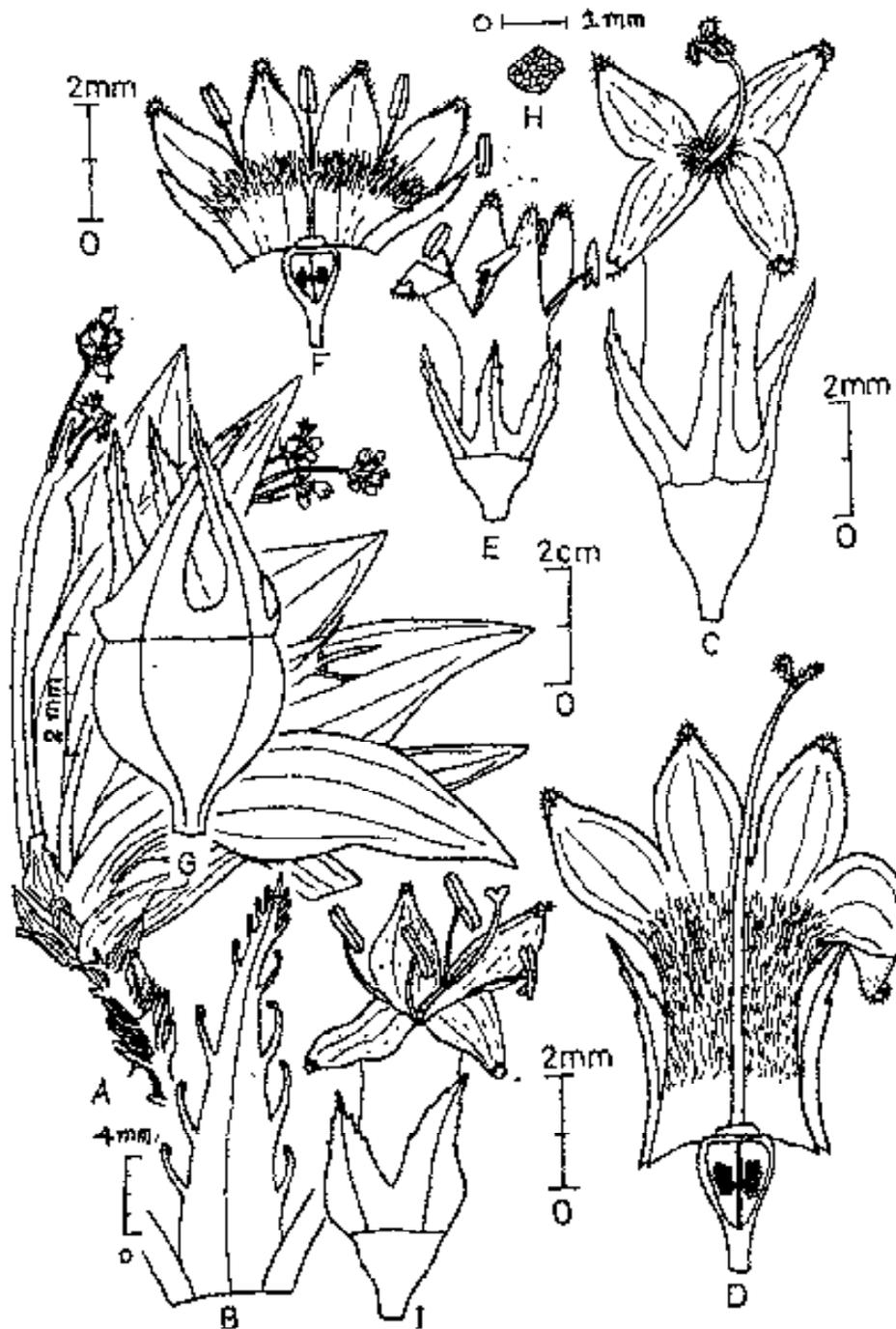


Plate 13. (A - H) *Hedyotis verticillaris* Wt. & Arn. : A. habit; B. stipule; C. long styled flower; D. opened flower; E. short styled flower; F. opened flower; G. capsule; H. seeds; *H. verticillaris* Wt. & Arn. subsp. *plantaginifolia* (Sri Lanka); I. homostylous flower.

Herbs perennial from a long woody root stock, stoloniferous, stemless or short stemmed with radical leaves in a rosette, glabrous. Leaves sessile, 10-30 (-40) × 3.5 - 4.5 cm; linear-lanceolate, acuminate at apex, amplexicaul at base, glabrous, yellow when dry; nerves 3-5-7, longitudinally ribbed from base to apex, very strong, prominent below, channelled above; stipules hidden in the radical leaves, 2-4 cm long, narrow, linear, acuminate, somewhat laciniate with short fleshy root like papillae. Inflorescence axillary peduncled subcapitate cymes; peduncle 6-20 cm long, shorter or longer than the leaves, branched trichotomously. Flowers sessile or subsessile, 4-12 mm long, bracteate, homostylous or heterostylous; bracts linear, 1-1.5 × 0.3-0.5 cm at the forks and below the heads. Hypanthium ovoid, purplish green, glabrous; 1.5-2 mm long. Calyx limb 0.3-0.8 mm long; lobes 4, 2-3.8 mm long, ovate, lanceolate or linear-lanceolate, acute, serrulate, erect or spreading usually longer than the corolla tube. Corolla widely infundibuliform, pale purple, 4-7 mm long; tube 2-4 mm long, dense pubescent at the throat; lobes 2-3 mm long, oblong, acute, incurved at apex, serrulate, minute pubescent inside. Stamens 4, inserted or exserted; filaments 0.2-0.5 mm or 1.5-2 mm long, arising from the throat of the corolla tube; anther linear, 1-1.3 mm long, papillose. Ovary 0.7-1.2 mm long, 2 chambered, many ovuled in axile median placenta; style 1-2 mm long in short styled flower or 7-8 mm in long styled flower and ± 4 mm long in homostylous flowers; stigmas linear, bilobed, fleshy, 0.5-0.8 mm long, papillose or globose, capitate. Capsule 2-3 × 2-3 mm, turbinate, glabrous, top raised above. Seeds many, 0.8-1 × 0.8-1 mm, angular, testa reticulate, brownish.

#### KEY TO THE SUBSPECIES

- 1a. Flowers 7-12 mm long, heterostylous; calyx lobes linear to lanceolate usually erect; corolla tube as long as or longer than the calyx lobes ... subsp. *verticillaris*
- 1b. Flowers 5-7 mm long, homostylous; calyx lobes ovate-lanceolate, usually spreading; corolla tube shorter than the calyx lobes ... subsp. *plantaginifolia*
- 1a. **H. verticillaris** Wt. & Arn. subsp. **verticillaris**.

Leaves 10-30 (-40) × 3-5 cm, linear-lanceolate. Flowers 6-10 mm long, white, heterostylous. Calyx lobes 3-3.8 × 0.2-0.3 mm, lanceolate or linear-lanceolate, usually erect.

*Fls.* : January July; *Frts.* : July December.

*Ecology* : In grass lands on marshy soil at 1950-2260 m in alt.

*Distrib.* : India : Tamil Nadu & Kerala.

*Exsiccata studied* : INDIA : Tamil Nadu : Nilghiri hills, Pykara, *J. S. Gamble* 11991 (DD), 12059 (CAL) & 16280 (BSI); Takkadi, *B. V. Shetty* 34075 (MH); Mudimund peak, *J. L. Ellis* 34774 (MH). Acc. No. 199090; Nilgerris, *G. King* 1228B (CAL); Kerala : Palghat Dt., Sispara to Walghat, Silent Valley, *R. E.* 2000 m alt. *N. C. Nair* 77202 (CAL).



1b. *H. verticillaris* Wt. & Arn. subsp. ***plantaginifolia*** (Arn.) Deb & Dutta, Comb. & Stat. nov. *H. plantaginifolia* Arn. Pugil. Pl. Ind. Or. 22 : 340. 1836 (Type : Sri Lanka, Walker s.n. K) Walp. Rep. 2 : 493. 1843. *Pleiocraterium plantaginifolium* (Arn.) Bremek. in Rec. d. Trav. Bot. Neerl. 36 : 440. 1939.

Leaves 10-15 cm long, linear-lanceolate. Flowers 5-7 mm long, homostylous. Calyx lobes 2-2.5 × 0.5-1 mm, ovate-lanceolate, usually spreading.

*Fls.* : April.

*Distrib.* : Sri Lanka.

*Exsiccata studied* : SRI LANKA : Newera Ellia, T. Thomson s. n. (CAL); Central Province, Thwaites C. P. 107(CAL).

2. *H. kurzii* Merr. in Papers Mich. Acad. Sc. 19 : 195. 1933. *H. wallichii* Kurz in Journ. Asiat. Soc. Beng. 45(2) : 136. 1876 & 46(2) : 136. 1877, non Walp. 1843 (Type : Nicobar, February, 1875, S. Kurz s. n. K! photo! selected as the lectotype; Kamorta, February 1875, S. Kurz s. n. K! photo! iso. CAL!); Hook. f. Fl. Brit. Ind. 3 : 53. 1880; Craib, Enum. Fl. Siam. 2 : 52. 1932. *Oldenlandia wallichii* (Kurz) Craib in Kew Bull. 1911 : 388. 1911. *O. rosea* Ridley in Journ. Roy. Asiat. Soc. Str. Br. 59 : 110. 1911 & Fl. Malay Penin. 2 : 54. 1923, non Raf. 1817. *H. nicobarensis* (Kurz) Lewis in Ann. Miss. Bot. Gard. 53 : 109. 1961, nom. superfl. *H. galioides* Wall. Cat. 866. 1829, nom. nud., non F. Muell. 1863. (Plate 14 a).

Herbs annual or perennial from a stout, woody rootstock, erect, diffusely branching, 10 - 100 cm long; stem slender, acutely angular, glabrous or pilose. Leaves subsessile or short petioled, 1.5-2 × 0.8-1.2 cm, ovate or elliptic, acute, membranous, pilose; hair 3-5 celled; petiole 0.5-2 mm; stipules 1-2 × 2-3 mm, 1-3 bristled or pectinately branching, pilose. Inflorescence terminal and axillary slender trichotomous lax panicles of cymes; peduncles and pedicels capillary. Flower 2-3 mm long, isostylous pedicels 1-1.5 cm long, slender, pubescent or glabrous. Hypanthium globose, 0.5-0.6 mm long; Calyx limb very short; lobes 4, 0.2-0.3 × 0.2-0.3 mm, triangular, acute. Corolla 2-2.5 cm long, purple or pale blue; tube 1.5-2 mm long; lobes 4, 0.5-0.7 mm, ovate, pubescent inside. Stamens 4, exserted; filaments 0.7-1 mm long, adnate at the sinus of corolla lobes; anthers 0.5-0.7 mm long, oblong. Ovary 0.5-0.6 mm long, ovules many; style slender, 1.5-2 mm long; stigma bilobed, 0.8-1 mm long, linear, papillose. Capsule small, ovoid or globose, 1-1.5 × 1-2 mm, glabrous or pubescent, top flat or shortly hemispheric, dehiscent loculicidally, then septically; calyx lobes distant in fruit, nearly equal to the crown. Seeds many, small, 0.2-0.3 × 0.18 mm, angular, reticulate, brown.

*Fls.* : September - October; *Fris.* : October - January.

*Ecology* : In mixed deciduous forest on hilly region or on rocky places.

*Distrib.* : India : Andaman; Myanmar, Malaysia; Indonesia and Thailand.

*Note* : Thailand specimens having calyx teeth lanceolate, capsule narrowly winged and hispid.

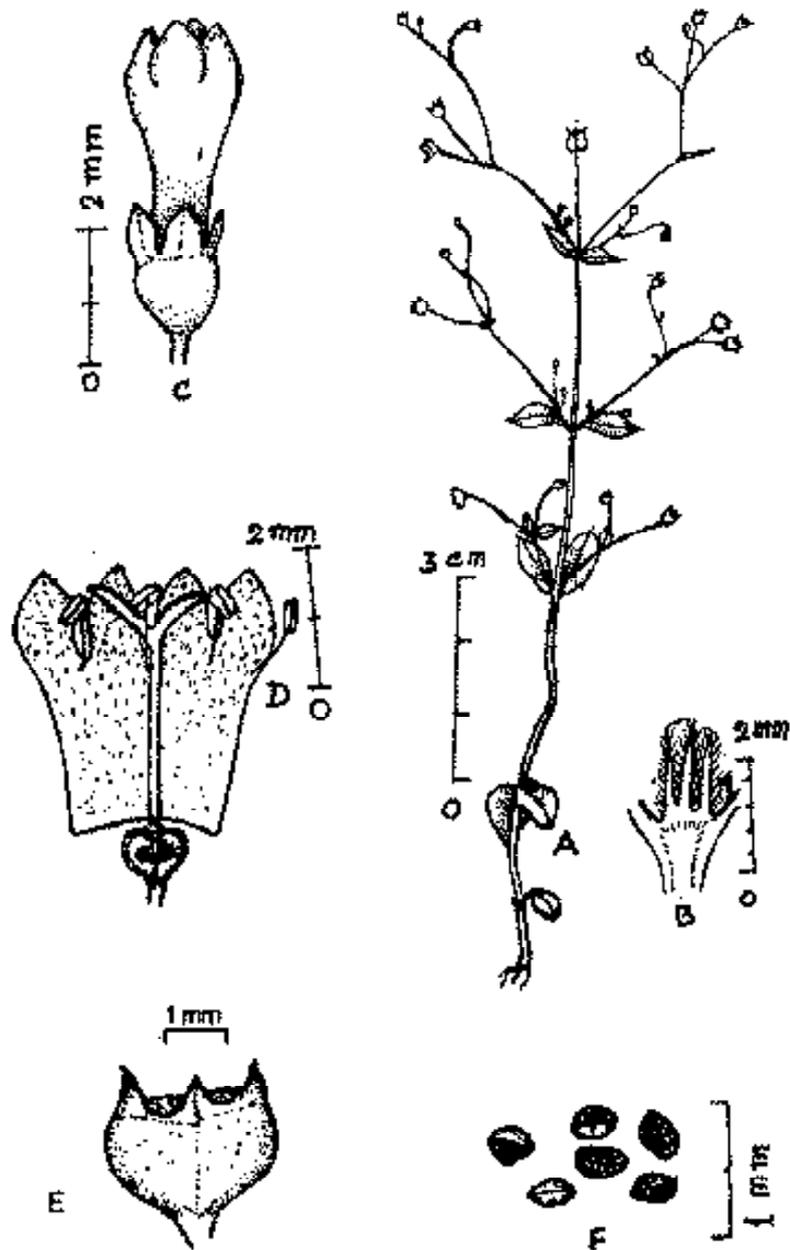


Plate 14a. (A - F) : *Hedyotis kurzii* Merr : A. habit; B. stipule; C. flower; D. opened flower; E. capsule; F. seeds.

*Exsiccata studied* : INDIA : West Bengal; Calcutta, cultivated, *Herfer* 173 (E).  
Andaman : Kamorta, *S. Kurz s. n.* (CAL).

MYANMAR : Tavoy, *Wall. Cat.* 866 A (CAL, E) & *J. Keenan et al.* 1775 & 1942 (E); Amherst, *Wall. Cat.* 866B (CAL, E); Moulmein, *G. King* 186 (CAL); Tenasserim, *Herfer* 2901 (CAL); Pegu, *S. Kurz* 1419 (CAL); Kamemoung, *A. Meebold* 17367 (CAL).

MALAYSIA : Kolanban, *Wall. Cat.* 866 (CAL); *King's collector* 379 (CAL).  
Thailand, *A. F. G. Kern* 1498 (CAL); Thailand; *C. Phengkklai* 3972 (CAL).  
Borneo : Bangarmassing, *J. Motley* 412 (CAL).

3. *H. trimenii* Deb & Dutta in *Taxon* 34(2) : 297, 1985. *H. lawsoniae sensu* Hook. f. *Fl. Brit. Ind.* 3 : 56, 1880, non *Wt. & Arn.* (1834) [Type : Sri Lanka, *Thwaites* 13 (CAL)]; *Trimen, Fl. Ceylon* 2 : 310, 1884. (Plate 15).

Herbs or undershrubs up to 2 m long, usually climbing, branching dichotomously, leafy above; stem obtusely angular, grooved, glabrous, shining, purple black when dry. Leaves 1.2-8 × 0.5-3 cm; ovate, elliptic-ovate or elliptic-lanceolate, acute or obtuse at apex, narrowed at base to petiole, sub-coriaceous to coriaceous, glabrous, pale below; lateral nerves 3-4 pairs, obscure, raphides more on lower surface; petiole 0.5-1 cm, often swollen at base; stipules deciduous, connate, 2-3 × 1.5-2 mm, ovate, obtuse, keeled down the centre, glandular black at tip. Inflorescence axillary loose umbellate cymes; peduncles 2-4 cm long, narrowly winged. Flowers 9-10 mm long, heterostylous; pedicel 2-3 mm long, slender. Hypanthium ovoid, 0.8-1 mm long; calyx limb 0.3-0.7 mm long; lobes 4, 0.5-0.6 mm long, broadly triangular, acute, keeled along the midrib, ciliate along the margin, rarely sparsely pubescent throughout. Corolla 7-8 mm long, white, funnel-shaped, sparsely pubescent outside; tube 4-5 mm long, broader above; lobes 4, 3-3.5 mm long, ovate-lanceolate, incurved, beaked at apex, densely pubescent inside along the lobes and throat. Stamens 4, inserted or exserted; filaments 0.2-0.5 mm or 2-3 mm long, adnate at throat; anthers globose, 1-1.5 mm long. Ovary 0.8-1 mm; ovules numerous on oblong placenta; style 2-3 mm or 8-9 mm long, inserted or exserted; stigma bilobed, 1-1.5 mm long, linear, fleshy, papillose. Capsule 4-6 × 2-3 mm, ellipsoid or ovoid, protruding above the calyx teeth, crustaceous, with reddish marking outside, glabrous. Seeds few to many, angular, planoconvex, narrowly winged; testa brownish, reticulate.

*Fls.* : March - June; *Frs.* : July - October.

*Ecology* : Mostly in forest on steep slopes; in Rhododendron forest with heavy undergrowth of bamboo.

*Distrib.* : Sri Lanka.

*Note* : *Lawsoniae purpurea* Lamk. *Enc. Meth.* 3 : 107, 1789 was described on the basis of *Pontaletje malabarensis* Rheed. *Hort. Mal.* 4 : t 57, 1683, collected from Cochin. It was transferred first to the genus *Wendlandia* Bartl., as *W. lawsoniae* DC. *Prodr.* 4 : 413, 1830, and subsequently treated as *Hedyotis lawsoniae* Wight & Arnott, *Prodr.* 407, 1834 and illustrated in *Wight Icon.* 1026, 1845. On the basis of

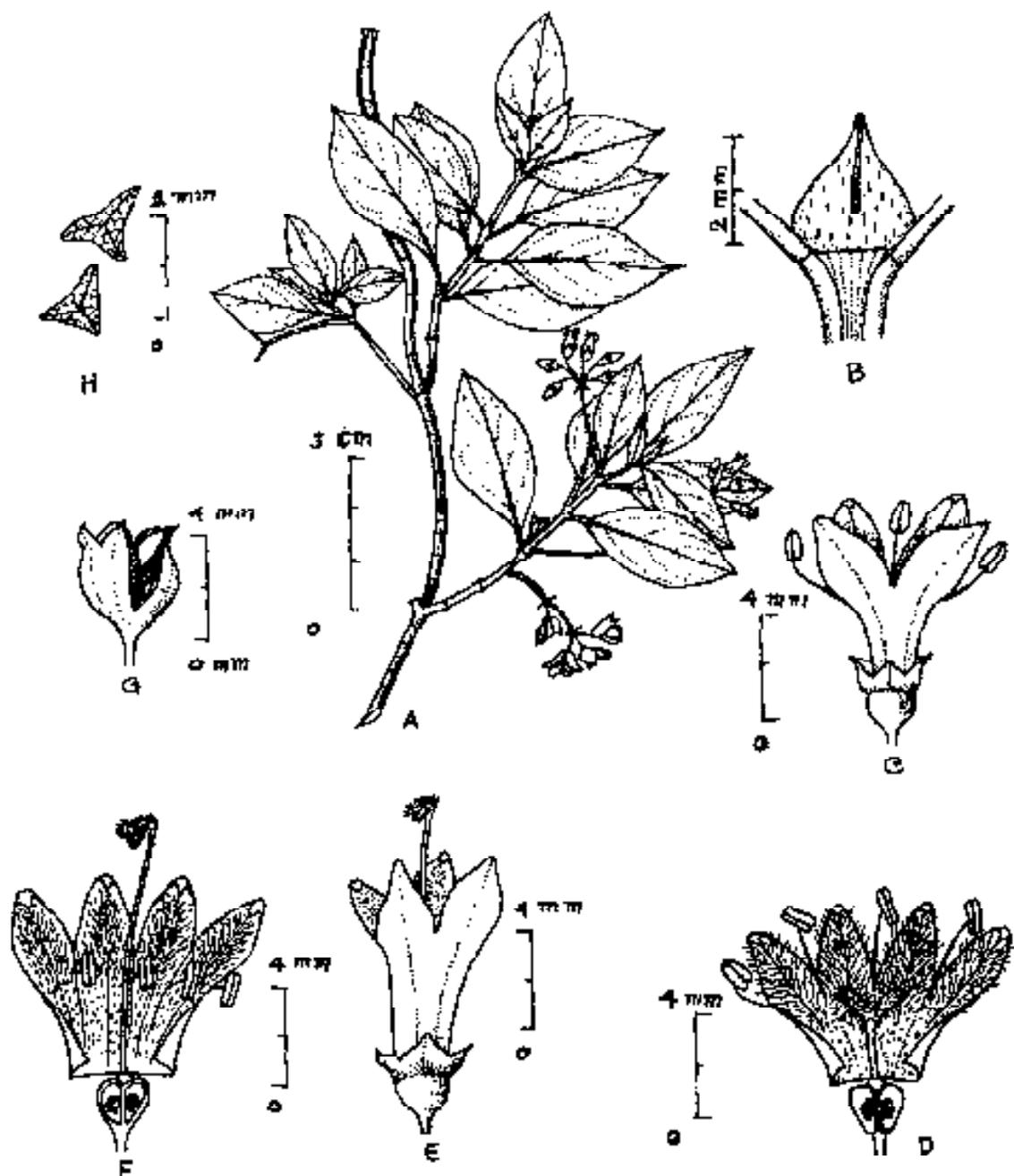


Plate 15 (A - H). *Hedyotis trimenii* Deb & Dutta : A. habit; B. stipule; C. short styled flower; D. opened flower; E. long styled flower; F. opened flower; G. capsule; H. seeds.

Nilgiri material, Wight (1834) also stated that his own collection from Sri Lanka exactly matching with the type. Thwaites, Enum. 140. 1864 used this name for his collection from Sri Lanka. J. D. Hooker, Fl. Brit. Ind. 3 : 56. 1880 pointed out that Wight Icon 1026. 1845 and Rheed. Hort. Mal. 4. t. 57. 1683 are two different plants other than *H. lawsoniae* Wt. & Arn. (l. c.). He further observed that Wight's figure of *H. lawsoniae* represents the corolla as 5 fid and the fruit as pubescent and of a different shape from this, with different placentation. It is probably a composite plate, in part of an *Ophiorrhiza*. Rheed. Hort. Mal. 4. t. 57 is a different Cochin plant, supposed by Wight and Arnott to be identical with that of Sri Lanka, but differing in quadrangular stem and terminal cymes which is *H. fruticosa* L. Trimen (1898) observed that their plant from Sri Lanka is not *Wendlandia lawsoniae* DC. In view of these differences J. D. Hooker (l. c.) gave a new circumscription to *H. lawsoniae* on the basis of Thwaites collection from Sri Lanka which is different from *H. lawsoniae* Wight & Arnott (1834). The name being preoccupied Hooker's taxon had to be given a new name.

*Exsiccata studied* : SRI LANKA : Black Pool, Thwaites C. P. 13 & 1697 (CAL); Walker s. n. (CAL); Adam, D. Chatterjee 529 (CAL); C. P. G. Davidas 7683 (CAL); Muwara, G. Davidas & D. B. Sumithraa racheli 8052 A (CAL); Wight 107 (E).

4. *H. tavoyensis* Balakr. in Journ. Bomb. Nat. Hist. Soc. 71 : 168. 1974 (Type : Tavoy, Talaingya, Chaung, 900 m, 7.2.1919, A. T. Gage 68A holo. CAL!; A. T. Gage 688 iso. CAL!) (Plate 14 b).

Shrubs up to 1 m, branches leafy above; stem acutely angular, glabrous. Leaves 10-15 × 2.5-5.5 cm, lanceolate, elliptic-oblong, oblong-lanceolate-acute, at apex, narrowed to petiole at base, chartaceous, subolivaceous when dry, pale beneath, darker above, midrib channelled above, lateral nerves 6-10 pairs ascending; petiole 0.5-2 cm long; stipules 5-8 × 3-4 mm, triangular, acuminate, fleshy, sometimes glandular-pectinate at margin. Inflorescence axillary, capitate cymes, glabrous; peduncles 10-14 cm long, trichotomous above, glabrous. Flowers sessile or subsessile, 7-8 mm long; bracts foliaceous, 0.5-2 × 0.5-0.8 cm, ovate-oblong or ovate, acute. Hypanthium ovoid, 1-1.5 mm long; calyx limb short; lobes 4, 1.5-2 mm long, triangular-lanceolate, interposed with gland tipped subulate teeth. Corolla cylindrical, white or purplish; tube 4-5 mm long; lobes 4, 1-1.5 mm long, ovate, obtuse, pubescent. Stamens 4, inserted; filaments 0.2-0.3 mm long, attached near the throat of the corolla tube; anthers 1-1.5 mm long, oblong-linear. Ovary 1-1.5 mm long, ovules many on submedian placenta; style shortly exerted, 6-6.5 mm long; stigma bilobed, 0.3-0.5 mm long, linear, papillose. Capsule 2.5-3 × 2.5-3 mm, subglobose or obovoid, glabrous. Seeds with persistent calyx lobes, few to many, angular or planoconvex, 0.2-0.3 × 0.2 mm exotesta reticulate, brownish.

*Fls. & Frts.* : March April.

*Distrib.* : Myanmar at about 870 m in altitude.

*Exsiccata studied* : MYANMAR : Tavoy, Heinye, P. T. Russel 181 & 1805 (CAL).

5. *H. scandens* Roxb. [Hort. Beng. 10. 1814] Fl. Ind. 1 : 369. 1820 (Type : Silhet, 1811, *M. R. Smith s. n. ex Wall. Cat.* 839 A holo. K-photo!; iso. CAL); D. Don, Prodr. Fl. Nepal. 134. 1825; DC. Prodr. 4 : 422. 1830; Prain, Beng. Pl. 556. 1903; Burkill in Rec. Bot. Surv. Ind. 4 : 112. 1910; Fischer in Rec. Bot. Surv. Ind. 12 : 100. 1938; Kar & Panigrahi in Bull. Bot. Surv. Ind. 5 : 230. 1963; Yamazaki in Hara, Fl. E. Himal. 310. 1966; Jain & Hazra in Bull. Bot. Surv. Ind. 17 : 83. 1975; Borthakur in Bull. Bot. Surv. Ind. 18 : 169. 1976; Hara in Hara & Williams, Enum. Fl. Pl. Nepal 2 : 202. 1979; Kumar *et al.* in Bull. Bot. Surv. Ind. 22 : 163. 1980; Balakr. Fl. Jowai 1 : 244. 1981; Deb, Fl. Tripura State 2 : 57. 1983. *Oldenlandia scandens* (Roxb.) K. Schum. in Pflanzenfam. 4(4) : 26. 1891; O. Ktze, Rev. Gen. Pl. 1 : 292. 1891; Gamble, Fl. Pres. Madras 600. 1921; Haines, Bot. Bih. Or. 444. 1922. *H. polycarpa* R. Br. ex G. Don, Gen. Syst. Gard. Bot. 3 : 527. 1834 (Type : Silhet, *H. Brace s. n. ex Wall. Cat.* 838 CAL). *H. volubilis* Wall. Cat. 840, *nom. nud.* (Plate 16).

Herbs perennial from long woody root-stock, about 3 m, erect, scandent or climbing; stem obtusely angular or terete, grooved, glabrous or sparsely hairy, turning yellowish on drying. Leaves sessile or petioled, 1.5-15 × 0.2-4.5 cm, lanceolate or elliptic-oblong, acuminate or caudate, narrowed at base, yellowish, glabrous, smooth, glossy below; midrib prominent; lateral nerves 4-5 pairs, obscure; petiole 0.1-0.5 cm long; stipules connate, 2-2.5 × 2-3 mm cup-shaped, keeled at the centre above, acute. Inflorescence terminal and axillary peduncled panicle of umbellate cymes, 3-10 × 2-15 cm; branches trichotomous, puberulous. Flowers pedicelled, 6-7 mm long, heterostylous; bracts 2-6 mm long, linear, spreading. Hypanthium ovoid, 0.7-1.5 mm long; calyx limb puberulous, 0.5-1 mm long; lobes 4, sometimes interposed with 2-4 subulate teeth, 0.5-1 mm broadly triangular, acute, keeled at the centre, rigid, erect. Corolla white or yellowish white, sparsely or densely puberulous outside; tube very short, 1-2 mm long; lobes 4 or sometimes 5, 3-4 mm long, oblong, beaked, incurved at apex, densely woolly inside. Stamens 4, rarely 5, inserted or exserted; filaments 0.8-1 mm or 2.5-3 mm, adnate at sinus of the corolla lobes or throat. Ovary 1-1.5 mm long, ovules many on subglobose placenta; style 1.5-2 mm or 4-4.5 mm long, pubescent above or throughout; stigma bilobed, 1-1.5 mm long, linear or subglobose, fleshy, papillose. Capsule 3-4 × 2-3 mm, globose or subglobose, protruded beyond calyx, rounded or obscurely 2-lobed at top, puberulous, dehiscing first loculicidally from top, then septocidally. Seeds many, 0.2-0.5 × 0.3-0.5 mm, angular, narrowly winged, exotesta reticulate, brownish.

*Fls. & Frts.* : Throughout the year.

*Ecology* : On steep hill slopes of rocky lime stone and black humus soil amidst grasses, *Mclastoma* and bamboo at 766 - 1800 m alt.

*Uses* : Roots are crushed and boiled in water and given to children suffering from dysentery.

*Local name* : *Gujii*, in Beng., *Khagai nimbu* in Bhutan, *Dudhe lahro* in Nepal; *Kinprong* in Caro, *Haniktu* in Mikir.

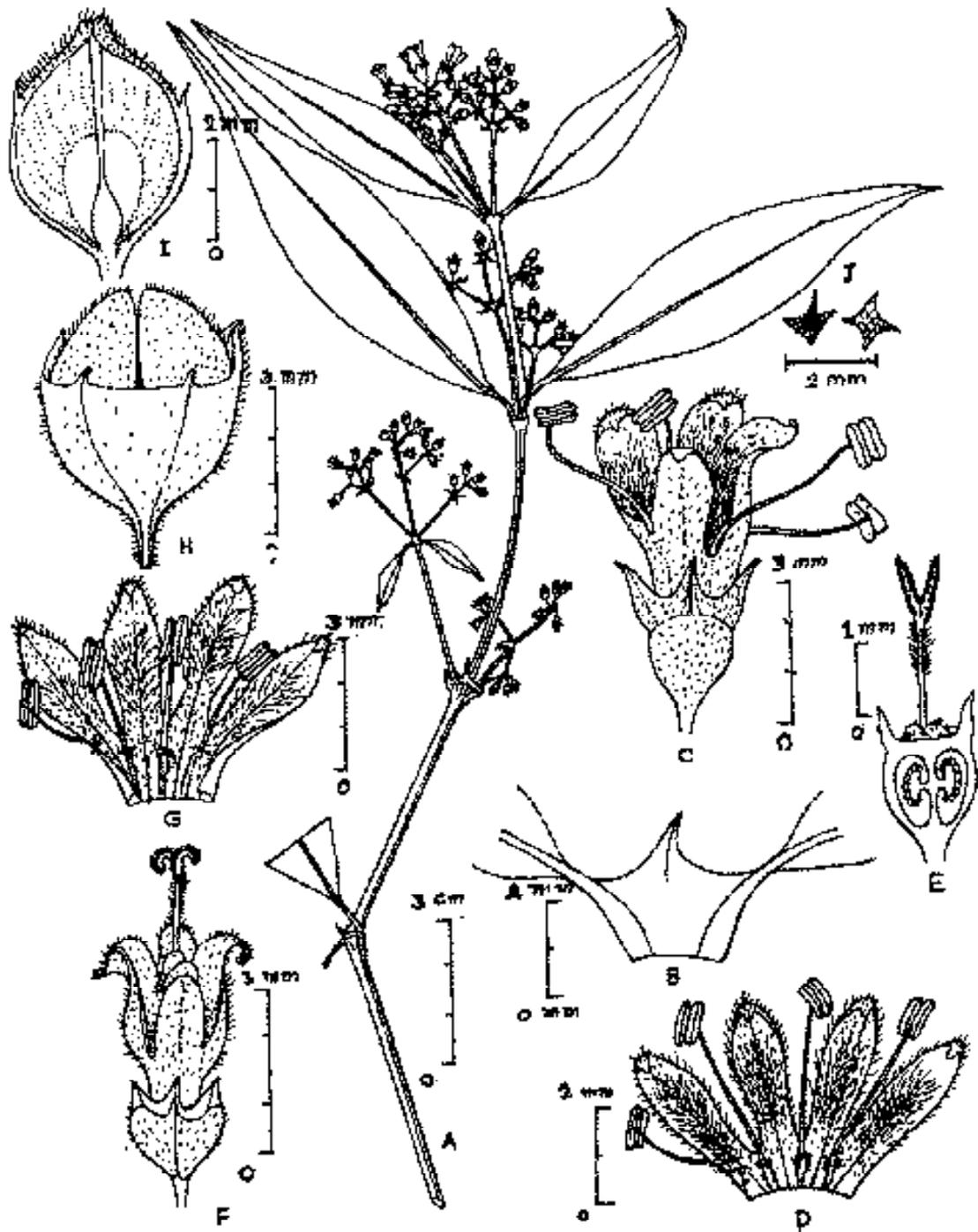


Plate 16. (A - J) *Hedyotis scandens* Roxb. : A. habit; B. stipule; C. short styled flower; D. opened flower; E. L. S. of ovary with style & stigma; F. long styled flower; G. opened corolla; H. & I. capsule; J. seeds.

*Distrib.* : Throughout Eastern India : Nepal, Bhutan, Bangladesh, Myanmar and China.

*Exsiccata studied* : INDIA : West Bengal; Darjeeling, Griffith K. D. No. 2903 (CAL) & J.S. Gamble 9850; Jalpaiguri, V. S. Rao 8 (DD); Kalimpong, T. Ripley 91(CAL) & K. Biswas 8496 (DD). Assam: Plains of lower assam, G. Munn 465 (CAL), Cachar, J.C. Prazer 61 (CAL) : Goalpara, G. Mann s.n. (BSIS), G. King s.n. (CAL) & G.K. Deka 12750 (ASSAM); Sibsagar, G. Watt 10366 (BSIS) & U.N. Kanjital 1849 (ASSAM); Haflong, W. G. Craib 395 (CAL); Kotung, I.H. Burkill 37573 (CAL); Makum, I.H. Burkill (CAL); D.M. Verma 46626 (ASSAM). Meghalaya ; Jaintia, H. Collett 3 (CAL) & N.P. Balakrishnan 42877 (ASSAM); C.B. Clarke 15175 (CAL); Khasia hills, G.Mann s.n. (D.D) & 531 (CAL) & J.S. Gammie 403 (CAL); Shillong, Gallatly 162 (CAL); Mungpo, Gallatly 46 (CAL); Garo hills, Baghmara, G.Panigrahi 22497 (ASSAM); Cherrapunjee, Gallatly 403 (CAL); Mausmai, C.B. Clarke 45909 A (CAL), H. Collett s.n. (CAL), Prain s.n. (CAL) & N.P. Balakrishnan 47240 (ASSAM); Garampani, U.N. Kanjital 1431 (DD); Dumpep, U. N. Kanjital 4484 (CAL); Pynursla, K. Biswas 4109 (CAL); Borapani, N. L. Bor 18024 (DD); Jorain, N. P. Balakrishnan 42786 (ASSAM). Arunachal Pradesh : Siang Dist. Daffla Hills, G. King 77 (CAL); Tutung, R. S. Rao 8958 (ASSAM); Kimin, G.Panigrahi 11496 (ASSAM); Tirap dist. Rusa, G. Panigrahi 16959 (ASSAM); Selari forest, J. Joseph 39999 (ASSAM). Mizoram : Lushai hills, A.T. Gage 48 (CAL); Aizal, D. B. Deb 30557 (ASSAM). Nagaland : Muku, G. Watt 5061 (BSIS); Kohima, G. Watt 7297 (BSIS), C.B. Clarke 41726 (CAL), D.Prain s.n. (CAL) & S.N. Bal 615 (BSIS); Baligaon, Prain 226 (CAL); Jaboca, Prain 520 (DD); Naga Hills, N.L. Bor s.n. (DD). Manipur, C.B. Clarke 7027 (CAL). Sikkim : Pankabaree, S.Kurz s.n. (CAL); Terai Jungles, S. Kurz s.n. (CAL); Sikkim, G.King 234 (CAL), R.C. Proudlock s.n. (CAL) & N.L. Bor 21300 (ASSAM) ; Pashok, D. Hooper s.n. (BSIS).

NEPAL : J. Scully 381 (CAL); Hattounda, I. H. Burkill 29558 (CAL); Tamur Valley, J.D.A. Stainton 1242 (CAL); Arun Valley, J.D.A. Stainton 1512 (CAL).

BHUTAN : J. Parker s.n. (CAL) & G. Sengupta 1132 (CAL).

BANGLADESH : South Sylhet, C.B. Clarke 8416 (CAL); Sylhet, Wall. Cat. 839A (CAL); Chittagong hill tracts, J.L. Lister (BSI) & S.Kurz s.n. (CAL); Kodala hill, Badul Khan 112 (CAL); Hazarikhil, C.E. Parkinson 4351 (DD).

MYANMAR : Upper Burma, Ruby mines, Abdul Huk 31 (CAL); Chin hills, Abdul Huk s.n. (CAL); Kachin hills, Shaik Mokim 55 (CAL) & s.n. (BSI); Bhamo, J.H. Lace 4502 (CAL); S. Shan State, R. W. Mac Gregor 915 (CAL); Wasi, S. M. Toppin 4047 (CAL); Kaban Tam, S. M. Toppin 6038 (CAL).

CHINA : Poneline, Yunan Expedition, D.J. Anderson s.n. (CAL).

6. *H. capitellata* Wall. ex G. Don, Gen. Syst. Gard. Bot. 3 : 527. 1834 (Type: Tavoy, 22.9.1817, W. Gomez 283 in Wall. Cat. 837 K-W photo! selected as the lectotype, iso. CAL!; Penang, 1822, Wall. Cat. 837B! Kurz in Journ. Asiat. Soc. Beng. 46 (2) : 135 1877; Hook. f. Fl. Brit. Ind. 3 : 56. 1880. *Oldenlandia capitellata*



(Wall. ex G. Don) O. Ktze. Rev. Gen. Pl. 1 : 292. 1891 (excl. var. *mollis*). *O. rubioides* Miq. Fl. Ind. Bat. 2 : 353. 1857 (Type : Sumatra, Bij Fort Elout, *Teysmann s.n.* Bo! iso. CAL! ; Banglae, *Horsfield s.n.*) (Plate 17).

Shrubs erect, scandent or climbing; stem 20-100 cm long, obtusely angular, grooved above, terete below, swollen at nodes, glabrous or brownish pubescent along the grooves, more so on young shoots. Leaves sessile or shortly petioled, 2-12 × 2.4-4 cm, lanceolate or elliptic-oblong, acuminate, cuneate at base, membranous or submembranous, glabrous or shortly pubescent above, glabrous or soft brownish pubescent along nerves beneath, margin sometimes revolute; lateral nerves 3-5 pairs, prominent below, channelled above; petiole 1-4 mm long, glabrous or pubescent; stipules connate, 2-4 mm broad, with 3-10 glabrous or coarse teeth, sheath pubescent. Inflorescence terminal and axillary capitate cymes; peduncles 1-5 cm long, trichotomously branched, bearing 3-25 flowers, radiating, 0.7-1 cm in diameter. Flowers sessile or shortly pedicelled, 8-10 mm long, heterostylous, bracteate; bracts 1-6 mm long, linear. Hypanthium ovoid, 0.7-1 mm long, glabrous or minutely pubescent, calyx limb ± 1 mm long; lobes 4, 1-2 mm long ovate to ovate-lanceolate, acute, ciliate at margin, midrib prominent. Corolla white or blue; tube 1-2 mm long; lobes 3-4 mm long, oblong, obtuse recurved, woolly inside. Stamens 4, inserted or exserted; filaments 2-4 mm long, usually flattened, pubescent below, adnate at the sinus of the corolla lobes; anthers oblong, 1.5-2 mm long. Ovary 0.7-1 mm long, ovules many; style 2-3 mm or 6-7 mm long, inserted or exserted, minutely pubescent; stigma bilobed, 1-1.5 mm long, linear, papillose. Capsule 2-3 × 1.5-2 mm, globose or ellipsoid, usually cuneate at base, protruded above, hemispheric or obscurely 2-lobed, glabrous, opening initially loculicidally at top, then septocidally. Seeds many, 0.2-0.5 × 0.2-0.3 mm, angular, narrowly winged; exotesta reticulate, brownish.

#### KEY TO THE VARIETIES

- |   |     |                          |
|---|-----|--------------------------|
| 1a. Stem, leaves sparse to dense pubescent, flowers sessile or shortly pedicelled | ... | 2                        |
| 1b. Stem, leaves glabrous; flowers sessile  | ... | var. <i>capitellata</i>  |
| 2a. Leaves minutely pubescent; flowers sessile; calyx lobes ovate, acute          | ... | var. <i>subpubescens</i> |
| 2b. Leaves densely pubescent; flowers pedicelled; calyx lobes ovate-lanceolate    | ... | var. <i>pubescens</i>    |

6a. *H. capitellata* R.Br. ex G. Don var. *capitellata*.

Stem leaves glabrous or nearly so. Stipules 2-3.5 mm broad, truncate, with few marginal bristles, glabrous. Inflorescence axis sparsely pubescent. Flowers sessile, capitate. Calyx lobes 0.8-1 mm long, ovate, minutely ciliate along the margin. Capsule glabrous.

*Fls.* : March - November; *Frts.* : October - December.

*Distrib.* : Myanmar, Malaysia, Thailand.

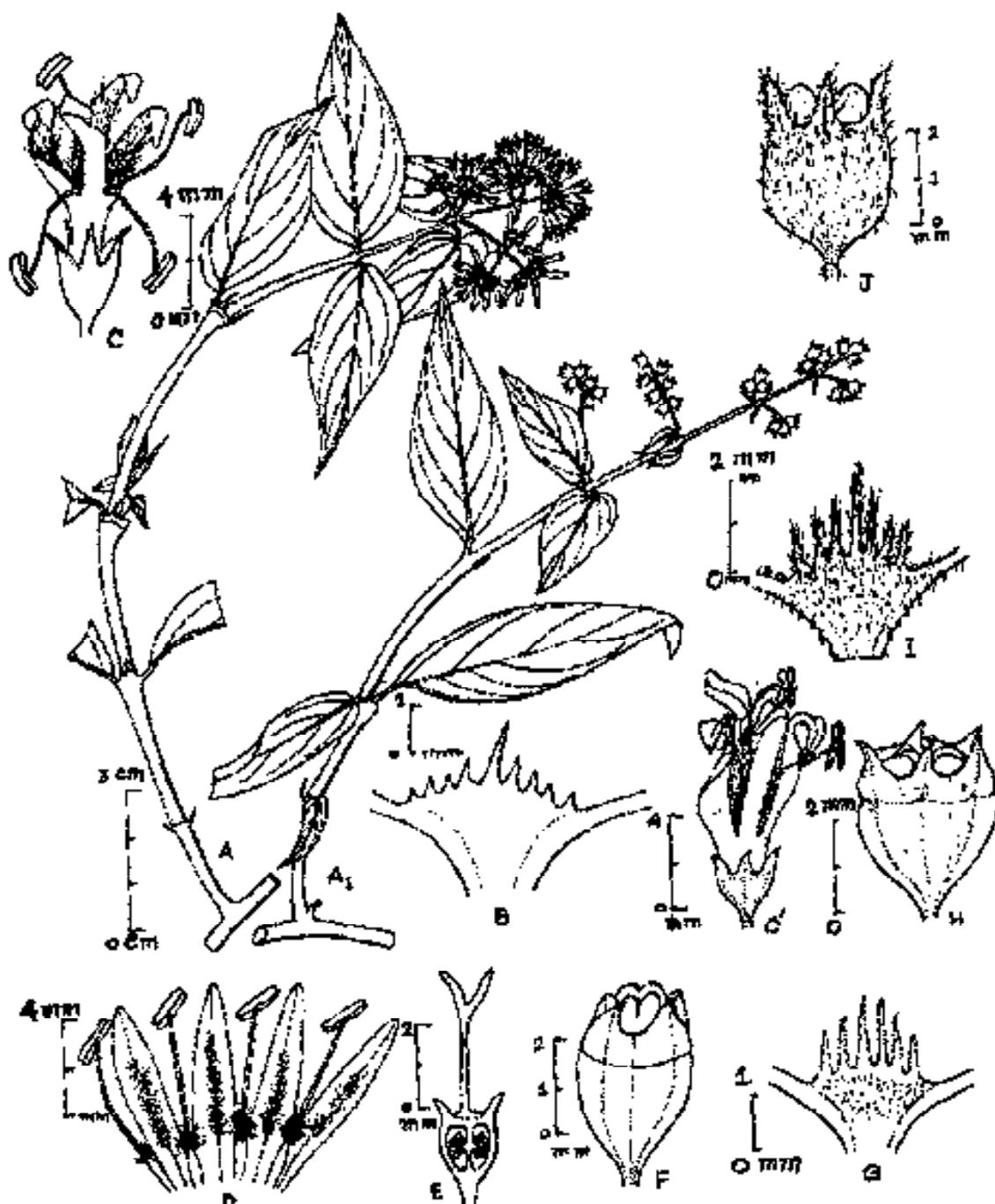


Plate 17. (AA' - J) *Hedyotis capitellata* Wall. ex G. Don : A. & A'. habit; B. stipule; C. short styled flower; C'. long styled flower; D. opened corolla; E. L.S. of ovary with style & stigma; F. capsule; G. & H. stipules and capsule (var. *subpubescens*); I. & J. stipule & capsule (var. *pubescens*).

*Exsiccata studied* : MYANMAR : Tavoy, Wall. Cat. 837A (CAL); Tenasserim, Mergui, Shaik Makim 22 (CAL), A. Meebold 14917 (CAL) & Brabourn's Collector 123 (DD); Maunglow, A. Meebold 14286 (CAL).

MALAY PENINSULA : Perk, Scortechini 530 (CAL); Malaya Peninsula, G. King 1885 & 8327 (CAL); Penang, Deschampa s.n. (BSI). THAILAND : N. Annandale s.n. (CAL). Borneo, Sarawak, 1890, G.D. Haviland s.n. (CAL).

♂ *H. capitellata* var. *subpubescens* Kurz in Journ. Asiat. Soc. Beng. 46 (2) : 135. 1877 [Type : Tenasserim, 1862, Helfer 2903 (CAL) selected as the lectotype; Tenasserim, Thougya, 750 m, Gallatley 78 (CAL)].

Stem glabrous. Leaves minutely pubescent above and along the nerves beneath; stipules minute, 2.5 -3 mm broad, bristles 6-7, minutely pubescent. Flowers sessile, capitate. Capsule minutely pubescent.

*Fls. & Frts.* : January February.

*Distrib.* : Manipur, Myanmar, Malaysia, Indonesia, China.

*Exsiccata studied* : INDIA : West Bengal - H.B.C, W. Helfer 430 (CAL); Manipur; Kassam, G. Watt 5082 (CAL); Bhamoo, G. Watt 5149 (CAL, E).

MYANMAR : Tenasserim, Gallatly 78 (CAL); Kachin Hills, Shaik Mokim 22 (CAL, BSI); Dauria Range, I. H. Burkill 30260 (BSIS); Kadingti, A. Meebold 17373 (CAL); Amherst, J. H. Lace 5598 (CAL, E).

MALAYSIA : *H. kunstler* 883 (CAL).

CHINA : Yunan Expedition, Poneshee, J.D. Anderson s.n. (CAL).

6c. *H. capitellata* Wall. ex G. Don var. *pubescens* Kurz in Journ. Asiat. Soc. Beng. 46 (2) : 135. 1877 [Type : Tywoon distr., Tonkyaghat, 600 m Roselay Valley, Kurz 1431 CAL; Martaban, Brandis 1127 CAL!].

Stem, leaves, stipules etc., are pubescent. Stipules 2.5 -3mm broad, bristles 6-7, densely pubescent. Flowers shortly pedicelled. Calyx lobes 1.5 -2 mm long, ovate-lanceolate, pubescent. Capsule pubescent.

*Fls. & Frts.* : December February.

*Distrib.* : Myanmar.

*Exsiccata studied* : MYANMAR : Moulmem, Tenasserim, Falconer s.n. (BSD) & G. Gallatley 740 (CAL); Pooker ridges, S. Kurz 1431 (CAL); Shan State, R. W. Mac Gregor 1297 (CAL); Kowpok, A. Meebold 17371 (CAL).

7. *H. fruticosa* L. Sp. Pl. 101. 1753 (Type : Sri Lanka, Hermann s. n. BM!); Wt. & Arn. Prodr. 408. 1834; Walp. Rep. 2:490. 1834; Thw. Enum. 142. 1859; Hook. f. Fl. Brit. Ind. 3 : 49. 1880; Trimen, Handb. Fl. Ceylon 2 : 305. 1894; Deb & Dutta in Red Data Book of Ind. Pl. 2 : 213. 1988. *Spermacoce hedyotideae* DC. Prodr. 4 : 455. 1830 (Type : Ind. Or. J. G. Koenig s. n. G. DC. Microfische!). *Oldenlandia fruticosa* (L.). K. Schum. in Engl. & Prantl. Pflanzenfam. 4(4) : 26. 1891; Gamble, Fl. Pres. Madras 597. 1921.

Shrubs or undershrubs, erect, branching, 15-30 cm; bark white, smooth, shining; stem obtusely angular to terete, grooved, glabrous. Leaves 2-12.5 × 2-3.5 cm, oblong-lanceolate to narrowly lanceolate, obtuse, acute or acuminate at apex, narrowed at base, dark green above, pale below, coriaceous, pellucid, glabrous; lateral nerves 6-12 pairs, very fine, oblique; petiole 1-10 cm long, winged; stipules 4-5 × 5-6 mm, triangular, acuminate, keeled, gland serrate at margin, often pubescent in the earlier stage. Inflorescence terminal and axillary peduncled corymbose cymes, 2.5 × 2-3 cm, branches whorled, glabrous or pubescent. Flowers sessile or subsessile, 8-10 mm long, heterostylous; bracts foliaceous, 1-3.5 × 0.3-1.5 cm, lanceolate; bracteoles 1-2 × 3 mm, fimbriate. Hypanthium ovoid, 1-1.5 mm long, minute to dense pubescent; calyx limb 0.8-1 mm long, lobes 4, 0.5-1.5 mm long, triangular, acute, recurved, often pubescent. Corolla white, sparsely pubescent outside; tube 2-3 mm long, densely pubescent inside near the throat; lobes 2-2.5 × 1-1.5 mm, oblong, acute, incurved at apex with spinous appendages outside, minute pubescent inside. Stamens 4, inserted or exserted; filaments 0.3-0.5 mm or 1.5-2 mm long, adnate to throat of corolla tube; anthers 0.7-1 mm long, linear. Ovary 1-1.5 mm long, ovules many; style 1-1.5 mm or 4-5 mm long, slender; stigma bilobed, 0.3-1 mm long, subglobose or linear, papillose. Capsule 2-3 × 2-2.5 mm, ribbed, glabrous or pubescent, top enclosed within calyx. Seeds angular or planoconvex, narrowly winged, 0.7-1 × 0.8-1 mm; exotesta reticulate, brownish.

*Fls.*: April August; *Frts.*: June November.

*Ecology*: Moist places up to 900 m in alt.

*Distrib.*: India: Tamil Nadu; Sri Lanka; Myanmar.

*Exsiccata studied*: INDIA: West Bengal, Serampore Garden (cultivated), *D. Brandis* 2271 (CAL & DD) Tamil Nadu: Peninsular Ind. or., *Wight s. n.* (CAL); Herb. Madras, *Wall. Cat.* 837 p. p. (CAL).

SRI LANKA: *Thwaites* C. P. 108 (CAL).

MYANMAR: Tavoy, *Rottler s. n. ex Wall. Cat.* 837A p. p. (CAL).

8. *H. barberi* (Gamble) Henry & Subramanyam in Proc. Ind. Acad. Sci. B. 76(2): 29. 1972; Henry et al. in Journ. Bomb. Nat. Hist. Soc. 75: 689. 1979; Deb & Dutta in Red Data Book of Ind. Pl. 2: 201. 1988. *Oldenlandia barberi* Gamble in Kew Bull. 1920: 68. 1920 & Fl. Pres. Madras 600. 1921 (*Type*: Agastiamalai Peaks, 1500-1800 m, 22.51901, *Barber* 2926 K-photo! : iso. CAL!) Calder & Narayanaswami in Rec. Bot. Surv. Ind. 11: 94. 1926.

Shrubs 1-2 m tall, branching dichotomously, crowded with leaves above; stem rough, glabrous, corrugated with stipular scars, turning black on drying. Leaves 1-2 × 0.6-1 cm, ovate, obtuse at apex, contracted at base to short petiole, pale brownish when dry, thickened at margin, entire or revolute, coriaceous, glabrous; midrib prominent, laterals obscure; petiole 0.2-0.5 mm flattened; stipules 2-4 × 3-4 mm, orbicular, sheathing at base, glandular at margin, white, scarious when dry. Inflorescence axillary (upper axils), sessile or subsessile cymes in fascicle, with 2

linear bracts at base. Flower 7-9 mm long; pedicel 0.5-1 mm long; bracts 1-2 mm long, linear. Hypanthium ovoid, 1-2 mm long, glabrous; calyx limb small, 0.3-0.5 mm long; lobes 4, lanceolate, 0.7-1 × 1 mm. Corolla pale white or tinged violet, fleshy; tube cylindrical, 3-4 mm long, throat dense pubescent; lobes 2-3 mm long, oblong, acute, minute pubescent inside. Stamens 4, exserted; filaments 1.5-2 mm long, adnate to throat; anthers linear, 0.5-1 mm long. Ovary 0.7-1 mm long, few ovules; style inserted, 3 mm long; stigma bilobed, 0.5-1 mm long, linear, densely papillose. Capsule 2.5-3.5 × 1-2 mm, ovoid, with prominent edges, glabrous. Seeds 8-10, 0.5-1 × 0.5-1 mm, planoconvex or angular, exotesta smooth, reticulate brownish.

*Fls. & Frts.* : May July.

*Distrib.* : INDIA : Tamil Nadu at an altitude of 1500 m.

*Exsiccata studied* : INDIA : Tamil Nadu : Tirunelveli dist., Agastiyamalai Peak, A. N. Henry & M. Chandrabose 191 (CAL).

9. *H. buxifolia* Bedd. in Trans. Linn. Soc. 25 : 218, 1865 (*Type* : Anamallays, *Beddome* 160 K. photo! ; iso. CAL!); Bedd. Icon. Pl. Ind. Or. t. 1. 1874; Hook. f. Fl. Brit. Ind. 3 : 52, 1880; Rama Rao, Fl. Pl. Travancore 204, 1914; Fischer in Rec. Bot. Surv. Ind. 9 : 91, 1921; Deb & Dutta in Red Data Book of Ind. Pl. 2 : 207, 1988. *Oldenlandia buxifolia* (Bedd.), O. Ktze. Rev. Gen. Pl. 1 : 292, 1891; Gamble, Fl. Pres. Madras 598, 1921.

Herbs or undershrubs, 15-30 cm long; stem obtusely angular or terete, articulated with scars of stipules and fallen leaves at short intervals, glabrous. Leaves 1-1.5 × 0.5-0.7 cm, ovate or elliptic, acute or obtuse at apex, contracted to a short petiole at base, revolute at margin, coriaceous, shining, glabrous, midrib prominent, laterals obscure; petiole 0.2-0.5 × 0.2 mm, short, flattened; stipules 2.5-3 × 3-4 mm, sheathing at base with short, stiff, 6-7 glabrous or ciliate bristles and a line of pubescence along the centre of stipules. Inflorescence terminal and axillary (upper axil), peduncled, 3-flowered cymes. Flowers sessile, 9-10 mm long, sparsely pubescent outside; bracts filiform, 1-2 mm long. Hypanthium ovoid, 1-1.5 mm long; Calyx limb 0.3-0.5 mm long; lobes 4, 1-1.5 mm long, lanceolate, acute. Corolla pale violet; tube 2-3 mm long, densely pubescent inside at throat; lobes 1.5-2.2 mm long, oblong, acute, incurved at apex, beaked, minutely pubescent inside. Stamens 4; filaments exserted, 1.5-2 mm long; adnate to throat; anthers 0.7-1 mm long, linear ovary 0.7-1 mm long; ovules many on submedian placenta; style 1-2 mm long, glabrous; stigma bilobed, 0.5-0.8 mm long, linear, papillose. Capsule 4-5 × 2-2.5 mm, ellipsoid or subglobose, glabrous, with fine striations, dehiscent septically, ultimately becoming quadripartite. Seeds many, small, 0.3-0.5 × 0.1-0.3 mm, angular, reticulate.

*Fls. & Frts.* : April June.

*Distrib.* : Tamil Nadu and Kerala on hill slopes at 2625 m in altitude.

*Exsiccata studied* : INDIA : Tamil Nadu, Anamalai, C. E. C. Fischer 3538 (CAL). Kerala, Travancore, Anaimudi Hills, H. L. Laraje s. n. (CAL) & B. V. Shetty 27357 (MH).

10. *H. uncinella* Hook. & Arn. Bot. Beech. Voy. 192. 1841 (Type : China, *Millet* s. n. K!); Walp. Rep. 2 : 493. 1843; Benth. Fl. Hongk. 149. 1861; Hook. f. Fl. Brit. Ind. 3 : 56. 1880; Kar & Panigrahi in Bull. Bot. Surv. Ind. 5 : 230. 1963; Balakrishnan, Fl. Jowai 1 : 244. 1981. *H. borrenoides* Champ. in Kew. Journ. Bot. 4 : 171. 1852 (Type : Hongkong, Chuckhow, *Champion* 105 K!). *H. uncinella* Hook. et Arn. var. *cephalophora* (R. Br.) Craib, Fl. Siam. Enum. 2 : 50. 1932. *H. cephalophora* R. Br. in Wall. Cat. 842. 1828, *nom. nud.* (Plate 18).

Herbs perennial, about 5 m in height, stem acutely angular to winged, grooved, glabrous or puberulous, pinkish when dry, ridges often black bordered. Leaves 3-9 x 2-2.5 cm, oblong, lanceolate or ovate-lanceolate, acute or acuminate at apex, narrowed at base to petiole, pale green when dry, coriaceous, punctate; glabrous or hispidulous; margin revolute, scabrid; nerves 3-5 pairs; petiole 0.3-4 mm long, usually winged, stipules 3-6 x 4-5 mm, short triangular, cuspidate, fringed with subulate teeth or glands or pectinate with 7-8 bristles, glabrous or hirsute. Inflorescence terminal or axillary, sessile or peduncled, dense flowered cymes in globose heads, 1-2 cm in diam. loose or compact, smooth or puberulous; peduncle 0.3-9 cm long, angular to winged, glabrous or puberulous. Flowers 7-8 mm long, heterostylous; pedicel 0.5-1 mm long, bracts 2-5 mm long, linear, ciliate at margin. Hypanthium ovoid, 1-1.5 mm long, nearly glabrous; calyx limb 0.3-0.5 mm long; lobes 4, 2.5-4 mm long, lanceolate, ciliate at margin. Corolla pale blue, pink; white or purplish white, minutely pubescent outside along the midvein of corolla lobes; tube 3-3.5 mm long, densely pubescent at throat inside, lobes 4, 1.5-2 mm long, oblong, acute, incurved, with spinous appendages outside. Stamens 4, inserted or exserted; filaments 0.5-5.0 mm long, adnate to throat of corolla; anther 1-1.5 mm long, linear-oblong. Ovary 1-1.5 mm long; ovules many; style inserted or exserted, 1-1.5 mm or 4-5.5 mm long, glabrous or pubescent above; stigma bilobed, 0.5-1 mm long, fleshy, papillose. Capsule 3-6 x 2-2.5 mm, globose or ovoid, didymous, ribbed, glabrous, with brownish recurved calyx lobes, sparse to dense ciliate along margin. Seeds about 30, 0.4-0.5 x 0.3-0.5 mm, subglobose to angular, planoconvex; exotesta pitted, chocolate.

*Fls.* : April - September; *Frts.* : August- December.

*Ecology* : In open grass land, shaded pine forest or open hill slopes, in rich soil, at alt. 1450 - 1500 m.

*Uses* : Decoction is used in fever.

*Local name* : *Sher-nit-along* in Khasia.

*Distrib.* : India : Meghalaya and Sikkim; China; Myanmar.

*Chromosome no.* :  $2n = 36$  was reported by H. S. U., C. C. 1968.

*Exsiccata studied* : INDIA : Meghalaya : Khasi, *Griffith* s. n. (K, CAL, DD), *G. Mann* 560 (CAL, DD) & 607 (CAL) & *C. B. Clarke* 19228 (CAL); Shillong, *C. B. Clarke* 38398 & 40515 (CAL), *U. N. Kanjilal* 436 & 2355 (ASSAM); *S. N. Bal* 625 (BSIS), *K. Biswas* 3761 (CAL), *N. L. Bor* 17956 (DD); & *H. Deka* 36909 (ASSAM); Dumpep, *S. Chowdhury* 25156 (CAL), *S. K. Kar* 25394 (CAL) & *H. Deka* 36909, *H.*

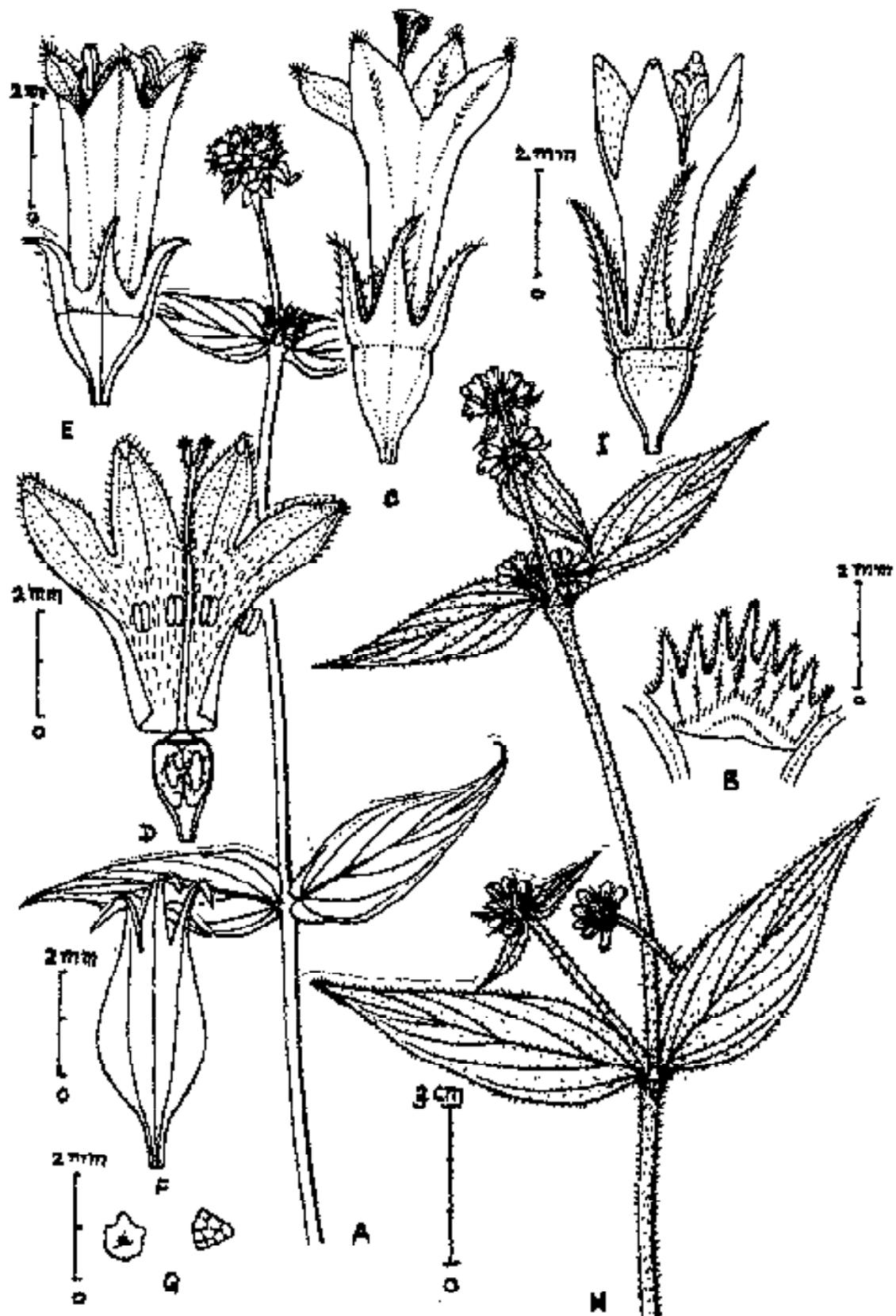


Plate 18. (A - D) *Hedyotis uncinella* Hook. & Arn. : A. habit; B. stipule; C. long styled flower; D. opened flower; E. short styled flower; F. capsule; G. seeds; H. habit (Burma); I. flower (Burma).

*Burkill* 34252 (CAL); Nongclow, *P. C. Kanjilal* 8192 (ASSAM); Jowai, *N. P. Balakrishnan* 42254 (ASSAM); Umulong, *N. P. Balakrishnan* 42991 (ASSAM); Nawput, *A. S. Rao* 38629 (CAL); Elephant falls, *P. K. Hazra* 25578 (CAL); Sikkim, *G. King s. n.* (CAL).

MYANMAR : Maymo hills, *Badal Khan* 171 (CAL), *J. H. Lace* 4303 (CAL) & *Mann Bule* 1599 (DD).

CHINA : *A. Henry* 12240A (CAL); Hongkong, *J. G. Champion s. n.* (CAL).

11. *H. travancorica* Bedd. Icon. Pl. Ind. Or. t. 7. 1874 (Type : Travancore, 1200 m, *Beddome* 96 K. photo!); Hook. f. Fl. Brit. Ind. 3 : 55. 1880; Rama Rao, Fl. Pl. Travancore 204. 1914; Henry *et al.* in Journ. Bomb. Nat. Hist. Soc. 75 : 689. 1979. *Oldenlandia travancorica* (Bedd.) O. Ktze. Rev. Gen. Pl. 1 : 293. 1891; Gamble, Fl. Pres. Madras 600. 1921. (Plate 19 a).

Herbs or small shrubs, branching dichotomously, 10-15 cm long, leafy above; stem acutely or obtusely angular, glabrous, pale white when dry. Leaves 1.5-3.5 × 0.7-1.7 cm, elliptic or ovate-lanceolate, acute or obtuse at apex, narrowed at base to short petiole, brownish black above, pale below sometimes revolute at margin, leathery, glabrous; lateral nerves obscure; raphides on both the surfaces; petiole 0.5-1 mm long; stipules 2-3 × 4-5 mm long, ovate, shortly pectinate, hoary. Inflorescence axillary, 2-4 flowers on 1.5-2 cm long slender pedicels. Flowers 6-10 mm long, heterostylous. Hypanthium ovoid, 1-1.5 mm long; calyx limb 0.3-0.5 mm long; lobes 4, 1-1.5 mm long, triangular-lanceolate, glabrous. Corolla funnel shaped, white; tube 3-3.5 mm long, broadening above, throat dense pubescent inside; lobes 4, 2-3 × 1.2 mm, oblong, acute, minutely pubescent inside. Stamens 4, inserted or exserted; filaments 0.3-0.5 mm or 1-2 mm long, adnate to sinus of corolla lobes; anthers oblong, 0.5-1.5 mm long. Ovary 1-1.2 mm long; ovules few; style 2-3 mm long, stout; stigma bilobed, 0.5-1 mm long, oblong, fleshy, papillose. Capsule globose or ellipsoid, 2.5-3 × 1-2 mm, finely ribbed, top raised above. Seeds 8-10, unequal, 0.7-1.8 × 0.7-1.2 mm, reticulate, black or brownish.

*Fls. & Frts.* : July August.

*Distrib.* : Tamil Nadu at 1175-1400 m in alt.

*Exsiccata studied* : INDIA : Tamil Nadu : Tirunelveli dist., Agastyanalai, *A. N. Henry* 17333 (CAL) & *A. N. Henry & M. Chandrase* 19175 (CAL).

12. *H. villosostipulata* (Gamble) Rao & Hemadri in Ind. For. 99 (6) : 379. 1973; Henry *et al.* in Journ. Bomb. Nat. Hist. Soc. 75 : 690. 1979; Henry & Swaminathan in Bull. Bot. Surv. Ind. 24 : 234. 1982. *Oldenlandia villosostipulata* Gamble in Kew Bull. 1919 : 405. 1919 & Fl. Pres. Madras 599. 1921 (Type : Travancore, Muthukulivayal, Oct. 1894, *T. F. Bourdillon* 338 K. photo! iso. MH!); Calder in Rec. Bot. Surv. Ind. 11 : 95. 1926. (Plate 20).

Undershrubs or herbs; branches dichotomous, 10-15 cm long; stem acutely angular, grooved, very often winged, yellowish green when dry, glabrous or sparsely villous. Leaves 3-7.5 × 1.5-2.5 cm, elliptic or elliptic-lanceolate, obtuse at apex, rounded at base, coriaceous, yellowish green above, pale below when dry,



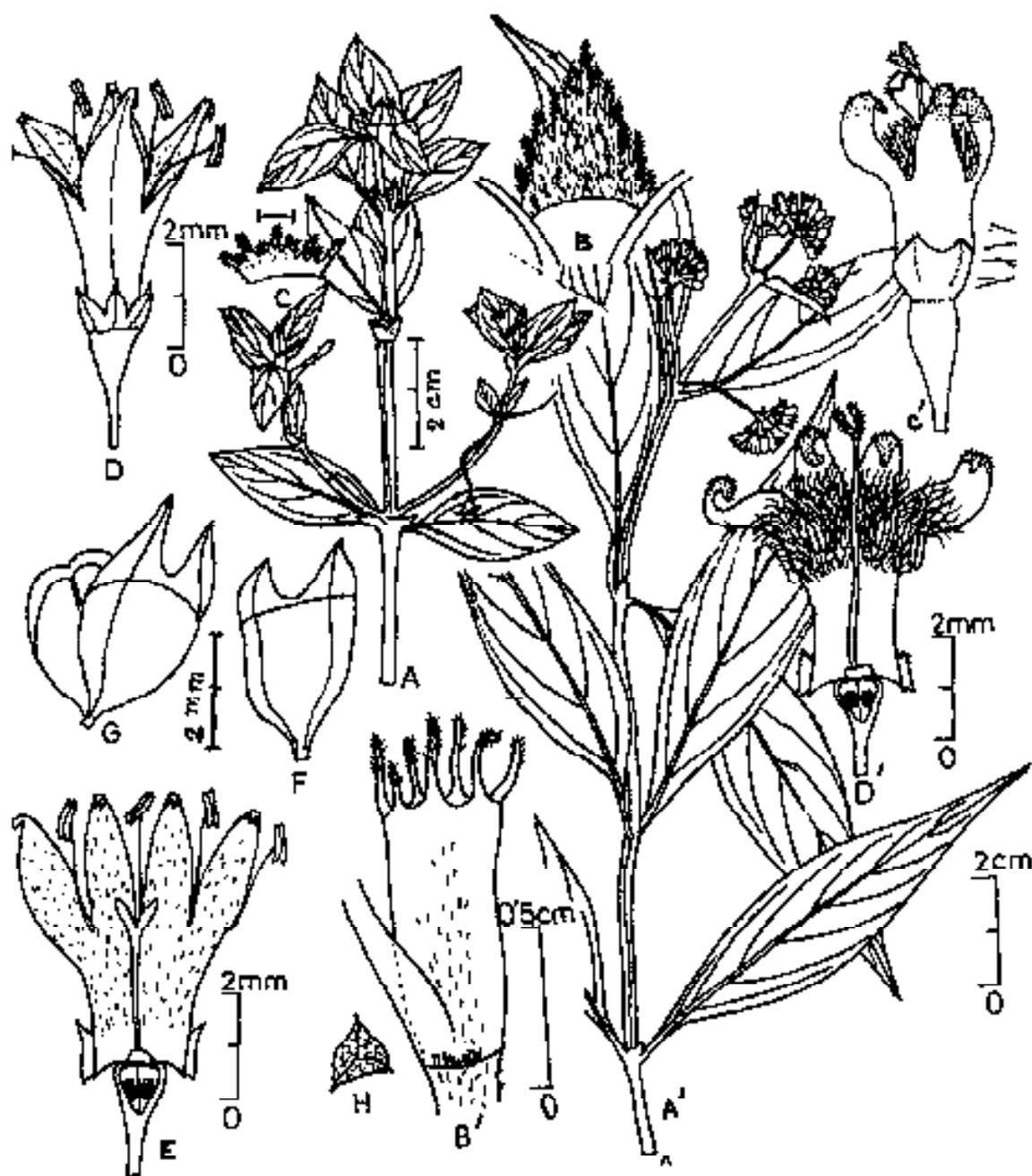


Plate 19a. (A - H) *Hedyotis travancorica* Bedd. : A. habit; B. stipule; C. bract; D. flower; E. opened flower; F. & G. capsule; H. seeds.

Plate 19b. (A' - D') *Hedyotis lessertiana* Arn. : A', habit; B', stipule; C', flower; D', opened flower.

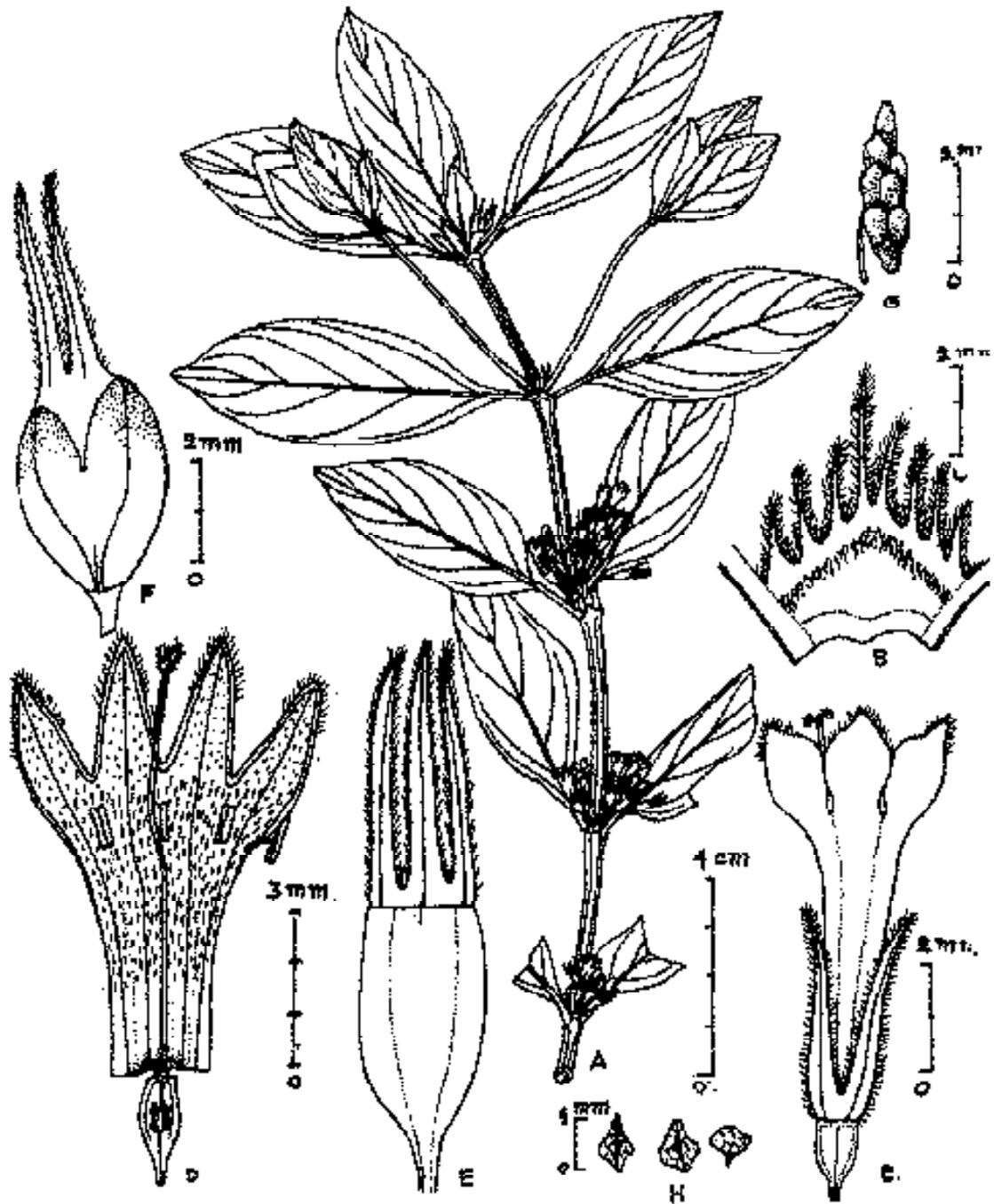


Plate 20. (A - H) *Hedyotis villosastipulata* (Gamble) Rolia Rao et Hemadri : A. habit; B. stipule; C. flower; D. opened flower; E. & F. capsule; G. dry placenta; H. seeds.

glabrous, flattened below; lateral nerves 3-5 pairs, subopposite, villous below; petiole 1-1.2 × 0.2-0.3 cm. winged, villous; stipules 2-3 × 5-7 mm, triangular, pinnatisect, villous. Inflorescence axillary, 10-20 flowers in fascicle on very short peduncle. Flowers 6-10 mm long, heterostylous; pedicel slender, 0.7-1 cm long. Hypanthium ovoid, 0.7-1 mm long, glabrous; calyx limb 0.3-0.5 mm long; lobes 4, 3-3.5 × 0.5-1.5 mm, lanceolate, acute, densely pilose along the margin. Corolla funnel shaped, light green or white; tube 3-4.5 mm long, pubescent at the throat inside; lobes 4, 2-2.5 mm long, oblong, acute, serrulate along the margin, minutely pubescent inside. Stamens 4, inserted or exserted; filaments 0.2-0.5 mm or 1-1.5 mm long, adnate to the throat; anthers 1-1.5 mm long, oblong-linear. Ovary 0.5-1 mm long; ovules many; style 2-3 mm or 6-7 mm long slender; stigma bilobed, 0.5-0.6 mm long, subglobose, fleshy, papillose. Capsule 3-4 × 1-2 mm, globose or ellipsoid, coriaceous, glabrous, with prominent ridges, top raised above, dehiscence septicidal. Seeds 30-40, 0.7-1 × 0.5-0.8 mm, angular, narrowly winged; exotesta reticulate, brownish.

*Fls.* : February - August; *Frts.* : March - October.

*Distrib.* : India : Kerala and Tamil Nadu at 1300 - 1400 m in alt.

*Exsiccata studied* : INDIA : Tamil Nadu : Tirunelveli, *Beddome s.n.* (MH); Naterikal, *D. Hooper & M.S. Ramaswami* 38535 (CAL); Kakachi, *K.M. Sebastine* 4503 (MH); Muthukughivajal, *A.N. Henry* 49653 (CAL); Kanya Kumari, *A.N. Henry* 53344 (CAL) & *A.N. Henry & M.S. Swaminathan* 53363 (CAL); Upper Kodayar, *A. N. Henry & M. S. Swaminathan* 68876 (CAL).

13. *H. swertioides* Hook. f. *Fl. Brit. Ind.* 3 : 51. 1880 [*Type* : Pulney Mountains, Sept. 1836, *Wight s.n.* K photo ! iso. (CAL) !]; Rama Rao, *Fl. Pl. Travancore* 204. 1914; Shetty & Vivekanant. in *Bull. Bot. Surv. Ind.* 13 : 32. 1971; Deb & Dutta in *Red Data Book* 2 : 217. 1988. *Oldenlandia swertioides* (Hook. f.) O. Ktze. *Rev. Gen. Pl.* 1 : 292. 1891; Gamble, *Fl. Pres. Madras* 598. 1921; Fischer in *Rec. Bot. Surv. Ind.* 9 : 91. 1921; Fyson, *Fl. S. Indian Hill Station* 1 : 273. t. 219. 1932.

Shrubs or undershrubs : branches 15-30 cm long, with stipular scar at short intervals; stem acutely angular grooved, stout, turning yellowish on drying, glabrous, minutely pubescent along the grooves near nodes. Leaves 2.5-7 × 1-2 cm, elliptic ovate, acute at apex, contracted to petiole at base, undulate at margin, yellowish when dry, coriaceous, glabrous; nerves 3-4 pairs ascending, rigid; petiole 2-3 × 1-2 mm, flattened, minutely pubescent; stipules 2-3 × 6-10 mm, free, elongating with pectinate teeth, subulate, glabrous, glandular, black at the tip. Inflorescence terminal and axillary (upper axis) paniculate cymes, 3-15 × 3-10 cm; branches trichotomous, or whorled; peduncle 1.5-2.5 cm long; densely pubescent all over. Flowers pedicelled, 7-8 mm long, heterostylous, pubescent; bracts foliaceous, 1-3 × 0.5-1 cm ovate, acute; bracteoles small, 1-2 mm long, linear. Calyx densely puberulous below. Hypanthium globose or ovoid, 1-1.2 mm long; calyx limb 0.2-0.3 mm long; lobes 4, lanceolate, acute, 1.5-2 mm long. Corolla pink or purple, hispid outside; tube cylindrical, 6-7 mm long, densely pubescent inside; lobes 4, oblong, acute, 2-3 mm long, minutely pubescent inside. Stamens 4, exserted or inserted;

filaments 0.2-0.3 mm or 1.5-2 mm long, adnate to throat of corolla; anthers 1-1.5 mm long, linear. Ovary 1-1.2 mm long, many ovuled; style 2-3 mm or 6-7 mm long, slender, glabrous; stigma bilobed, 0.5-1 mm long, subglobose or linear, papillose. Capsule 2-3 × 1-2 mm, globose, hispid. Seeds many, 0.5-1 × 0.3-0.5 mm, angular, winged; exotesta reticulate.

*Fls.* : June - October; *Frts.* : October - February.

*Distrib.* : India : Kerala and Tamil Nadu, on hill slopes at 1500 - 2000 m in alt.

*Exsiccata studied* : INDIA : Tamil Nadu : Kodaikanal, *Bourne* 3252 & 571 (CAL); *St. Munch* 3 (CAL) & *K.M. Sebastine* 24571 (CAL); Upper Pulney, *C.E.C. Fischer* 2857 (CAL), Madurai dist., Pamban forest, *A. Meebold* 13186 (CAL); Kerala, Kottayam, *B.V. Sherry* 26505 (CAL).

14. *H. lessertiana* Arn. Pugill. Pl. Ind. Or. 21 : 339. 1836 (*Type* : Sri Lanka 300 m, *Walker s.n.*); Walp. Rep. 2 : 492. 1843; Thwaites, Enum. 141. 1859; Hook. f. Fl. Brit. Ind. 3 : 52. 1880; Trimen, Handb. Fl. Ceylon 2 : 301. 1894, excl. var. *flavescens*. (Plate 19 b).

Shrubs stout, obtusely angular or terete, glabrous or slightly pubescent. Leaves 8-18 × 1.5-6 cm, lanceolate, elliptic-lanceolate or ovate-lanceolate, acuminate at apex, cuneate or obtuse at base, sometimes revolute at margin, membranous to coriaceous, subglabrous or pubescent on upper surface, particularly along the veins, nerves 3-7 pairs, channelled above, raised below; petiole 0.5 - 1.1 cm long, rarely 2 cm long (in var. *major*), slightly pubescent or glabrous; stipules connate, 1-3 × 0.7-1.2 cm, loose, sheathing, subglabrous or pubescent, with 10-12 bristles, 3-8 mm long, glabrous or pubescent, tips having a tuft of hairs. Inflorescence terminal, peduncled capitate or umbellate cymes, 2-7 × 4-7 cm, branches trichotomous, glabrous. Flowers subsessile or shortly pedicelled, 8-10 mm long, heterostylous; bracts or pedicel 1-1.5 mm long (4 mm in var. *pilosa*). Hypanthium ovoid, 1-2 mm long, glabrous or pubescent; tube 0.7 - 1.5 mm long. Calyx limbs triangular, lanceolate or linear-lanceolate or subulate, denticulate or hispid at margin, accessory calyx teeth present or absent. Corolla 6-8 mm long, tube 3-4 mm long; lobes 4, rarely 5, 3-4 mm long, lanceolate or oblong-lanceolate, acute swollen, beaked at apex, pubescent inside, pruinose outside. Stamens 4, inserted or exserted; filaments 0.5-1 mm or 2-3 mm long, attached to sinus; anthers 1-1.5 mm long, linear. Ovary 1-2 mm long, ovules few; style 1-2 mm or 6-7 mm long, slender, glabrous; stigma bilobed, 0.8-1 mm long, swollen, pubescent. Capsule 2-3 × 2-2.5 mm, ovoid or ellipsoid, top included within calyx limb. Seeds 8-12, flattened, compressed or triangular, winged, 0.8-1 × 0.6-0.8 mm, testa reticulate, black.

*Fls. & Frts.* : October - December.

*Distrib.* : Sri Lanka at 900-2100 m in altitude.

#### KEY TO THE VARIETIES

- |  |     |   |
|--|-----|---|
| 1a. Calyx lobes subulate, 1 mm long                            | ..  | 2 |
| 1b. Calyx lobes linear-lanceolate or lanceolate, 1.5-3 mm long | ... | 3 |

- 2a. Stipules slightly pubescent; flowers subsessile ... var. *lessertiana*  
 2b. Stipules densely pubescent; flower distinctly pedicelled ... var. *pilosa*  
 3a. Leaves elliptic-lanceolate; calyx-lobes lanceolate, 2 mm long ... var. *major*  
 3b. Leaves ovate or elliptic-lanceolate; calyx lobes triangular-lanceolate, 2-3 mm long ... var. *confertiflora*

14a. *H. lessertiana* Arn. var. *lessertiana*.

Leaves 10-12 × 1.5-2 cm, lanceolate, acuminate at apex, narrowed to petiole at base, membranous, glabrous; stipules about 2 cm long, slightly pubescent. Flowers subsessile in umbellate cymes. Calyx subulate, lobes 0.8-1 mm long, serrulate at margin. Capsules glabrous.

*Exsiccata studied* : SRI LANKA : *Thwaites* C.P. 99 (CAL).

14b. *H. lessertiana* Arn. var. *major* Thwaites, Enum. 141. 1859. (*Type* : Sri Lanka, *Thwaites* C.P. 96 CAL!).

Leaves petioled, 15-18 × 5-6 cm, elliptic-lanceolate, acute at apex, cuneate at base, coriaceous, glabrous; lateral nerves 7-8 pairs, rigid; petiole 2-3 cm long, dilated at base; stipules about 3 cm long, glabrous. Flowers subsessile. Calyx lobes lanceolate, 1.5-2 mm long, margin dentate. Capsule glabrous.

14c. *H. lessertiana* Arn. var. *confertiflora* Thwaites, Enum. 141. 1859. (*Type* : Sri Lanka, *Thwaites* C.P. 86, 126 CAL!).

Leaves petioled, 10-15 × 4-5 cm, ovate-lanceolate, acuminate at apex, narrowed at base, coriaceous, glabrous; lateral nerves 6-7 pairs, prominent below; petiole 1-1.5 cm long; stipules 2 cm long, glabrous. Flowers subsessile. Calyx lobes triangular-lanceolate, 2-3 mm long, dentate to hispid at margin. Capsule glabrous to pubescent.

14d. *H. lessertiana* Arn. var. *pilosa* Thwaites, Enum. 141. 1859. (*Type* : Sri Lanka, *Thwaites* C.P. 2819 CAL!).

Leaves shortly petioled, 8-10 × 1-2 cm, lanceolate, acuminate at apex, narrowed at base, membranous, pubescent below; lateral nerves 3-4 pairs, pubescent; petiole 0.5-1 cm long; stipules about 1 cm long, densely pubescent. Flowers pedicelled. Calyx subulate, lobes 0.7-1 mm long, margin serrulate. Capsule glabrous.

15. *H. ramarowii* (Gamble) Rao & Hemadri in Ind. For. 99 (6) : 378. 1973; Henry *et al.* in Journ. Bomb. Nat. Hist. Soc. 75 : 689. 1979; Deb & Dutta in Red Data Book Ind. Pl. 1 : 329, 1987. *Oldenlandia ramarowii* Gamble in Kew Bull. 1919 : 405. 1919 & Fl. Pres. Madras 599. 1921 (*Type* : Ponmudi, 9.2. 1914, *Rama Rao* 2373 K. photo 1); Calder & Narayanaswami in Rec. Bot. Surv. Ind. 11 : 95. 1926.

Undershrubs, branches soft, thick; stem obtusely angular, whitish, puberulous. Leaves 8-12 × 3-4 cm, lanceolate or elliptic-lanceolate, acuminate at apex, narrowed at base to petiole, pale green, membranous, puberulous, scabrid at margin; lateral nerves 8-10 pairs, prominent; petiole 1-2 cm long, winged at base, puberulous; stipules 2-3 × 3.5 mm, triangular, whitish, with 4-6 bristles, puberulous. Inflorescence axillary, subpeduncled, dense flowered, puberulous. Flowers 6-7 mm long, puberulous; pedicel 2-4 mm long; bracts linear, 1-2 mm long. Hypanthium 0.8-1 mm long; calyx limb 0.5-0.6 mm long; lobes 4, 1.5-2 × 0.5-1 mm, linear-lanceolate. Corolla cylindric, white, 4-5.5 mm long; tube 3-3.5 mm long, pubescent inside; lobes 4, 1.5-2 × 1.2-1.4 mm, ovate-lanceolate, hispid outside. Stamens 4, slightly exerted; filaments 1-1.5 mm long; anthers linear, 0.8-1 mm long. Ovary 0.5-0.8 mm long, 5-6 ovules on oblong placenta, style 2-2.5 mm long, slender, glabrous; stigma swollen, 0.5 mm long, bifid, pilose. Capsule 2-2.8 × 1.3-1.5 mm, ovoid or ellipsoid, 8-10 ribbed, glabrescent or puberulous, dehiscing septicidally, top angular, raised above calyx tube. Seeds 10-12, 0.8-1 × 0.6-0.8 mm, angular, narrowly winged, exotesta reticulate, brownish to black.

*Fls. & Frts.* : March April.

*Distrib.* : India : Tamil Nadu and Kerala in evergreen forest.

*Exsiccata studied* : INDIA : Tamil Nadu : Tirunelveli hill, Calcad, collector? (MH); Kerala : Chimunji, T. F. Bourdillion 1373 (CAL).

16. *H. albonervia* Bedd. Icon. Pl. Ind. Or. t. 3. 1874. (*Type* : Tirunelveli hills, April, 1868, *Beddome* 48 K-photo! selected as the lectotype; Travancore, 1200 m, May 1869, *Beddome* 84 K-photo!) : Rama Rao, Fl. Pl. Travancore 204. 1914. Deb & Dutta in Red Data Book Ind. Pl. 1 : 324. 1987. *Oldenlandia albonervia* (Bedd.) Gamble, Fl. Pres. Madras 599. 1921; Sebastine & Vivekanan. in Bull. Bot. Surv. Ind. 9 : 173. 1967.

Herbs woody at base; branches 7-8 cm long; stem obtusely angular to terete, pinkish when dry, glabrous. Leaves 9-11 × 2-2.5 cm, lanceolate, acuminate, narrowed to petiole at base, pale green when dry, submembranous, glabrous; nerves 5-6 pairs, oblique, very fine, distinct; petiole 1-1.5 cm long; stipules free, 2-3.5 × 7-10 mm long, ovate, deeply pectinate with long glabrous teeth, black glandular at tip. Inflorescence axillary cymes; peduncle 0.5-1 cm long. Flowers 5-6 mm long, heterostylous; pedicel 0.7-1 cm long, slender, glabrous. Hypanthium 1-1.5 mm. Calyx lobes 4, about double the hypanthium, lanceolate, 1.5-2 mm long, erect, glabrous. Corolla white; tube 1.5-2 mm long, densely pubescent at throat inside; lobes 4, 1.5-2 mm long, ovate, acute, recurved, minute pubescent inside. Stamens 4, inserted; filaments 0.3-0.5 mm long, at sinus of the corolla lobes; anthers 1-1.5 mm-long, oblong-linear. Style 2-7 mm long, exerted or not; stigma 0.5-0.7 mm long, bilobed, swollen, papillose. Capsule globose, 2-3 × 2-3 mm glabrous. Seeds few to many, angular; exotesta reticulate, brownish.

*Fls.* : March April; *Frts.* : May June.

*Distrib.* : Tamil Nadu and Kerala, on the floor of the forest at 200 m in alt.

*Exsiccata studied* : INDIA : Tamil Nadu : Tirunelveli dist., Agastyamalai peak, A. N. Henry 16365 (CAL).

17. *H. hirsutissima* Bedd. Madras. Journ. Lit. Scr. 3, 1 : 49. 1864 & Icon. Pl. Ind. Or. t. 2. 1874 (Type : Nilgiri, 2100 m, January 1868, *Beddome s. n.* K.-photo! selected as the lectotype; Nilgiri, Komdals, *Beddome* 3696 K-photo!); Hook. f. Fl. Brit. Ind. 3 : 55. 1880; Deb & Dutta in Red Data Book Ind. Pl. 1 : 327. 1987. *Oldenlandia hirsutissima* (Bedd.) O. Ktze, Rev. Gen. Pl. 1 : 293. 1891; Gamble, Fl. Pres. Madras 599. 1921; Fyson, Fl. S. Indian Hill Station. 1 : 274. 1932.

Shrubs or undershrubs, 5-15 cm long; branches leafy above and with scars of stipules and fallen leaves below; stem obtusely angular or terete, glabrous. Leaves sessile or shortly petioled, 1-5 × 0.8-2.5 cm, ovate or elliptic lanceolate, mucronate at apex, attenuate at base, coriaceous, densely yellowish hirsute on both surfaces; nerves 3-4 pairs, strong, raised below, hirsute; petiole stout, 1-2 mm long, hirsute; stipules sheathing at base, 1-2 × 2-4, deeply pectinate, hirsute. Inflorescence axillary, peduncled, panicle of few flowered corymbose cymes; branches slender, shorter than leaves, dense hirsute. Flowers 18-20 mm long, hirsute outside, bracteate; pedicel 1-2 mm long; bracts foliaceous, 1-4 × 0.8-2 mm, linear-lanceolate. Hypanthium 1.5-3 mm long; calyx limb 1-2 mm long; lobes 4, 2.5-3.5 mm long, lanceolate, acuminate; midnerve prominent. Corolla campanulate; tube 12-13 mm long, dense pubescent inside, lobes 4, ovate, acute, 5.5-6.5 mm, minute pubescent inside. Stamens 4, exserted; filaments 2-3.5 mm long, adnate at the throat; anthers 1-2 mm long, oblong-linear. Ovary 1-1.5 mm long; ovules many; style 8-9 mm long, slender; stigma bilobed, 0.5-1 mm long, fleshy, pilose. Capsule 2-3 × 2-2.5 mm, globose, top enclosed within calyx lobes, hirsute. Seeds 0.7-1 × 0.5-0.7 mm, angular, narrowly winged; exotesta reticulate, brownish.

*Fls.* : May-July; *Frts.* : August-November.

*Distrib.* : Tamil Nadu in hilly places.

*Exsiccata studied* : INDIA : Tamil Nadu : Nilgiri dist., Sispara, J. S. Gamble 13377 (DD, CAL) & 20598 (BSI).

18. *H. beddomei* Hook. f. Fl. Brit. Ind. 3 : 52. 1880; Rama Rao, Fl. Pl. Travancore 204. 1914; Henry *et al.* in Journ. Bomb. Nat. Hist. Soc. 75 : 689. 1979; Deb & Dutta in Red Data Book Ind. Pl. 1 : 325. 1987. *Oldenlandia capitata* Bedd. Icon. Pl. Ind. Or. t. 191. 1874, *non* Lamk. 1792 (Type : Palghat hills, 1800 m, March 1872, *Beddome* 255 K. - photo!, iso, CAL!). *O. beddomei* (Hook. f.) O. Ktze. Rev. Gen. Pl. 1 : 292. 1891; Gamble, Fl. Pres. Madras 598. 1921.

Shrubs 15-20 cm long, branching dichotomously; stem angular above, terete below, whitish on drying, glabrous or strigose above. Leaves sessile or subsessile, 0.7-4 × 0.6-2 cm, elliptic-ovate or elliptic-oblong, acute at apex, contracted to a short petiole at base, recurved at margin, coriaceous, scabrid; lateral nerves 6-9, channelled above, raised beneath; petiole 0.5-1 mm long, flattened; stipules connate, 2-3 × 4-5 mm, triangular, sharply toothed, villous in the centre. Inflorescence terminal and from upper axils, capitata cymes with 2-6 involucreal leaves, 0.8-1.5 × 1-1.5 cm, orbicular, ciliate at margin; peduncle 2-3 cm long, strigose. Flowers sessile,

7-8 mm long; bracts 1-1.5 × 1-1.5 mm, pectinate. Hypanthium ovoid, 1-2 mm long; calyx limb 0.7-1 mm long; lobes 4, ovate, acute hispid, 0.8-1 mm long. Corolla cylindrical, 4-5 mm long, strigose outside; tube 2-2.5 mm long, throat woolly inside; lobes 4, 2-2.5 mm long., oblong, acute, apex incurved. Stamens 4, inserted or exserted; filaments 0.3-0.5 mm long, adnate at throat of the corolla tube; anthers linear-oblong, 1-2 mm long. Ovary 1-2 mm long, ovules few; style 1-2 mm long, with spreading hairs; stigma bilobed, pilose. Capsule 4-5 × 1-2 mm, oblong or ellipsoid, hispid, dehiscing septicidally. Seeds 16 - 20, planoconvex or angular, 0.7-1 × 0.5-1 mm, narrowly winged, exotesta reticulate, brownish.

*Fls. & Frts.* : March - April.

*Distrib.* : India, Kerala in open grass land.

*Exsiccata studied* : Type sheet only.

19. *H. gamblei* Henry & Subraman. in Proc. Ind. Acad. Sc. B. 76(1) : 26, 1972. (*Type* : Tirunelveli, Man-Janamparani, Singampatti R. F, Henry 16368A holo. CAL!, iso. MH!); Henry *et al.* in Journ. Bomb. Nat. Hist. Soc. 75 : 689, 1979. (Plate 21).

Shrubs 2-3 m tall; stem obtusely angular, grooved, glabrous. Leaves 10-13.5 × 4.58 cm; ovate, elliptic-lanceolate or oblong-lanceolate, acuminate at apex, narrowed at base, coriaceous, glabrous; nerves 4-5 pairs, prominent below; petiole 2-3 cm long, glabrous; stipules free, ovate-triangular, cuspidate 3-4 × 4-5 mm, glandular or viscid black at margin. Inflorescence terminal and axillary, sessile or pedunculate capitate cymes with involucre bracts at the base; bracts 0.7-2.5 × 0.5-1 cm, lanceolate. Flowers 6-7 mm long, heterostylous; pedicel 0.5-0.8 mm long. Hypanthium subglobose, 0.5-1 mm long; calyx limb 0.2-0.3 mm long; lobes 4, 3-3.2 mm long. Corolla funnel shaped, 4-5 mm long, white; tube 3-4 mm long, minutely pubescent inside, throat densely pubescent; lobes 4, 2-2.5 × 0.7-1 mm, ovate-oblong, recurved. Stamens 4, exserted; filaments 1.5-2 mm long; anthers linear-oblong, 0.8-1 mm long. Ovary 0.5-1 mm long; ovules many on submedian placenta; style 3-4 mm long, inserted, filiform, glabrous; stigma 2 lobed, 0.5-1 mm long, linear, papillose. Capsule 2-3 × 3-3.5 mm, subglobose, crustaceous, glabrous, top raised above. Seeds few, angular, 0.8-1 × 0.8-1 mm exotesta pitted, black.

*Fls. & Frts.* : August-September.

*Distrib.* : India : Tamil Nadu.

*Exsiccata studied* : INDIA : Tamil Nadu : Kanyakumari, A.N. Henry 49647 (CAL); Upper Kodayar, A.N. Henry 68887 (CAL).

20. *H. griffithii* Hook. f. Fl. Brit. Ind. 3 : 58, 1880 (*Type* : Bhutan, Griffith *s. n.* K. photol, iso. : CAL!); Yamazaki in Hara, Fl. E. Himal. 1 : 125, 1971. *Oldenlandia griffithii* (Hook. f.) O. Ktze. Rev. Gen. Pl. 1 : 292, 1981. (Plate 22 a).

Shrubs or herbs with long, tapering, woody root-stock; branches about 60 cm long, with crowded leaves above; stem acutely angular, scabrid at ridges, black on



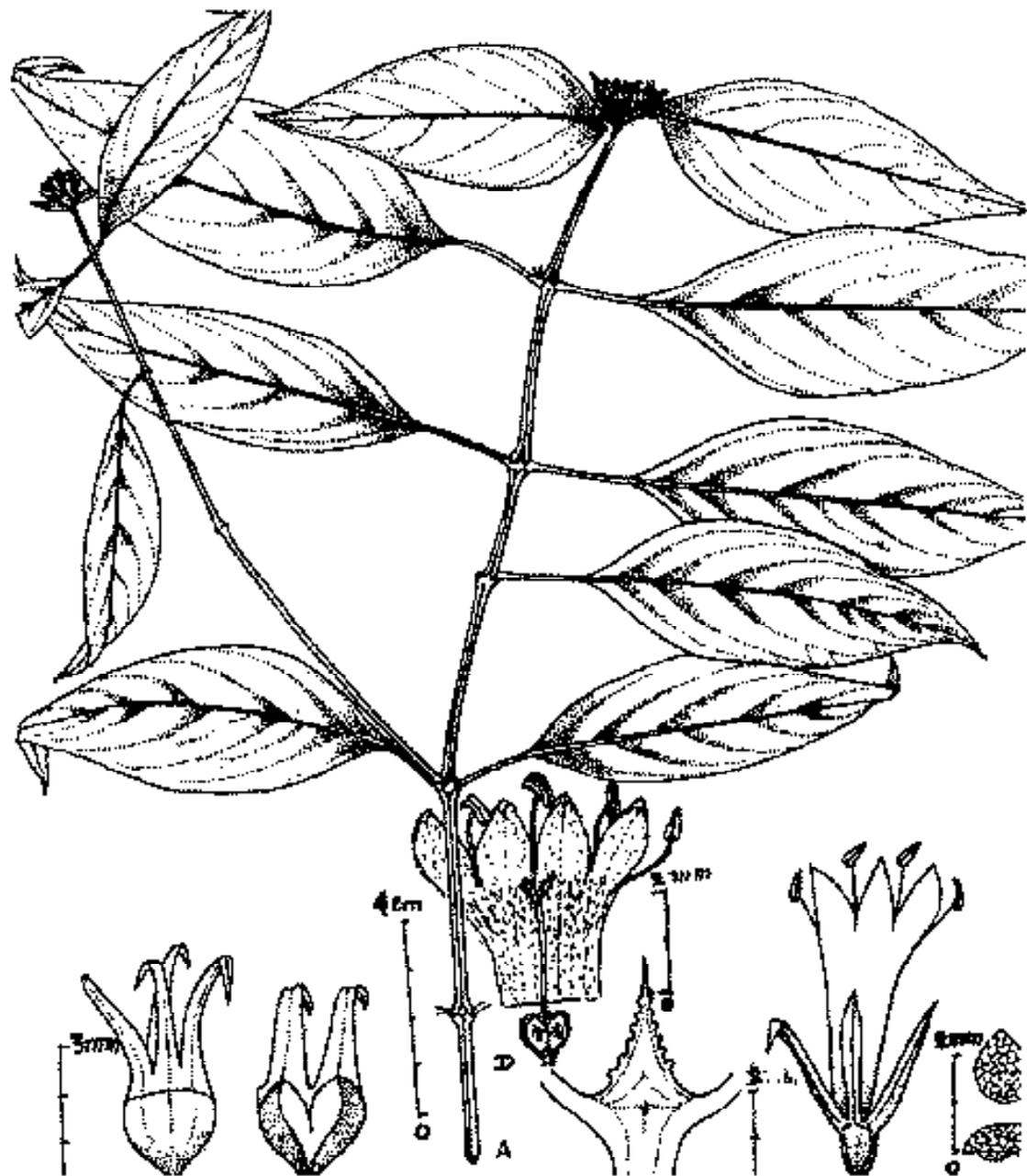


Plate 21. (A - G) *Hedyotis gambleri* Henry and Subram. : A. habit; B. stipule; C. flower; D. opened flower; E. & F. capsule; G. seeds.

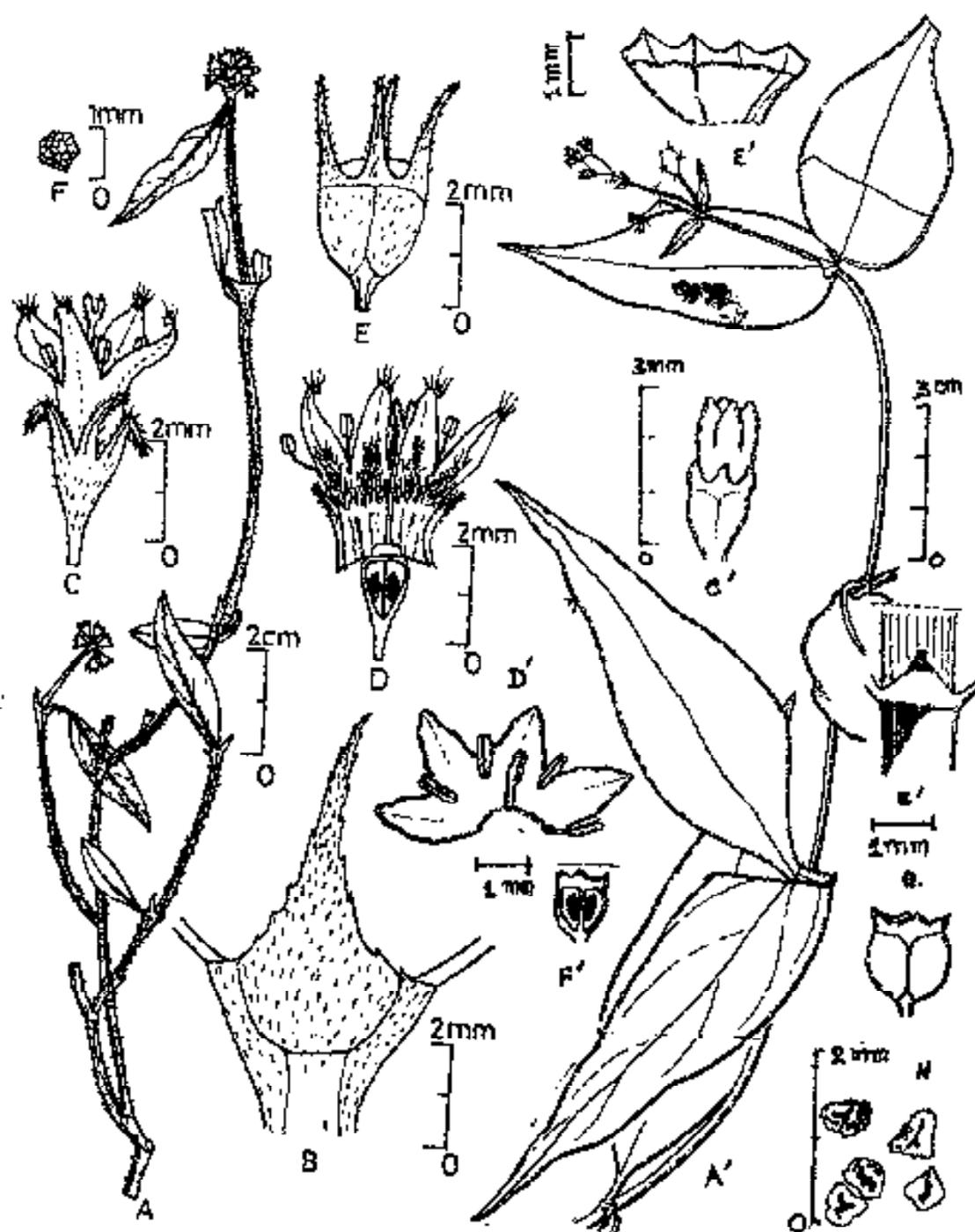


Plate 22a. (A - F) *Hedyotis griffithii* Hook. f. : A. habit; B. stipule; C. flower; D. opened flower; E. capsule; F. seeds.

Plate 22b. (A' - H') *Hedyotis acutangula* Champ. ex Benth. : A'. habit; B'. stipule; C'. flower; D'. opened corolla; E'. calyx lobe; F'. L. S. of ovary; G'. capsule; H'. seeds.

drying. Leaves 3-4 × 0.5-1 cm, lanceolate, narrowed at both ends, blackish when dry, scabrid above and along the nerves beneath; lateral nerves obscure; petiole 1-2 mm long; stipules free, 2-3 × 3-4 mm, triangular, with glandular margin and cuspidate tip. Inflorescence terminal, sessile, capitate cymes with 2-6 involucral bracts, 1-3 × 0.5-1 cm, lanceolate. Flowers pedicelled, 4-5 mm long, sparsely pubescent outside. Hypanthium ovoid, 0.8-1 mm long, scabrid; calyx limb 0.2-0.3 mm long; lobes 4, 1-2 mm long, linear-lanceolate, scabrid, accessory calyx teeth often present. Corolla tube 1.5-2 mm long; lobes 4, 1-2 mm long, oblong, acute, apex incurved with spinous appendages outside, throat and lobes dense pubescent inside. Stamens 4, exserted; filaments 1-1.5 mm long, adnate at the sinus of the corolla lobes; anthers globose or subglobose, 0.5-1 × 0.3-0.5 mm. Ovary 0.5-1 mm long, ovules many; style 3-3.5 mm long, exserted, slender, swollen above, pubescent; stigma bilobed, 0.2-0.3 mm long ellipsoid, papillose. Capsule 2-2.5 × 2-3 mm, subglobose or ellipsoid, crustaceous, scabrid, crown raised above. Seeds many, angular, 0.4-0.5 × 0.3-0.5 mm; exotesta reticulate, brownish.

*Fls. & Frts.* : April - September.

*Distrib.* : Bhutan at 1300 - 1800 m in alt.

*Exsiccata studied* : BHUTAN : Punokha, R.C. Cooper 2463 (E); Lhuntzi, Dzong, Kurucha, F. Ludlow, G. Sherriff & J.H. Hicks 20999 (E); Tama, D.B. Deb 328 (CAL).

21. *H. eualata* (Bedd. ex Gamble) Henry & Subram. in Proc. Ind. Acad. B. 76 (1) : 28, 1972; Deb & Dutta in Red Data Book Ind. Pl. 2 : 211, 1988. *Oldenlandia eualata* Bedd. ex Gamble in Kew Bull. 1919 : 404, 1919 & Fl. Pres. Madras 598, 1921 (Type : South Tirunelveli hills, 1200-1500 m, December 1880, *Beddome* 25 K ! selected as the lectotype; Nilgiris, Pykara Falls, 1500 m, 1884, M.A. Lawson s.n.).

Herbs or undershrubs, about 2 m, erect or branching, rooting at lower nodes; stem obtusely angular often with prominent wings at lower nodes, grooved, glabrous, white when dry. Leaves 3-17 × 1.5-5.6 cm, ovate, elliptic-lanceolate or oblong-lanceolate, acuminate at apex, attenuate at base, pale green or yellowish green, membranous, glossy below, glabrous; lateral nerves 8-10 pairs, faint; petiole 0-1.2 cm long, dilated at base; stipules 3.5-4 × 7-8 mm, triangular, often with 3-5 bristles, entire, fleshy, winged at base, glabrous. Inflorescence terminal or axillary, peduncled, slender, spreading, trichotomous or whorled, paniculate cymes, 5-14 × 3-10 cm often nodding, glabrous. Flowers 7-8 mm long; pedicel 1-2 mm long; bracts foliaceous, 0.2-3 × 0.2-2 cm, lanceolate or linear-lanceolate; bracteoles 1-2 mm long, linear. Hypanthium ovoid, 0.7-1 mm long; calyx limb about 0.1 mm long; lobes 4, 1-3 mm long, linear-lanceolate or ovate-lanceolate, minute white hairy along the margin. Corolla funnel shaped, white; tube 2-4 × 1-1.2 mm slender, pubescent at throat inside; lobes 1.5-2 mm × 0.5-0.8 mm, oblong, acute, incurved at apex, puberulous outside, pubescent inside. Stamens 4, inserted or exserted; filaments 0.2-0.3 mm or 1-2 mm long, adnate to sinus of corolla lobes; anthers 0.8-1 mm, linear. Ovary ovoid, 0.5-0.7 mm long; ovules many; style 3-3.5 mm or 7-8 mm long, inserted or exserted, slender; stigma bilobed, linear, fleshy, 0.8-1 mm, papillose. Capsule 2-2.5 × 2-2.5 mm, globose or subglobose,

depressed, glabrous. Seeds 8-20, angular or plano-convex, 0.8-1 × 0.5-0.8 mm, exotesta reticulate, brownish.

#### KEY TO THE VARIETIES

1a. Stipules with 3-5 bristles, glandular black at apex; calyx lobes linear-lanceolate  
... var. *eualata*

1b. Stipules without any bristle, entire exglandular; calyx lobes ovate-lanceolate  
... var. *agastyamalayana*

21a. *H. eualata* (Gamble) Henry & Subram. var. *eualata*.

Stipule 3.5-4 × 7-8 mm, pectinately elongating, with 3-5 bristles, fleshy, winged at base; bristles glabrous, black glandular at apex. Calyx lobes 4, linear-lanceolate, 1-3 × 0.5-1 mm. Corolla white, funnel shaped; tube 2-4 mm long, pubescent at throat inside; lobes 1.5-2 mm long.

*Fls. & Frts.* : April - December.

*Distrib.* : India : Tamil Nadu and Kerala at an alt. of 1400 m.

*Exsiccata studied* : INDIA : Tamil Nadu: Madras, *Beddome s.n.* (MH); Kanyakumari, dist., Muthukuzhi, *A.N. Henry 52470* (BLAT). Kerala : Travancore, *T. F. Bourdillon 791* (CAL).

21b. *H. eualata* (Gamble) Henry & Subram. var. *agastyamalayana* Henry & Subram. in Proc. Ind. Acad. B. 76(1) : 29.1972 (*Type* : Tamil Nadu, Agastyamalai dist., Tirunelveli, 30.6.1964, *Henry 19166 A*, CAL-holo!; iso. MH!).

Stipules 2-3.5 × 4-5 mm, triangular or triangular-ovate, fleshy, entire. Calyx lobes 4, ovate to ovate-lanceolate, acute, 1-2 × 0.5-1 mm. Corolla pinkish white or pale yellow, funnel shaped, throat densely pubescent inside.

*Fls. & Frts.* : June ?

*Distrib.* : Tamil Nadu.

*Exsiccata studied* : *Type specimens only.*

22. *H. acutangula* Champ. ex Benth. in Kew Journ. Bot. 4 : 171. 1852 (*Type* : Hongkong, *Champion s. n.*, K); Benth. Fl. Hongk. 148. 1861; Deb & Dutta in Taxon 34(2) : 297. 1985. *H. elegans* Wall. ex Kurz in Journ. Asiat. Soc. Beng. 2, 46 : 133. 1877. (*Type* : Penang, Tavoy, *W. Gomez s. n. ex Wall. Cat. 887* CAL!); Hook. f. Fl. Brit. Ind. 3 : 53. 1880. *H. helferi* Hook. f. Fl. Brit. Ind. 3 : 53. 1880 (*Type* : Andaman Islands, *Helfer s. n.*, K. photo!; iso. CAL!) (Plate 22 b).

Herbs woody at base, about 60 cm long, erect or decumbent; stem acutely angular to 4 winged, stout below the inflorescence, glabrous. Leaves sessile or subsessile to short petioled, 6-10 × 2.5-3.5 cm, ovate-lanceolate, acuminate, narrowed at base to the petiole, coriaceous, glabrous; margin rarely scabrid; rib prominent, lateral nerves obscure below; petiole up to 5 mm long; stipules 1-2 × 1-1.5 mm, triangular, acute, glandular at margin, often inwardly curved, winged. Inflorescence

terminal, panicle of cymes, 2-15 × 3-10 cm; branches slender, trichotomous or dichotomous; peduncle long, glabrous. Flowers sessile or short pedicelled, 4-5 mm long heterostylous; pedicel 0.7-1 mm long; bracts 2-3 mm long, linear. Hypanthium ovoid, 0.5-0.7 mm long, calyx limb nearly 0.5 mm long; lobes 4, 0.5-0.6 mm long, ovate, acute. Corolla 3.5-4 mm long; tube 1-1.5 mm long; lobes 2-2.5 mm long, oblong, acute, pubescent inside near the throat, apex incurved, pubescent. Stamens 4, inserted or exserted; filaments 1-1.5 mm long, adnate to throat; anthers 0.7-1 mm long, linear. Ovary 0.5-0.6 mm; style 0.5-3.5 mm long; stigma bilobed, 0.1-0.7 mm long, linear, papillose. Capsule 1-2 × 1-1.5 mm, globose or ellipsoid, shortly hemispheric above, narrowly winged, glabrous. Seeds few to many, 0.3-0.5 × 0.3-0.5 mm, angular, narrowly winged; exotesta reticulate, brownish.

*Fls.* : November - January; *Frts.* : March - April.

*Ecology* : In pine and bamboo forest and grasslands.

*Distrib.* : China and Myanmar.

*Note* : In describing *Hedyotis elegans* Wall. ex Hook. f. Fl. Brit. Ind. 3 : 53. 1880, J. D. Hooker noted, inter alia, that it is very near to the Chinese *H. acutangula* Champ. ex Benth. in Kew Journ. Bot. 4 : 17. 1852 except (1) acutely angular stem and sessile leaves. In course of our study we find that above two characters are very variable. For instance, stem acutely angular to winged, sometimes terete below in *R. E. Mac Gregor* 678 (E) and *J. Keenan, U. Tun Aung & R. H. Rub* 976 (E). Leaves also show variation, sessile to subsessile or base narrowed to petiole. Thus none of the distinguishing characters attributed to *H. elegans* is tenable. No other differences also could be discovered. Hence it is relegated to a synonym. Further *H. helferi* Hook. f. probably from Tenasserim is treated here as synonymous as it does not show any taxonomic difference. After Helfer's incomplete gathering no further collection is reported.

23. *H. nodulosa* Arn. Pugill. 22 : 1836 (*Type* : Sri Lanka, *Walker s. n. K*); Walp. Rep. 2 : 493. 1834; Hook. f. Fl. Brit. Ind. 3 : 54. 1880; Trimen, Handb. Fl. Ceylon 2 : 307. 1894. *H. nodulosa* Arn. var. *B* Thw. Enum. 143. 1859 (*Type* : Sri Lanka, *Thwaites C. P. 88 CAL!*). *H. nodulosa* Arn. var. *walkeri* Hook. f. Fl. Brit. Ind. 3 : 55. 1880. *H. walkeri* Arn. in Nov. Act. Acad. 18 : 339. 1836; Walp. Rep. 2 : 493. 1843. (Plate 23 a).

Herbs or undershrubs, stout below, slender above; stem obtusely angular or terete, hispid. Leaves 3-12.5 × 1.5-5 cm, ovate to elliptic-lanceolate, acute or acuminate, at apex, attenuate at base, brown to black above, pale below, submembranous, minutely serrulate at margin, hirsute; lateral nerves 5-9 pairs; pilose below; petiole 1-2 cm long, densely pilose; stipules connate, 3-4 × 2.4 mm, truncate above, with 2-4 bristles, membranous, pilose. Inflorescence axillary, subverticillate cymes of 30-50 flowers. Flowers sessile, 8-9 mm long, heterostylous. Hypanthium subglobose, 1-1.5 mm long; calyx limb 0.3-0.5 mm long; lobes 4, 1.5-2 mm long, oblong-linear, pilose, ciliate at margin. Corolla sparsely hairy outside, white or yellowish; tube 4-5 mm long, woolly at the throat; lobes 3-4 × 1-1.2 mm,

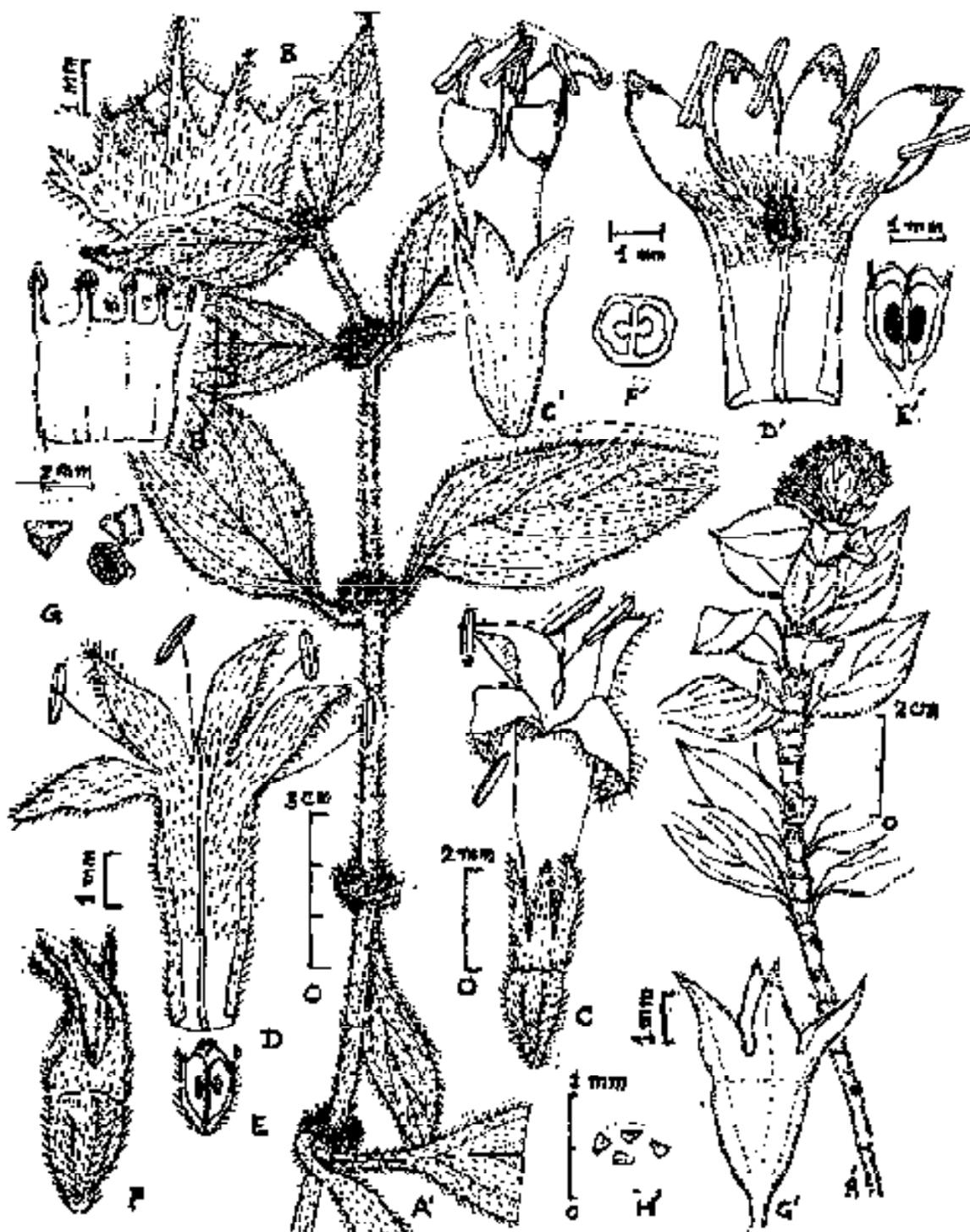


Plate 23a. (A - G) *Hedyotis nodulosa* Arn. : A. habit; B. stipule; C. flower; D. opened flower; E. L. S. of ovary; F. capsule; G. seeds.

Plate 23b. (A' - H') *Hedyotis flavescens* Thw. : A'. habit; B'. stipule; C. flower; D'. opened corolla; E. & F. L. S. and T. S. of ovary; G'. capsule; H. seeds.

ovate, acute, recurved, inner surface glabrous or minutely pubescent. Stamens 4, inserted or exserted; filaments 1-2 mm or 3-4 mm long; anthers 1-1.5 mm, linear. Ovary 0.7-1 mm long; ovules many on oblong placenta; style 3-5 or 9-10 mm long, inserted or exserted, slender; stigma bilobed, 1-1.3 mm long, papillose. Capsule 2-2.3 × 1.5-1.8 mm, oblong, turbinate, with conical top, hirsute, splitting longitudinally. Seeds 16-25, triangular, 0.5-0.7 × 0.4-0.6 mm, winged, exotesta reticulate, purple.

*Fls.* : April - September; *Frts.* : October - December.

*Distrib.* : Sri Lanka at 900-2100 m in alt.

*Exsiccata studied* : SRI LANKA : *Thwaites* C. P. 88 & 3542 (CAL).

24. *H. flavescens* Thw. Enum. 141 & 149. 1859 (*Type* : Sri Lanka, Adam's Peak, 1500-2100 m, *Thwaites* 126. CAL!); Hook. f. Fl. Brit. Ind. 3 : 52. 1880, in syn. (Plate 23 b).

Shrubs or undershrubs, 15-16 cm long, stout; stem terete, obtusely angular near nodes, whitish, glabrous. Leaves 2-3 × 2-2.2 cm, ovate or ovate-lanceolate, acute at apex, obtuse at base, thin at margin, densely ciliate, coriaceous, glabrous, midrib prominent below, lateral nerves obscure; petiole 2-5 mm long, flattened, glabrous; stipules 8-10 mm long, connate, with 10-12 bristles, glabrous except tips of bristles. Inflorescence terminal subcapitate cymes. Flowers sessile, 6-8 mm long, heterostylous; bracts foliaceous, 0.8-1 × 0.5 cm, lanceolate or linear-lanceolate. Hypanthium ovoid, 1.5-2 mm long; calyx limb 0.8-1 mm long; lobes 4, 0.8-1 × 1-1.5 mm ovate-lanceolate, acute, serrulate at margin, glabrous. Corolla 6-7.5 mm long; tube 3-5 mm long, dense pubescent at throat; lobes 3-4.5 mm long, oblong to lanceolate, incurved and beaked at apex, outer surface pruinose. Stamens 4, exserted; filaments 1.5-2 mm long, adnate at the sinus or throat of the corolla tube; anthers 0.8-0.9 mm or 1-1.5 mm long, linear-oblong or linear. Ovary 1-2 mm long; ovules many; style 2-3 mm or 5-6 mm long, slender, glabrous; stigma bilobed, 0.8-1.5 mm long, linear; slightly swollen, papillose. Capsule (immature) oblong, 4-5 mm long with lanceolate calyx lobes. Seeds 8-15 mm, exotesta reticulate, purple.

*Fls.* : October ?

*Distrib.* : Sri Lanka at about 1800 m in altitude.

*Note* : After *Thwaites*, no collection has yet been made. Hook. f. (*l.c.*) placed it under *H. lessertiana* Arn. but the present observation reveals that it is distinct, deserving restoration to its original specific status.

*Exsiccata studied* : Type specimen only.

25. *H. quinquecervia* Thw. Enum. 141. 1859 (*Type* : Sri Lanka, Central Province, 2100-2400 m, *Thwaites* C. P. 120. CAL!); Bedd. Icon. Pl. Ind. Or. t. 8. 1874; Hook. f. Fl. Brit. Ind. 3:52. 1880; Trimen, Handb. Fl. Ceylon 2 : 310. 1894, (Plate 24).

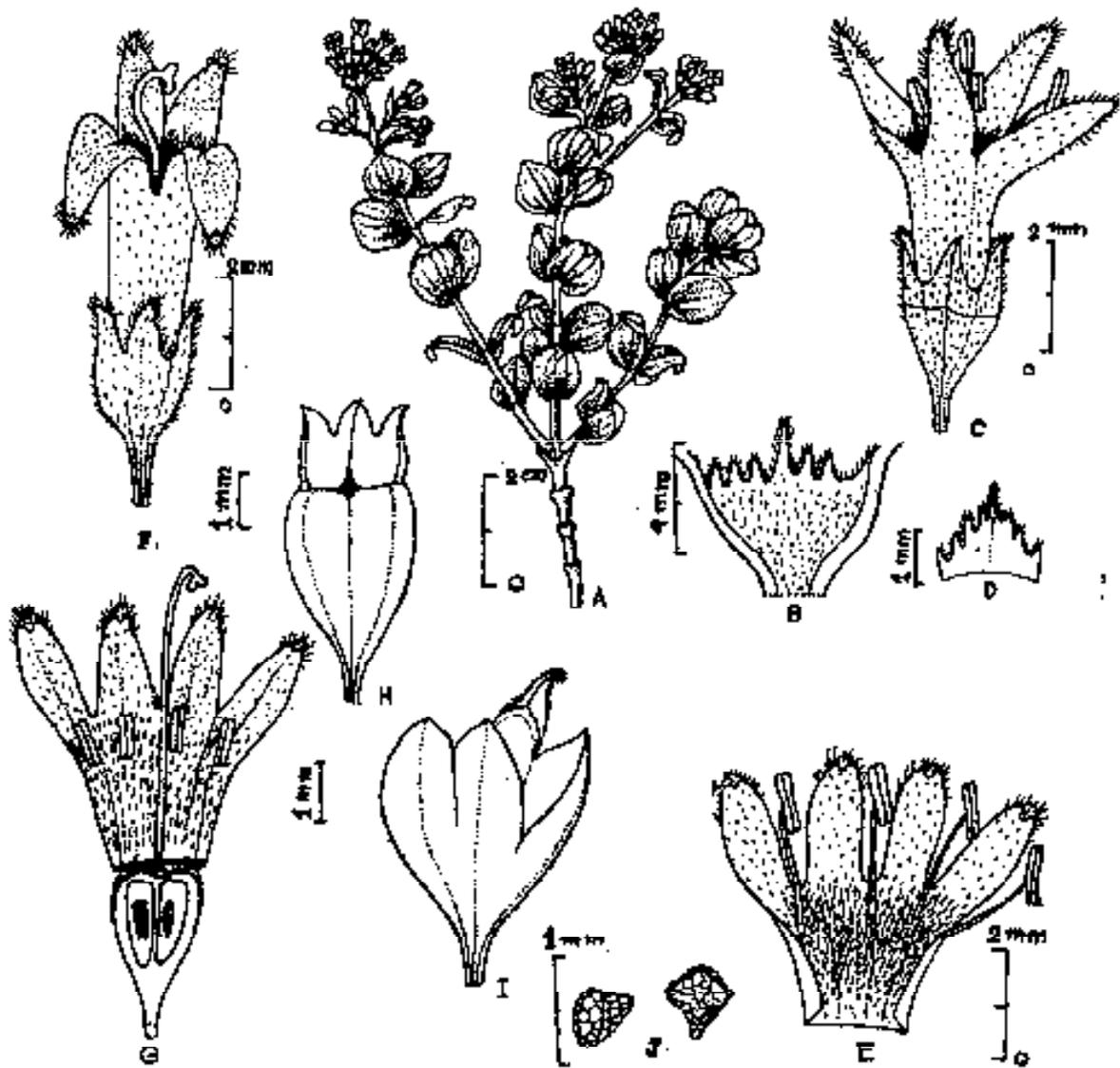


Plate 24. (A - J) *Hedyotis quinquerivis* Thw. : A. habit; B. stipule; C. short-styled flower; D. bract; E. opened corolla; F. long-styled flower; G. opened flower; H. & I. capsule; J. seeds.



Shrubs 10-17 cm long, branching dichotomously; stem angular, compressed, whitish, glabrous, pubescent along the ridges. Leaves sessile, 1-2 × 0.8-1 cm, orbicular or ovate-orbicular, abruptly contracted at base, revolute at margin, coriaceous, glabrous, 5-nerved, yellowish when dry; nerves deeply channelled above, rigid below; stipules 1-1.5 × 2-3 mm, cupuliform with filiform 4-5 teeth, pilose below, ciliate along margin. Inflorescence terminal subcapitate cymes, 1-2 × 2 cm; peduncle 0.8-1 cm long, glabrous. Flowers sessile, 6-7 mm long, heterostylous; bracts 0.1-0.2 × 0.1 mm, ovate, pectinate, ciliate. Hypanthium ovoid, 1-1.2 mm long; calyx limb 0.5-1 mm long; lobes 4, 0.5-1 × 0.5-1 mm, ovate-lanceolate, ciliate along margin, veins prominent. Corolla cylindric, white or purple, sparsely pubescent outside; tube 2.5-3 mm long; lobes oblong, acute, 2-3 mm long, incurved at apex, with spinous appendages outside, pubescent inside, throat densely pubescent inside. Stamens 4, inserted or exserted; filaments 0.3-0.5 mm or 1.5-2 mm long, adnate to throat of corolla tube; anthers 1-2 mm long, oblong-linear. Ovary 0.8-1 mm long, ovules few on subbasal placenta; style 1-2 mm or 4-5 mm long; stigma bilobed, 0.2-0.5 mm long. Capsule 2-3 × 1.5-2 mm, ellipsoid, glabrous. Seeds 10-12, 0.8-1 × 0.5-1 mm, plano convex or angular; testa smooth, reticulate, brownish.

*Fls. & Frts.* : April July.

*Distrib.* : Sri Lanka on upper montane zone.

*Exsiccata studied* : SRI LANKA : Pasaw Talle Gulla, *M. M. Bakstt* 1508 (CAL).

26. *H. leschenaultiana* DC. Prodr. 4 : 422. 1830, excl. var. B (*Type* : Nilgiri, *Leschenault s.n.* G. DC. Microfische !); Deb & Dutta in *Taxon* 34 (2) : 296. 1985. *H. stylosa* R.Br. ex Wt. & Arn. Prodr. 407. 1834. (*Type* : Nilgiri, *E. Noton s.n.* ex Wall. Cat. 853. K-W. photo !); Hook. f. Fl. Brit. Ind. 3 : 51. 1880; Rama Rao, Fl. Pl. Travancore 204. 1914; Shetty & Vivekananthan in Bull. Bot. Surv. Ind. 13 : 32. 1971. *Oldenlandia stylosa* (Wt. & Arn.) O. Ktze. Rev. Gen. Pl. 1 : 293. 1891; Gamble, Fl. Pres. Madras 598. 1921; Fyson, Fl. S. Ind. Hill stations. *H. sisaparensis* Gage in Journ. Asiat. Soc. Beng. 2, 1 : 244. 1905 (*Type* : Sispara, Gamble, 13381. K. lectotype photo !, iso. CAL !). *O. anamalayana* Gamble, Kew Bull. 1920; 67. 1920. (*Type* : Anamalai Hills, *Beddome s.n.* K-photo !); Calder in Rec. Bot. Surv. Ind. 11 : 64. 1926. *H. anamalayana* (Gamble) Rao et Hemadri in Ind. For. 99 : 378. 1973; Henry *et al.* in Journ. Bomb. Nat. Hist. Soc. 75 : 689. 1970. (Plate 25 a).

Herbs or undershrubs up to 3 m, branching dichotomously, leafy above, with stipular scars below, usually yellowish green when dry, rarely whitish. Leaves 2.5-11 × 1.5-2.9 cm, ovate, elliptic-ovate or lanceolate, acute or acuminate at apex, cuneate at base, sometimes revolute, subcoriaceous or coriaceous, glabrous above, mostly pubescent along midrib below; lateral nerves 4-7 pairs, oblique; often deeply sunk on upper surface and raised on lower; petiole 3-10 mm long, glabrous or pubescent; stipules 2-4 × 4-9 mm, triangular, pectinate with 7-11 bristles, filiform, pubescent or villous. Inflorescence terminal or axillary peduncled panicle of cymes, 2-10 × 2-6 cm branches usually trichotomous, glabrous. Flowers 7-11 cm long, heterostylous; pedicel 1-2 mm long; bracts foliaceous, 0.5-1 × 0.2-

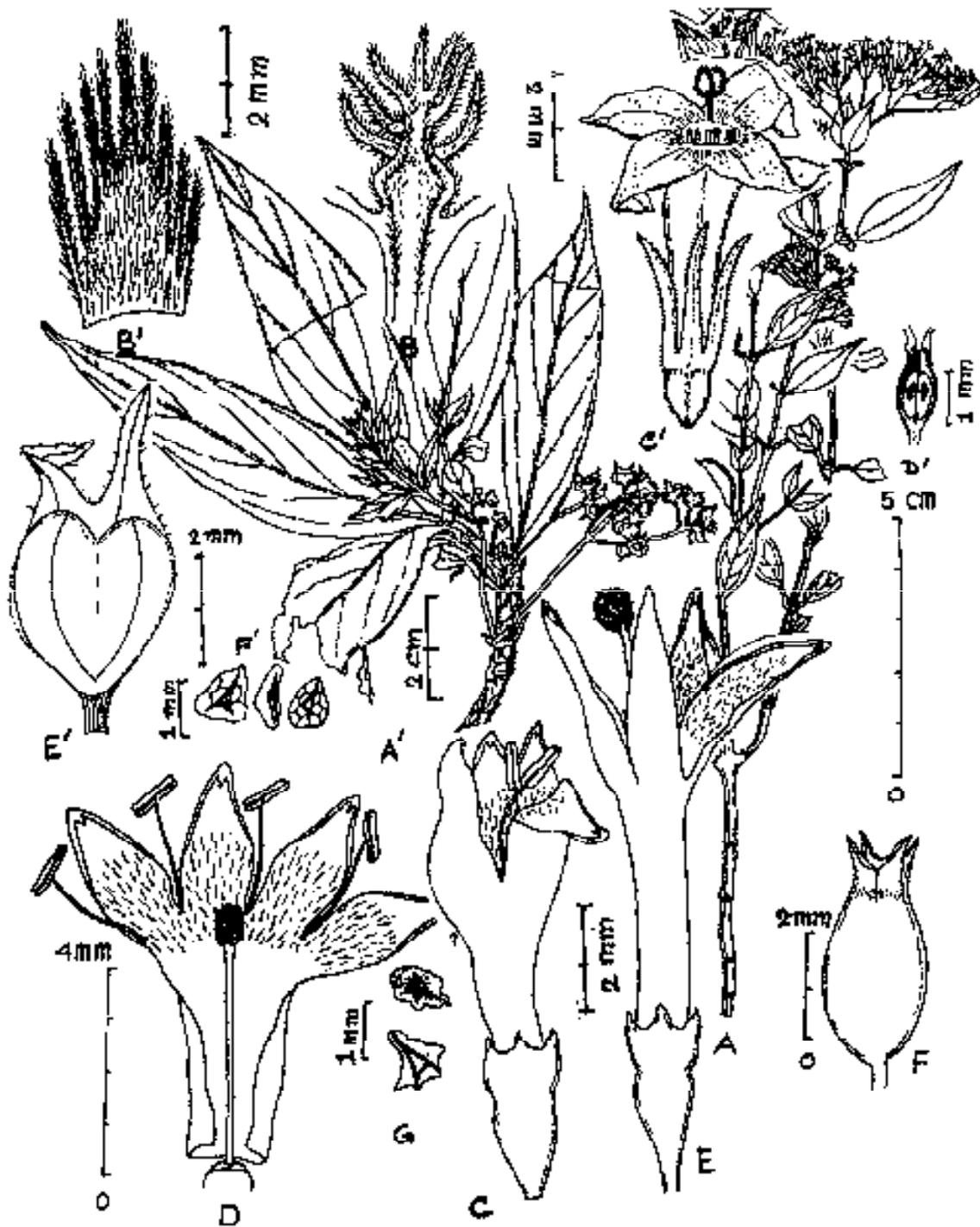


Plate 25a. (A- J) *Hedyotis leschenaultiana* DC. : A. habit; B. stipule; C. short-styled flower; D. opened flower; E. long-styled flower; F. opened flower; G. capsule; I. seeds.

25b. (A - E') *Hedyotis leschenaultiana* DC. var. *wynadensis* (Gamble) Deb & Dutta : A'. habit; B'. stipule; C. flower; D'. ovary; E'. capsule.

0.8 cm long; bracteoles 1-2 mm long, linear, glabrous, Hypanthium globose to ovoid, 0.8-1 mm long; calyx limb 0.3-1.2 mm long, lobes 4, 0.7-1 mm long, triangular, triangular-lanceolate or linear-lanceolate, acute, glabrous or sparsely pubescent along margin. Corolla white, pinkish white, purple, blue or violet, sweet scented; tube 3-5 mm, narrow, often broader above; lobes 1.5-4 mm long, lanceolate to oblong-lanceolate, minute puberulous above, inner surface shortly or densely pubescent below, swollen, incurved at apex, Stamens 4, exerted or inserted; filaments 0.3-0.5 mm or 2-2.5 mm long, adnate to sinus of corolla lobes or throat; anthers 1-1.5 mm long, linear. Ovary 0.8-1 mm long, ovules many; style 3-4 or 8-9 mm long, slender, glabrous; stigma bilobed, 0.8-1 mm long, swollen, papillose. Capsule globose or ellipsoid, 2-4 × 1.5-2 mm long, glabrous, crustaceous, with subulate or lanceolate calyx teeth. Seeds 8-12, 0.8-1 × 0.5-0.8 mm, angular, narrowly winged, often flattened, exotesta reticulate, brownish.

## KEY TO THE VARIETIES

- 1a. Bristles pubescent; calyx-lobes triangular ... var. *leschenaultiana*  
 1b. Bristles villous; calyx-lobes linear-lanceolate ... var. *wynaadensis*

26a. *H. leschenaultiana* DC. var. *leschenaultiana*.

Leaves 2.5-11 × 1-2.5 cm, lanceolate to elliptic - lanceolate, acuminate at apex, cuneate at base; petiole 0.3-10 mm long; stipules 4-7 mm long, with 7-11 filiform bristles, pubescent. Inflorescence terminal and axillary paniculate cymes; branches trichotomous. Flowers 8-11 mm long pedicelled, white, purple or pinkish with bluish tinge. Hypanthium 0.8-1 mm long; calyx limb 0.5-1 mm long; lobes 4, 0.7-1 mm long, triangular, acute. Corolla cylindrical, 7-9 mm long; tube 4-5 mm long; lobes 3-4 mm long, lanceolate to oblong-lanceolate, glabrous above, sparse to dense pubescent beneath, swollen, incurved at apex. Stamens 4, inserted or exerted; filaments 0.3-0.5 mm or 2-2.5 mm long adnate at the sinus of the corolla lobes; anthers 1-1.5 mm long, linear. Capsule 2-4 × 2-2.5 mm, globose or ellipsoid, glabrous.

*Fls. & Frts.* : September July.

*Ecology* : Along the margin of shola; common.

*Distrib.* : India, Tamil Nadu at outskirts of the evergreen forest at 1890-2250 m in alt.

*Exsiccata studied* : INDIA : Tamil Nadu : Nilgiri, *Wall. Cat.* 853B (CAL) & *Schmidt s. n.* (CAL); *Wight s. n.* (Kew distrib. no. 1354) (CAL) & 1356 (CAL); *C. B. Clarke* 10518 C (CAL), *A. Meebold* 11800 (CAL), *C. E. C. Fischer* 258 (CAL), *G. King s. n.* (CAL), *J. S. Gamble* 11627 (CAL, DD), *G. Bidie s. n.* (MH), *C. Mc. Cann* 50187 (BLAT), *S. K. Jain & R. C. Bharadwaja* 22711 (DD), *K. M. Vaid* 23546 (DD), *Sethi & Nagi* 26107 (DD); Coonoor, *C. B. Clarke* 10510 D & 10510 E (CAL), *D. Prain s. n.* (CAL), *K. M. Sebastine* 2052 (MH); *J. S. Gamble* 11294 (CAL & DD), Pykara, *G. King s. n.* (CAL) & 1184 G (CAL), *A. Meebold*

11649 (CAL), Sispara, *J. S. Gamble* 13379 (CAL); Dodabetta, *M. A. Lawson s. n.* (CAL) & *J. S. Gamble* 16148 (BSI); Kotagiri, *R. D. A.* 321 (MH); Shembaganur, *A. Sauliere* 47 (CAL); Bikkapattimund, *C. E. C. Fischer* 4606 (CAL); Staircase shola, *N. L. Bor* 5310(DD); Ketagiri Aravenue, *K. Subramanyam* 1902 (MH); Kodaikanal, Pillar rocks, *K. Subramanyam* 5535 (MH) & *D. B. Deb* 30840 (MH); Palni hills, *C. Saldanha* 5195 (BLAT); Gundar shola, *K. Subramaniam* 2679 (DD); Madurai Dist, Kotagiri, *D. B. Deb* 31515 (MH); Dodabetta, *D. B. Deb* 31592 (MH) & *B. D. Sharma* 35976 (MH); Archpooza, Upper Bhavani, *B. V. Shetty* 34023 (MH); Nilgiris, Nanjanand, *J. L. Ellis* 34516 (MH); Kodanad, *E. Vajravelu* 34917 (MH); Dodabetta *R. F., Aeradamattam. E. Vajravelu* 36899 (MH).

26b. *H. leschenaultiana* DC. var. *wynaadensis* (Gamble) Deb & Dutta in *Taxon* 34(2) : 296.1985. *Oldenlandia wynaadensis* Gamble in *Kew Bull.* 1919 : 405. 1919 (*Type* : Western Ghats, Chembra Peak forest, 1315-1800 m, *Beddome s. n.* K-photo!, iso. CAL!). *H. wynaadensis* (Gamble) Rao & Hemadri in *Ind. For.* 99 : 378. 1973; *Henry et al.* in *Journ. Bomb. Nat. Hist. Soc.* 75 : 690. 1979. (Plate 25 b).

Leaves 5-9.5 × 1-2.5 cm, lanceolate, acuminate at apex, cuneate at base; petiole 0.6-1 cm; stipules triangular, 2-2.5 × 5-6 mm pinnatisect, villous. Inflorescence axillary (upper axil) panicle of cymes; peduncle slender, 2.5-3 cm long, branches trichotomous, glabrous. Flowers pedicelled, 7-8 mm long. Hypanthium 1-1.5 mm long; calyx limb 0.3-0.5 mm long; lobes 4, 1.5-2 mm long, lanceolate. Corolla cylindrical, 5-6 mm long; tube 3-4 mm long; lobes 1.5-2 mm long, lanceolate, swollen, incurved at apex. Stamens 4, exserted; filaments 0.8-1 mm long, adnate at the throat of the corolla. Capsule 2-2.5 × 2-2.5 mm, globose, glabrous.

*Exsiccata studied* : Type sheets only.

27. *H. devicolamensis* Deb & Dutta in *Journ. Bomb. Nat. Hist. Soc.* 82(3) : 619 f. 1. 1986. (*Type* : Kerala State, Kottayam District, Devicolam, 11.9.1968. *D. B. Deb* 30480 CAL. holo! *D. B. Deb* 30481 CAL; Umaiya Malai, 2025 m, Devicolam, 17.4.1966, *B. V. Shetty* 27311 CAL; Rajumallai, 1950 m, 2. 2. 1970, *B. V. Shetty* 31783 CAL).

Shrubs or undershrubs, 1-2 m in height, branching above; stem obtusely angular, often with prominent ridges, grooved, compressed above, glabrous. Leaves 2.2-11 × 0.9-3.5 cm, ovate or elliptic-lanceolate, obtuse, acute or acuminate at apex, attenuate at base, sometimes revolute at margin, coriaceous, pale green or yellowish when dry, glabrous except pubescence along margin in young leaves; lateral nerves 5-7 pairs, oblique, usually strong; petiole 3-10 mm long; stipules 2.5-4 × 7-10 mm, pectinately elongating, with 7-11 bristles, pubescent to glabrous, glandular black at apex. Inflorescence terminal and axillary peduncled panicle of umbellate cymes, 1-7 × 2-5 cm, branches trichotomous or whorled, close, leafy, glabrous. Flowers 7-8 mm long, heterostylous; bracts foliaceous, 0.8-1 × 0.5-0.8 cm, lanceolate; bracteoles small, 0.5-1 mm long, fimbriate; pedicel 0.5-1 mm long. Hypanthium ovoid, 1-1.5 mm long, calyx limb 0.5-1 mm long; lobes 4, 2-3 × 1-1.5 mm, linear-lanceolate, acute, membranous, sparsely pubescent along the margin, dense raphides present all over. Corolla broadly tubular, usually with reflexed lobes, white or white with purple pigments or pale violet; tube 3.5-4 mm × 2-2.5 mm, often as long as the calyx lobes;

lobes 2-3 mm × 1-1.5 mm oblong, acute, incurved, beaked at apex, puberulous outside, minute pubescent inside, dense pubescent at throat. Stamens 4, inserted or exserted; filaments 0.3-0.5 mm or 1-1.5 mm long, adnate to sinus of corolla lobes; anthers linear, 1.5-1.9 mm long. Ovary 0.7-1 mm long, ovules many; styles 3-3.5 mm or 7-8 mm long, glabrous; stigma bilobed, 0.5-1 mm long; subglobose, fleshy, papillose. Capsule 5-6 × 2.5 mm, subglobose to oblong, crustaceous, glabrous. Seeds 10-20, angular or planoconvex, narrowly winged, 0.8-1 × 0.5-0.6 mm, testa reticulate, brownish.

*Fls. & Frts.* : April - November.

*Distrib.* : India : Tamil Nadu and Kerala at about 1500 m in alt.

*Exsiccata studied* : INDIA : Tamil Nadu : Brahmagiri sholas, C. E. C. Fischer 258 (CAL); Coimbatore dist., Akkamalai, J. Joseph 13768 (CAL) & 15534 (MH); Konalar, R. Makali 65900 (CAL) & M. Chandrabose 65815 (CAL).

28. *H. purpurascens* Hook. f. Fl. Brit. Ind. 3 : 50. 1880; Rama Rao, Fl. Pl. Travancore 204. 1914; Sharma *et. al.* in Bull. Bot. Surv. Ind. 15 : 59. 1973. *H. purpurea* Bedd. Icon. Fl. Ind. Or. t. 5. 1874, non Torrey & Gray 1841 (*Type* : Travancore, Tirunelveli hills, *Beddome* 3655 BM). *Oldenlandia purpurascens* (Hook. f.) O. Ktze. Rev. Gen. Pl. 1 : 292. 1891; Gamble, Fl. Pres. Madras 597. 1921; Fyson, Fl. S. Ind. Hill Stations 1 : 274. 1932. *O. purpurascens* (Hook. f.) O. Ktze. var. *pallida* Gamble, Fl. Pres. Madras 597, syn. nov. (Plate 26).

Shrubs 2-3 m high; stem obtusely angular, grooved above, terete below, glabrous, turning yellowish green on drying. Leaves 4-6.5 × 2.3-4 cm, ovate, elliptic-lanceolate or lanceolate, acuminate at apex, attenuate at base, coriaceous, glabrous, yellowish green when dry; nerves 3-6 pairs; petiole 0.5-2 mm; stipules 2-3 × 5-6 mm, triangular, acute to acuminate, black glandular-serrate or with marginal bristles, glandular black at tip. Inflorescence terminal peduncled panicle of corymbose cymes, 3.5-10 × 4-15 cm, branches trichotomous or dichotomous, angular or winged, glabrous. Flowers sessile or subsessile, 10-11 mm long, heterostylous; bracts foliaceous, 0.5-4 cm × 1-1.5 cm, lanceolate; bracteoles small, 0.5-1 mm long, fimbriate. Hypanthium ellipsoid or ovoid, 1-2 mm long; calyx limb 1.5-2 mm long; lobes 4, 2-4 mm long, oblong, acute, erect, accrescent. Corolla pink or bluish pink; tube 5-6 mm long, pubescent inside; lobes 2-3 mm long, oblong, acute, minutely pubescent inside. Stamens 4, inserted or exserted; filaments 0.5-1 mm or 2-2.5 mm long; ovules many on oblong placenta; style 1-2 mm or 7-8 mm long, included or exserted; stigma bilobed, linear, 1-2 mm long, papillose. Capsule 2-4.5 × 2-3 mm, oblong, finely ribbed, glabrous. Seeds 12-20, 0.8-1 × 0.6-0.8 mm angular or planoconvex with fine shining epidermal cells along margin.

*Fls.* : June - October; *Frts.* : July - December.

*Local name* : Mal.- *Koonthamaniyan*, Tam.- *Kuccharichedi*.

*Distrib.* : India, Tamil Nadu and Kerala up to 1300 m in alt.

*Note* : Gamble distinguished the var. *pallida* on the basis of leaves sessile,

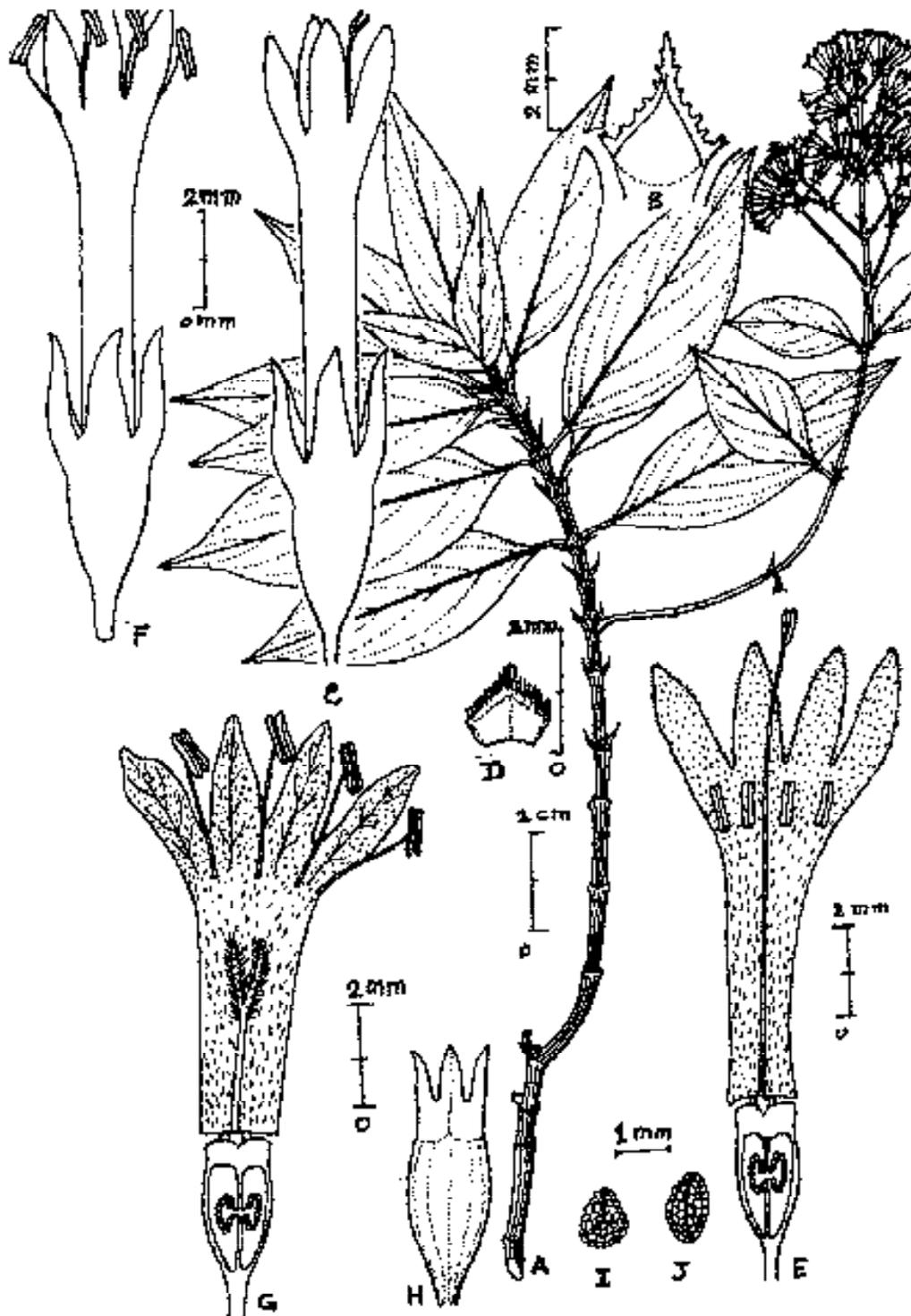


Plate 26. (A - J) *Hedyotis purpurascens* Hook. f. : A. habit; B. stipule; C. long-styled flower; D. bract; E. opened flower; F. short-styled flower; G. opened flower; H. capsule; I & J. seeds.

ovate, acute and stipules glandular pectinate. Both these characters are variable for which var. *pallida* Gamble is not tenable.

*Exsiccata studied* : INDIA : Tamil Nadu, *Wight Cat.* 1357, p. p. & 1360 (CAL); Kannikatti, *C. A. Barber* 3009 (CAL, MH) & *K. M. Sebastine* 9617 (MH); Tirunelveli dist., Naterikal, *D. Hooper* & *M. S. Ramaswami* 38521 (CAL); Sangalteri, *D. Hooper* & *M. S. Ramaswami* 39258 (CAL) & *C. E. C. Fischer* 3913 (CAL); Kakachi, *K. M. Sebastine* 4412 (MH); Tirunelveli, *Blatter* & *Hallberg* 843 (CAL) & *A. N. Henry* & *Chandrabose* 19172 (CAL, MH); Kannyakumari dist., Upper Kodayar, *A. N. Henry* s. n.; Balamore, *A. N. Henry* 47547 (CAL) & 68895 (CAL). Kerala : Trivandrum distr., Penmudi, *N. C. Nair* 50992 (CAL).

29. *H. tetrandra* (Roxb.) Craib, *Fl. Siam. Enum.* 2 : 49. 1932. *Rondeletia tetrandra* Roxb. *Hort. Beng.* 85, 1814 & *Fl. Ind.* 2 : 136. 1824. (*Type* : Paulo Penang, cultivated in Bot. Gard. Calcutta, *Roxb. s. n.*); *Roxb. Icon.* 1115 (CAL). *Scleromitrium tetrandrum* (Roxb.) Kurz in *Journ. Asiat. Soc. Beng.* 46(2) : 136. 1877. *H. macrophylla* Wall. ex *Wt. & Arn. Prodr.* 408. 1834, non *Lepr. & Perr. ex DC.* 1830 (*Type* : Paulo-Penang, Aug. 5. 1822, *Wall. Cat.* 841. K-W, CAL!); *Walp. Rep.* 2 : 492. 1843. *H. nodiflora* Wall. ex *G. Don., Gen. Syst.* 3 : 526. 1834. (*Type* : Tavoy, 12. 8. 1827, *W. Gomez* 84 ex *Wall. Cat.* 855A K-W! iso. CAL!); Craib, *Fl. Siam. Enum.* 2 : 43. 1932. *Wendlandia tetrandra* (Roxb.) DC. *Prodr.* 4 : 412. 1830. (Plate 27).

Shrubs up to 2 m high, puberulous to subglabrous, younger parts more so; stem stout, acutely angular or winged, puberulous. Leaves 5-12 × 3-7 cm elliptic, ovate-lanceolate or oblong-lanceolate, acute or acuminate at apex, narrowed at base, glabrous to subpuberulous; nerves 5-10 pairs, prominent or obscure; petiole 0.5-2.2 cm long, very often winged at base; stipules 3-4 × 4-5 mm, cupular, membranous, subglabrous or puberulous, truncate, with 2-3 small projections or pectinately many toothed bristles, puberulous. Inflorescence axillary, verticillate cymes, densely aggregated, 1-2.5 cm in diam. Flowers 4-5 mm long, puberulous; pedicel 0.7-1 mm long, puberulous; bracts 1.5-2 mm long, with a number of bristles, puberulous above, glabrous beneath. Hypanthium 0.5-0.8 mm long, ovoid; calyx limb 0.2-0.3 mm long, puberulous; lobes 4, 0.8-1 mm long, ovate-lanceolate or lanceolate, acute, margin ciliate. Corolla tube 2-2.5 mm long, glabrous inside, pubescent on throat; lobes 1-1.5 × 1.2-1.5 mm, ovate, acute. Stamens 4, filaments 0.5-1 mm long, adnate to sinus of corolla lobes; anthers 0.6-0.8 mm long, linear. Ovary 0.5-0.8 mm long, ovules many on oblong placenta; style 3 mm long, slender, glabrous; stigma swollen, bilobed, 0.5-1 mm long, papillose. Capsule 2-2.2 × 1.5-2 mm, oblong or ovoid with fine ribs, puberulous, crown flat below the calyx tube. Seeds 10-15, 0.4-0.5 × 0.3-0.4 mm, triangular, compressed or flat, reticulate.

*Fls. & Frts.* : September - February.

*Distrib.* : India : Arunachal Pradesh, Nagaland; Myanmar and Malaysia.

*Exsiccata studied* : INDIA : Arunachal Pradesh : Tirap dist, Niauxa, *G. Panigrahi* 16709 (ASSAM). Nagaland : Baligaon, *M. A. Hock* 399 (CAL). Myanmar : Tavoy, *Wall. Cat.* 855A (CAL); Malaya : Tenasserim, *A. Meebold* 14757 (CAL), *Griffith s. n.* (K, CAL) & *Helper s. n.* (CAL).

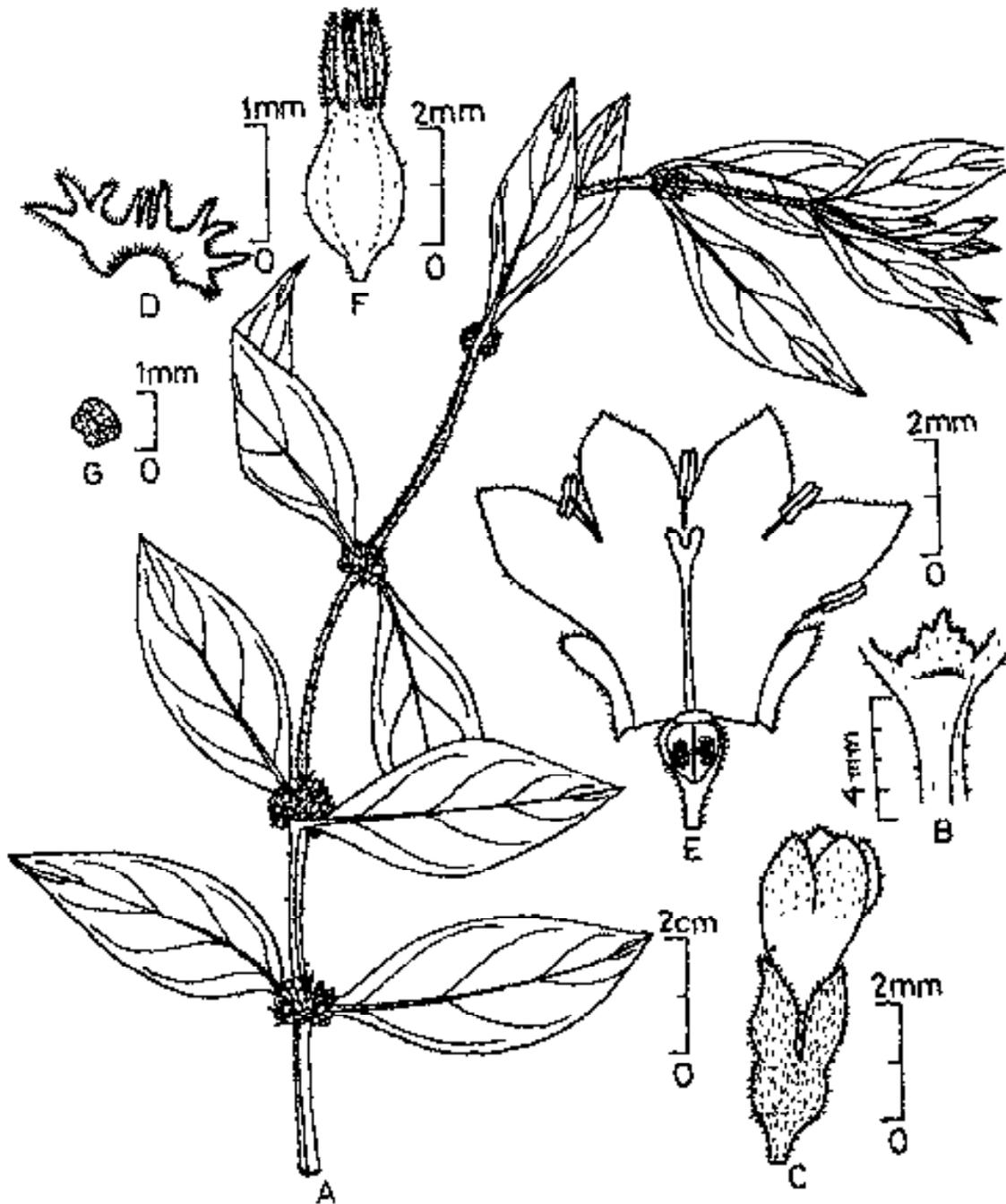


Plate 27. (A - G) *Hedyotis tetrandra* (Roxb.) Craib : A. habit; B. stipule; C. flower; D. bract; E. opened flower; F. capsule; G. seeds.



30. *H. membranacea* Thw. Enum. 143, 1859 (Type : Sri Lanka, Ambagamowa, Sept. 1859, *Thwaites* C. P. 3621 CAL!); Hook. f. Fl. Brit. Ind. 3: 59, 1880; Trimen, Handb. Fl. Ceylon 2 : 306, 1894; Chandrabose & Srinivasan in Bull. Bot. Surv. Ind. 18 : 236, 1976; Deb & Dutta in Taxon 34(2) : 297, 1983. *H. macrophylla* Thw. Enum. 142, 1859 (Type : Sri Lanka, forest above Adam's Peak, *Thwaites* C. P. 104 & 466 CAL!), non Wall. ex Wt. & Arn. 1834. *H. thwaitesii* Hook. f. Fl. Brit. Ind. 3 : 54, 1880; Trimen, Handb. Fl. Ceylon 2 : 307, 1894. *Oldenlandia membranacea* (Thw.) O. Ktze. Rev. Gen. Pl. 1 : 292, 1891; Gamble, Fl. Pres. Madras 600, 1921.

Shrubs or undershrubs, 1-2 m sparingly branched; stem obtusely or acutely angular, glabrous or puberulous. Leaves 5-15 × 3-5.6 cm, oblong-lanceolate or elliptic-lanceolate, acute to acuminate at apex, narrowed at base to petiole, membranous, blackish or deep brownish above, pale below; lateral nerves 6-8 pairs, obscure or prominent, glabrous or sparse to dense puberulous; petiole 0.1-3 cm long, winged; stipules membranous, connate at base, 2-3 × 4-5 mm, with 5-7 bristles or ovate with many bristles, hispid. Inflorescence axillary verticillate congested cymes, glabrous or puberulous. Flowers sessile or subsessile, 4-6 mm long; bracts 2-3 mm long, linear, glabrous or minutely pubescent outside. Hypanthium ovoid, 0.5-1 mm long, calyx limb 0.7-1 mm long; lobes 4, lanceolate, acute, 3-4 mm long, glabrous or puberulous, ciliate at margin. Corolla tube about 2 mm long, throat dense, pubescent inside; lobes 4, 1.5-2 mm long, ovate, acute, minutely pubescent inside and along the margin. Stamens 4; filaments 0.5-0.7 mm long, adnate to sinus of corolla lobes; anthers linear, 0.5-1 mm long. Ovary 0.5-1 mm long; ovules many; style slender, 3-4 mm long, minutely pubescent; stigma 2 lobed, 0.5-1 mm long, papillose. Capsule 2-3 × 1-2 mm, globose or subglobose, glabrous or puberulous, dehiscent septically from base to apex; persistent calyx teeth lanceolate, much longer than capsule. Seeds many, small, angular, 0.2-0.5 × 0.5 mm; exotesta reticulate.

*Fls. & Frts.* : July - November.

*Distrib.* : Kerala in India; Sri Lanka.

*Exsiccata studied* : INDIA : Kerala, Indukki dist. Valara water falls, *K. Ramamurthy* 73002 (CAL, MH). SRI LANKA : Central Province, *Thwaites* C. P. 466 & 104 (CAL). Ambagamund, *Thwaites* s. n. (CAL).

31. *H. srilankensis* Deb & Dutta in Taxon 32(2) : 285, 1983. *H. cymosa* Thw. Enum. 142, 1859, non Spreng. 1815. (Type : Sri Lanka, C. P., Hinidoon Circle, 300 m, *Thwaites* C.P. 3421 iso. CAL!); Bedd. Icon. Pl. Ind. Or. t. 35, 1874; Hook. f. Fl. Brit. Ind. 3 : 50, 1880; Trimen, Handb. Fl. Ceylon 2 : 305, 1894. (Plate 28).

Shrubs or undershrubs, 20-25 cm high; stem acutely angular, black on drying, scabrid at the ridges. Leaves sessile, 1.5-7 × 1-1.5 cm long, lanceolate, acute at apex, attenuate at base, shining, glabrous; midrib prominent; lateral nerves very obscure; stipules triangular, acute, keeled, 1-2 × 5-6 mm, short glandular toothed. Inflorescence terminal and axillary (upper) peduncled panicle of lax corymbose cymes, 3-5 × 5-6.5 cm; branches trichotomous or dichotomous, puberulous. Flowers

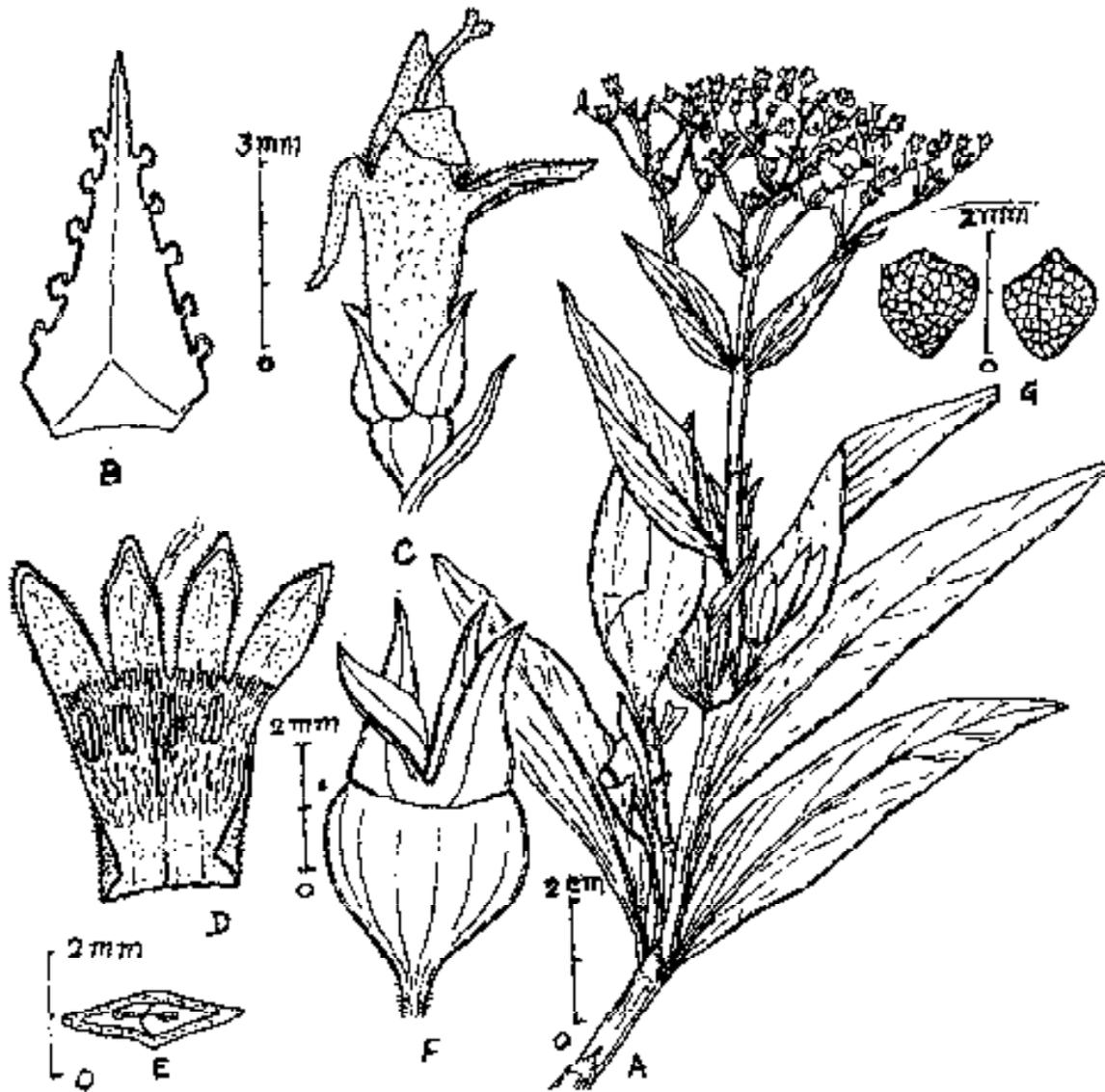


Plate 28. (A - G) *Hedyotis srilankensis* Deb & Dutta : A. habit; B. stipule; C. flower; D. opened corolla; E. style & stigma; F. capsule; G. seeds.

sessile or pedicelled, 7-8 mm long, heterostylous; bracts foliaceous, 0.5-2 × 0.2-0.8 cm, lanceolate; bractcoles 0.5-1 mm, linear. Hypanthium 0.8-1 mm long; calyx limb very short; lobes 4, 1-1.2 × 0.5-1 mm, ovate-lanceolate or lanceolate, glabrous. Corolla white, scabrid outside; tube 3-4 mm long; lobes 2-2.5 mm long, minute pubescent inside, throat pubescent, apex incurved. Stamens 4, inserted; filaments very short, 0.2-0.5 mm long, adnate to throat; anthers 1-1.2 mm long, oblong-linear. Ovary 0.6-1 mm long, ovules 2-4; style 5-6 mm long, exserted, minute pubescent; stigma bilobed, 0.3-0.5 mm long, subglobose, papillose. Capsule 2-3 × 1.5-2 mm globose, glabrous. Seeds 2-4, 1-1.5 × 1.5 mm, planoconvex or angular; exotesta reticulate, black.

*Fls.* : March September.

*Distrib.* : Sri Lanka in moist low land.

*Exsiccata studied* : Isotype only. No other collection is known.

32. *H. viscida* Bedd. Icon. Pl. Ind. Or. t. 4. 1874 (*Type* : Tirunelveli hills, May 1868, *Beddome* 49 BM!, K. photo!); Hook. f. Fl. Brit. Ind. 3 : 57. 1880; Rama Rao, Pl. Pl. Travancore 204. 1914. *Oldenlandia viscida* (Bedd.) O. Ktze. Rev. Gen. Pl. 1 : 293. 1891; Gamble, Fl. Pres. Madras 600. 1921; Fyson, Fl. S. Ind. Hill Stations 1 : 274. 1932. (Plate 29).

Shrubs 24-30 cm long, branches slender; stem obtusely angular, grooved, glabrous or minutely pubescent above. Leaves 1-10.5 × 0.3-4 cm, elliptic or ovate-lanceolate, acuminate, narrowed to petiole at base, coriaceous, glabrous, pale green when dry; nerves 3-5 pairs; petiole slender, 1-2 cm long; stipules 2-3.5 × 4-5 mm, triangular or ovate-lanceolate, acuminate, gland-toothed, viscid black at margin. Inflorescence terminal and axillary (upper axil), peduncled, loose, corymbose cymes, 3-10 × 1-4 cm; branches trichotomous, glabrous. Flowers 7-9 mm long, heterostylous; pedicel slender, 1.5-2 mm long; bracts linear, 5-7 mm long, viscid black at apex. Hypanthium, 0.8-1 mm long, sparsely pubescent; calyx limb very short; lobes 4, lanceolate, 0.7-1 mm long, viscid at margin. Corolla funnel shaped, white, pubescent outside; tube 4-5 mm long, woolly at throat, lobes 1-2 mm long, oblong, acute, incurved, beaked at apex, with spinous appendages outside, sparsely pubescent inside. Stamens 4, inserted or exserted; filaments 0.3-0.5 mm or 1.5-2 mm long, adnate to throat; anthers 1-1.5 mm long, linear. Ovary 0.6-0.8 mm long; ovules few on oblong placenta; style 2-4 mm or 6-7 mm long; stigma bilobed, 0.7-1.2 mm long, linear, hairy. Capsule 2-2.5 × 2-2.3 mm, globose or subglobose, finely ribbed, glabrous, with viscid calyx lobes. Seeds 10-12, 0.5-1.2 × 0.5-1 mm, angular or planoconvex, narrowly winged exotesta smooth, reticulate.

*Fls.* : February May; *Frts.* : June September.

*Distrib.* : Tamil Nadu at 900-1000 m in alt.

*Exsiccata studied* : INDIA : Tamil Nadu Tirunelveli, *Beddome s. n.* (CAL); Kannikatti, C. A. Barber 2973 (MH); Naterikal, D. Hooper & M. S. Ramaswami 38355 (CAL) & C. A. Barber 13353 (MH); Sengalteri, D. Hooper & M. S. Ramaswami 38623

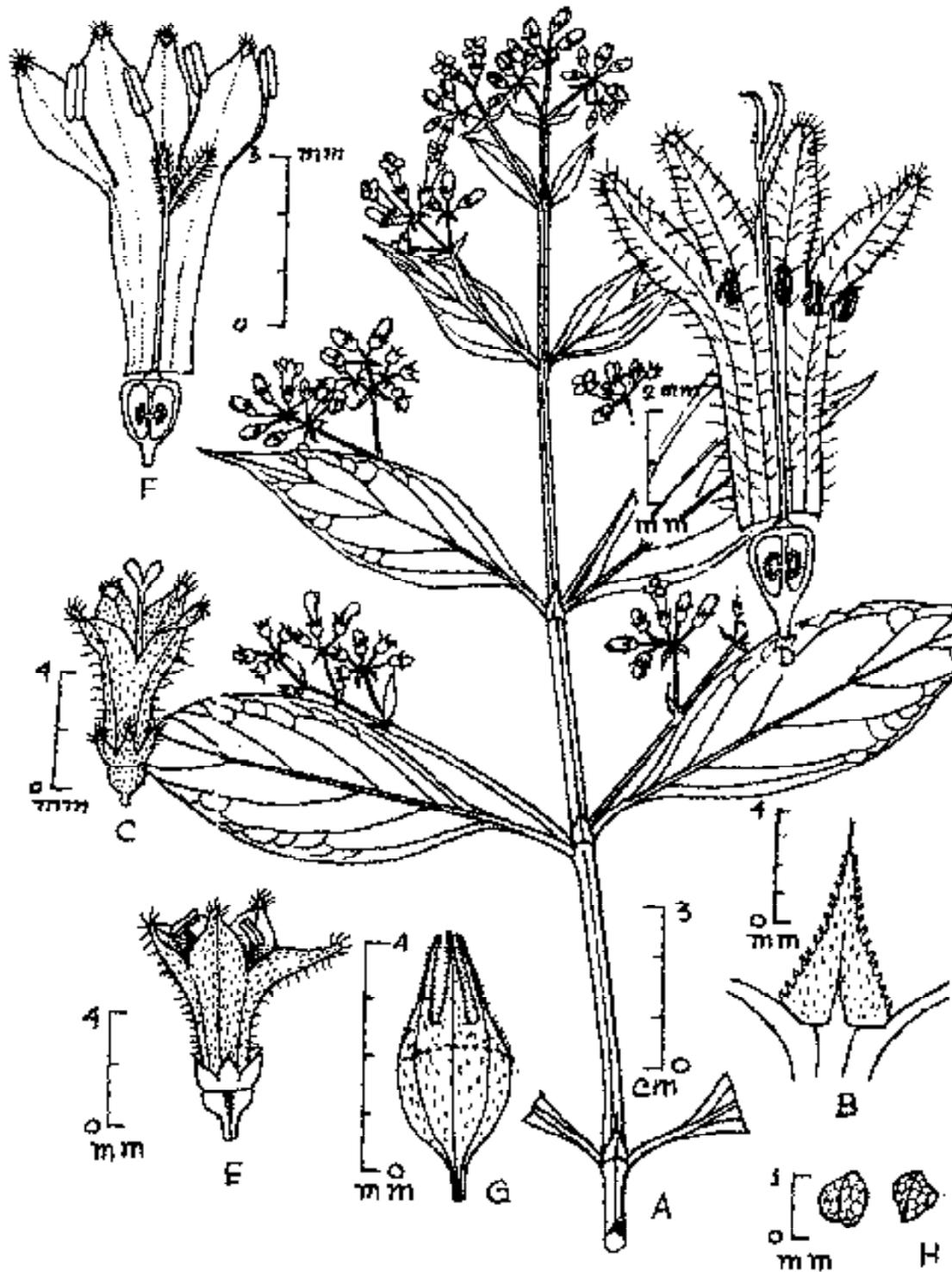


Plate 29. (A - H) *Hedyotis viscida* Bedd. : A. habit; B. stipule; C. long-styled flower; D. opened flower; E. short-styled flower; F. opened flower; G. capsule; H. seeds.

(CAL), *C. E. C. Fischer* 3885 & 15883 (CAL) & *E. Vajravelu* 29120 (MH); Mundanthisai, *C. A. Barber* 12216 (MH).

33. *H. articularis* R. Br. ex Wt. & Arn. Prodr. 407. 1834. (Syn. types : Nilgherry, *Noton s. n. ex Wall. Cat.* 854, *Gardner s. n.*, Hohenacker 990 K. photo!; & *Wight Cat.* 1291 CAL!); Wt. Icon. t. 1028. 1845; Hook. f. Fl. Brit. Ind. 3 : 51. 1880; Rama Rao, Fl. Pl. Travancore 204. 1914; Shetty & Vivekananth. in Bull. Bot. Surv. Ind. 13 : 32. 1971, *Oldenlandia articularis* (R. Br.) Gamble, Fl. Pres. Madras 599, 1921; Fyson, Fl. S. Ind. Hill Stations 1 : 272. t. 218. 1932. (Plate 30).

Shrubs or undershrubs, 30-60 cm long, branching dichotomously, leafy above, with stipular and leaf scars below; stem obtusely or acutely angular to winged, glabrous or puberulous above, yellowish on drying. Leaves 1.5-2 × 0.5-1.3 cm, lanceolate or ovate-lanceolate, acute or obtuse, contracted to short and broad petiole at base, coriaceous or subcoriaceous, puberulous above or glabrous, sometimes recurved at margin; nerves 4-6 pairs, distinct, broad, velvety below, channelled above; petiole 0.5-1 × 0.8-1 mm; stipules 3-4 × 5-8 mm, triangular, acute, sheathing at base; margin with pectinate bristles, pubescent to glabrous or glandular black at apex, often stipular base with wing-like appendages. Inflorescence terminal, panicle of cymes 1-4 × 1-3 cm, branches short, trichotomous, dense-flowered; peduncles 0.5-1.5 cm long, angular, winged, puberulous or glabrous. Flowers sessile or short pedicelled, 7-10 mm long, heterostylous; bracts foliaceous, 0.5-2 × 0.2-0.8 cm, lanceolate; bracteoles 0.1-0.5 mm long, linear. Hypanthium globose or ovoid, 0.8-1 mm long; calyx limb 0.5-1.5 mm; lobes 4, 1-3 mm long broadly ovate to lanceolate, more or less divided, often prominently 3-4 nerved, puberulous or nearly so. Corolla infundibuliform, sparsely pubescent outside, white or pale purple; tube 2-3.5 mm long, pubescent on the throat; lobes 3-4 mm long, oblong, acute, incurved at apex, minutely, denticulate at margin, pubescent inside. Stamens 4, inserted or exserted; filaments 0.3-0.5 mm or 1.5-2 mm long, adnate below sinus or at throat of corolla; anthers 1-2 mm, oblong-linear. Ovary 0.8-1 mm long, ovules many on sub-median placenta; style 1.5-2 mm or 6-7 mm long, inserted or exserted, glabrous or puberulous; stigma bilobed, 0.5-1.8 mm long, linear, papillose. Capsule 2-5 × 2-3 mm, globose or oblong-ellipsoid with longitudinal striations, pruinose all over or glabrous. Seeds 12-14, angular, winged or not, 1-1.3 × 0.6-1 mm, exotesta pitted or reticulate, often with prominent marginal epidermal cells.

#### KEY TO THE SUBSPECIES

- 1a. Leaves sometimes, velvety below; calyx lobes short ... subsp. *articularis*  
 1b. Leaves glabrous; calyx lobes longer ... subsp. *santapauli*

#### 33a. *H. articularis* subsp. *articularis*.

Shrubs. Stem obtusely angular, grooved, glabrous or puberulous. Leaves subsessile, 1-3 × 0.8-1 cm, lanceolate or elliptic-lanceolate, obtuse at apex, narrowed

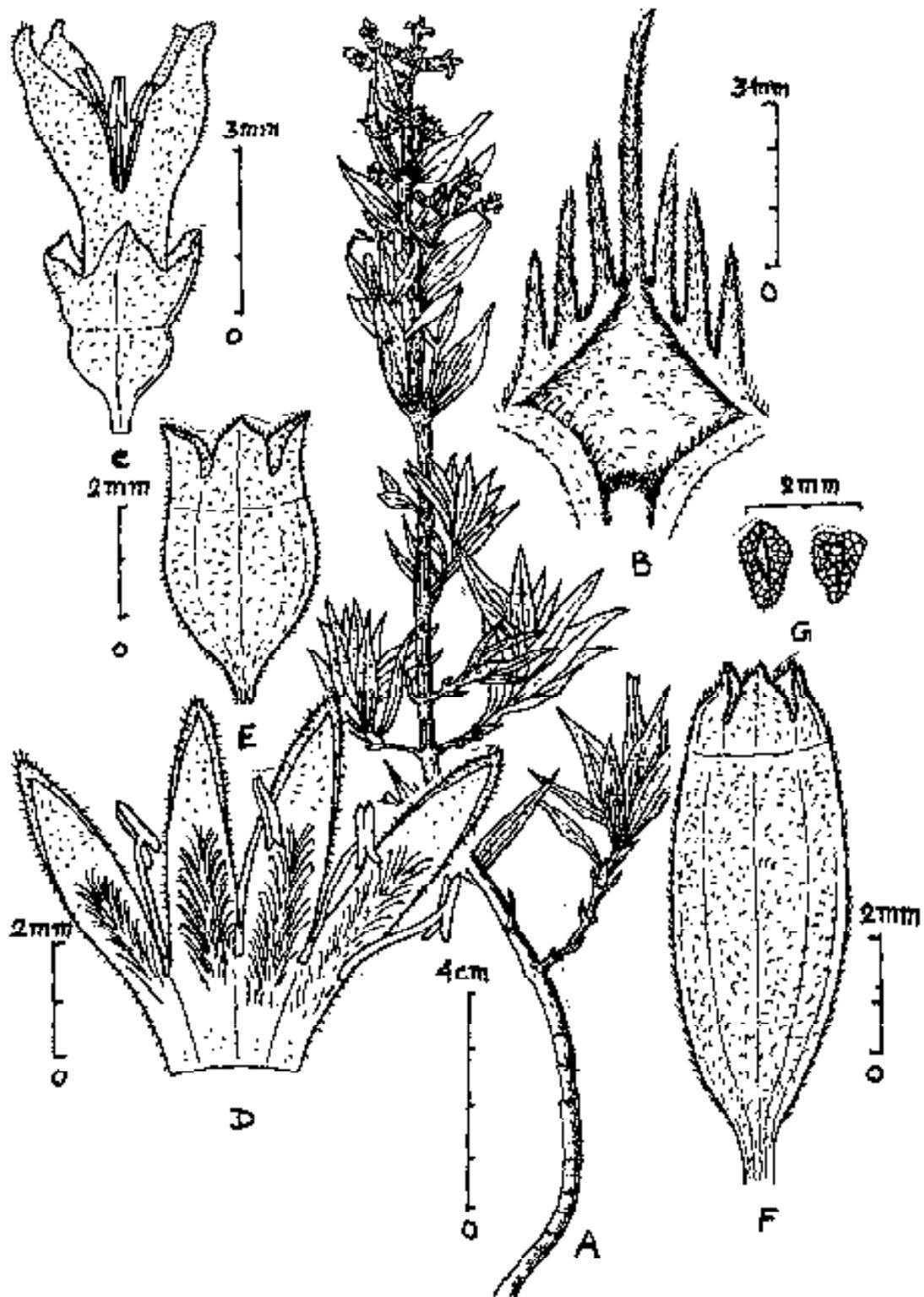


Plate 30. (A- G) *Hedyotis articulata* R. Br. ex Wt. & Arn. : A. habit; B. stipule; C. flower; D. opened corolla; E. L.S. of ovary; F. capsule; G. seeds.

to short, broad petiole at base; nerves broad, valvate below; stipules 7-8 × 2-3 mm, triangular, with 5-7 bristles, glabrous or puberulous. Flowers 7-9 mm long, puberulous outside. Hypanthium 0.8-1 mm long; Calyx limb 1-1.5 mm long; lobes 4, 1-1.2 mm long, ovate, acute. Capsule 3-6 × 2-3 mm, subglobose or oblong, top raised above within calyx tube.

*Fls. & Frts.* : Throughout the year.

*Distrib.* : Tamil Nadu, Kerala, Karnataka at 1800 - 2400 m in alt.

*Exsiccata studied* : INDIA : Tamil Nadu - Nilgiri dist., *J. S. Gamble* 13382 (CAL); Dodabetta, *J. S. Gamble s. n.* (CAL); *B. D. Sharma* 36090 (MH) & *J. F. Ellis* 34781 (MH); Pulneys, *A. G. Bourne* 571 (CAL); Pambar shola, *Barber* 7504 (MH); South Malabar, *C. E. C. Fischer* 2308 (CAL); Kodaikanal, *St. Munch* 4 (CAL) & *A. Sautier* 62 (CAL); Coimbatore dist., Annamalai Hills, *M. Chandrabose* 69026 (CAL.). Kerala : Cannanore, *G. King* 1014 (CAL); Coonoor, *J. S. Gamble* 12258 (DD); *C. A. Barber* 5532 (MH) & *C. A. Barber s. n.* (CAL); Kottayam district., Umaiya Malai, *B. V. Shetty* 28329 (MH). Karnataka : *G. Thomson s. n.* (CAL); Peninsular India Orientalis, *Wight* 1358 (CAL).

33b. *H. articularis* subsp. *santapaul* (Shetty & Vivekananthan) Deb & Dutta in *Taxon* 32(2) : 285. 1983. *H. santapauli* Shetty & Vivekananthan in *Bull. Bot. Surv. Ind.* 11 : 447. 1969 (*Type* : Kerala, Kottayam, Umaiya Malai, Deviscolam, 17.11.1965. *Shetty & Vivekananthan* 26471 A & H. CAL!); Shetty & Vivekananthan in *Bull. Bot. Surv. Ind.* 13:32. 1971; *Henry et al.*, in *Journ. Bomb. Nat. Hist. Soc.* 75 : 689. 1979.

Shrubs robust, stem acutely angular to winged, glabrous. Leaves subsessile, 2-5.2 × 1-1.3 cm, lanceolate, glabrous, acute, contracted at base to short, flattened petiole; nerves ribbed below, glabrous; stipules 5-10 × 2-3 mm with pectinate bristles, pubescent to glabrous, glandular black at apex, usually winged at base. Flowers 7-8 mm long, sparsely pubescent outside. Hypanthium 0.8-1 mm long; calyx limb 0.5 mm long; lobes 4 - 2-3 mm long, lanceolate, glabrous. Capsule 2-3 × 2-3 mm, globose or subglobose, top raised within the calyx lobes.

*Fls. & Frts.* : August - November.

*Distrib.* : India : Kerala at about 2075 m in alt.

*Exsiccata studied* : INDIA : Kerala, Kottayam, Umaiya Malai, Anaimudi Slopes, *B. V. Shetty* 29393 (MH).

34. *H. pruinosa* Wt. & Arn. *Prodr.* 408. 1834 (*Type* : *Wight Cat.* 1923 K, photol!); *Walp. Rep.* 2 : 492. 1843; *Hook. f. Fl. Brit. Ind.* 3 : 51. 1880; *Rama Rao, Fl. Pl. Travancore* 204. 1914. *Oldenlandia pruinosa* (Wt. & Arn.) O. Ktze. *Rev. Gen. Pl.* 1 : 292. 1891; *Gamble, Fl. Pres. Madras* 598. 1921, *H. lentiginosa* *Bedd. Icon. Pl. Ind. Or. t. 6.* 1874 (*Type* : Travancore near Mundykaim, *Beddome* 3667 & 3668 BM!). *H. corymbosa* *Wall. Cat.* 6202a non L. (Plate 31).

Undershrubs 15 cm - 1m high; stem obtusely angular with distinct grooves, glabrous or sparsely pruinose hairy above, yellowish on drying. Leaves 5-10 × 2-4.5 cm, lanceolate or ovate-lanceolate, acuminate at apex, attenuate at base,

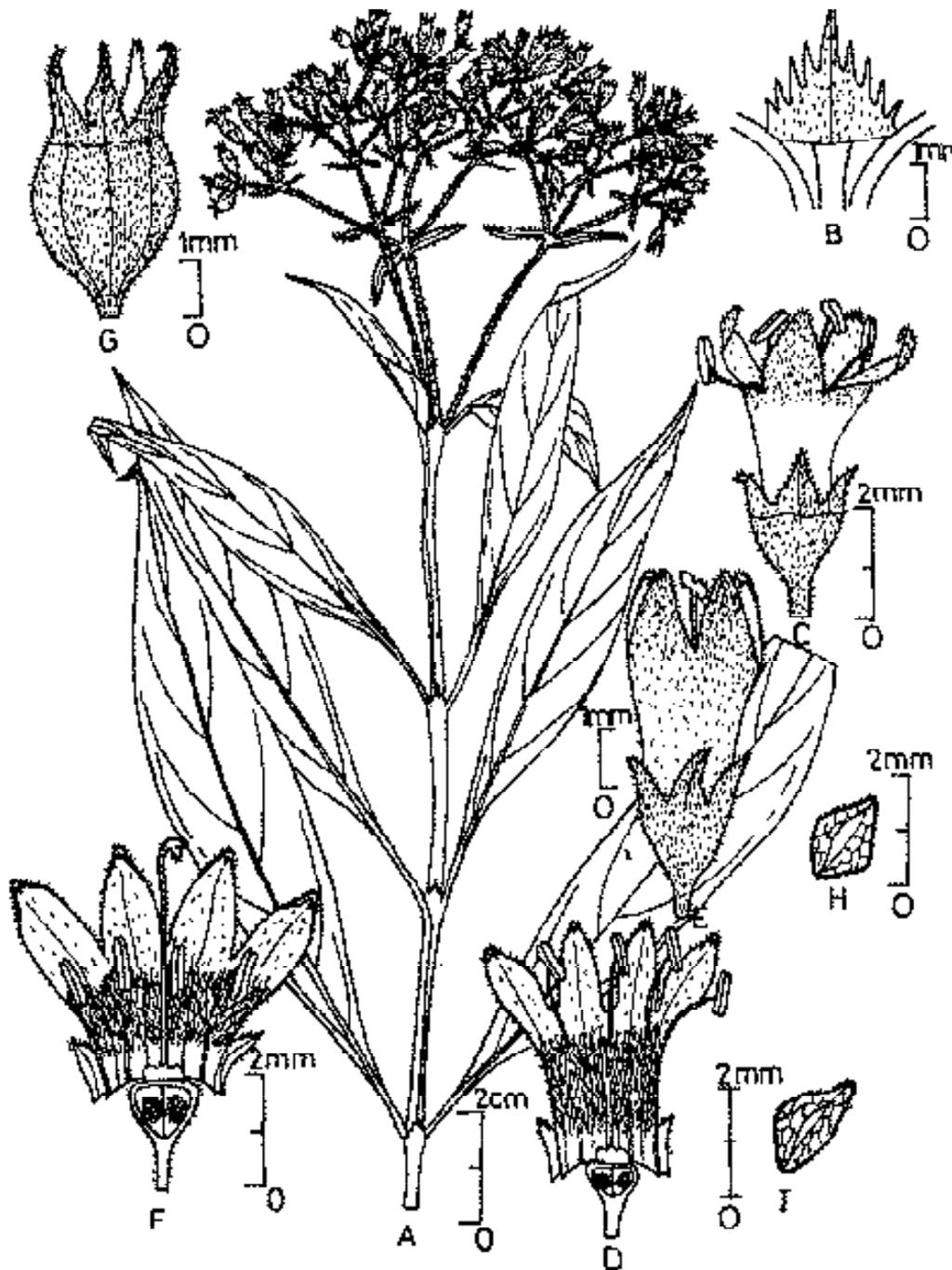


Plate 31. (A - I) *Hedyotis pruriens* Wt. & Arn. : A. habit; B. stipule; C. short-styled flower; D. opened flower; E. long-styled flower; F. opened flower; G. capsule; H & I. seeds.



membranous, glabrous or sparsely pruinose; lateral nerves 3-5 pairs, sub opposite, faint; petiole 1-1.5 cm long, dilated at base; stipules free, 2-2.5 × 2-3 mm, orbicular or ovate, acute with marginal pectinate segments, pruinose or powdery white hairy all over. Inflorescence terminal and axillary (upper axil) peduncled panicles of corymbose cymes, 5-10 × 7-10 cm; branches trichotomous or dichotomous, pruinose all over. Flowers pedicelled, 6-6.5 mm long, heterostylous, pruinose; bract foliaceous, 0.8-3 × 0.5-1 cm, lanceolate; bracteoles small, 1-2 mm. Hypanthium ovoid, 1-1.2 mm long; calyx limb 0.3-0.6 mm long; lobes 4, 0.5-1.5 × 0.5-1 mm, ovate, acute. Corolla purple or pale violet; tube 2-3 mm long, dense pubescent inside; lobes 2-2.5 mm long, oblong, acute, minute pubescent inside. Stamens 4, inserted or exerted; filaments 0.3-0.5 mm or 1.5-2 mm long, adnate to throat; anthers 0.8-1 mm long, oblong-linear. Ovary 0.8-1 mm long; ovules many; style 1-2 mm or 3.5-4 mm long, inserted or exerted, glabrous or puberulous; stigma bilobed, 0.5-0.7 mm long, subglobose or linear, papillose. Capsule 2-3 × 1-2 mm, subglobose, pruinose. Seeds 10-20, angular, 0.4-0.5 × 0.2-0.3 mm, exotesta smooth with fine reticulations, chocolate colour.

*Fls. & Frts.* : April - November.

*Distrib.* : Kerala, on dry places on laterite and loamy soil.

*Chromosome no.* :  $2n = 72$  was reported by Philip O & Mathew P. H. 1976.

*Exsiccata studied* : INDIA : Kerala, Quilon, *M. A. Lawson s. n.* (CAL), *M. M. Rama Rao* 500(DD) & *K. N. Subramanyan* 70755 (BSI); Trivandrum, *M. A. Lawson s. n.* (MH), *A. Meebold* 12670 (BSI) & *R. S. Rao* 61368 (BSI); Travancore, *T. F. Bourdillon* 50 & *C. C. Calder & M. S. Ramaswami* 827 (CAL); Ariankaru-Tumalai, *C. C. Calder* 1378 (CAL); Katara Kala, *Raizada* 25785 (DD); Anchal, *M. Y. Ansari* 54061 (BSI); Tenmalai, *K. N. Subramanyan* 70931 & 76975 (BSI); Ponmudi, *M. Ansari* 50244 (BSI) & *M. Mohanan* 52544 (CAL); Ranni, *N. C. Nair* 50736 (CAL). Peninsular Ind. Or., *Wight* 1352 (CAL).

35. *H. bourdillonii* (Gamble) Rao *et* Hemadri in *Ind. For.* 99(6) : 378. 1973; Henry *et al.* in *Journ. Bomb. Nat. Hist. Soc.* 75 : 689. 1979; Nair *et al.* in *Bull. Bot. Surv. Ind.* 22 : 205. 1980; Deb & Dutta in *Journ. Bomb. Nat. Hist. Soc.* 80 : 402. 1983; Deb & Dutta in *Red Data Book Ind. Pl.* 2 : 203. 1988; *Oldenlandia bourdillonii* Gamble in *Kew Bull.* 1919; 404. 1919 & *Fl. Pres. Madras* 598. 1931 (*Type* : Travancore, 610-1200 m, Aug. 1887, *T. F. Bourdillon* 111. K, photo!; iso., MH!); Calder & Narayan, in *Rec. Bot. Surv. Ind.* 11:94.1826. *H. silent-valleyensis* Vajravelu *et al.* in *Journ. Bomb. Nat. Hist. Soc.* 80 : 409. 1983. (*Type* : Kunthipuzha dam site, Silent Valley, *R. F. Kerala*, 27.5.66, *Vajravelu* 27674 Holo. CAL!).

Shrubs or woolly herbs, about 1.25m tall, branching dichotomously; stem angular or terete, pubescent above, glabrous below, greyish when dry. Leaves 5-6 × 1-1.5 cm, elliptic-lanceolate or lanceolate, subacute or acuminate at apex, attenuate at base, membranous, pubescent, more along nerves; nerves 3-4 pairs, oblique; petiole 2-3 mm long, pubescent; stipules 2-2.5 × 3-5 mm, triangular, with 9-11 pectinate teeth, pubescent. Inflorescence terminal, peduncled panicle of

corymbose cymes, 5-10 × 7-15 cm, branches trichotomous or dichotomous, spreading, pubescent. Flowers sessile or subsessile, 7-8 mm long; bracts foliaceous, 2-4 × 1-1.5 cm, linear-lanceolate, acute, pubescent; bracteoles small, 1-1.5 × 1 mm, linear, pubescent. Calyx pinkish, pubescent. Hypanthium ovoid, 1.5-2 mm long, calyx limb 0.8-1.5 mm long; lobes 4, 1-1.2 × 0.8-1 mm, broadly triangular, acute, midnerve prominent, pubescent. Corolla broader at base, bluish purple or violet, pubescent outside; tube narrow, 2-3 mm long, dense pubescent on throat; lobes 2-3 mm long, oblong, incurved, beaked at apex, with spinous appendages outside, pubescent inside, serrulate at margin. Stamens 4, inserted; filaments short, 0.5-0.6 mm long, adnate to sinus of the corolla lobes; anthers 1-2 mm long, linear. Ovary 1-2 mm long, ovules many; style slender, 4-5 mm long, minutely pubescent; stigma bilobed, 0.3-0.5 mm long, fleshy, papillose. Capsule 5-6 mm (rarely 9 mm) × 2-3 mm, ellipsoid or obovoid, densely pubescent at base. Seeds 16-20, 0.8-1 × 0.5-1 mm, planoconvex or triangular, narrowly winged; exotesta reticulate, brownish.

*Fls. & Frts.* : July August.

*Distrib.* : Kerala in scrub forest.

*Exsiccata studied* : INDIA : Kerala, Travancore, *Bourdillon s. n.*, (CAL); Palghat dist., Silent Valley, *Ansari* 51466 (MH & CAL) & *N. C. Nair* 64439 (CAL).

### HEDYOTIS L. SECT. INVOLUCRELLA

Hook. f. in Benth. & Hook. f. *Gen. Pl.* 2 : 57. 1873 & *Fl. Brit. Ind.* 3 : 62. 1880. *Oldenlandia* L. sect. *Involucrella* (Hook. f.) K. Schumann in *Engl. & Prantl, Pflanzenfam.* 4(4) : 26. 1891. *Scleromitrium* (Wt. & Arn.) Meissn. subg. *Euscleromitrium* Kurz in *Journ. Asiat. Soc. Beng.* 46(2) : 136. 1877, pro parte.

*Type* : *H. merguensis* Hook. f.

Herbs annual or perennial. Leaves sessile or subsessile, oblong-linear, 1-nerved. Inflorescence terminal or from upper axils, half included in the embracing bases of involucre-like upper-most leaves. Corolla long tubular. Capsule ovoid or ellipsoid with converging calyx lobes.

*Pollen morphology* : Pollen grain sub-prolate, P × E = 32 50 × 21 35 μm, 3 colpi; colpi 30 × 3 μm. OS lalongate, 5 × 8 μm diam, with diffuse margin, A<sub>2</sub>. Exine 2 μm thick, finely retipilate, sexine thicker than nexine, lumina 1-1.5 μm, muri narrow.

*Distrib.* : One species in Tripura, Mizoram, Myanmar, China, Malaya and Philippine Islands. Plate 12 B (Partly).

36. *H. merguensis* Hook. f. in Benth. & Hook. f. *Gen. Pl.* 2 : 57. 1873 (*Type* : Merugi, *Griffith s. n.* K); Bakh. f. in Becker & Bakh. f. *Fl. Java* 2 : 286. 1965. *H. coronaria* (Kurz) Craib, *Fl. Siam. Enum.* 2 : 39. 1932; Deb, *Fl. Tripura* 2 : 53. 1983.

*Scleromitrium coronarium* Kurz in Journ. Asiat. Soc. Beng. 46(2) : 136. 1877 (Type : Amherst, 1827, Wall. Cat. 856 CAL, K). *H. coronata* Hook. f. Fl. Brit. Ind. 3 : 62. 1880 (erroneously *H. connata*) (Type : Tavoy, 2.10.1827, W. Gomez 462 ex Wall. Cat. 685B CAL!); King & Gamble in Journ. Asiat. Soc. Beng. 72(2) : 163. 1903; Ridley, Fl. Malay Penin. 2 : 48. 1923; Fischer in Rec. Bot. Surv. Ind. 12(2) : 100. 1938. *Oldenlandia connata* (Hook. f.) O. Ktze. Rev. Gen. Pl. 1 : 291. 1891. (Plate 32).

Herbs woody below, rooting at lower nodes, decumbent; stem 10-20 cm long 4 angular, pubescent or glabrescent. Leaves sessile or subsessile, 6-10 × 1.8-2 cm, oblong to linear-oblong, acute at apex, narrowed at base, membranous to subcoriaceous, glaucous underneath, puberulous above and along the nerves and margins, midrib prominent; petiole when present, usually broad, 2-4 mm long; stipules connate, 6-10 × 5-8 mm, bristles 8-12, erect, stiff, scabrid. Inflorescence sessile cyme, terminal or at upper axils, partly hidden within the leaf-bases and stipules. Flowers sessile, bracteate; bracts stipule-like, with 6-8 bristles, 6-8 mm long. Hypanthium 3-3.5 mm long, ovoid; calyx limb 1-1.5 mm long, narrow; lobes 4, 1-1.5 mm lanceolate to linear-lanceolate, acute to acuminate, ciliate at margin, nerves faint. Corolla 14-15 mm long, bluish purple, pink or violet, tube 10-12 mm long, upper part broader, tufted with long hairs; lobes 4-5 × 2-2.5 mm, swollen at apex, with 3-5 spinous appendages on dorsal side. Stamens 4, inserted; filaments minute; anther 1 mm long. Ovary 2.5-3 mm long; ovules many on oblong placenta; style slender, exserted, about as long as corolla; stigma bifid, lobes 1-1.5 mm, linear. Capsule oblong or ellipsoid-oblong, 3-5 × 2.5-3 mm, with converging calyx lobes, top protruded above, membranous, obscurely dehiscent. Seeds many, irregularly angular, 0.4-0.5 × 0.3-0.4 mm, exotesta reticulate, black.

*Fls.* : March August; *Frts.* : April October.

*Ecology* : On the ground floor of the evergreen and semi evergreen forest.

*Distrib.* : India : Tripura and Mizoram; China, Myanmar, Malaysia and Philippine Islands.

*Exsiccata studied* : INDIA : Tripura : Garji Reserve forest, R. S. Rao 8953 (ASSAM); Kailashahar, D. B. Deb 2660 (CAL); Shakhon-Tlangsang, D. B. Deb 27437 (CAL) Mizoram : Lushai Hills, N. E. Parry s. n. (CAL); Bhalpui, R. M. Dutta 35884 (CAL).

MYANMAR : Tavoy, W. Gomez 462 ex Wall. Cat. 856 (CAL); Chin hills, Upper Burma, Abdul Huk s. n. (CAL); Kachin hills, Shaik Mokim s. n. (CAL); Biserat, Julor, D. T. Gwynn-Vaughan Tounfoo, C. G. Rogers s. n. (CAL); Attran, D. Brandis 1277 (DD); Toungoo, West Lura Reserve, C. Gilberts Rogers s. n. (CAL).

CHINA : Yunnan expedition, D. J. Anderson 1175(CAL).

MALAYASIA : Kedah, H. N. Ridley 15820 (CAL); Perak, King's collector 2328 (CAL); H. N. Ridley 14534 (CAL) & Scortechini 91 (CAL); Kuala Aring, R. H. Gupta 21 (CAL); Singapore, M. R. Henderson 22681 (CAL).

PHILIPPINE : Luzon, A. D. E. Elmer 17717 (CAL).

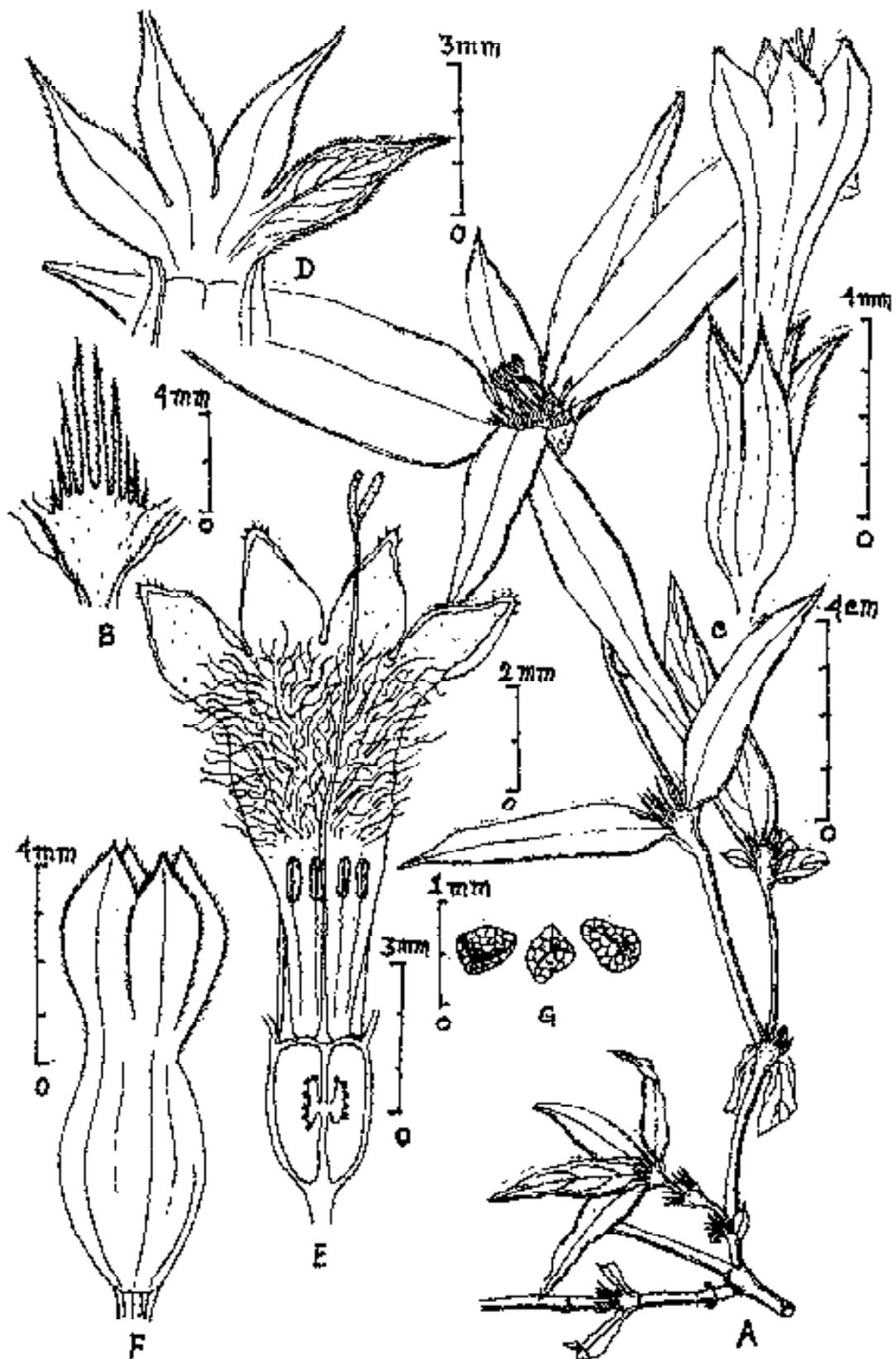


Plate 32. (A - G) *Hedyotis merguensis* Hook. E. : A. habit; B. stipule; C. flower; D. calyx lobes; E. opened flower; F. capsule; G. seeds.

**HEDYOTIS L. SECT. HEDYOTIS**

*Hedyotis* L. sect. *Euhedyotis* Wt. & Arn. Prodr. 411. 1834; Walp. Rep. 2 : 497. 1843; Miq. Fl. Ind. Bat. 2:177. 1857; Hook. f. in Benth. & Hook. f. Gen. Pl. 2 : 151. 1873 & Fl. Brit. Ind. 3 : 58. 1880 (excl. sub. sect. *Scleromitron*). *Oldenlandia* L. sect. *Hedyotis* (L.) K. Schum. in Engl. & Prantl, Pflanzenfam. 4(4) : 23. 1891(excl. *O. pinifolia* Wall.).

*Type* : *H. auricularia* L.

Herbs subscaudent, rarely shrubs. Leaves ovate, elliptic-lanceolate, linear-lanceolate or oblong-lanceolate, acuminate, caudate-acuminate; mostly plaited longitudinally with very strong nerves. Inflorescence axillary cymes, rarely terminal capitate cymes (*H. scabra*.) Flowers mostly heterostylous. Calyx lobes subulate or lanceolate, rarely broadly triangular, accessory calyx teeth often present. Corolla short tubular or bell-shaped. Anther globose to oblong. Capsule globose, ovoid or ellipsoid, didymous, usually broadening at base, top truncate above or angular, often raised and enclosed within spreading or converging calyx lobes, crustaceous, hard or fleshy, smooth or muricated, indehiscent or late dehiscent. Seeds few to many, angular.

*Pollen morphology* : Pollen grain sub prolate or prolate spheroidal,  $P \times E = 25-40 \times 20-30 \mu\text{m}$ , 3 colporate, rarely 4 colpi long,  $20-30 \times 2-3 \mu\text{m}$ ; OS simple, lalongate  $3-6 \mu\text{m}$  diam, margin distinct, synzonorate, A1. Exine  $1-3 \mu\text{m}$ , fine to coarse retipilate, sexine twice thicker than nexine, lumina  $0.5-2 \mu\text{m}$ .

*Distrib.* : About 24 species in Indo Malesia : 8 species in India (Plate 11).

37. *H. scabra* Wall. ex Kurz in Journ. Asiat. Soc. Beng. 46(2) : 136. 1877 (*Type* : Burma, Moulmein, 1827, Wall. Cat. 880. holo. CAL. iso, K-W, photo!); Hook. f. Fl. Brit. Ind. 3 : 62. 1880; Craib, Fl. Siam. Enum. 2 : 47. 1932. *Oldenlandia scabra* (Wall.) O. Ktze. Rev. Gen. Pl. 1 : 291. 1891. Deb & Dutta in Red Data Book Ind. Pl. 2 : 215. 1988.

Herbs annual or perennial from a stout, long woody root stock; branches about 1 m long, erect or decumbent; stem obtusely angular above, terete below, scabrid, sometimes glabrescent below. Leaves sessile or subsessile,  $2-10 \times 1.5-2$  cm, lanceolate, tapering at both ends, membranous, dark brown, when dry, scabrid above and along the nerves beneath; petiole 1-2 mm long, puberulous; stipules  $2-3 \times 3.5$  mm, triangular, pubescent, pectinately gland serrated. Inflorescence terminal, few flowered, involucrate, capitate cymes; involucreal leaves 4-6,  $1.5-3.5 \times 1-2$  cm, ovate, acute. Flowers 4-5 mm long; pedicel 0.3-1 mm long; bracts 0.8-1 mm long, pectinate. Hypanthium ovoid, 0.5-1 mm long; Calyx limb short; lobes 4, 1-2 mm long, triangular-lanceolate, scabrid along the margin. Corolla white, minutely pubescent outside; tube 1.5-2 mm long, enclosed within calyx lobes, throat dense pubescent inside; lobes 2-3 mm long, oblong, acute, apex incurved with spinous appendages outside, minute pubescent inside. Stamens 4, inserted or exserted; filaments 1-1.5 mm long, pubescent, adnate to throat of corolla; anthers 0.6-1 mm long, linear-oblong. Ovary 0.5-0.8 mm long, ovules many; style 1-2 mm long, pubescent; stigma bilobed, 0.2-0.3 mm or 0.5-1 mm long, subglobose, or

linear, papillose. Capsule 2-3 × 1-2 mm, globose, crustaceous, muricated, glabrous or minute pubescent, apparently indehiscent but late dehiscent loculicidally on the crown, then septicidally. Seeds 20-40, angular, 0.5-0.2 mm; testa reticulate, brownish.

*Fls.* : July - September; *Frts.* : October - December.

*Ecology* : In dense Bamboo forest or at the edge of the forest.

*Distrib.* : India : Assam, Arunachal Pradesh; Myanmar and Bangladesh.

*Exsiccata studied* : INDIA : West Bengal : Calcutta (cultivated), *J. W. Helfer* 80 (CAL, E). Assam, *Masters* s. n. (DD). Arunachal Pradesh, Kameng dist., Sessa, *J. Joseph* 39873 (CAL).

MYANMAR : Moulmein, *Wallich* ? 72 (CAL.); Tenasserim, *Helfer* 2893 (CAL.) & *Gallaty* 601 (CAL). Tonkyeghat, *Kurz* 1426 (CAL).

BANGLADESH : Cox's Bazar, *J. Sinclair* 3187 (CAL).

38. *H. congesta* R. Br. ex G. Don, Gen. Syst. Gard. Bot. 3 : 526. 1834 (*Type* : Penang, *Wall. Cat.* 844 K-W, CAL!); Hook. f. Fl. Brit. Ind. 3 : 61. 1880; King & Gamble in Journ. Asiat. Soc. Beng. 72(2) : 161. 1903; Ridley, Fl. Malay Penin. 2 : 51. 1923; Craib, Fl. Siam. Enum. 2 : 37. 1932; Deb & Dutta in Journ. Bombay Nat. Hist. Soc. 84(1) : 216. 1987. *Oldenlandia congesta* (R. Br.) O. Ktze. Rev. Gen. Pl. 1 : 292. 1891. *Exallage congesta* (R. Br. ex G. Don) Bremek. in Verh. Kon. Nederl. Akad. Wet. Afd. Natuurk. Ser. 2, 48(2) : 142. 1952. *H. congesta* R. Br. var. *nicoborica* King in Journ. Asiat. Soc. Beng. 72(2) : 161. 1903. *H. argentea* Wall. ex G. Don, Gen. Syst. Gard. Bot. 3 : 526. 1834 (*Type* : Paulo Penang, *Wall. Cat.* 858). (Plate 33a).

Shrubs stout, robust; stem 4 angular, acute or obtuse, glabrous, yellowish-purple on drying. Leaves 6-16 × 1.5-6 cm, oblong, elliptic or linear-lanceolate, acute or acuminate at apex and base, coriaceous, pubescent above towards base and midrib, glabrous underneath; petiole 3-7 (-10) mm, minutely pubescent or glabrescent; stipules 2-4 × 4-10 mm, pinnately lacerate, coriaceous, puberulous. Inflorescence in axillary sub peduncled cymes of 8-15 (-20) flowers. Flowers 4-5 mm long; pedicel 1-2 mm long, glabrous; bracts 1-1.5 mm long, ciliate. Hypanthium ovoid, 0.6-1 mm long; calyx limb very short; lobes 4, 1-1.2 × 0.8-1 mm, ovate or rounded, obtuse, hispid at margin. Corolla white; tube 2-3 mm long, glabrous; lobes 1-1.2 mm long, oblong or linear-lanceolate glabrous. Stamens 4, inserted; filaments 0.2-0.3 mm long, attached below the sinus of corolla lobes; anthers 0.4-0.6 mm long, oblong. Ovary 0.6-1 mm long, ovules 16-20; style about 3 mm long, slender, exerted; stigma 0.5 mm long, slightly swollen, 2-lobed, pubescent. Capsule ellipsoid to ovoid, 3-3.5 × 2-3 mm, glabrous, crown included within calyx lobes, waxy white, subdrupaceous, hard, apparently indehiscent but later divides septicidally, dense raphides present. Seeds 16-20 triangular, 0.5-0.6 × 0.3-0.5 mm, narrowly winged, testa smooth, reticulate, black.

*Fls.* : Throughout the year but more common in June-August. *Frts.* : Throughout the year, but common from September to December.

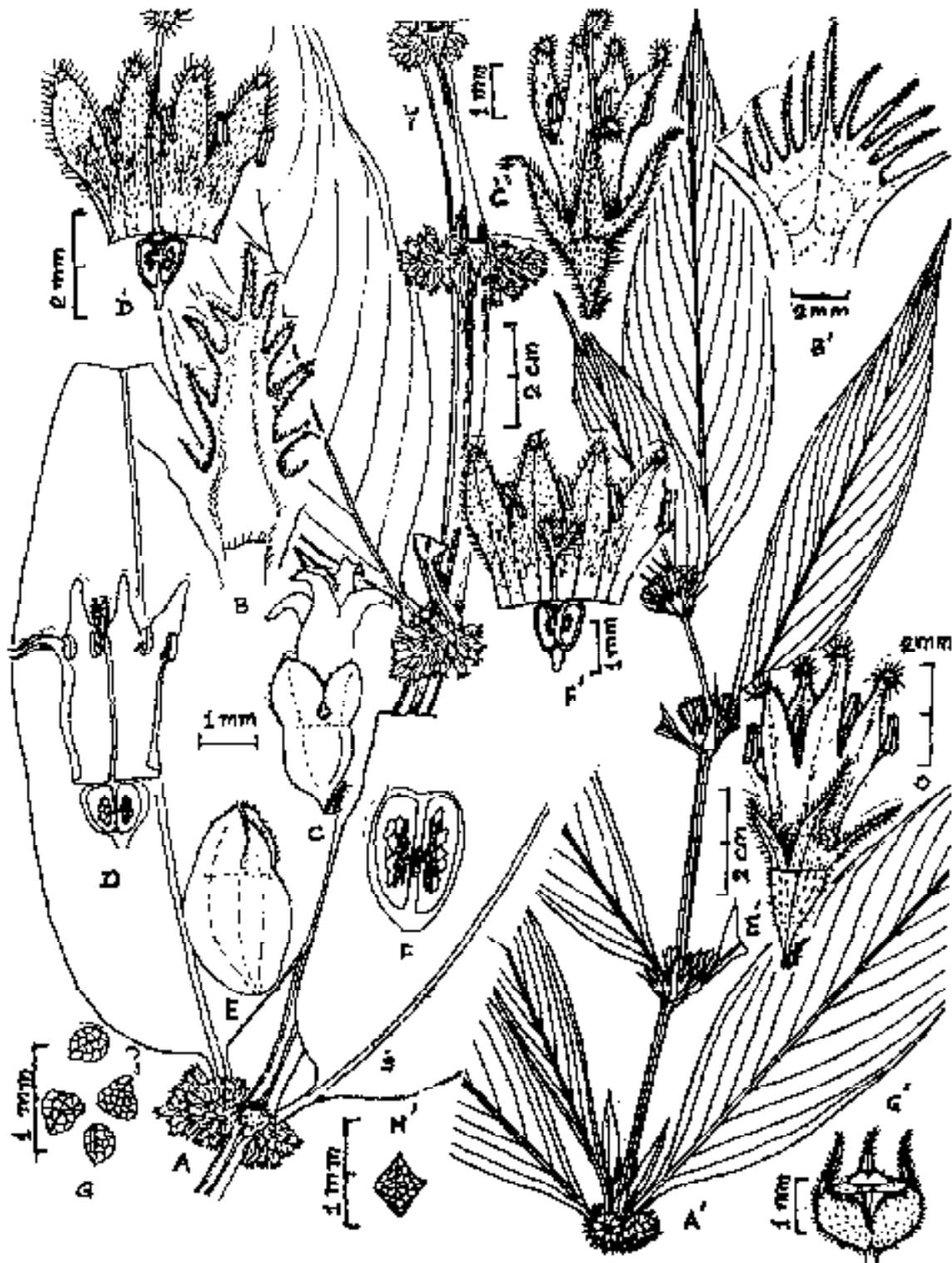


Plate 33a. (A -H) *Hedyotis congesta* R. Br. ex G. Don. : A. habit; B. stipule; C. flower; D. opened flower; E. L.S. of ovary; F. & G. capsule; H. seeds.

Plate 33b. (A' - H') *Hedyotis paradoxa* Kurz : A'. habit; B'. stipule; C'. short-styled flower; D'. opened flower; E'. long-styled flower; F'. opened flower; G'. capsule; H'. seeds.

*Ecology* : Growing in dense bamboo forest, mostly in hilly areas (400-900 m. in alt.) on sandy loamy soil in Andaman Island.

*Uses* : Used in indigenous system of medicine; white fruits are eaten by birds.

*Distrib* : India : Nicobar Islands; Malaysia and Indonesia.

*Note* : King (1903) distinguished the var. *nicobarica* (King 506) for narrowly elliptic-lanceolate leaves, tapering at both ends and cymes few flowered. Leaves are very variable in this species in shape, size and texture; flowers are few in the type sheets (Penang, 1822, *Wall. Cat.* 844). Hence it does not deserve a varietal status. King remarked on herbarium sheet that var. *nicobarica* is probably *H. carnosa* Korthals from Borneo, the type of which has been examined and appears to be different.

*Exsiccata studied* : INDIA : Nicobar Island, Kamorta, *S. Kurz s.n.* (CAL); Nicobar Islands, *King's collector* 506 (CAL); Katchal Island, *P. Chakravorty* 1226 (CAL, BSI & ANC) & 2130 (CAL); Great Nicobar, *P. Chakravorty* 3242 (CAL).

MALAYASIA : Penang, *Wall. Cat.* 844 & 844B (CAL) & *G. King s.n.* (CAL) *Hullett* 193 (CAL) & *C. Cartis* 2846 (CAL), *E. Deschamps s.n.* (BSI, CAL), Singapore, *T. Anderson* 99 (CAL) & *Hullett* 350 (CAL). Malaya, *A.C. Maingay s.n.* (K.D.No. 888 & 889) (CAL); Malacca, *Griffith* 74, (K.D. No. 2890) (CAL); Bukil, Bingarang, *King's collector* 295 (CAL); Goping, *King's collector* 520 (CAL & BSI); Perak, *King's collector* 5535 (CAL), *B. Scortechini* 564 (CAL); *King's collector* 11018 (CAL), *L. Wray* 825 (CAL) & 3982 (CAL); Thaijung, *B. Scortechini* 78 (CAL); Ophir, *Hullett* 784 (CAL); Johar, Gunang, *N. Natine* 3626 (CAL).

BORNEO, *R.W. Hullett* 319 (CAL); Bongaya, *R.W. Hullett* 9078 (CAL).

39. *H. paradoxa* Kurz in Journ. Asiat. Soc. Beng. 45 (2) : 135. 1876 (*Type* : South Andaman, *Jelinek* 225 holo. CAL); Hook. f. Fl. Brit. Ind. 3 : 59. 1880; Chakravorty in Bull. Bot. Surv. Ind. 21: 9. 1979. *Scleromitrium paradoxum* (Kurz) Kurz in Journ. Asiat. Soc. Beng. 46 (2) : 137. 1877. *Oldenlandia paradoxa* (Kurz) O. Ktze. Rev. Gen. Pl. 1 : 292. 1891. *Exallage paradoxa* (Kurz) Bremek. in Verh. Kon. Nederl. Akad. Wet. Afd. Natuurk. Ser. 2, 48 (2) : 142. 1952 (Plate 33 b).

Herbs erect or creeping or undershrubs; stem about 1 m long, usually robust, obtusely angular, compressed or terete, hispid, hispidulous or glabrous. Leaves 10-19 × 1.5-3.5 cm, linear-lanceolate, oblanceolate, coriaceous, narrowed at both ends or abruptly narrowed above, and below to short petiole, glabrous above, pale green, glossy beneath, glabrous to puberulous along the nerves; lateral nerves 8 pairs, subopposite, very faint; petiole 1-2 mm long, usually winged, hispidulous to hispid; stipules connate at base, 2-4 × 1-2 mm, truncate, with 6-8 erect bristles, 5-8 mm long, hispid. Inflorescence axillary, dense flowered, capitate cyme, 0.8-1 cm across. Flowers 4-5 mm long; pedicel 0.5-1 mm long; bracts 0.5-1 mm long, shortly pectinate. Hypanthium ovoid, obtusely angular, 0.5-1 mm long, sparsely hispid; calyx limb short, 0.2-0.3 mm long; lobes 4, 1-1.5 mm long, triangular-lanceolate with interposed gland tipped subulate teeth, hispid. Corolla white, sparsely pubescent outside; tube



1-1.5 mm long, pubescent on throat; lobes 4, 1.5-2 mm long, oblong, minute pubescent inside, apex incurved with spinous appendage. Stamens 4, exerted; filaments 1-1.5 mm long, adnate to sinus of corolla lobes; anthers 1-1.2 mm long, narrowly oblong, minute pubescent along margin. Ovary 0.3- 0.8 mm long, ovules few to many; style 1-4 mm long, inserted or exerted; stigma bilobed, 0.2-0.3 mm or 0.5-1 mm, subglobose or linear, papillose. Capsule 2-3 × 1-2 mm, globose or subglobose, truncate above, broader at base, crustaceous or hard, muricated, hispid, apparently indehiscent but there is a groove on the crown which opens by a small slit. Seeds few, angular, 0.3-0.5 × 0.2-0.3 mm, exotesta smooth, reticulate.

*Fls.* : July - September; *Frts.* : November - December.

*Ecology* : Sandy or moist loamy or lime soil on hill slopes or Bamboo forest, up to 200 m in alt.

*Distrib.* : India : Andaman & Nicobar Islands; Myanmar.

*Note* : Kurz (1876 & 1877) described the plant as shortly hispid but his type sheet "Zelinek 225" at CAL shows that stem is almost glabrous and leaves are variable from linear-lanceolate to oblanceolate.

Both hispid and glabrous collections are critically examined. Leave are usually oblanceolate in hispid ones. King noted on some herbarium sheets as var.  $\beta$  for hispid stem and oblanceolate leaves. There is no clear line of distinction by which it can be separated.

*Exsiccata studied* : INDIA : Andaman & Nicobar Islands : South Andaman, Hope town, Kurz *s.n.* (CAL); St. Monat, Kurz *s.n.* (CAL); North Corbyn's Cone, King *s.n.* (CAL); Namoonaagar, G. King *s.n.* (CAL); South Andaman, Prain 57 (CAL) & K. Thothathri 9060 (CAL); Mount Harriet, N.P. Balakrishnan 1369 (CAL); Herbartabad, N.P. Balakrishnan 672 (CAL) & N.C. Nair 3175 (CAL). Middle Andaman, Polobjig, N.Bhargava 1720 (CAL). South Nicobar, P. Chakravarty 3215 (CAL), N.P. Balakrishnan 4051 (CAL) & D. K. Hore 6767 (CAL). Great Nicobar, N. P. Balakrishnan 3822 (CAL); N.G. Nair 6259 (CAL); Rangal, N. Bhargava 6316 (CAL).

40. *H. auricularia* L. Sp. Pl. 101, 1753 (*Type* : Sri Lanka, Linn. 123.2 LINN microfischel!); DC. Prodr. 4 : 420, 1830; Walp. Rep. 2 : 497, 1843; Hook. f.Fl. Brit. Ind. 3 : 58, 1880 (Plate 34a).

Herbs with woody root-stock, adventitious roots at nodes; stem about 1 m long, deep violet, procumbent, spreading loosely, sparse to densely pubescent along the grooves or puberulous throughout. Leaves sessile or subsessile, 1-10 × 1-3.5 cm, ovate-lanceolate, elliptic-lanceolate or lanceolate, acute at apex, cuneate or rounded at base, plaited above, membranous, scabrid above along the margin, pubescent near leaf base and along nerves beneath; nerves 3-7 pairs, subopposite, channelled above; petiole 1-2 mm long, pubescent; stipules connate, 2-3 mm broad, with 2-5 pilose or 6-7 puberulous bristles, 2-8 mm long. Inflorescence subsessile or shortly peduncled, axillary dense flowered cymes, 1-1.4 cm across. Flowers 3-4 mm long, minutely pubescent outside, heterostylous; pedicel 0.5-1 mm long; bracts minutely

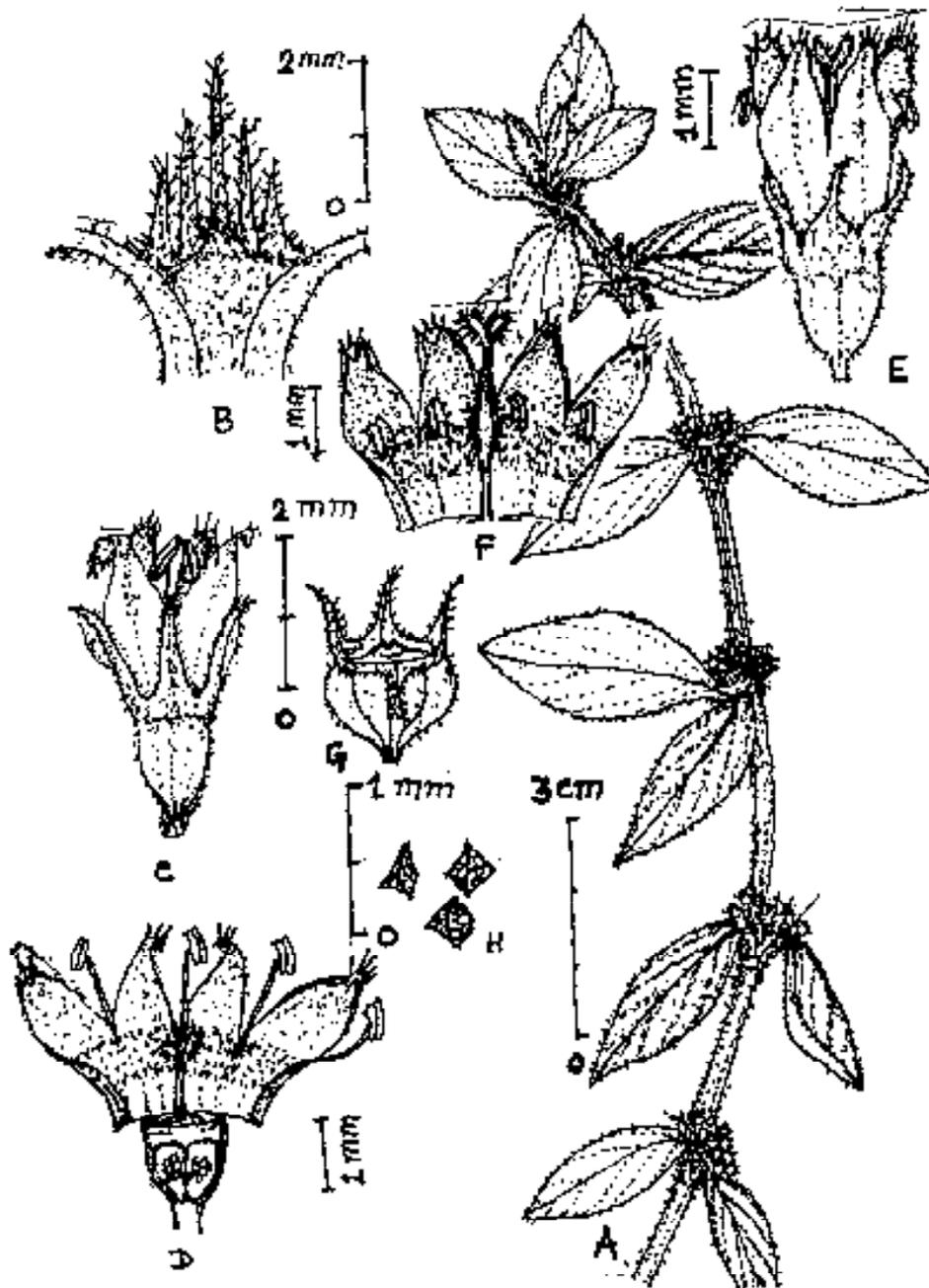


Plate 34a. (A - H) *Hedyotis auricularia* L. : A. habit; B. stipule; C. short-styled flower; D. opened flower; E. long-styled flower; F. open flower; G. capsule; H. seed.

pectinate, 0.7-1 mm long. Hypanthium ovoid, 0.8-1 mm long, sparsely pubescent. Calyx limb very short, 0.2-0.3 mm long; lobes 4 or 5, triangular-lanceolate, 0.8-1 mm long, ciliate along the margin. Corolla white, creamy or greenish yellow; tube 1-1.5 mm long densely pubescent inside around the style; lobes ovate-oblong, 1-1.5 mm long, incurved, with spinous appendages at apex, minutely pubescent inside. Stamens 4, inserted or exserted; filaments 0.3-0.5 mm or 1-1.5 mm long, adnate to sinus of the corolla lobes; anthers 0.5-1 mm long, oblong. Ovary 0.5-0.8 mm long, ovules many; style 0.3-0.5 mm or 2-3 mm long, inserted or exserted; usually longer one swollen in the middle, pubescent; stigma 0.3-0.5 mm long, bilobed, fleshy, pubescent. Capsule 2-2.5 × 1-2 mm, globose, broader at base, top truncate with persistent base of style, pale brown, crustaceous, muricated, minute or densely pubescent. Seeds 16-20, 0.3-0.5 mm long, angular, exotesta black, reticulate.

#### KEY TO THE SUBSPECIES

- 1a. Leaves ovate to ovate-lanceolate; nerves 3-4 pairs;  
stipules with 3-5 pilose bristles ... subsp. *auricularia*
- 1b. Leaves lanceolate, tapering, acute at both ends;  
nerves 5-7 pairs; stipules with 6-7 puberulous  
bristles ... subsp. *venosa*

#### 40a. *H. auricularia* L. subsp. *auricularia*.

L.Sp. Pl. 101. 1753, DC. Prodr. 4 : 420. 1830, p.p.; Wt. & Arn. Prodr. 412. 1834; Bedd. Icon. Pl. Ind. Or. t. 27. 1874; Hook. f. Fl. Brit. Ind. 3 : 58. 1880, p.p.; Trimen, Handb. Fl. Ceylon 2 : 313. 1894; Rama Rao, Fl. Pl. Travancore 204. 1914; Alston, Fl. Kandy 51. 1938; Manilal & Sivarajan, Fl. Calicut 140. 1982. *Oldenlandia auricularia* (L.) K. Schum. in Engl. & Prantl, Pflanzenfam. 4 (4) : 25. 1891; Gamble, Fl. Pres. Madras 597. 1921; Raghavan *et al.* in Rec. Bot. Surv. Ind. 21 : 42. 1981. *Exallage auricularia* (L.) Bremek. in Verh. Kon. Nederl. Akad. Wet. Ago. Natuuak. Ser. 2, 48 (2) : 142. 1952 (excl. syn. *Metabolos venosus* Bl.). *H. lineata* Wall. Cat. 6198.

Stem acutely angular, compressed, pubescent along the grooves near nodes. Leaves sessile or subsessile, 1-10 × 0.5-3.5 cm, ovate to ovate-lanceolate, acute at apex, cuneate or rounded at base, glabrous or scabridulous near the margin above, pubescent along nerves beneath; nerves 3-4 pairs; stipules membranous, with 3-5 bristles, pilose.

*Fls.* : June - December; *Frts.* : August - March.

*Local name* : 'Getu-kola' in Sri Lanka.

*Uses* : The plant is medicinal. The bruished leaves mixed with butter, are used to bring abscesses to maturity.

*Ecology* : In open forest, rocky slopes, red laterite or rocky moist soil or coarse

marshy wet soil, along the shades of trees or on hill slopes at 90-1016 m alt. in rainfall of about 2000 mm.

*Distrib.* : India: Orissa, Madhya Pradesh, Goa, Maharashtra, Andhra Pradesh, Karnataka, Kerala, Tamil Nadu, Sri Lanka.

*Exsiccata studied* : INDIA : Orissa Jeypore Estate, *H. F. Mooney* 3915 (DD); Dedhari, *A.R.K. Sastry* 29880 (ASSAM). Madhya Pradesh : Bagmandle, *R. K. Arora* 55288 (BSI); Bastar, *G. Panigrahi* 1180 (BSA). Goa : Margon, *R.S. Rao* 84493 (BSI); Butpal, *R.S. Rao* 84675 (BSI); Budsai, Goundugarha, *R.S. Rao* 84591 (BSI); Curti village, *K.C. Kanodia* 89641 (BSI); Varkin, *K.C. Kanodia* 89560 (BSI); Valpai, *K.C. Kanodia* 88345 (BSI); Ordford forests, *R.S. Rao* 103496 & *K. C. Kanodia* 89498 (BSI). Chimbhel, *R.S. Rao* 92824 (BSI). Jamen, *N.P. Singh* 124606 (BSI); Caranzal, *N.P. Singh* 12486 (BSI); Bati, *N.P. Singh* 125181 (BSI) *Chansuriaghata*, *N. P. Singh* 125276 (BSI); Nondrona, *N. P. Singh* 12479 (BSI). Maharashtra : Castle Rock, *A. Meebold* 9944 (CAL), *H. Santapau* 17649 (BLAT); & *MRA* 341 (BLAT); Gund Chinchkhanda, *J. Fernandez* 1494 (BLAT); Paderu, *S. K. Wagh s. n.* (BLAT); Forest at Chiplun Road, *J. A. Varavada s. n.* (BLAT); Talacomery, *A. S. Rao* 85782 (BSI); Bhagamandala, *A. S. Rao* 95228 (BSI); Andhra Pradesh : Godavari dist. Suhmamri hills, *J. S. Gamble s. n.* (CAL) ; Kota, *V. Narayanaswami* 529 (CAL); Maredumilli, *G. V. S. Rao* 24203 (MH). Karnataka : Ind. Or. (Kanara). *R. F. Hohenacker s. n.* (E); North Kanara, *Talbot* 724 (DD) & *C. A. Barber* 2224 (MH); Malahalla, *S. D. Mahajan* 1653 (BSI); Kalagal, *G. S. Puri* 1942 (BSI); Jog falls, *S. K. Jain* 24581 (BSI); Bisle forest, *S.D. Mahajan* 1990 (BSI); Mercara, Coorg, *G.S. Puri* 45828 (BSI) & *R.K. Arora* 46274A (BSI) Hassan, Bisleghat, *S.D. Mahajan* 34775 (BSI); Venakeabbi Agumbi, *R.S. Rao* 62539 (CAL); South Kanara, *C. Saldanha* 5879 (BLAT); Charmadighat, *C. Saldanha* 6270 (BLAT); Bethamgady, *C. Saldanha* 6476 (BLAT); Charmadi ghat, *C. Saldanha* 6270 (BLAT) ; Bethamgady, *C. Saldanha* 6476 (BLAT); Mercara, *A.S. Rao* 74406 (BSI). Shimoga dist. Varahi, *R.S. Rao* 80787 (CAL); Hulical, *R.S. Rao* 90229 (CAL); Bagmandala, *A.S. Rao* 85882 (BSI). Kerala : Travancore, *M.A. Lawson s.n.* (MH), *Gamble* 14689 (CAL) & *C.C. Calder & Ramaswami* 47 & 860 (CAL); Quilon, *A. Meebold* 12776 (CAL) & *M. Rama Rao* 2215 (CAL); Kumarampur, *M. Chandrabose* 49005 (CAL). Muthanga, *C.E. Fischer* 4509 (CAL). Kerala, *Sethi & Negi* 25768 (DD) & *G.S. Puri* 15021 (BSI); Pamsade, *G.S. Puri* 15246 (BSI); Puthupalli, *G.S. Puri* 36571A (BSI); Edamon, *J.A. Vasudeva* 37072 (BSI); Trivandrum, *R.S. Rao* 61359 (BSI); Kallada Valley, *K.C. Kanodia* 63026, 63256 (BSI); Tenmalai, *K.N. Subramaniam* 70869 (BSI); Trichur dist, Kannankuzhi, *K. Ramamurthy* 98457 (CAL); Trivandrum dist, Vithura, *M. Mohanan* 58524 (CAL); Palghat dist, Mudimarathode, *V.J. Nair* 67411 (CAL); Panthanthode, *N.C. Nair* 56860 (CAL).

40b. *H. auricularia* L. subsp. *venosa* (Bl.) Deb, Fl. Tripura 2 : 52. 1983. *Metabolos venosus* Bl. Bijdr. 991. 1826 (Type : Buitenzorg *Blume s.n.* L). *H. venosa* (Bl.) Korthals in Nederl. Kruidk. Arch. Ser. 2 : 160, 1951; Craib, Fl. Siam. Enum. 2 : 50. 1932. *H. auricularia auct.* Plur. p.p. *non* L; Roxb. F. Ind. 1 : 370.1820; DC. Prodr. 4 : 420. 1830, p.p.; Benth. Fl. Hongk. 149. 1861; Kurz in Journ. Asiat. Soc. Beng. 46(2) : 135.1877; Hook. f. Fl. Brit. Ind. 3 : 58. 1880, p.p., King &

Gamble in Journ. Asiat. Soc. Beng. 72(2) : 163. 1903; Prain, Beng. Pl. 557. 1903; Ridley, Fl. Malay Penin. 2 : 49. 1923; Merr. Enum. Philip. Fl. Pl. 3 : 595. 1923; Kitamura in Kihara, Fauna & Fl. Nep. Himal. 1 : 229. 1953; Bakh. f. in Backer & Bakh. f. Fl. Java 2 : 87. 1965; Hara in Hara & Williams, Enum. Fl. Pl. Nepal. Pl. 2 : 202. 1979; Balakr. Fl. Jowai 1 : 246. 1981; *Oldenlandia auricularia* F. Muell. Census 74. 1882; Elmer, Leaf. Philip. Bot. 1 : 20. 1906; O. Ktze. Rev. Gen. Pl. 1 : 291. 1891 (excl. var. *fulva* & var. *barta*); Rao & Rabha in Bull. Bot. Surv. Ind, 8 : 300. 1966; Kar & Panigrahi in Bull. Bot. Surv. Ind 5 : 229. 1963. *H. costata* R.Br. ex G. Don, Gen. Syst. Gard. Bot. 3 : 526. 1834, non Kurz 1877 (Type : Penang, Wall. Cat. 849; Sylhet, Wall. Cat. 849B.K-W, CAL. iso!). *H. auricularia* L. var. *nervosa* Smith in Rees Cycl. 17. 1811. *H. nervosa* Wall. Cat. 857. 1929, nom. nud. *H. procumbens* Wall. Cat. 861. 1829, nom. nud.

Stem obtusely angular to terete, compressed, grooved, sparse to dense puberulous all over. Leaves sessile or subsessile, 1.5-8 × 0.3-2 cm, lanceolate, tapering at both ends, scabrid above, puberulous below along the nerves; lateral nerves 5-7 on either side of the midrib; stipules membranous, 6-7 puberulous to hispid.

*Fls.* : August-January; *Frs.* : September - February.

*Ecology* : Open rocky places along roadside, and moist clayey soil at alt. 60-1524 m.

*Distrib.* : India : West Bengal, Assam, Meghalaya, Tripura, Bangladesh, Myanmar, Malaysia and Philippines.

*Exsiccata studied* : INDIA : West Bengal : Kalimpong, T. Ripley s.n. (CAL). Assam : Mergareta, D. Prain s.n. (DD); Tangali, D. Prain s.n. (CAL); Upper Dihing Reserve forest, G. Panigrahi 18886 (ASSAM); Goalpara, A.S. Rao 39111 (ASSAM); Kamrup, A.S. Rao 38883 (ASSAM). Meghalaya : Khasia, Griffith K.D. No. 2891 & G. King s.n. (CAL); Cherra, C.B. Clarke 7440 (CAL) & G. Gallaty 1878 (CAL); Mawmye, T. Anderson s.n. (CAL); Mungpo, C.B. Clarke 37232 (CAL); Shillong, C.B. Clarke 44537 (CAL); Jorain, N.P. Balakrishnan 42646 (ASSAM). Tripura : Radhakishorepore, R.S. Rao 8942 (BSA). Sikkim : Sikkim, Terai, C.B. Clarke 36957 (CAL). Tista, C.H. Cane s.n. (E).

BANGLADESH : Sylhet, De Silva s.n. (CAL). Lawachera, R.N. De 18821 (ASSAM); Chittagong, D. Arora 25908 (BSIS).

MYANMAR : Upper Burma, Madoc Hills, G. King 130 (CAL); S. Shan State, R.W. Mac Gregor 732 (CAL); Tenasserim, A. Ahmedali s.n. (CAL).

MALAYSIA : Malaya, A.C. Maingay 3369 (CAL); Perak, Scortechini s.n. (CAL) & L. Wray 3055 & 3087 (CAL).

MALESIAN ISLANDS : Singapore, T. Anderson 93 (CAL); HCR 2863 (CAL) & E.J.H. Corner 25909 (CAL); Sezawak, R.W. Hullell 267 (CAL).

PHILIPPINES : Luzon, M. Ramos 21710 (CAL).

41. *H. insularis* (Spreng.) Deb & Dutta in Taxon 32 (2) : 285. 1983. *Spermacoce insularis* Spreng. Syst. 1 : 404. 1825. *S. glabra* Roxb. (Hort. Beng. 83. 1814, *nom. nud.*) & Fl. Ind. 1 : 372. 1820, *non* Michaux 1803 (Type : Paulopenang, Wall. Cat. 848. K-W!; iso, CAL!). *Hedyotis glabra* R. Br. ex Wall. Cat. 848. 1828 (based on *Spermacoce glabra* Roxb.); Miq. Fl. Ind. Bat. 2 : 183. 1857; Hook. f. Fl. Brit. Ind. 3 : 58. 1880; Kurz in Journ. Asiat. Soc. Beng. 46(2) : 135. 1877; Prain, Beng. Pl. 557. 1903; King & Gamble in Journ. Asiat. Soc. Beng. 72(2) : 160. 1903. Ridley, Fl. Malay Penin. 2 : 48. 1923; Craib, Fl. Siam. Enum. 2 : 41. 1932; Kar & Panigrahi in Bull. Bot. Surv. Ind. 5 : 229. 1963; Balakr. Fl. Jowai 1 : 246. 1981, Deb, Fl. Tripura 2 : 56. 1983. *Oldenlandia glabra* (Wall.) O. Ktze. Rev. Gen. Pl. 1 : 292. 1891. *Exallage glabra* (Roxb.) Bremek. in Verh. Kon. Nederl. Akad. Wet. Afd. Natuurk. Ser. 2, 48 (2) : 142. 1952. (Plate 35a).

Herbs decumbent; branches 60-100 cm long, slender, obtusely angular or terete, glabrous or pubescent on the grooves or all over (in Burmese material), nodes swollen. Leaves 2-11 × 0.5-3.5 cm, ovate-lanceolate or linear-lanceolate, caudate acuminate at apex, narrowed at base, plaited, glabrous, glossy above, glabrous or finely pubescent underneath along the nerves; lateral nerves subopposite, 5-7 pairs, very oblique; petiole 1-2 mm long; stipules connate at base, 2-3 mm broad, triangular, with 3 long teeth, 5-9 mm long; sheath pubescent. Inflorescence axillary, corymbose or rarely umbellate cymes, puberulous; peduncle filiform, 1-1.5 mm long. Flowers small, 2.5-3 mm long; pedicel 1-2 mm long; bracts linear, 2-4 mm long. Hypanthium 0.3-0.6 mm long, globose; calyx limb very short; lobes 4, 0.3-0.3 mm long, ovate, acute ciliate along the margin. Corolla bell shaped, white; tube 0.8-1 mm long, densely pubescent inside; lobes 0.5-1 mm long, oblong, obtuse, puberulous inside. Stamens 4, exserted, filaments 0.8-1 mm long; anther oblong, 0.3-0.5 mm long. Ovary 0.3-0.5 mm long, ovules many; style 1-3 mm long, inserted or exserted; usually swollen above, pubescent; stigma bilobed, 0.3-0.5 mm long, oblong, papillose. Capsule 1-1.5 × 1-1.5 mm, very small, globose, hard, muricated, minute pubescent, top truncate, with spreading campanulate calyx lobes, apparently indehiscent but later on small slit appears on the groove through which seeds are released. Seeds 6-8, 0.3-0.5 × 0.5 mm, angular, narrowly winged, black, exotesta reticulate.

Fls. : April - August; Frts. : September - February.

*Ecology* : Grows on clayey loam or rich soil in shaded places up to an altitude of 1200 m.

*Distrib.* : India : Assam, Meghalaya, Manipur, Mizoram; Bangladesh; Myanmar; Thailand; Malaysia.

*Exsiccata studied* : INDIA : Assam : Kamrup, G. Manu 791 (CAL); Assam, U. N. Kanjilal 6319 (CAL). Meghalaya : Khasi, C. B. Clarke 42968 (CAL) & U. N. Kanjilal 6319 (ASSAM, DD); Tura, D. B. Deb 28997 (ASSAM); Shillong, U. Chatterjee & N. C. Saha 13655 (CAL). Mizoram : Aijaul, Godfrey 550 (CAL). Manipur : Itong, A. Meebold 6082 (BSI). Andaman : W. Helfer 2885 (CAL).

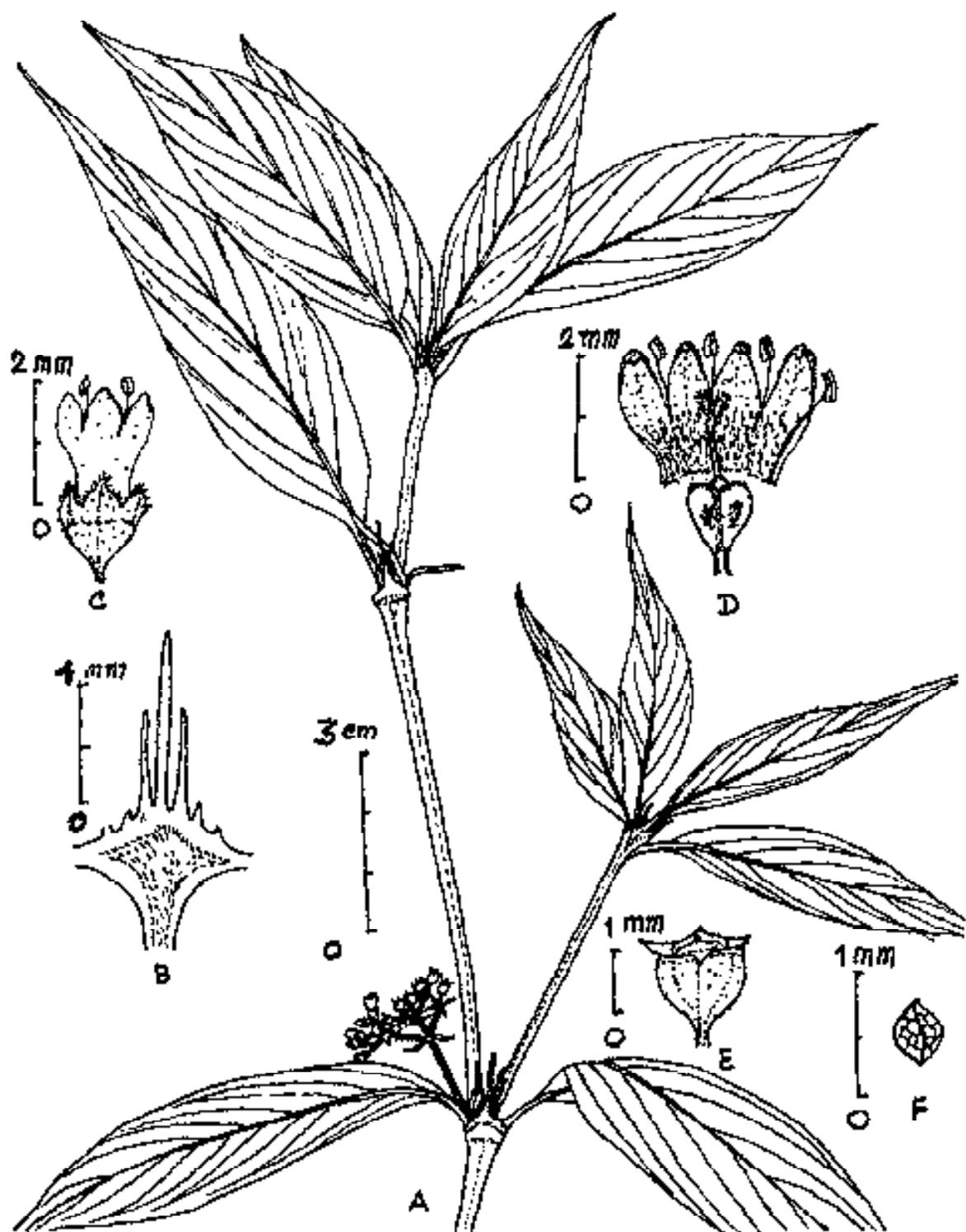


Plate 35a. (A - F) *Hedyotis insularis* (Spreng.) Deb & Dutta : A. habit; B. stipule; C. flower; D. opened flower; E. capsule; F. seed.

BANGLADESH : Chittagong, *J. L. Lister* 352; Sylhet, *W. Gomez* 259 ex *Wall. Cat.* 848 (K, CAL) & *De Silva s. n.* (CAL).

MYANMAR : Ruby mine, Nogok Plain, *A. Rodger* 158 (CAL).

MALAYSIA : Pinang, *G. King* 1370 & s. n. (CAL); & Paulo-Penang, *H. Br.* 3749 (CAL).

THAILAND : Kab Yaw, Collector ? (CAL).

42. *H. lineata* Roxb. Hort. Beng. 10, 1814, *nom. nud.* & Fl. Ind. 1 : 369, 1820 (*Type* : Chittagong, 1810, *J. Roxb. s. n.*); DC. Prodr. 4 : 420, 1830; Hook. f. Fl. Brit. Ind. 3 : 59, 1880; Clarke in Journ. Linn. Soc. 25 : 30, 1889; Prain, Beng. Pl. 557, 1903; Kar & Panigrahi in Bull. Bot. Surv. Ind. 5 : 230, 1963; Yamazaki in Hara, Fl. E. Himal. 309, 1966; Hara in Hara & Williams, Enum. Fl. Pl. Nepal 2 : 202, 1979; Deb, Fl. Tripura State 1 : 56, 1983. *H. ulmifolia* Wall. in Roxb. Fl. Ind. 1 : 370, 1820 (*Type* : Nepal, *Gardner s. n.* K); DC. Prodr. 4 : 421, 1830; Walp. Rep. 2 : 497, 1843; Kurz in Journ. Asiat. Soc. Beng. 46(2) : 135, 1877. *H. lineata* D. Don, Prodr. Fl. Nepal 135, 1825 (*Type* : Goalpara, l. 5, 1808, *Hamilton s. n.* ex *Wall. Cat.* 862 B. K-W! photo (CAL!)). *Oldenlandia lineata* (Roxb.) O. Ktze. Rev. Gen. Pl. 1 : 292, 1891. *Exallage ulmifolia* (Wall.) Bremek. in Vern. Kon. Nederl. Akad. Wet. Afd. Natuurk. Ser. 2, 48(2) : 142, 1952. (Plate 36).

Herbs annual or perennial from a long woody yellowish root stock; branches about 90 cm long, erect to decumbent; terete or obtusely angular, compressed, dense yellowish pubescent all over, more so on young branches. Leaves 5-9.5 × 1.5-3.5 cm, ovate-lanceolate, acute at apex, narrowed at base to petiole, plaited, membranous, scabrid at margin, pubescent above and along nerves beneath; nerves 6-7 pairs, subopposite, strong, deeply grooved above; petiole 1-2 mm, slightly channelled, pubescent; stipules cupular, 2-3 mm long, membranous, pubescent, with 1-5 long cilia, 4-8 mm long. Inflorescence axillary, loose cymes, densely pubescent; peduncles 1-1.5 cm long, several at each axil, usually trichotomously branched. Flowers 3-4 mm long; bracts subulate, 1-2 mm long; pedicel 1.5-2 mm long. Hypanthium globose, 0.8-1 mm long; calyx limb very short; lobes 4, often with 2-4 accessory teeth, 1-1.5 mm long, lanceolate. Corolla 2.5-3 mm long, white, sparsely pubescent outside; tube 1-1.5 mm long, glabrous inside below, pubescent at throat; lobes 1-1.5 mm long, lanceolate, acute, incurved with spinous appendages at apex outside, minute pubescent inside, densely pubescent below. Stamens 4, exserted or nearly so; filaments 6.5-1 mm long, adnate to sinus of corolla lobes; anthers 0.5-0.8 mm long, narrowly oblong. Ovary 0.8-1 mm long; ovules on submedian placenta; style 2-2.5 mm long, pubescent; stigma bilobed, 0.3-0.5 mm long, subglobose, papillose. Seeds about 36-40, angular, 0.8-1 × 0.8-1 mm, brownish or black, exotesta reticulate.

*Fls.* : May July; *Frts.* : June October.

*Ecology* : In loamy humus covered moist soil amidst grasses and sedges at alt. 1000-1500 m.



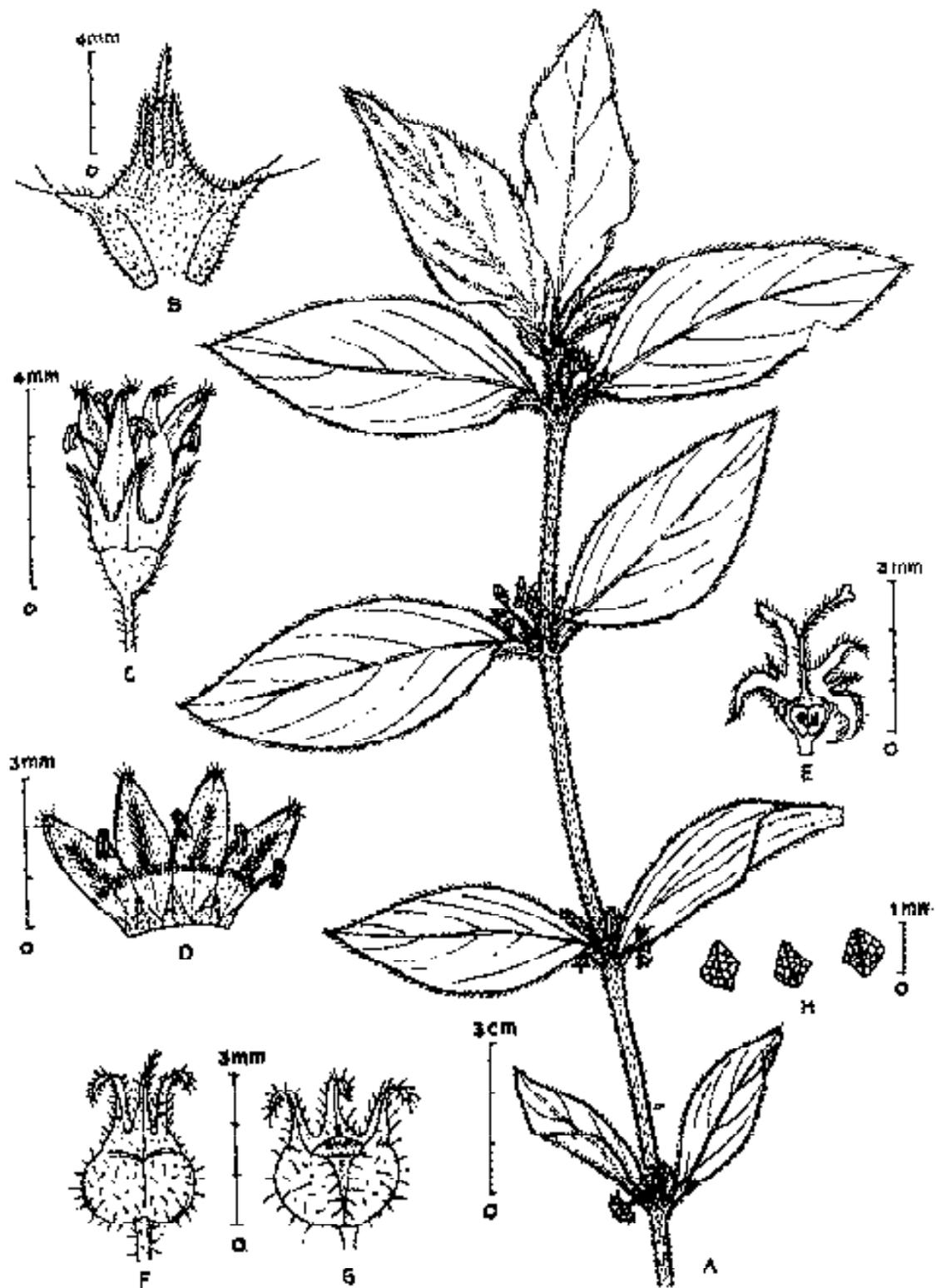


Plate 36. (A - H) *Hedyotis lineata* Roxb. : A. habit; B. stipule; C. long-styled flower; D. corolla split open; E. L. S. of ovary with style and stigma; F. & G. capsule; H. seeds.

*Distrib.* : India : Uttar Pradesh, West Bengal, Assam, Meghalaya, Nagaland, Tripura, Sikkim; Nepal; Myanmar; Bangladesh.

*Exsiccata studied* : INDIA : Uttar Pradesh : Kumaon, *D. D. Awasthi* 1553 (DD), West Bengal : Singhbhum, *H. H. Haines* 753 (CAL, DD); Jalpaiguri, *H. Burkill* 29006 (BSIS). Assam : Goalpara, *Hamilton s. n.* (E); lower Assam, *G. Mann* 353(DD) & *Jenkins s. n.* (DD); Sibsagar, *C. B. Clarke* 38061 (CAL) & *King s. n.* (CAL); *A. C. Chatterjee s. n.* (CAL); Kulsi R. F., *G. Panigrahi* 9655 (ASSAM); Bagchong, *B. N. Saikia s. n.* (ASSAM); Dergaon, *G. Panigrahi* 21524 (ASSAM); Kaziranga, *D. B. Deb* 34904 (ASSAM); Kamrup dist. Singra, *A. S. Rao* 39182 (ASSAM); Rajapara, *A. S. Rao* 38875 (ASSAM). Meghalaya : Khasi hills, *G. Mann* 353 (CAL); Mausmai, *Burkill* 230 (CAL). Nagaland : Kohima, *C. B. Clarke* 4750 (CAL), *D. Prain s. n.* (BSIS, CAL); *G. Watt* 11638 (BSIS, CAL) & *G. K. Deka* 13127 (ASSAM). Tripura : Agartala, *P. M. Debbarman* 882 (CAL); Bisalgarh, *R. S. Rao* 8835 (CAL); Chandrapur, *R. S. Rao* 8979 (ASSAM); Shekerkut, *D. B. Deb* 1006 (DD). Sikkim, *Griffith K. D.* No. 2889 & *Kurz s. n.* (CAL).

NEPAL : Nepal, *Wall. Cat.* 862 (CAL); Nagarjini, *B. D. Pande* 802 (DD); Gokarna, *R. Thapa & P. Pradhan* 6413 (CAL).

BANGLADESH : Silhet, *J. D. Hooker & T. Thomson s. n.* (CAL).

MYANMAR : Maymyo, *Badal Khan* 113 (BSI, CAL) & *J. H. Luce* 3207 (CAL); Kachin Hills, *Shaik Mokim* 80 (CAL, BSI); Katha, *A. Rodger* 66 (CAL).

43. *H. vestita* R. Br. ex G. Don, *Gen. Syst. Gard. Bot.* 3 : 527. 1834 (*Type* : Penang, 1822, *Wall. Cat.* 847A. CAL!); *Walp. Rep.* 2 : 497. 1843; *Hook. f. Fl. Brit. Ind.* 3 : 58. 1880; *Clarke in Journ. Linn. Soc.* 25 : 30. 1889; *King & Gamble in Journ. Asiat. Soc. Beng.* 72(2) : 159. 1903; *Haines, Bot. Bih. Or.* 444. 1922; *Ridley, Fl. Malay Penin.* 2 : 49. 1923; *Fischer in Rec. Bot. Surv. Ind.* 5 : 229. 1963; *Rao & Rabha in Bull. Bot. Surv. Ind.* 8 : 300. 1966; *Paul & Aslam in Bangladesh Journ. Bot.* 3 : 103. 1974; *Raizada & Saxena, Fl. Mussourie* 1 : 314. 1978; *Balakr. Fl. Jowai* 1 : 246. 1981. *H. costata* (Roxb.) *Kurz in Journ. Asiat. Soc. Beng.* 46 (2) : 135. 1877, *non* G. Don. 1834; *Walp. Rep.* 2 : 497. 1843; *Merr. Enum. Philip. Fl. Pl.* 3 : 497. 1923; *Jain & Hazra in Bull. Bot. Surv. Ind.* 17 : 82. 1975; *Deb, Fl. Tripura State* 2 : 54. 1983. *Spermacoce costata* *Roxb. Hort. Beng.* 10. 1814 & *Fl. Ind.* 1 : 376. 1820 (*Type* : Moluccas, [cultivated in Bot. Gard. Calcutta], *Roxb. s. n.*; *Roxb. Icon* 1334 CAL!); *Metabolos lineatus* *Berl. ex DC. Prodr.* 4 : 435. 1830 (*Type* : Mexico, *Haenke s. n.* PR.) *M. coeruleus* *Bl. Bijdr.* 993. 1826; (*Type* : Buitenzorg, Java, *Blume s. n.* L.). *H. coerulea* (Bl.) *Korthals in Nederl. Kruidk. Arch.* 11, 2 : 160. 1851, *non* L., *nec* *Wt. & Arn.* 1834. *H. capituliflora* *Miq. Fl. Ind. Bat.* 2 : 183. 1857 (*Type* : Buitenzorg, Java, *Blume s. n.* L.). *Exallage costata* (Roxb.) *Bremek. in Verh. Kon. Nederl. Acad. Natuurfk. Ser. 2,* 48(2) : 142. 1952. *Oldenlandia coerulea* (Bl.) *O. Ktze Rev. Gen. Pl.* 1 : 292. 1981. (Plate 35b).

Herbs annual or perennial from a long woody rootstock, stem stout, 1 m long, procumbent, decumbent or prostrate, obtusely angular, grooved, sparse to densely

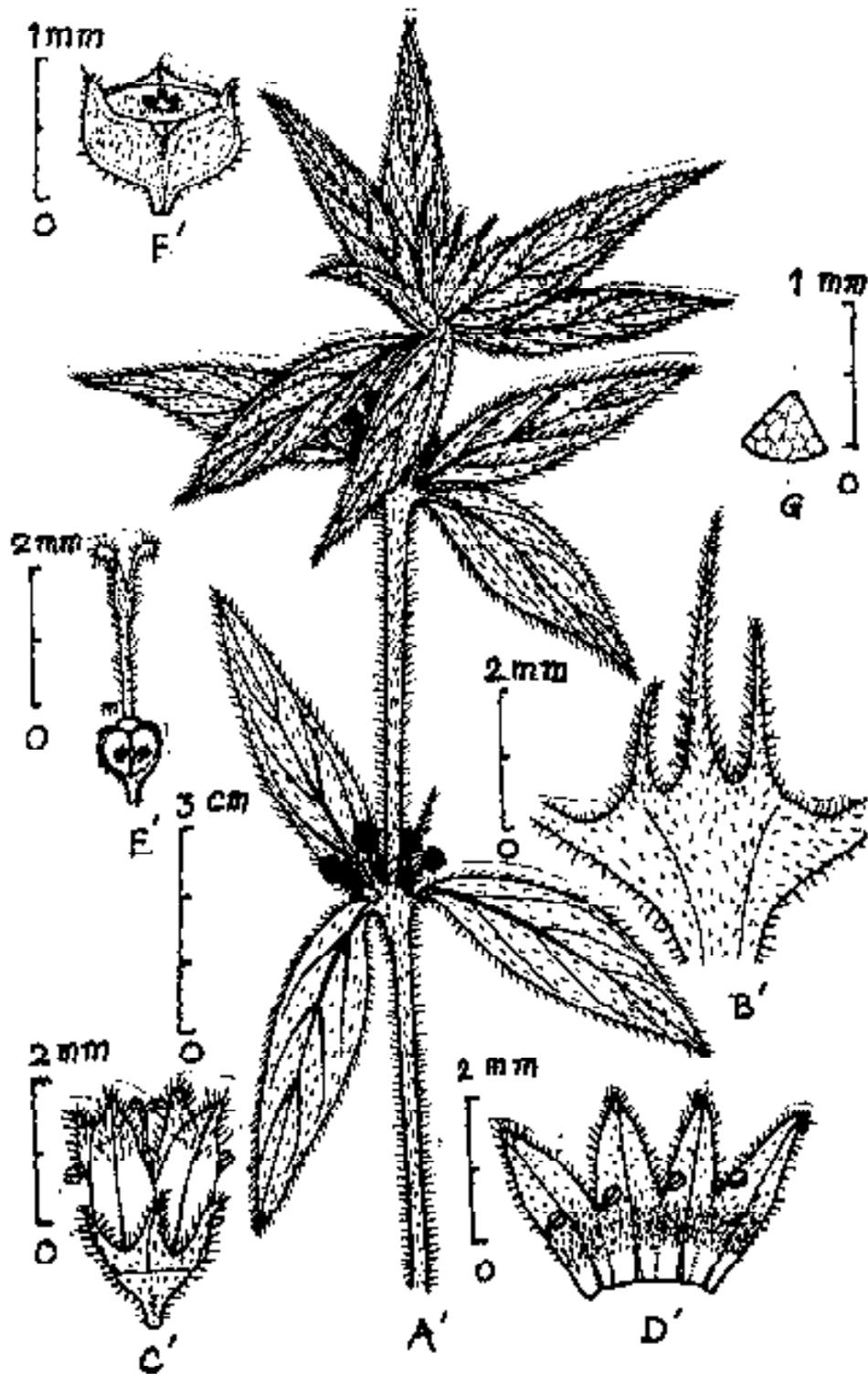


Plate 35b. (A' - G') *Hedyotis vestita* R. Br. ex G. Don : A'. habit; B'. stipule; C'. flower; D'. opened corolla; E'. L. S. of ovary with stigma and style ; F'. capsule; G'. seed.

brownish retrorsely villous throughout. Leaves 1-9.5 × 0.5-3 cm, lanceolate or ovate-lanceolate, acuminate at apex, narrowed at base to petiole, plaited, membranous, scabrid at margin, villous, more so on the nerves beneath; nerves 3-5 pairs, oblique; petiole 1-2 mm long, villous; stipules connate, 2-3 mm broad, membranous, villous, with 1-3 subulate long cilia, 7-8 mm long. Inflorescence axillary sessile cyme; branches trichotomous, villous; peduncle 5-7 mm long. Flowers small sessile or subsessile, 2.5-3 mm long, heterostylous. Hypanthium ovoid, 0.4-0.5 mm long. Calyx lobes 4, lanceolate, hispid along the margin, Corolla bell shaped, white, purple or pale blue; tube 0.8-1.5 mm long; dense white pubescent inside; lobes 0.8-1.2 mm long, lanceolate, apex incurved, with spinous appendages outside. Stamens 4, inserted or shortly exserted; filaments 0.3-0.5 mm long, adnate to sinus of corolla lobes; anthers globose, 0.5-1 mm long. Ovary 0.3-0.5 mm long, ovules many; style 0.8-1 mm or 1.5-2 mm long, pubescent, usually swollen above; stigma 0.3-0.6 mm long, bilobed, subglobose or oblong, fleshy, papillose. Capsule 0.5-1 × 0.5-1 mm, small, globose, flat at the top often with persistent base of style, rounded at base, crustaceous, hard, muricated, minute pubescent, apparently indehiscent but there is a groove on the crown which opens by a small slit. Seeds many, small, 0.4-0.5 mm long, angular, exotesta reticulate, black.

*Fls. & Frts.* : Throughout the year.

*Ecology* : In open jungles, bamboo forest, shaded open places along foot tract on lime stone hills, 124-152 m in alt.

*Distrib.* : India : West Bengal to Arunachal Pradesh and Andaman; Bangladesh, Myanmar, Malesia and Philippines.

*Note* : Style is very often short in the early stage, elongating at the time of maturity of the flower.

*Exsiccata studied* : INDIA : West Bengal : Calcutta, *J. W. Helfer* 447 (CAL) & 196 (E); Jalpaiguri, *S. K. Mukerjee* 924 (DD); Darjeeling, *J. M. Cowan s. n.* (E); Assam : Lakhimpur, *C. B. Clarke* 7075 (CAL); Halflong, *W. G. Craib* 38 (CAL); Kamrup, *Hamilton* 361 (E); Silchar, *S. K. Kar s. n.* (CAL); Meghalaya : Khasi hill, *J. D. Hooker & T. Thomson. s. n.* (CAL) & *G. Mann* 559 (CAL); Cherra, *G. Gallatly* 193 (BSI); Sohra, *C. B. Clarke* 15589 (CAL); Nungpo, *C. B. Clarke* 37206 (CAL); Nongkhlaw, *G. Panigrahi* 16208 (CAL). Arunachal Pradesh : Duphla Hills, *J. L. Lister* 11 (CAL); Tirap dist., *D. B. Deb* 26587 (ASSAM); Laju, *G. Panigrahi* 14669 (CAL). Nagaland : Kohima, *Prain s. n.* (CAL, BSIS). JACOBA, *Prain* 105 (CAL). Manipur : Barak, *A. Meebold* 6013 (CAL). Sikkim : Bhisop, *T. Anderson s.n.* (CAL), *G. King* 887 & *s.n.* (CAL). Mamsing, *Ribu* 883 (CAL). Andaman & Nicobar Islands, Kamorta, *S. Kurz. s. n.* (CAL); Car Nicobar, *King s. n.* (CAL); North Nicobar, Katchal Islands, *P. Chakrabarty* 6011 (CAL); South Nicobar, Kopenheat, *N. P. Balakrishnan* 3906 (CAL); Great Nicobar Island, *D. K. Hore* 7998 (CAL).

BANGLADESH : Chittagong Hill tract, *G. King* 47 (CAL); Kodala Hills, *King's collector* 518 (CAL); Sylhet, *F. de Silva s. n. ex Wall. Cat.* 847B (CAL).

MYANMAR : Helfer 126 & 2886 (CAL); Martaban, Brandis 1227 (CAL); Kachin Hills, Shaik Mokim 126 (CAL); Wasi, S. Toppin 4086 (CAL); Myitkyina, J. A. Lace 5555 (CAL).

MALAYSIA : Gaenong Phuli, G. King 213 (CAL); Malaya, G. King 4574 (CAL); Perk, G. King 10267 (CAL), H. N. Ridley 14320 (CAL) & Scortechini 200 (CAL); Pahang, W. Brown 1289 (CAL) & E. Deschamps s. n. (BSI).

INDONESIA : Java, S. H. Koorder s. n. (CAL).

PHILIPPINES : Manila, A. Lohr 5093 (CAL); Luzon, M. Ramos 33582 (CAL).

44 *H. fulva* Hook. f. Fl. Brit. Ind. 3 : 58. 1880 (Type : Khasi Hills, below Nuncklow, 1200-1500 m, 21.5.1850, J. D. Hooker & T. Thomson s. n. K. photo! iso. CAL!). (Plate 37).

Herbs perennial, woody at base, erect or procumbent, stem 30-35 cm long, obtusely angular grooved above, terete below, pinkish when dry, sparse to dense yellowish villous, more so when young. Leaves sessile or subsessile, 4.5-5 × 1-1.5 cm, narrowly lanceolate, acute or acuminate at apex, narrowed at base, subcoriaceous, punctate, bright yellow when dry, villous, more so along lateral nerves; nerves 2-3 pairs, impressed above; petiole if present 0.2-0.3 mm long, stipules truncate, or nearly so, 2-3 mm broad, with 3-5 bristles, 4-5 mm long, villous. Inflorescence axillary cymes, trichotomously branched, villous; peduncles slender, 0.5-1.5 cm long, 2-3 or more at each axil. Flowers sessile or shortly pedicelled, 3-4 mm long, heterostylous; pedicel when present 0.3-0.8 mm long; bracts linear, 0.5-1 mm long. Hypanthium globose, sparsely pubescent, 0.3-0.6 mm long; lobes 4-5, 0.5-1 mm long, triangular, acute, keeled, ciliate along the margin. Corolla 4-5 lobed, 2-3 mm long, white, yellowish white or pale blue, minute pubescent outside; tube 1-1.5 mm long, pubescent on the throat; lobes 1-1.5 × 0.2 mm, ovate, acute, incurved, with spinous appendages. Stamens 4-5, inserted or exserted; filaments 0.2-0.3 mm or 0.8-1 mm long, adnate to throat; anthers globose or subglobose, 0.2-0.3 mm long. Ovary 0.3-0.5 mm long, ovules many; style 0.5-0.6 mm or 1-2 mm long, glabrous or pubescent, stigma bilobed, linear or subglobose, 0.2-0.3 mm long, papillose. Capsule 1-1.3 × 1 mm, globose, hard, muricated, narrowly winged at both ends near calyx base, minute pubescent all over, crown angular, raised, enclosed within converging calyx lobes, apparently indehiscent, but there is a loculicidal trace on the crown which divides septically into two closed cocci. Seeds 4-8, 0.4-0.5 × 0.5 mm, angular, narrowly winged; exotesta black, reticulate.

*Fls. & Frts.* : May June.

*Ecology* : On dry hill at alt. 1200-1500 m.

*Distrib.* : India : Meghalaya; Myanmar; China.

*Note* : J. D. Hooker (1880) described cymes as glabrous, but the type material in CAL shows that cymes are not glabrous. Hooker placed it under sect. *Dimetia* but in this study it is placed near *H. auricularia* in sect. *hedyotis* for the following

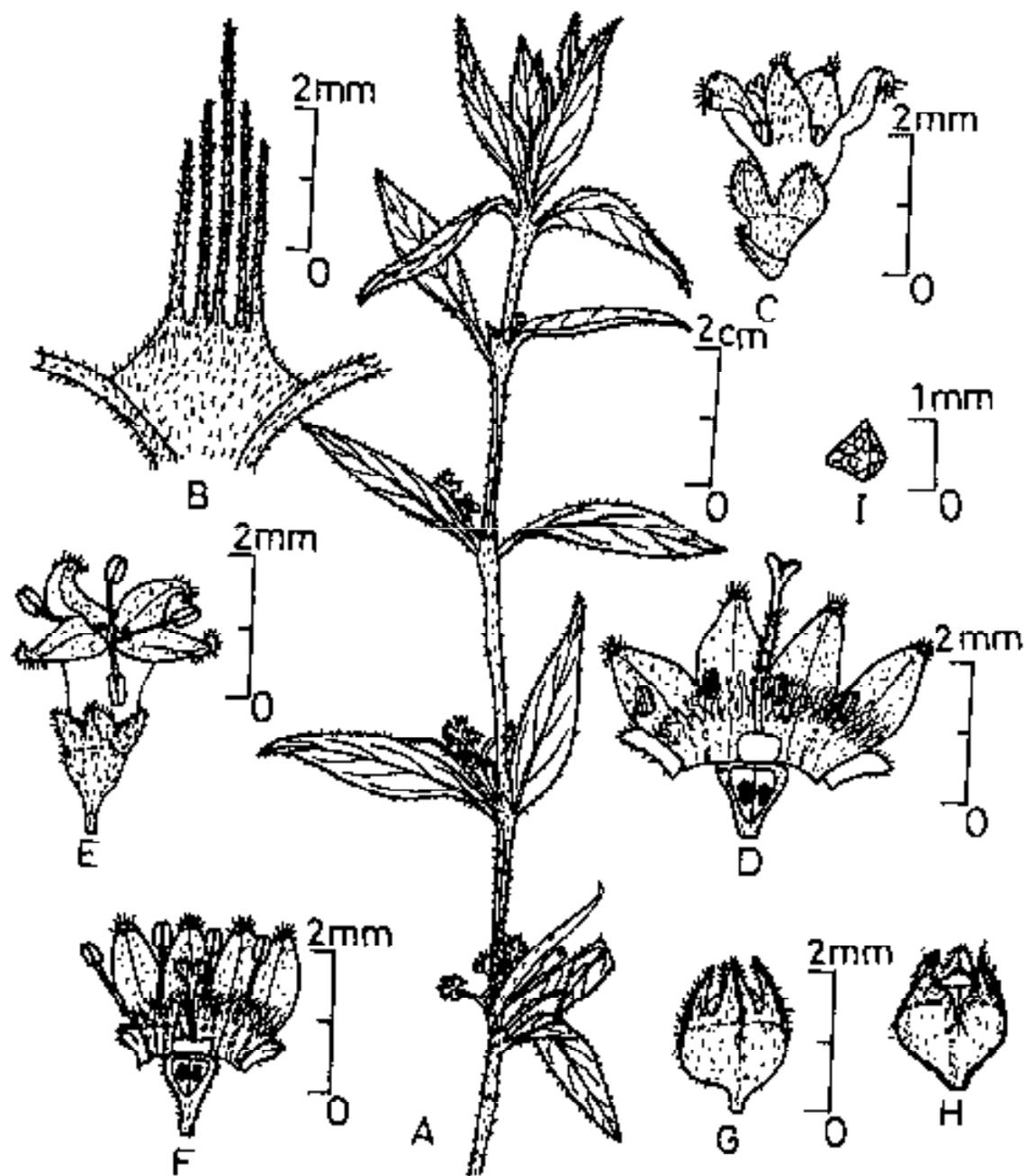


Plate 37. (A - D) *Hedyotis fulva* Hook. f. : A. habit; B. stipule; C. long-styled flower; D. opened flower; E. short-styled flower; F. opened flower; G. & H. capsule; I. seeds.

reasons :- Capsule hard muricated, with raised crown and converging calyx teeth, apparently indehiscent and inflorescence axillary.

*Exsiccata studied* : INDIA : Meghalaya, Khasi, *J. D. Hooker & T. Thomson s. n.* (CAL);

MYANMAR : Upper Burma, Shan Hills, 1200 m May 1888, *C. B. Collett 722* (CAL).

CHINA : Yunan, 1899, *A. Henry 11989*(CAL).

### HEDYOTIS L. SECT. OLDENLANDIA

(L.) Wt. & Arn. Prodr. 413. 1834 (excl. subsect. *Kahautia* Cham. & Schlecht.); Walp. Rep. 2 : 498. 1843. *Oldenlandia* L. Sp. Pl. 119. 1753 & Gen. Pl. ed. 5:55. 1754; DC. Prodr. 4 : 424. 1830; Hook. f. in Benth. & Hook. f. Gen. Pl. 2 : 58. 1873 & Fl. Brit. Ind. 3 : 64. 1880; Bremek. in Verh. Kon. Nederl. Akad. Wet. Afd. Natuurk. Ser. 2, 48(2) : 183. 1952; Hepper in Fl. W. Trop. Afr. ed. 2, 2 : 210. 1963; Verdc. Fl. W. Trop. Afr. Rubiac. (I) : 268. 1976. *Hedyotis* L. subg. *Oldenlandia* (L.) Kurz in Journ. Asiat. Soc. 46(2) : 132. 1877. *Oldenlandia* L. sect. *Euoldenlandia* (Hook. f.) K. Schum. in Engl. & Prantl, Pflanzenfam. 4(4) : 26. 1891; Boissier, Fl. Or. 3 : 10. 1875. *Oldenlandia* L. subg. *Anotidopsis* (Hook. f.) Bremek. in Verh. Kon. Nederl. Akad. Wet. Afd. Natuurk. Ser. 2, 48(2) : 193. 1952, pro parte. *Oldenlandia* L. sect. *Anotidopsis* (Hook. f.) K. Schum. in Engl. & Prantl, Pflanzenfam 4(4) : 25. 1891, pro parte. *Hedyotis* L. sect. *Anotidopsis* Hook. f. Gen. Pl. 2 : 57. 1873, pro parte. *Oldenlandia* L. subg. *Octoneuron* Bremek. in Verh. Kon. Nederl. Akad. Wet. Afd. Natuurk. Ser. 2, 48(2) : 194. 1952. *Oldenlandia* L. sect. *Gonothea* (Bl. ex DC.) K. Schum. in Engl. & Prantl, Pflanzenfam. 4(4) : 26. 1891. *Gonothea* Bl. ex DC. Prodr. 4 : 429. 1830, non Raffin 1808; Endlicher, Gen. Pl. 548. 1836. *Thecagonum* Babu in Bull. Bot. Surv. Ind. 11 : 214. 1969 & Herb. Fl. Dehra Dun 231. 1977.

*Type* : *H. corymbosa* (L.) Lamk. (*Oldenlandia corymbosa* L.).

Herbs mostly annuals. Leaves linear-lanceolate, elliptic-oblong or elliptic-rounded, 1-nerved or with lateral nerves. Inflorescence terminal and axillary paniculate cyme or 2-several flowered axillary pedunculate cyme or solitary flowered. Flowers mostly isostylous, rarely heterostylous, usually slender pedicelled. Corolla rotate, short tubular, funnel-shaped or campanulate. Anthers globose or subglobose, rarely linear, mostly overtopped by stigma. Both stamens and styles included or exerted. Capsule globose, ovoid or ellipsoid, didymous, terete, angular or winged, top truncate, hemispheric or pyramidal, thinly cartilaginous or coriaceous, dehiscing loculicidally. Seeds many, subglobose or angular.

*Pollen morphology* : Pollen grain prolate, subprolate, prolate spheroidal or subspheroidal,  $P \times E = 20-52 \times 14-48 \mu\text{m}$ ; 3 colpi, rarely 4, 5-6 or 7-8 colpi; colpi  $13-30 \times 1-2 \mu\text{m}$ , OS, lalongate rarely circular,  $2-5 \times 7-10 \mu\text{m}$  or  $5-6 \mu\text{m}$  diam., margin distinct, free,  $A_3$  or synzonorate,  $A_1$  or obscure margin,  $A_2$ . Exine  $1.5-2 \mu\text{m}$  thick; reticulation fine to medium or coarse, heterobrochate or retipilate, lumina  $0.5-2 \mu\text{m}$ , mesocolpium  $12-14 \mu\text{m}$ .

*Distrib.* : About 304 species in the warmer parts of the world. About 18 species in India, chiefly in Southern India. 2 species extending to Maldives, Sri Lanka and one extending to Bangladesh, Myanmar, China, Philippines and Polynesia. (Plate 12 A & 12B).

45. *H. ovatifolia* Cav. Icon. 6 : 52. t. 573. f. l. 1801 (*Type* : Manila, *Cavinellus* s. n. MA); Yamazaki in Hara, Fl. E. Himal. 310. 1966; Bakh. f. in Backer & Bakh. f. Fl. Java 2 : 285. 1965; Rao & Hemadri in Ind. For. 99(6) : 377. 1973; Balakr. Fl. Jowai 1 : 244. 1981; Deb. Fl. Tripura State 2 : 50. 1983; *Oldenlandia ovatifolia* (Cav.) DC. Prodr. 4 : 427. 1830; Craib, Fl. Siam. Enum. 2 : 57. 1932. *O. nudicaulis* Roth, Nov. Sp. 95. 1821 (*Type* : India Orientalis, *Haines* s. n. BM); Hook. f. Fl. Brit. Ind. 3 : 70. 1880; Prain, Beng. Pl. 560. 1903; Gamble, Fl. Pres. Madras 602. 1921; Haines, Bot. Bih. Or. 449. 1921; Kanjilal *et al.* Fl. Assam 3 : 39. 1939; Rao & Rabha in Bull. Bot. Surv. Ind. 8 : 300. 1966. *H. nudicaulis* (Roth.) Wt. & Arn. Prodr. 416. 1834; Walp. Rep. 2 : 499. 1843. *O. spergulacea* DC. Prodr. 4 : 428. 1830 (*Type* : Nepal, *Wallich* s. n. G. Microfische.); *Gonotheca ovatifolia* (Cav.) Sant. & Wagh. in Bull. Bot. Surv. Ind. 5 : 107. 1964. *Thecagonum ovatifolium* (Cav.) Babu in Bull. Bot. Surv. Ind. 11 : 214. 1971 & Herb. Fl. Dehra Dun 231. 1977; Rao & Razi, Fl. Mysore 539. 1981. *O. rotundifolia* (Ham. ex Wall.) G. Don, Gen. Syst. Gard. Bot. 3 : 531. 1834 (*Type* : Goalpara, *Hamilton* s. n. ex Wall. Cat. 6190, CAL :). *H. spergulacea* (DC.) Kurz in Journ. Asiat. Soc. Beng. 46(2) : 134. 1877. *O. sedgwickii* Blatter in Journ. & Proc. Asiat. Soc. Beng. Ser. 2, 26 : 344. 1930 & Blatter & McCann in Journ. Bomb. Nat. Hist. Soc. 36 : 785. 1934 (*Type* : North Kanara, Karwar, *Sedgwick* 6653 BLAT). *H. rotundifolia* Ham. in Wall. Cat. 6190. 1832, *nom., non* DC. *H. scapigera* R. Br. in Wall. Cat. 881, *nom. nud.* (Plate 38).

Herbs annual, erect, 4-15 cm, rooting at base; stem terete, pubescent. Leaves in whorls of 4, 1.2-7 × 1-4.5 cm, ovate, elliptic-ovate or ovate-oblong, obtuse at apex, attenuate at base, membranous, pubescent; nerves 3-4 pairs; petiole 2-8 mm long, pubescent; stipules connate, 2-3 × 1-2 mm, truncate, 2-3 dentate above. Inflorescence terminal, dichotomously branched, loose corymbose cymes; peduncles 4-7 cm very slender, terete, pubescent. Flowers 3-3.2 × 1-1.5 mm, pedicel 4-12 mm long, slender, terete, smooth. Hypanthium globose or ovoid, 0.5-0.8 mm long; calyx limb very short; lobes 4, 0.5-0.7 × 0.2-0.3 mm, triangular, acute. Corolla white; tube 0.5-1 mm, glabrous; lobes 1.5-2 × 0.5-0.6 mm, oblong, acute, pubescent at the middle of the inner surface. Stamens 4, inserted at sinus of corolla lobes; filaments 1-1.5 mm long, nearly equal to the corolla lobes; anthers oblong, 1-1.5 mm long. Ovary 0.5-0.8 mm long, ovules many on globose placenta; style stout, 3-3.2 mm long. Capsules ovoid, hemispheric above, globose at base, 1.5-2 × 2-3 mm, obtusely angular, dehiscing loculicidally, nerves prominent, glabrous; raphides dense. Seeds 36-40, subglobose or angular, 0.1-0.15 × 0.1-0.2 mm, deeply reticulate, purple to blackish; raphides present.

*Fls.* : June - December; *Frts.* : June - February.

*Ecology* : On damp soil in sandy forest and near streams on hill slopes.

*Distrib.* : Almost throughout India; Myanmar.



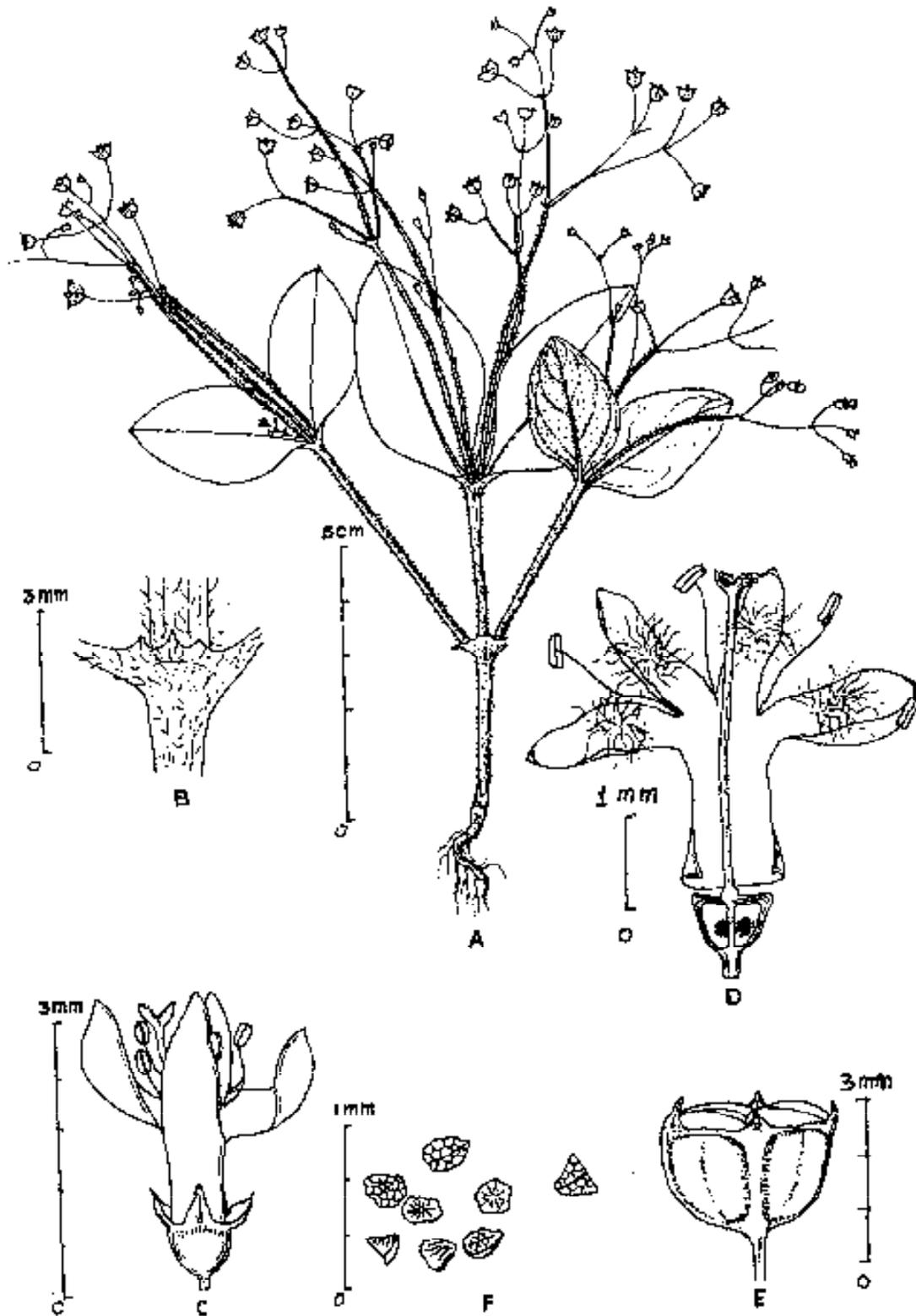


Plate 38. (A - F) *Hedyotis ovalifolia* Cav. : A. habit; B. stipule; C. flower; D. opened flower; E. capsule; F. seeds.

*Exsiccata studied* : INDIA : Assam : Goalpara, *Hamilton s. n. ex Wall. Cat.* 6190 (CAL), N. Cachar, Haflong, *W. C. Craib* 300 (CAL). Nowgaon distr., Doboka, *D. B. Deb* 35418 (ASSAM). Kamrup distr., Sattargaon, *A. S. Rao* 38842 (ASSAM). Meghalaya : Khasi, *J. D. Hooker & T. Thomson. s. n.* (CAL); Umsaw, *G. K. Deka* 20616 (ASSAM); Kopili River bed, *N. P. Balakrishnan* 47042 (ASSAM). Tripura : Chandrapur, *D. B. Deb* 1109 (DD). Sikkim, *G. King s. n.* (CAL). West Bengal : Calcutta, *J. W. Belfer* 170 (E); Purulia, *J. Campbell* 59 (BSI); Manbhum, *C. B. Clarke* 20636 B (CAL). Bihar : Munger hills, *Hamilton* 377 (E). Rajmahal hills, *C. B. Clarke s. n.* (CAL); Parasnath, *C. B. Clarke* 20247 (CAL); Chota Nagpur, *D. Prain s. n.* (CAL); Singhbhum, *I. H. Burkill* 19743 (BSIS). Orissa : Ganjam distr., Sutungi, *J. S. Gamble* 13648 (MH); Vulada, *J. S. Gamble* 91577 (DD); Sambalpur dist., Barapahar, *H. F. Mooney* 3627 (DD). Madhya Pradesh : Bastar dist., North Kanger Valley, *K. Subramanyum* 8632 (MH). Rewa dist., Kaimur hills, *K. M. Sebastine* 8845 (MH); Gandhigram, *G. Panigrahi* 5543 (BSA); Amarpatan, *G. Panigrahi & Arora s. n.* (BSA); Sidhi, *G. Panigrahi* 2415 (BSA); Bhopal, *M. Ommachun s. n.* (BSI); Bilaspur, *G. Panigrahi* 12884 (BSA). Raigurh dist., Thutthikona forest, *G. Sengupta* 16390 (BSA). Uttar Pradesh : Dehra Dun, *J. S. Gamble* 23366 (CAL), *P. W. Mackinnon s. n.* (CAL); *M. B. Raizada s. n.* (DD) & *H. O. Saxena* 2340 (DD), *C. K. Babu* 35460 (BSD); & *B. D. Naithani* 38544 (BSD) & *T. A. Rao* 3450 (BSD). Mirzapur, *U. C. Bhattacharyya* 17753 (BSD); Churk Sulhat forest, *G. Panigrahi & R. Prasad* 2644 (BSA); Bahraich, *G. Panigrahi & O. P. Misru* 6355 (BSA); Saharanpur, *P. C. Pant* 38527 (BSD); Rajaji Sanctuary, *G. V. S. Rao* 39894 (BSD); Corbett National Park, *P. C. Pant* 43006 (BSD). Tamil Nadu : Rampa hills, *V. Narayanaswami* 79 (CAL); Maradum ulli Metta, *V. Narayanaswami* 319 (CAL). Kerala : Travancore, *C. C. Calder & M. S. Ramaswami* 501 (CAL); Trichur dist. Thunakadavu, *K. M. Sebastine* 22340 (MH). Karnataka : North Kanara, *W. A. Talbot s. n.* (BSI). Andhra Pradesh : Godavari, *C. A. Barber* 4999 (MH). Kurnool dist., Gundla Brahmeswaram, *J. L. Ellis* 22211 & 32685 (MH); Nallamalais, *J. L. Ellis* 32475 (MH).

MYANMAR : Prome hills, *Anderson s. n. ex Wall. Cat.* 881 (CAL); Irrawaddi, *Wall. Cat.* 881a (CAL); Yomah, *S. Kurz* 1427 (CAL); Gopal Bazar, *G. King s. n.* (CAL); Mingiss, *J. C. Prazer s. n.* (CAL); Chin Hills, *Shaik Mokim* 436 (CAL); Maymyo Plateau, *J. H. Lace* 4302 (CAL).

46. *H. puberula* (G. Don) Atn. Pug. 18 : 342. 1836; Deb & Dutta in Journ. Bomb. Nat. Hist. Soc. 81(1) : 232. 1984. *Oldenlandia puberula* G. Don, Gen. Syst. Bot. 3 : 530. 1834 (Type : *Heyne s. n. ex Wall. Cat.* 884 K-W!). *H. umbellata* (L.) Lamk. Tabl. Encycl. 1 : 272. 1792, non Walt. 1788; Wt. & Arn. Prodr. 413. 1834; Walp. Rep. 2 : 498. 1843; Manilal & Sivarajan, Fl. Calicut 142. 1982. *O. umbellata* L. Sp. Pl. 119. 1753 (Type : Ceylon, *Hermann s. n.* 2 : 35 No. 67 BM selected as lectotype by Sivarajan et al. 1993 : 393); Roxb. Corom. Pl. t. 3. 1795 & Roxb. Fl. Ind. 1 : 442. 1820 & 1 : 421. 1832; DC. Prodr. 4 : 425. 1830; Hook f. Fl. Brit. Ind. 3 : 66. 1880; Trimen, Handb. Fl. Ceylon 2 : 316. 1894; Cooke, Fl. Pres. Bomb. 1 : 590. 1903; Gamble, Fl. Pres. Madras 601. 1921; Haines, Bot. Bih. Or. 447. 1922; Fyson Fl. South Ind. Hill Stations 1 : 272. 1932; Ramaswami et al. Fl. Bangalore 578. 1973; Sharma & Tiagi, Fl. N. E. Rajasthan 188. 1979; Rao & Razi, Fl. Mysore 537. 1981; Sharma et al. Fl. Karnataka

130. 1984. *H. brevicalyx* Sivar. *et al.* Kew Bull. 48(2) : 393. 1993. *O. wightii* Hook. f. Fl. Brit. Ind. 3 : 66. 1880 (Type : Western Peninsula, Wight 1511. K. photo!); Rama Rao, Fl. Pl. Travancore 206. 1914; Gandhi in Saldanha *et al.* Fl. Hassan 586. 1978; Matthew, Mat. Fl. Tamil Nadu & Carnatic 235. 1981 & Fl. Tamil Nadu & Carnatic 730. 1983. *H. wightii* (Hook. f.) K. K. Nair in Journ. Bomb. Nat. Hist. Soc. 79(2) : 453. 1983. *H. puberula* R. Br. ex Wall. Cat. 884. 1829. *nom. nud.* *H. linearifolia* R. Br. ex Wall. Cat. 870. 1829. *nom. nud.* *H. wightii* (Hook. f.) Sivar. *et al.*, in Kew Bull. 48(2) : 395. 1993, a superfl. name. (Plate 39).

Herbs annual or perennial from long woody yellow-red root-stock, prostrate or ascending; stem angular, ribbed, scaberulous. Leaves usually whorled, sessile, 1-2 cm x 0.2-0.3 mm, linear or oblong-lanceolate, acute at apex, narrowed at base, flat or recurved at margin, 1-nerved, squarrose, punctate and usually glabrous above, scabrid mostly on the mid-nerve below; stipules 2-4 mm long, truncate with 2-5 bristles. Inflorescence alternate axillary, short racemose cymes. Flowers congested or lax, 4-5 mm long, heterostylous; peduncle 1-2 cm long, stiff, erect, scaberulous; pedicel 0.5-1 mm, glabrous or scaberulous; bracts truncate, 1 mm long, with 2-3 bristles. Hypanthium ovoid, 0.3-1 mm long; calyx limb 0.1-0.2 mm long; lobes 4, triangular or ovate-lanceolate, 1-2 mm x 0.8-1 mm, serrated and spinescent at margin. Corolla white, 4-4.2 mm long; tube 1.5-2.2 mm long, glabrous; lobes 1.5-2 x 0.6-0.8 mm, oblong, acute, pubescent inside at the sinus in the long styled flower or throughout in short styled ones. Stamens 4, inserted or exserted; filaments 0.5-1 mm or 1.5-2 mm long; anther 0.5-1 mm long, oblong-linear. Ovary 0.3-0.8 mm long; ovules many on globose submedian placenta; style 4-4.2 mm in long styled flowers or 2-2.2 mm in short styled ones; stigma linear, bifid, slightly flattened, minutely pubescent. Capsule ovoid or globose, broader than long, mostly 2-2.3 x 2 mm, didymous, hemispheric, glabrous or scabrid. Seeds many, triangular, 0.2-0.25 x 0.18-0.2 mm, exotesta smooth, reticulate, purple red.

*Fls. & Frts.* : Throughout the year but flowers more common in September-December. Fruits usually from September to February.

*Ecology* : Mostly in dry places, in coastal sands, red soils etc. at 100-900 m in alt.

*Uses* : Bark of the root yields red dye for which it was often cultivated.

*Local name* : *Cherivelue*, Tel.; *Saya*, Tamil.

*Distrib.* : India : Orissa, Andhra Pradesh, Maharashtra, Karnataka, Kerala, Tamil Nadu & Maldivia Islands; Sri Lanka; Myanmar.

*Exsiccata studied* : INDIA : Orissa; Chilka lake, *Alcock s. n.* (CAL); Gopalpur, *D. Prain s. n.* (CAL); Puri, *H. F. Mooney* 3021 (DD). Andhra Pradesh : Cuddapah dist. Badrel, *J. S. Gamble* 11094 (CAL & DD); Kristna Dist, Marulipatam, *J. S. Gamble* 12377 (CAL); Chittor dist., Mamandur, *C. E. C. Fischer* 4615 (CAL); E. Godavari dist. Saspavaram, *S. K. Wagh* 1945 (BLAT); Kakinada, *S. K. Wagh* 1994 (BLAT); Waltair, *S. K. Wagh* 2723 (BLAT) & *H. Santapau* 20671 (BLAT); W. Godavari dist.,

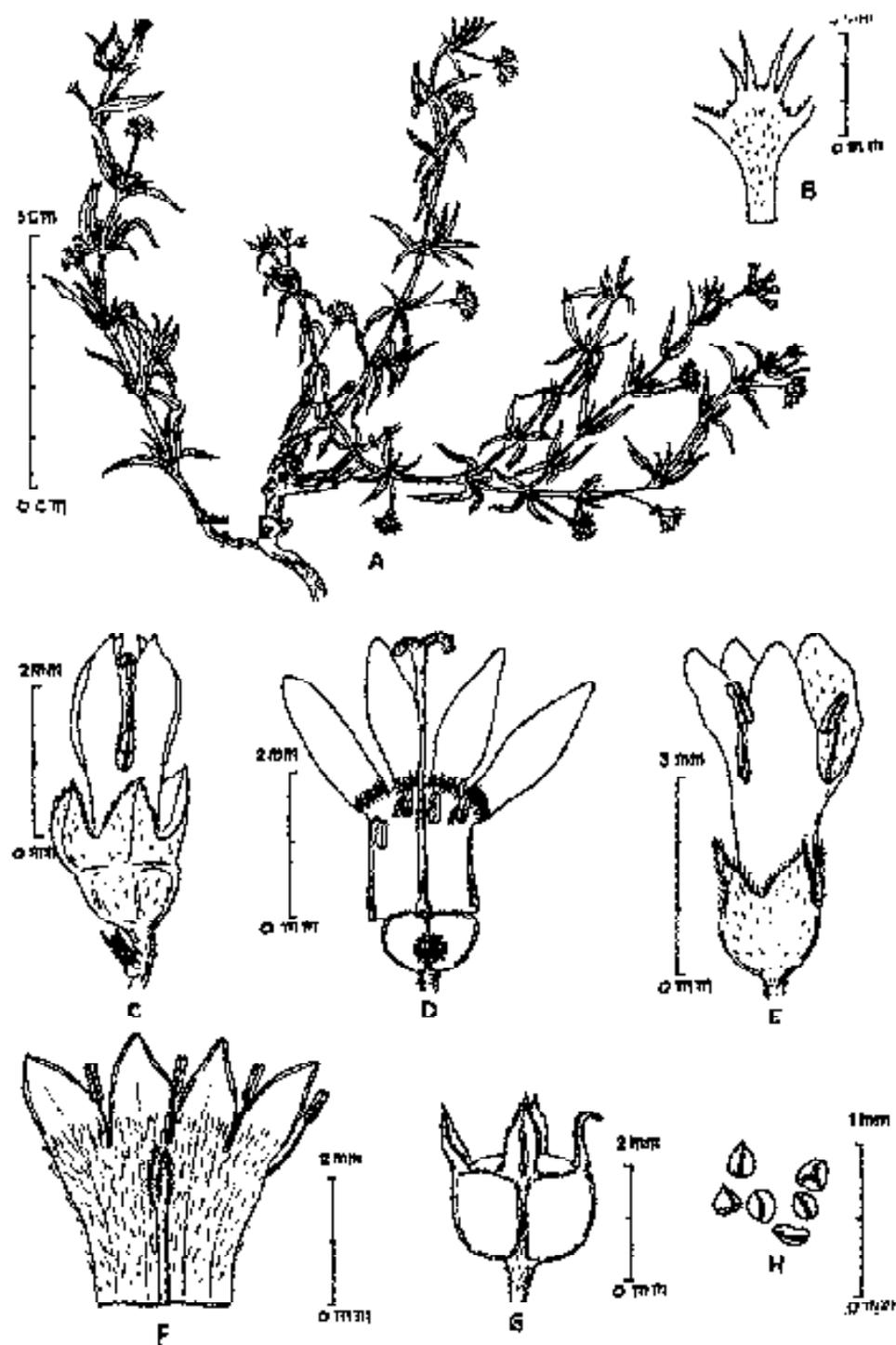


PLATE 39. (A - H) *Nedyopsis puberula* (G. Don) Arn. : A. habit; B. stipule; C. long-styled flower; D. opened flower; E. short-styled flower; F. opened flower; G. capsule; H. seeds.

Rangapuram, S. K. Wagh 6829 (BLAT); Cuddapah dist, Guvoalcheruvu, Palkonda R. F., K. Subramanyam 6421 (MH); Cuddapah, E. R. Krishna s. n. (DD); Medak Dist., Narsapur, K. M. Sebastine 6699 (MH); Nalconda dist., Nagarjuna Sagar, K. M. Sebastine 9740 (MH); Warangal dist, Pakhal R. F., K. M. Sebastine 13162 (MH); Kurnool dist, Chelamra, J. L. Ellis 16749 (MH). Maharashtra; Khandala, H. Santapau 2780 (BLAT). Karnataka : Dharwar Byadgi, W. A. Talbot 1777 (CAL & BSI); Kunjun Falls, W. A. Talbot 1962 (CAL); Virampuram, I. H. Burkill 17708 (BSIS); Badami, A. Meebold s. n. (CAL.); Bangalore, A. Meebold 11355 (CAL); Maliyabad, B. M. Wadhwa 44704 (BSI); Kuppal, B. M. Wadhwa 44914 (BSI); Kalluru, B. M. Wadhwa 45018 & 45033 (BSI); Manasa Gangotri, A. S. Rao 79739 (BSI); Hills between Horlebid & Belur, C. J. Saldanha 15023 (E). Pondichery : *M. Ervoleet* s. n. (K). Kerala : Cochin, A. Meebold 12593 (CAL); Courtallum, M. Rama Rao 1880 & 1962 (CAL); Travancore, M. A. Lawson 318 (CAL) & C. C. Calder & M. S. Ramaswami 1285 (CAL); Ottakkal (Tenmalai), K. C. Kanodia 63037 (BSI); Kazhuthurthy, K. N. Subramanium 70949 (BSI); Arainkavu, K. N. Subramanium 77268 (BSI); Palghat, Valayar Forest, J. Joseph 17036 (MH); Trivandrum dist., Kerala University Campus, C. M. Mohanana 52723 (CAL); Quilon dist., Kodumon, C. N. Mohanana 63499 (CAL); Tamil Nadu : Nilgiri Hills, B. Schmid s. n. (CAL); Madras, Heyne s. n. ex Wall. Cat. 871 A (CAL); Peninsular Ind. Or., Wight 1303 (E) & 1303 A ex Wall. Cat. 871 B, D (CAL, K) & Wight 1306 (E) & 1373 (CAL) & J. Campbell s. n. (K); Northern division, D. Klighorn s. n. (CAL); Madras, G. Thomson s. n. (CAL); C. B. Clarke 10624 C, D & F (CAL), J. H. Burkill 17776, 17784 (BSIS), G. Bideireg s. n. (MH) & M. Debrajalu s. n. (BSIS); Nellore dist., J. S. Gamble 12778 (DD); Pulneys, Bourne 970 (CAL); Mahabalipuram, G. Watt 12912 (BSIS); Anamalai, Poonachi Ghat, C. A. Barber 3633 (MH); Chepauk, Bourne 2436 (CAL); Coimbatore, C. E. C. Fischer 7, 89, 119, 2040 (CAL); Kuridimalai, K. Subramanyum 879 (MH); Thekkumalai, K. M. Sebastine 1491 (MH); Maruthumalai, K. M. Sebastine 1872 (MH); Valankulama, M. Chandrabose 30580 (MH); Madurai dist., Pachakumatchi, K. N. Subramanium 8267 (MH); Madura, A. Meebold 13607 (CAL); Tirunelveli dist., Naterikal, D. Hooper & M. S. Ramaswami 38458 (CAL); Siva Vaperi, C. E. C. Fischer 3867 (CAL); Muthalapuruppan, C. E. C. Fischer 3887 (CAL); Kudenamoti Terc. K. M. Sebastine 13604 (MH). S. Arcot, S. R. Raju, & Naganathan 17946 (MH); Trichinopoly, J. Sinclair 3512 (K); Salem dist. Panangaram R. F., E. Vajravelu 22425 (MH); Nilgiri dist., Anaikatty, G. V. Subba Rao 36184 (MH); Ramnad Dt., Neeranmalai, E. Vajravelu 38664 (MH); Ramnad dist. Sattur, D. Meenakshi Sundaram 22012 (MH); Sanjeenmalai, E. Vajravelu 39549 (MH). Ramanathapuram dist., Kanadukatham, N. C. Nair 52995 (CAL). Thanjavur dist., Nagapattanam, V. J. Nair 57120 & 57126 (CAL). Ramanathapuram dist., Vellamalai, N. C. Nair 57409 (CAL); Podupatti, N. C. Nair 60814 (CAL). Maldavia islands : Horshurg Stoll, J. S. Gardiner s. n. (CAL).

SRI LANKA : J. Watson s. n. (CAL); Rudburgh 3664 (CAL); Thwaites 125 (CAL).

MYANMAR : Burma, Griffith K. D. No. 2895 (CAL).

47. *H. racemosa* Lamk. Enc. Meth. 3 : 80. 1789 & III. t. 62 f 2. (Type : P. Sonnerat s.n. PLAT, non Plukenet f. 2. t 454. f. 2. 1705); Spreng. Syst. 1 : 413. 1825; Bl. Bijdr.

972. 1826; Wt. & Arn. Prodr. 414. 1834; Walp. Rep. 2 : 498. 1843. *Oldenlandia paniculata* L. Sp. Pl. 2 : 1667. 1763; (Type : Ceylon, *Hermann s. n.* BM); Burm. f. Fl. Ind. 38. t. 15. f. 1. 1768; DC. Prodr. 4 : 427. 1830; Benth. Fl. Hongk. 152. 1861, excl. syn.; Hook. f. Fl. Brit. Ind. 3 : 69. 1880; Prain, Beng., Pl. 560. 1903; Haines, Bot. Bih. Or. 449. 1922. *O. alata* Roxb. Fl. Ind. 1 : 442. 1820, non Koenig (Type : Bengal, *Roxburgh s. n.*); Gamble, Fl. Pres. Madras 2 : 602. 1921; Rao & Razi, Fl. Mysore 537. 1981; Sharma *et al.* Fl. Karnataka 128. 1984; Matthew. Mat. Fl. Tamil Nadu & Carnatic 233. 1981 & Fl. Tamil Nadu & Carnatic 724. 1984. *H. paniculata* (L.) Kurz in Journ. Asiat. Soc. Beng. 46(2) : 134. 1877, non Lamk.; Yamazaki in Hara, Fl. E. Himal. 310. 1966. *H. multiflora* Cav. Icon. 53. t. 574. f. 2. 1801. (Type : Amicorum, insuls Bubao, *nee Dedit s. n.* MA!). *H. ramosissima* Bl. Bijdr. 972. 1826, non Spreng. 1815 (Type : Buitenzorg, *Blume s. n.* L.). *H. blumeana* Steud. Nom. ed. 2. 1 : 726. 1840. *H. minima* Heyne ex Wall. Cat. 877. 1829, *nom. nud.* (Plate 40a).

Herbs annual or perennial from long root-stock, 3-4 m long, branched from base, erect or ascending, stem succulent, acutely angular, glabrous, raphides present. Leaves sessile or petiolate, 5-7 × 1-3 cm, elliptic-lanceolate or elliptic-obovate, obtuse, mucronate, narrowed to petiole at base, fleshy, glabrous; nerves obscure; petiole when present 0.5-10 mm long; stipules connate at base, 2-3 × 1-2 mm, truncate, with one (median) or 3-5 bristles, glabrous. Inflorescence subterminal racemose cymes, repeatedly branched, many flowered. Flowers 3-4.5 mm long; pedicel 3-6 mm long. Hypanthium globose or subglobose, 0.8-1 mm long; calyx limb almost nil; lobes 4, 0.5-3 × 0.5-8 mm, triangular, acute. Corolla white, gibbous at base, 2-3 mm long; tube 1-1.5 mm long, glabrous; lobes 1-1.5 mm long, oblong, acute, densely pubescent at throat inside. Stamens 4, included; filaments short, inserted at sinus of corolla lobes; anther globose or ovoid, 0.2-0.3 mm long. Ovary : ovules many in globose or ovoid placenta; style short, 1.5-1.8 mm long, swollen above; stigma 0.3-0.5 mm long, linear, bifid, slightly swollen. Capsule ovoid rounded at base 3-3.2 × 2.8-3 mm, didymous, glabrous, dehiscent loculicidally, crown hemispheric, over-topping the subulate calyx lobes. Seeds 40-50, ellipsoid or subglobose, 0.4-0.5 × 0.3-0.4 mm, exotesta scrobiculate, purple.

*Fls. & Frts.* : Throughout the year, mostly in rainy season.

*Ecology* : In waste places, moist land, shady places near water course, sea-shore and river banks.

*Distrib.* : India : Throughout excluding the Punjab and Maharashtra; Bangladesh; Myanmar; Malaysia; Philippine Island; China; Polynesia.

*Chromosome no.* :  $2n = 36$ ; Raghavan T. S. & Rangaswamy K. 1941; Mazumdar L. 1973; Sarker A. K., Dutta N. & U. Chatterjee 1980.

*Exsiccata studied* : INDIA : Assam, *Jenkins s. n.* (CAL & DD), West Bengal, Darjeeling, *Griffith s. n.* (CAL); Bengal, *J. D. Hooker & T. Thomson s. n.* (CAL) & *G. King s. n.* (CAL); Calcutta, *T. Thomson s. n.* (CAL & DD); Chandanagar, *Abu Hossein s. n.* (BSI); Barrackpore, *I. H. Burkill s. n.* (BSIS); Barisha, *S. K. Das* 30585 (BSIS); Hooghly, *G. Watt s. n.* (E); Barrackpore, *J. Sinclair* 4417 (E).

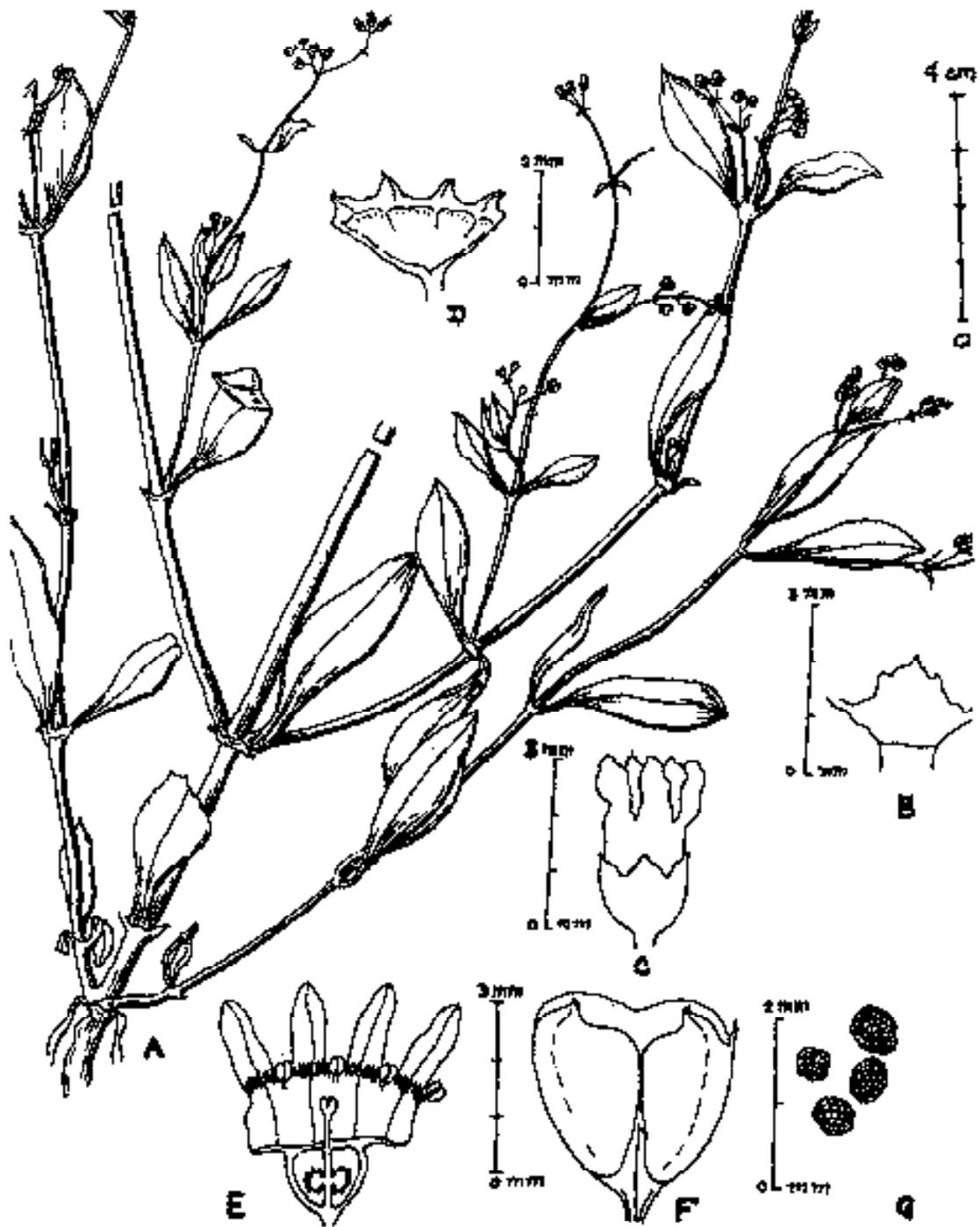


Plate 40a. (A - G) *Hedyotis racemosa* Lamk. : A. habit; B. stipule; C. flower; D. calyx lobes; E. opened flower; F. capsule; G. seeds.

Behar : Darbhanga, *Prain's collector s. n.* (CAL) & Gorakhpur Dist., Ganaughat, *Harsukh* 23372 (DD); Gorakhpur, *C. M. Arora* 1488 (BSA). Uttar Pradesh : Bahraich, *Harsukh* 22375 (DD); Rupaiddiha, *G. Panigrahi* 2816 BSA; Hishangarha, *G. Panigrahi & O. P. Misra* 6522 (BSA); Bichhia, *O. P. Misra* 7990 (BSA). Rajasthan : Barankola, *B. M. Wadhwa* 9411 (BSA); Kota, *B. M. Wadhwa & R. Prasad* 9460 (BSA). Orissa : Chilka lake, *D. Hooper* 39553 (CAL); Cuttack dist, Mahandi Delta, *H. F. Moony* 3417 (DD); Pondichery, *A. Meebold* 2294 (CAL). Andhra Pradesh : Godavari dist., Mantur, *C. A. Barber* 4935 (CAL); Sambalkot, *G. V. Narayana* 16816 (MH); Warangal dist, Pakhal lake, *K. M. Sebastine* 13167 (MH). Karnataka : North Kanara, Siddulgundi, *W. A. Talbot* 930 (CAL & BSI). Kerala : Quilon, *M. Rama Rao* 435 (CAL); Shencotta, *M. Rama Rao* 1706 (CAL); Anyankavi, *C. C. Calder & M. S. Ramaswami* 717 (CAL). Tamil Nadu : Nilgiri, *B. Schmid s. n.* (in part) (CAL); Madras, *W. Griffith s. n.* (CAL), *G. Thomson* 23 (CAL) & *J. S. Gamble* 16237 (CAL, BSI, DD) & 17646 (CAL) & *M. S. Ramaswami* 559 (CAL). Aryankava, *C. C. Calder & M. S. Ramaswami* 717 (CAL); Trivandrum, *M. Mohanan* 63282; Rayalpettah, *G. Bidie s. n.* (MH); Nilgiri, *Beddome s. n.* (CAL); Coimbatore, *C. E. C. Fischer* 564 (CAL); *C. E. C. Fischer* 2669 (CAL) & *M. Chandrabose* 28426 (MH); Aintholai, *N. P. Balakrishnan* 8732 (MH); Nellore dist, Kodavellur, *C. E. C. Fischer* 4177 (CAL); South Arcot dist, Chidambaram, *K. M. Sebastine* 5272 (MH); Bhuvanagiri, *K. Ramamurthy* 60102 (CAL). Tirunelveli dist., Kudiramoli Teri Sunai, *K. M. Sebastine* 13683 (MH); Mamnad dist., Tirupachetti, *K. Ramamurthy* 20052 (MH); Sivaganga, *K. Ramamurthy* 24690 (MH); Thanjavur dist., Pattukkottai, *K. Ramamurthy* 51276 (CAL); Thiruvarur, *V. J. Nair* 57156 (CAL); Ramanathapuram dist., Muthukulathur, *N. C. Nair* 57321 (CAL); Kanniyakumari dist., Kuzhithurai river bed, *M. S. Swaminathan* 70301 (CAL). Andaman Islands : South Andaman, *G. King s. n.* (CAL); Great Nicobar, *N. G. Nair* 7157 (CAL) & Pulo Babi, *K. C. Sahni* 23022 (DD); South Nicobar, Muscar Nicobar, *K. Thothathri* 9322 (CAL); Hopenheit, *D. K. Hore* 7245 & 7911 (CAL), North Nicobara, Katchal Islands, *N. K. Vasudeva Rao* (CAL); Campbell Bay, *D. K. Hore* 7285 (CAL).

BANGLADESH : Dhaka, *C. B. Clarke* 7911 (CAL); Khulna, *C. B. Clarke* 21773 B(CAL).

MYANMAR : Attaran, *Wall. Cat.* 875, 875 B (CAL); Martaban, *S. Kurz* 1418 (CAL); Meingyan, *Abdul Huk s. n.* (CAL); Shan State, *Abdul Huk* 14 & 51 (CAL).

48. *H. herbacea* L. Sp. Pl. 102. 1753 (Type : Ceylon, *Hermann* 419 BM holo. photo!); Willd. Sp. Pl. 1. 566. 1798 (Excl. syn. & including var. B); Bakh. f. in Backer & Bakh. f. Fl. Java 2 : 286. 1965; Rao et Hemadri in Ind. For. 99(6) : 376. 1973; Manilal & Sivarajan, Fl. Calicut 141. 1981. *Oldenlandia herbacea* (L.) Roxb. Hort. Beng. 11. 1814 & Fl. Ind. 1 : 445. 1820; Cooke, Fl. Pres. Bomb. 1 : 589. 1903; Gamble, Fl. Pres. Madras 601. 1921; Haines, Bot. Bih. Or. 447. 1922; Hutch. & Dalz. Fl. W. Trop. Afr. 2 : 131. 1931; Barnes in Journ. Bomb. Nat. Hist. Soc. 44 : 443. 1944; Bremek. in Verh. Kon. Nederl. Akad. Wet. Afd. Natuurk. Ser. 2. 48(2) : 244. 1952; Hepper in Fl. W. Trop. Afr. ed. 2. 2 : 12. 1963; Ramaswami et al. Fl. Bangalore 578. 1973; Verdc. Fl. Trop. E. Afr. Rubiac. 305. 1976; Gandhi in Saldanha



*et al.* Fl. Hassan 586. 1978; Rao & Raji, Fl. Mysore 537. 1981; Matthew, Mat. Fl. Tamil Nadu & Carnatic 234. 1981 & Fl. Tamil Nadu & Carnatic 728. 1983; Mukherjee, Fl. Pachmarhi 145. 1984; Sharma *et al.* Fl. Karnataka 129. 1984. *O. heynei* Hook. f. 19. Brit. Ind. 3 : 65. 1880 excl. *O. linearis*, *O. linifolia* and *O. usperula* DC. (Type : India, Heyne, s. n. in Wall. Cat. 867. B.p.p. K-W, iso CAL!); Hiern in Fl. Trop. Afr. 3 : 59. 1877; Clarke in Journ. Linn. Soc. 25 : 31. 1889; Rama Rao, Fl. Pl. Travancore 205. 1914. *H. heynei* R. Br. (in Wall. Cat. 867A, 1828 nom) ex Wt. & Arn. Prodr. 416. 1834; Dalz. in Dalz. & Gibs. Bomb. Fl. 116. 1861; Sond. Fl. Cap. 3 : 10. 1865. *O. dichotoma* Roxb. Icon. 546. (CAL). *Schanganum pulla* Rheed. Hort. Mal. 10. p. 45. t. 23. 1690. (Plate 40b).

Herbs annual or perennial from strong woody branched root-stock, 20-60 cm long, robust, erect or suberect, dichotomously branching; stem acutely angular or 4 ribbed, often narrowly winged at nodes, glabrous, reddish black when dry. Leaves sessile or subsessile, 0.6-5.5 cm × 4-5 mm, linear or linear-lanceolate, acute at apex, narrowed at base, glabrous or scabrid at margin, nerveless, petiole when present 0.2-0.4 mm, often pubescent, stipules 2-4 × 0.2-0.3 mm, truncate with few setae on the margin. Flowers 3-4 mm long, rarely heterostylous, solitary or a pair at nodes, on long pedicel; pedicel capillary, 6-22 mm or rarely 30 mm long, as long as or longer than the leaves. Hypanthium ovoid, 0.8-1 mm long, glabrous, rarely papillose or shortly hairy; lobes 4, 0.5-1.5 mm long, narrowly triangular, scabridulous at the margin, black in fruit. Corolla white, lilac or mauve with purple spot or white with pink tinge, infundibuliform; tube 2-3 mm long, glabrous inside; lobes 0.5-1 × 0.2-1 mm, ovate, acute, finely reticulate. Stamens 4, inserted within tube or on throat, often visible; filaments very short in isostylous flower, anther 0.1-0.2 mm long, linear, subsessile or with short filament. Ovary 0.5-1 mm long; ovules many; style slender, 3-3.5 mm long; stigma bilobed, filiform, 0.7-0.8 mm long. Capsule didymous, globose or ovoid, rounded, straw coloured, crowned by blackish calyx lobes, top protruded beyond the erect calyx segments, glabrous. Seeds 30-40, angular, brownish, 0.1-0.2 × 0.2 mm, strongly reticulate, mucilaginous.

*Fls. & Frts.* : Almost throughout the year.

*Ecology* : On rocky crevices, near edge of ponds, roadside, in harvested rice fields among grasses or sand dunes.

*Distrib.* : Throughout India, Sri Lanka, Malaya and tropical Africa.

*Chromosome no.* :  $2n = 18$ ; Philip, D. & Mathew, P. M. 1976.

*Uses* : The plant is used in medicine and regarded as bitter tonic and febrifuge.

*Vern. name* : 'Guichi', 'Gharpoda' in Oriya.

*Exsiccata studied* : INDIA : Meghalaya : Khasi, Griffith K. D. No. 2897 (CAL), J. D. Hooker & T. Thomson s. n. (CAL) & G. Mann s. n. (CAL); Nowpoot, C. B. Clarke 15139 (CAL). Nagaland : Kohima, C. B. Clarke 41548 C (CAL). Bihar : Hazaribagh, C. B. Clarke 25064 5089, 25091 (CAL) & K. C. Kanodia 1181 (CAL); Manbhum, C. B. Clarke 25205 C (CAL); Chotonagpur, J. S. Gamble 8610 (CAL); Lohardanga, C. B. Clarke 33879 (CAL); Orissa : Mayurbhunj, C. B.

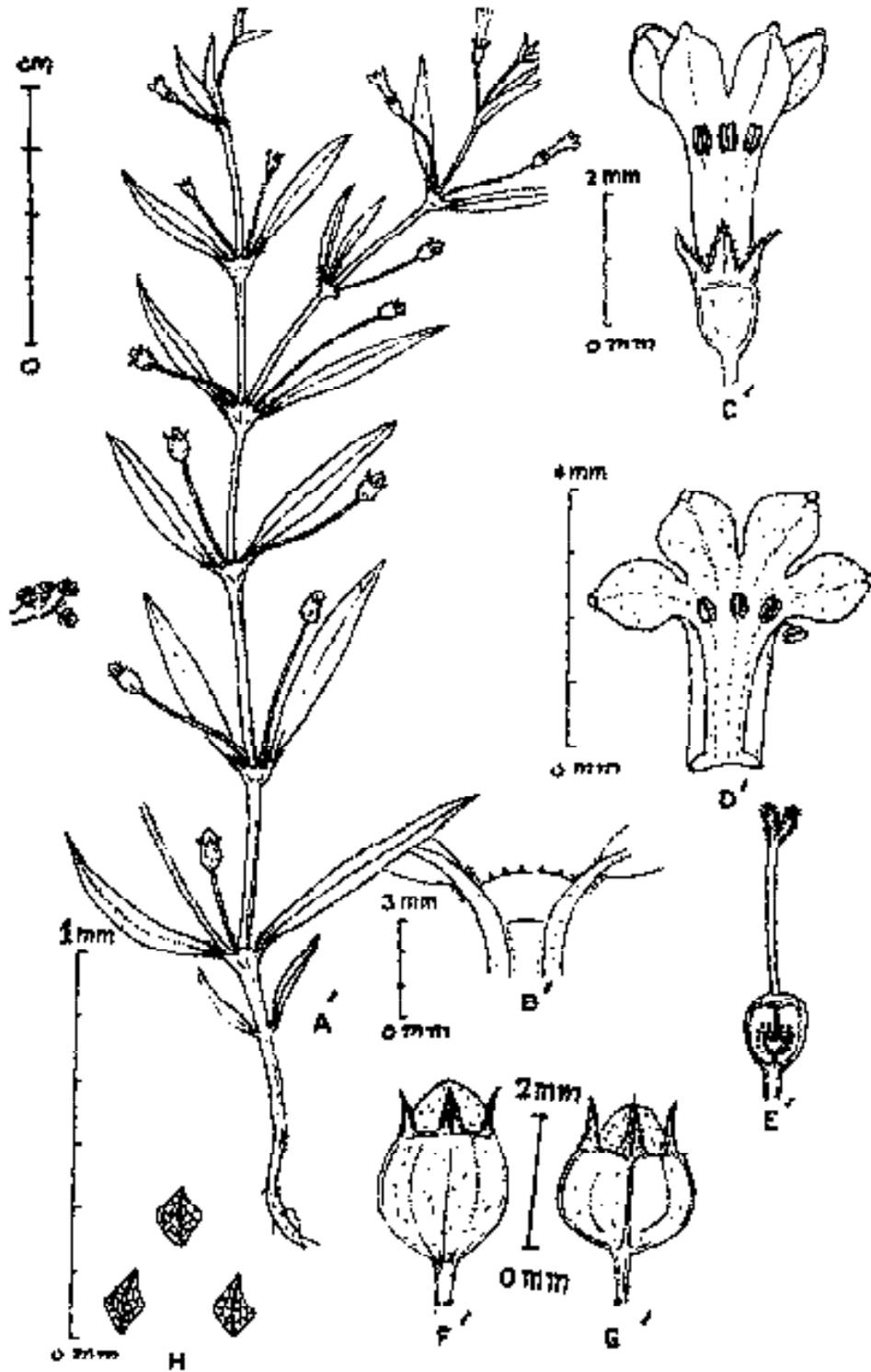


Plate 40b. (A' - H') *Hedyotis herbacea* L. : A', habit; B', stipule; C', flower; D', opened corolla; E', L.S. of ovary with style & stigma; F' & G', capsules; H', seeds.

Clarke 34434 (CAL); Ganjam dist., Mohendragiri Hills, *C. E. C. Fischer s. n.* (CAL); Barkuda, *N. Annandale* 1217, 1270 (CAL); Keonjhar, *G. Panigrahi* 8714 (CAL); Udaigiri, *C. R. Rao* 2349 (CAL); Bhatigar, *G. Panigrahi* 23572 (CAL); Barqud, *G. Panigrahi* 23853 (CAL); Konark Coast, *A. K. Mukherjee* 6033 (CAL). Madhya Pradesh : Kainala range, *J. F. Duthie* 10451 (CAL); Northern division, *Cleghora s. n.* (CAL); Bailadila, *G. Panigrahi* 6938 (CAL). Andhra Pradesh : Bison hills, *C. A. Barber* 5084 (CAL); Madikonakutta, *K. M. Sebastine* 6749 (CAL); Araku valley, *N. P. Balakrishnan* 590 (CAL); Polavaram Agency, *D. C. S. Raju* 243 (CAL); Simhachalam hills, *D. C. S. Raju* 556 (CAL); Visakhapatnam dist. *G. V. S. Subba Rao* 29667 (CAL). Maharashtra : Dharwar, *L. J. Sedgwick s. n.* (DD); Khandala, *R. D. Acland* 546 (BLAT) & *H. Santapau* 8096 (BLAT); Anikola, *J. C. Dharma* 51 (CAL); Bombay, *S. K. Jain* 7700, 34976 (CAL); Karwar, *S. K. Jain* 16498 (CAL); Poona, *G. A. Gammie* 18825 (BSI), *S. D. Mahajan* 32005 (CAL) & 32100 (BSI); Mulshi Taluk, *B. Venkata Reddi* 96102 (CAL); Maharashtra, Thane dist., *K. V. Billore* 113337 (CAL); Takarada range, *K. V. Billore* 113946 (BSI) & 115821 (CAL, DST), Dolkhand, *K. V. Billore* 116094 (CAL, BSI); Karnataka : Bangalore, *G. King s. n.* (CAL); Belgaum, *W. A. Talbot* 2068 (BSI); Mysore, *G. Thomson s. n.* (CAL); Malabar, *Stocks & Lawson etc. s. n.* (CAL); S. Canara, *C. A. Barber* 2295 (CAL) & *C. J. Saldanha* 9171 (CAL); Sullai, *C. A. Barber* 2053 (CAL); Chittoor dist. *C. E. Fischer* 4416 (CAL); North Canara, Katagal, *S. D. Mahajan* 1562 (BSI); Siddarpur, *G. S. Puri* 11548 (BSI); Karwar, *K. P. Sreenai & C. J. Saldanha* 9171 (CAL); Baswanna Konivey, *S. K. Jain* 30996 (CAL); Chikkaballapw, *S. K. Jain &* 31169 (CAL); Hirekulgudda state forest, *R. M. Wadhwa* 44582 (BSI); Chamundi hills, *G. S. Puri* 52921 (BSI); Tirthamuthru, *R. S. Rao* 81021 (CAL); Nirdha forest, *A. S. Rao* 94765 (BSI); Sampajee, *A. S. Rao* 95077 (BSI); Kanniyakumari dist., Vellimalai, *M. S. Swaminathan* 68972 (CAL). Kerala : Travancore, *M. A. Lawson* 300 (CAL) & *C. C. Calder & M. S. Ramaswami* 31 (CAL); *Sethi & Negi* 25775 (DD); Alleppy, *M. Rama Rao* 1347 (CAL); North Malabar, *G. V. Narayana* 81747 (MH); Melampuzha, *G. S. Puri* 36418 (CAL); Tenmslai, *K. N. Subramanyam* 76945 (BSI); Pandyan Para, *K. N. Subramanyam* 77329 (BSI); Palghat dist., Dhoni R. F., *J. Joseph* 17172 (CAL) & Thiruvizhamkundu, *E. Vajravelu* 33355 (CAL); *J. Joseph* 17172 (CAL). Cananore dist, Chandana Thode, *J. L. Ellis* 26384 (CAL); Trivandrum, *T. A. Rao* 8032 (CAL); Iddikki dist., Kozhikannam, *K. Vivekananthan* 46627 (CAL); Quilon, *C. N. Mohanan* 54929 (CAL). Tamil Nadu : Nilghiri, *C. B. Clarke* 10973 (CAL) Coonoor, *J. S. Gamble* 12337 (CAL); Anatapur dist., *J. S. Gamble* 20882 (CAL); Kodaikanal, *Bourne* 967 (CAL); Coimbatore, *C. E. C. Fischer* 52 (CAL); Kuridimalai, *K. Subramanyam* 1217 (CAL); Kotagiri, Aravenu, *K. Subramanyam* 1014 (CAL); Anamalais, *K. Subramanyam* 3502 (CAL); Rocky hills, *Beddome* 73 (CAL); Madurai, *K. Subramanyam* 3397 (CAL); Tirunelveli dist. Courtallam, *K. Subramanyam* 4948 (CAL); Nilgiri dist., Pakasuramalai, *K. M. Sebastine* 4179 (CAL); Aravancadu, *K. M. Sebastine* 4091 (CAL); Trichinapally dist., Narthamalai, *K. Ramamurthy* 23694 (CAL); Salem dist. Kaveri peak, *D. B. Deb* 31261 (CAL); Karimnal Island, *A. R. K. Sastry* 7730 (CAL); Marakkaanum, *A. R. K. Sastry* 9033 (CAL); Chingleput dist., Bedanthangal, *A. N. Henry* 47054 (CAL); South Arcot dist., Thyagadurgam, *K. Ramamurthy* 50687 (CAL); Kanniyakumari dist., Vellimalai Perumchilamba, *M. S. Swaminathan* 68972 (CAL).

49. *H. graminifolia* L.f. Suppl. 1 : 119. 1781 (Type : *Koenig s. n.* ex Linn. 123.6 LINN microfische!). *Oldenlandia stricta* L. Mant. 200. 1767. (Type : Malabar, *Koenig s. n.* ex Linn. 155.11. LINN microfische!); Hook. f. Fl. Brit. Ind. 3 : 69. 1880; Trimen, Handb. Pl. Ceylon 2 : 315. 1894; Gamble, Fl. Pres. Madras 602. 1921. *O. graminifolia* (L.f.) DC. Prodr. 4 : 425. 1830. *H. stricta* (L.) Rolla Rao et Hemadri in Ind. For. 99(6) : 378. 1973, non Smith 1811, nec. Wall. 1820 (Plate 41a).

Herbs annual or perennial from long woody rootstock, branching dichotomously, erect, leafy and sometimes grass-like below, stem wiry, terete or angular to winged, glabrous, nodes swollen, rarely scabrid. Leaves sessile or subsessile, opposite or verticillate, 0.8-5 × 0.3-0.8 cm, linear-lanceolate, acute at apex, forming a connate tube with stipules at base, flat or revolute, 1-nerved, membranous or coriaceous, squarrose, glabrous, sometimes scabrid, scattered hispid towards base; stipules truncate, 1.5-2 mm long, rarely scabrid. Inflorescence terminal dichasial cyme, branches usually raceme-like wide spreading or abbreviated with distant or close flowers, rarely short umbel-like. Flowers 5-10 mm long, pedicelled, isostylous; pedicel 2-12 mm long, glabrous, rarely hispid. Hypanthium 1-1.8 mm long, limb very short; lobes 4, 0.6-0.7 mm long, triangular-lanceolate, acute, glabrous. Corolla funnel-shaped, white, turning bluish or purple; tube 3-3.5 mm long, slightly broader at the middle; lobes 2-3 mm long, lanceolate, glabrous. Stamens 4, exserted; filaments 2-3 mm long, inserted at sinus of corolla lobes, anthers oblong or linear, 0.5-0.8 mm long. Ovary 1-1.6 mm long; ovules many on globose or elongated submedian placenta; style exserted, 4-5 mm long, slender, glabrous; stigma 0.4-0.5 mm long, linear, bifid. Capsule 2.5-4.5 × 2-2.5 mm, about twice as long as broad, didymous, narrowed at mouth, crown hemispheric, nearly equal to the calyx teeth. Seeds many, angular, 0.2-0.3 × 0.2 mm, exotesta reticulate, orange.

#### KEY TO THE SUBSPECIES AND VARIETIES

- 1a. Cyme branches slender with distant flowers;  
pedicel 5-10 mm long ... subsp. *graminifolia*
- 2a. Leaves 2-5 cm long, flat or recurved, glabrescent;  
stipules glabrous, cyme branches diverting ... var. *graminifolia*
- 2b. Leaves 0.8-1.5 × 0.2 cm, revolute and stipules scabrid;  
cymes branches sparingly branched, stiff ... var. *shuteri*
- 1b. Cymes short and stout; flowers usually close;  
pedicel 3-5 mm long ... subsp. *arenaria*

#### 49a. *H. graminifolia* L. f. var. *graminifolia*.

Leaves sessile or subsessile, 3-4 × 0.3-0.5 cm, linear-lanceolate, glabrous, rarely scattered hispid at the margin towards base; stipules glabrous. Inflorescence cymes, branches wide spreading, slender, glabrous. Flowers 5-10 mm long, pedicelled; pedicels, 5-10(20) mm long, sometimes very slender, opposite or alternate on elongated racemose cyme.

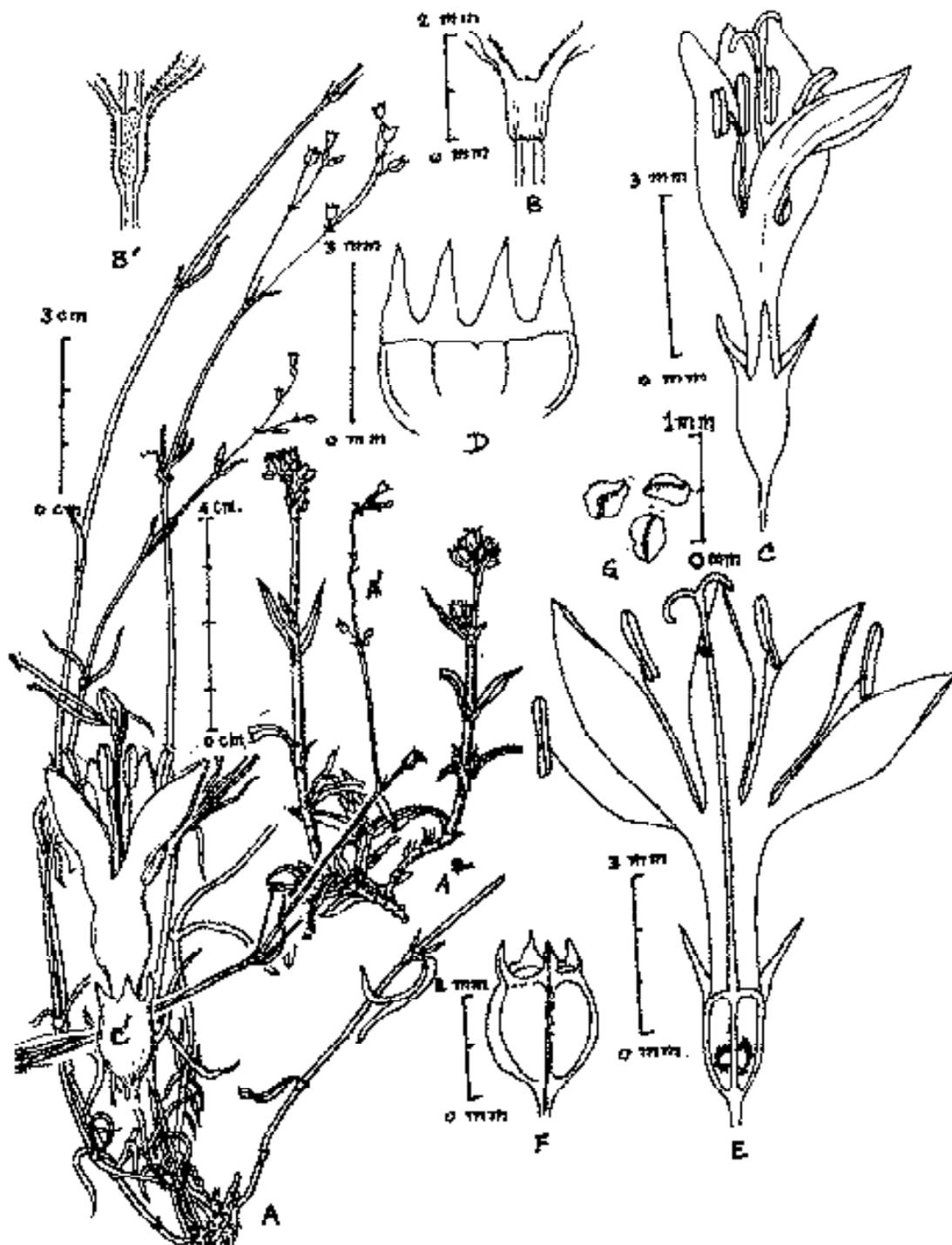


Plate 41a. (A - G) *Hedyotis graminifolia* L. f. : A. habit; B. stipule; C. flower; D. calyx lobes; E. opened corolla; F. capsule; G. seeds; H. T. S. and L. S. of ovary.

Plate 41b. (A' - C) *Hedyotis graminifolia* L.f. var. *shuteri* (Hook. f.) Deb & Dutta : A'. habit; B'. stipule; C. flower.

Plate 41c. (A2) *Hedyotis graminifolia* L.f. subsp. *arenaria* (Haines) Deb & Dutta : A2. habit.

*Fls.* : June December; *Frts.* : July December.

*Ecology* : Grows on sandy soil.

*Distrib.* : India : Tamil Nadu, Andhra Pradesh; Sri Lanka.

*Exsiccata studied* : INDIA : Tamil Nadu Madras, *Wall. Cat.* 6192 p.p. (CAL); Travancore, *Wall. Cat.* 6192 B, p.p. (CAL); Mahabalipuram, *G. Watt* 12909 (BSIS); Peninsular India, *Wight* 1381 (p.p.) (CAL); Nellore dist., Kottapalam, *J. S. Gamble* 20377 (CAL); Nellore Distr., Krishnapalam, *C.E.C. Fischer* 4117 (CAL); South Arcot, Marakkanam, *K. Rammurthy* 51122 (CAL); Ramanathapuram dist., Sayalkudi, *N. C. Nair* 53171 (CAL); Mahabalipuram, *T. A. Rao & A. R. K. Sastry* 7611 (CAL); Thanjavur dist., Thalsinagar, *V. J. Nair* 5709 (CAL). Andhra Pradesh : Srikakulam dist., Barua coast, *G. V. Subba Rao* 62320 (CAL).

49b. *H. graminifolia* L. f. var. *shuteri* (Hook. f.) Deb & Dutta in *Taxon* 32(2) : 285. 1983. *Oldenlandia shuteri* Hook. f. *Fl. Brit. Ind.* 3 : 69. 1880; Gamble, *Fl. Pres. Madras* 662. 1921 (*Type* : Madras, 1859, *Shuter s. n.* K, photo!); Sharma *et al.* *Fl. Karnataka* 130. 1984. *H. shuteri* (Hook. f.) Rao *et Hemadri* in *Ind. For* 99(6) : 378. 1973. *H. maritima* Wall. ex *Wt. & Arn. Prodr.* 417. 1834, non L. f. 1781 (*Type* : Madras, *Wight s. n. ex Wall. Cat.* 6192a p.p. CAL!) (41 b).

Leaves sessile or subsessile, opposite or verticillate, rigid, 0.8-1.5 × 0.1-0.2 cm, linear-lanceolate, scabrid, midnerve strong, margin revolute; stipule truncate, 1.5-2 mm, scabrid. Flowers pedicelled, solitary, alternate or opposite on shortly branched, stiff cyme, brown, 6.5 mm long, pedicel 0.2-5(10) mm long. Corolla tube narrow, broaden above. Capsule ovoid with short-stalk, 3 × 2.5 mm.

*Fls. & Frts.* : June February.

*Ecology* : Grows on sea-beach.

*Distrib.* : India : Tamil Nadu & Andhra Pradesh.

*Exsiccata studied* : INDIA : Tamil Nadu : Madras, *Wall. Cat.* 6192, p.p. (CAL); Madras, *Wight s. n. ex Wall. Cat.* 6192a (CAL); Travancore, *Wall. Cat.* 6192 B, p.p. (CAL); Peninsular India, *Wight* 1381 p.p. (CAL); Madras, *Mainfassa s. n.* (CAL); Chingleput dist., *J. S. Gamble* 17624 (MH); Elliott's beach, *Bourne* 2662 (CAL) & *Bourne s. n.* (DD); Tirunelveli dist., Kudiramoli Teri, *K. M. Sebastine* 13657 (MH); South India, *T. A. Rao & A. R. K. Sastry* 7688 (CAL). Andhra Pradesh : Kristna dist., Chunia Gungam, *J. S. Gamble* 12376 (DD, CAL).

49c. *H. graminifolia* L. f. subsp. *arenaria* (Haines) Deb & Dutta in *Taxon* 32(2) : 285. 1983. *Oldenlandia arenaria* Haines in *Journ. Asiat. Soc. Beng. Ser.* 2, 15 : 315. 1920 & *Bot. Bih. Or.* 448. 1922. (*Type* : Orissa Coast, September 1917, *Haines s. n.* K, photo!). (41c).

Leaves sessile, 1.5-2 × 0.3-0.4 cm, linear, margin recurved. Inflorescence short, stout umbellate cyme. Flowers shortly pedicelled, close.

*Fls. & Frts.* : August - October.

*Ecology* : On the sandy coast.

*Distrib.* : India : Orissa.

*Exsiccata studied* : INDIA : Orissa, Puri, *H. G. Carter* 24 (BSIS) & *H. F. Mooney* 3022 (DD); Bargud, *G. Panigrahi* 23858 (CAL).

50. *H. stocksii* (Hook. f.) Rao & Hemadri in Ind. For. 99(6) : 378. 1973. *Oldenlandia stocksii* Hook. f. Fl. Brit. Ind. 3 : 67. 1880 (*Type* : Cancan, *Stocks s. n.* K. photol; Malabar, Bababudan Hills, *Stocks & Lawson s. n.* K. photo! Iso. CAL!); Rama Rao, Fl. Pl. Travancore 206. 1914; Sharma *et al.* Fl. Karnataka 130, 1984; Deb & Dutta in Journ. Bomb. Nat. Hist. Soc. 81(1) : 232. 1984. *O. maheshwarii* Sant. & Merch. in Journ. Ind. Bot. Soc. 42A : 213. tt. 1-6. 1964 (*Type* : Mahabaleshwar, 13th Sept. 1959, *Y. A. Merchant* 1267 holo BLAT! *Y. A. Merchant* 1266 K!); Sant. in Rec. Bot. Surv. Ind. 16(1) : 115. 1967. *H. maheshwarii* (Sant. & Rao *et Hemadri*) in Ind. For. 99(6) : 376. 1973. (Plate 42).

Herbs annual, 8-25 cm long, tufted, slender, erect, branching; stem terete or angular, glabrous or pruinose. Leaves sessile, 1-1.2 x 0.1-0.2 cm, linear, acicular, glabrous or minutely pruinose, revolute at margin, 1-nerved, stipules 1-1.5 mm long, with 4-5 bristles. Inflorescence axillary solitary flower or terminal 2 flowered cyme. Flowers pedicelled, 3-6 x 2-6 mm.; pedicel 1-2 cm long, slender, terete, pruinose. Hypanthium globose, 0.7-1 mm long; calyx limb very short; lobes 4, 2-2.5 mm long, ovate-lanceolate, pruinose, revolute at margin, acicular at apex, often accessory calyx teeth present. Corolla campanulate, white or pink; tube 2-3 mm long, broad, glabrous inside; lobes 4, 1-2 mm long, glabrous, ovate, acute or ovate-elliptic to elliptic-lanceolate, acute or obtuse. Stamens 4, exserted; filaments inserted at sinus of corolla lobes, 0.7-1 mm long; anthers 1 mm long, oblong. Ovary 0.5-0.8 mm long; ovules 20-30; style 2.5-3 mm long, linear; stigma bifid, linear, 1 mm long, granulate. Capsule ovoid or globose, 1.5-1.8 x 1.5-1.6 mm, loculicidally dehiscent, with persistent calyx lobes, alternating with accessory calyx teeth; calyx lobe usually double the length of the capsule, crown raised but far below the calyx lobes, pruinose all over. Seeds few, more or less triangular, 0.3-0.4 x 0.2-0.3 mm, purple.

*Fls.* : September - November; *Frts.* : October - December.

*Ecology* : Growing on moist rocks at 1500 - 1800 m in alt.

*Distrib.* : India : Karnataka, Maharashtra and Goa.

*Exsiccata studied* : INDIA : Karnataka : Malabar, Cancan, *Stocks s. n.* & *Lawson s. n.* (CAL); Bababudan hills, *Lawson s. n.* (CAL) & *Cleghorn s. n.* (K) : Santaveri, *W. A. Talbot* 3275 (CAL, BSI); Kalhatt; Bababudan, *A. Meebold* 10794 (CAL). Goa : Surla, *N. P. Singh* 124721 (BSI); Maharashtra : Mahabaleshwar, *Talbot s. n.* (BSI) & *M. Y. Ansari* 67695 (BSI); Khandala, *G. A. Gammie* 15400 (BSI); Pokheri, *R. S. Rao* 66259 (BSI); Bhimasankar, *K. P. Janardhanan* 81741 & 81874 (BSI); *B. V. Reddi* 99039 (BSI); Jannar, *K. Hemadri* 107460 (BSI); Septashringu, *J. Cherian*

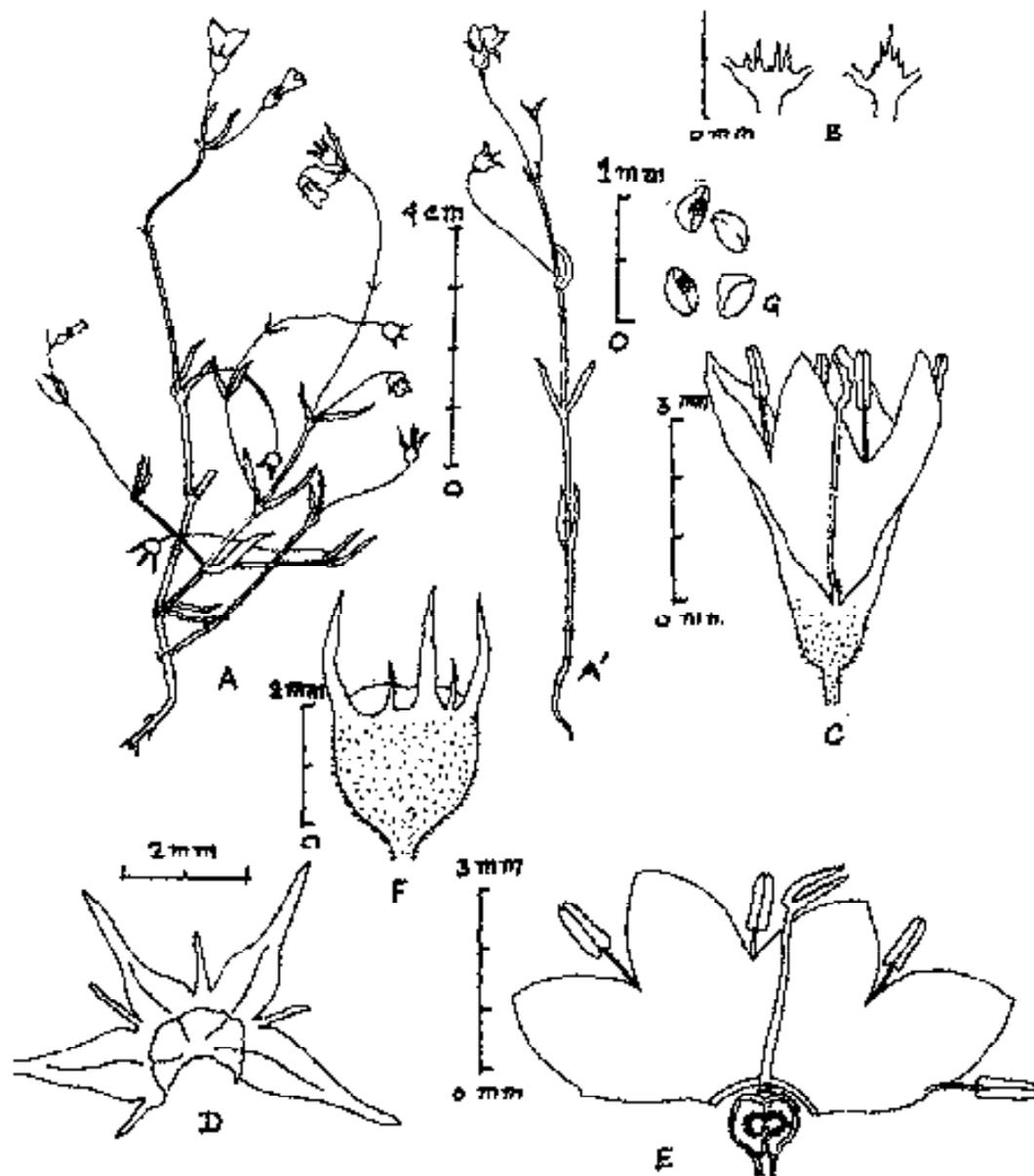


PLATE 42. (A' - H) *Hedyotis stocksii* (Hook. f.) Rolia Rao et Hemadri : A, & A'. habit; B. stipules; C. flower; D. calyx lobes; E. opened flower; F. & G. capsule; H. seeds.



104638 (BSI); Washala Range, *K. V. Billore* 115301 (BSI); Tokavada Range, *K. V. Billore* 115593 (BSI); Taramli hill top, *K. V. Billore* 115935 (BSI); Nagar dist., Panchuai Harichandra Garle, *B. M. Wadhwa* 127647 (BSI); Ratangarh, *B. M. Wadhwa* 128142 (BSI).

51. *H. pterita* Bl. Bijdr. 972. 1826 (Type : Java, *Blume* 202700 L !); Bakh. f. in Backer & Bakh. f. Fl. Java 2 : 285. 1965. *Oldenlandia pterita* (Bl.) Miq. Fl. Ind. Bat. 2 : 193. 1856; Craib, Fl. Siam. Enum. 2 : 57. 1932. *H. alata* Koenig. ex Wt. & Arn. Prodr. 413. 1834 (Type : Madras, *Koenig s. n. ex Wall. Cat.* 6196 CAL!); Walp. Rcp. 2 : 498. 1843. *O. alata* (Koen.) Hook. f. Fl. Brit. Ind. 3 : 70. 1880; Gamblé, Fl. Pres. Madras 602. 1921; *Gonotheca blumei* DC. Prodr. 4 : 429. 1830. (Type : Java, Calcareis, Kuripan, *Blume s. n. L!*); Endl., Atakt. 23 t. 22. 1833; Decaisne in Nauv. Arn. Mus. 3 : 417. 1834; Korthals in Nederl. Kruid. Arch. 2 : 153. 1851 (Plate 43a).

Herbs annual or perennial from woody long root-stock, 25-30 cm simple or branching at base; stem stout or slender, acutely angular to winged, fleshy, glabrous, raphides present. Leaves 3-6 cm × 1-1.5 cm, elliptic or oblong, acute or obtuse at apex, narrowed at base, coriaceous, glabrous; nerves obscure; petiole 1-5 mm long; stipules connate at base, 4-5 × 1-2 mm, truncate or shortly toothed, minutely pubescent. Inflorescence terminal or axillary, 1-3 or 3-8 flowered subcapitate cymes. Flowers 2-3 mm long; pedicel 0.5-1 mm long, winged. Hypanthium ovoid, 1-2 × 1-2 mm, 4-winged; calyx limb 0.2-0.3 mm; lobes 4, 0.8-1 × 0.8-1 mm broadly triangular, ciliate at margin. Corolla white, gibbous at base; tube 1-1.5 mm long, glabrous; lobes ovate, acute, 1-1.5 × 1 mm, throat pubescent. Stamens 4, inserted at lower part of corolla tube; filaments 0.1 mm long; anthers globose, 0.5-0.6 mm long. Ovary with many ovules on oblong placenta; style stout, 0.2-0.5 mm long, stigma bilobed. Capsule sessile or short stalked, 5-6 × 2-3 mm, ellipsoid, with 4 longitudinal, subequal wings, ciliate along the margin, sparsely pubescent to glabrous. Seeds many, globose, 0.4-0.5 × 0.4-0.5 mm; exotesta deeply pitted, purple.

*Fls. & Frts.* : January - December.

*Ecology* : At 200- 300 m in alt.

*Distrib.* : India : Tamil Nadu, Andhra Pradesh; Myanmar.

*Chromosome no.* : 2n = 36 Raghavan, T. S. & Rangaswamy, K. 1941.

*Exsiccata studied* : INDIA : Andhra Pradesh : Godavari dist., *C. A. Barber s. n.* (CAL). Tamil Nadu : Madras, *Koenig s. n. ex Wall. Cat.* 6196 CAL); Peninsular India or. *Wight* 1377 (CAL); Coimbatore dist., Avanasli, *C. E. C Fischer* 1532 (CAL); Trichinapally, *K. M. Sebastine* 6212 (MH).

52. *Hedyotis hermaniana* Dutta. J. Econ. Tax. Bot. Vol. 23(3) : 734. 1999. *Hedyotis biflora* (L.) R. Br. ex. Wt. & Arn. Prodr. 413. 1834. *non* Lamk. (1792). (Type : *Heyne s. n.* in *Wall. Cat.* 879 K-W iso CAL). *Oldenlandia biflora* L. Sp. Pl.

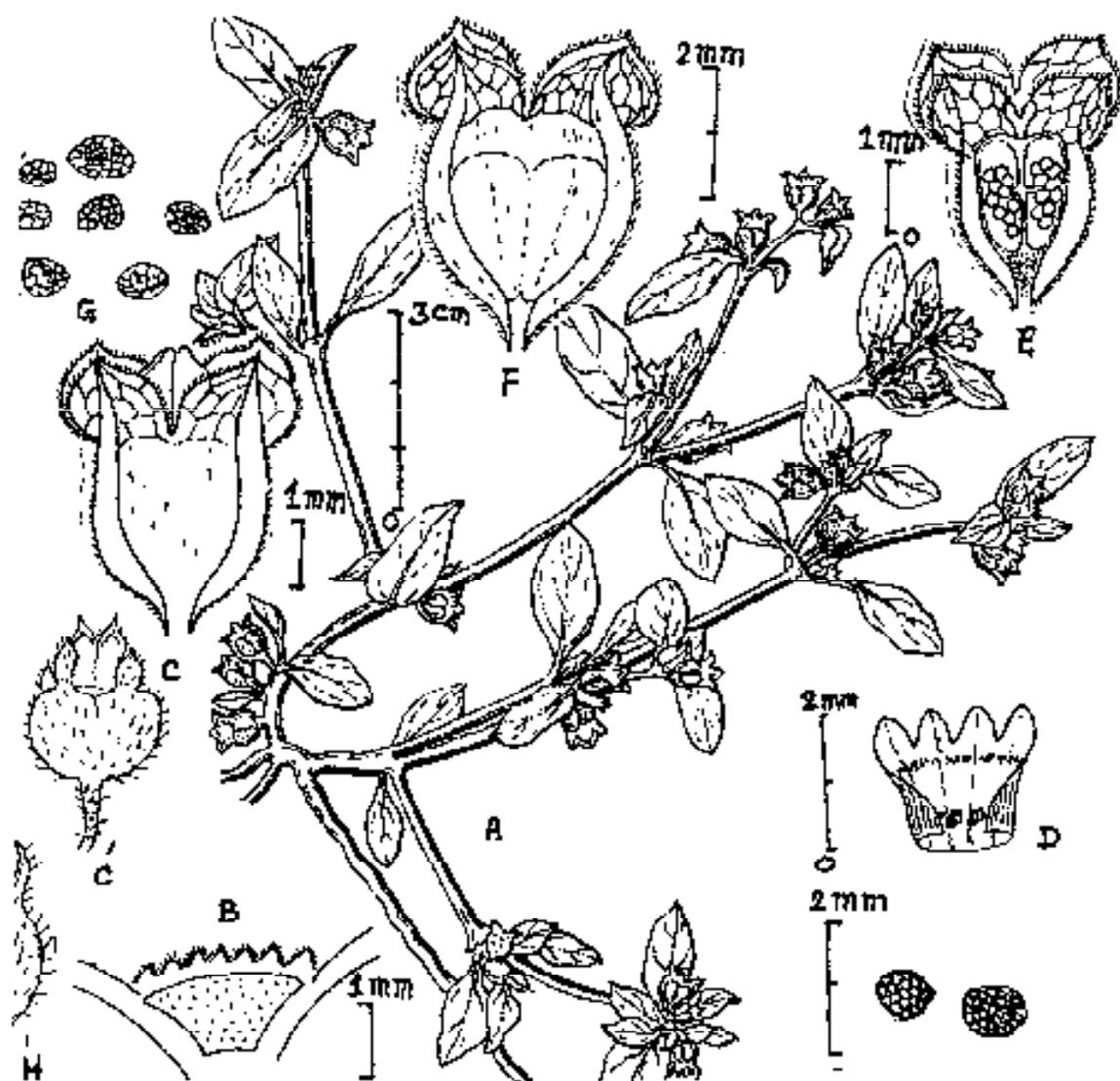


Plate 43a. (A - G) *Hedytia perita* Bl. : A. habit; B. stipule; C. flower; D. opened corolla; E. L.S. of ovary showing style and stigma; F. capsule; G. seeds.

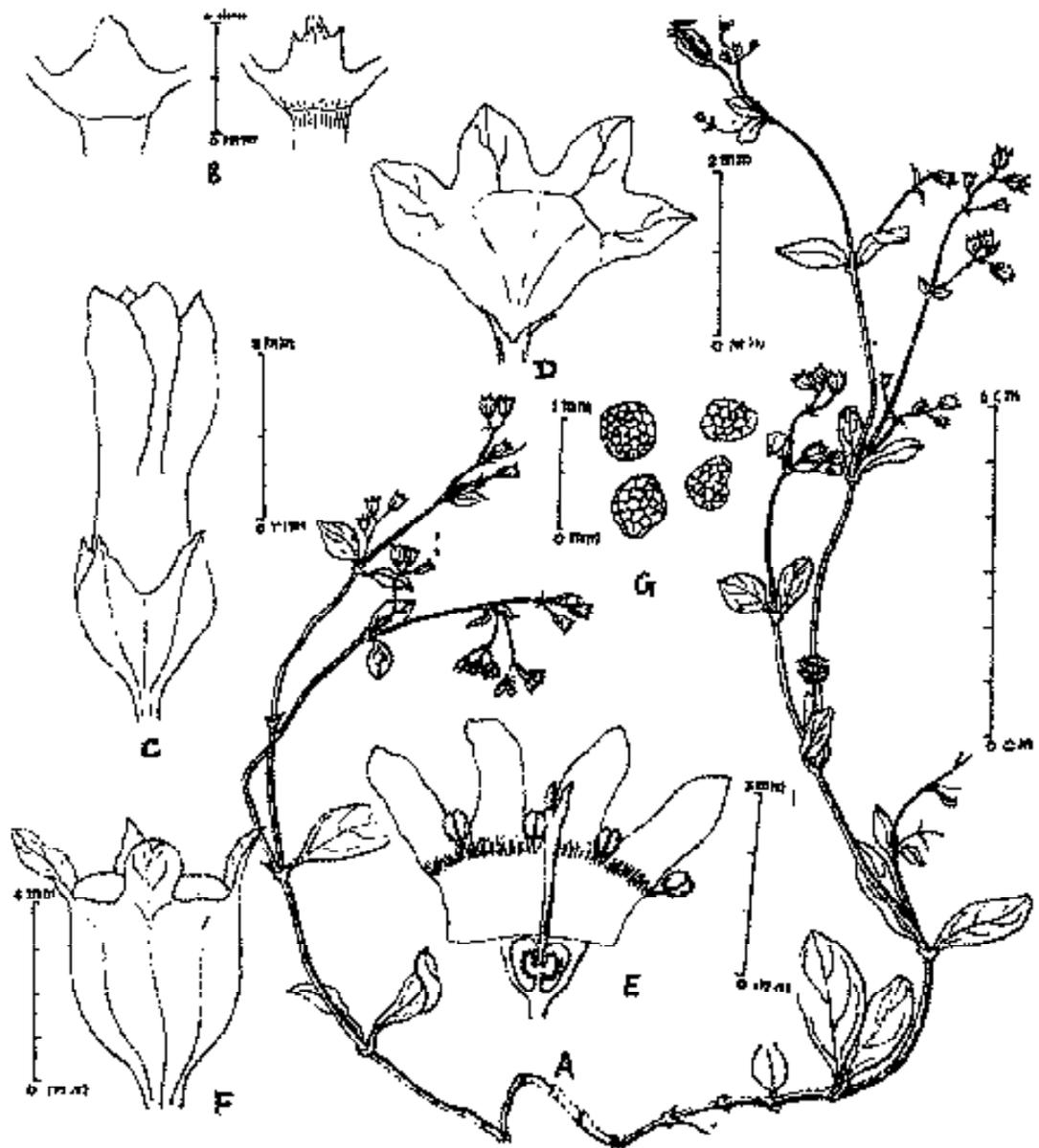


Plate 44. *Hedyotis hermansiana* Dutta : A. habit; B. stipule; C. flower; D. calyx lobe; E. opened flower; F. capsule; G. seeds.

I : 119. 1753 (Type : Ceylon, *Hermann s. n.* holo. BM photo!); Hook. f. Fl. Brit. Ind. 3 : 70. 1880. (Plate 44).

Herbs annual or perennial from long, woody root-stock, 4-20 cm, erect, prostrate or procumbent, diffusely branching at base; stem succulent, acutely angular, glabrous, raphides present. Leaves petiolate, 2.5 × 1-1.5 cm elliptic-oblong or narrowly oblong, obtuse or acute at apex, attenuate at base, glabrous, glossy below; nerves obscure; petiole 2-10 mm long; stipules connate at base, broad, 1-1.5 × 2-3 mm, truncate or with 1-3 bristles, glabrous. Inflorescence terminal or axillary (upper axils), 1-3 or 3-5 flowered pedunculate cymes, less branched; peduncle 1-2 cm long, slender. Flowers 3-6 mm long; pedicel 0.5-0.7 mm long, slender, angular. Calyx, campanulate. Hypanthium ovoid, 0.8-1 mm long, calyx limb short; lobes 0.8-1 mm long, ovate-lanceolate. Corolla white or white with pinkish tinge; tube swollen, 3-4 mm long; lobes 1.5-2 mm long, oblong, acute, densely pubescent below. Stamens 4, inserted filaments 0.3-0.5 mm, adnate below sinus of corolla lobes; anther 0.3-0.35 mm long, ovate or oblong. Ovary 0.3-0.5 mm long, ovules many on median oblong placenta; style 2-2.5 mm long; stigma bilobed, linear, 0.8-1 mm long, glabrous. Capsule 2.5 × 2-3 mm, oblong ellipsoid, cuneate at base, usually with 2-4 narrow wings, extending to the stalk, glabrous, dense raphides present, crown enclosed within calyx segments, dehiscence loculicidal. Seeds many, 40-50 globose or subglobose, 0.3-0.5 × 0.3-0.5 mm; exotesta deeply pitted, purple.

*Fls. & Frts.* : June to February.

*Ecology* : In stony crevices of moist sandy soil.

*Distrib.* : India : Maharashtra, Tamil nadu, Karnataka, Kerala, Lakshadweep Islands, Maldives Islands; Sri Lanka.

*Exsiccata studied* : INDIA : Maharashtra : *T. Cooke s. n.* (BSI). Karnataka : Biliary, Coll ? (CAL). Kerala : Courtallum, *Wight 375 (E)*; Quilon, *Wight 433 (E)*; Trivandrum, *M. Mohanan 63282 (CAL)*. Tamil Nadu : Peninsular India Or., *Wight 1305 ex Wall. Cat. 879 (E)*; *Heyne s. n.* ex *Wall. Cat. 875 p.p. (CAL)*; Nilgiri, *B. Schmidt s. n.* (CAL); Shanikulam, *C.A. Barber 798 (MH)*; Tirunelveli dist., Kattalaimalai, *C.A. Barber 512 (MH)*; Trichinapally dist., Respa forest, *K. Ramamurthy 24954 (MH)*; Kanniyakumari dist., Balanore R.F., *A.N. Henry 49444 (CAL)*; Ramanathapuram dist., Kānedukathan. Lakshadweep Islands : Kalapani, *Alecock s. n.* (CAL); Cardamum, H. M. I. M. "Investigator" *s. n.* (CAL); Kovarthy Island, *B. M. Wadhwa 45466 (BSI)*; Agathi Islands, *B. M. Wadhwa 48917, 48931 & 68863 (BSI)*; Ameni Islands, *B. M. Wadhwa 49037 & 68758 (BSI)*; Kalpani Islands, *B. M. Wadhwa 64811 (BSI)*; Minicoy Islands, *B. M. Wadhwa 69860 (BSI)*; Androth Islands, *B. M. Wadhwa 68472 (BSI)*; Maldives Islands : Veemandu in Kolumadulu, *J. S. Gardiner s. n.* (CAL).

53. *H. trinervia* (Retz.) Roem. & Schult. Syst. Veg. 3 : 197. 1818; Wt. & Arn. Prodr. 414. 1834; Walp. Rep. 2 : 499. 1843; Dalz. in Dalz. & Gibs. Bomb. Fl. 115. 1861; Bedd. Icon. Pl. Ind. Or. t. 29. 1874; Bakh. f. in Backer & Bakh. f. Fl. Java 2 : 286. 1965; Rao & Hemadri in Ind. For. 99(6) : 378. 1973; Manilal & Sivarajan, Fl. Calicut 141. 1982. *Oldenlandia trinervia* Retz. Obs. 4 : 23. 1786 (Type : Ind. Or. *Koelng s. n.* BM, K photo!); Hook. f. Fl. Brit. Ind. 3 : 66. 1880; Cooke, Fl. Pres. Bomb. 1 : 590.

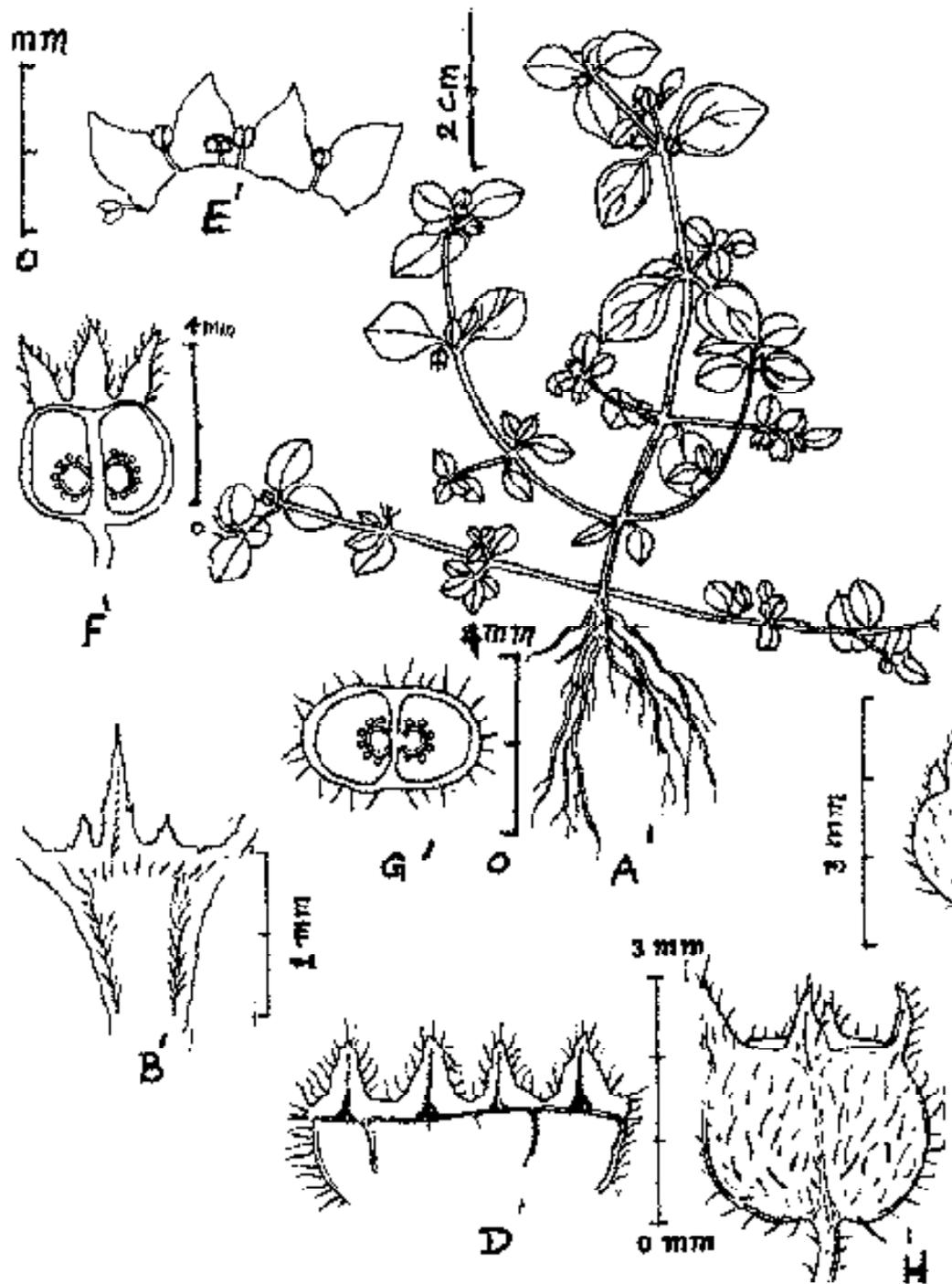


Plate 43b. (A - H) *Hedyotis trinervis* (Retz.) Roem. & Schult. : A. habit; B. stipule; C. flower; D. calyx lobes; E. opened flower; F. & G: L.S. and T.S. of ovary; H. capsule.

1903; Prain, Beng. Pl. 599. 1903; Rama Rao, Fl. Pl. Travancore 206. 1914; Blatter in Journ. Bomb. Nat. Hist. Soc. 36 : 785. 1934; Sharma *et al.* Fl. Karnataka 130. 1984. *O. repens* Burm. f. Fl. Ind. 38. t. 15. 1768, non *L. H. rotundifolia* Spreng. Pug. 1 : 33. 1813 (Type : India Or., Heyne s. n. B); DC. Prodr. 4 : 420. 1830. *H. serpyllifolia* Poir, Suppl. 3 : 14. 1813 (Type : Borboniae, Borey s. n.). *H. orbiculata* Heyne in Wall. Cat. 6191. *H. repens* (Burm. f.) G. Don., Gen. Syst. Bot. 3 : 526. 1834 (Plate 43b).

Herbs annual, prostrate or creeping, rarely erect, branches diffuse, slender, stem acutely angular to winged, weak, pilose. Leaves 6-12 × 6-7 mm, orbicular, broadly ovate or elliptic, acute, often mucronate at apex, narrowed at base to short petiole, membranous, punctate, pale green when dry, 3-nerved below, setulose at margin, glabrous on both surfaces or hispid along midrib and nerves below; petiole 0.5-1.5 mm long, broad, winged, pilose; stipules connate, short, 1.5-2 mm broad, with 2-3 bristles, about 1 mm long. Inflorescence axillary cluster or 2-6 flowers or solitary. Flowers 2-3 mm long; pedicel 1-1.5 mm, pilose. Hypanthium 1-1.2 mm long, globose; calyx limb very short; lobes 4, 1-1.2 × 0.3-0.4 mm, triangular to ovate-lanceolate, pilose on the outer surface. Corolla tube very short; lobes 1.5-1.8 × 0.6-0.10 mm. Stamens 4, included within corolla, 0.5-1 mm long; anthers small, globose, adherent around stigma. Ovary 0.8-1 mm long; ovules many on globose placenta towards the base; style 0.3-0.5 mm long; stigma capitate, bilobed. Capsule globose, 1.5-1.8 × 1.5-1.8 mm didymous, laterally compressed, top truncate or shortly protruded, soft dense hispid all over. Seeds many, triangular, 0.15-0.2 × 0.1-0.13 mm, exotesta reticulate, purple.

*Fls. & Frts.* : July to May.

*Distrib.* : India : Orissa, Pondichery, Tamil Nadu, Kerala, Karnataka and Maharashtra; Sri Lanka; Bangladesh; Myanmar; Malaya.

*Exsiccata studied* : INDIA : Orissa : Puri, *H. F. Mooney* 3035 (DD) & *G. Panigrahi* 23236 (ASSAM); Pondichery, *M. Perrotet s. n.* (E) & *A. Meebold* 2311 (CAL); Maharashtra : Bombay, *Dalzell s. n.* (DD, CAL). Karnataka : North Kanara, *W. A. Talbot s. n.* (BSI) & 1836 (CAL). Karwar, *L. J. Sedgwick & T. R. D. Bell* 5074 (CAL); Mysore, *Wight* 1707 (E). Kerala : Travancore, *M. A. Lawson s. n.* (MH); Quilon, *M. Rama Rao* 1138 (CAL) & 2236 (CAL).

SRI LANKA : *Thwaites* 1681 (CAL).

BANGLADESH : Chittagong, *J. D. Hooker & T. Thomson s. n.* (E) & 150 (CAL) & Cox's Bazar, Kelatuli, *J. Sinclair* 3097 (CAL).

MYANMAR : Akyab, *S. Kurz* 3081 (CAL).

MALAYSIA : Penang, *C. Curtis* 1844 (CAL). Singapore *Coll ?* 8047 (CAL).

54. *H. affinis* Roem. & Schult. Syst. Veg. 3 : 194. 1818 (Type : India, *Koenig s. n.* BM-holo.); *Walp. Rep.* 2 : 499. 1843. *Oldenlandia affinis* (Roem. & Schult.) DC. Prodr. 4 : 428. 1830; Bremek. Verh. Kon. Nederl. Akad. Wet. Afd. Natuurk. Ser. 2, 48 (2) : 226. 1952; Sant. & Merch. in Bull. Bot. Surv. Ind. 3 : 109. 1962; Verdc. Fl. Trop. E. Afr. Rubiac. 1 : 291. 1976; Gandhi in Saldanha *et al.* Fl. Hassan 585. 1976; Rao & Razi, Fl. Mysore 532. 1981; Matthew, Mat. Fl. Tamil Nadu & Carnatic 234.

1981 & Fl. Tamilnadu & Carnatic 723. 1983; Sharma *et al.* Fl. Karnataka 128. 1984. *H. dichotoma* Koen. ex Roth, Nov. Sp. 93. 1821, non Cav. 1801 (*Type* : India Or. Koenig s. n. B); Wt. & Arn. Prodr. 416. 1834 (excl. some synonyms). *O. dichotoma* (Koen. ex Roth) Hook. f. Fl. Brit. Ind. 3 : 67. 1880, non Spreng. 1815; Gamble, Fl. Pres. Madras 601. 1921; Haines, Bot. Bih. Or. 448. 1922. *H. heynei* Bedd. Icon. Pl. Ind. Or. 5 : 33. 1874; non R. Br. ex Wt. & Arn. 1834. (*Type* : Anamalaya Hills, *Beddome* 3555 BM; Salem hills, *Beddome* 3554 BM), (Plate 45).

Herbs annual or perennial, about 2 m erect, scrambling or trailing; stem terete, slender, rarely 4-angled and ribbed, shining, glabrous or pubescent. Leaves 2-6 × 0.4-0.8 cm, linear-lanceolate, ovate-lanceolate or elliptic-oblong to elliptic, acute or acuminate at apex, cuneate or rounded at base, 1-nerved, glabrous or scabrid above and along the margin and midnerve beneath; petiole 0.2-0.5 mm, ciliate; stipules small, 0.2-0.3 cm, truncate, with or without 2-3 bristles. Inflorescence terminal or in axillary slender lax panicles. Flowers 4-7 mm, heterostylous; pedicel 1-2 mm long or sometimes more in length, glabrous. Corolla funnel shaped, dark blue, blue-purple or deep violet, 4.5-5 mm long; tube 2-2.5 mm long; lobes 2.5-3 mm long, elliptic-oblong, hairy below the sinus. Stamens 4, inserted or exserted; filaments very short, 0.3 mm, long, adnate near throat of corolla; anthers 0.5-1 mm long, oblong. Ovary globose or subglobose, 0.2-0.5 mm long; ovules many; style 4-4.5 mm long in long styled flowers; stigma bifid, linear, 0.8-1.2 mm long. Capsule globose, 1.5-1.8 × 1.2-1.5 mm, glabrous, usually thin-walled, narrowed above, crown raised slightly. Seeds many, 0.18-0.25 × 0.18-0.2 mm, triangular, reticulate, purple red in colour.

*Fls.* : July - January; *Frts.* : July - March.

*Local name* : *Kejuri Mal.*

*Ecology* : Grows on moist humus soil, either in shade or open.

*Distrib.* : India : Manipur, West Bengal, Bihar, Uttar Pradesh, Gujrat, Madhya Pradesh, Orissa, Andhra Pradesh, Maharashtra, Karnataka and Tamil Nadu; Myanmar; Malaysia.

*Chromosome no.* :  $2n = 18$  Lewis, W. H. 1976.

*Note* : Verdcourt (1976) recognised the subsp. *jugex* on the following characters : i) Plant more robust with coarser shorter pedicel; ii) More evident bracts; iii) Rather larger calyx-lobes; iv) Thicker walled more globose capsule.

In the Indian material the calyx lobes are very variable in size, and the capsule is often slightly larger and wall is thick but peduncle and pedicel are filiform. These variations show that the distinction of the subspecies by verdcourt (*i.e.*) needs reconsideration or modification.

*Exsiccata studied* : INDIA : Manipur : Mapoong, G. Wast 7299 (BSIS). Bihar : Manbhum, C. B. Clarke 25224B (CAL) & A. Campbell 8778 (BSIS, DD). Lohardanga, J. S. Gamble 8644 (CAL) & C. B. Clarke 33976A (CAL); Hazaribagh, C. B. Clarke 24968 C (CAL); Chota Nagpore, J. J. Wood s. n. pp. (CAL); Tundi Hills, G. Wast 8778 (E). Uttar Pradesh. Kumaon, J. F. Duthie 2986 (DD, E); Ranipur, Sis Ram s. n. (DD); Denakari, E. Barnes s. n. (DD); Mirzapur, G. Panigrahi 12596,

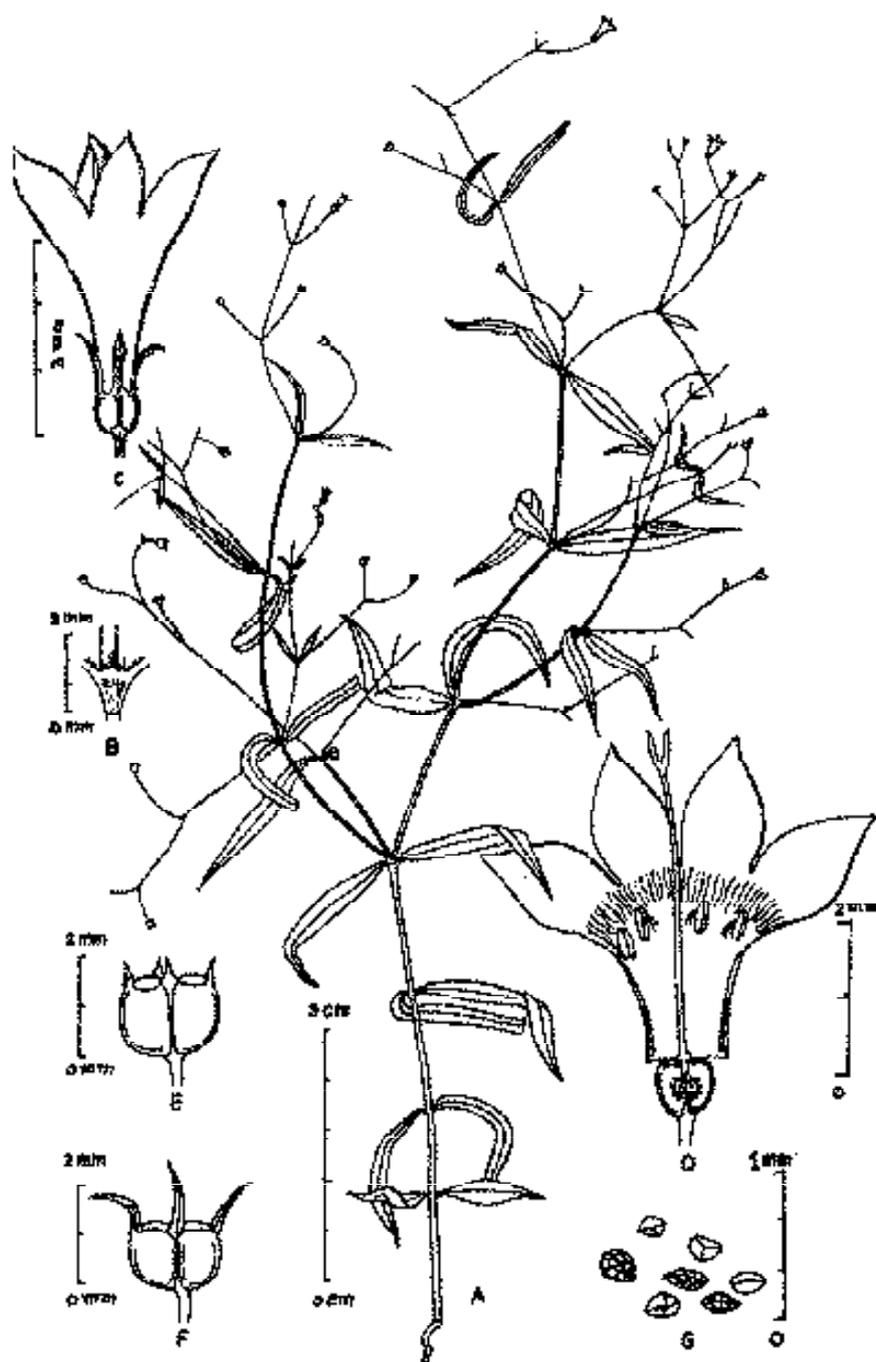


Plate 43. (A - G) *Hedyotis affinis* Roem. & Schult. : A. habit; B. stipule; C. flower; D. opened flower; E. & F. capsule; G. seeds.



12900 & 12659 (BSA); Gujarat : Nadiad, P. S. Toor 39427 (BSI). Madhya Pradesh : Panchmarhi, J. F. Duthie 10416 (DD); Bastar dist, Keskal, K. Subramanyam 7083 (MH); Bilaspur, C. M. Arora 3995 (BSA); Madai, G. Panigrahi 12910 (BSA); Sidhi dist., Bhadama, G. Sengupta 14379 (BSA); Mara forest, G. Sen Gupta 12105 (BSA). Orissa : Ganjam dist, Gullery, J. S. Gamble 21725 (BSI); Chondugiri, J. S. Gamble 21568 (DD); Jashpur, H. J. Mooney 1850 (DD). Andhra Pradesh : Cuddaph dist., Hruleybenda, J. S. Gamble 15182 (MH, CAL); Horsleyvineds, J. S. Gamble 20902 (CAL, BSI). Chittoor dist., Haraleybenda, C. E. C. Fischer 4384 (CAL); Godavari dist, Borna gudem, V. Narayanaswami 284 (CAL); Madikonakuttanarsapur, K. M. Sebastine 6750 (MH); Kurnool dist., Sunnipenta, J. L. Ellis 22119 (MH); Nallamalais, J. L. Ellis 32458 (MH); Chittoor dist., Gyanayagundlu, G. V. Subba Rao 46823 (CAL). Maharashtra : *Beddome* 72 (CAL); Poona, *Woodrow s.n.* (E); Amaravati dist., Labada, I. H. Burkill 31174 (BSIS); Alandighat, K. P. Janardhanan 72992 (BSI). Shivneri Forest, R. S. Rao 83580 (BSI); Mhaismal hills, K. P. Janardhanan 100116 (BSI); Gandhi hill, K. P. Janardhanan 100914 (BSI); Junnar, K. Hemadri 104345 & 106908 (BSI). Karnataka : Virampuram, I. H. Burkill 17710 (BSIS); Badami, A. Meebold 11243 (CAL); Mysore dist, Ketadevargudi R. S. Rao 32904 (BSI); Raichur dist., Gangavathi, S. B. Manohar 0823 (CAL); Chitradurga dist, Santhebunde R. F., B. R. Ramesh 10543 (CAL). Tamil Nadu : Madras, *Wall. Cat.* 6204 (CAL; E); Peninsular Ind. Or., *Wight* 1313 (DD, E) : Nilgiris, J. S. Gamble 15644 (CAL); Mayar R. F. B. D. Sharma 35586 (MH); Chingleput dist, Kambakam, *Bourne* 2177 (CAL & MH); Coimbatore, C. E. C. Fischer 740 (CAL); Jattakarai, C. E. C. Fischer 1216 (CAL); Anamalai Hills, Attakatti, C. E. C. Fischer 3284 (CAL); Pemmali, A. Sauliere 993 (CAL); Tirunelveli dist, Sivanaperi, C. E. C. Fischer 3866 (CAL); Rampa dist., Bomagudem, V. Narayanaswami 284 (CAL); Madura, K. C. Jacob 17539 (MH); Kodaikanal, M. Chandrabose 51708 (CAL).

55. *H. attenuata* Willd. Act. Amst. Nat. Cur. 4 : 216. 1803 (*Type* : Ind. Or. 1797, *Klein s. n.* Willd. microfische!); Roem. & Schult. Syst. Veg. 3 : 192. 1818. *H. brachiata* Wight in Wt. & Arn. Prodr. 416. 1834 (*Type* : Trichinapolly, *Wight* 1311 ex *Wall. Cat.* 6201 p.p. K! photo! E !, iso. CAL); Walp. Rep. 2 : 499. 1843. *Oldenlandia brachiata* (Wight) Hook. f. Fl. Brit. Ind. 3 : 66. 1880; Prain, Beng. Pl. 559. 1903; Duthie, Fl. Upp. Gang. Pl. 419. 1903; Haines, Bot. Bih. Or. 448. 1922. *O. pusilla* Rottl. in Ges. Naturf. Fr. Neue. Schr. 4 : 216. 1803; Gamble, Fl. Pres. Madras 610. 1921; Rao & Razi, Fl. Mysore 537. 1981; Sharma *et al.* Fl. Karnataka 129. 1984. *H. angustifolia* Wall. *Cat.* 6203, *nom. nud.* (Plate 46a).

Herbs annual, about 22cm long, stiff, erect; stem acutely 4 angled, sparsely setaceous or glabrous. Leaves sessile, 1.2-2.5 × 0.2-0.3 cm, linear, 1-nerved, revolute at margin, glabrous except setaceous margin and midrib; stipules connate, 2-3 mm broad, truncate, with bristles. Inflorescence terminal panicle or simple cymes or axillary solitary flowered; peduncles 0.8-1 cm long, angular to terete. Flowers 2-3 mm long; pedicels mostly 0.7-1 cm long, angular or terete, glabrous or setaceous; bracts linear, about 1 mm long, setaceous along the margin. Hypanthium 0.7-1 mm long; calyx limb very short; lobes 4, 0.3-0.5 mm long, ovate to triangular, glabrous. Corolla gibbous below, white or purple; tube 0.5-0.8 mm long, pubescent above; lobes 0.6-

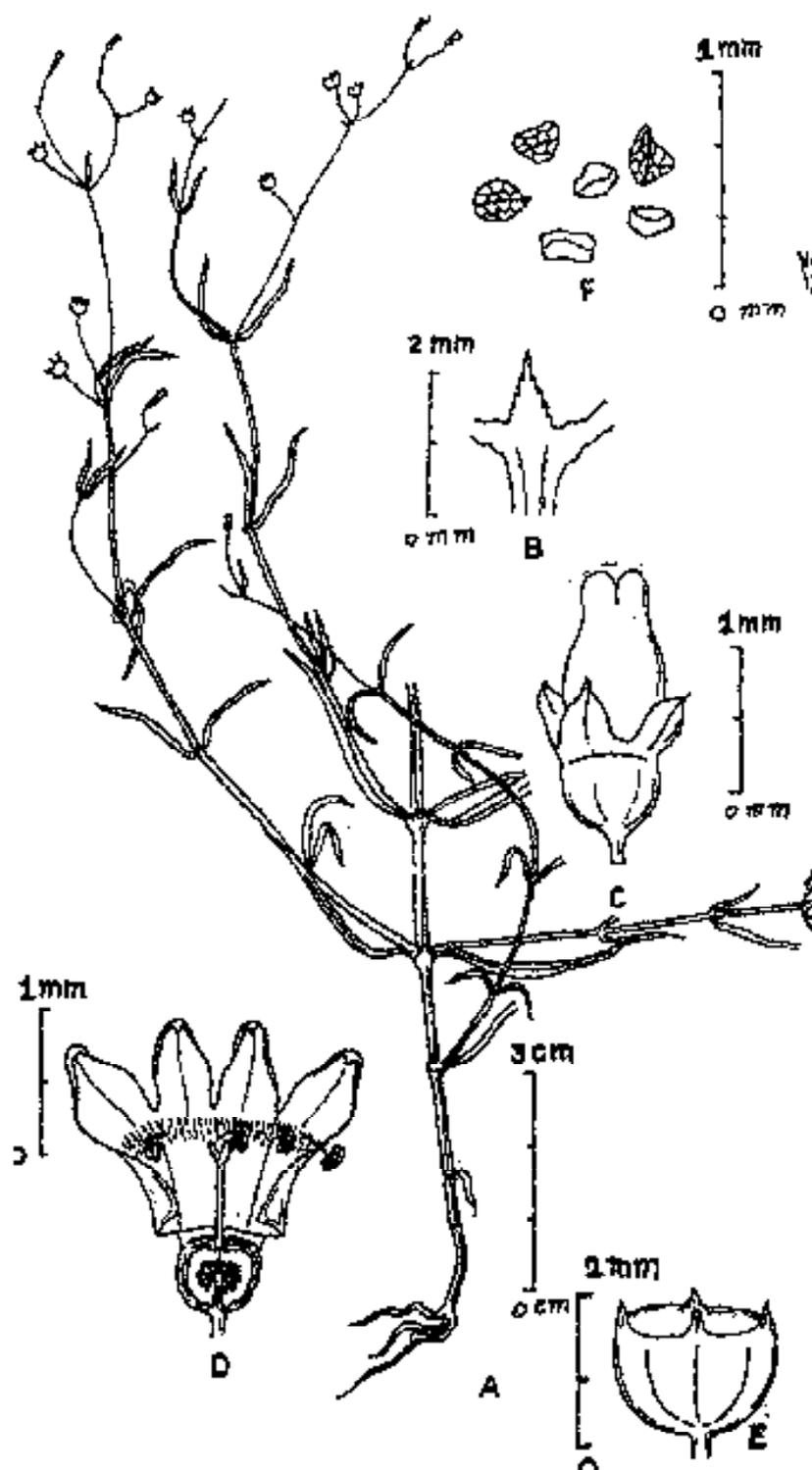


Plate 46a. (A - F) *Hedyotis attenuata* Willd. : A. habit; B. stipule; C. flower; D. opened flower; E. capsule; F. seeds.

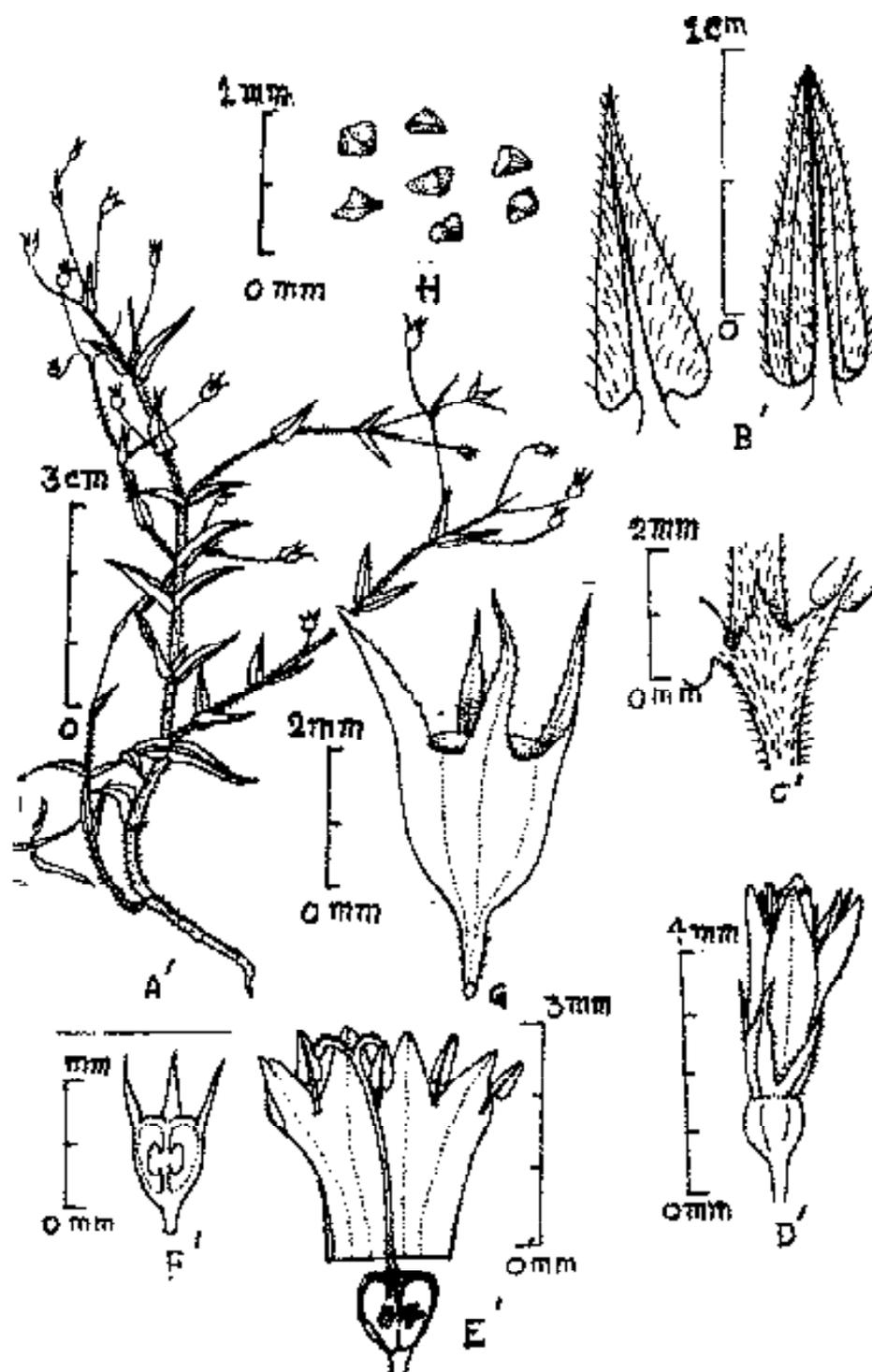


Plate 46b. (A' - H') *Hedyotis linoides* (Griff.) Kurz : A', habit; B', leaves (Dorsal & ventral view); C', stipule; D', flower; E', opened flower; F', L.S. of ovary; G', capsule; H', seeds.

0.8 mm long, oblong-linear, glabrous. Stamens 4, included; filaments 0.3-0.6 mm long, pubescent above, adnate to throat. Ovary 0.2-0.5 mm long; ovules numerous on sub basal placenta; style about 0.5 mm long; stigma 0.2-0.3 mm long, bifid, linear. Capsule 1.3-1.5 × 1.5-2 mm, much broader than long, didymous, crown truncate or slightly hemispheric, glabrous with subulate short calyx teeth, outer surface usually reddish veined. Seeds many, triangular, 0.1-0.2 × 0.2 mm, exotesta reticulate, purple red.

*Fls.* : July - September; *Frts.* : September - October.

*Distrib.* : India : West Bengal, Bihar, Uttar Pradesh, Andhra Pradesh, Tamil Nadu, Karnataka.

*Exsiccata studied* : INDIA : West Bengal : Santiniketan, *B. P. Guha s. n.* (CAL); Bihar : Patna, *Hamilton 375 ex Wall. Cat. 6203* (CAL, E); Uttar Pradesh, Northern division, *W. Elliot s. n.* (E); Agra, *Janeason s. n.* (DD); Kotwa, *G. Panigrahi 2567* (CAL); Sathot, *G. Panigrahi 2640* (CAL); Madhya Pradesh : Sanchi, *A. Meebold 8889* (CAL); Gwalior, *G. Panigrahi 5756* (CAL). Andhra Pradesh : Chittoor dist., Chandragiri fort, *K. Subramanyam 6968* (MH); Visakhapatnam dist., Srungararupukota, *N. P. Balakrishnan 1016* (CAL); Srikakulam, *N. P. Balakrishnan 1017* (CAL); Tamil Nadu : Tiruchirapally, *Wight Cat. 1331 & Wall. Cat. 6201* (E, CAL); Nagapatam, *Wight s. n.* (E); Peninsular India, *Wight 433* (E); Madras, *Wall. Cat. 867* (CAL); Coimbatore, Viziamangalam, *C. E. C. Fischer 2111* (CAL); S. Arcot dist, *K. Rammurthy 60382* (CAL); Karnataka : *G. Thomson s. n.* (CAL).

56. *H. hygrophila* (Bremek.) Bennet. in Journ. Econ. Tax. Bot. 4 : 592. 1983. *Oldenlandia hygrophila* Bremek. in Kew Bull. 29 : 359. 1974. (Type : Kerala State, Molampuzha dam near Palghat, *R. Vasudevan Nair s. n.* K!).

Herbs annual, erect, unbranched, delicate, 3-12 cm long; stem 4-angular, winged, prominent at nodes, minutely pubescent. Leaves sessile or subsessile, 8-10 × 0.7-10 mm, elliptic, acute, 1-nerved, margin and nerves scabrid; stipules connate, 1-2 mm broad, with 2-3 bristles, 0.8-1 mm long. Inflorescence axillary solitary flower or 2 flowered cyme. Flowers 3.5-4 mm long; pedicel 1-1.5 cm long, slender. Hypanthium ovoid, 0.8-1 mm long, glabrous; lobes 4, 0.7-1 × 0.5-0.7 mm, ovate, acute, setulose at margin. Corolla broadly tubular, blue; tube 1.5-2 mm long; lobes oblong, acute, 1-1.2 mm long, glabrous inside. Stamens 4, exerted; filaments 0.5-0.7 mm long, adnate to sinus of corolla lobes; anthers oblong, 0.5-0.6 mm long. Ovary 0.5-0.7 mm long; ovules many; style 2-2.5 mm long; stigma bilobed, 0.3-0.5 mm, papillose. Capsule ovoid, 2-2.5 × 1.5-2 mm, crown, raised above. Seeds many, angular, 0.3-0.5 × 0.3-0.5 mm, exotesta reticulate, slimy when moist.

*Ecology* : Water-logged soil on granite rock.

*Distrib.* : Kerala.

*Exsiccata studied* : Type sheet only.

57. *H. pumila* L. f. Suppl. 119. 1781 (*Type* : Tranquebar, *Koenig s. n.*); Wt. & Arn. Prodr. 414. 1834; Walp. Rep. 2 : 499. 1843; Bakh. f. in Backer & Bakh. f. Fl. Java 2 : 285. 1965. *Oldenlandia pumila* (L.f.) DC. Prodr. 4 : 425. 1830; Bremek. in Verh. Kon. Nederl. Akad. Wet. Afd. Natuurk. Ser. 2, 48(2) : 250. 1952; Sant. & Merch. in Bull. Bot. Surv. Ind. 3 : 109. 1961; Verde. Fl. Trop. E. Afr. Rubiac. 1 : 307. 1976; Bonnet, Fl. Howrah 350. 1979; Sharma & Tiagi, Fl. N. E. Rajas. 187. 1979; Rao & Razi, Fl. Mysore 537. 1981; Raghavan et al. in Rec. Bot. Surv. Ind. 21(2) : 42. 1981; Sharma et al. Fl. Karnataka 129. 1984. *O. crystallina* Roxb. (Hort. Beng. 11 : 1814 nom.) & Fl. Ind. 1 : 443. 1820 & 1 : 444. 1832 (*Type* : Bengal, *Roxburgh s. n.* K-W photo!); DC. Prodr. 4 : 426. 1830; Hook. f. Fl. Brit. Ind. 3 : 65. 1880; Collett, Fl. Siml. 230. 1902; Prain, Beng. Pl. 559. 1903; Cooke, Fl. Pres. Bomb. 589. 1903; Duthie, Fl. Upp. Gang. Plain 414. 1903; Gamble, Fl. Pres. Madras 661. 1921; Haines, Bot. Bih. Or. 447. 1922; Moore in Fawcett & Rendle, Fl. Jam. 7 : 34. 1936; Nair, Fl. Bash. Himal. 134. 1977; Choudhury & Wadhwa, Fl. Himach. 2 : 348. 1984. (Plate 47a).

Herbs annual or perennial from long and woody root stock, usually branched near the base, branches diffuse procumbent to prostrate; stem acutely angular, minutely dentate on the ribs. Leaves sessile, 0.7-1.8 × 0.1-0.6 cm, elliptic or elliptic-lanceolate, acute, narrowed at base to petiole, membranous, scabrid above along margin and midrib below, often crystalline dots present in the lower surface; stipules 2-3 mm × 0.5-2 mm with 2-5 bristles. Inflorescence axillary, opposite or alternate, 1-flower or 2-flowered cymes; peduncle 0.7-1 cm long. Flowers pedicelled, 2.5-3 mm long : pedicel 1-1.5 cm long, distinctly ribbed, denticulate along ribs. Hypanthium ovoid, 0.3-1 mm long; calyx limb very short; lobes 4, rarely 5, 0.5-0.6 mm long ovate-lanceolate or triangular, acute, dentate at margin. Corolla about 2 mm long, white; tube 1.2-1.3 mm long, pubescent at throat; lobes 4, 0.5-0.8 × 0.5-0.6 mm, ovate, acute, incurved at apex. Stamens 4, included; filament very short, 0.2-0.3 mm long, adnate to sinus of corolla lobes; anthers 0.3-0.4 cm long, oblong. Ovary 0.3-0.7 mm long; ovules many on submedian oblong placenta, style exerted, 1-1.3 mm long; stigma bilobed, fleshy, 0.3-0.5 mm long, tufted hairy. Capsule ellipsoid or oblong-ovoid, 2-3 × 2.5-3 mm, didymous distinctly ribbed, glabrous. Seeds 30-40, 0.7 × 0.1 mm, angular; exotesta strongly reticulate, brownish.

*Fls. & Frts.* : September - January.

*Local name* : *Punki* in Bengali.

*Ecology* : On hill slopes black soil, not common.

*Distrib.* : India : West Bengal, Rajasthan, Madhya Pradesh, Maharashtra, Kerala, Tamil Nadu, Andaman; Bangladesh; Myanmar; Indonesia, Malesia; Vietnam, Introduced in Africa and a weed in Jamaica.

*Note* : Bremekamp (*l.c.*) described *H. pumila* L. f. having flowers all solitary while the Indian plants have often 2-flowered cymes for which it is very near to *Oldenlandia caespitosa* (Benth.) Hiern, var. *major* Bremek.

*Exsiccata studied* : INDIA : West Bengal : Sibpore, *S. Kurz s. n.* (CAL) & *S. R. Bennet* 1072 (CAL); Malda, *R. M. Dutta* 551 (CAL). Rajasthan : Aboo hills, *G. King s. n.* (CAL); Banswara, *K. C. Kanodia* 75174 (BSI); Hinglesia, *K. C. Kanodia* 82345,

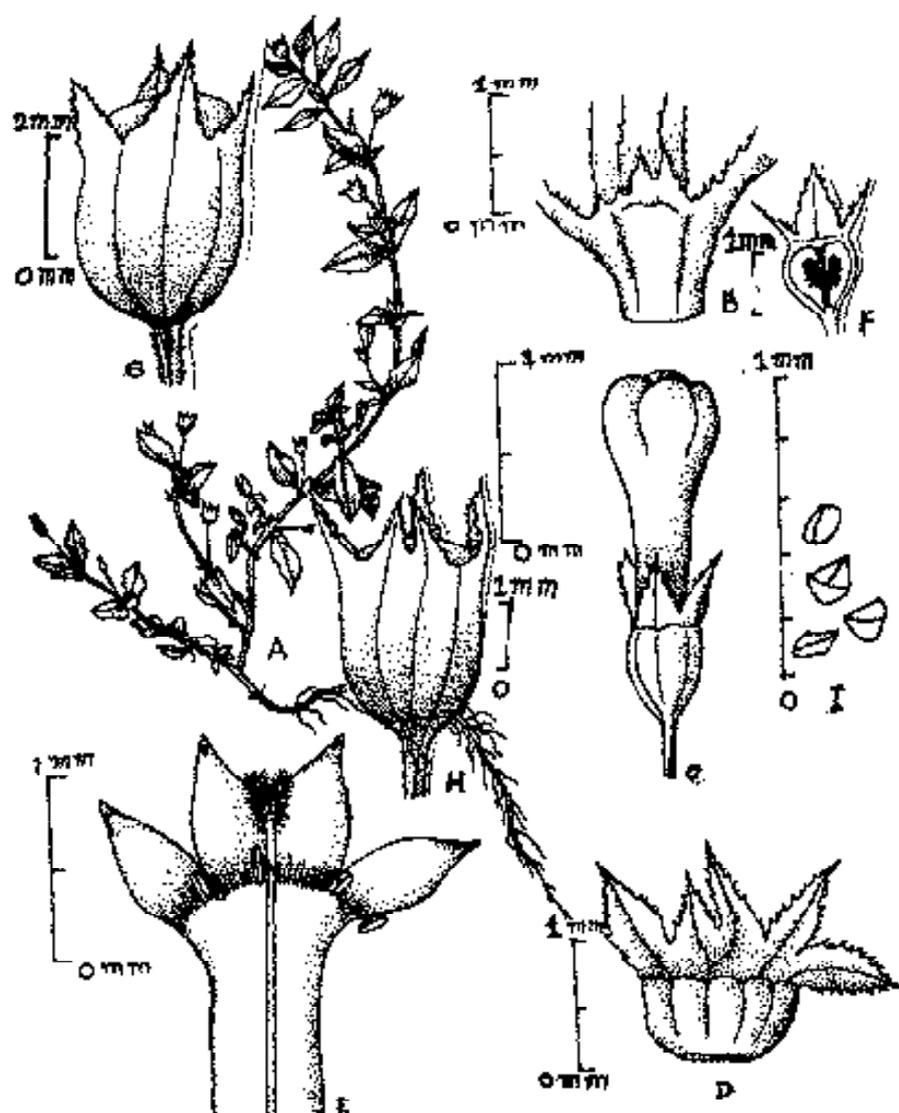


Plate 47a. (A - F) *Hedysotis pumila* L.F. : A. habit; B. stipule; C. flower; D. calyx lobes; E. opened corolla; F. L.S. of ovary; G. & H. capsule; I. seeds.

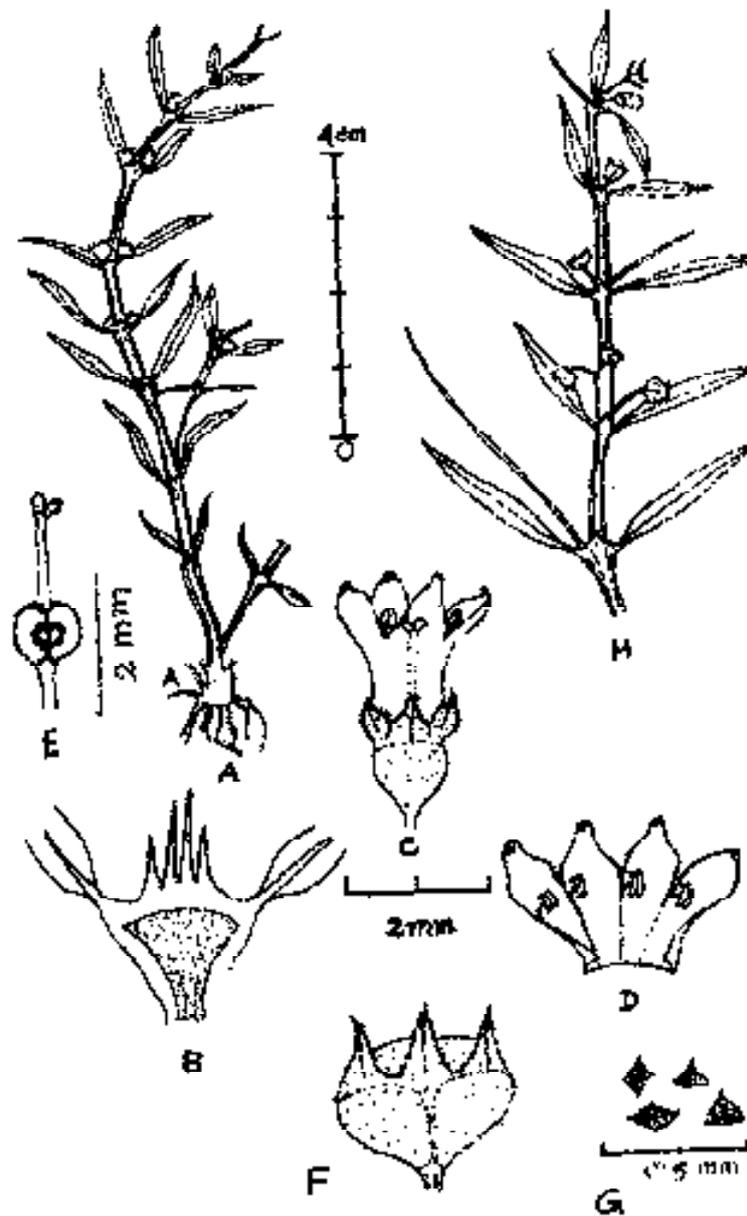


Plate 47b. (A - G) *Hedyotis diffusa* Willd. : A, habit; B, stipule; C, flower; D, opened corolla; E, L.S. of ovary with style and stigma; F, capsule; G, seeds.

(BSI); Looda, *R. B. Majumder s. n.* (BSA); Maharashtra : Vadgaon Ghenaud, *K. P. Janardhanan 72678* (BSI); Junnar, *K. Hemadri 99764* (BSI). Dadra, *M. Y. Ansari 93855* (BSI). Madhya Pradesh : Indore dist., Jai Jayavanthi, *A. S. Rao 79227* (BSI); Lalpur, *G. Panigrahi 6223* (BSI). Kerala : Travancore, Punaloor, *M. Rama Rao 1413* (CAL); Travancore, Koni, *C. C. Calder & M. S. Ramaswami 86* (CAL); Tamil Nadu : Madras, *C. A. Barber 136* (MH); Madras Museum Compound, *Bourne 2661* (CAL); Tirunelveli Dt., Courtallum, *K. C. Jacob 16239* (MH); Andaman : *D. Prain s. n.* (CAL).

58. *H. diffusa* Willd., Sp. Pl. 1 : 566. 1797, [Type : Travancore *Klein 60(B)* in *Willdenow 2588* (2) right hand specimen, microfische!]. Yamazaki in Hara Fl. E. Himal. 309. 1966. *Oldenlandia diffusa* Roxb. Hort. Beng. 11. 1814 & Fl. Ind. 1 : 444. 1820; Hook. f. Fl. Brit. Ind. 3 : 65. 1880; Prain, Beng. Pl. 601. 1903; Heinig, Enum. 601. 1907; Gamble, Fl. Pres. Madras 601. 1921; Haines, Bot. Bih. Or. 447. 1922. (Plate 47b).

Herbs annual, 20-45 cm long, suberect, procumbent or prostrate, diffusely branching, often rooting at nodes; stem terete, compressed, glabrous, rarely scabrid. Leaves sessile or subsessile, 4-5 × 0.3-0.5 cm, linear or linear-lanceolate, acute, narrowed at base, glossy, scabrid above along the margin, midrib faint below : stipules connate, 2-3 mm broad, with 2-3 bristles, often serrated at margin. Inflorescence axillary, solitary sessile or pedicelled flower or pedunculate cyme of 2-3 flowers; peduncle 1-3 at each axil; peduncle and pedicel stout or slender. Flowers 4.5 × 1.5-2 mm. Hypanthium 0.8-1.3 × 1-1.5 mm, globose; calyx limb very short, lobes 4, 0.5-1 mm long, ovate-lanceolate, ciliate along the margin or serrated. Corolla broadly tubular, white, pinkish white, pale pink or light blue; tube 1.5-1.7 mm long; lobes 1-1.6 mm, ovate, acute, incurved at apex, glabrous inside. Stamens 4, exserted; filaments 0.5-1.5 mm, adnate to sinus of corolla lobes, anthers globose or nearly so, 0.5-0.7 mm often coherent around the stigma. Ovary subglobose, 0.8-1 mm; ovules many on subglobose placenta; style stout, 2-2.5 mm; stigma bilobed, fleshy, papillose. Capsule nodding, 2-3 × 2-4 mm, globose, didymous, depressed, truncate or flat above, glabrous, reddish green when mature. Seeds many, small, 0.1-0.15 × 1-0.15 mm, angular, narrowly winged, brownish.

#### KEY TO THE VARIETIES

- 1a. Flowers sessile or short pedicelled; solitary or 2-3 together; pedicel less than 2 mm long ... var. *diffusa*
- 1b. Flowers pedicelled, solitary or pedunculate cyme; pedicel more than 2 mm long ... var. *extensa*

58a. *H. diffusa* Willd., Sp. Pl. 1 : 566. 1798 var. *diffusa*; Smith in Rees Cycl. 17 : 14. 1811; Yamazaki in Hara, Fl. E. Himal, 303. 1966; Hara in Hara & Williams, Enum. Fl. Pl. Nepal 2 : 202. 1979; Manilal & Sivarajan, Fl. Calicut 141. 1982; Deb, Fl. Tripura State 2:55. 1983; Chowdhury & Wadhwa, Fl. Himach. 2 : 346. 1984. *H. ramosissima* Kutz. in Journ. Asiat. Soc. Beng. 46(2) : 133. 1877. Trimen, Handb. Fl. Ceylon 2 : 315. 1894; Prain, Beng. Pl. 1 : 559. 1903; Duthie, Fl. Upp. Gang. Pl. 414. 1903; Cooke, Fl.



Pres. Bomb. 589. 1903; Gamble, Fl. Pres. Madras 601, 1921; Haines, Bot. Bih. Or. 1 : 413. 1922; Babu, Fl. Dehra Dun 227. 1977; Raizada & Saxena, Fl. Mussourie 1 : 307. 1978. *O. brachypoda* DC. Prodr. 4 : 424. 1830 (Type : Nepal, Wallich s. n.; Philippines, Haenka s. n.; Java, Blume s. n. G. DC. Microfische!). *H. burmanniana* R. Br. var. *brachypoda* (DC.) Thwaites Enum. 419. 1859. *H. brachypoda* (DC.) Sivarajan & Biju in Taxon 39(4) : 672. 1990.

This plant is usually glabrous. Flowers axillary or solitary on a very short, stout pedicel; pedicel mostly less than 2 mm long.

*Fls.* : July - September; *Frts.* : October - December.

*Ecology* : In moist humus covered clayey or sandy alluvial soil.

*Distrib.* : Throughout India : Nepal; Bhutan; Bangladesh; Sri Lanka; Indonesia.

*Exsiccata studied* : INDIA : Assam : S. N. Bal 287 (CAL) & Jenkins s. n. (CAL); Makum, G. A. Gammie 92 (CAL); Dibrugarh, Prain 532 (CAL); Halflong, W. G. Craib 486 (CAL); Baguri, G. Panigrahi 9348 (CAL); Kaziranga, R. S. Rao 9852 (CAL); Orange-Barscola, G. Panigrahi 14233 (CAL); Upper Dihing Reserve, G. Panigrahi 18771 (CAL); Kamrup dist., Chandubhi Lake, A. S. Rao 38884 (CAL). Arunachal Pradesh : Tirap dist. Soha, R. S. Rao 20372 (CAL); Khonga, G. Panigrahi 14505 (CAL); Subansiri dist. Kimin, G. Panigrahi 19422 (CAL); Zoram, G. Panigrahi 19774 (CAL). Meghalaya : Khasi, Griffith s. n. (CAL); Mikir hills Deygrum, G. Panigrahi 9348 (CAL). Nagaland : Kohima, C. B. Clarke 41582 (CAL). Tripura : Abhaynagar, P. M. Debburman 377 (CAL); Agartala, P. M. Debburman 377, 176 & 751 (CAL). Charilam, D. B. Deb 2527; Sarduk Chara, D. B. Deb 1441. Manipur : Imphal, G. Watt 6933 (CAL). West Bengal : J. L. Lister s. n. (CAL); Kurz s. n. (CAL); Siliguri, G. King s. n. (CAL); Darjeeling, C. B. Clarke 35527B (CAL); Mungpoo, Kari 1313 (CAL) & Ribu & Rhomeo 3892 (CAL); Jalpaiguri, V. Narayanswami 2363 (CAL); Raja Bhatkhowa, C. R. Das 31 (CAL); Hooghly dist., Tarakeshwar, R. B. Ghosh 2419 (CAL); Dakshinmaju, S. S. R. Bennet 708 (CAL); Malda dist., Hatimari, R. M. Dutta 464 (CAL). Uttar Pradesh : Dehra Dun, J. F. Duthie 1665 (DD, CAL); Mussourie, G. King 44 (CAL); Amaria, C. L. Malhotra 50945 (CAL). Tamil Nadu : Lower Pulney, Bourne 24 (CAL); S. India, Blatter & Hallberg 505 (CAL); Madras, Sauliere 434 (CAL); Kudiramoli, K. M. Sebastine 13686 (CAL). Karnataka : North Canara, W. A. Talbot 468 & 1175 (CAL); Kerala : Travancore, C. C. Calder 375 (CAL) & C. C. Calder & M. S. Ramaswami 1616 (CAL). North Nicobar, P. Chakraborty 6030 (CAL). Sikkim : Terai, J. D. Hooker s. n. (CAL) & G. King s. n. (CAL); G. A. Gammie 251 (CAL); Mungpoo, Sikkim, 2000, Kari 1313 (CAL); Ribu & Rhomoo 3892 (CAL).

BHUTAN : G. King s.n. (CAL); G. Sen Gupta s. n. (CAL).

NEPAL : Tilhar, Staitan, Sykes & William 562 (CAL); Gokarna, R. Thapa & P. Prodhon 6414 (CAL).

BANGLADESH : Dacca, C. B. Clarke 6761 (CAL); Comilla, C. B. Clarke 6913 (CAL).

SRI LANKA : Central Province, *Thwaites* 2638 (CAL).

MALACCA : *Hervey s. n.* (CAL).

MALAYSIA : Perak, *Scortechini* 186 (CAL). *G. King* 279 & *L. Wray* 3261 (CAL).

58b. *H. diffusa* Willd. var. *extensa* (Hook. f.) Dutta comb. nov. *Oldenlandia diffusa* Roxb. var. *extensa* Hook. f. Fl. Brit. Ind. 3 : 65 1880 (Type : Sylhet, *R. D. Silva s. n.* in *Wall. Cat.* 869 K-W photo! iso! CAL; Khasi, *Wight* 2910 K-photo!). Hook. f. Fl. Brit. Ind. 3 : 65. 1880. *O. diffusa* Roxb. var. *polygonoid* Hook. f. [(Type : Burma, *Wall. Cat.* 872 K-W photo!); iso! CAL.].

The plants usually scabrid. Flowers axillary solitary on slender pedicel, alternate or opposite or flowers in pedunculate cyme of 2-3 flowers; pedicel 3-12 mm long; peduncle 2-14 mm long; both peduncle and pedicel scabrid. Capsules usually nodding.

*Fls.* : July - September; *Frts.* : October - December.

*Ecology* : Marshy places or grass land, sandy or loamy soil or waste land near water.

*Distrib.* : Almost throughout India; Myanmar; Bangladesh; Eastern Asia; Malaya; Australia & America.

*Exsiccata studied* : INDIA : West Bengal : Taldanga, *S. Kurz s. n.* (CAL); Malda, *C. B. Clarke* 26954 (CAL); Sundarban, *Prain s. n.* (CAL); Kankarjhora, *G. Sengupta* 509 (CAL); Burgachia, *S. S. R. Bennett* 619 (CAL); Bishnupur, *M. N. Sanyal* 172, 305 (CAL); Gopalpur, *M. N. Sanyal* 240 (CAL); Bishnupur, Birati, *K. M. Roy Chowdhury* 24 (CAL); Malda, Mashalda, *R. M. Dutta* 531 (CAL). Bihar : Chotonagpur, *J. J. Wood s. n.* (CAL); Singhbhum, *H. H. Haines* 449 (CAL); Ranchi, *R. N. Banerjee* 220 (CAL); Uttar Pradesh : Kissingunj, *L. S. Sedgwick & T. R. D.* 6720 (CAL) Abdullagunj, *G. Panigrahi & O. P. Misra* 6386 (CAL); Dhandaaraul Dam, Mirzapur, *O. P. Misra* 9810 (CAL); Amarai Pilibhit, *C. L. Malhotra* 42428 (CAL). Madhya Pradesh : Bilaspur, *G. Panigrahi* 15393 (CAL). Tamil Nadu : Madras, *Beddome* 71 (CAL); Madras, *M. S. Ramaswami* 900 (CAL); Coimbatore dist., Uppukaral, *C. E. C. Fischer* 1392 (CAL); Vellingiri Hills, *K. M. Sebastine* 3133 (CAL); Tirunelveli dist., Kalakkadu, *J. Joseph* 15265 (CAL); Kerala : Kalabar dist., Olavakkot, *C. E. C. Fischer* 2817 (CAL); Quilon, *M. Rama Rao* 2214 (CAL) & *C. M. Mohanan* 54925 (CAL). Orissa : Rebna-Palaspal, *G. Panigrahi* 8449 (CAL); Harishpur, *G. Panigrahi* 23935 (CAL); Kalahandi dist., Gourtalia, *S. K. Mukherjee* 4278 (CAL); Orissa coast, Chandipur, *T. A. Rao*, 5603 (CAL). Andhra Pradesh : Visakhapatnam dist., Araku Valley, *N. P. Balakrishnan* 10765 (CAL); East Godavari dist. Maredumelli, *G. V. Subba Rao* 24406 (CAL). Maharashtra : Pune dist., Lonaula, *Reddi* 100953 (CAL & 98617 CAL). Andaman : Dhani Khari hill, *G. King s. n.* (CAL); North Andaman, *K. Thothathri* 9139 (CAL), Gupta Para, *N. P. Balakrishnan* 168 (CAL); Maymyo, South Andaman, *N. P. Balakrishnan* 1382 (CAL) & *N. Bhargava* 4206 (CAL).

MYANMAR : Mandalay, *Henderson s. n.* (CAL); Kachin hills, *Shaik Mokim* 122 (CAL).

BANGLADESH : Chittagong, *Shaik Mokim s. n.* Cox's Bazar, *J. Sinclair* 3065 (CAL).

EASTERN ASIA : China : Hupeh, *A. Henry* 4298 & 8203 (CAL).

MALAYSIA : Penang, *Curtis* 1988 (CAL); Penang, *E. Deschamps s.n.* (CAL).

59. *H. corymbosa* (L.) Lamk. Tabl. Encycl. 1 : 272. 1792; Bakh. f. in Backer & Bakh. f. Fl. Java 2 : 284. 1965; Balakr. Fl. Jowai 1 : 245. 1981; Manikal & Sivarajan, Fl. Calicut 143. 1982; Deb, Fl. Tripura State 2 : 54. 1983. *Oldenlandia corymbosa* L. Sp. Pl. 119. 1753. (*Type* : Plumier, Nov. Gen. 42.t. 36. 1703 selected as the lecto. type by Verdcourt 1976 : 308); DC. Prodr. 4 : 426. 1830; Hiern, Fl. Trop. Afr. 3 : 62. 1877, excl. syn.; Hook. f. Fl. Brit. Ind. 3 : 64. 1880, p.p.: K. Schum. in Engl. & Prantl. Pflanzenfam. 4 (4) : 26. 1891; Bremek. in Verh. Kon. Nederl. Akad. Wet. Afd. Natuurk. Ser. 2, 48(2) : 254. 1952, excl. syn.; Hepper in Fl. West. Trop. Afr. ed. 2.2 : 211. 1963; Lewis in Grana Polynol. 5 : 330. 1964 & in Ann. Miss. Bot. Gard. 53 : 257. 1966; Bahu, Herb. Fl. Dehra Dun 227. 1978; Gandhi in Saldanha et al. Fl. Hassan 586. 1976; Bennet, Fl. Howrah 151. 1979; Singh, Fl. Banswara Rajasthan 122. 1983; Sharma et al. Fl. Karnataka 129. 1984. (Plate 48).

Herbs annual, 5-30 cm long, prostrate or erect, branching near the base, stem acutely angular, ridges prominent, glabrous or scabridulous. Leaves sessile, 1.3-3.5 × 0.2-0.7 cm, linear to narrowly elliptic, acute or apiculate at apex, narrowed to the base, flat or recurved, glabrous or sparsely to densely scabridulous, particularly on the midnerve; stipules 2-3 × 2-3 mm, 2-5 fimbriate in the middle. Inflorescence axillary, 2-5 flowered corymbs, umbels or racemose cymes or 1-several flowers at axil; peduncles 0.5-2 cm long; pedicel 0.1-1 cm long. Flowers 2-4 mm long. Hypanthium ovoid or ellipsoid, 0.7-1 mm long; calyx limb very short; lobes 4, triangular or triangular-lanceolate, 0.5-1.8 mm long. Corolla tubular, often gibbous at base, white, blue tinged, pink, purple or with 2 pink stripes on each lobe; tube 0.8-2.5 mm long glabrous or with a ring of pubescent hairs inside below sinus or tube; lobes 0.7-1.5 mm ovate or oblong, minute pubescent inside, incurved at apex. Stamens 4, inserted; filaments 0.2-0.8 mm long, adnate to sinus or throat of corolla tube; anthers subglobose, 0.3-0.5 mm long. Ovary 0.5-1 mm long, ovules many; style 0.5-2.5 mm long, often sparsely hirtellous; stigma bilobed, 0.3-0.5 mm long, subglobose, fleshy, papillose. Capsule 1.2-2.5 × 1.8-2.8 mm, globose or ellipsoid, didymous, rarely broader than long, top truncate or slightly raised. Seeds many, 0.1-0.3 × 0.1-0.2 mm triangular, exotesta reticulate, pale brown.

#### KEY TO THE VARIETIES

- |   |     |                        |
|---|-----|------------------------|
| 1a. Mostly 2-5 flowered cymes; style glabrous                                       | ... | 2                      |
| 1b. Flowers mostly solitary, rarely 2-3 flowered cymes;<br>style usually hirtellous | ... | var. <i>caespitosa</i> |

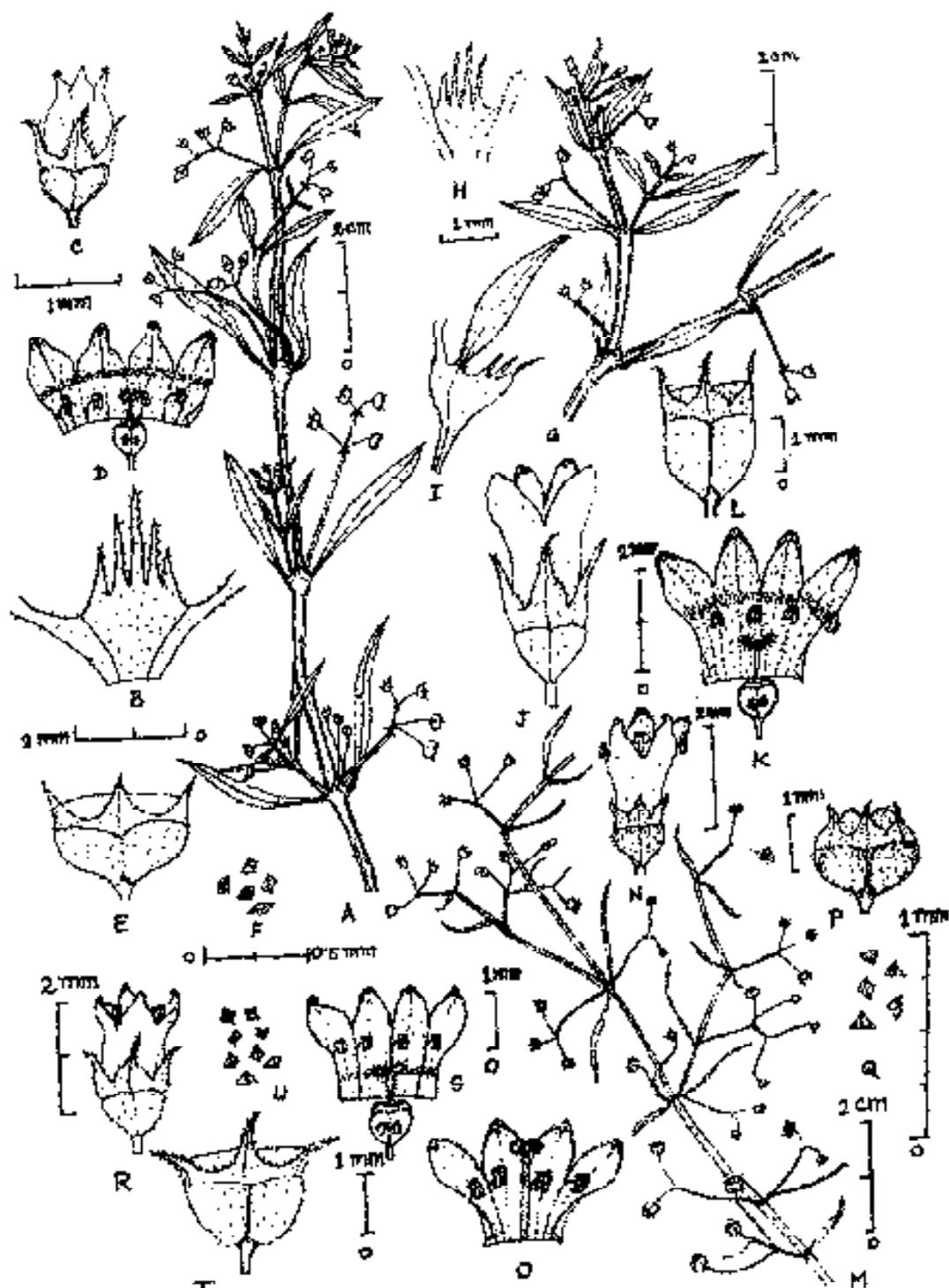


Plate 48. (A - U) *Hedyotis corymbosa* (L.) Lamk. : A. habit; B. stipule; C. flower; D. flower split open; E. capsule; F. seeds; G-L. *H. corymbosa* (L.) Lam. var. *linearis* (Di.) Deb & Dutta; G. Habit; H. & I. Stipule; J. flower; K. flower split open; L. capsule; M-Q. *H. pseudocorymbosa* Bakh. f. M. habit; N. flowers; O. corolla split open P. capsules; Q. seeds; R-U. *H. corymbosa* (L.) Lamk. var. *caespitosa* R. flower; S. splitted flower; T. capsule; U. seeds.

2a. Leaves elliptic, 0.3-0.7 cm broad; corolla tube 0.5-0.6 mm long ... var. *corymbosa*

2b. Leaves linear, 0.5-0.6 mm broad, corolla tube 1-2 mm long ... var. *linearis*

59a. *Hedyotis corymbosa* (L.) Lam. K. Tabl. Encycl. 272. 1792. var. *corymbosa*  
*Oldenlandia corymbosa* L. var. *corymbosa* Verdc. Fl. Trop. E. Africa Rubiac. 1 : 309.  
11976. *Gerontogea corymbosa* (L.) Cham. & Schlecht. in Linnea 4 : 154. 1829.

Herbs erect or prostrate; stem angular with prominent ribs, glabrous or nearly so. Leaves 1.5-2 x 0.5-0.7 cm elliptic or linear-lanceolate. Inflorescence mostly 3-5-flowered corymbose cyme or axillary, solitary flower. Flowers 2-2.5 mm long. Corolla white, gibbous at base; tube 0.3-0.6 mm long; lobes 0.3-0.5 mm long, throat with a ring of pubescence inside. Stamens inserted above the base of corolla tube. Capsule globose, 1.5-2 x 2-2.5 mm, didymous, top truncate. Seeds many, angular, exotesta granulate; with wavy walls.

*Fls.* : May - November; *Frts.* : June - December.

*Ecology* : Moist sandy soil.

*Uses* : Root produces red dye.

*Distrib.* : India : Sikkim, West Bengal, Tripura, Orissa, Kerala; Andaman & Nicobar Islands; Africa; Malaysia.

*Exsiccata studied* : INDIA : West Bengal : Calcutta, *W.H. Helfer* 89 & 331 (CAL); Bengal, *D. Chatterjee* 712 (CAL); Howrah, *S.S. R. Bennet* 171 (CAL), Bally, *L.K. Banerjee s.n.* (CAL); Dum Dum, *P. Basu* 12 (CAL); Hooghly dist., *J.P. Solomon* 434 (CAL); Baidyabati, *Subir Sen* 796 (CAL). Tripura : Agartala, *P. Debbarman* 833 (CAL). Orissa : Cuttack dist., Sikharpur, *M.K. Ghosh* 36 (CAL); Sisua, *M.K. Ghosh* 274 (CAL). Kerala: Trivandrum dist., Chirayinkil *M. Mohanan* 61804 (CAL); Kovalam, *M. Mohanan* 61804 (CAL); Kovalam, *M. Mohanan* 63893 (CAL). Andaman, & Nicobar Islands : S. Andaman, *S. Kurz s. n.* (CAL) & *D. Prain s. n.* (CAL); Corbyn's Cave, *K. Thothathri* 9395 (CAL); N. Andaman, Mayabunder, *K. Thothathri* 9139 (CAL); Port Blair, *K. Thothathri* 10207 (CAL); Middle Andaman, Mayabunder, *N. Bharagava* 1975 (CAL); Great Nicobar, *D.K. Hore* 8271 (CAL) & *P. Chakraborty* 3245 (CAL); & *P. Chakraborty* 6053 (CAL); North Nicobar, Katchal Islands, *N.C. Nair* 6220 (CAL). Sikkim : Terai, *J. Naskar s.n.* (CAL).

MALAYSIA : Penang, *Wall. Cat.* 837 (CAL) & *Stolzsk s.n.* (CAL); Java, Buitenzorg, *H. dilur s.n.*; Singapore, Johor 11142 (CAL) & *E. Deschamps s.n.* (CAL).

59b. *H. corymbosa* (L.) Lamk. var. *linearis* (DC.) Deb & Dutta in Journ. Bombay Nat. Hist. Soc. 83 (3) : 692. 1986. *Oldenlandia linearis* DC. Prodr. 4 : 425. 1830 (*Type* : Senegal, *Porrotet s.n.* G. DC. holo, microfische ! CAL); Bremek. in Verh. Kon. Nederl. Akad. Wet. Afd. Naturk. Ser. 2, 48 (2) : 1952; Hepper in Pl. West. Trop. Afr. ed. 2.2 : 211. 1963. *H. biflora* sensu Smith in Rees cycl. 15. 1811 (*Type* : East Indies 1804, *N.E. Kindersley s.n.* Linn. microfische!) *O. biflora* Roxb. Fl. Ind. 1 : 422. 1820 & 1 : 444. 1832. (*Type* : Bengal, *Roxb. s.n.* K); Roxb. Icon. 2117! CAL, 1342

*K. H. intermedia* Wt. & Arn. Prodr. 415. 1834 [Type : Wall. Cat. 868 h, Hb. Wight (*O. crystallina*) K.-W photo!]. *H. linearis* (DC.) Steud. Nom. Bot. 728. 1840. *H. erecta* Manilal & Sivarajan in Bot. Notiser 129 (2): 191. 1975 [Type : Kerala, Idimuzhikkhal, Sivarajan 419 (CAL)]. *O. corymbosa* L. var. *linearis* (DC.) Verdc. in Kew Bull. 30 : 296. 1975 & Fl. Trop. E. Afr. (Rubiaceae 1) : 309 1976.

Herbs erect; stem angular, glabrous or scabrid along ridges, purple or red when dry. Leaves sessile 1-4 x 0.4-0.6 cm. linear. Inflorescence mostly 2-3-flowered cyme, rarely solitary flowered. Flowers 3-4 mm long. Corolla tubular, pinkish white or white; tube 1.5-2 mm long; lobes 1-1.20 mm long, a ring of pubescent hairs at the throat. Anthers with short filaments adnate to tube of corolla. Capsule globose, 2.5-3 x 1.5-2 mm. Seeds angular, exotesta granular, with straight wall.

*Fls.* : May - December; *Frts.* : September - January.

*Ecology* : On dry places, sandy loam or dried up rice fields.

*Distrib.* : Throughout India, Nepal, Bhutan, Africa.

*Exsiccata studied* : INDIA : West Bengal : Bot. Gard. Calc. Saik Ismail 31 (CAL); Mirick, K. Biswas 5895 (CAL); Durgapur, S.K. Mukherjee 4454 (CAL); Santiniketan, B.P. Guha s.n. (CAL); Murshidabad, Jangipur, D.N. Guha Bakshi 285 (CAL); Maldah, Khajurai, R.M. Dutta 106 (CAL); Nadia dist., Kalyani, D.B. Deb 489 (CAL). Bihar : Hazaribagh, J.S. Gamble 8591 (CAL); Gaya, C.B. Clarke 22470 (CAL); Lohardanga, C. B. Clarke 25007 (CAL); Chotonagpur, Prain s.n.; Champaran, Motihari, R.N. Banerjee 217 (CAL); Udaipur forest, B.V. Shetty 125 (CAL). Orissa : Chamundia, Mahanadi K. Biswas 6277 (CAL); Podampur, G. Panigrahi 20529 (CAL); Borasonbar, G. Panigrahi 20654 (CAL) Uttar Pradesh : Dehra Dun, G. King s.n. (CAL); Gangetic Plain, J.F. Duthie 6395 (CAL); Kumaon, C.M. Arora 50088 (CAL); Assam : Nowgong, N.P. Balakrishnan 39327 (CAL). Meghalaya : Shillong, G. Panigrahi 3257 (CAL); Andhra Pradesh : Medak dist., Pegarikulte, K.M. Sebastine 6621 (CAL); Visakhapatnam dist., Anantagiri, G.V. Subba Rao 19578 (CAL). Tamil Nadu : Coimbatore, Varapalayam, K. Subramanyam 666 (CAL); Coimbatore, J. Joseph 13381 (CAL); Tirunelveli dist., K. Subramanyam 3867 (CAL); Annamalai, J. Joseph 13381 (CAL); Madurai dist., Soranganar falls, K. Subramanyam 8182 (CAL); Salem dist., Hogainakkal, E. Vajravelu 23525 (CAL); Kanyakumari dist., Kuzhithurai, A. N. Henry 4956 (CAL). Karnataka : Mysore, G. Thomson s.n. (CAL); W. A. Talbot 12 (CAL). Kerala : Quilon, M. Rama Rao 2163 (CAL); Rampa dist., V. Narayanswami 458 (CAL); Madhya Pradesh : G. King 210 (CAL); Parihat Road, V. Narayanswami 3170 (CAL); Amarkantak, J. K. Maheshwari 4289 (CAL); Saugor dist., Rahatgarh, N. P. Balakrishnan 11482 (CAL); Baleghat, J. K. Maheshwari 4393 (CAL); Shibpuri, G. Panigrahi 6026 (CAL); Baster, S. K. Jain 5171 (CAL); Allahabad, T. Rajagopal 3180 (CAL); Jabbalpur, K. M. Sebastine 15503 (CAL); Indore, C. M. Arora 5679 (CAL); Maharashtra : Nagpur, K. Subramanyam 4581 (CAL); Poone, R. S. Raghavan 64553 (CAL); Rajasthan : Aboo, G. King (CAL) & J. Ellerton 198 (CAL); Jyalswar, B. M. Wadha 5458 (CAL); Jaipur, S. Sharma 841 (CAL); Tong dist., Tordisagar, B. V. Shetty 1100 (CAL); Bissalpara B. V. Shetty 1312 (CAL); Himachal Pradesh : Bassoli, C. B. Clarke 31652 (CAL).

59c. *H. corymbosa* (L.) Lamk. var. *caespitosa* (Benth.) Dutta et Deb, comb. nov. *Oldenlandia herbacea* (L.) Lamk. var. *caespitosa* Benth. in Hook. f. Niger Fl. 403. 1849 (Type : Liberia, Cape Palamas, Vogel 51 K, holo). *O. caespitosa* (Benth.) Hiern, Fl. Trop. Afr. 3 : 61. 1877; Bremek. in Vrh. Kon. Ned. Akad. West. Afrd. Natuurk. Ser. 2. 48(2): 254. 1952. excl. syn. *O. corymbosa* L. var. *subpedunculata* O. Ktze. Rev. Gen. Pl. 3 : 121. 1891 (Type : Mozambique, *O. Kuntze s. n.*); *O. corymbosa* L. var. *caespitosa* (Benth.) Verdc. in Kew Bull. 30 : 298. 1975.

Herbs small, caespitose, stem angular, ribbed, scabrid. Leaves 1-2 × 0.3-0.5 cm, linear-lanceolate. Inflorescence axillary, solitary flowers in clusters or 2-3-flowered cyme, peduncle up to 2 mm long. Flowers 2.5-3 mm long. Corolla tube short, 1 mm long, with a ring of pubescence; lobes 0.5-0.8 mm long; style short, hirtellous. Capsule 1.5-2.5 × 2-2.5 mm. Seeds many, angular, granular.

*Fls.* : May - July; *Frts.* : August- December.

*Ecology* : On sandy soil.

*Distrib.* : India : West Bengal, Uttar Pradesh, Maharashtra, Andaman Islands, Sikkim; Africa.

*Exsiccata studied* : INDIA : West Bengal : Birati, C.B. Clarke 26934 (CAL). Bihar : Udaipur, K. Thothathri 9884 (CAL). Uttar Pradesh : H. J. Lace 1097 (CAL); Baria, A.S. Bell 202 (CAL), Mirzapur, G. Panigrahi 8431 (CAL). Maharashtra : Kavarathy Islands, B. M. Wadhwa 45452 (CAL); Ameni Islands, B.M. Wadhwa 68765 (CAL); Kalpani Islands, B.M. Wadhwa 64894 (CAL); Kadamat Islands, B.M. Wadhwa 68838. Andaman Islands : R.K. Ponnata 6113 (CAL); Lakshadweep, K. Srinivasan s.n. (CAL). Sikkim : Tista Plains, Ribu & Rhomoo 3703 (CAL); Terai, J.N. Naskar 241 (CAL).

*Notes* : *Oldenlandia scabrida* sensu Haines, Bot. Bih. Or. is quite different from *O. scabrida* DC. from Nepal, in leaves, inflorescence, flowers, corolla & anthers. Haines described *Oldenlandia scabrida* from Lohardanga, Singhbhum, having axillary solitary flowers on long pedicels. Flowers 2-4 in each axil, 4 mm long. Corolla tube 2-2.5 mm long, ring of pubescent hairs inside. Anthers with slender filaments and style long, slender. It differs from *H. corymbosa* and its varieties by having much longer corolla tube, anthers with distinct filaments, and slender style. This is not collected after the original discovery.

60. *H. pseudocorymbosa* Bakh. f. in Blumea 12 : 62. 1963 & Fl. Java 2 : 286. 1965. *O. pseudocorymbosa* (Bakh. f.) Babu, Herb. Pl. Dehra Dun 227. 1977. *O. furmannia* R. Br. ex Will. Cat. non Schult. 1827 (Plate 48).

Herbs annual, 5-45 cm long, erect, ascending semiprostrate or procumbent, often rooting at nodes; stem terete, scabrid throughout. Leaves sessile or subsessile, 3-5 × 0.3-0.5 mm linear-lanceolate, narrowed at both ends, membranous, or revolute, scabrid above along margin and midrib below, nerves faint; stipules 1-2.5 mm × 1-2 mm, slightly pectinate with few teeth above. Inflorescence axillary pedunculate cyme, 2-4 flowered, rarely solitary flower; peduncle 1-3 in each axil, 6-15 mm long.

thin terete, scabrid. Flower 2-3 × 1-1.5 mm; pedicel 2.5-14 mm long, slender, terete, scabrid. Hypanthium globose, 0.7-1 mm long; calyx limb very short; lobes 4, 0.5-0.6 mm long, narrowly triangular, mucronate, ciliate along margin. Corolla short tubular, white or white with red tinge above, tube 1-1.5 mm long; lobes 0.8-1 mm, glabrous inside. Stamens 4, slightly exserted; filaments 0.1-0.2 mm, long adnate to sinus of corolla lobes; anthers globose, 0.5-0.6 mm long, coherent around the stigma. Ovary 0.5-1 mm, ovules many; style 1-1.5 mm long; stigma bilobed, 0.3-0.5 mm, fleshy, papillose. Capsule 2-2.5 × 2-3 mm, nearly globose, didymous, broadening at base, narrower towards mouth, top raised above, glabrous or minutely scabrid. Seeds many 0.2-0.3 × 0.2-0.3 mm, angular, reddish brown, exotesta reticulate, mucilaginous when kept in water.

*Fls. & Frts.* : September - March.

*Ecology* : On dry sandy river beds or on moist rice fields, gravelly soil, in shady places or mixed Sal forest.

*Vernacular name* : *Gharpoda* (Oria), *Papara* (Punjabi); *Potpada* (Marathi).

*Uses* : Very much used as a medicine in remittent and bilious fever.

*Distrib.* : Throughout India : Nepal; Bhutan; Bangladesh; Myanmar; Malaysia; Philippines.

*Exsiccata studied* : INDIA : Assam, *Jenkins s. n.* (CAL); Nowgong dist., Tapatala, *N. P. Balakrishnan* 39327 (CAL). Tripura : Agartala, *P. M. Debburman* 752 (CAL). West Bengal : *J. D. Hooker & T. Thomson s. n.* (CAL); Jaldaka, *Ribu & Rhomoo* 3645 (CAL); Ayodhya hills, Purulia, *J. C. Sengupta* 2065 (CAL); Arambagh, *P. K. Hajra* 115 (CAL); Kankrajhora forest, *G. Sengupta* 492 (CAL); Bagnan, *Balaram Naskar s. n.* (CAL); Budge Budge, *S. K. Mukherjee* 600 (CAL); Mourigram, *S. S. R. Bennet* 443 (CAL); Burdwan dist., *A. K. Dutta* 530 (CAL); Bishnupur, *M. N. Sanyal* 314 (CAL); Bot. Gard. Calc. *V. S. Sharma* 595 (CAL); Hindmotor, *Subir Sen s. n.* (CAL). Bihar : Manbhum, *J. Campbell s. n.* (CAL); Lohardanga *C. B. Clarke* 25110 (CAL); Gobardanga, *B. V. Shetty* 381 (CAL). Orissa : Barkuda, *N. Anandale* 1317 (CAL); Kalahandi, *S. K. Mukherjee* 4306 (CAL); Barquad, *G. Panigrahi* 23853 (CAL); Uttar Pradesh : Dehra Dun, *J. S. Gamble* 24649 (CAL); Raigrah, *J. S. Gamble* 23927 (CAL); *Cleghorn s. n.* (CAL); Pharendra, *C. M. Arora* 1409 (CAL); Churk Sulhal forest, *G. Panigrahi* 2670 (CAL), Mirzapur, *G. Panigrahi* 9617 (CAL). Madhya Pradesh : Chanda dist., *J. F. Duthie* 9518 (CAL). Bastar dist, Keshal, *N. P. Balakrishnan* 11883 (CAL); Kondagaon, *K. Subramanyam* 7189 (CAL). Satna dist, Satna, *K. M. Subramanyam* 8927 (CAL). Sangor dist., Mohli tank, *N. P. Balakrishnan* 11507 (CAL); Banda R.F., *N. P. Balakrishnan* 11380 (CAL). Balaghat dist, Khara, *J. K. Maheshwari* 4476 (CAL); Bilaspur, *G. Panigrahi* 16789 (CAL). Andhra Pradesh: Godavari dist, *J. S. Gamble* 15855 (CAL); Godavari Delta, *Bourne* 3206 (CAL); Kalchur, *Bourne* 3350 (CAL); Guddapah dist, Paikonda range, *K. Subramanyam* 7807 (CAL); Warangal dist, *K. M. Sebastine* 11614 (CAL), Kasara, *S. K. Jain* 14764 (CAL); Sakarapathar, *A. S. Rao* 85267 (CAL); Pandongar hill, *B. Reddi* 98384 (CAL); Mulshi taluk, *B. V. Reddi* 93433 (CAL); Washala Range, *K. V. Billore* 111977 (CAL); Saiwan forest, *K. V. Billore* 713055 (CAL). Tamil Nadu : *Wight s. n.* (Kew distrib. No.



1383). (CAL); *Beddome s.n.* (CAL); South Arcot, *K.M. Sebastine* 5268 (CAL); Madurai dist, Palni velan Combai, *K.M. Sebastine* 25069 (CAL); Guidry, *A. N. Henry* 47174 (CAL). Karnataka : North Kanara, *W. A. Talbot* 863 (CAL); Malabar, *Stock & Lawson s. n.* (CAL); South Kanara, *C. E. C. Fischer* 4538 (CAL); Cannanore, *T. A. Rao* 10072 (CAL); Rajasthan : Banswara dist. Pune Pathan forest, *V. Singh* 3669 (CAL). Andaman : Dhani Khari hill, *G. King s. n.* (CAL). Sikkim : Tindharai, *K. Biswas* 7803.

NEPAL : Bharomdin Tharpu, *H. Hara et al.* 1327 (CAL).

BHUTAN : Phunt sholing, *G. V. Subba Rao* 381 A (CAL).

BANGLADESH : Cox's bazar, *Sinclair* 3838 (CAL).

SRI LANKA : Central Province, Matale dist. Wewals, *D. B. Sumithraarachchi* 8147 (CAL).

CHINA : Yunan expedition, *D. J. Anderson s. n.* (CAL).

MALAYSIA : Penang, *S. Kurz s. n.* (CAL).

PHILIPPINES : Bangui, Luzon, *M. Ramos* 27521 (CAL).

61. *H. Inoides* (Griff.) Kurz in Journ. Asiat. Soc. 46(2) : 134. 1877. *Oldenlandia inoides* Griff. Not. 4 : 265. 1854 (Type : Mergui, *Cutweng s. n.*; *Griffith* 377 K, E!) *O. arguta* (R. Br.) Hook. f. Fl. Brit. Ind. 3 : 67. 1880 (Type : Tavoy, *W. Gomez* 216 ex *Wall. Cat.* 864 K-W! iso. CAL!). *H. arguta* R. Br. ex *Wall. Cat.* 864, nom. nud. (Plate 46b).

Herbs annual, rooting at base, dichotomously branching, 5-20 cm long; stem terete, setaceous. Leaves subsessile or semiamplexicaul. 4-10.5 × 1-3 mm, triangular-lanceolate, sagitate, acuminate, hispid at both surface, revolute at margin; midrib prominent; stipules hispid 1.5 × 1-2 mm, truncate, with median bristles. Inflorescence a cyme of twice or thrice forked; peduncles slender, scabrid. Flowers 3.5-4 × 2.2 mm; pedicel 1-1.5 mm long, filiform, scabrid. Hypanthium ovoid, 0.5-0.8 mm long; calyx limb very short; lobes 4, 1-1.2 × 0.8 mm, subulate or linear-lanceolate, acuminate, serrulate at margin, upper surface glabrous or sparsely scabrid. Corolla 4 lobed, blue or purple; tube 2 mm long; lobes 0.8-1 × 0.6-0.7 mm, glabrous. Stamens 4, exserted; filaments 0.5-0.7 mm long, black to purple, adnate below sinus of corolla lobes; anthers 0.7-1 mm long, oblong. Ovary 0.3-0.5 mm long, ovules many on globose or oblong placenta; style 2-2.5 mm long, exserted; stigma 0.5-0.7 mm long, linear, bifid, granulate. Capsule 2.2-2.6 × 2-2.5 mm, ellipsoid or ovate-oblong, glabrous, crown raised, but shorter than calyx lobes. Seeds many, triangular, 0.18-0.2 × 0.15-0.18 mm, exotesta smooth, reticulate, orange.

*Fls. & Frts.* : September - October.

*Distrib.* : Myanmar.

*Exsiccata studied* : MYANMAR : Tavoy, W. Gomez 216 ex Wall. Cat. 864 (CAL, E); Rangoon, C. E. Parkinson 15193 (DD); Mergui, Griffith E. D. No. 377 (E).

62. *H. graminicola* Kurz in Journ. Bot. 4 : 326. 1875 (Type : Nicobar Islands, Kamorta, Feb. 1875, S. Kurz. s. n. CAL). *H. biflora* Smith var. *graminicola* (Kurz) Kurz in Journ. Asiat. Soc. Bot. 46(2) : 133. 1877.

Herbs annual, erect, simple or branching dichotomously; stem angular, ridges prominent, sparsely hairy. Leaves sessile, 1-2 × 0.2-0.4 mm, linear-lanceolate, acute, glabrous, revolute at margin; midrib prominent; stipules short, 1-1.5 mm broad, truncate or with 1-2 bristles. Flowers axillary, solitary or 2 in cyme, 7-8 mm long; pedicel slender, 1-1.5 cm long, terete, scabrid. Hypanthium ovoid, 1-1.2 × 0.8-1 mm; lobes 4, 1-1.3 × 1 mm, triangular, acute. Corolla white, campanulate; tube 2-3 mm long, twice the calyx lobe; lobes 1.5-2 mm long, oblong, acute, minute puberulous inside. Stamens 4, exserted; filaments 0.8-1 mm long, adnate to sinus of corolla lobes; anthers oblong, 0.5-1 mm long. Ovary 0.7-1 mm long; ovules many; style 3-4 mm long, exserted; stigma bilobed, 0.5-0.8 mm long, linear. Capsule subglobose, 1.5-2 × 2-2.5 mm with hemispheric crown, glabrous. Seeds many, angular, 0.2-0.3 × 0.2 mm exotesta smoothly reticulate, chocolate colour.

*Fls. & Frts.* : February.

*Distrib.* : India : Nicobar Islands on grassland.

*Exsiccata studied* : Type sheet only. No further collection is known.

### HEDYOTIS L. SECT. KOHAUTIA

(Cham. & Schlecht.) Walp. Rep. 2 : 501. 1843. *Kohautia* Cham. & Schlecht. in Linnaeus 4:156. 1829; DC. Prodr. 4 : 429. 1830; Endlicher, Atakt. t. 23. 1833; Royle, Illustr. Himal. 241. t. 53. f. 1. 1835; Benth. in Hook. f. Niger Flora 403. 1849; Bremek. in Verh. Kon. Nederl. Akad. Wet. Afd. Natuurk. ser. 2. 48(2) : 56. 1952; Heper in Fl. W. Trop. Afr. ed. 2. 2: 209. 1963; Ramaswamy & Razi, Fl. Bangalore 579. 1973; Verdc. Fl. Trop. E. Afr. Rubiac. (I) : 228. 1976; Hara in Hara & Williams, Enum. Fl. Pl. Nepal 2 : 203. 1979. *Hedyotis* L. sect. *Oldenlandia* (L.) Wt. & Arn. subsect. *Kohautia* (Cham. & Schlecht.) Wt. & Arn. Prodr. 417. 1834. *Oldenlandia* L. subg. *Kohautia* (Cham. & Schlecht.) Hook. f. in Benth. & Hook. f. Gen. Pl. 2 : 59. 1873 & Fl. Brit. Ind. 3 : 67. 1880. *Oldenlandia* L. sect. *Kohautia* (Cham. & Schlecht.) Boiss. Fl. Or. 3 : 11. 1875; K. Schum. in Engl. & Prantl. Pflanzenfam. 4(4) : 26. 1891.

*Type* : *H. senegalensis* (Reichenb.) Steud. (syn. *Knoxia senegalensis* Reichenb.)

Herbs annual or perennial, usually erect; root-stock woody, long. Leaves opposite or whorled, sessile or subsessile, linear, narrowly lanceolate or oblong-linear, mostly 1-nerved. Inflorescence terminal dichasial or monochasial cyme, lax flowered. Flowers never heterostylous. Corolla narrowly cylindrical; tube up to 6 times the lobes, swollen above, with or without any constriction. Stamens sessile or subsessile, included in upper swollen part of corolla tube; anthers linear-oblong. Style included in the narrow part of the corolla tube; stigma bilobed, linear, rarely

unlobed, ovoid or cylindrical, overtopped by anthers. Capsule globose or ellipsoid, hemispheric, crustaceous, dehiscent loculicidally. Seeds numerous, angular, exotesta often granulate.

*Pollen morphology* : Pollen grain sub-prolate, prolate-spheroidal or oblate spheroidal,  $P \times B = 18-28 \times 13-22 \mu\text{m}$ , 4-5 colpi rarely 4 or 3 colpi; colpi long,  $11-16 \times 1-2 \mu\text{m}$ , OS simple, circular rarely lalongate,  $2 \mu\text{m}$  diam. or  $5 \times 9 \mu\text{m}$ , margin distinct, free,  $A_3$ . Exine  $2 \mu\text{m}$  thick, reticulate, columellate, heterobrochate or homobrochate, mesocolpium  $7 \mu\text{m}$ .

*Distrib.* : About 60 species, in South Africa, Madagascar and Tropical Asia. 5 species in India, One restricted to Pakistan. (Plate 11).

63. *H. coccinea* (Royle) Walp. Rep. 2 : 501, 1843. *Kohautia coccinea* Royle, Illustr. Himal. 241. t. 53. f. 1. 1835. (*Type* : N. W. India, Budraj, *Royle s. n.* holo. LIVI. iso. CAL!) : Bremek. in Verh. Kon. Nederl. Akad. Wet. Afd. Natuurk. Ser. 2. 48 (2) : 82. 1952; Babu, Herb. Fl. Dehra Dun. 225. 1977; Verdc. Fl. Trop. E. Afr. Rubiac. (I) : 235. 1976; Hara in Hara & Williams, Enum. Fl. Pl. Nepal 2 : 203. 1979; Naithani, Fl. Chamoli 284. 1984. *Oldenlandia coccinea* (Royle) Hook. f. Fl. Brit. Ind. 3: 69. 1880; Collett, Fl. Simla 230. 1902; Singh in Journ. Bomb. Nat. Hist. Soc. 68: 787. 1971; Noir, Fl. Bash. Himal. 134. 1977; Raizada & Saxena, Fl. Mussourie 1 : 307. 1978; Kapur & Sarin in Bull. Bot. Surv. Ind. 20 : 9. 1978; Chowdhury & Wadhwa, Fl. Himach. 2 : 348. 1984. (Plate 49 a).

Herbs annual, slender, erect; stem obtusely angular or terete, scabridulous or spinous. Leaves sessile,  $2-4 \times 0.2-0.5 \text{ cm}$ , acute at apex, narrowed at base, membranous, 1-nerved, spinous, raphides on lower surface; stipules thin, 2-3 mm broad, with 3-5 bristles, 2-3 mm long. Inflorescence terminal monochasial cyme of 3-10 flowers. Flowers 11-12 mm long, densely spinous, pedicel 3-10 mm long; bracts 1-1.2 mm long, ovate-oblong, with 4-5 bristles. Hypanthium ellipsoid,  $2-2.5 \times 0.8-1 \text{ mm}$ , densely spinous; lobes 4,  $2-3.5 \times 0.5-1 \text{ mm}$ , linear or narrowly triangular, acute, bristly outside, glabrous inside. Corolla 8-10 mm long, pink, scarlet or purple, paler beneath, scabridulous or rarely glabrous outside, veins often purplish black or red; tube 3-4 mm long, broadening at the middle; lobes 4,  $4-5 \times 0.8-1 \text{ mm}$ , linear, notched below. Stamens 4, inserted at middle of corolla tube; filaments short, adnate to base of the corolla tube; anthers 1-1.2 mm long, linear-oblong. Ovary 2-2.5 mm long, ovules many; style 2.5-3 mm long; stigma ovoid or cylindrical, papillose. Capsule  $3-3.5 \times 2.5 \text{ mm}$ , oblong-ellipsoid, crown slightly raised, didymous, glabrous or glabrescent; raphides present; calyx teeth sometimes longer than capsules. Seeds 50-60, angular; testa reticulate, black or dark brown.

*Fls.* : August - October; *Frts.* : September - November.

*Distrib.* : India : Kashmir, Himachal Pradesh, Uttar Pradesh; Nepal; at 1000-2500 m in altitude.

*Exsiccata studied* : India : Kashmir : Bassoli, *C. B. Clarke* 31584 (CAL). Himachal Pradesh : Simla, *T. Anderson s. n.* (CAL), *G. Watt s. n.* (BSIS), *C. B. Clarke*

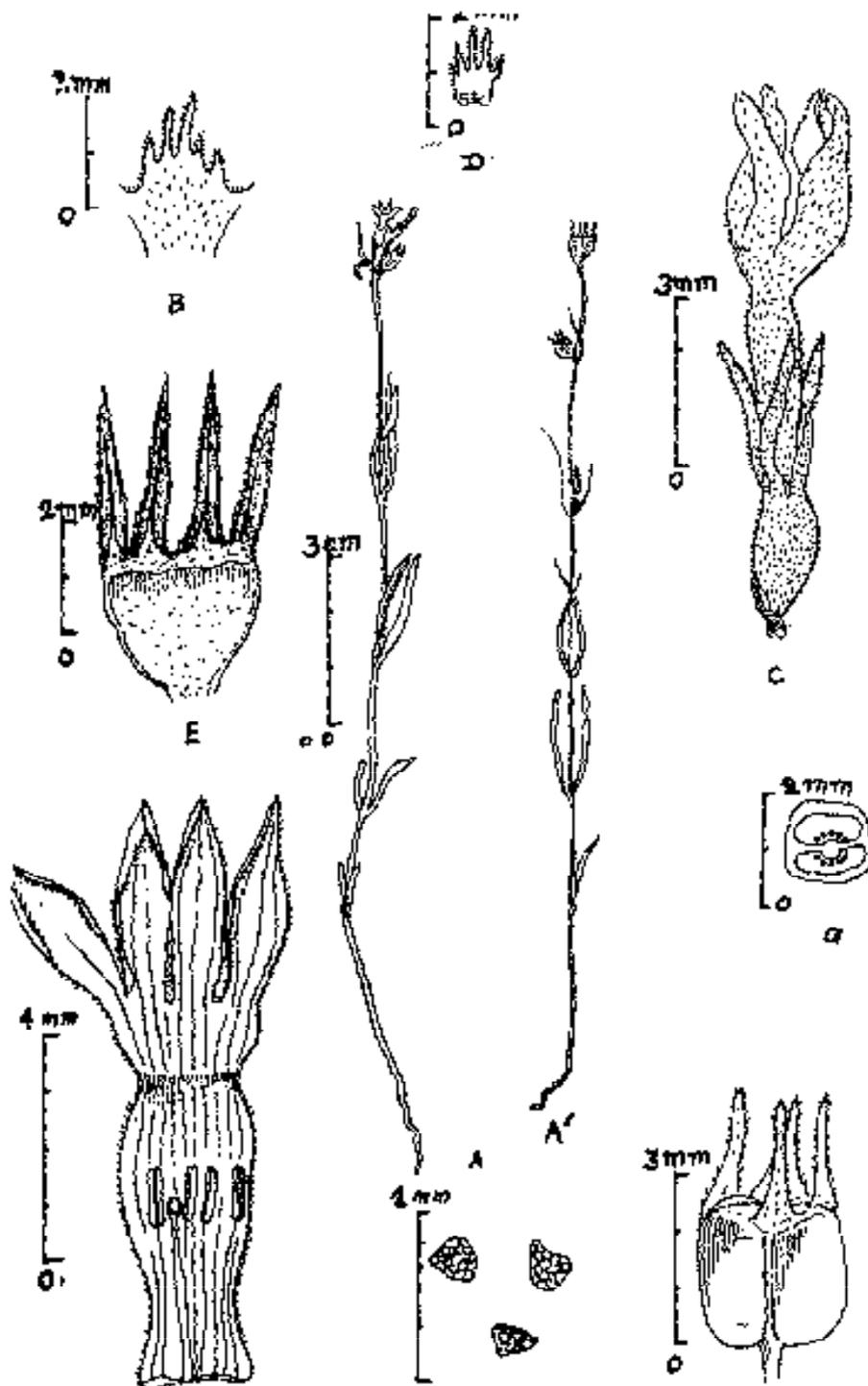


Plate 49a. (A - D) *Hedyotis coccinea* (Royle) Walp. : A. & A' habit; B. stipule; C. flower; D. bract; E. calyx lobes; F. opened corolla; G. T. S. of ovary; H. capsule; I. seeds.

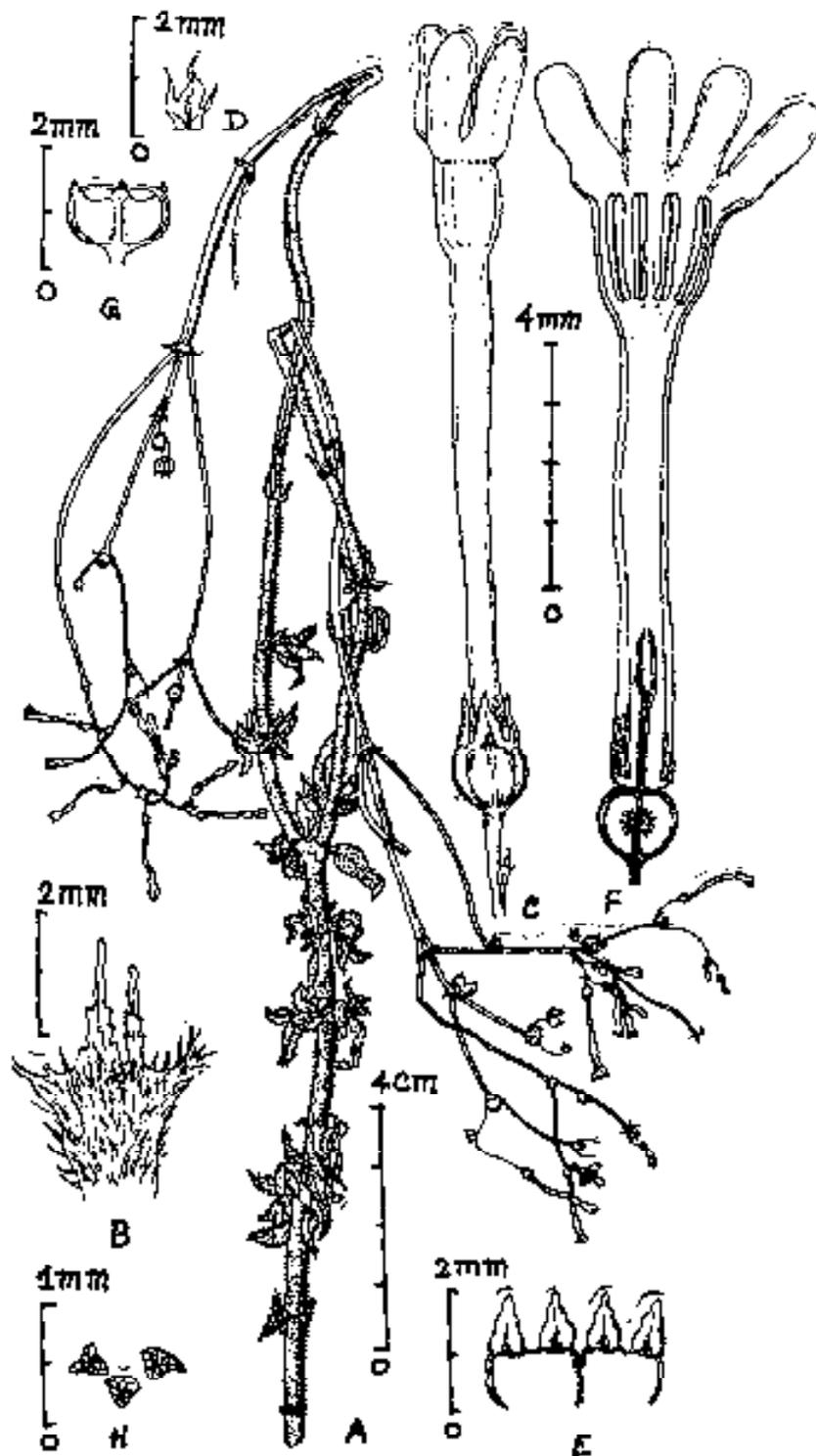


Plate 49b. (A - I) *Hedyotis retrorsa* (Boiss.) Rolla Rao & Hemadri : A. habit; B. stipule; C. flower; D. bract; E. calyx lobes; F. opened corolla; G. & H. capsule; I. seeds.

(CAL) & *J.R. Drummond s.n.* (DD); Dalhousie, *C.B. Clarke* 22568B (CAL) Bashahr state, *M.B. Raizada* 19683 (DD); Gopalpur, *M.B. Raizada* 19761 (DD). Uttar Pradesh : Kumaon, Kali valley, *J.F. Duthie* 2988 (DD); Mussourie, *G.King s.n.* (CAL), *A.Campbell s.n.* (CAL, BSI & DD) & *B.L. Gupta s.n.* (DD) & *M.O.Saxena* 1383 (DD); Jainsar, *J.S. Gamble* 15092 (CAL) & 25260 (DD); Almora, *T.A.Rao* 4725 (BSD) & *P.C.Pant* 12921 (BSD); Thadiar, *K.C. Sahni* 27054 (DD); Garhwal, *Falconer* 519 (CAL) & *U.C.Bhattacharyya* 24205 (BSD); Rhata-Trijujinarain, *M.A.Rau* 8515 (BSD), Vishnuprayag, *U.C.Bhattacharyya* 29688 (BSD); Nandkeshri, *U.C. Bhattacharyya* 31084 (BSD). N.W. Himalaya, *S.Kurz s.n.* (BSI); Himalaya, Pabun Valley, Col. 447/1(CAL).

NEPAL : Mayangdi Khola, *Stainton, Sykes & Williams* 4040 (CAL); Maikot, *Stainton, Sykes & Williams* 4724 (CAL).

64. *H. retrorsa* (Boiss.) Rao & Hemadri in Ind. For. 99 (6) : 378. 1973. *Oldenlandia retrorsa* Boiss. Fl. Or 3 : 12. 1875 (Type : Arabia, Chebek mountain, *Aucher* 4678 BM! selected as lectotype; Sciende, Stock 481 Paratype CAL !); Hook.f. Fl. Brit. Ind. 3 : 68. 1880; Cooke, Fl. Pres. Bomb. 1 : 591. 1903; Blatter in Journ. Bomb. Nat. Hist. Soc. 36 : 785. 1934. *Kohautia retrorsa* (Boiss.) Bremek. in Verh. Kon. Nederl. Wet. Afd. Ser. 2, 48 (2) : 100. 1952. in note. (Plate 49b).

Herbs perennial, with woody root-stock, branching, leafy at base, naked above; stem terete, glabrous above, retrorsely hispid below. Leaves sessile; 1-1.5 x 0.4-0.6 cm, linear-oblong to linear-lanceolate, acute or apiculate at apex, narrowed at base, membranous, 1-nerved, hispid; stipules 2-3 mm broad, membranous, truncate, with 2-3 bristles, 1-2 mm long. Inflorescence terminal, slender, divergicately monochasial cymes, glabrous. Flowers sessile or pedicelled, 12-15 mm long; pedicel 2-6 mm long, glabrous; bracts 0.7-0.8 x 0.3-0.5 mm, membranous, with 3 bristles. Hypanthium globose or ovoid, 0.7-1 mm long, calyx lobes 4, 0.7-0.8 x 0.3-0.4 mm, elliptic or triangular, acute, glabrous. Corolla 10-13 mm long, slender; tube cylindrical, 10-11 mm long, broadening to about 2 mm below the lobes, with prominent constriction; lobes 2-2.5 x 0.7 mm, oblong, obtuse or rounded, minutely serrulate along margin. Stamens 4, inserted at upper broader part of corolla tube; filaments very short, attached near base of corolla tube; anthers 1.8-2 mm long, linear-oblong. Ovary 0.5-1 mm long, ovules many; style 1.5-2 mm long, slender; stigma bifid, 1-1.2 mm long, linear. Capsule 3-3.5 x 2-2.5 mm, globose or subglobose, didymous, slightly protruding above, glabrous. Seeds many, 0.2-0.3 x 0.2-0.3 mm, reticulate, testa purple.

*Fls. & Frts.* : September - October.

*Local name* : *Harjungi* in Baluchistan.

*Ecology* : On sand dunes or on banks of rivers.

*Distrib.* : The Western India, Pakistan.

*Exsiccata studied* : INDIA : India, *Dalzell s. n.* (CAL). PAKISTHAN : Karachi, *J. E. Stocks* 481 (CAI) & *J. E. Stocks s. n.* (CAL) in part; Sind : *W. Burns s. n.* (BSI). Beluchistan : Las Bela, *G. Watt* 18832 (BSIS).

65. *H. gracilis* Wall. in Roxb. Fl. Ind. 1 : 371, 1820. (*Type* : Nepal, Terai, *William Jack s. n.* K). *Oldenlandia gracilis* (Wall.) Hook. f. Fl. Brit. Ind. 3 : 68, 1880 (excl. *H. aspera* Bedd. in syn.); Gamble, Fl. Pres. Madras 602, 1921; Haines, Bot. Bib. Or. 449, 1922; Cooke, Fl. Pres. Bomb. 1 : 591, 1903; Prain, Bengal. Pl. 559, 1903; Duthie, Fl. Upp. Gang. Pl. 415, 1903; Blatter in Journ. Bomb. Nat. Hist. Soc. 36 : 785, 1938; Kamathy *et al.* in Bull. Bot. Surv. Ind. 9 : 219, 1967; Sharma *et al.* Fl. Karnataka 129, 1984. *H. stricta* Wall. in Asiat. Res. 13 : 369, 1820, non Smith 1811. *Kohautia gracilis* (Wall.) DC. Prodr. 4 : 430, 1830; Sant. & Merch. in Bull. Bot. Surv. Ind. 3 : 108, 1961; Babu, Herb. Fl. Dehra Dun 225, 1977; Hara in Hara & William, Enum. Fl. Pl. Nepal 2 : 203, 1979; Sharma & Tiagi, Fl. N. E. Rajasthan 184, 1979; Rao & Razi, Fl. Mysore 536, 1981; Mukherjee, Fl. Pachmarhi & Bori 142, 1984. *H. fusca* Buch.-Ham. ex D. Don., Prodr. Fl. Nepal 134, 1825. (*Type* : Nepal, Orania, 12.3.1814, *Hamilton s. n.* ex Wall. Cat. 843 C CAL!; Bhimnagar, *Hamilton s. n.* ex Wall. Cat. 843 C, CAL!). (Plate 50).

Herbs perennial from woody root-stock, branching below, erect, unbranched above; stem terete, pinkish, glabrescent above, scaberulous below. Leaves subsessile, 5-9 × 0.2-0.5 cm, linear, acuminate at apex, narrowed at base, sometimes revolute, membranous, glabrous, scabrid along the margin; stipules 1.5-2 × 1-2 mm, truncate, with 2-4 bristles, 2-4 mm long. Inflorescence terminal monochasial cymes, slender, spreading. Flowers 15-20 mm long; pedicel 1.5-2 mm long. Hypanthium globose or ovoid, 1-2.5 mm long; calyx limb very short; lobes 4, with 2 accessory teeth, 1-1.5 × 1-2 mm, linear-lanceolate, glabrous. Corolla 13-17 mm long, pale brown, lurid green or purple; tube 10-13 mm long, cylindrical, broadening above, without any prominent constriction; lobes 3.5-4 × 5-9 mm, oblong, acute, glabrous. Stamens 4, inserted at upper broader part of corolla tube; filaments very short; anthers 1-1.3 mm long, linear-oblong. Ovary 1.5-2 mm long, ovules many; style 5-7 mm long, slender; stigma bilobed, 1-1.2 mm long, linear. Capsule dull brown, 4-6 × 2.5-3 mm, ellipsoid or oblong-ellipsoid, didymous, conical to oval, protruding above, 2 accessory calyx teeth present in between calyx lobes in fruit, glabrous. Seeds many, 0.3-0.5 × 0.3-0.4 mm, triangular, narrowly winged, testa reticulate, purple or black.

*Fls.* : January May; *Frts.* : February September.

*Ecology* : In open places or on dark humus soil in grass lands on the hill.

*Local name* : *Gsohega-Soa* in Nepal.

*Distrib.* : India : Jammu & Kashmir, Punjab, Uttar Pradesh, Rajasthan, Maharashtra, Madhya Pradesh, Tamil Nadu, Andhra Pradesh, and Orissa; Pakistan; Nepal; Myanmar and Sri Lanka.

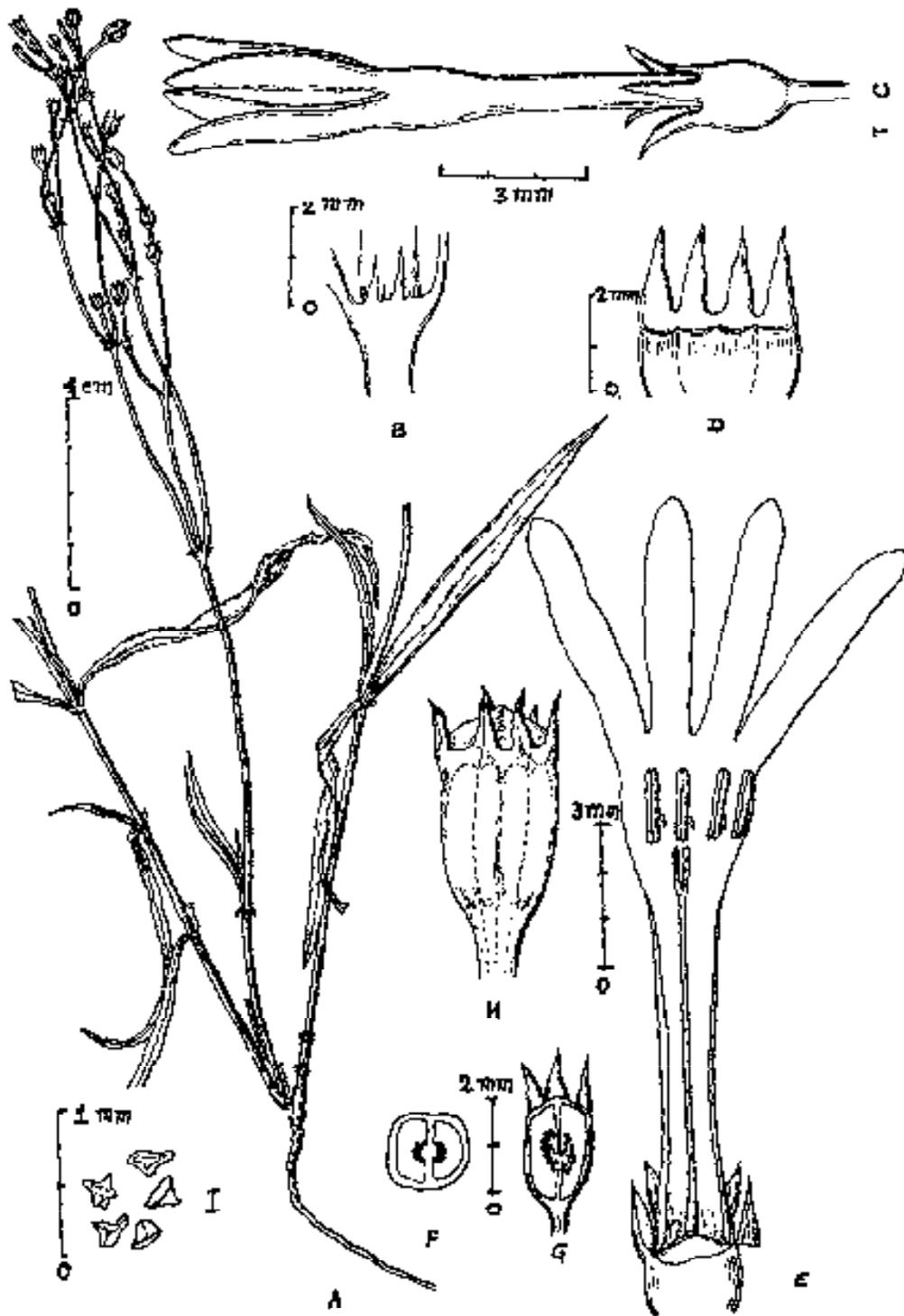


Plate 50. (A - I) *Hedyotis gracilis* Wall. : A. habit; B. stipule; C. flower; D. calyx lobes; E. opened corolla; F. & G. T.S. and L.S. of ovary; H. capsule; I. seeds.



*Excelsata studied* : INDIA : Jammu & Kashmir, *H. F. Royle s. n.* (CAL). Punjab : Hazara, *Stewart 363* (CAL). Rajasthan : Aboo, *G. King s. n.* (CAL). Uttar Pradesh : Kumaon, *Wall. Cat. 843 B* (CAL); Garhwal, *Wall. Cat. 520* (CAL). *Falconer s. n.* (CAL); Kumaon, *T. Thomson s. n.* (CAL); Almora, *T. Anderson s. n.* (CAL); Lucknow, *T. Anderson s. n.* (CAL); Mussoorie, *G. King s. n.* (CAL); Siwaliks, *J. F. Duthie s. n.* (DD), Rameserai valley, *J. F. Duthie 1325* (CAL), Tonsvalley, *J. S. Gamble 25441* (CAL) & *U. N. Kanjilal s. n.* (DD); Jansar, *J. F. Duthie 19791* (DD); Sendra, *J. S. Gamble 26628* (CAL); Pilibhit, *Inayat 22364* (DD); Kumaon, *U. C. Bhattacharyya 15056* (BSD); Pithoragarh, *U. C. Bhattacharyya 15079 & 21120* (BSD); Nagnath, *C. C. Malhotra 27297* (BSD); Rispona, *C. R. Babu 34958* (BSD); Hajeti (Thal), *P. C. Panj 31875* (BSD). Purnea, *C. B. Clarke 11704 B* (CAL); Chotanagpur, *G. Watt. 8454* (CAL) & *A. Champbell s. n.* (DD). Gorakhpur, *Harsukh 22365 b* (DD); Hazaribagh, *C. B. Clarke 34790* (CAL). West Bengal : W. Duars, *J. S. Gamble 6646 B* (CAL); Dinajpur, *C. B. Clarke 26986 C* (CAL); Siliguri, *C. B. Clarke 27039* (CAL). Orissa : Ganjam dist. Daringbadi, *C. A. Barber 1425* (MH); Bonai, *H. P. Mooney 3783* (DD). Madhya Pradesh : Bori, *G. Panigrahi 6365* (BSA); North Bilaspur, *C. M. Arora 3927* (BSA); Sonkayari Charga, *G. Panigrahi & C. M. Arora 8893* (BSA); Bilaspur, *G. Panigrahi 8893* (BSA). Andhra Pradesh : Chodavatam, *K. Himadri 108792* (BSI). Maharashtra : Akraui dist., Jusamnal, *W. A. Talbot 4962* (BSI). Tamil Nadu : Coimbatore, *Beddome 107* (CAL); Courtallum, *C. B. Barber 3250* (MH); Mangarai, *C. E. C. Fischer 1891* (CAL).

MYANMAR : Upper Burma, *C. B. Collett 57* (CAL); Shan State, Inle Lake, *N. Annandale s. n.* (CAL).

NEPAL : Onanle and Bhimnagarh, *Hamilton s. n. ex. Wall. Cat. 843 C* (CAL); Syanagaon, *Bis Ram 306* (DD).

PAKISTAN : Karachi, *Stocks s. n.* (CAL); Rawal Pindi, *J. E. T. Aitchison 422* (DD); Alsundi, *I. H. Burkill 27055* (BSIS).

SRI LANKA : Central Provinces, Jerdon. ? *Coll. s. n.* (CAL).

66. *H. aspera* Heyne ex Roth, Nov. Pl. Ind. Or. 94. 1821 (*Type* : India Orientalis, *Heyne s. n.* BM!); *Wt. & Arn. Prodr. 417.* 1834; *Dalz. in Dalz. & Gibs. Bomb. Fl. 115.* 1861. *Oldenlandia aspera* (Heyne ex Roth) DC. *Prodr. 4 : 428.* 1830; *Hook. f. Fl. Brit. Ind. 3 : 68.* 1880; *Cooke, Fl. Pres. Bomb. 1 : 591.* 1903; *Duthie, Fl. Upp. Gang. Pl. 415.* 1903; *Gamble, Fl. Pres. Madras 602.* 1921; *Blatter in Journ. Bomb. Nat. Hist. Soc. 36 : 785.* 1934; *Santapan, Fl. Purand. 60.* 1957 & *Fl. Saur. 265.* 1962; *Maheshwari, Fl. Delhi 180.* 1963; *Nair, Fl. Punjab 131.* 1978; *Gandhi in Saldanha et al. Fl. Hassan 586.* 1978. *Sharma et al. Fl. Karnataka 129.* 1984. *Kohautia aspera* (Heyne ex Roth) *Bremek. in Verh. Kon. Nederl. Akad. Wet. Afd. Ser. 2, 48(2) : 113.* 1952; *Sant. & March. in Bull. Bot. Surv. Ind. 3 : 108.* 1961; *Ramaswami & Razi, Fl. Bangalore 579.* 1973; *Verdc. Fl. Trop. E. Afr. Rubiac. (I) : 241.* 1976; *Bhandari, Fl. Ind. Desert 189.* 1978; *Sharma & Tiagi, Fl. N. E. Rajasthan 184.* 1979; *Rao & Razi, Fl. Mysore 536.* 1981; *Matthew, Fl. Tamil Nadu Carnatic 714.* 1983; *Singh, Fl. Banswara Rajasthan*

121. 1983. *H. elongata* R. Br. ex G. Don Gen. Syst. Gard. Bot. 3 : 327. 1834. (Type : East India, Heyne s. n. ex Wall. Cat. 865 (CAL). *H. aspera* Bedd. Icon. Pl. Ind. Or. t. 33. 1874 (Type : Anamalais Hills, 1200 m, Coimbatore Plains, Beddome 3558 BM). (Plate 51).

Herbs annual or perennial from long woody root-stock, profusely branching, leafy below; stem about 90 cm long, terete, pinkish, scaberulous throughout, raphides present. Leaves sessile, opposite or verticillate, 3-6 × 0.3-0.9 cm, linear, acute at apex, narrowed at base, pale green, glabrous above, scabrid mostly at the base and nerves below, 1-nerved, raphides on lower surface; stipules 2-2.5 × 1-2 mm, membranous, truncate, with 4-5 bistles, 2.5-3 mm long. Inflorescence terminal monochasial cymes, branches loose, divaricate, scaberulous. Flowers 8-10 mm long; pedicel 0.5-0.8 mm long, scabrid; bracts 0.7-1 × 0.9-1 mm, with 3-4 bristles, pectinate. Hypanthium globose, 0.7-0.9 mm long; calyx limb very short; lobes 4, 0.8-1 × 0.2-0.3 mm, triangular, acute, scabrid or spinulose above. Corolla 5-7 mm long, about 2 mm across, violet, bluish white or creamy; tube 4-5.5 mm long, cylindrical, broadening above, notched below; lobes 1-1.5 × 0.6-0.8 mm, ovate, obtuse above, glabrous, rarely scabrid outside. Stamens 4, inserted at upper broader part of corolla tube; filaments very short; anther 0.5-0.9 mm long, linear-oblong. Ovary 0.5-0.8 mm long, many ovules on submedian placenta; style 4 mm long; stigma bilobed, 0.9-1 mm long. Capsule 3-4 × 3-4 mm, globose, terete or compressed, 2 horned, didymous, crown slightly protruding above, minutely scabrid. Seeds many 0.3-0.5 × 0.2-0.3 mm, angular; testa reticulate, purple.

*Fls.* : January - October; *Frts.* : March - December.

*Ecology* : Moist or loose sandy soil.

*Distrib.* : India : Uttar Pradesh, Delhi, Haryana, Punjab, Gujarat, Maharashtra, Rajasthan, Madhya Pradesh, Karnataka, Andhra Pradesh; Sri Lanka.

*Note* : I. D. Hooker (1880) treated *H. aspera* Bedd., as synonymous with *H. gracilis* Wall. Examination of Beddome's specimen shows that this is more allied to *H. aspera* Heyne than to *H. gracilis* Wall. differing in longer corolla tube (6-7 mm) and much branched inflorescence.

*Exsiccata studied* : INDIA : Uttar Pradesh : Hamirpur, *J. Banks s. n.* & *U. C. Bhattacharyya* 20935 (BSD). Delhi, *S. Gil* 43 (DD). Haryana : Hissar, *J. S. Gamble* 20692 (DD). Punjab : Mahendragarh, *N. C. Nair* 16306 (BSD); Sirsa, *N. C. Nair* 18914 (BSD), Narnaul, *N. C. Nair* 20659 (BSD); Hissar dist., Badopal, *N. C. Nair* 24938 (BSD), Gujarat : Beyt. Shankkodhar Island, *M. B. Raizada* 23877 (DD); Kutch, *S. K. Jain* 46865 (BSI). Rajasthan : Bikaner, *M. B. Raizada s. n.* (DD); Jaisalmer North, *Mohan Vaswani s. n.* (DD); Lohargal, *N. C. Nair* 938 (BSD); Pali dist., Erinpura, *R. S. Rao* 66760 (BSI). Madhya Pradesh: Goonah, *G. King* 113 (CAL); Ratlam, Salakhedi, *J. A. Vasarada* 27588 (BSI); Simrol, *A. S. Rao* 79124 (BSI); Sauwer, *A. S. Rao* 79242 (BSI). Andhra Pradesh: Guntur dist., Vinukonda, *C. A. Barber* 4769 (CAL); Chittoor

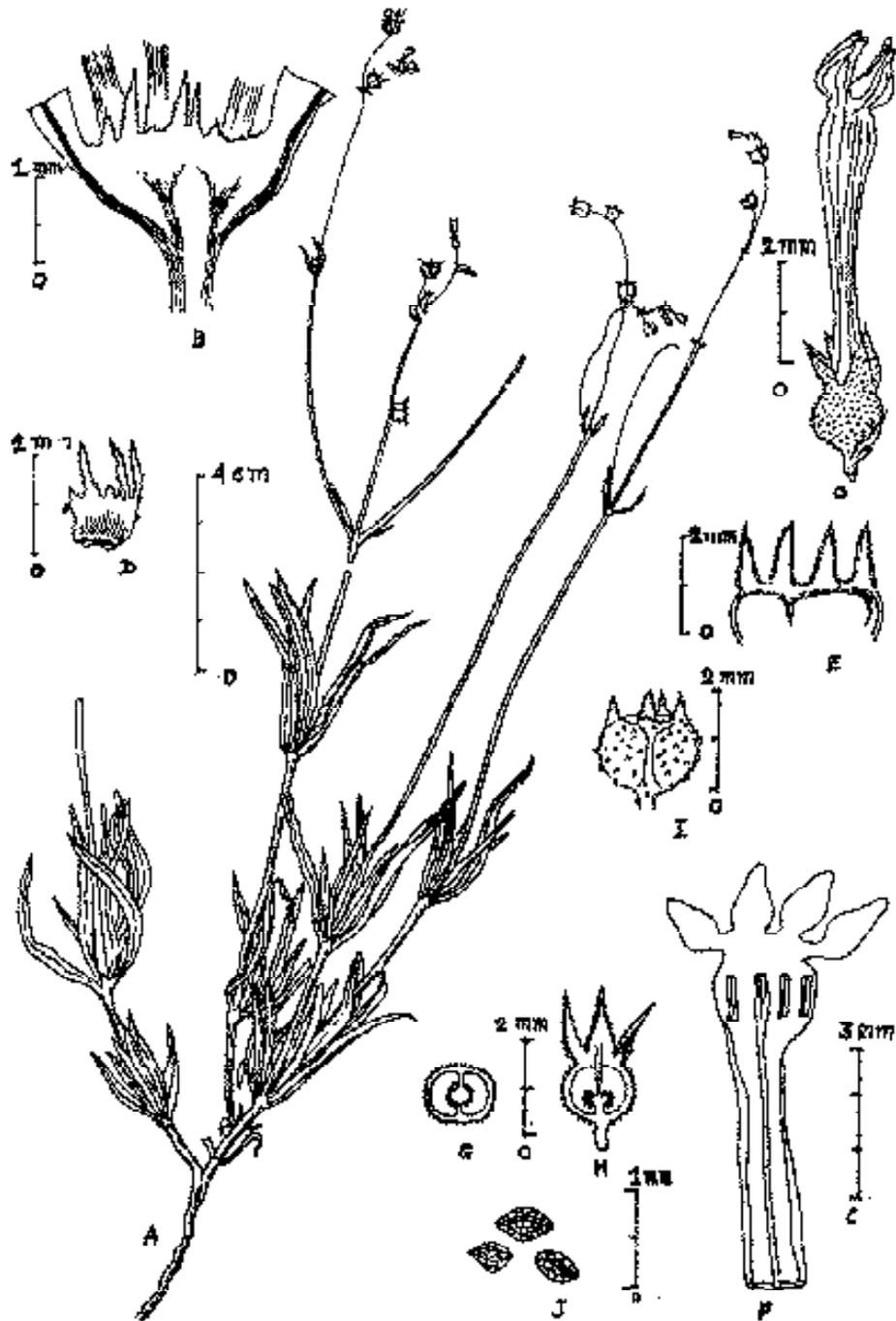


PLATE 51. (A - J) *Hedyotis aspera* (L.) Heyne ex Roth : A. habit; B. stipule; C. flower; D. bract; E. calyx lobes; F. open corolla; G. & H. T.S. and L.S. of ovary; I. capsule; J. seeds.

dist., Amudalakona, G.V. Subba Rao 46758 (CAL). Nagapatam, Wight s.n. (E) Cuddapah dist., Camulapuram, J.S. Gamble 11210 (CAL); Karnataka : Belgaum hills, D. Ritchie 1782 (CAL); Dharwar, W.A. Talbot 1667 (CAL) & 1974 & 2538 (BSI); Haveri, W.A. Talbot 2232 (DD); Bijapur, A. Meebold 11189 (CAL); Kamalapore, A. Meebold 11306 (CAL). Maharashtra : Bombay, N. Dalzell s.n. (CAL); Poona, L.D. Garade 661 (BSI) & N.B. Kanade s.n. (BSIS); Nagpur dist., Khat, J.S. Gamble 10417 (DD). Saroli, G.S. Puri 44071 (BSI); Alandi ghat, K.P. Janardhanan 72796 (BSI); Sangurdi, K.P. Janardhanan 76687 (BSI); Nuruli, K.P. Janardhanan 78248 (BSI); Junnarsomet, M.Y. Ansari 81926 (BSI); Pathardi hill, K.P. Janardhanan 1000010 (BSI); Bhir dist., Simdkhedraja hill, K.P. Janardhanan 100256 & 100444 (BSI). Tamil Nadu: Palemcoottah, W. Wight 1382 (CAL); Coimbatore dist., Kollegal, C. E. C. Fischer 74 (CAL); Virumandampalayam, C.E.C. Fischer 2127 (CAL); Salem dist., Santha Maranduhalli, Coll.? 9722 (MH); Krishnagiri, Coll.? 14879 (MH), Hogainokkal, E. Vajravelu 21951 (MH); Rannad dist. Sanjuvimalai, E. Vajravelu 39564 (MH); South Arcot dist., Pallamaei R.F., K. Rammurthy 52890 (CAL); Tindivansm, K. Rammurthy 60296 (CAL); Ramanathapuram dist., Sirumalai Pudappatti, N.C. Nair 61080 (CAL), Rajapalayam, N.C. Nair 61430 (CAL).

67. **H. naggorensis** (Brace ex Haines) Rao & Himadri in Indian For. 99 (6) : 78. 1973. *Oldenlandia naggorensis* Brace ex Haines, Bot. Bih. Or. 48. 1922 (Type : Chotonagpur, Brace s.n. K, photo !); Raghavan *et al.* in Rec. Bot. Surv. Ind. 21 : 42. 1981. Sharma *et al.* Fl. Karnataka 129. 1984, *Kohautia naggorensis* (Brace ex Haines) Sant. & Merch. in Bull. Bot. Surv. Ind. 3 : 108. 1961; Sharma in Indian for. 99 (3) : 159. 1973; Raizada. Suppl. Upp. Gang. Pl. 93. 1976. *O. senegalensis* Hook. f. Fl. Brit. Ind. 3.68. 1880, non Hiern 1877; Narine, Fl. Pl. W. India 143. 1894; Woodrow in Journ. Bomb. Nat. Hist. Soc. 11 : 644. 1898; Cooke, Fl. Pres. Bomb. 1 : 592. 1903; Blatter in Journ. Bomb. Nat. Hist. Soc. 34 : 785. 1933. *H. senegalensis* Dalz. in Dalz. & Gibs. Bomb. Fl. 117. 1861. (Plate 52).

Herbs annual, mostly unbranched, erect, stem 15-25 cm long, slender, wiry, terete, glabrous to scaberulous. Leaves sessile or subsessile, 1.5-5.5 x 0.1-0.3 cm, linear, narrowed at both ends, scabrid minutely, 1-nerved; stipules 0.8-1 x 0.5-1 mm, truncate, with 1-3 bristles. Inflorescence terminal dichasial cymes; peduncles 1-2 cm long, slender. Flowers 5-10 mm long; pedicel 1-1.7 cm long, slender, scaberulous. Hypanthium globose or subglobose, 0.7-1 mm long, calyx limb very short, scabrid; lobes 4, 0.7-1 x 0.3-0.5 mm, linear, glabrous. Corolla 4-8 mm long, pink; tube 3-6.5 mm long, broader above with a prominent constriction at the junction of corolla lobes and tube; lobes 4, 0.5-1 mm, linear, acute. Stamens 4, inserted at the upper broader part of the corolla tube; filaments very short, adnate below middle of corolla tube; anthers 0.8-1 mm long, linear-oblong. Ovary 0.5-1 mm long; ovules many; style slender, 3 mm long; stigma bilobed, 0.8-1.2 mm long, linear. Capsule 1-2 x 1.8-2 mm globose or ellipsoid, slightly protruding above, scaberulous. Seeds many, triangular, 0.2-0.4 x 0.2-0.3 mm, exotesta reticulate, deep brown.

Fls. & Frts. : August - November.

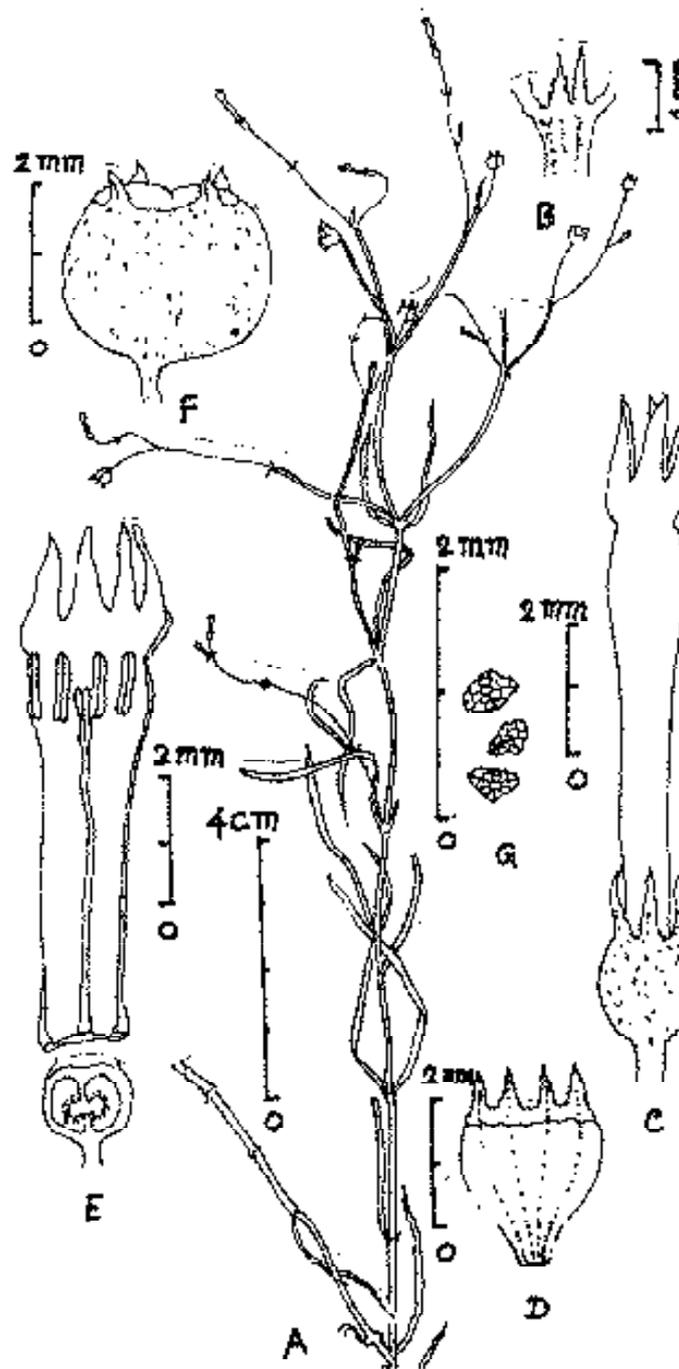


Plate 52. (A-G) *Hedyotis naggorensis* (Bruce ex Haines) Rolla Rao & Hemadri; A. habit; B. stipule; C. flower; D. calyx lobes; E. opened flower; F. capsule; G. seeds.

*Ecology* : Grows among grasses on clayey dry soil up to 1200 m in altitude.

*Distrib.* : India : Bihar, Uttar Pradesh, Gujarat, Maharashtra.

*Exsiccata studied* : INDIA : Uttar Pradesh : Tehri-Garhwal, *J.F.Duthie* 1682 (CAL); Saharanpur dist., Siwaliks, *J.S. Gamble* 23984 (CAL & DD). Gujarat : Broach dist., Piplod, *R.D.Pataskar* 112202 (BSI). Maharashtra : Alandighat, *K.P. Janardhanan* 72991 (BSI); Khuldaha, *R.S.Rao* 71373 (BSI); Aurangabad, *R.S.Rao* 76874 (BSI); Ajanta caves, *R.S.Rao* 71432 (BSI); Junnar, *M.Y.Ansari* 83665 (BSI).

### HEDYOTIS L. SECT. SCLEROMITRION

Wt. & Arn. Prodr. 413. 1834; Walp. Rep. 2: 497. 1834. *Scleromitron* (Wt. & Arn.) Meissn. Pl. Vasc. Gen. Pl. I: 160. 1838; Korthals in Nederl. Kruidk. Arch. 2 (2) : 155. 1851; Miq. Fl. Ind. Bat. 2 : 185. 1857; Kurz in Journ. Asiat. Soc. Beng. 46 (2) : 136. 1877 (excl. *S. coronarium*). *Hedyotis* L. sect. Wt. & Arn. subsect. *scleromitron* (Wt. & Arn.) Hook. f. in Benth. & Hook. f. Gen. Pl. 2 : 57. 1873 & Fl. Brit. Ind. 3 : 60. 1880.

*Type* : *H. neesiana* Arn. (syn. *H. nitida* Wt. & Arn.) selected as the lectotype.

Herbs suffrutescent. Leaves sessile or subsessile, elliptic lanceolate, linear-lanceolate or linear, usually 1-nerved. Inflorescence axillary, 2-6 or more flowers in cluster. Flowers isostylous; stamens and styles both exserted. Corolla divided equally or more than half way down. Anthers oblong. Capsule globose to ovoid, with converging calyx teeth, dehiscent on the crown or top only. Seeds many.

Pollen morphology : Pollen grain subprolate, prolate-spheroidal or oblate spheroidal.  $P \times E = 28-44 \mu\text{m} \times 22-33 \mu\text{m}$ , 3 colpi, rarely 5-6 colpi; colpi long.  $15-32 \mu\text{m} \times 1-3 \mu\text{m}$ , OS simple, lalongate,  $3-6 \mu\text{m} \times 12-14 \mu\text{m}$ , margin distinct, free  $A_3$  or synzonorate  $A_1$ . Exine 2-3.5  $\mu\text{m}$  thick, faintly or distinctly reticulate columella 1  $\mu\text{m}$  high, sexine thicker than nexine, muri thick psilate, faintly spinulate or undulate.

*Distrib.* : 5 species in India and S.E. Asia (Plate 10).

68. *H. angustifolia* Cham. & Schlecht. in Linnaea 4 : 153. 1829 (*Type* : Philippines, Luzon, *Chamisso s.n.* LE); DC. Prodr. 4 : 419. 1830; Kurz in Journ. Asiat. Soc. Beng. 46 (2) : 134. 1877. *Scleromitron angustifolium* (Cham. & Schlecht.) Benth. in Kew Journ. Bot. 4 : 172. 1852. *S. tetraquetrum* Miq. Fl. Ind. Bat. 2 : 185. 1857 (*Type* : Java, *Jungh s.n.* L1, K). *H. tenelliflora* Hook. f. Fl. Brit. Ind. 3 : 60. 1880, non Blume 1826; Clarke in Journ. Linn. Soc. 25 : 30. 1889; King & Gamble in Journ. Asiat. Soc. Beng. 72 (2) : 164. 1903; Merr. Enum. Philip. Fl. Pl. 3 : 501. 1923; Ridley, Fl. Malay Penin. 2 : 51. 1923; Craib, Fl. Siam. Enum. 2 : 49. 1932; Kanjilal *et al.* Fl. Assam 3 : 38. 1939; Kar & Panigrahi in Bull. Bot. Surv. Ind. 5 : 230. 1963; Jain & Hazra in Bull. Bot. Surv. Ind. 17 : 82. 1975; Balakr. Fl. Jowai 1 : 245. 1983. *Oldenlandia angustifolia* (Cham. & Schlecht.) Benth. Fl. Hongk. 151.

1861. *H. approximata* R. Br. (in Wall. Cat. 852. 1929) ex Wt. & Arn. Prodr. 423. 1834. (Plate 53).

Herbs annual or perennial, diffusely branched at base erect to decumbent; stem up to 6 cm long, dark black when dry, acutely angular, grooved above, terete below, glabrous, minutely pubescent at nodes. Leaves sessile or subsessile 4.5 × 0.3-0.9 cm, linear or linear-lanceolate, acicular at apex, narrowed to petiole at base, revolute at margin, coriaceous, punctate, scabrid above along margin and mid-nerve below; petiole 0.5-1 mm long, minutely pubescent or glabrous; stipules triangular, 2-3 mm broad, with 2-4 bristles, 3-4 mm long. Inflorescence axillary sessile cyme, 2-4 flowered. Flowers 4-6 mm long; pedicel 0.7-1 mm long, 4-angular, glabrous bract 0.1-0.2 × 0.1 mm with minute bristles. Hypanthium ovoid 0.5-1 mm long; calyx limb 0.5-0.7 mm long; lobes 4, 1-1.5 mm long, ovate-lanceolate, keeled, rigid, outer surface hispid. Corolla 3.5-4 mm long, white or yellowish white; tube 1-1.5 mm long, narrow, broader at base, pubescent; lobes 1-1.5 mm long, lanceolate, incurved at apex with 4-5 appendages on the outer surface, glabrous inside. Stamens 4, exserted; filaments 1-1.2 mm long, attached below sinus of corolla lobes; anthers oblong, 0.5-0.7 mm long. Ovary 0.5-0.8 mm long, ovules many; style as long as corolla lobes, 3-4 mm long; stigma bifid, 0.2-0.3 mm long, subglobose, papillose. Capsule ovoid, 2.5-3 × 2 mm, didymous, coriaceous, punctate, ridged, glabrous, loculicidal on crown only. Seeds 20-30, 0.5 × 0.25 mm, angular, exotesta finely reticulate, orange.

*Fls. & Frts.* : August-May.

*Ecology* : Inland forest, mostly in hilly regions on sandy soil.

*Distrib.* : India : Assam, Meghalaya, Nagaland, Andaman & Nicobar Islands; Myanmar; Malesia; Indonesia; Philippines.

*Exsiccata studied* : INDIA : Assam : North Cachar, Haflong, *W.G. Craib* 164 (CAL) & *N. Naskar* 410 (CAL). Meghalaya : Khasi, *J.D. Hooker & T. Thomson*, s.n. (CAL) & *C.B. Clarke* 44772 A (CAL); Nungklow, *C.B. Clarke* 45511 B (CAL); Mambo, *C.B. Clarke* 45439 D (CAL). Mushmai, *P.C. Kanjilal* 8135 (ASSAM); Pongtring, *G.K. Deka* 18819 (ASSAM); Umsaw forest, *S.R. Sharma* 2001 (ASSAM); Jorain, *N.P. Balakrishnan* 42554 (ASSAM) & 46792 (CAL). Nagaland : Kohima, *G. Watt* 11658 (CAL), *D. Prain* s.n. (CAL, BSIS, E), *A. Meebold* 5495 (BSI), *N.L. Bor* 6326 & 16208 (DD). Mizoram : Champhai, *D.B. Deb* 30962 (ASSAM); Bhalpur, *R.M. Dutta* 33884 (CAL). Nicobar Islands : Kamorta, *S. Kurz* s.n. (CAL); Car Nicobar, *N.G. Nair* 3581 (CAL).

MYANMAR : Chin hills, *Abdul Huk* s.n. (CAL); Fort Stedman, *Abdul Huk* s.n. (BSI & CAL); Upper Chindwin, *J.H. Luce* 4194 (CAL, E); Palusawa, *J.H. Luce* 4194 (E); S. Shan State, *R. W. MacGregor* 518 & 682 (CAL).

MALAYSIA : Penang, *G. King* s.n. (CAL); Perak, *Scortechini* s.n. (CAL) & *L. Wray* (JR) 3680 (CAL).

MALACCA : Durian, *Harvey* s.n. (CAL).

⊗ *H. cyanantha* *Kurz* in Journ. Asiat. Soc. Beng. 45 (2) : 336. 1876.

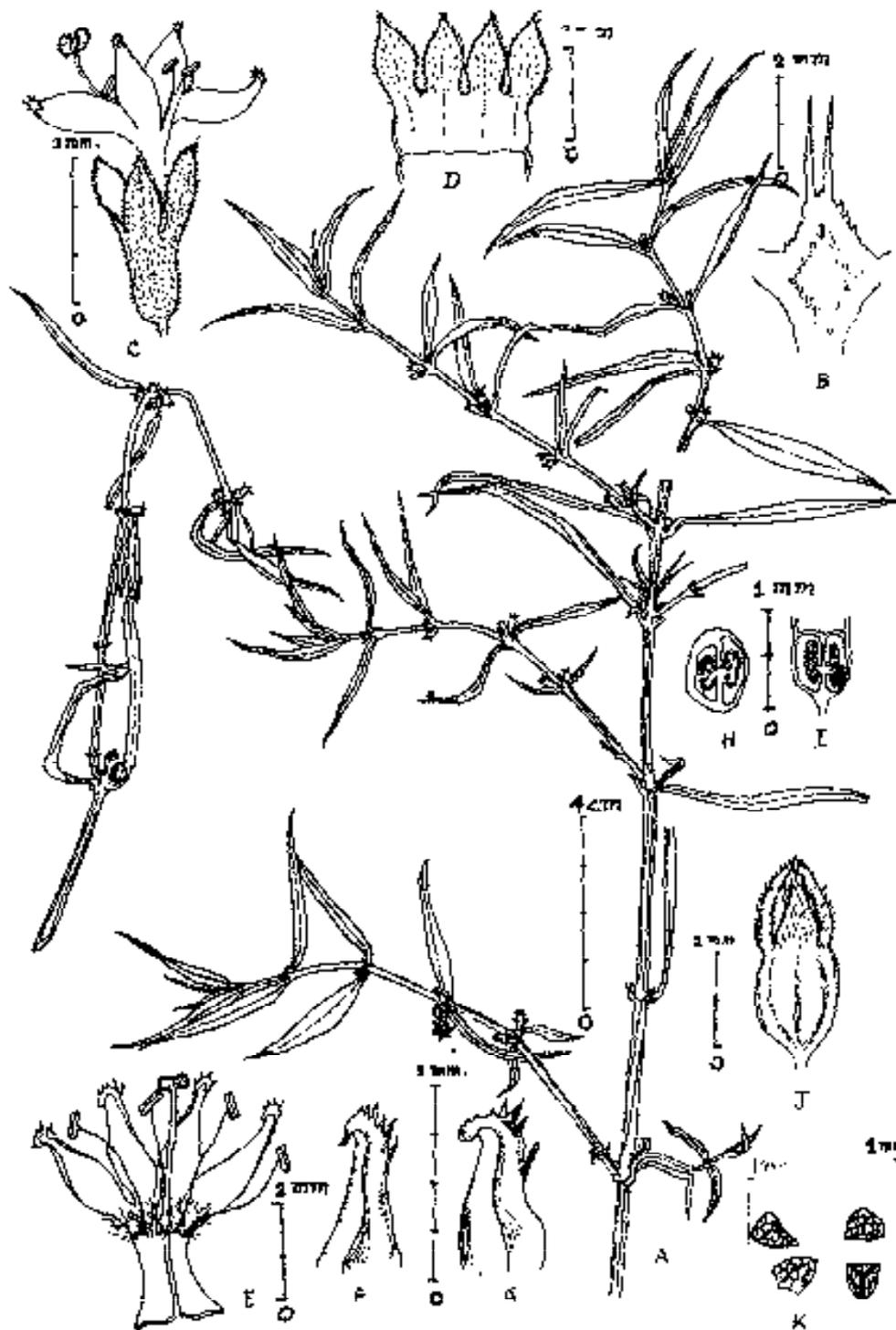


Plate 53. (A - K) *Hedysotis angustifolia* Cham. & Schlecht. : A. habit; B. stipule; C. flower; D. calyx lobes; E. opened corolla; F. & G. corolla with spinous appendages; H. & I. T.S. and L.S. of ovary; J. capsule; K. seeds.



*H. coerulea* Wt. & Arn. Prodr. 412. 1834, non Linn. nec. Korth. (Type : Tanjore, Munargoody village, *Wight Cat.* 1302 K-photo !); Bedd. Icon. Pl. Ind. Or. 5 : 30. 1874; Hook. f. Fl. Brit. Ind. 3 : 60. 1880; Trimen, Handb. Fl. Ceylon 2 : 312. 1894; Cooke, Fl. Pres. Bombay 1 : 587. 1903; Rama Rao, Fl. Pl. Travancore 205. 1914; Ridley, Fl. Malay Penin. 2 : 52. 1923; Rao & Hemadri in Ind. For. 99 (6): 375. 1973; Manilal & Sivarajan, Fl. Calicut 141. 1982. *Oldenlandia coerulea* (Wt. & Arn.) Gamble, Fl. Pres. Madras 597. 1921; Gandhi in Saldanha *et al.* Fl. Hassan 586. 1978; Matthew, Fl. Tamil Nadu Carnatic 722. 1983; Sharma *et al.* Fl. Karnataka 129. 1984. *O. pygmoea* Wall. ex O. Ktze. Rev. Gen. Pl. 1 : 292. 1891; Blatter in Journ. Bomb. Nat. Hist. Soc. 36 : 784. 1934. *H. pygmoea* Wall. Cat. 6199. 1832. *nom. nud.*, non Roem. & Schult. 1818. Deb & Dutta in Nayar & Sastry, Red Data Book Ind. Pl. 2 : 209. 1988.

Herbs annual, erect, branching below; root-stock stout, branching; stem 6-18 cm long, stiff, terete, setaceous. Leaves sessile, opposite or verticillate, 1-1.5 × 0.2 cm, linear, aristate at apex, coriaceous, punctate, rigid, revolute at margin, setaceous above and along midrib below; stipules 2-2.2 × 1-2 mm, white, membranous, with 3-4-bristles, 3-3.5 mm long. Inflorescence axillary or terminal capitate cymes with 3-4-flowers. Flowers sessile or shortly pedicelled, 4-5 mm long; pedicel up to 1 mm long, setaceous. Hypanthium globose, 0.7-1 mm long; calyx limb 0.5-1 mm long, setaceous; lobes 4, 1-1.5 × 0.1-0.12 mm, triangular-lanceolate, aristate at apex. Corolla 3-4 mm long, blue; tube 1-1.5 mm long, glabrous inside; lobes 4, 2.5-3 × 1 mm, lanceolate to linear-lanceolate, 3 nerved, minute puberulous inside, incurved at apex. Stamens 4, exserted, longer than corolla lobes; filaments 3-3.5 mm long, attached near sinus of corolla lobes, ciliate at base; anthers oblong, 0.5-0.8 mm long. Ovary 0.5-0.8 mm long, ovules many; style slender, 4-5 mm long; stigma bifid, 0.5-1 mm long, linear, feathery. Capsules globose or ovoid, 2-4 × 1.5-2 mm, notched at apex, subcoriaceous, ribbed, punctate setaceous, with rigid calyx teeth, loculicidal on crown only. Seeds 40-70, 0.1-0.15 mm, triangular, narrowly winged, reticulate, very often orbicular.

*Fls. & Frts.* : October - January.

*Local name* : *Vushop-pilloo* in Tamil.

*Ecology* : In deciduous forest, on rocky slopes or in scrub forest up to 1650 m in alt.

*Distrib.* : India : Tamil Nadu, Maharashtra and Karnataka; Sri Lanka

*Exsiccata studied* : INDIA : Tamil Nadu : Concan, Malabar, *Stocks, Lawson et al.* s.n. (CAL); Podukkottai dist., Siddannavasel, *K. Ramamurthy* 53741 (CAL); Maharashtra : Bombay, *N. Datzell s. n.* (CAL). Karnataka : Canara, *Lawson s. n.* (CAL); Badami, *W. A. Talbot* 2447 (CAL), *A. Meebold* 11203 (CAL); S. Canara, Johlsur, *C. A. Barber* 2413 (CAL, MH); Upin Ongadi, *A. Meebold* 10793 (CAL); Karkkal, *C. E. C. Fischer* 4542 (CAL); Coorg, Mercara, *A. S. Rao* 74737 (BSI); Talacauvery, *A. S. Rao* 95126 (BSI).

SRI LANKA : Near the Coast, *Thwaites* 1674 (CAL).

70. *H. pinifolia* Wall. ex G. Don, Gen.Syst. Gard. Bot. 3 : 526. 1834 (Type : Amherst, 1829, Wall. Cat. 850 K-W, iso! CAL); Hook. f. Fl. Brit. Ind. 3 : 60. 1880; Prain, Beng. Pl. 556. 1903; King & Gamble in Journ. Asiat. Soc. Beng. 72 (2) : 166. 1903; Blatter in Journ. Bomb. Nat. Hist. Soc. 18 : 390. 1908; Ridley, Fl. Malay Penin. 2 : 52. 1923; Craib, Fl. Siam. Enum. 2 : 44. 1932; Deb in Bull. Bot. Surv. Ind. 3 : 310. 1961; Bakh. f. in Backer & Bakh. f. Fl. Java 2 : 286. 1965; Babu, Herb. Fl. Dehra Dun 224. 1977; Subramanyam in Bull. Bot. Surv. Ind. 20 : 116. 1973; Raizada & Saxena, Fl. Mussourie 1 : 313. 1978; Hara in Hara & Willams, Enum. Pl. Nepal 2 : 202. 1979; Chakraborty in Bull. Bot. Surv. Ind. 21 : 10. 1979; Kulkarni & Singh in Bull. Bot. Surv. Ind. 21 : 212. 1979; Sasidharan in Ind. Journ. For. 6 : 234. 1983. *Oldenlandia pinifolia* (Wall. ex G. Don) K. Schum. in Engl. & Prantl. Pflanzenfam. 4 (4) : 25. 1981. *Scleromitrium rigidum* Kurz in Journ. Asiat. Soc. Beng. 46(2) : 136. 1877, excl. syn. Miquel (Type : Tenasserim, Kurz. s. n.). *O. pinifolia* Wight ex O. Ktze. Rev. Gen. Pl. 1 : 292. 1891. (Plate 54).

Herbs annual, or perennial, root-stock long, woody, slender, fibrous rooting; stem long, creeping, diffuse, wiry, 4 angular or 4 winged, grooved, hispid. Leaves sessile or subsessile, 2-4 × 0.2-0.3 cm, linear, acute at apex, adnate to stipules at base, subcoriaceous, punctate, revolute at margin, hispid above, glabrous below, midrib minutely hispid; stipules 2-3 × 2 mm, truncate above, with 4-5 bristles, 2-3 mm long. Inflorescence axillary or terminal cymes, congested or lax, 3-10 (30) flowered, 0.8-1.5 cm in diam. Flowers 4-5 mm long; bracts 0.8-1 × 1-2 mm, fimbriate at margin; pedicel 0.5-1 mm long, hispid. Hypanthium globose, 1-1.2 mm across; calyx limb hispid, 0.6-1 mm long, lobes 4, 1.5-2 × 0.1 mm, triangular-lanceolate, pointed, keeled, hispid at margin. Corolla 4 mm long, white; tube 1.5-2 mm long, pubescent near attachment of filaments; lobes 4, 1-2 mm long, oblong, acute, incurved at apex, 3-nerved, glabrous. Stamens 4, exserted; filaments 1.5-2 mm long, stout, adherent at sinus of corolla lobes; anthers 0.3-0.5 × 0.5 mm, oblong. Ovary ovoid, 0.8-1 mm; ovules many; style 4-6 mm long; stigma bifid, 0.5-1 mm long, linear, feathery. Capsule 2.5-3 × 1-2 mm, ovoid, ridged, subcoriaceous, punctate, hispid, dehiscent loculicidally at top. Seeds 40-60, polyhedral or irregular in outline, 0.1-0.2 × 0.1-0.15 mm, testa brownish or rusty red, smooth, reticulate.

*Fls. & Frts.* : September - November.

*Ecology* : Grows on moist situations.

*Distrib.* : India : Uttar Pradesh, Bihar, Orissa, West Bengal, Manipur, Madhya Pradesh and Andhra Pradesh; Myanmar; Malesia.

*Exsiccata studied* : INDIA : Uttar Pradesh : Kalunga, J. S. Gamble 24605 (BSI); Dehra Dun, H. O. Saxena 2337 (DD) & C.R.Babu 34050 (BSD); Mirzapur, G.Panigrahi 12530 (BSA) & G. Panigrahi & R.Prasad 2640 (BSA); Bahraich, G.Panigrahi & O.P. Misra 6362 (BSA); Madhya Pradesh : Jiawan, D.M. Verma 5678 (BSA); Baster dist., Dantewara, G.Panigrahi & Arora 6777 (BSA). Orissa : Ganjam dist., Ramba, J.S.Gamble 21649 (BSI). Keonjhar, H. F. Mooney 2749 (DD); Sambalpur dist., Kholgaon, H.F. Mooney 2935 (DD). Bihar: S. Kurz

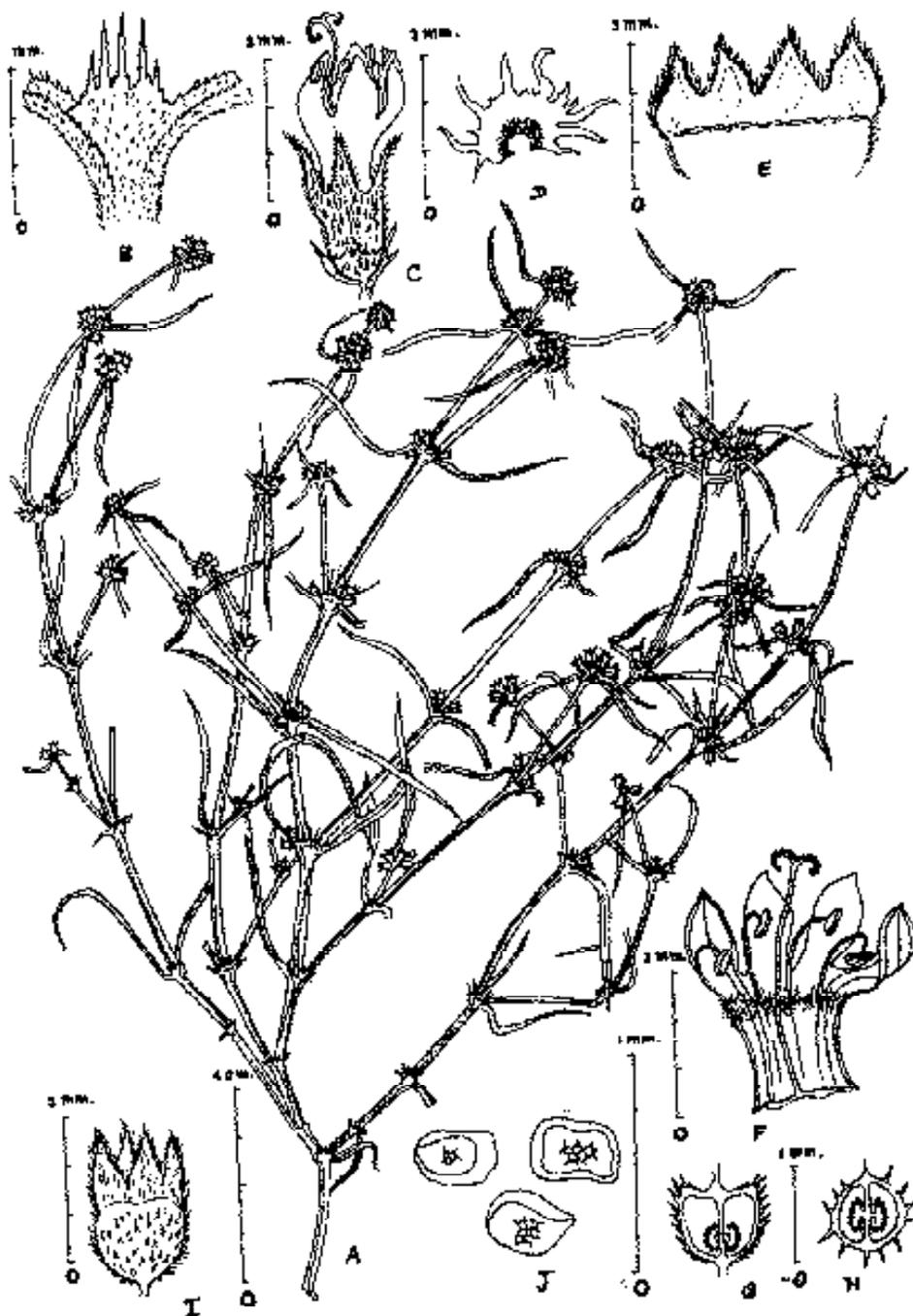


Plate 54. (A - J) *Hedyotis pinifolia* Wall. ex G. Don. : A. habit; B. stipule; C. flower; D. bract; E. calyx lobes; F. opened corolla; G. & H.L.S. and T.S. of ovary; I. capsule; J. seeds.

*s. n.* (CAL); Pareshnath, C.B. Clarke 24852 D (CAL); Hazaribagh, J.J. Wood *s.n.* (CAL); West Bengal : Manbhum dist., Pokhuria, A. Campbell 8739 (BSIS) & N. Gill *s.n.* (CAL).

MALAYSIA : Penang, Wall. Cat. 850 & 800B (CAL); Singapore, Wall. Cat. 874 (CAL), Kurz 2943 (CAL) & 8924 (CAL); Buthemth Province, Wallesles, G. King *s. n.* (CAL); Perak, Scortechini 1012 (CAL) & H. N. R. 3070 (CAL), Sungei, Meaw Pchang, H. A. Bodes 1623 (CAL).

MYANMAR : Amherst, Wall. Cat. 850 A(CAL); Kohah, Southern Burma, S. Kurz *s. n.* (CAL); Langkani, Scutes *s. n.* (CAL).

71. *H. verticillata* (L.) Lamk. Table. Encycl. 1 : 271. 1972; Merr. Enum. Philip. Fl. Pl. 3 : 501. 1923; Craib, Fl. Siam. Enum. 2 : 51. 1932; Bakh. f. in Backer & Bakh. f. Fl. Java 2 : 286. 1965; Yamazaki in Hara, Fl. E. Himal. 1 : 310. 1966; Raizada & Saxena, Fl. Mussourie 1 : 313. 1978; Hara in Hara & Williams, Enum. Fl. Pl. Nepal 2 : 202. 1979; Balakr. Fl. Jowai 1 : 245. 1981; Chowdhury & Wadhwa, Fl. Himachal 2 : 346. 1984. *Oldenlandia verticillata* L. Mant. 1 : 40. 1767 (Type : Amboina, Linn. 155. 1 LINN microfisch.); Willd. Sp. Pl. 1 : 674. 1798. *H. hispida* Retz. Obs. 4 : 23. 1786 (Type : China, Canton, Wennerberg *s. n.* LUNDI); Willd. Sp. Pl. 1 : 565. 1798; Roxb. Fl. Ind. 1 : 368. 1820; DC. Prodr. 4 : 420. 1830; Hook. f. Fl. Brit. Ind. 3 : 60. 1880; Clarke in Journ. Linn. Soc. 25 : 31. 1889; Prain, Beng. Pl. 557. 1903; Collett, Fl. Simla 229. 1902; King & Gamble in Journ. Asiat. Soc. Beng. 72 : 166. 1903; Kar & Panigrahi in Bull. Bot. Surv. Ind. 5 : 229. 1963. *O. hispida* (Retz.) Lamk. Encycl. Meth. 4 : 536. 1798; Benth. Fl. Hongk. 150. 1861. *H. crataegonum* Spreng. Pugill. 2 : 35. 1815; (Type : Amboyna, Rumph. Amb. 6. 25. t. 10. 1748). *Scleromitrium hispidum* (Retz.) Korthals in Nederl. Kruidk. Arch. 2, 2:155. 1851; Miquel, Fl. Ind. Bat. 2 : 185. 1857; Kurz in Journ. Asiat. Soc. Beng. 46(2) : 137. 1877. (Plate 55).

Herbs annual or perennial, root-stock woody, long branching; stem 20-50 cm long, diffuse, prostrate or procumbent, rooting at nodes, 4 angular, grooved, compressed, hispid. Leaves sessile or short petioled; 3-7 × 0.6-1.5 cm, linear-lanceolate or elliptic-lanceolate, acute, acuminate or acicular at apex, narrowed to petiole, thinly coriaceous, punctate, scabrid at apex and margin, midrib prominent, hispid on lower surface; petiole 0.5-1 mm long, hispid; stipules cupular, 3-4 mm broad, truncate, with 4-6 cilia, 8-10 mm long, hispid. Inflorescence axillary clusters of 4-10 (16) flowers. Flowers 8-10 mm long; pedicle 0.7-1 mm long; bracts 1-2 mm long; with 3-4 bristles. Hypanthium ovoid or subglobose, 1-1.5 mm long; calyx limb 0.5-0.7 mm long; lobes 4, 2-2.5 × 0.8-1 mm, ovate-lanceolate to triangular, hispid above. Corolla 6-8 mm long, yellowish white; tube 3-4 mm long, glabrous; lobes 4, 3-4 × 0.1 mm, linear-lanceolate, apex incurved with spinous appendages outside. Stamens 4, exerted, slightly longer than corolla lobes; filaments 4-4.6 mm long, attached to sinus of corolla lobes; anthers oblong, 1-1.5 mm long. Ovary 0.8-1.2 mm long; ovules many on submedian placenta, style about 9 mm long; stigma bilobed, subglobose, 0.3-0.7 mm long, swollen below. Capsule globose or subglobose, 2.5-3 × 2.5-3 mm, subcoriaceous, ribbed, hispid, loculicidal on the crown only. Seeds numerous, triangular, 0.25 × 0.25 mm, with finely reticulate purple testa.

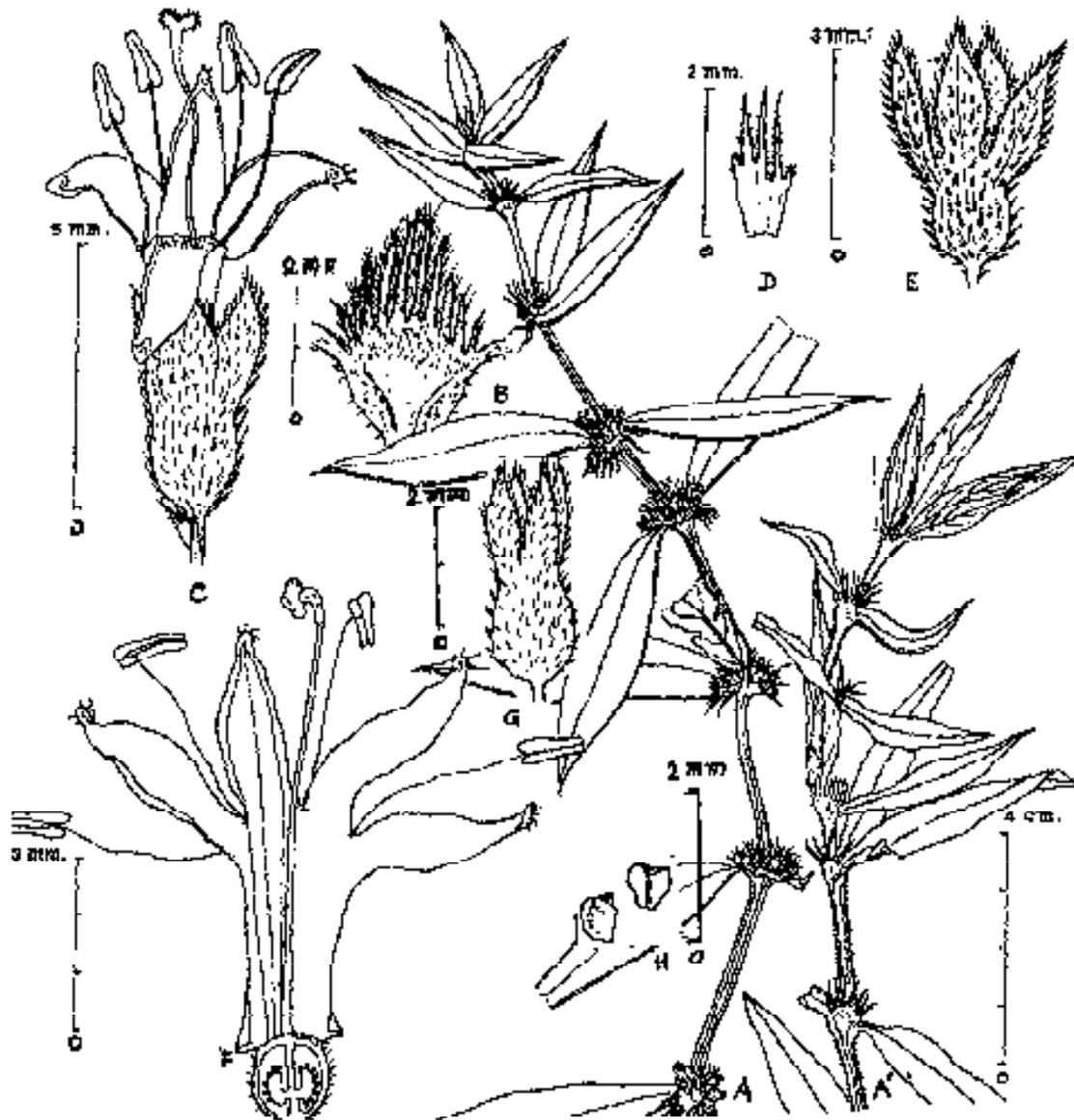


Plate 55. (AA' - J) *Hedyotis verticillata* (L.) Lamk. : A. & A'. habit; B. stipule; C. flower; D. bract; E. calyx lobes; F. opened corolla; G. & H. L. S. and T.S. of ovary; I. capsule; J. seeds.

*Fls.* : July-October; *Frts.* : September-April.

*Ecology* : In clayey moist soil, in forest clearing.

*Distrib.* : India : Himachal Pradesh, Uttar Pradesh, Bihar, West Bengal, Sikkim, Assam, Meghalaya, Arunachal Pradesh, Nagaland, Mizoram and Tripura; Nepal; Bangladesh; Myanmar and Malaya.

*Chrom. no.* :  $2n = 32$  was reported by Khooshoo, T.N. & Bhatia S.K. 1963a.

*Exsiccata studied* : INDIA : Himachal Pradesh : Kangra, G.A. Gammie 18673 (BSD); Uttar Pradesh : Dehra Dun, J. F. Duthie 2311 (DD, BSD), S.K. Malhotra 17333 (BSD), B.I. Gupta 42342 (DD) & M.B. Raizada s.n. (DD); Rajpur, H.O. Saxena 208 (DD); Lachman-sidh, B.D. Naithani 38540 (BSD); New forest, H.B. Naithani 7479 (DD); Bihar : Singbhum, C.B. Clarke 34241B (CAL) & H. H. Haines 2865 (DD, CAL). West Bengal : J. H. Helfer 118 (CAL, E); Bengal, J. D. Hooker & T. Thomson s.n. (CAL); Darjeeling, C. B. Clarke 26938 (DD); Mungpoo, G. A. Gammie s. n. (DD); Kalimpong, Ripley 32 (CAL); Rajabhatkhawa, V. Narayanaswami 2390 (CAL). Sikkim : D. Prain s. n. (CAL); Rongsong, G. H. Cave s. n. (E); Tista, G. H. Cave s. n. (CAL, E). Assam : Cachar : J. C. Prazer s. n. (CAL); Gabru, A. C. Chatterjee 186 (CAL & BSI); Goalpara, Buchanan 370 (E) & G. K. Deka 13143 (ASSAM); Kamrup dist., Sattargach, A. S. Rao 38843 (ASSAM). Meghalaya : Mongpoh, S. R. Sharma 16748 (ASSAM); Garampani, N. P. Balakrishnan 46990 (ASSAM); Khasi hill, P. K. Hazru 38692 (CAL). Arunachal Pradesh : Janakmukh, I. H. Burkill 37256 (CAL). Nagaland : Baligan, M. A. Hook 482 (CAL). Manipur : Nambal, D. B. Deb 220 (CAL). Mizoram : Bunglang, D. B. Deb 31442 (ASSAM). Tripura : Bagapasha, D. B. Deb 1071 & 1090 (CAL, DD). Andaman & Nicobar Islands : Great Nicobar, D.K. Hore 8236 (CAL).

72. *H. neesiana* Arn. Pugill. 18(1) : 34. 1836 (*Type* : Ceylon, Walker s. n. K!); Walp. Rep. 2 : 493. 1843. *H. nitida* Wt. & Arn. Prodr. 412. 1834, non H. B. K. 1820 (*Type* : Ceylon, Walker s. n. ex Wight. Cat. 1301 K photo!); Walp. Rep. 2 : 497. 1843; Hook. f. Fl. Brit. Ind. 3 : 61. 1880; Trimen, Handb. Fl. Ceylon 2 : 312. 1894; Cooke, Fl. Pres. Bomb. 1 : 587. 1903; King & Gamble in Journ. Asiatic Soc. Beng. 72(2) : 165. 1903; Rama Rao, Fl. Pl. Travancore 205. 1914; Ridley, Fl. Malay Penin. 2 : 51. 1923; Craib, Fl. Siam Enum. 2 : 43. 1932; Alston, Kandy Fl. 50. 1938. *Oldenlandia nitida* (Wt. & Arn.) Gamble, Fl. Pres. Madras 597. 1921. (Plate 56).

Herbs annual or perennial, root-stock woody, branches erect, procumbent, creeping or prostrate, rooting at nodes; stem about 5 m long, whitish, when dry, 4 angular, grooved, compressed, glabrescent. Leaves sessile or shortly petioled, 3-5.5(-7) × 0.5-2 cm, linear-lanceolate or elliptic-lanceolate, acute, acuminate or acicular at apex, narrowed to petiole, coriaceous, shining above, punctate, glabrous, minutely scabrid at margin, apex and midrib; petiole 1-1.5 mm long, minutely hispid; stipules 4-5 mm broad, sheathing, with 4-5 rigid bristles, 3-4 mm long, minute pubescent. Inflorescence axillary clusters of 4-8-15(-30) flowers. Flowers 4-6 mm long; pedicels 0.5-1 mm long; bracts 1-2 mm long. Hypanthium ovoid, 1-1.5 mm, long; calyx limb 0.8-1 mm long; lobes 4, 1-2 × 1-1.2 mm, ovate-lanceolate, keeled, midrib prominent, ciliate at margin. Corolla 4-5 mm long,

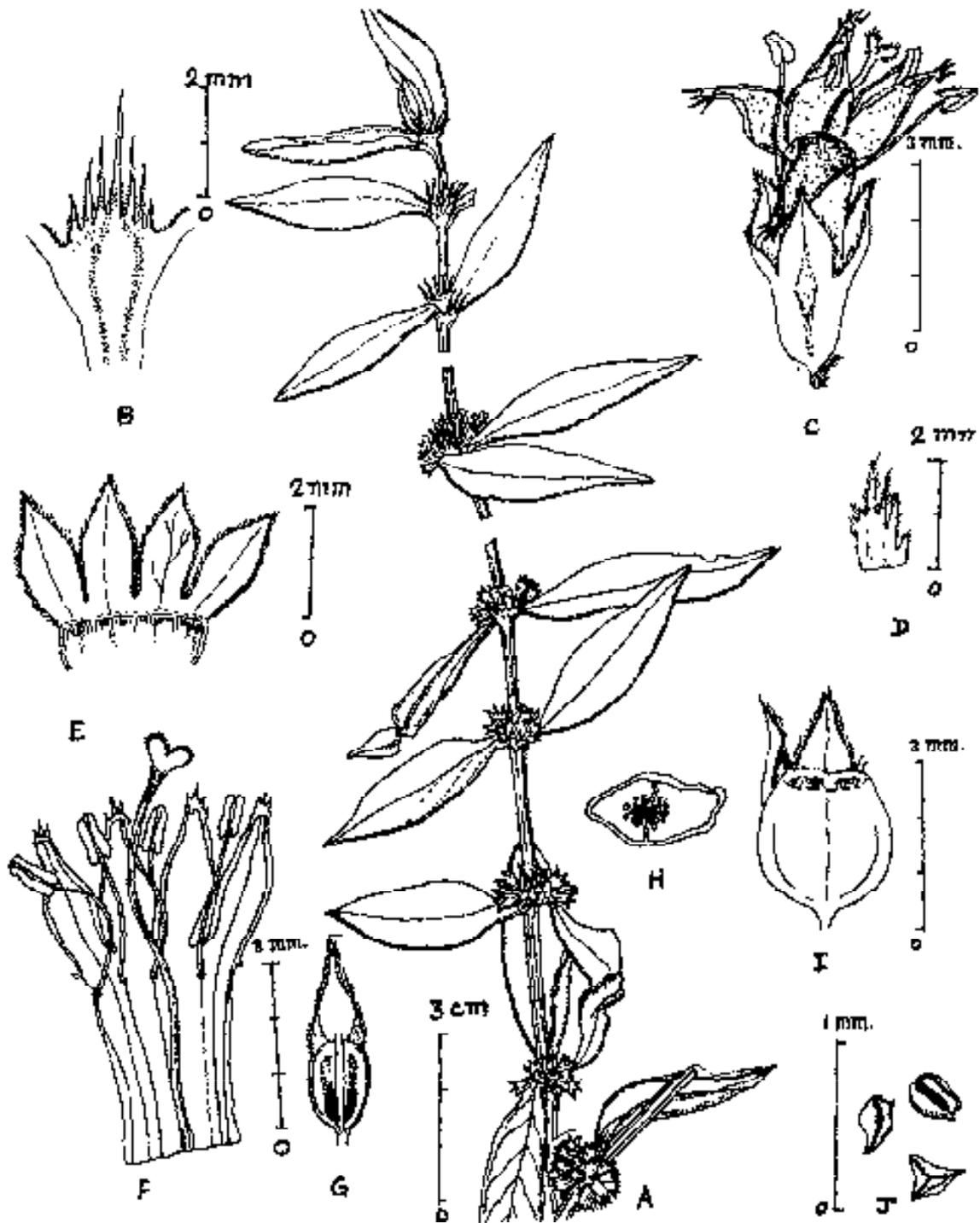


Plate 56. (A - J) *Hedyotis neesiana* Arn. : A, habit; B, stipule; C, flower; D, bract; E, calyx lobes; F, opened corolla; G, & H, T.S. and L.S. of ovary; I, capsule; J, seeds.

white or yellowish white; tube 2-2.3 mm long, 2 mm across, glabrous inside; lobes 4, 2-2.4 × 1-1.5 mm long, oblong, acute, apex incurved with 3-4 spinous, appendages outside, glabrous inside. Stamens 4, exserted; filaments 1-2 mm long, adnate below sinus of corolla lobes; anthers 0.5-1 mm, oblong. Ovary 0.8-1.2 mm long, ovules numerous; style 0.5-6 mm long, slender; stigma bifid, swollen, 0.5-0.8 mm long, granulate. Capsule ovoid, 2.5-3 × 2-3 mm, glabrous, coriaceous, punctate, raphides present, dehiscence loculicidal from the crown. Seeds 40-60, angular, 0.25 × 0.25 mm, exo-testa reticulate, brownish.

*Fls.* : March - November; *Frts.* : November - April.

*Uses* : Leaves are finely chopped and boiled and eaten with rice by Sinhalese (Watt.).

*Local name* : *Pita-sudu-pab* in Sri Lanka.

*Ecology* : In forest clearing on clayey moist soil associated with *Phyllanthus* and *Curcuma*.

*Distrib.* : India : Andhra Pradesh, Tamil Nadu, Kerala and Karnataka; Sri Lanka; Myanmar and Malaysia.

*Chrom. no.* :  $2n = 72$  was reported by Philip, O & Mathew P. H. (1976).

*Exsiccata studied* : INDIA : Andhra Pradesh : Godavari dist., Rumpa, J. S. Gamble 15924 (CAL) & M. S. Ramaswami 1523 (CAL); Kurnool dist., Gundlacher rameswaram, J. L. Ellis 16949 & 22212 (MH); Chittoor dist., Nerabybe, G. V. Subba Rao 31991 (MH). Tirumalai Hills, S. K. Wagh 8155 (BLAT); Northern Circars, Parla-Kimedi, I. H. Burkill 20466 (BSIS). Tamil Nadu : *Wight* 1301 (E); Courtallum *Wight* ? 373 (E) & *Ritchie* 357 (E); Malabar, *Wight s. n.* (E); Peninsular India, *Wight* 1374 (CAL); Anamalya, R. A. Beddome s. n. (MH) & 68 (CAL); Cancan Ghat, J. S. Gamble 18411 (DD). Pulney dist., Kodaikanal ghat, A. G. Bourne 138 R (CAL); Kannikatti, C. A. Barber 374 (MH); Sturttannimalais, C. E. C. Fischer 3454 (CAL). Coimbatore dist., Muttipulam, C. E. C. Fischer 2201 (CAL); Shalaiyar, K. M. Sebastine 17269 (MH); Pulamalay, St. Munch 142 (CAL); Shruvani, K. Subramanyam 1547 (MH). Tirunelveli dist., Therkumalai K. Subramanyam 4918 (MH); Madurai dist., Aruna Estate, B. V. Sherry 10350 (MH). Kanyakumari dist., Balamore A. N. Henry 47519 (CAI); Karnataka : North Canara, W. A. Talbot 25 (CAL), Deudeli, H. Santapau 18777 (BLAT); Manibile, G. S. Puri 19106 (CAL), Airatari forest, S. K. Jain 3891 A (BSI); Siddapur, S. K. Jain 18388 A (BSI); Kalgukan, S. K. Jain 29883 A (BSI). S. Canara, Jolpad, C. A. Barber 2385 (CAL, MH); Gersoppa Falls, Hall & McCann 35166 (BLAT); Charmadighat, C. Saldanha 6422 A (BLAT); Bissle ghat, S. R. Raju & Naganathan 18243 (MH); Karwar, L. J. Sedgwick & T. R. D. Bell 6701 (CAL); Coorg dist, Watkoley, G. S. Puri 32255 (BSI); Agumbe ghat, G. S. Puri 19426 (BSD) & R. S. Raghavan 62869 & 68095 (CAL). Kalhale, R. K. Arora 46183 (BSI), Talacauvery, A. S. Rao 85782 (BSI); Kouded forest, A. S. Rao 95041 (BSI); Keratifest, A. S. Rao 95338 (BSI). Mysore, Shimoga, R. S. Raghavan 90445 (CAL) & B. S. Ahuja 51433 (BSI); Bandipur R. F., B. D. Naithani s. n. (MH), Keelar, A. S. Rao 74773 (BSI); Kerala; Cochin, A. Meebold 12428 (CAL); Travancore, M. Rama Rao 1262 (CAL); C. C. Calder & M. S. Ramaswami 168 (CAL); Maduvathu Muzhi, M. Rama Rao



1246 (CAL); Aramba Mush, *V. Narayanswami* 1270 (MH); Thennyalai, *K. C. Kauddis* 63078 (BSI); Moolakayam, *K. N. Subramaniam* 70585 (BSI); Kambipalam, *K. N. Subramaniam* 77121 (BSI); Palghat dist., Dhoni River, *E. Vajravelu* 19084 (MH); Trichur dist., Thunakadavu, *K. M. Sebastine* 20909 & 22348 (MH); Ernakulam dist., Thundathal Range, *K. M. Sebastine* 25373 (MH). Idukki dist. Narakknam, *K. Vivekananthan* 49693 (CAL). Quilon dist., Kulathupuzha, *C. M. Mohanan* 58418 (CAL); Cannore dist., Kottayam, *V. J. Nair* 59794 (CAL). Trivandrum dist., Porimottai, *C. M. Mohanan* 61848 (CAL); Aruvikkara, *C. M. Mohanan* 63864 (CAL); Ponnudi, *C. M. Mohanan* 69249 (CAL).

### HEDYOTIS L. SECT. ANOTIDOPSIS

Hook. f. in Benth. & Hook. f. Gen. Pl. 2 : 57. 1873 & Fl. Brit. Ind. 3 : 62. 1880 (excl. *H. stipulata* R. Br. & *H. trinervia*). *Oldenlandia* L. sect. *Anotidopsis* (Hook. f.) K. Schumann in Engl. & Prantle, Pflanzenfam. 4(4) : 25. 1891 (excl. *O. repens* Burm. & *O. hirsuta* L. f.).

*Type* : *H. brunonis* Merr. (= *H. monocephala* R. Br. ex Hook. f.) is selected as the lectotype in supersession of Bremekamp's selection as noted below.

Herbs annual or perennial, stem erect, decumbent or straggling often succulent. Leaves sessile or short petioled, elliptic-lanceolate or ovate-oblong. Inflorescence terminal capitate or subcapitate cymes. Flowers sometimes heterostylous. Calyx lobes lanceolate, ovate or oblong-lanceolate often keeled and recurved in fruit. Corolla tubular. Capsule globose or ovoid, keeled or narrowly winged, compressed, membranous, glabrous, crown not protruded above; dehiscence loculicidal or often obscure. Seeds many.

*Pollen morphology* : Pollen grain prolate spheroidal,  $P \times E = 26-40 \mu\text{m} \times 18-35 \mu\text{m}$ , 3 colporate; colpi  $21-30 \mu\text{m} \times 2-4 \mu\text{m}$  : OS simple, lalongate,  $6 \times 12 \mu\text{m}$  or  $4 \mu\text{m}$  diam. margin distinct, free  $A_3$  or synzonorate  $A_1$ . Exine,  $2 \mu\text{m}$  thick, finely or coarsely reticulate, sexine slightly thick, lamina  $1-2 \mu\text{m}$ .

*Distrib.* : 3 species, one in Assam, Mizoram, Tripura, Bangladesh & Myanmar, one restricted to Andaman & Nicobar Islands and one to Sri Lanka. (Plate 12 B).

*Note* : Hooker f. (1873) described the section *Anotidopsis* under the genus *Hedyotis* and treated *H. monocephala* Wall., *H. hirsuta* L. f. (*H. stipulata* Br.), *H. lindleyana* Hook. & Arn. (*Oldenlandia japonica* Miq.), *H. trinervia* Roem. & Schult. under it. But subsequently he (1880) excluded *H. trinervia* from this section and placed it under subg. *Euoldenlandia*. Schumann (1891) accepted the original delimitation of sect. *Anotidopsis* by transferring *H. trinervia* (*O. repens* Burm.) to it and at the same time excluding *H. monocephala* Wall. Bremekamp (1952) raised the section to subgenus and selected *H. trinervia* Roem. & Schult. (= *Oldenlandia trinervia* Retz.) as the type. Bremekamp (*l.c.*) distinguished subg. *Anotidopsis* as having seeds not slimy, stigma subglobose, corolla tube and style glabrous. In the present treatment the subgeneric status of *Anotidopsis* (Hook. f.) Bremek. is not recognized as the characters used in subgeneric classification do not seem to hold good. Moreover, seeds slimy or not, when moistend, do not show any

definite correlation with other characters. Now on consideration of different delimitations by the earlier workers it appears that the original sect. *Anotidopsis* which Hook. f. subsequently restricted to some species of *Hedyotis* is a better one. Hook. f. did not consider any type for the Section. *H. trinervia* is selected as the lectotype for the subg. *Antidopsis* by Bremckamp, which is more akin to sect. *Oldenlandia* than to *Anotidopsis* for which selection of this species as the type for the section *Anotidopsis* does not seem to be justified. The species is here treated under the section *Oldenlandia*. Accordingly *H. monocephala* Wall. is selected as the lectotype for sect. *Anotidopsis* Hook. f.

73. *H. brunonis* Merr. in Philipp. Journ. Sc. 60 : 35. 1936. *Hedyotis monocephala* R. Br. (Wall. Cat. 846. 1829, *pro macrocephala lege monocephala*) ex Hook. f. Fl. Brit. Ind. 3 : 63. 1880, non Miquel 1869. (Type : Sylhet, March 1820, Wall. Cat. 846 ! K- W. iso! CAL); Clarke in Journ. Linn. Soc. 25 : 30. 1889; Craib, Fl. Siam. Enum. 2 : 43. 1932; Kar & Panigrahi in Bull. Bot. Surv. Ind. 5 : 230. 1963; Sikdar in Journ. Bomb. Nat. Hist. Soc. 78(1) : 103. 1984. *Oldenlandia monocephala* (Hook. f.) O. Ktze. Rev. Gen. Pl. 1. 292. 1891.

Herbs annual, or perennial, woody at base, branches decumbent, straggling or scrambling; stem 10-35 cm long, 4-angular, grooved, ridges puberulous, dark-brown or dark-black when dry. Leaves sessile or subsessile 3-8 × 0.5-2.5 cm, elliptic-lanceolate, acuminate, cuneate at base, glabrous, sometimes sparsely pubescent along the nerves; nerves 3-4 pairs, obscure; petiole 0.7-1 mm long, minutely pubescent; stipules connate, membranous, 1.5-2 × 3-4 mm, elongating, toothed or pectinate. Inflorescence terminal capitate cymes, 0.5-1.5 cm in diam., rarely on short axillary branches with 2-4 involueral leaves; involueral leaves 1-3 × 0.8-1 cm., lanceolate. Flowers subsessile, 7-8 mm long, heterostylous. Hypanthium 1-1.5 mm long, ovoid with prominent ridges; calyx limb very short; lobes 4, accessory teeth very often present, lanceolate, 1.5-3 mm long, serrate at margin. Corolla 5-6 mm long, white or pinkish; tube cylindrical, 2.5-3 mm long, pubescent inside above; lobes 4, 2.5-3 mm long, acute serrate along the margin, pubescent on the upper half, densely pubescent on the lower half inside. Stamens 4, inserted or exserted; filaments 0.5-1 mm or 2-2.5 mm long, minutely pubescent; anthers linear-oblong, 0.8-1 mm long. Ovary 1-1.5 mm long, ovules many on median placenta; style stout or slender, 2-3 mm or 4-4.5 mm long, inserted or exserted, pubescent; stigma bilobed, 1-1.5 mm long, linear, papillose. Capsule globose or subglobose, 2-3 × 2-3 mm, glabrous, prominently ridged or keeled, membranous, dehiscence obscure or loculicidal. Seeds many, small, angular, 0.5-1 × 0.5-0.7 mm, testa granulate, black.

*Fls.* : February - March; *Frts.* : March - April.

*Ecology* : Sandy dried bed of forest stream at 225 m in alt.

*Distrib.* : India : West Bengal, Assam; Bangladesh & Myanmar.

*Exsiccata studied* : INDIA : Assam - Kamrup, Barauni, *Fr. Buchanan* 370 (E); Lower Assam, *G. Mann* 55 (ASSAM); Assam, *W. Fischer s. n.* (CAL); Nowgong, *C. B. Clarke* 37674 (CAL); Makum, Dihing river, *G. A. Gammie* 121 (CAL); Dumer,

Dulong, *G. Watt* 10453 (CAL. BSI); Chapal, *A. C. Chatterjee s. n.* (BSI, E); Assam, *Masters s. n.* (F); Lakhimpur, *H. G. Carter* 41170 (BSIS); Dibrugarh, *N. L. Bor* 16743 (DD); Charduar, *G. Panigrahi* 5617 (ASSAM); Dulong R. F., *G. Panigrahi* 27625 (ASSAM); West Bengal : Calcutta, *W. Helfer* 486 (CAL); Bengal, *K. Biswar* 437 (CAL).

BANGLADESH : Sylhet, *Wall. Cat.* 846 & 846 A (CAL); East Bengal, *Griffith s. n.* (Kew Distribution No. 2884) (CAL); Sunamganj, *C. B. Clarke* 8388 (CAL).

MYANMAR : Chindwin, Bhamo, *Sindney Tappin R. A.* 3063 (CAL).

74. *H. andamanica* Kurz in Journ. Asiat. Soc. Beng. 41 (2) : 311. 1872 & 46 (2) : 132. 1877 (*Type* : South Andaman, *S. Kurz s. n.* holo, & iso! CAL); Hook. f. Fl. Brit. Ind. 3 : 64. 1880; Ridley, Fl. Malay Penin. 2 : 49. 1923; Craib, Fl. Siam. Enum. 2 : 36. 1932; Thothathri in Bull. Bot. Surv. Ind. 2 : 365. 1960; Chakravarty in Bull. Bot. Surv. Ind. 2 : 9. 1979. (Plate 57).

Herbs annual. 30-40 cm, simple or branched; stem obtusely angular, setaceous. Leaves 4-8 × 2-4 cm, ovate to ovate-oblong, apiculate at apex, attenuate at base, dark glossy green above, pale or reddish below, puberulous; lateral nerves 5-6 pair, faint; petiole 0.5-1 mm long; stipules connate at base, 8-9 × 5-6 mm, membranous, with 3-5 unequal bristles, puberulous. Inflorescence terminal or axillary subcapitate cyme; peduncles 2-3 cm long. Flowers 5-6 mm long; pedicel 1-3 mm long, setaceous; bracts 0.8-1 mm long, membranous, with 3 cilia, puberulous. Hypanthium subglobose, 1-1.2 mm long, rounded at base; calyx limb 0.2 - 0.3 mm long; lobes 4, 3 3.5 × 1-1.2 mm, oblong-lanceolate or ovate-lanceolate, recurved, scabrous at margin; midrib prominent, keeled. Corolla funnel-shaped, 4-5 mm long, white; tube narrow, 2-2.5 mm long, broader above, glabrous inside; lobes 4, 2-2.5 × 0.8-1 mm, linear-lanceolate, acute, recurved at margin, densely pubescent inside. Stamens 4, exserted; filaments about 2 mm long, adnate to sinus of corolla lobes; anthers linear, 0.8-1 mm long. Ovary 1-1.2 mm long, ovules many on median placenta; style slender, 4-5 mm long; stigma bilobed, 0.5-1 mm long subglobose, swollen at base. Capsule 2-2.5 × 2.5-3 mm, ovoid, narrowly winged, compressed, membranous, glabrous. Seeds many, 40-50, triangular or plano-convex, 0.2-0.3 × 0.2 mm, exotesta reticulate, smooth, purple to rusty red, with dense raphides.

*Fls.* : May - August; *Fris.* : August - October.

*Distrib* : India : Andaman & Nicobar Islands on sandy loam or clayey soil up to 10 m in alt.

*Note* : *H. andamanica* Kurz is treated as an anomalous species by Hook. f. (1980). Now it is placed in Sect. *Anotidopsis* Hook. f. for the following characteristics : calyx teeth triangular-lanceolate, recurved, capsule membranous, crown low and inflorescence subcapitate cyme, mostly terminal and from upper axis.

*Exsiccata studied* : INDIA : Andaman & Nicobar Islands - South Andaman, Aberdeen, *S. Kurz s. n.* (CAL); S. Andaman, *G. King s. n.* (CAL); Manpur-Hill, *G. King's Collector s. n.* (CAL & BSIS); Wimberleyganj, *M. V. Lurie* 11862 (DD); Nilambur, *N. Bhargava* 2478 (CAL); Baralang Islands, *N. Bhargava* 5950 (CAL); Little Andaman, *N. Bhargava* 6571 (CAL); North Andamans, *N. C. Nair* 4850 (CAL).

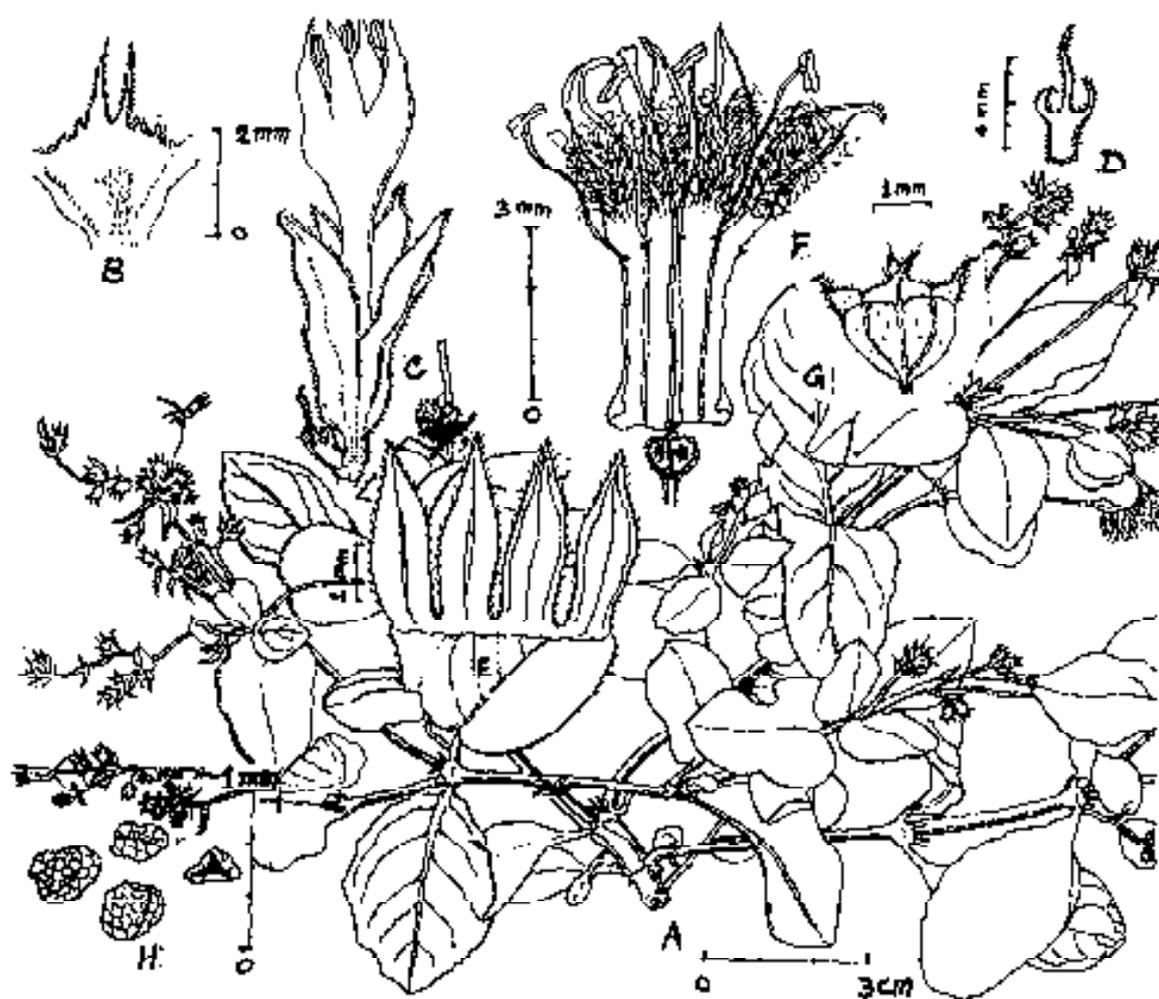


Plate 57. (A - H) *Hedyotis andamanica* Kurz : A. habit; B. stipule; C. flower; D. bract; E. calyx lobes; F. opened flower; G. capsule; H. seeds.

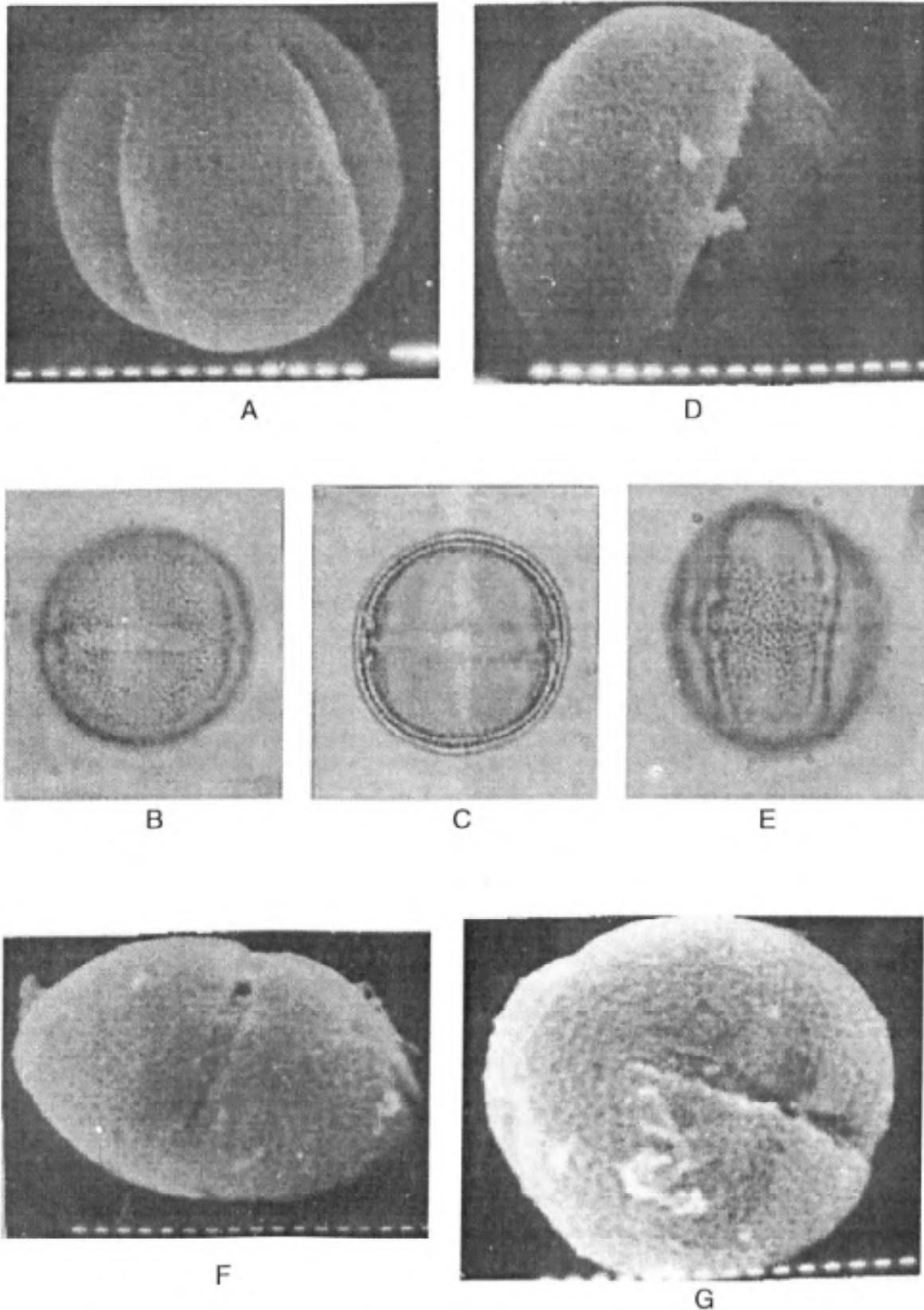
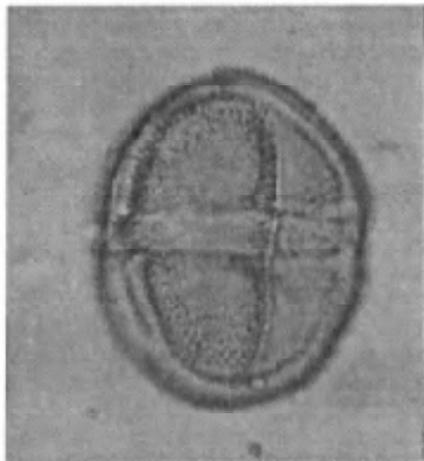
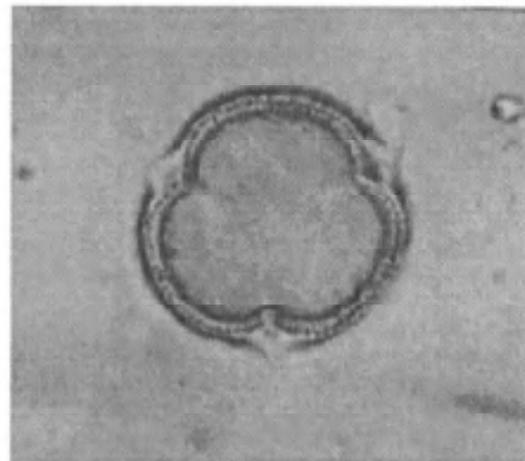


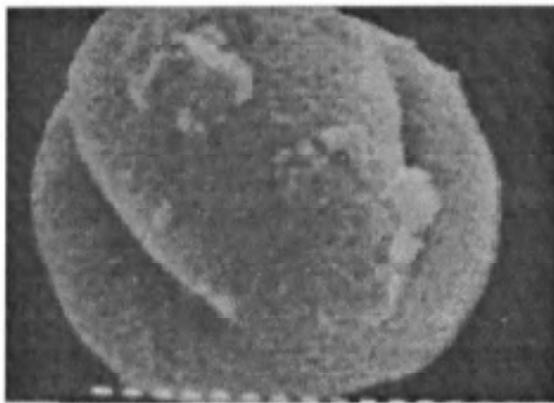
Plate 58. A-C. Pollen of *H. devicolamensis*, A. SEM : Equatorial view,  $\times 3,200$ ; B. LM : Surface view with colporate aperture,  $\times 1000$ ; C. LM : Optial cross section of exine in equatorial view showing columellate exine,  $\times 1000$ . D-E. Pollen of *H. travancorica*, D. SEM : Equatorial view,  $\times 3200$ ; E. LM : Showing reticulate surface,  $\times 1,000$ ; F. Pollen of *H. swertioides*, SEM,  $\times 3200$ ; G. Pollen of *H. scandens*, SEM,  $\times 3200$ .



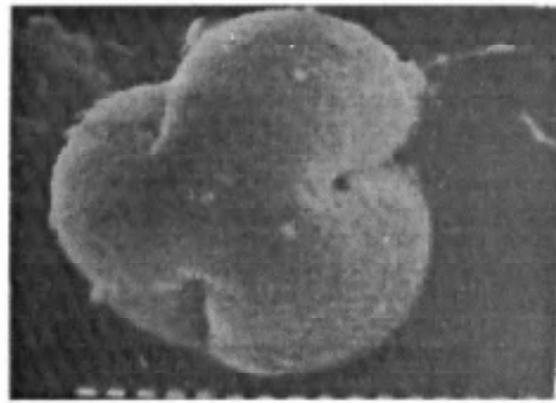
A



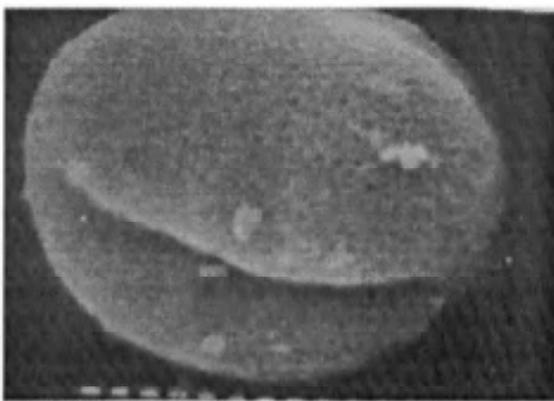
B



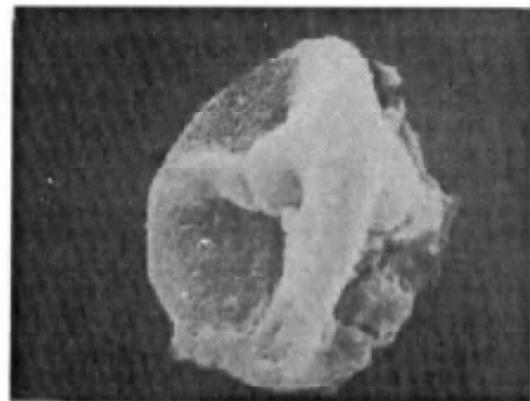
C



D



E



F

Plate 59. A-B. Pollen of *H. villosostipulata*, A. LM : Equatorial view showing synzonorate condition,  $\times 1000$ ; B. LM : Optical cross section of exine in polar view,  $\times 1000$ ; C. Pollen of *H. articularis*, SEM : Equatorial view,  $\times 3200$ ; D. Pollen of *H. pruinosa*, SEM : Polar view showing striate-reticulate exine,  $\times 3200$ ; E. Pollen of *H. leschenaultiana*, SEM : Exine reticulate,  $\times 3200$ ; F. Pollen of *H. merguensis*, SEM : Equatorial view, exine reticulate,  $\times 5000$ .

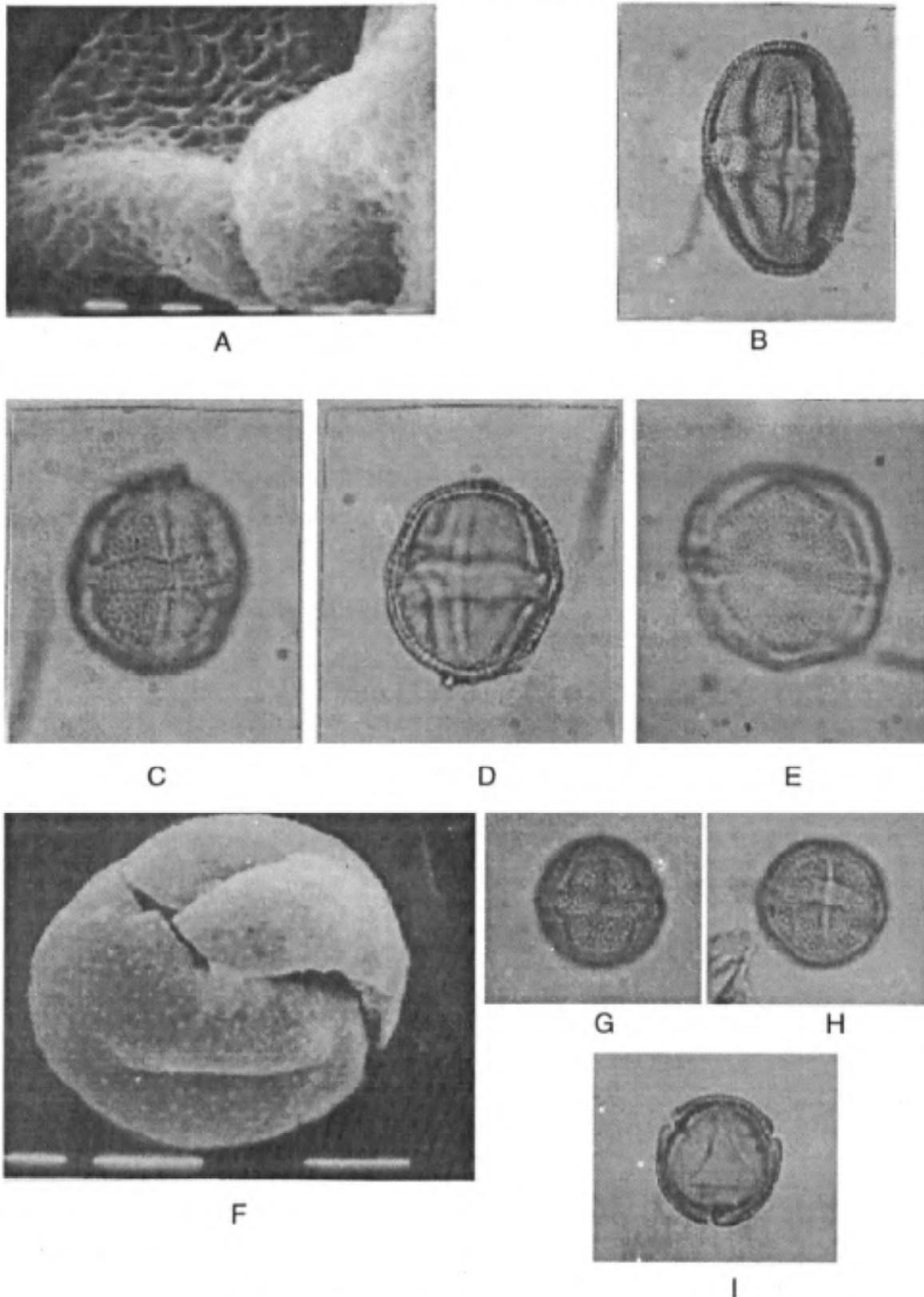


Plate 60. A-B. Pollen of *H. merguensis*, A. SEM : Exine surface,  $\times 10,000$ ; B. LM : Sub surface view showing colporate aperture and columellate exine,  $\times 1000$ ; C-D. Pollen of *H. scabra*, C. LM : Subsurface view showing alongate endocolpium and reticulate exine,  $\times 1000$ ; D. LM : Optical cross section of exine,  $\times 1000$ ; E. Pollen of *H. paradoxa*; LM : Mesocolpium region showing reticulate exine and margin of endocolpia,  $\times 1000$ ; F-I. Pollen of *H. hermanniana*, F. SEM : Note perforations and spinules on exine,  $\times 2500$ ; G. LM : Exine surface,  $\times 1000$ ; H. LM : Colporate aperture,  $\times 1000$ ; I. LM : Polar view in optical cross section with 3 apertures,  $\times 1000$ .

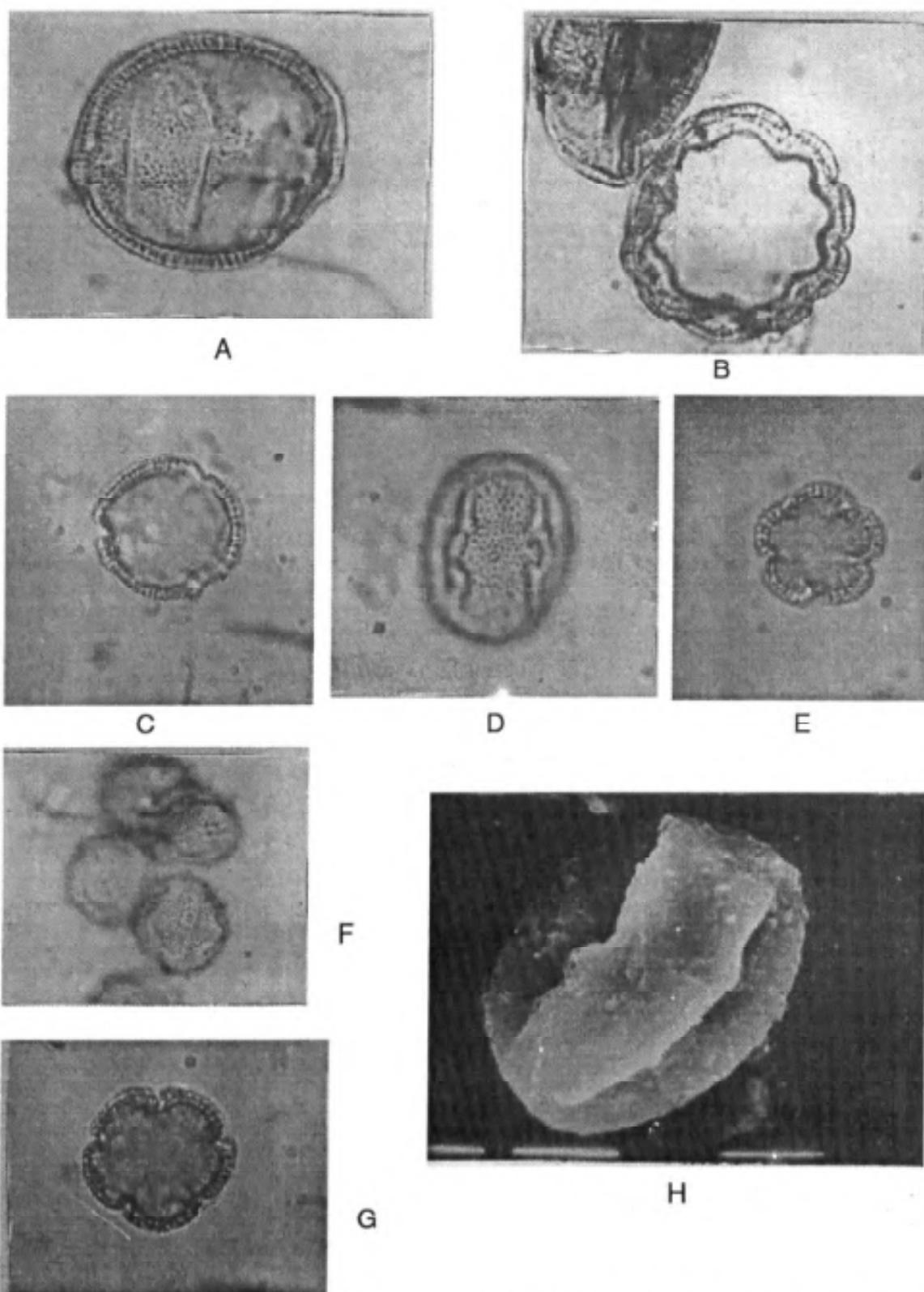


Plate 61. A-B. Pollen of *H. stocksii*, A. LM : Optical cross section showing exine structure,  $\times 1000$ ; B. LM : Polar view showing multiapertures,  $\times 1000$ ; C. Pollen of *H. herbacea*, LM : Polar view showing 3 apertures and columellate exine in optical cross section,  $\times 1000$ ; D. Pollen of *H. puberula*, LM : Reticulate exine in mesocolpium region,  $\times 1000$ ; E. Pollen of *H. retrorsa*, LM : Polar view showing 5 apertures,  $\times 1000$ ; F-H. Pollen of *H. gracilis*, F. LM : Showing colporate aperture,  $\times 1000$ ; G. LM : Polar view showing 5 apertures,  $\times 1000$ ; H. SEM : Equatorial view showing reticulate exine and colpi,  $\times 2500$ .



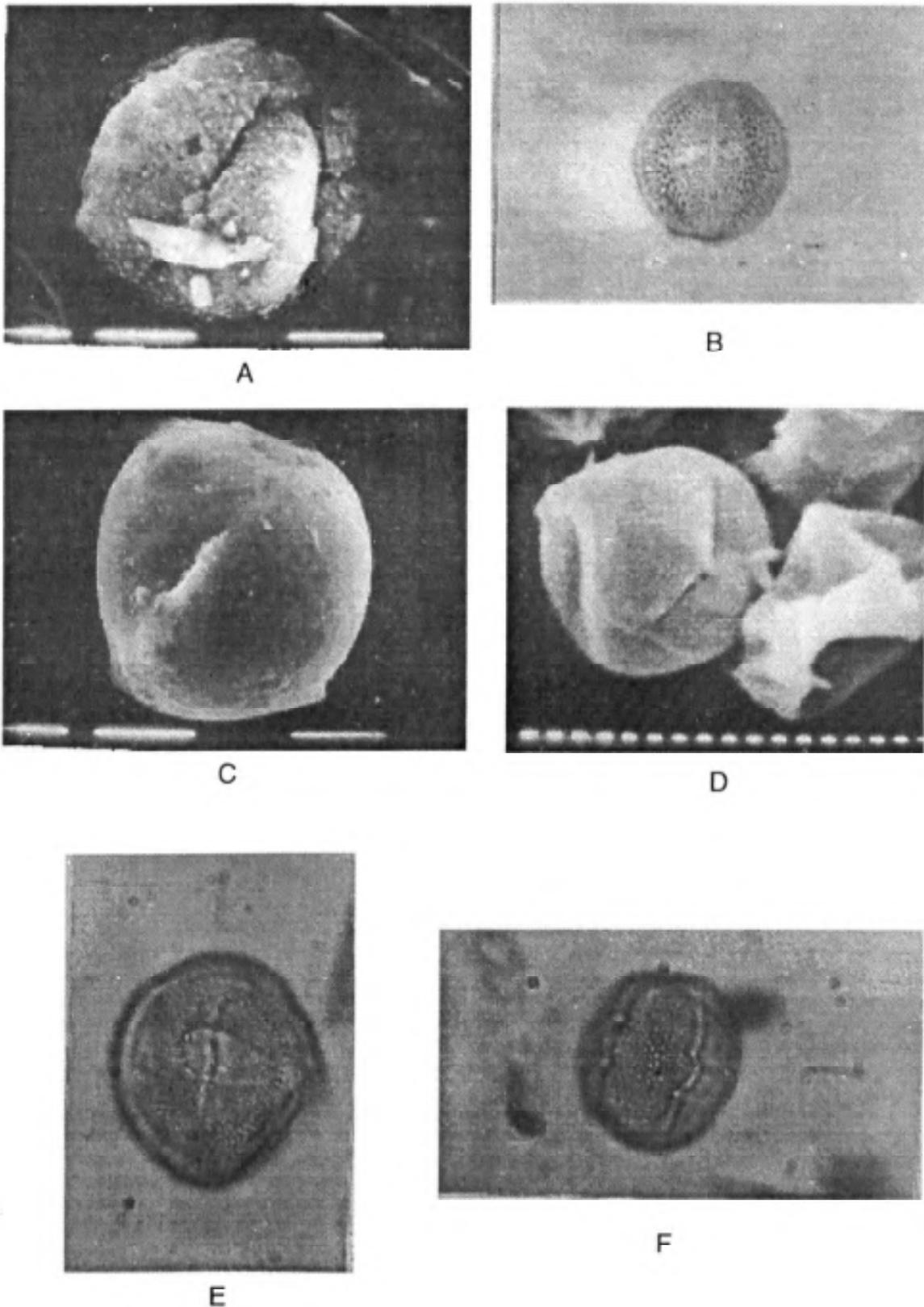
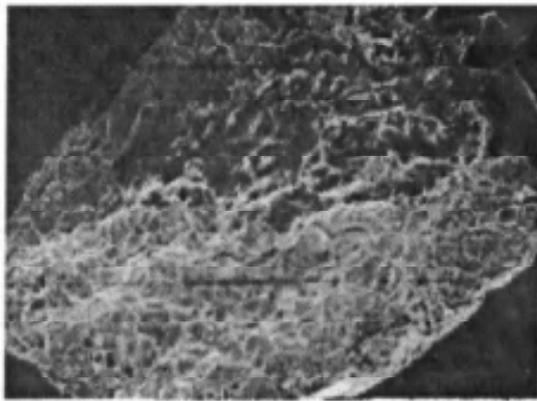


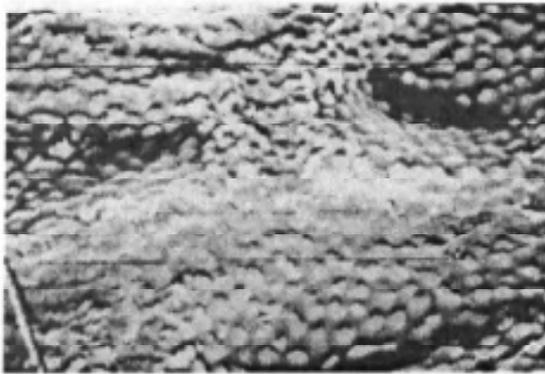
Plate 62. A. Pollen of *H. stocksii*, A. SEM : Showing granulate exine,  $\times 2500$ ; B-C. Pollen of *H. cyanantha*, B. LM : Showing apertures and reticulate exine,  $\times 1000$ ; C. SEM : Pollen,  $\times 5000$ ; D. Pollen of *H. neesiana*. D. SEM : Showing granulate exine,  $\times 3200$ ; E. Pollen of *H. andamanica*. LM : Showing endocolpium,  $\times 1000$ ; F. Pollen of *H. brunonis*, F. LM : Exine appears as reticulate,  $\times 1000$ .



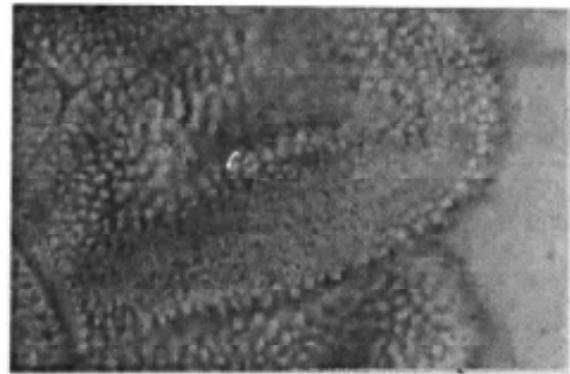
A



B



C



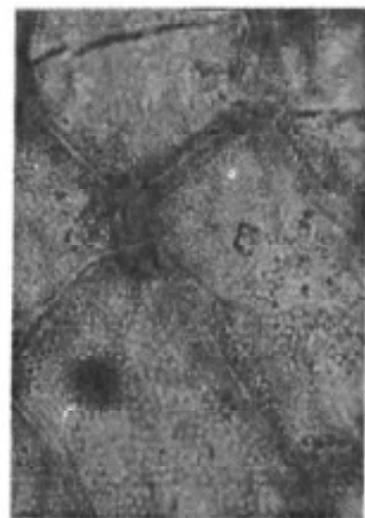
D



E

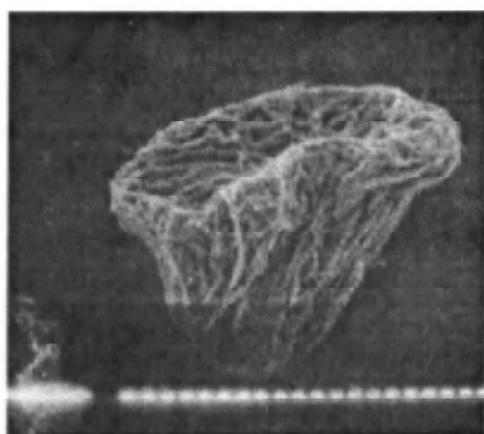


F

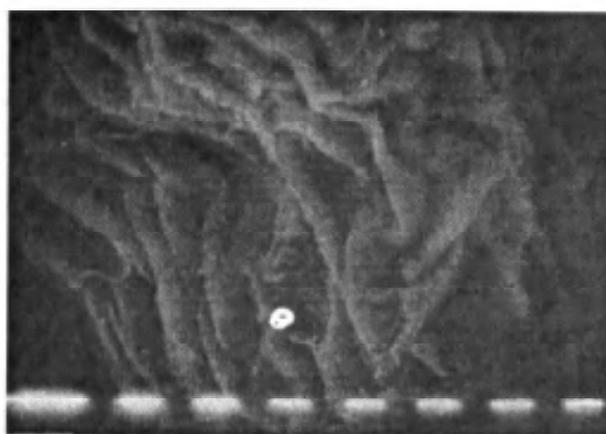


G

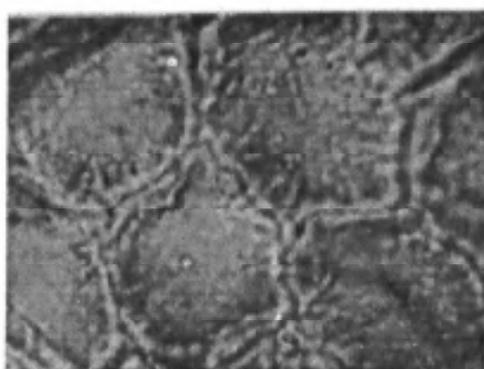
Plate 63. Seed coat of the sect. *Diplophragma*, A-B. *H. gamblei*, A. SEM : Seed,  $\times 250$ ; B. SEM : Cell wall surface perforated,  $\times 750$ ; C-D. *H. purpurascens*, C. SEM : Cell surface granulate,  $\times 2000$ ; D. LM : Showing coarsely granulate surface,  $\times 1000$ ; E. *H. verticillaris*, LM : Showing granulate surface and wavy cell wall,  $\times 1000$ ; F. *H. tetrandra*, LM : Showing granulate surface,  $\times 1000$ ; G. *H. griffithii*, LM : Showing granulate surface and straight cell wall,  $\times 1000$ .



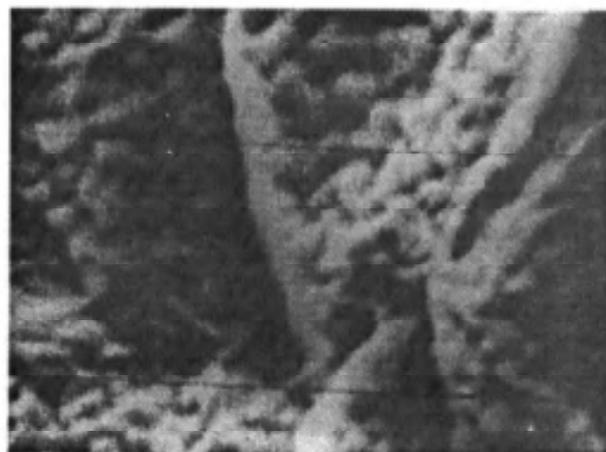
A



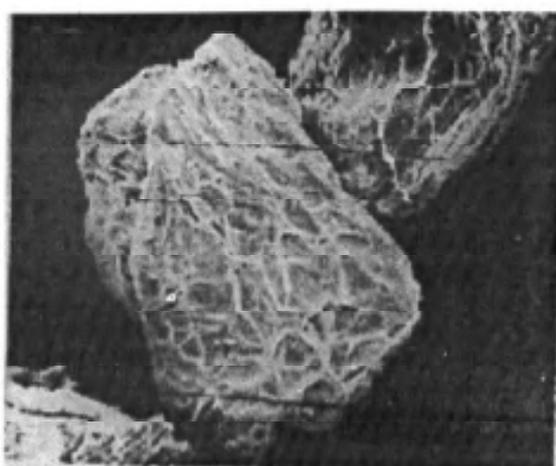
B



C



D

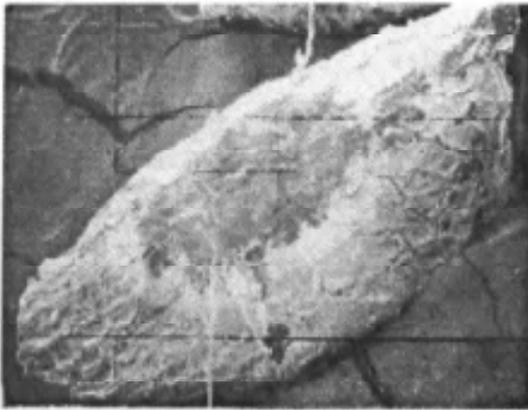


E



F

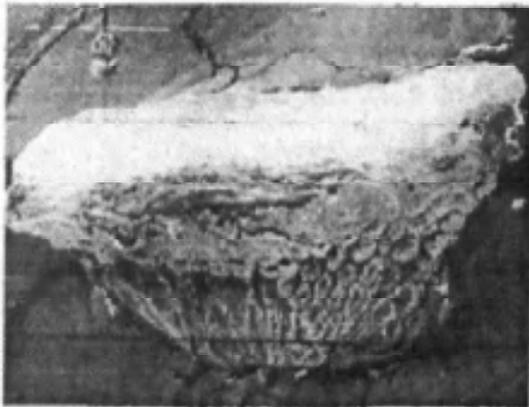
Plate 64. Seed coat of sect. *Hedyotis*, A-B. *H. fulva*. A. SEM : Seed,  $\times 200$ ; B. SEM : Cell surface striated,  $\times 1600$ ; C-D. *H. auricularia*, C. LM : Showing cell surface minutely granulate,  $\times 1000$ ; D. SEM : Cell surface tuberculate,  $\times 3000$ . Seed coat of section *Oldenlandia*; E-F. *H. corymbosa*; E. SEM : Seed,  $\times 250$ ; F. SEM : Cell wall surface smooth,  $\times 750$ .



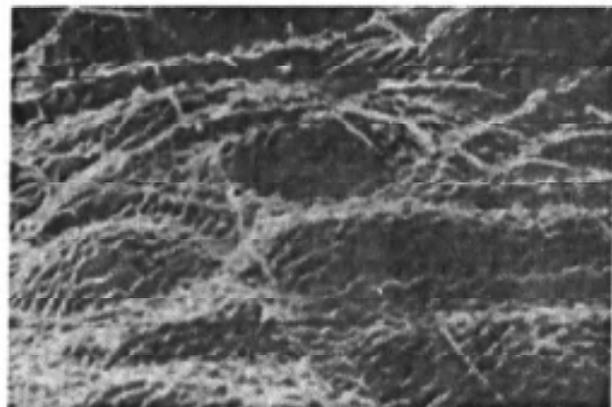
A



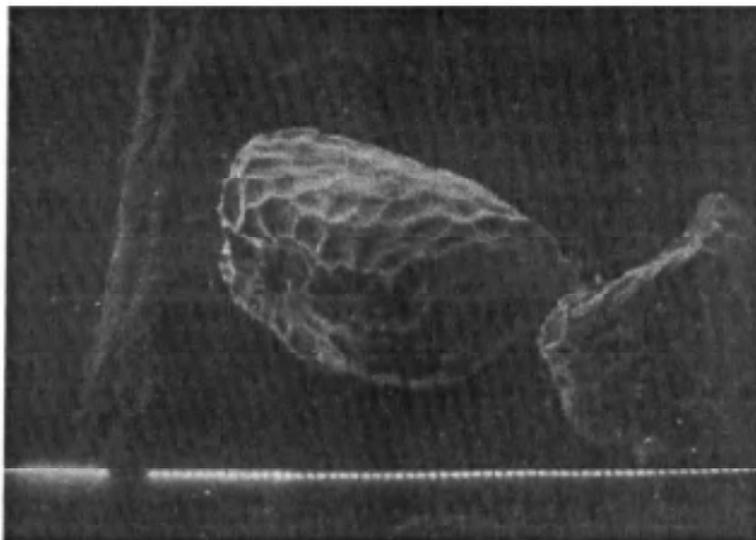
B



C

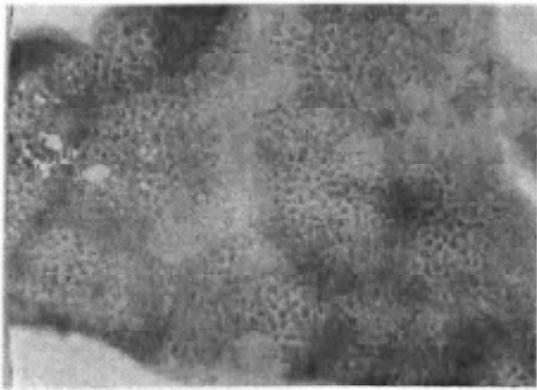


D



E

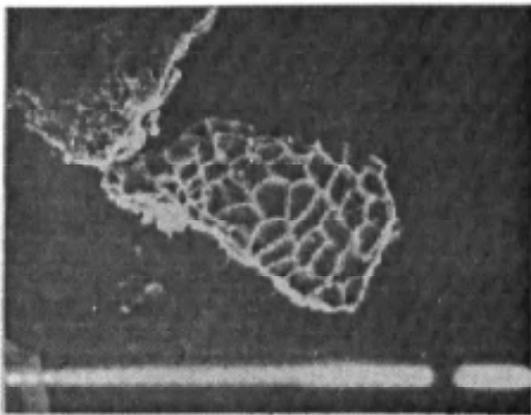
Plate 65. Seed coat of sect. *Diplophragma*. A-B. *H. travancorica*. A. SEM : Seed,  $\times 65$ ; B. SEM : Cell surface faintly granulate,  $\times 2000$ ; C-D. *H. pruinosa*; C. SEM : Seed,  $\times 250$ ; D. SEM : Cell shortly depressed, surface verrucate,  $\times 1500$ ; E. *H. merguensis* (sect. *INVOLUCRELLA*). SEM : Seed showing reticulate surface  $\times 100$ .



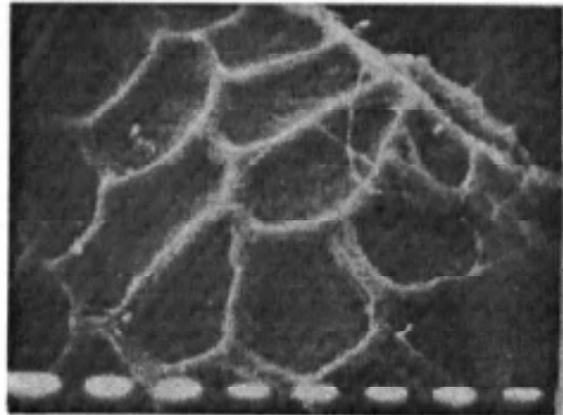
A



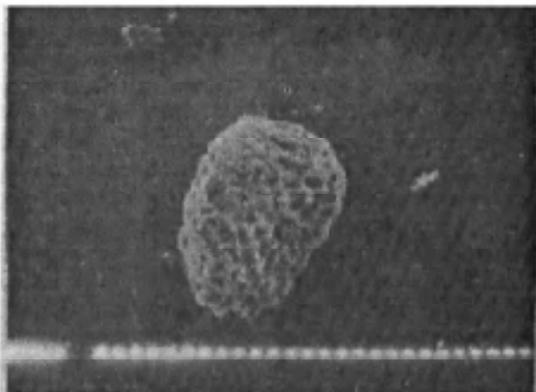
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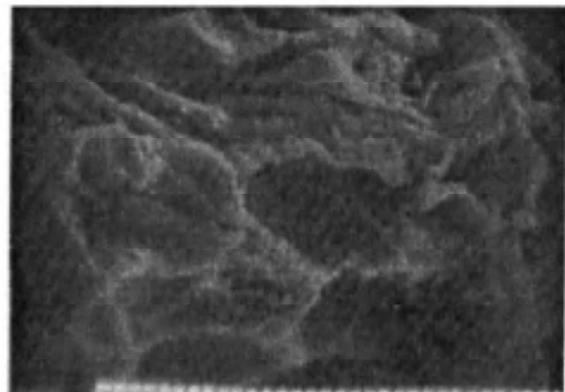
C



D

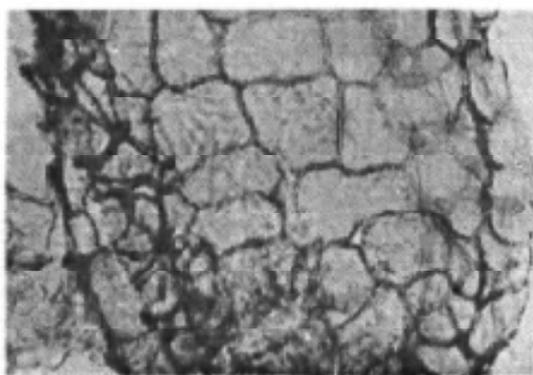


E



F

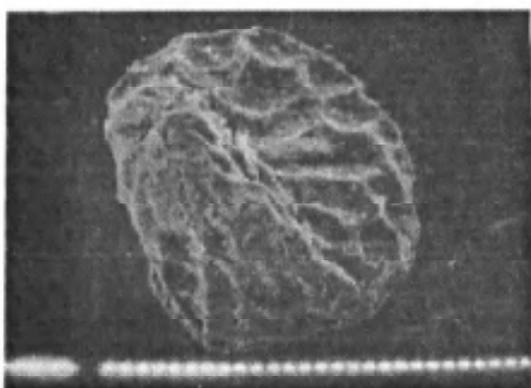
Plate 66. A-B. *H. merguensis* (sect. *Involucrella*) A. LM : Showing reticulate cell surface,  $\times 500$ ; B. SEM : Showing cell surface verrucate,  $\times 750$ ; C-F. Seed coat of section *HEDYOTIS*, C-D. *H. lineata*. C. SEM : Seed showing reticulate surface,  $\times 200$ ; D. SEM : Testa cell surface faintly granulate,  $\times 3200$ ; E-F. *H. vestita*. E. SEM : Showing coarsely reticulate seed surface,  $\times 800$ ; F. SEM : Testa cell wall smooth,  $\times 3200$ .



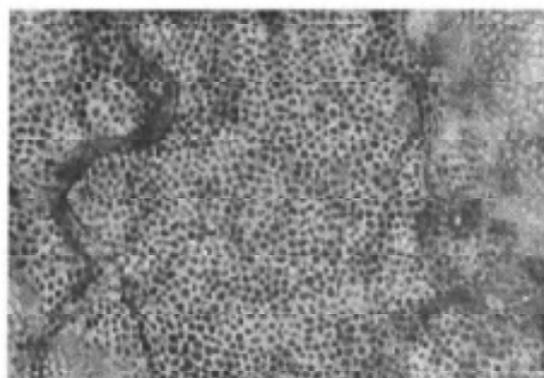
A



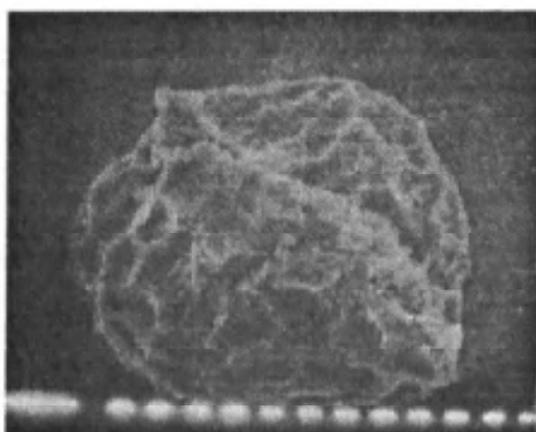
B



C



D

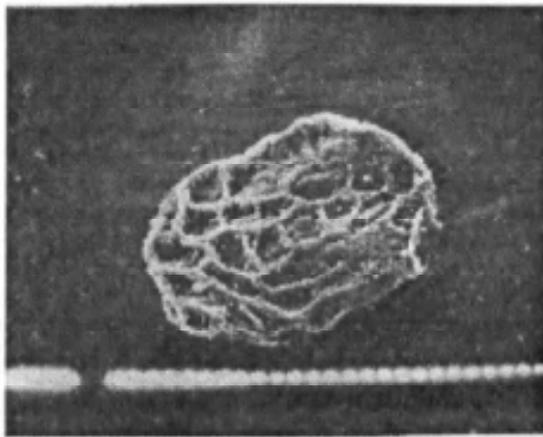


E

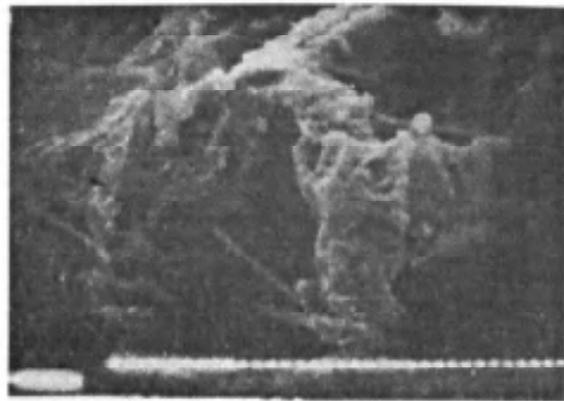


F

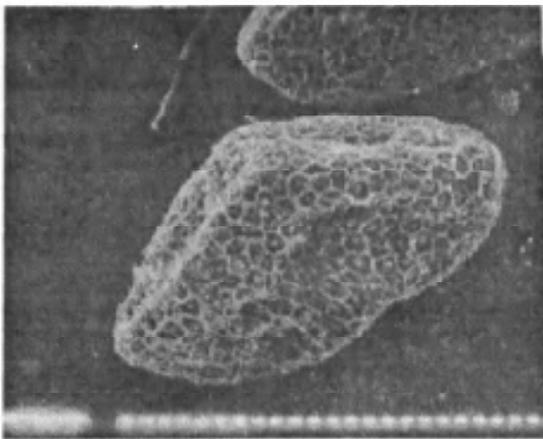
Plate 67. Seed coat of sect. *Oldenlandia*, A. *H. corymbosa*. LM : Showing slightly wavy cell wall and smooth cell surface,  $\times 500$ . B. *H. stocksii*. SEM : Finely striated cell surface,  $\times 2500$ ; C-D. *H. ovatifolia*. C. SEM : Seed,  $\times 200$ ; D. LM : Showing reticulate and granulate surface,  $\times 1200$ . E-F. *H. trinervia*. E. SEM : Seed,  $\times 200$ ; F. LM : Cell surface finely granulate,  $\times 750$ .



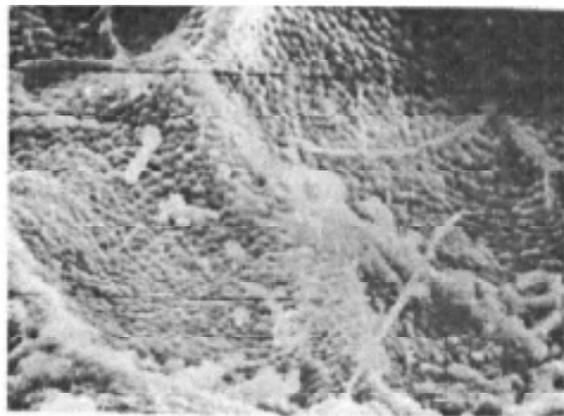
A



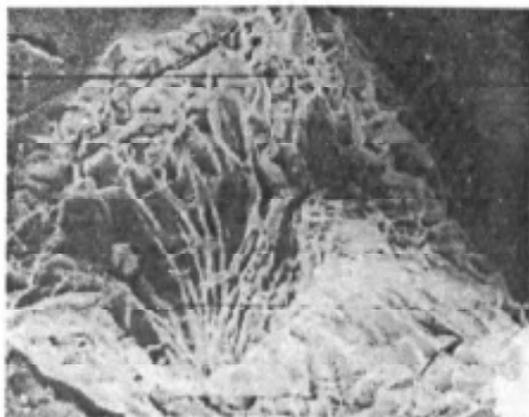
B



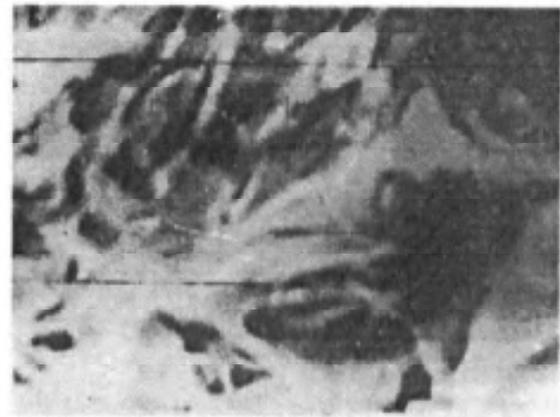
C



D

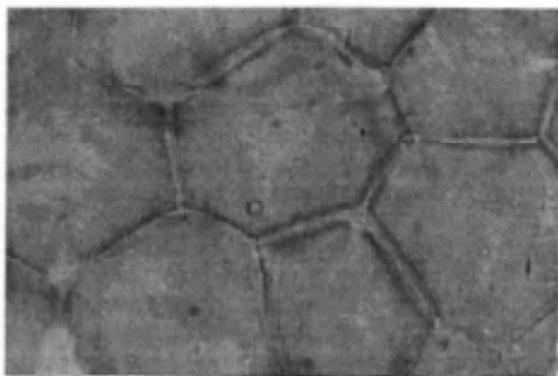


E

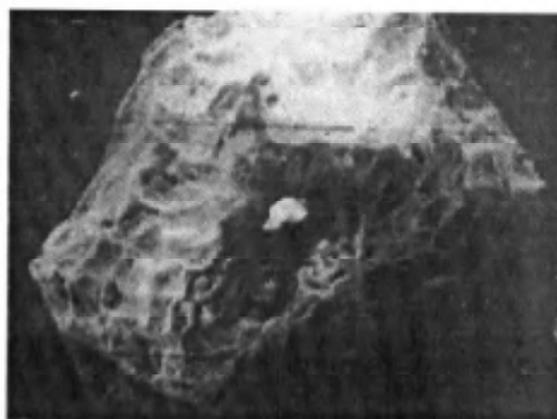


F

Plate 68. Seed coat of sect. *Oldenlandia*. A-B. *H. racemosa*. A. SEM : Seed,  $\times 200$ ; B. SEM : Cell surface,  $\times 800$ . Seed coat of sect. *Kohautia*. C-D. *H. coccinea*. C. SEM : Seed,  $\times 200$ ; D. SEM : Cell surface granulate,  $\times 2000$ . E-F. *H. aspera*. E. SEM : Seed,  $\times 250$ ; F. SEM : Cell surface striated,  $\times 2500$ .



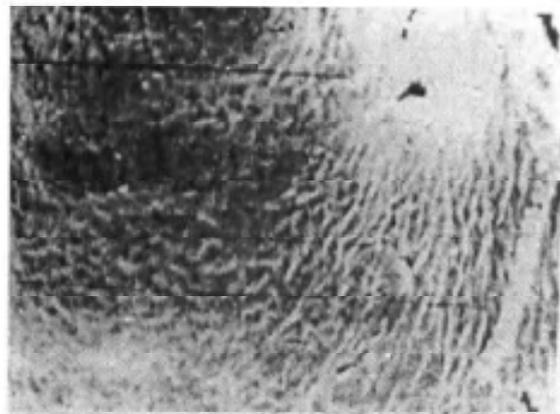
A



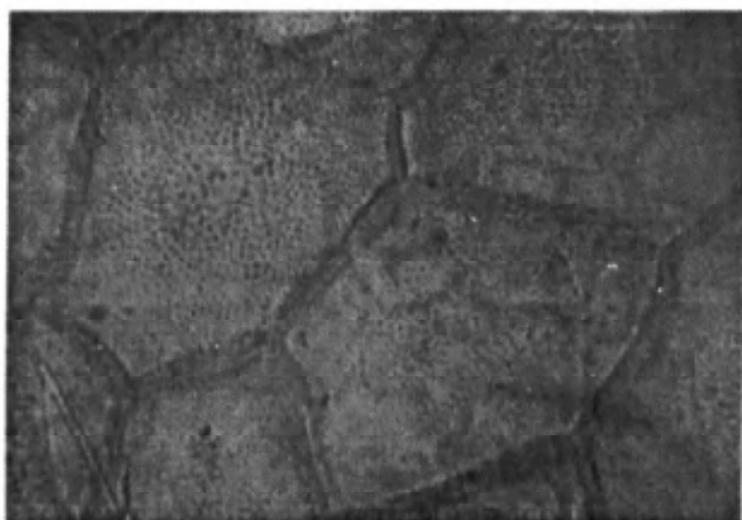
B



C



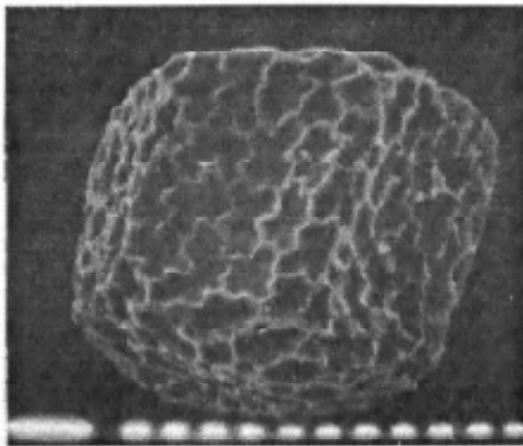
D



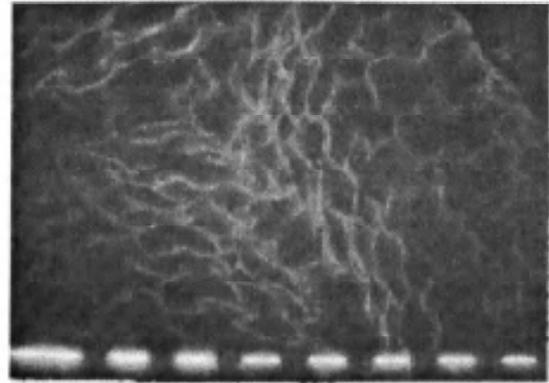
E

Plate 69. Seed coat of sect. Kohautia. A. *H. aspera*, LM : Cell smooth, finely striated,  $\times 1000$ . Seed coat of sect. Scleromitron. B-D. *H. neesiana*, B. SEM : Seed,  $\times 250$ ; C. SEM : Cell surface striated  $\times 2500$ ; D. SEM : Cell surface,  $\times 5000$ . E. *H. cyanantha*. LM : Cell surface finely granulate,  $\times 1000$ .

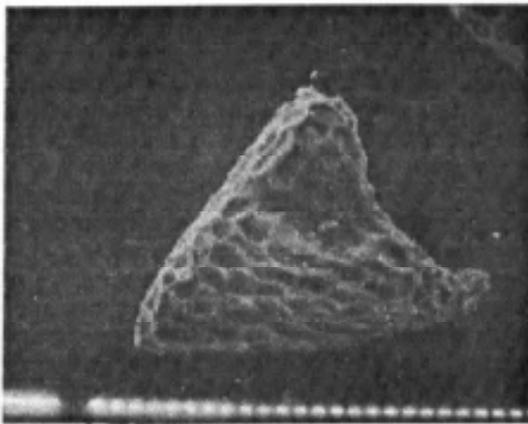




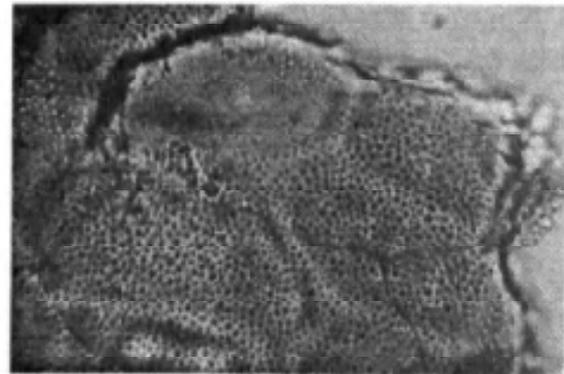
A



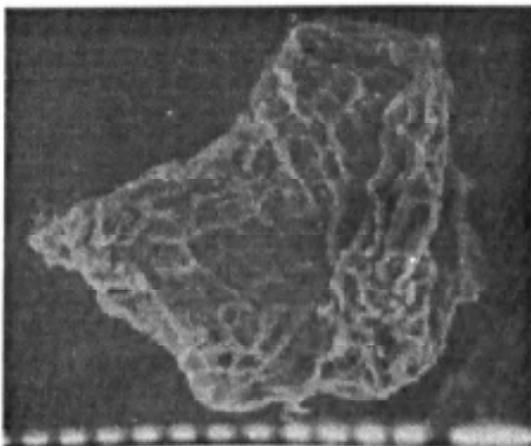
B



C



D

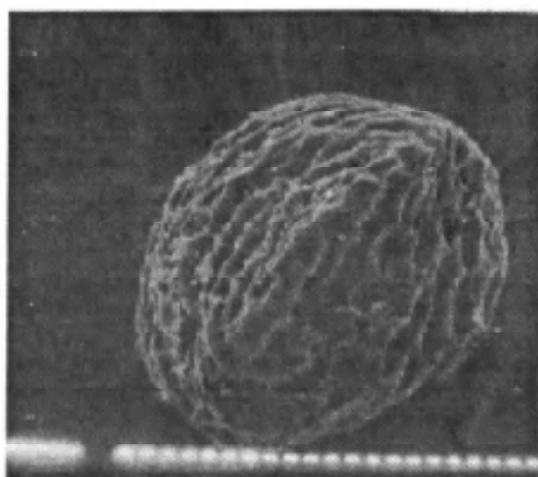


E

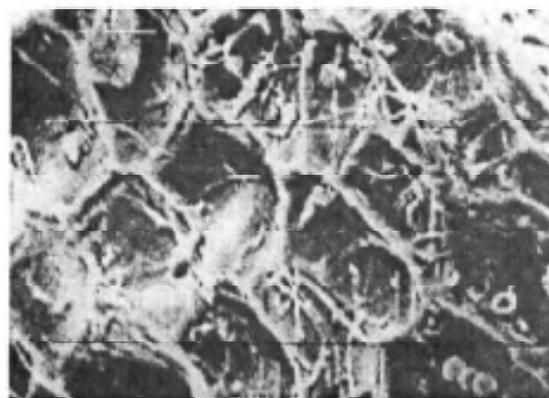


F

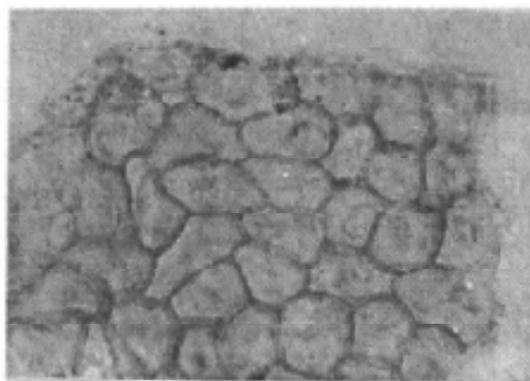
Plate 70. Seed coat of sect. *Scleromitron*. A-B. *H. tenelliflora*. A. SEM : Seed,  $\times 200$ ; B. SEM : Cell showing curve marginate and smooth surface,  $\times 800$ ; C. *H. pinifolia*, SEM : Showing reticulate surface,  $\times 200$ ; D. *H. verticellata*. LM : Showing reticulate and granulate cell surface,  $\times 1000$ ; E-F. *H. cyanantha*. E. SEM : Seed,  $\times 400$ ; F. SEM : Testa cell slightly sunken, surface finely granulate,  $\times 2500$ .



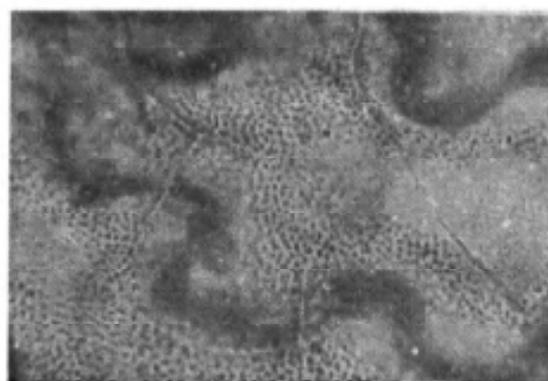
A



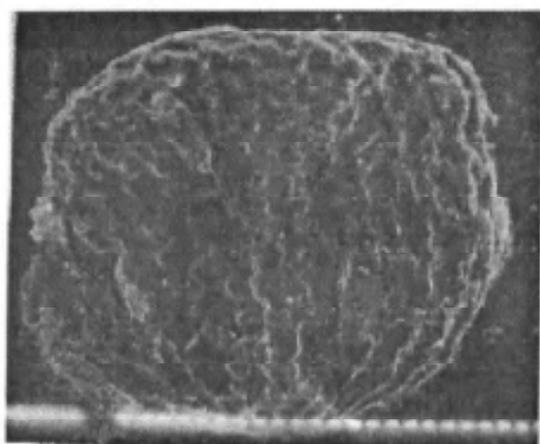
B



C



D



E



F

Plate 71. Seed coat of sect. Anotidopsis. A-C. *H. brunonis*. A. SEM : Seed;  $\times 100$ ; B. SEM : Testa cell slightly depressed, punctate.  $\times 750$ ; C. LM : Cell wall wavy, and cell surface punctate.  $\times 833$ ; D-F. *H. andamanica*; D. LM : Showing psilate cell,  $\times 750$ ; E. SEM : Seed,  $\times 200$ ; F. SEM : Cell surface granulate,  $\times 2500$ .

## APPENDIX 1

### MICRO CHARACTERS OF POLLEN GRAINS

In case of aperture description the terminology used by Lewis (1965) is followed. Margin distinct, synzonorate A1, free A3, margin obscure A2.

*Hedyotis verticillaris* Wt. & Arn. Pollen grain subprolate,  $P \times E = 39-46 \mu\text{m} \times 25-34 \mu\text{m}$ , 3 colporate; colpi  $34 \times 3 \mu\text{m}$ , OS lalongate,  $4 \times 15 \mu\text{m}$ , margin distinct, free, A3. Exine 1.5-2  $\mu\text{m}$  thick, finely reticulate (SSF). Exorectal cell surface under LM study (Plate 63E).

*H. kurzii* Merr. Pollen grain prolate spheroidal,  $P \times E = 32-54 \times 25-29 \mu\text{m}$ , 3 colporate; colpi  $40 \times 3 \mu\text{m}$ , OS lalongate,  $5 \mu\text{m}$  diam., margin distinct, synzonorate, A1 giving the impression of formation of an equatorial girdle. Exine 2  $\mu\text{m}$  thick, medium reticulate, lumina 1-1.5  $\mu\text{m}$ .

*H. scandens* Roxb. Pollen grain prolate spheroidal,  $P \times E = 25-27 \times 20-22 \mu\text{m}$ , 4 colporate; colpi  $20 \times 3 \mu\text{m}$ , OS lalongate, 4  $\mu\text{m}$  diam., margin distinct, synzonorate, A1, giving impression of formation of an equatorial girdle. Exine 1.5-2  $\mu\text{m}$  thick, coarsely reticulate, honey comb-like (SSF).

Pollen under SEM (Plate 58C).

Pollen grain subprolate,  $P \times E = 25-39 \times 16-29 \mu\text{m}$ , 4 colporate; colpi  $22 \times 2 \mu\text{m}$ , OS lalongate, 4  $\mu\text{m}$  diam., margin distinct, synzonorate, A1. Exine 1.5-2  $\mu\text{m}$  thick, coarsely reticulate honey comb-like (LSF).

*H. capitellata* Wall. ex G. Don : Pollen grain subprolate,  $P \times E = 33-38 \times 24-26 \mu\text{m}$ , 4 colporate; colpi  $25 \times 3 \mu\text{m}$ , OS lalongate,  $6 \mu\text{m}$  diam., margin distinct, synzonorate, A1, giving impression of formation of an equatorial girdle. Exine 2  $\mu\text{m}$  thick, coarsely reticulate, lumina 1-2  $\mu\text{m}$  (SSF).

*H. fruticosa* L. Pollen grain  $P \times E = 41-46 \times 28-36 \mu\text{m}$ , 3 colporate; colpi  $33 \times 4 \mu\text{m}$ , OS lalongate, 6  $\mu\text{m}$  diam., margin distinct, synzonorate, A1, giving the impression of formation of an equatorial girdle. Exine 2  $\mu\text{m}$  thick, medium reticulate, lumina 0.5-1  $\mu\text{m}$  (LSF).

Pollen grain prolate,  $P \times E = 44-51 \times 24-37 \mu\text{m}$ , 3 colporate; colpi  $35 \times 3 \mu\text{m}$ , OS lalongate, 6  $\mu\text{m}$  diam., margin distinct, synzonorate, A1. Exine 3  $\mu\text{m}$  thick, finely reticulate, lumina 0.5  $\mu\text{m}$  (SSF).

*H. buxifolia* Bedd. Pollen grain subprolate,  $P \times E = 47-65 \times 30-45 \mu\text{m}$ , 3 colporate; colpi  $40 \times 3 \mu\text{m}$ , OS lalongate, 6  $\mu\text{m}$  diam., margin distinct, synzonorate, A1, giving impression of formation of an equatorial girdle. Exine 2  $\mu\text{m}$  thick, medium reticulate (SSF).

*H. uncinella* Hook. & Arn. Subprolate,  $P \times E = 34-38 \times 24-31 \mu\text{m}$ , 3 colporate; colpi long  $26 \times 2 \mu\text{m}$ , OS lalongate,  $5 \times 13 \mu\text{m}$ , margin distinct, free, A3. Exine 2  $\mu\text{m}$  thick, finely reticulate (SSF).

*H. travancorica* Bedd. Pollen grain subprolate or prolate spheroidal.  $P \times E = 40-48 \times 30-34 \mu\text{m}$ , 3 colporate, colpi  $35 \times 4 \mu\text{m}$ , OS lalongate,  $4 \times 9 \mu\text{m}$ , margin distinct

free, A3. Exine 2  $\mu\text{m}$  thick, finely reticulate, lumina 0.5  $\mu\text{m}$  (SSF).

Pollen under SEM (Plate 58D) and LM study (Plate 58E).

Seed and exotestal cell surface under SEM (Plate 65A-B).

*H. villosostipulata* (Gamble) Rao & Hemadri. Pollen grain subprolate,  $P \times E = 40-44 \times 27-34 \mu\text{m}$ , 3 colpi; colpi  $31 \times 3 \mu\text{m}$ , OS lalongate, 5  $\mu\text{m}$  diam. margin distinct, synzonorate, A1, giving impression of formation of equatorial girdle. Exine 3  $\mu\text{m}$  thick, finely reticulate (LSF).

Pollen under LM study (Plate 59A-B).

*H. swertioides* Hook. f. Pollen grain subprolate,  $P \times E = 49-51 \times 35-40 \mu\text{m}$ , 3 colpi; colpi  $36 \times 5 \mu\text{m}$ , OS lalongate, 7  $\mu\text{m}$  diam., margin distinct, synzonorate, A1, giving impression of formation of an equatorial girdle. Exine 3  $\mu\text{m}$  thick, finely reticulate (SSF).

Pollen grain subprolate,  $P \times E = 41-55 \times 28-40 \mu\text{m}$ , 3 colpi; colpi  $39 \times 6 \mu\text{m}$ , OS lalongate, 7  $\mu\text{m}$  diam. margin distinct, synzonorate, A1. Exine 3  $\mu\text{m}$  thick, finely reticulate (SSF).

Pollen under SEM (Plate 58F).

*H. lessertiana* Arn. Pollen grain subprolate,  $P \times E = 43-52 \times 28-35 \mu\text{m}$ , 3 colpi; colpi  $39 \times 4 \mu\text{m}$ , OS lalongate,  $5 \times 15 \mu\text{m}$ , margin distinct, synzonorate, A1, giving impression of formation of an equatorial girdle. Exine 2  $\mu\text{m}$  thick, medium reticulate (LSF).

*H. ramarowii* (Gamble) Rao & Hemadri; Pollen grain subprolate,  $P \times E = 35-44 \times 21-35 \mu\text{m}$ , 3 colpi; colpi  $32 \times 4 \mu\text{m}$ , OS lalongate,  $4 \times 11 \mu\text{m}$ , margin distinct free, A3. Exine 2  $\mu\text{m}$  thick, columellate, columella palisade like (SSF).

*H. gamblei* Henry & Subramanyam: Pollen grain subprolate,  $P \times E = 28-39 \times 20-27 \mu\text{m}$ ; colpi  $22 \times 4 \mu\text{m}$ , OS lalongate, 5  $\mu\text{m}$  diam. synzonorate, A1, giving impression of formation of an equatorial girdle. Exine 3  $\mu\text{m}$  thick, finely reticulated. (SSF).

Exotestal cell wall surface under SEM (Plate 63A-B).

*H. griffithii* Hook. f. Pollen grain prolate spheroidal,  $P \times E = 28-38 \times 22-31 \mu\text{m}$ , 3 colpi; colpi  $22 \times 3 \mu\text{m}$ , OS lalongate,  $5 \times 2 \mu\text{m}$ , margin distinct, free, A3. Exine 1.5  $\mu\text{m}$  thick coarsely reticulate, lumina 1-1.5  $\mu\text{m}$  (LSF).

Exotestal cell surface under LM study (Plate 63G).

*H. eualata* (Bedd. ex Gamble) Henry & Subram. Pollen grain subprolate or prolate spheroidal,  $P \times E = 33-38 \times 25-30 \mu\text{m}$ , 3 colpi; colpi  $28 \times 2 \mu\text{m}$ , OS lalongate,  $5 \times 10 \mu\text{m}$ , margin distinct, free, A3. Exine 3  $\mu\text{m}$  thick, medium reticulate, lumina 0.5-1  $\mu\text{m}$  (short-styled flower).

*H. eualata* (Gamble) Henry & Subram. var. *agastyamalayana* Henry & Subram. Pollen grain subspheroidal,  $P \times E = 39-42 \times 35-39 \mu\text{m}$ , 3 colpi; colpi

30 × 3 μm, OS lalongate, 5 × 70 μm, margin distinct, free, A3. Exine 3 μm thick, medium reticulate, lumina 0.5-1 μm (short styled flower).

*H. acutangula* Champ. ex Benth. Pollen grain prolate spheroidal, P × E = 30-35 × 23-24 μm, 3 colporate; colpi 24 × 4 μm, OS lalongate, 4 × 10 μm, margin distinct, free, A3. Exine 2 μm thick, finely reticulate (Long styled flower).

Pollen grain subprolate, P × E = 37-42 × 27-28 μm, 3 colporate, colpi 30 × 4 μm, OS lalongate, 5 × 10 μm, margin distinct, free, A3. Exine 1.5 μm thick, medium reticulate, lumina 1-1.5 μm (short styled flower).

*H. nodulos* Arn. Pollen grain or subprolate, P × E = 35-45 × 24-35 μm, 3 colporate; colpi 32 × 3 μm, OS lalongate, 4 μm, diam., margin distinct, synzorate, A1, giving impression of formation of an equatorial girdle. Exine 1.5 μm thick, medium reticulate, columellate, lumina 0.5-1 μm (SSF).

*H. flavescens* Thw. Pollen grain subprolate, P × E = 43-55 × 30-45 μm, 3 colporate; colpi 40 × 5 μm, OS lalongate, 5 μm diam., margin distinct, synzorate, A1, giving impression of formation of an equatorial girdle. Exine 1.5 μm thick, medium reticulate, columellate, lumina 0.5-1 μm (SSF).

*H. quinquinervia* Thw. Pollen grain subprolate, P × E = 45-56 × 30-39 μm, 3 colporate; colpi 39 × 4 μm, OS lalongate, 9 μm diam., margin distinct, synzorate, A1, giving impression of formation of an equatorial girdle. Exine 3 μm, thick, reticulate (SSF).

*H. leschenaultiana* DC. Pollen grain prolate, P × E = 37-48 × 21-30 μm, 3 colporate; colpi 33 × 3 μm, OS lalongate 5 μm diam., margin distinct, free, A3. Exine 2 μm thick finely reticulate, columellate (LSF). Pollen under SEM study (Plate 59E).

*H. devicolamensis* Deb & Dutta : Pollen grain subprolate, P × E = 39-48 × 28-33 μm, 3 colporate, colpi 30 × 3 μm, OS lalongate, 5 × 16 μm, margin distinct, free, A3. Exine finely reticulate, columellate (long styled flower). Pollen under SEM (88A) and L.M. study (Plate 59B-C).

*H. purpurascens* Hook. f. Pollen grain prolate, P × E = 45-55 × 27-40 μm, 3 colporate; colpi 40 × 3 μm, OS lalongate, 8 μm diam., margin distinct, synzorate, A1, giving impression of formation of an equatorial girdle. Exine 1.5-2 μm thick, reticulate (LSF).

Seeds under SEM study (Plate 64C). Exotestal cell under LM study (Plate 64D).

*H. tetrandra* (Roxb.) Craib : Pollen grain, prolate, or subprolate, P × E = 24-30 × 15-20 μm, 3 colporate; 18 × 2 μm, OS lalongate, 3 μm diam., margin distinct, synzorate, A1, giving impression of formation of an equatorial girdle. Exine 2 μm thick, tectum 0.5-1 μm thick, psilate (LSF).

*H. viscida* Bedd. Pollen grain, subprolate, P × E = 43-50 × 31-37 μm, 3 colporate; colpi 35 × 3 μm, OS lalongate, 7 μm diam., margin distinct synzorate, A1, giving impression of formation of an equatorial girdle. Exine 2 μm thick, medium reticulate (long styled flower).

Pollen grain subprolate,  $P \times E = 42-45 \times 29-40 \mu\text{m}$ ; 3 colpi; colpi  $33 \times 3 \mu\text{m}$ , OS lalongate,  $5 \mu\text{m}$  diam., margin distinct, synzonorate, A1, giving impression of formation of an equatorial girdle. Exine  $2 \mu\text{m}$  thick, medium reticulate (short styled flower).

*H. articularis* R. Br. ex Wt. & Arn. Pollen grain subprolate,  $P \times E = 43-55 \times 29-37 \mu\text{m}$ ; 3 colpi; colpi  $42 \times 4 \mu\text{m}$ , OS lalongate,  $6 \mu\text{m}$  diam., margin distinct, free, A3. Exine  $2 \mu\text{m}$  thick, medium reticulate (long styled flower).

Pollen under SEM study (Plate 59C).

*H. articularis* R. Br. ex Wt. & Arn. subsp. *santapauli* (Shetty & Vivek.) Deb & Dutta. Pollen grain, subprolate,  $P \times E = 41-54 \times 29-34 \mu\text{m}$ , 3 colpi; colpi  $33 \times 3 \mu\text{m}$ , OS lalongate,  $4 \mu\text{m}$  diam., margin distinct, synzonorate, A1, giving impression of formation of an equatorial girdle. Exine  $3 \mu\text{m}$  thick, finely reticulate, lumina  $0.5 \mu\text{m}$  (LSF).

*H. pruinosa* Wt. & Arn. Pollen grain prolate spheroidal,  $P \times E = 36-41 \times 27-32 \mu\text{m}$ , 3 colpi; colpi  $30 \times 4 \mu\text{m}$ , OS lalongate,  $6 \times 15 \mu\text{m}$ , margin distinct, free, A3. Exine  $3 \mu\text{m}$  thick, finely reticulate (SSF). Seed and exotestal cell under SEM (Plate 66 C-D). Pollen under SEM study (Plate 60D), exotestal cell under LM study (Plate 65C-D).

*H. bourdillonii* (Gamble) Rolla Rao & Hemadri : Pollen grain subprolate or prolate spheroidal,  $P \times E = 39-42 \times 29-34 \mu\text{m}$ , 3 colpi; colpi  $30 \times 3 \mu\text{m}$ , OS lalongate,  $4 \mu\text{m}$  diam., margin distinct, synzonorate, A1 giving impression of formation of an equatorial girdle. Exine  $3 \mu\text{m}$  thick, finely reticulate lumina  $0.5 \mu\text{m}$  (short styled flower).

*H. merguensis* Hook. f. Pollen grain subprolate;  $P \times E = 32-50 \times 20-35 \mu\text{m}$ , 3 colpi; colpi  $30 \times 3 \mu\text{m}$ , OS lalongate,  $5 \times 8 \mu\text{m}$ , margin obscure, free, A2. Exine  $2 \mu\text{m}$  thick, finely retipilate. Sexine twice thick, lumina  $1-1.5 \mu\text{m}$ , muri narrow.

Pollen under SEM (Plate 60F & 61 A) LM study (Plate 61 B) seed under SEM (Plate 66A); Exotestal cell under LM study (Plate 67A) & SEM (Plate 66B).

*H. scabra* Wall. ex Kurz : Pollen grains prolate spheroidal,  $P \times E = 30-35 \times 24-26 \mu\text{m}$ , 3 colpi; colpi  $28 \times 2 \mu\text{m}$ , OS lalongate,  $6 \mu\text{m}$  diam., margin distinct, synzonorate, A1 giving impression of formation of an equatorial girdle. Exine  $2 \mu\text{m}$  thick, coarsley reticulate (SSF).

Pollen under LM study (Plate 60 C-D).

*H. congesta* R.Br.ex G. Don : Pollen grain orolate spheroidal,  $P \times E = 25-31 \times 20-26 \mu\text{m}$ , 3 colpi; colpi  $21 \times 2 \mu\text{m}$ , OS lalongate,  $3 \mu\text{m}$  diam., margin distinct, synzonorate, A1, giving impression of formation of an equatorial girdle. Exine  $1 \mu\text{m}$  thick, medium reticulate, lumina  $0.5 \mu\text{m}$ .

*H. paradox* Kurz : Pollen grain, subprolate,  $P \times E = 28-32 \times 20-25 \mu\text{m}$ , 3 colpi; colpi  $24 \times 2 \mu\text{m}$ , OS lalongate,  $4 \mu\text{m}$  diam., margin distinct, synzonorate, A1, giving impression of formation of an equatorial girdle. Exine  $1-1.5 \mu\text{m}$  thick, finely reticulate (LSF).

Pollen under LM study (Plate 60E).

*H. auricularia* L. : Pollen grain prolate spheroidal,  $P \times E = 25-40 \times 20-27 \mu\text{m}$ , 3 colporate, colpi  $22 \times 2 \mu\text{m}$ , OS lalongate,  $5 \mu\text{m}$  diam., margin distinct, synzonorate, A1, giving impression of formation of an equatorial girdle. Exine  $1 \mu\text{m}$  thick, retipilate, lumina  $1-2 \mu\text{m}$  (LSF).

Exotestal cell under LM and SEM study (Plate 64C-D).

*H. insularis* (Spreng.) Deb & Dutta : Pollen grain, subprolate,  $P \times E = 31-40 \times 20-25 \mu\text{m}$ , 3 colporate; colpi  $30 \times 3 \mu\text{m}$ , OS lalongate,  $5 \mu\text{m}$  diam., margin distinct, synzonorate, A1, giving impression of formation of an equatorial girdle. Exine  $1 \mu\text{m}$  thick coarsely, reticulate, columella head  $0.5 \mu\text{m}$  (SSF).

*H. lineata* Roxb. Pollen grain prolate spheroidal,  $P \times E = 30-36 \times 23-30 \mu\text{m}$ , 3-(4) colporate; colpi  $30 \times 2 \mu\text{m}$ , OS lalongate,  $5 \mu\text{m}$  diam., margin distinct, synzonorate, A1, giving impression of formation of an equatorial girdle. Exine  $2 \mu\text{m}$  thick, medium reticulate, lumina  $1 \mu\text{m}$  (LSF).

Seed and exotestal cell under SEM study (Plate 66C-D).

*H. vestita* R. Br. ex G. Don : Pollen grain subprolate,  $P \times E = 30-38 \times 21-27 \mu\text{m}$ , 3 colporate; colpi  $25 \times 2 \mu\text{m}$ , OS lalongate,  $5 \mu\text{m}$  diam., margin distinct, synzonorate, A1. Exine  $3 \mu\text{m}$  thick, reticulate, columellate, sexine thrice thicker (LSF).

Seed and exotestal cell surface under SEM (Plate 66E-F).

*H. fulva* Hook. f. Pollen grain prolate spheroidal,  $P \times E = 26-33 \times 20-25 \mu\text{m}$ , 3 colporate; colpi  $22 \times 2 \mu\text{m}$ , OS lalongate,  $6 \mu\text{m}$  diam., margin distinct, synzonorate, A1, giving impression of formation of an equatorial girdle. Exine  $3 \mu\text{m}$  thick, medium retipilate (LSF).

Seed and exotestal cell surface under SEM (Plate 64A-B).

*H. puberula* (G. Don.) Arn. Pollen grain subprolate or prolate spheroidal,  $P \times E = 27-35 \times 20-24 \mu\text{m}$ , 3 colporate; colpi  $21 \times 2 \mu\text{m}$ , OS lalongate,  $5 \times 3 \mu\text{m}$ , margin diffuse, free, A2. Exine  $2 \mu\text{m}$  thick, medium retipilate, lumina  $1 \mu\text{m}$ , colpus bridge present, mesocolpium  $12 \mu\text{m}$  (LSF).

Pollen grain subprolate,  $P \times E = 33-40 \times 24-34 \mu\text{m}$ , colpi  $30 \times 1 \mu\text{m}$ , OS lalongate,  $5 \times 9 \mu\text{m}$ , margin diffuse, free, A2. Exine  $2 \mu\text{m}$  thick, coarsely reticulate, lumina  $1-2 \mu\text{m}$ ; colpus bridge (SSF).

Pollen under LM study (Plate 61 D) seed.

*H. ovatifolia* Cav. Seed under SEM and exotestal cell surface under LM study (Plate 67C-D)

*H. racemosa* Lamk. Pollen grain subprolate or prolate spheroidal,  $P \times E = 27-30 \times 20-24 \mu\text{m}$ , 3 colporate; colpi  $20 \times 2 \mu\text{m}$ , OS lalongate,  $4 \mu\text{m}$  diam. margin distinct free, A3. Exine  $1-1.5 \mu\text{m}$  thick, medium reticulate.

Seed and exotestal cell surface under SEM (Plate 68 C-D).

*H. herbacea* L. Pollen grains subprolate,  $P \times E = 30-33 \times 20-30 \mu\text{m}$ , 3-(4) colpi; colpi  $20 \times 3 \mu\text{m}$ , OS lalongate,  $4 \times 8 \mu\text{m}$ , margin distinct, free, A3. Exine  $2 \mu\text{m}$  thick, medium reticulate. Pollen under LM study (Plate 61C).

*H. graminifolia* L.f. Prolate spheroidal,  $P \times E = 31-40 \times 23-30 \mu\text{m}$ , 3 colpi; colpi  $30 \times 2 \mu\text{m}$ , OS lalongate,  $2 \times 10 \mu\text{m}$ , margin distinct, free, A3. Exine  $2 \mu\text{m}$ , thick, finely reticulate.

*H. stocksii* (Hook. f.) Rolla Rao & Hemadri : Pollen grain subprolate,  $P \times E = 41-51 \times 28-48 \mu\text{m}$ , 7-8 colpi; colpi  $25 \times 2 \mu\text{m}$ , OS lalongate,  $5 \mu\text{m}$ , margin distinct, synzonorate, A1. Exine  $2 \mu\text{m}$  thick, finely reticulate, lumina  $0.5 \mu\text{m}$ , mesocolpium  $13 \mu\text{m}$ .

Pollen under LM (Plate 62A &B) and SEM study (Plate 62 A).

Seed under SEM study (Plate 67B)

*H. biflora* (L.) Lamk. Pollen grain subprolate,  $P \times E = 30-50 \times 19-32 \mu\text{m}$ , 3 colpi; colpi  $20 \times 2 \mu\text{m}$ , OS lalongate,  $5 \mu\text{m}$  diam. margin distinct, synzonorate, A1, giving impression of formation of an equatorial girdle. Exine  $1.5-2 \mu\text{m}$ , medium reticulate.

Pollen under SEM (Plate 61 F) & LM study (Plate 60 G-1).

*H. trinervia* (Retz.) Roem. & Schult. : Pollen grain subprolate,  $P \times E = 22-28 \times 15-22 \mu\text{m}$ , 3 colpi; colpi  $20 \times 3 \mu\text{m}$ , OS lalongate,  $5 \mu\text{m}$  diam., margin distinct, free, A3. Exine  $1-1.5 \mu\text{m}$  thick, reticulate.

Exotestal cell surface under LM study (Plate 68 F) seed and exorstal cell surface under SEM (Plate 68 E).

*H. attenuata* Willd. Pollen grain subprolate,  $P \times E = 22-35 \times 15-23 \mu\text{m}$ , 3 colpi; colpi  $18 \times 2 \mu\text{m}$ ; OS lalongate,  $4 \times 12 \mu\text{m}$ , margin distinct, free, A3. Exine  $1.5-2 \mu\text{m}$  thick, medium reticulate.

*H. pumila* L. f. Pollen grain, subprolate,  $P \times E = 26-31 \times 18-25 \mu\text{m}$ , 3 colpi; colpi  $22 \times 2 \mu\text{m}$ , OS lalongate,  $4 \mu\text{m}$ , margin distinct, free, A3. Exine  $1-1.5 \mu\text{m}$  thick, medium reticulate.

*H. diffusa* Willd. var. *diffusa* : Pollen grain prolate,  $P \times E = 30-38 \times 16-34 \mu\text{m}$ , 5 colpi; colpi  $26 \times 2 \mu\text{m}$ , OS lalongate,  $4 \times 8 \mu\text{m}$ , margin distinct, free, A3. Exine  $2 \mu\text{m}$  thick, coarsely reticulate, lumina  $1-2 \mu\text{m}$ .

*H. diffusa* Willd. var. *extensa* : Pollen grain subprolate or prolate-spheroidal,  $P \times E = 40-52 \times 30-35 \mu\text{m}$ , 5-(6) colpi; colpi  $25 \times 1 \mu\text{m}$ , OS lalongate,  $4 \times 8 \mu\text{m}$ , margin distinct, free, A3. Exine  $2 \mu\text{m}$  thick, coarsely reticulate, lumina  $2-3 \mu\text{m}$ .

*H. corymbosa* (L.) Lamk. Pollen grain subspheroidal,  $P \times E = 20-22 \times 18-20 \mu\text{m}$ , 3 colpi; colpi  $13 \times 1 \mu\text{m}$ , OS lalongate  $3 \times 10 \mu\text{m}$ , margin distinct, free, A3. Exine  $1.5-2 \mu\text{m}$  thick, medium reticulate. Exotesta cell wall surface under LM study (Plate 68 A).

*H. corymbosa* (L.) Lamk. var. *linearis* (DC.) Deb & Dutta : Pollen grain,



subprolate,  $P \times E = 29 - 35 \times 20-25 \mu\text{m}$ , 3 colpi; colpi  $22 \times 2 \mu\text{m}$ , OS lalongate,  $4 \times 8 \mu\text{m}$ , margin distinct, free, A3. Exine  $2 \mu\text{m}$  thick, coarsely reticulate.

*H. pseudocorymbosa* Bakh. f. : Pollen grain prolate spheroidal,  $P \times E = 24 - 30 \times 19-26 \mu\text{m}$ , 3-(-4) colpi; colpi  $19 \times 3 \mu\text{m}$ , OS lalongate,  $4 \times 7 \mu\text{m}$ , margin distinct, free, A3. Exine  $2 \mu\text{m}$  thick, coarsely reticulate.

*H. graminicola* Kurz : Pollen grain oblate spheroidal,  $P \times E = 27 - 29 \times 30 - 32 \mu\text{m}$ , 5-6 colpi; colpi  $14 \times 1 \mu\text{m}$ , OS circular,  $5-6 \mu\text{m}$  diam., margin distinct, free, A3. Exine  $1.5-2 \mu\text{m}$  thick, reticulate heterobrochate, lemina  $1 \mu\text{m}$ , mesocolpium  $14 \mu\text{m}$ .

*H. coccinea* (Royle) Walp. Pollen grain subprolate or prolate spheroidal,  $P \times E = 20 - 23 \times 15-19 \mu\text{m}$ , 4 colpi; colpi  $16 \times 2 \mu\text{m}$ , OS circular,  $2 \mu\text{m}$  diam., margin distinct, free, A3. Exine  $2 \mu\text{m}$  thick, reticulate, heterobrochate.

Seed and exotestal cell surface under SEM (Plate 68C - D).

*H. retrorsa* (Boiss.) Rao & Hemadri : Pollen grain sub-prolate,  $P \times E = 18 - 22 \times 13-18 \mu\text{m}$ , 5 colpi; colpi  $15 \times 1 \mu\text{m}$ , OS circular, margin distinct,  $2 \mu\text{m}$  diam., free, A3. Exine  $2 \mu\text{m}$  thick, coarsely reticulate, heterobrochate.

Pollen under LM study (Plate 61 E).

*H. gracilis* Wall. Pollen grain prolate spheroidal,  $P \times E = 21 - 28 \times 17-23 \mu\text{m}$ , 4-5 colpi; colpi  $11 \times 2 \mu\text{m}$ , OS circular,  $2 \mu\text{m}$  diam. or lalongate  $18 \times 1 \mu\text{m}$ , margin distinct, free, A3. Exine  $1.5-2 \mu\text{m}$  thick, reticulate, columellate, mesocolpium  $7 \mu\text{m}$ .

Pollen under LM study (Plate 61 F & G) and under SEM study (Plate 61 H).

*H. aspera* Heyne ex Roth : Pollen grain prolate spheroidal,  $P \times E = 22 - 25 \times 17-21 \mu\text{m}$ , 5-6 colpi; colpi  $16 \times 2 \mu\text{m}$ , OS circular,  $2 \mu\text{m}$  diam., margin distinct, free, A3. Exine  $2 \mu\text{m}$  thick, coarsely reticulate, columellate. Exotestal cell surface under LM study (Plate 70 A); Seed and exotestal cell surface under SEM study (Plate 68 E-F).

*H. nagporensis* (Brace ex Haines) Rao & Hemadri : Pollen grain prolate spheroidal,  $P \times E = 20 - 26 \times 16-19 \mu\text{m}$ , 3-4 colpi; colpi  $12 \times 1 \mu\text{m}$ , OS circular,  $2 \mu\text{m}$  diam., margin distinct, free, A3. Exine  $2 \mu\text{m}$  thick, reticulate, columellate, homobrochate.

*H. angustifolia* Cham. & Schlecht. Pollen grain sub-prolate, spheroidal,  $P \times E = 32 - 37 \times 24-27 \mu\text{m}$ , 3 colpi; colpi  $29 \times 3 \mu\text{m}$ , OS lalongate,  $3 \times 4 \mu\text{m}$ , margin distinct, free, A3. Exine  $2 \mu\text{m}$  thick, fine and faintly reticulate, sexine twice thicker.

*H. tenelliflora* Bl. Seed and exotestal cell wall surface under SEM (Plate 70 A & B).

*H. cyanantha* Kurz : Pollen grain prolate spheroidal,  $P \times E = 34 - 44 \times 30-33 \mu\text{m}$ , 3 colpi; colpi  $32 \times 3 \mu\text{m}$ , OS lalongate,  $4 \times 15 \mu\text{m}$ , margin distinct, synzonorate, A1, giving impression of an equatorial girdle. Exine  $3 \mu\text{m}$  thick, prominently reticulate, columellate, columella  $1 \mu\text{m}$  high, sexine twice thick, muri psilate. Pollen

under LM (Plate 61 B) and SEM study (Plate 61 C) Seed or exotestal cell surface under SEM study (102 E & F); exotestal cell surface under LM study (Plate 71 D).

*H. pinifolia* Wall. ex G. Don. Pollen grain prolate spheroidal,  $P \times E = 28 \times 35 \times 24-28 \mu\text{m}$ , 3 colporate; colpi  $25 \times 2 \mu\text{m}$ , OS lalongate,  $3 \times 14 \mu\text{m}$ , margin distinct, free, A3. Exine  $2 \mu\text{m}$  thick, finely retipilate.

Seed under SEM (Plate 70 C).

*H. verticillata* (L.) Lamk. Pollen grain oblate spheroidal,  $P \times E = 28 \times 31 \mu\text{m}$ , 5-6 colporate; colpi  $15 \times 1 \mu\text{m}$ , OS lalongate,  $6 \times 12 \mu\text{m}$ . Exine 3-3.5  $\mu\text{m}$  thick, finely reticulate, columellate, surface undulate (verrucate), sexine 3 times thicker than the nexine. Exotestal cell surface under LM study (Plate 70 D).

*H. neesiana* Arn. Pollen grain subprolate,  $P \times E = 31 - 36 \times 22-32 \mu\text{m}$ , 3 colporate; colpi  $26 \times 2 \mu\text{m}$ . OS lalongate,  $4 \times 15 \mu\text{m}$ , margin distinct, free, A3. Exine  $2 \mu\text{m}$  thick, finely reticulate, columellate surface spinulate. Pollen under SEM (71D).

*H. brunonis* Merr. Pollen grain prolate spheroidal,  $P \times E = 26 - 30 \times 18-22 \mu\text{m}$ , 3 colporate; colpi  $21 \times 2 \mu\text{m}$ , OS lalongate,  $4 \mu\text{m}$  diam., margin distinct, synzorate, A1, giving impression of formation of an equatorial girdle. Exine  $1 \mu\text{m}$  thick, coarsely reticulate, sexine slightly thick.

Pollen under LM study (Plate 62 F). Exotestal cell surface under LM study (Plate 71 C). Seed and exotestal cell surface under SEM (Plate 71 A & B).

*H. andamanica* Kurz : Pollen grain prolate spheroidal,  $P \times E = 39 - 40 \times 30-35 \mu\text{m}$ , 3 colporate; colpi  $30 \times 4 \mu\text{m}$ , OS lalongate,  $6 \times 12 \mu\text{m}$ , margin distinct, free, A3. Exine  $2 \mu\text{m}$  thick, finely reticulate.

Pollen under LM study (Plate 62 E) Exotestal cell under LM study (Plate 71 D). Seed and exotestal cell wall surface under SEM (Plate 71 EF).

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<i>plantaginifolium</i> (Arn.) Bremek.		<i>ovatifolium</i> (Cav.) Babu	112
	43	<i>Wendlandia tetrandra</i> (Roxb.)	
<i>verticillare</i> (Wt. & Arn.)		DC.	79
Bremek.	41	<i>lawsoniae</i> DC.	43