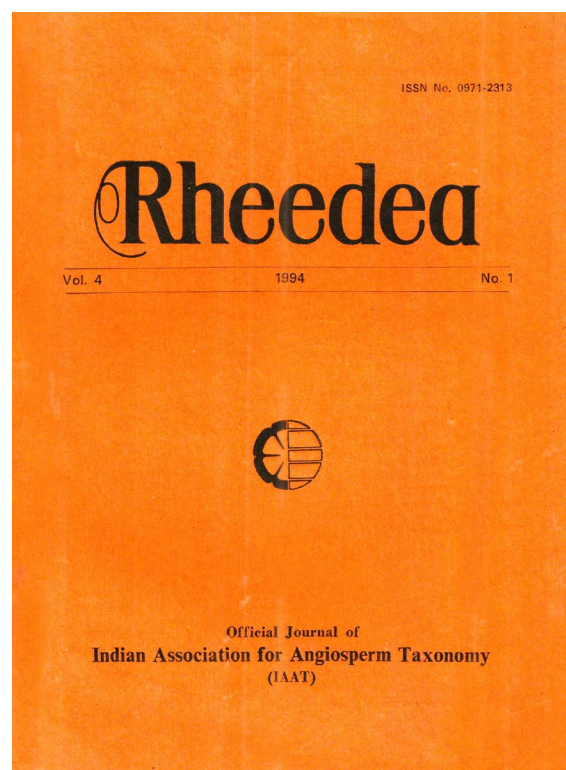




On the taxonomy and infraspecific classification of *Abelmoschus angulosus* Wall. ex Wt. & Arn. (Malvaceae)

Sivarajan V.V., Pradeep A.K. & A.K. Pandey



How to cite:

Sivarajan V.V., Pradeep A.K. & A.K. Pandey 1994. On the taxonomy and infraspecific classification of *Abelmoschus angulosus* Wall. ex Wt. & Arn. (Malvaceae). *Rheedia* 4(1): 1–12.

<https://dx.doi.org/10.22244/rheedia.1994.04.01.01>

Published in print: 30.06.1994

Published Online: 01.01.2022

**On the taxonomy and infraspecific classification of
Abelmoschus angulosus Wall. ex Wt. & Arn. (Malvaceae)**

V. V. Sivarajan, A. K. Pradeep

Department of Botany, University of Calicut, 673 635,
Kerala, India
and

A. K. Pandey

Department of Botany, Bhagalpur University,
Bhagalpur - 812 007, India

Abstract

Abelmoschus angulosus Wight & Arn. is currently treated as a highly polymorphic taxon, especially with respect to indumentum, leaf size and shape, and flower colour. Thwaites (1858) recognised two varieties in this species and was followed by Masters (1874). None of the recent authors have made attempts for its infraspecific classification. The present study shows the existence of three distinct varieties. The white-flowered one is the typical form of the species (var. *angulosus*), while, var. *grandiflorus* (yellow-flowered) and var. *purpureus* Thw. (pink-flowered) are reinstated here.

Abelmoschus angulosus widely distributed in South and Southeast Asia was originally described by Robert Wight and Walker-Arnott (1834:53) as follows:

“Stem herbaceous, not prickly; leaves on long petioles, cordate, 5-lobed, unequally toothed; lobes ovate acuminate, upperside pubescent with short softish hairs, under slightly tomentose; pedicels rigidly and horizontally hairy, about as long as the petioles; involucl falling off long before the flower-buds open; calyx conical from a broad base, sepals only slightly cohering; capsules ovoid, acute, very hispid.” They also added a note that “so fugacious is the involucl that we have not been able to see it on our specimens”. Obviously Wight and Arnott had mistook the fugacious calyx to the involucl which is actually persistent. Subsequently, while describing and illustrating the species in his *Icones Plantarum Indiae Orientalis* (1845), Wight recognised this mistake and made amends.

Since then, this species has been sought to be defined in terms of its characteristic involucl having 4-5 ovate, connate segments (Thwaites, 1858; Masters, 1874; Trimen, 1893; Borssum Waalkes, 1966; Paul & Nayar, 1988).

V. V. Sivarajan, A. K. Pradeep and A. K. Pandey

Consequently, it has been recognised as a highly variable taxon, so much so that Wight (1840:66) remarked that "had this plant not been previously named 'angulosus', Dr. Zenker's specific name (in his 'Neelgherry plants', Zenker had named it as *Hymenocalyx variabilis*) would have been most appropriate" (parenthesis ours).

Recent authors like Borssum Waalkes (1966) and Paul and Nayar (1988) too have recognised it as a highly variable taxon with respect to indumentum, shape of leaves and colour of corolla.

Thwaites (1858), however, recognised two distinct varieties in this species in Sri Lanka, namely,

var. *purpureus* ("petiolis pilis rigidis hispidis; corolla purpurea, venis pallidioribus; seminibus globosis. - C. P. 1117").

var. *grandiflorus* ("petiolis scabris, nec hispidis; corolla majore, flava; seminibus subpyriformibus. - C. P. 2567").

This treatment was subsequently followed by Masters (1874) and Trimen (1893). Alston (1931), who included *Abelmoschus* in *Hibiscus*, treated them as separate species and named them *H. molochinus* and *H. primulinus*, respectively. Dunn (1914), in the meanwhile, described yet another, closely related species, *H. setinervis* ("*H. anguloso* Steud., affinis, foliorum nervis setosis nec tomentosus distinctus") based on several South Indian specimens, of which Borssum waalkes (1966) has selected *Sauliere* 409 from Pulney Hills as the syntype. Subsequent authors have, however, treated it as conspecific with *H. angulosus*.

In spite of this variability, most recent workers have not endeavoured an infraspecific classification, probably because they thought that it may not be taxonomically worthwhile, and have treated it as a highly polymorphic taxon. This is probably due to over reliance on herbarium specimens rather than on living plants in living communities. Borssum Waalkes (1966) was, however, more circumspect in suggesting that "for the purpose of distinguishing forms or varieties a careful study of more specimens from the whole area and of living populations is required."

It is in this backdrop, that we thought of a re-investigation of *Abelmoschus angulosus* in India, especially in the peninsular part. Since then, we have studied the variability of this species in nature and have scanned relevant literature. We have also consulted types and other authentic specimens. Extensive studies reveal that there are three distinct entities of this species, the white-flowered, pink-flowered and the yellow-flowered, which differ among themselves also in

Abelmoschus angulosus (Malvaceae)

some other characters including hairs on the spermoderm as could be deduced from the descriptions given at the end of this article. Apart from the morphological features, they also differ in their altitudinal distribution and habitat requirements. The white and pink or purple-flowered forms are invariably seen in grasslands and fringes of forests above 900m. The yellow-flowered form is most common in the coastal plains and midlands upto an altitude of 800 m. At least in Peninsular India, their distribution is never found to overlap considerably. We are convinced that these three forms deserve to be reckoned as three distinct varieties of *Abelmoschus angulosus*.

But then, we have, first of all, to determine which of the three corresponds to the typical var. *angulosus*.

A. angulosus was originally described on the basis of two specimens (Wallich n. 1927-1 and Wight 202), both from Nilgiris. Of these, Borssum Waalkes (1966) has selected Wallich's specimen as the lectotype. We have now seen this specimen (microfiche) and also its description and illustration (Wt., Icon. t. 951. 1845), which perfectly match the white-flowered specimens we collected from Nilgiris. Consequently, this is treated as var. *angulosus*. Apparently this does not occur in Sri Lanka, as could be inferred from the accounts given by Thwaites (1858), Trimen (1893) and Alston (1931).

We have also studied the types of the two varieties described by these authors from Sri Lanka. Of them, var. *purpureus* (*H. molochinus* Alston) compares well with our collection from Kutajadri and Bababudan Hills on the Western Ghats of Karnataka. This is closely similar to var. *angulosus* in appearance and indumentum pattern, but have much larger, pink or purple flowers. Borssum Waalkes (1966) rightly suspected it to be "near *H. setinervis* Dunn", but was prevailed upon by Fischer, who maintained that they are different. After careful study of the types of both *A. angulosus* var. *purpureus* (CP 1117, BM) and *H. setinervis* Dunn (*Sauliere* 409, K), we are of the opinion that they are the same and should be treated as var. *purpureus*, as has been done by Thwaites.

The type of var. *grandiflorus* (CP 2567, BM) and its description by Thwaites, match well with the most common element of this species in the coastal plains of India with bright yellow flowers. This taxon is rather very different from the other two in its growth habit, indumentum and flowers, and deserves to be treated as a distinct variety (if not as a separate species) as has been done by Thwaites.

A diagnostic description of the species, an artificial key to varieties, their nomenclature and brief description are provided here, as it would be of help for taxonomists to identify the infraspecific taxa.

V. V. Sivaraġan, A. K. Pradeep and A. K. Pandey

angulosus Wall. ex Wight & Arn., Prodr. Fl. Pen. Ind. Or. 1: 53. Bot. Beechey, Fl. Ind. 3: t. 951. 1845; Backer & Bakh. f., Fl. Java 1: 434. 1963; Blumea 14: 104. 1966; Britto & Matthew in Matthew, Fl. Tam. (1): 103. 1983; Sald. & Ramesh in Sald., Fl. Karnataka 1: 242. 1988; Paul & Nayar in Nayar et al. (eds.), Fasc. Fl. India 19: 68. 1988.

scabridus (Wight & Arn.) Steud., Nomencl. ed. 2, 1: 758. 1840; Mast. in Fl. Brit. India 1: 341. 1874; Hochr., Ann. Coserv. Jard. Bot. Ind. 1: 156. 1900; Cooke, Fl. Pres. Bombay 1: 111. 1903; Dunn in Fl. Pres. Madras 1: 97. 1915. (for types see under varieties)

woody shrubs, 0.5—4 m tall. Stems green or tinged with reddish, mostly or with scattered rigid bulbous based hairs, occasionally with long bristly hairs or glabrescent. Leaf blades orbicular - cordate in outline, lobed, membranous to coriaceous, margins crenate-serrate or serrate, venation pinnate, creamy-white, bright yellow or deep pink. Involucellar bracts connate at base, coriaceous to membranous, pubescent, accrescent. Calyx and corolla fugacious. Capsules 3—4.5 cm long, ovoid to globose, mostly bristly or hispid. Seeds reniform, 3 mm long, with concentric layers of brown hairs, spermoderm reticulate with distinct polygonal cells; hairs bulbous based or not, unicellular, sharp pointed.

Key to the Varieties

- Stems densely rigid bristly all over; flowers white, 2
- Stems laxly branched, scabrid or hispid, but not bristly; flowers bright yellow with a dark eye.....var. *grandiflorus*
- Stems laxly branched, scabrid or hispid, but not bristly; flowers bright yellow with a dark eye.....var. *angulosus*
- Stems laxly branched, scabrid or hispid, but not bristly; flowers bright yellow with a dark eye.....var. *purpureus*

angulosus Wall. ex Wight & Arn., Prodr. Fl. Pen. Ind. Or. 1: 53. Bot. Beechey, Fl. Ind. 3: t. 951. 1845. var. **angulosus** (Wight & Arn.) Nilgiri Hills, Wallich n. 1927-1 (K-W).
angulosus sensu Borss., Blumea 14: 104 1966, in part; Paul & Nayar, Fl. Karnataka 1: 242. 1988, in part.

scabridus (Wight & Arn.) Steud., Nom. ed. 2, 1: 758 1840; Mast. in Fl. Brit. India 1: 341. 1874, in part; Fyson, Fl. Nilgiri & Pulney Hills, Fl. Ind. 3: t. 46. 1915, 2: t. 36. 1915; Dunn in Gamble, Fl. Pres. Madras 1: 97, in part.

(Figs. 1 & 4a-b)

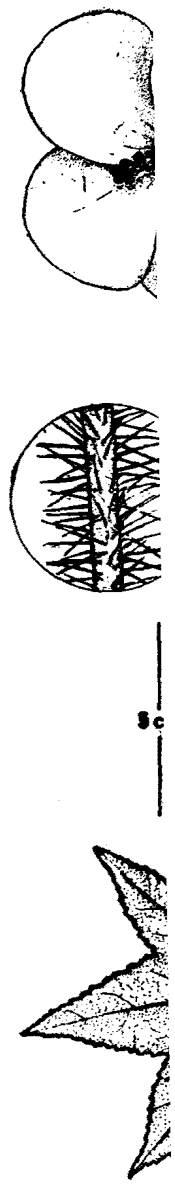


Fig. 1. *Abelmoschus* (1)
 C-D. stem
 H. seed.

Abelmoschus angulosus (Malvaceae)

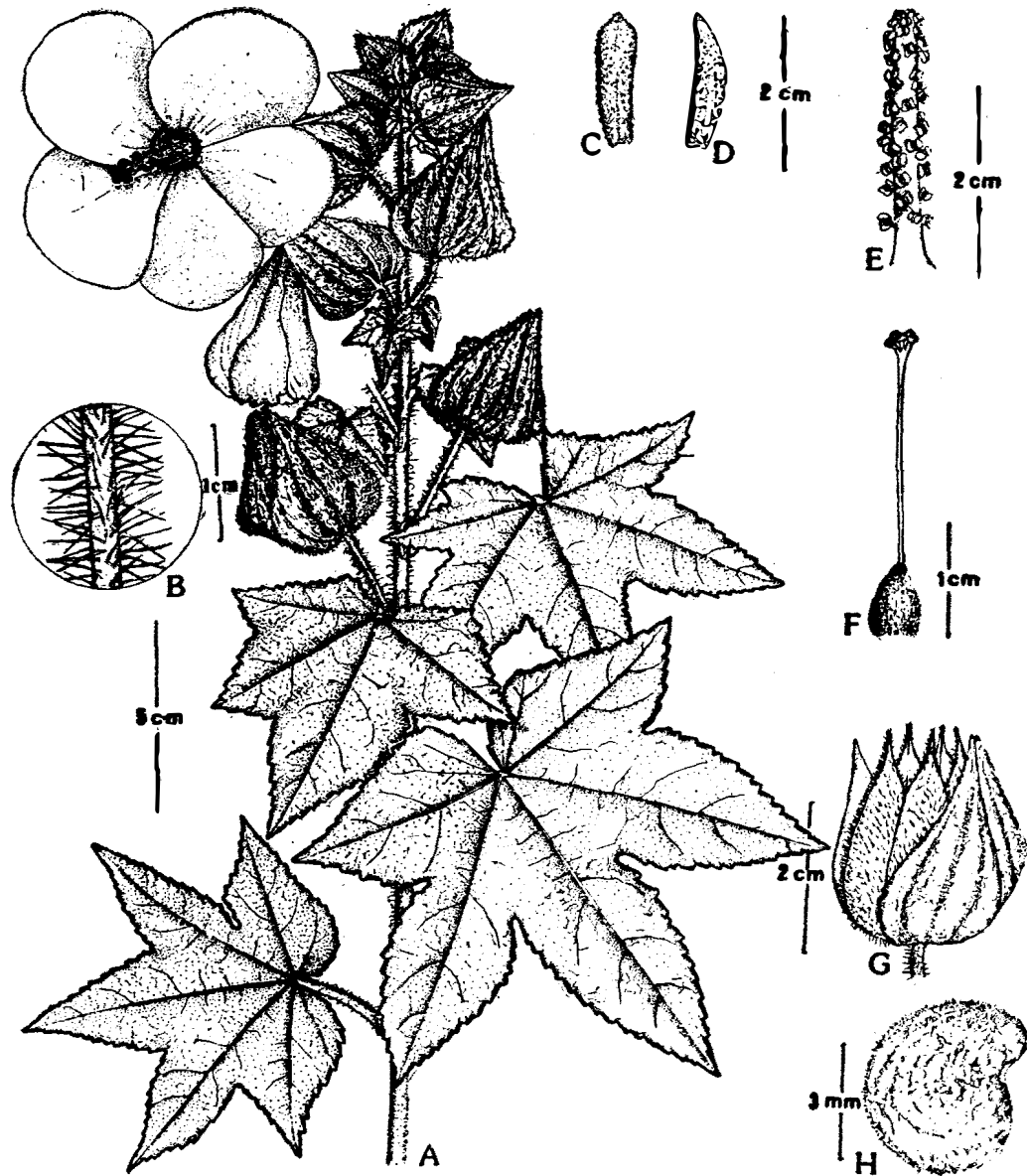


Fig. 1. *Abelmoschus angulosus* var. *angulosus*. A, flowering branch; B, stem pubescence; C-D, stipules; E, staminal column; F, pistil; G, fruit with persistent calyx; H, seed. (from Pradeep 44718).

V. V. Sivarajan, A. K. Pradeep and A. K. Pandey

Woody shrubs to 3 m tall. Stem erect, green, stout and woody, often tinged with purple, especially towards nodes, densely pubescent with rigid bulbous based (often pungent) hairs, intermingled with short stellate hairs. Leaf blades 5–10 × 8–11 cm, 3–5 angular or lobed, cordate and 3–5 nerved from base, the lobes triangular to ovate-elliptic, acute to acuminate at apex, margins serrate, densely pubescent with simple rigid hairs on the upper surface, densely so on the nerves beneath. Petioles 2.5–18 cm long, pubescent with short simple hairs, occasionally with a longitudinal tuft of hairs above. Stipules 5 × 1 mm, lanceolate, margins hairy. Flowers axillary, solitary, sometimes due to decrescence of upper leaves in apparent racemes. Pedicels stout, 1.5–2.5 cm long in flowers to 6–9 cm in fruits, pubescent with rigid simple and short stellate hairs. Involucellar bracts 4, connate from base to middle or throughout and splitting on one or two sides at anthesis. Bracts 20 × 8 mm, ovate-triangular coriaceous, hairy externally and densely sericeous internally. Calyx 2.5 cm long, greenish-yellow, membranous, spathaceous, splitting to one-side. Corolla 6 cm long, 7 cm diameter, creamy-white, with a small purple eye at centre; petals 5.5 × 3.5 cm obovate, glabrous, nerves slightly raised externally. Staminal column 3 cm long, creamy-white, glabrous, antheriferous throughout except towards base; staminal filaments 1.5 mm long; anthers creamy-white, 2.5 mm long. Ovary 8 × 5 mm, ovoid, densely appressed hairy; stylar branches 5, upto 1 mm long; stigmas discoid. Capsules 3–4 × 1.5–2.0 cm, fusiform to ovoid, 5-costate, acuminate at apex, densely hispid all over with rigid yellowish hairs, valves glabrous inside. Seeds 3 mm diameter, globose with concentric rings of white hairs, the hairs simple, minute, bulbous at base, hooked at tip, not twisted.

Note: *A. angulosus* var. *angulosus* occurs in grassy hill slopes and forest fringes of the Nilgiris at altitude 1500–2700 m. It flowers almost round the year, but reaches a peak in Jan.-Feb. It differs from the var. *grandiflorus* in its woody habit with rather stout branches, densely rigid hairy all over and by its smaller, erect, creamy-white flowers with a small dark eye at its base.

Specimens examined. INDIA: Kerala, Idukki Dt. : Munnar, Pradeep and Sivarajan 47752 (CALI). Tamil Nadu, Nilgiri Dt. : Near Kodanad, Vajravelu 39703; Kattabettu - Doddabetta road, Subramanyam 2005; Kodanad - Kottagiri road, Subramanyam 1929; Naduvattum, Ellis 37866 (MH); Perar near, Kottagiri, Pradeep 44718 (CALI).

Abelmoschus angulosus var. **grandiflorus** Thw., Enum. Pl. Zeyl. 26. 1858.
Type: Ceylon, Thwaites 2567 (BM, K)

Hibiscus angulosus var. *grandiflorus* (Thw.) Mast. in Hook. f., Fl. Brit. India 1: 341. 1874; Trimen, Handb. Fl. Ceylon 1: 156. 1893.

Abelmoschus angulosus (Malvaceae)

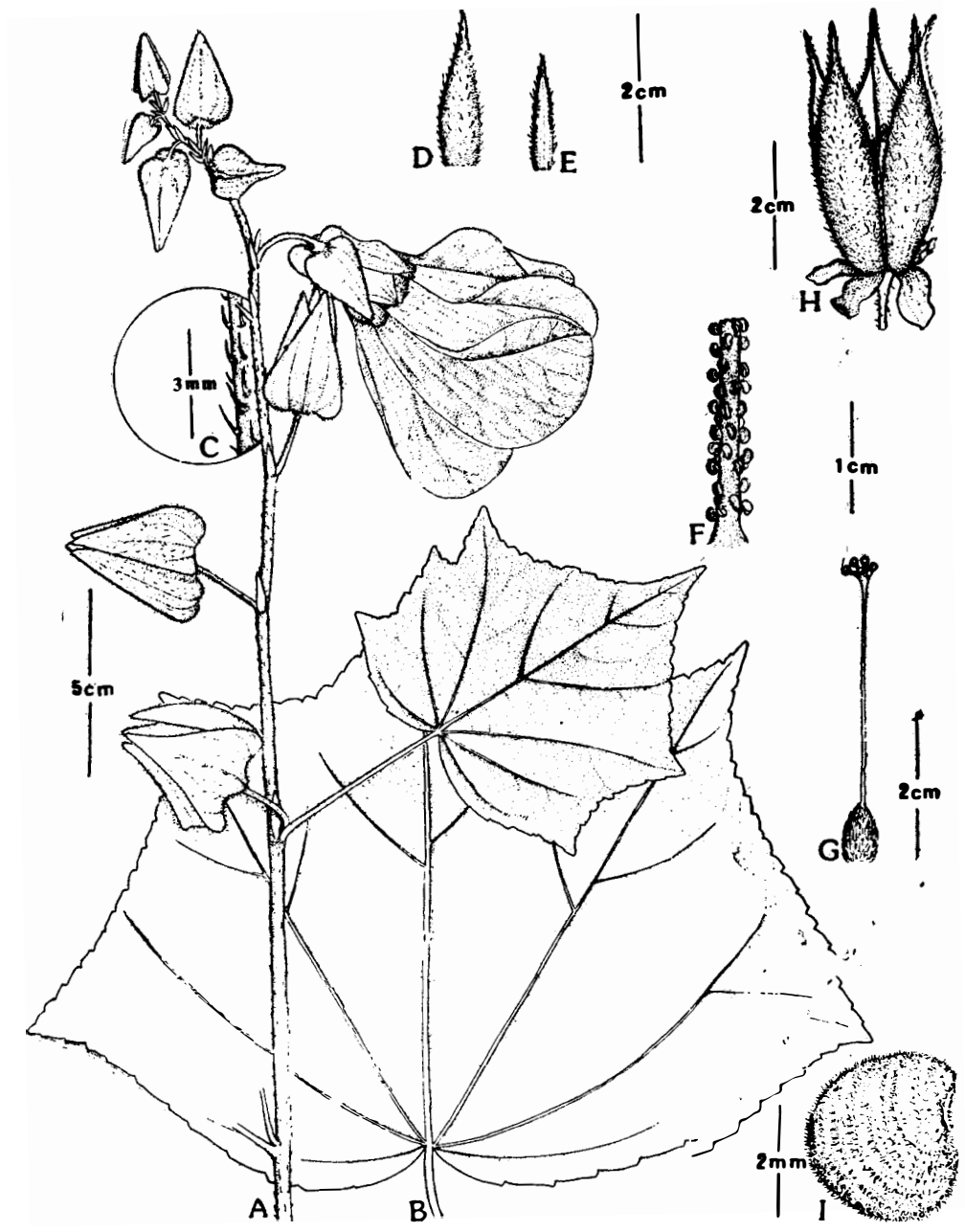


Fig. 2 *Abelmoschus angulosus* var. *grandiflorus*. A, flowering and fruiting branch; B, mature leaf; C, stem pubescence; D-E, stipules; F, staminal column; G, Pistil; H, fruit with calyx; I, seed. (from Sivarajan & Pradeep 5265).

V. V. Sivarajan, A. K. Pradeep and A. K. Pandey

Hibiscus primulinus Alston, Handb. Fl. Ceylon 6, Suppl. 29, 1931, *nom. illeg.*

Abelmoschus angulosus sensu Borss., Blumea 14: 104, 1966, in part; Mani. & Sivar., Fl. Calicut 49, 1982; Mani., Fl. Silent Valley 25, 1988; Ramach. & Nair, Fl. Cannanore 59, 1988; Vajravelu, Fl. Palghat Dist. 77, 1990. (Fig. 2 & 4 c-d)

Erect subshrubs to 2 m tall. Stems terete, green, often tinged with purple at nodes, pubescent with scattered rigid bulbous based simple hairs, but not bristly, occasionally with minute stellate hairs or glabrescent. Leaf blades 5–20 cm in diameter, orbicular or 3–5 angular or lobed, membranous, shallowly cordate or hastate at base, 5–7 nerved from base, the lobes ovate-triangular or lanceolate, acuminate at apex, sinuses rounded, margins coarsely crenate to serrate, rarely subentire, upper surface prominently simple hairy, lower surface pubescent with short rigid simple hairs, intermingled with tribrachiate hairs. Flowers pendant, initially solitary in upper axils, later due to reduction of upper leaves (the leaves then represented by stipules) in long terminal racemes. Involucellar bracts 4, triangular, thin and papery, never coriaceous, obscurely 3–5 nerved, minutely tomentose outside, glabrescent within, completely enclosing the young fruits, reaching just above the middle in mature fruits, finally reflexed and withering. Corolla 8 cm in diameter, bright yellow with dark purple centre. Capsules 3.5–4.0 × 1.5–1.8 cm, fusiform to ovoid, much acuminate at apex, densely hispid with rigid simple hairs on costae, sparsely so in between. Seeds 3 mm in diameter, globose with dense, concentric rings of golden brown hairs; hairs simple, elongated distinctly twisted, not bulbous at base, not hooked at tip.

Note: *A. angulosus* var. *grandiflorus* grows in plains and hills. It is common along roadsides, forest margins and occasionally as an undergrowth in deciduous forests, generally below 900 m. It flowers principally from August to December but occasionally also in other seasons. It differs from var. *angulosus* and var. *purpureus* by its slender habit, absence of dense stiffly indumentum, membranous involucellar bracts and pendant bright-yellow flowers with a dark purple centre.

Specimens examined: INDIA: Kerala. Kollam Dt.: Kollam, Pradeep 44982 (CALI). Wynad L: Lakkidy, Pradeep 5195; Suresh 22338 (CALI). Kozhikode Dt. Karingad Pradeep 51666 (CALI). Palakkad Dt.: Dhony forests, Sivarajan & Pradeep 5264 (CALI); Sappal Hill - Dhony R. F., Joseph 17813; Mukkali forest, Vajravelu 26264; Silent Valley, Nair 64423 (MH). Thrissur Dt.: Vettilappara, Rajamurthy & Rajan 75584 (MH). Kannur Dt. Chengalayi Ansari 69974; Nedumpoil, Ramachandran 64067; Kannothe R. F., Ramachandran 58257, Peria-Chandanathode, Ellis 29523 (MH). Idukki Dt.: Tholnada-Pooyamkuttu, Bhargavan 87496 (MH). Pathanamthitta Dt.:

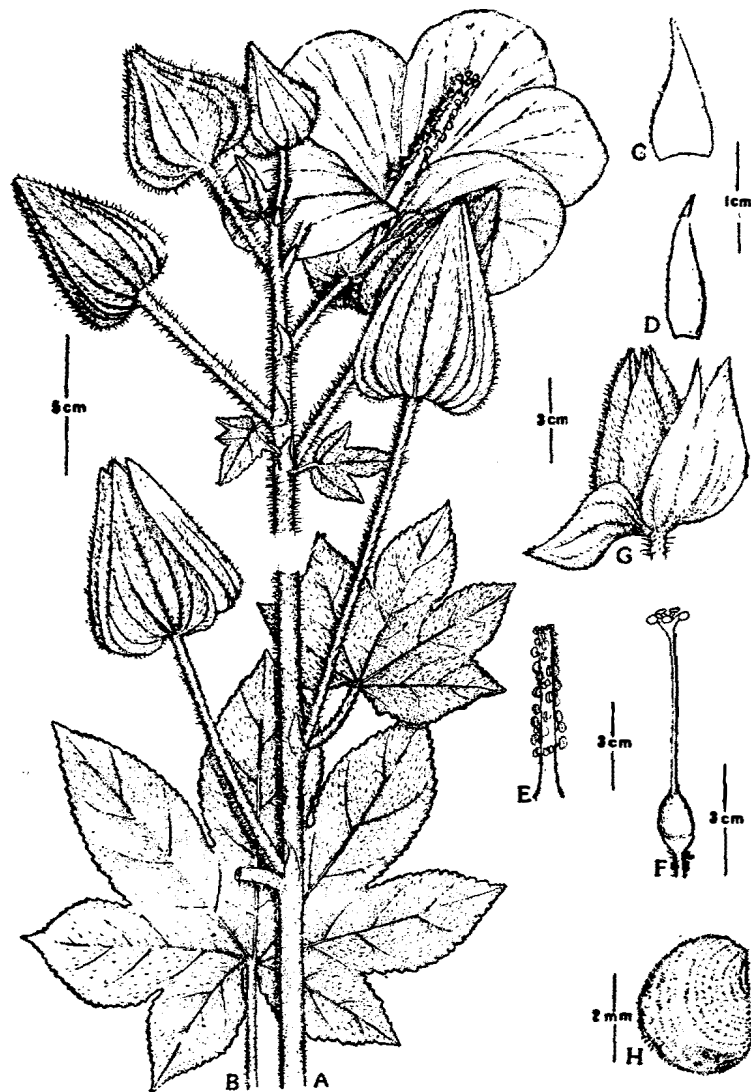
Abelmoschus angulosus (Malvaceae)

Fig. 3. *Abelmoschus angulosus* var. *purpureus*. A, flowering branch; B, mature leaf; C-D, stipules; E, staminal column; F, pistil; G, fruit; H, seed. (from Pradeep & Sivaraman 44945).

V. V. Sivarajan, A. K. Pradeep and A. K. Pandey

Upper Moozhiyar, *Anil Kumar* 1158 (MH). Tamil Nadu, Nilgiri Dt.: Ayyankolli forest, *Vajravelu* 42890 (MH). Karnataka, Dakshin Kannad Dt.: Sullia, *Barber* 2132 (MH).

Abelmoschus angulosus* var. *purpureus Thw., Enum. Pl. Zeyl. 26. 1858.

Type: Ceylon, *Thwaites* 1117 (isotypes: BM, K).

Hibiscus angulosus var. *purpureus* (Thw.) Mast. in Hook. f., Fl. Brit. India 1: 341. 1874; Trimen, Handb. Fl. Ceylon 1: 157. 1893.

Hibiscus molochinus Alston, Handb. Fl. Ceylon 6. Suppl. 29. 1931, *nom. illeg.*

Hibiscus setinervis Dunn, Kew Bull. 324. 1914; Dunn in Gamble, Fl. Pres. Madras 1: 97. 1915.

Type: India, Pulney Hills, *Sauliere* 409 (syntype: K).

Abelmoschus angulosus sensu Bcrss., Blumea 14: 104. 1966, in part; Paul & Nayar in Nayar et al. (eds), Fasc. Fl. India 19: 68. 1988, in part.

(Fig. 3 & 4 e-f)

Woody shrubs to 4 m tall. Stems stout, terete, densely clothed with erect, rigid, yellowish (often pungent) hairs. Leaf blade 5–14 × 6–15 cm, cordate at base, 3–7 angular or lobed, 5–7 nerved at base, margins serrate, pubescent with stiff appressed simple hairs on both surfaces. Flowers axillary, solitary. Involucellar bracts 4, connate throughout their length, splitting on one-side at anthesis, ovate-acute, coriaceous, erect, never reflexed, accrescent, prominently ribbed, densely hispid with rigid bristly hairs, intermingled with short stellate hairs outside, densely appressed hairy within. Corolla 11 cm long, uniformly deep pink. Capsules 4.5 cm long, ovoid, acute, very densely pubescent with pale yellowish, rigid, shiny, prickly hairs. Seeds 3 mm diameter, subglobose, brownish-black, concentrically pubescent with white hairs, the hairs simple, elongated, bulbous at base, hooked at apex, not twisted.

Note: *A. angulosus* var. *purpureus* occurs in forest margins and grassy hill slopes generally at an altitude above 900 m. It flowers from October to December and probably also during other seasons. The plant is unique in having a uniformly deep pink corolla.

Specimens examined: INDIA: Kerala, Palakkad Dt.: Silent Valley R. F., Kunthipuzha, *Vajravelu* 48873; Valiyaparathode, *Nair & Bhargavan* 69121; *Nair* 65477 (MH). Idukki Dt.: Puli Yamala, *Mohanan* 76133 (MH). Kottayam Dt.: Umayamalai - Devikolam, *Shetty* 26631 (MH). Tamil Nadu, Coimbatore Dt.: Iyer padi, Anamalais, *Barber* 4043; *Chandrabose* 65886

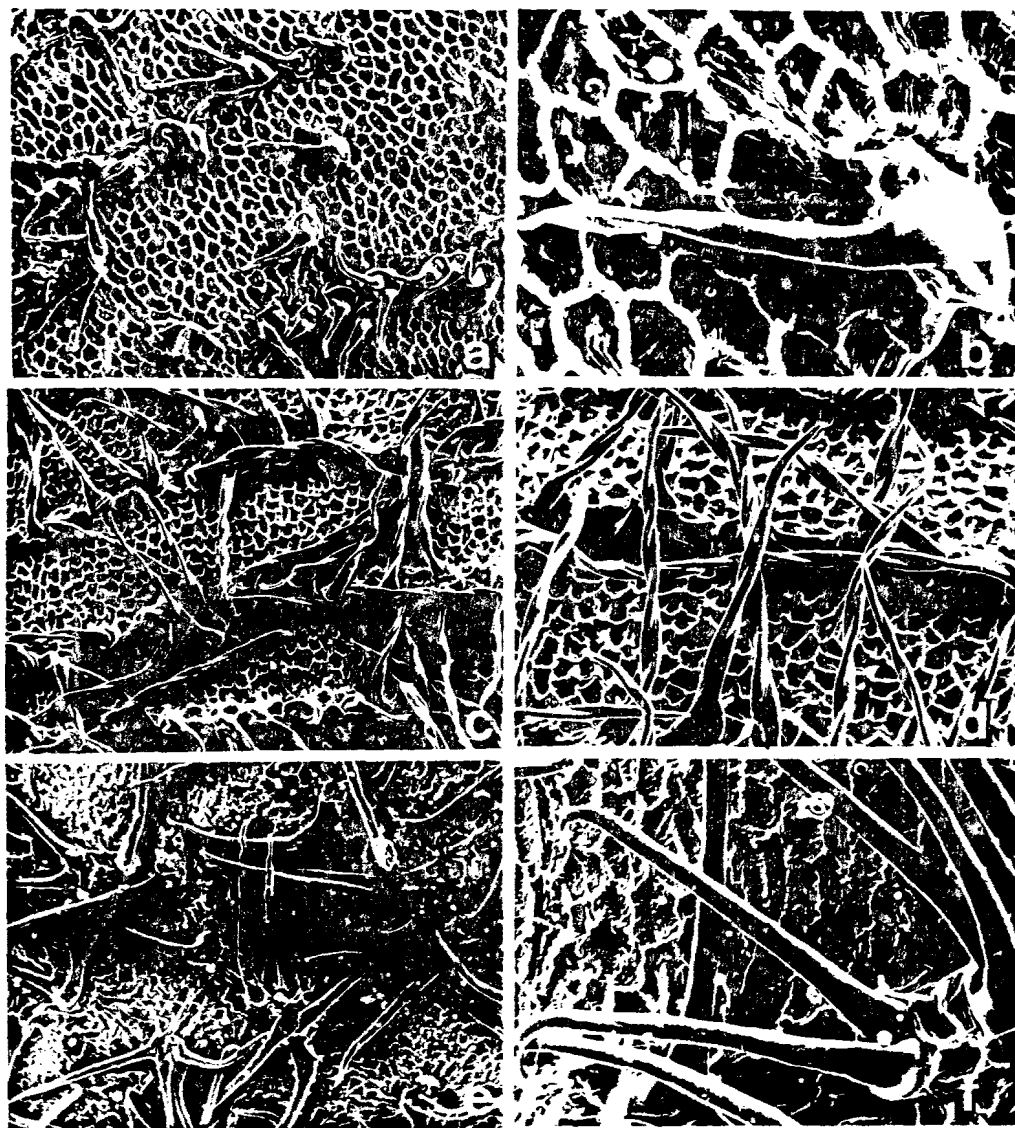
Abelmoschus angulosus (Malvaceae)

Fig. 4. *Abelmoschus angulosus*. a-b. var. *angulosus*. spermoderm with bulbous based hairs. (from Pradeep 44978). c-d. var. *grandiflorus*. spermoderm with twisted hairs. (from Pradeep 5265). e-f. var. *purpureus*. spermoderm with bulbous based hairs and apically hooked hairs. (from Sivarajan 44914).

(Scale: a,c,e, $\times 200$; b, $\times 1000$; d, $\times 400$; f, $\times 600$)

V. V. Sivarajan, A. K. Pradeep and A. K. Pandey

(MH). Nilgiri Dt.: Ebanad, *Subba Rao* 37368 (MH); Nilgiris, *Gammie* 16875 (BSI). Madura Dt.: Pulneys, *Barber* 1289 (MH). Salem Dt.: Kaveri peak, Yercaud, *Deb* 31312; Balamadier Estate-Yercaud, *Subramanyam* 7516 (MH). Tiruchirappali Dt : Kollimalai, *Barbar* 11410 (MH)., Karnataka, Dakshin Kannad Dt.: Kutajadri, *Pradeep & Sivarajan* 44945 (CALI). Chikmagalur Dt : Bababudan Hills, *Pradeep & Sivarajan* 47724 (CALI). Shimoga Dt.: Agumbe, *Almeida* 1869 (BLAT). Kodagu Dt.: Talacauveri, *Rao* 95143 (BSI).

Acknowledgements

The authors are thankful to Dr. Roy Vickery, British Museum (Natural History), London and Dr. V. J. Nair, Indian Liaison Officer, Royal Botanic Gardens, Kew for sending us type photographs. Dr. Wijesundara, National Herbarium, Peradeniya kindly helped us with some literature. We also thank the Jt. Directors, Botanical Survey of India, Coimbatore and Pune, and Dr. S. M. Almeida, Blatter Herbarium, Bombay for facilities to study the material there. A. K. Pradeep is grateful to the Council of Scientific and Industrial Research, New Delhi for fellowship.

Literature Cited

- Alston, A. H. G. 1931. *A Handbook to the Flora of Ceylon* London, 6 (Suppl.): 29.
- Borssum Waalkes, J. van. 1966. Malesian Malvaceae revised. *Bulmea* 14: 1-213.
- Dunn, S. T. 1914. Decades of Kewensis IXXXI-IXXXII. *Kew Bulletin* 324-325.
- Masters, M. T. 1874. Malvaceae. In J. D. Hooker (ed). *Flora of British India*. London. 1: 317-353.
- Paul, T. K. and M. P. Nayar. 1988 Malvaceae. In M. P. Nayar, K. Thothathri and M. Sanjappa (eds.), *Fascicles of Flora of India*. Howrah. 19: 64-233.
- Thwaites, G. H. K. 1858. *Enumeratis Plantarum Zeylanicae*, London. 26.
- Trimen, H. 1893. *A Handbook of the Flora of Ceylon*, London. 1: 140-162.
- Wight, R. 1840. *Illustrations of Indian Botany*, Madras. 1: 65-66.
- Wight, R. 1845. *Icones plantarum Indiae Orientalis*, New York. 2: 951.
- Wight, R. and G. A. W. Arnott. 1834. *Prodromus Florae Peninsulae Indiae Orientalis*, London 1: 45-59.