

A NEW ALSTONIA (APOCYNACEAE) FROM THE MALAY PENINSULA  
AND SOME COMMENTS ON THE GENUS

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SUMMARY

A new species, *Alstonia undulifolia* Kochummen & Wong, is described from the Malay Peninsula. Two sections of the genus occur in the Malay Peninsula, *Alstonia* sect. *Monuraspermum* Mon. and *Alstonia* sect. *Alstonia*, the latter being the correct name for what was previously known as sect. *Pala* (Adr. Juss.) Benth. Various characteristics, including growth architecture, are examined for their usefulness in distinguishing these two sections of the genus. In comparing *A. angustiloba* Miq. and *A. pneumatophora* Berger, both of which have not been properly differentiated by characteristics of the reproductive organs, *A. pneumatophora* var. *petiolata* Mon. is reduced to synonymy under *A. angustiloba*. A key to the seven species of *Alstonia* native to the Malay Peninsula is provided.

INTRODUCTION

The most recent synopsis of the genus *Alstonia* R. Br. in Malesia is that by Markgraf (1974) whose treatment generally agreed with that in the revision by Monachino (1949). Both authors recognized 12 species in Malesia, five in sect. *Alstonia* (formerly sect. *Pala* (Adr. Juss.) Benth.) and seven in sect. *Monuraspermum* Mon. The discovery of a new species, presently described, brought forward the occasion to examine its characteristics against those attributed by Markgraf and Monachino to these sections. In addition, other characteristics segregating the two sections in the Malay Peninsula, and which may have significance in a more regional overview, are discussed. The relationship between *A. angustiloba* Miq. and *A. pneumatophora* Berger, both of which have not been distinguished by characteristics of the reproductive organs, is also discussed.

*Alstonia undulifolia* K.M. Kochummen & K.M. Wong, *spec. nov.* (sect. *Alstonia*) –  
Fig. 1.

Arbor, usque ad 30 m alta; foliis 3- vel 4-verticillatis marginibus undulatis; venis secundariis foliorum approximatis, versus costa fere perpendicularibus, 30–60 paribus. Calyx glaber, limbo quam lobi longiori, 5-fidus, marginibus brevi-ciliatis. Corolla hypocrateriformis, tubo 4 mm

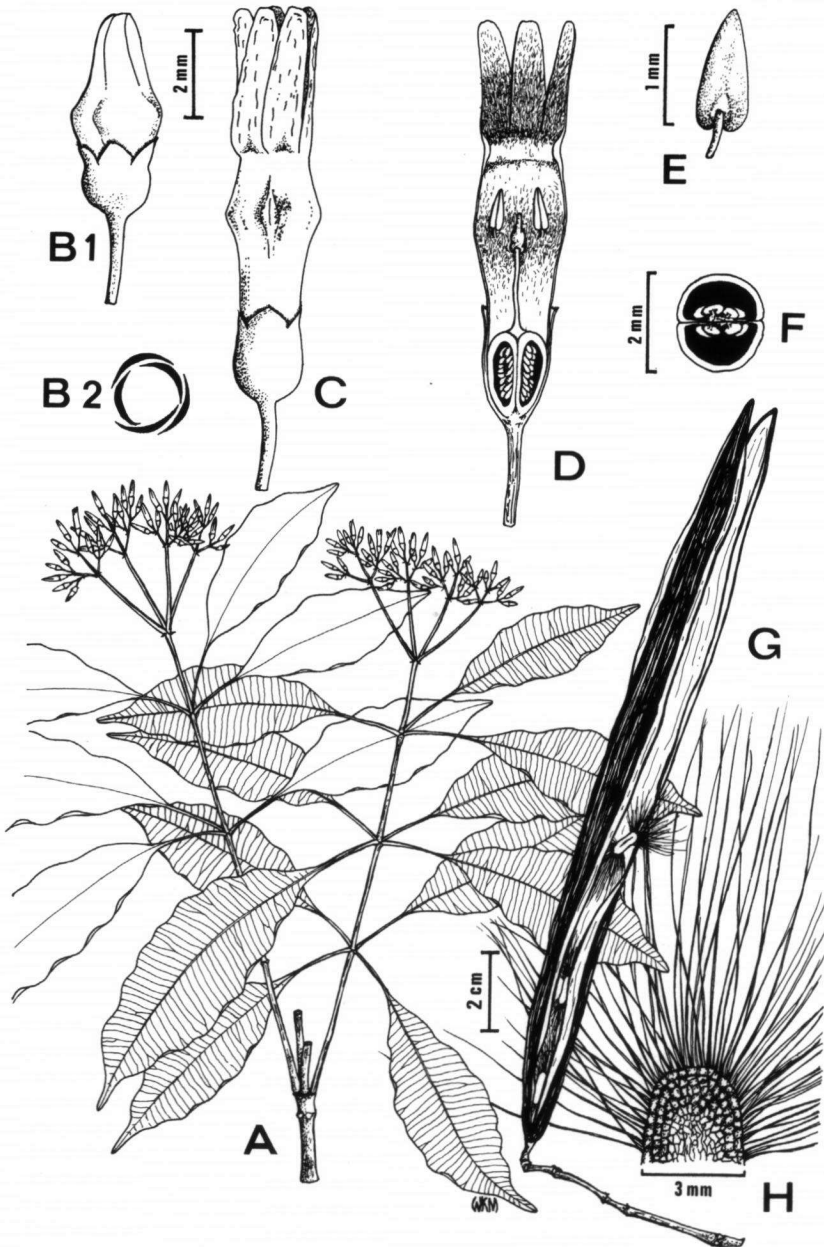


Fig. 1. *Alstonia undulifolia* Kochum. & Wong. – A. Flowering twig; B1. flower bud; B2. aestivation of calyx lobes; C. external view of mature flower; D. mature flower longitudinally sectioned to reveal internal organization; E. anther in dorsal aspect; F. diagrammatic transverse section of ovary; G. one of a pair of ripe follicles; H. detail of part of seed, showing tuft of long hairs at one end.

longo, supra medium dilatatum, extrinsecus glabra, intus medialiter piloso; lobis 5, sinistrorse obtegentibus, 3 mm longis, oblongis, extrinsecus glabris, intus pilosis. Stamina inclusa, in tubo corollae supra medium inserta, antheris ad 1.3 mm longis, filamentis ad 0.5 mm longis. Ovarium biloculare, superiore, stylo 2 mm longo, stigmatem mammiforme. Follicula binata, 15–23 cm longa, 9–13 mm lata, seminibus 9–10 mm longis, 2.5–3 mm latis, ellipticis, cacuminibus rotundatis, comoso-ciliatis; testis verruculatis. — *Typus*: *Kochummen FRI 32505* (holotypus KEP), Kedah, Gunong Jerai, 530 m alt.

Medium to large tree, to 30 m tall and 2 m girth; bole cylindrical, not fluted, without buttresses. Bark greyish to pale yellowish brown, shallowly fissured; inner bark pale brown mottled orange, exuding copious white latex when cut. *Leaves* in whorls of 3–4, reddish when young, yellowing before abscission; petioles 1.5–2.5 cm, slender, channelled above; blades 4–7 cm long and 2–3.5 cm wide, glabrous, not glaucous below, coriaceous, elliptic, caudate, with wavy margins; secondary nerves numerous (30–60 pairs), 2–3 mm apart, nearly at right angles to the midrib. *Flowers* on pedicels 1–2 mm long; calyx glabrous, ciliate on the margin, with 5 lobes, the lobes broader than tall and shorter than the calyx cup; corolla tube of mature flowers 4 mm long, dilated just above the middle, glabrous outside, short hairy inside at the middle; corolla lobes 5, overlapping to the left, 3 mm long, oblong, glabrous outside, dense short hairy inside. *Stamens* 5, included, inserted just above the middle of the corolla tube, anthers 1.3 mm long, filaments 0.5 mm long. *Ovary* of 2 free, superior carpels joined by a style 2 mm long; stigma nipple-shaped. *Fruit* follicles in pairs, 15–23 cm long, 9–13 mm wide; seeds 9–10 mm long, 2.5–3 mm wide, elliptic and obtuse at both ends, each end with a dense tuft of fine brown hairs 15–20 mm long, testa verruculate.

MALAY PENINSULA. Kedah. Gunong Jerai, 530 m alt., Kochummen FRI 32505 (KEP, holotype), Kochummen FRI 29491 (KEP); 300 m alt., Chan FRI 21728 (KEP). Sik, Bt. Enggang For. Res., Compt. 16, 470 m alt., Mohd. Awal KEP 83608 (KEP). Perangin For. Res., on ridge, Awang CF 42403 (KEP). — Kelantan. Gunong Stong, ridge crest, Burgess FRI 10361 (KEP). — Pahang. Road to Fraser Hill, in valley, Kochummen FRI 32548 (KEP).

*Ecology*. Occurs in the Hill Dipterocarp and Upper Dipterocarp forest types of the Malay Peninsula, at 300–1000 m altitude.

*Notes*. The distinctive field characteristics of *A. undulifolia* are the shallowly fissured bole (fig. 2) and elliptic leaves with regularly undulating margins. In reproductive features, *A. undulifolia* is distinctive by the following combination of character states: calyx and corolla glabrous outside, corolla lobes overlapping to the left and shorter than the tube, fruit follicles about 1 cm broad (fig. 3), seeds obtuse at both ends with a dense tuft of long hairs at each end, testa verruculate.

#### SECTIONS ALSTONIA AND MONURASPERMUM IN THE MALAY PENINSULA

As a nomenclatural comment, the correct name for sect. *Pala* (Adr. Juss.) Benth. — which includes and was defined on *A. scholaris* (L.) R. Br., the type species of the genus — should be sect. *Alstonia*.

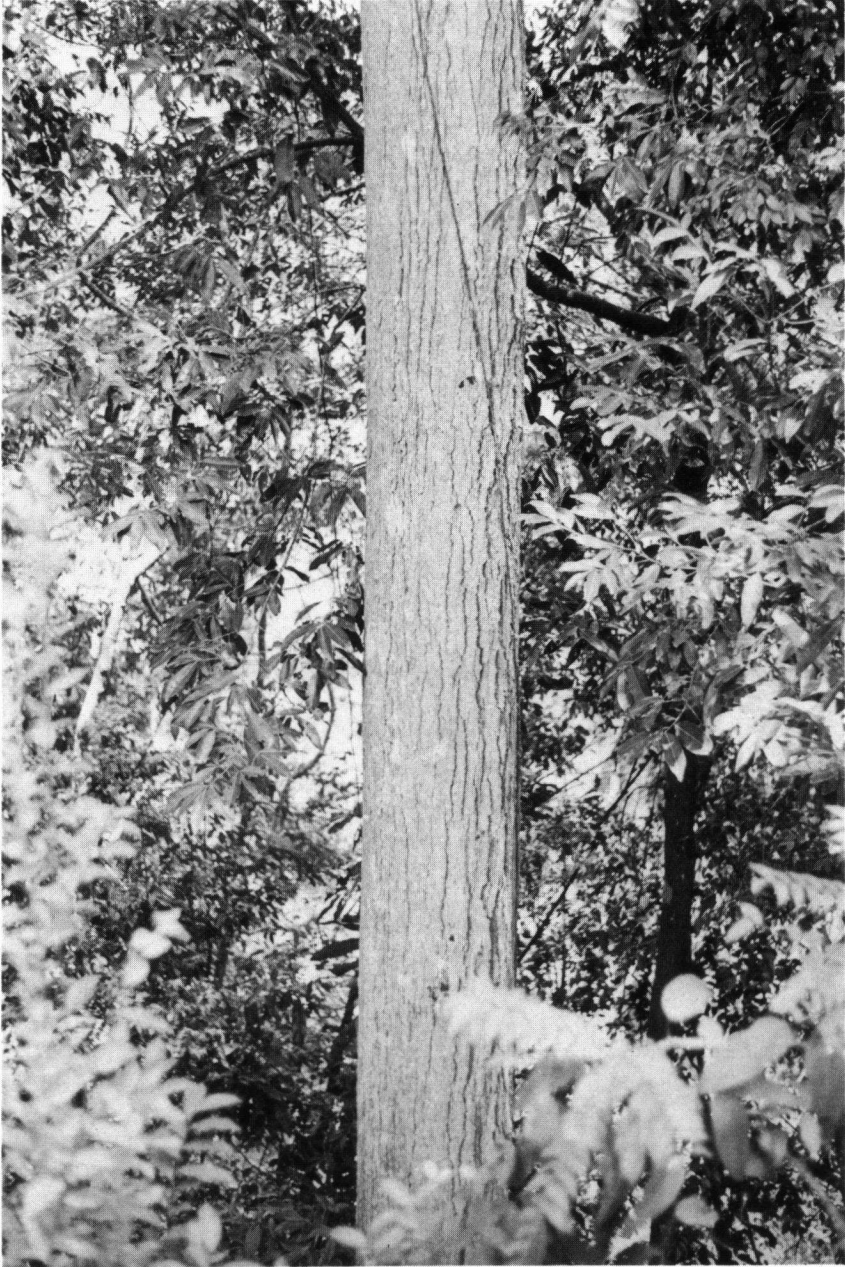


Fig. 2. The shallowly fissured, cylindrical bole of *Alstonia undulifolia* Kochum. & Wong contrasts well with the usually smooth to grid-cracked, fluted boles of other species of *Alstonia* in the Malay Peninsula.



**Fig. 3.** Mature foliicles of *Alstonia undulifolia* Kochum. & Wong (photographed at Gunong Jerai in Kedah state).

Table 1. A comparison of the characteristics of sect. *Alstonia* and sect. *Monuraspermum* as circumscribed by Markgraf (1974) with those of *Alstonia undulifolia*.

sect. <i>Alstonia</i> (Markgraf, 1974, as sect. <i>Pala</i> )	sect. <i>Monuraspermum</i> (Markgraf, 1974)	<i>Alstonia undulifolia</i>	Value in sectional delimitation
1. Leaves in whorls of 4–8.	Leaves in whorls of 3–4 or decussate.	Leaves in whorls of 3–4.	Only as a supporting character.
2. Lateral nerves numerous (40–100 pairs), straight, 1–5 mm apart.	Lateral nerves less numerous (10–20 pairs), 4–15 mm apart.	Lateral nerves numerous (30–60 pairs), straight, 2–3 mm apart.	Good.
3. Leaves papillose below.	Leaves not papillose below.	Leaves papillose below.	Good.
4. Flowers mostly yellow.	Flowers white or cream.	Flowers white.	Nil.
5. Corolla lobes overlapping to left.	Corolla lobes overlapping to right.	Corolla lobes overlapping to left.	Good.
6. Seeds obtuse at both ends.	Seeds acuminate at the upper end.	Seeds obtuse at both ends.	Good.
7. Seeds glabrous or very short- haired on margin.	Seeds long-haired on margin.	Seeds long-haired on margin.	Nil.

A comparison of the features attributed to the sections *Alstonia* and *Monuraspermum* by Markgraf (1974) with those of *A. undulifolia* (table 1) revealed that the most consistent features for demarcating the two sections are the aestivation of the corolla lobes, seed shape, spacing of secondary nerves and whether or not the leaf undersurface is papillose.

While length of hairs on the seeds is not a useful character to differentiate between these two sections, our observations are contrary to that of Markgraf (1974) who described seeds with 'borders glabrous or very short-haired' in species of sect. *Alstonia*. All the Malay Peninsula species examined have seed hairs as long as or longer than the seed proper itself.

In addition, for the Malay Peninsula at least, these two sections differ in architectural construction of the tree (fig. 4) as well as in whether latex is exuded freely from the cut bark. The two Malayan species which belong to sect. *Monuraspermum* (viz., *A. angustifolia* DC. and *A. macrophylla* Don) have the growth architectural model of Koriba (as defined by Halle, Oldeman & Tomlinson, 1978) and exude white latex when cut only from the twigs; this latter feature has earned the group the vernacular name of 'Pulai penipu' ('deceitful *Alstonia*') among foresters (e.g., Whitmore, 1973). In the other five species, belonging to sect. *Alstonia*, the growth architectural model is that of Prevost (as defined by Halle, Oldeman & Tomlinson, 1978) and white latex is exuded freely from the cut bark on both the twigs and the trunk.

In terms of growth architecture, all seven Malayan species of *Alstonia* have sympodially constructed trunks. Through Prevost's model (fig. 4A) the vertical axis forming the trunk ceases growth after several internodes and height growth is continued by a branch assuming erect growth and which has arisen from the node below the terminal tier of branches. In contrast, Koriba's model (fig. 4B) achieves a sympodial trunk through erect growth of one of the branches from the terminal branch tier itself. In both instances, branch extension develops by apposition growth.

These characters apparently reflect two broad categories of morphological and physiological traits which support the distinction between the two sections within the genus in the Malay Peninsula. The segregation between these two sections is, in consideration of such evidence, a natural one.

#### ALSTONIA ANGUSTILOBA AND ALSTONIA PNEUMATOPHORA COMPARED

Throughout the literature (Monachino, 1949; Whitmore, 1973; Markgraf, 1974) these two species have not been distinguished one from the other by the reproductive organs. The differentiating feature consistently used has been the elliptic, acuminate leaves attributed to *A. angustiloba* Miq. against the spatulate leaves with rounded apices attributed to *A. pneumatophora* Berger. We concur with previous authors that the flowers are extremely alike and that in each species the inflorescences can vary from one with groups of closely crowded flowers on the peduncle to that with a more branched habit.

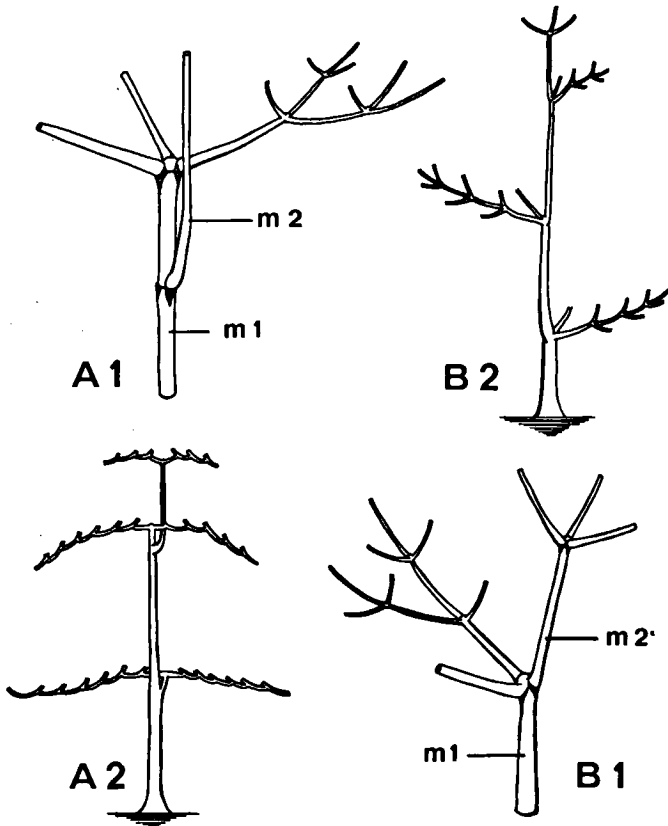


Fig. 4. Two distinct growth forms in *Alstonia* species in the Malay Peninsula. – A1. In *Alstonia* sect. *Alstonia* the trunk sympodium is derived via Prevost's model, in which the trunk module continuing height growth (m2) develops from below the tier of branches terminating the previous module (m1); B1. in *Alstonia* sect. *Monuraspermum* the trunk sympodium is achieved following Koriba's model, where the tier of branches terminating the earlier trunk module (m1) is composed of initially similar branches, one of which (m2) later assumes erect dominant growth to continue height extension. Branch development is by apposition growth in both cases and the resulting modular constructions are idealized in A2 (Prevost) and B2 (Koriba).

When *A. pneumatophora* var. *petiolata* Mon. was described, the only feature that was used to characterize it against the typical variety was the presence of a petiole 2–2.5 cm long. We find that this variety grades into *A. angustiloba* which has leaves varying from elliptic-acuminate to narrowly obovate with blunt apices. While Whitmore (1973) has recorded *A. pneumatophora* var. *petiolata* as occurring in swamps and *A. angustiloba* in non-swampy, hilly areas, we note the following situations:



- a) Typical *A. angustiloba* (with elliptic-acuminate leaves) is also found in swampy localities. Specimens examined include:

*Badong KEP 66210*, Selangor, Kuala Selangor (KEP);  
District Forest Officer, *Klang KEP 41736*, Selangor, Telok For. Res. (KEP);  
*Symington KEP 44062*, Selangor, Sg. Tinggi (KEP).

- b) Specimens identical to those named by Whitmore as *A. pneumatophora* var. *petiolata* through comparison with the holotype (*Endert 537*, L) are also found in non-swampy localities, viz.:

*Kochummen KEP 76781*, Selangor, Kepong, hillside (KEP);  
*Manaf KEP 78113*, Pahang, Bentong, 200 ft alt. (KEP);  
*Matan KEP 80208*, Selangor, Kepong, hillside (KEP);  
*Ngadiman SF 37007*, Singapore, Bukit Timah Res. (KEP).

While the only comment on this has been that by Markgraf (1974) who noted that 'Monachino's var. *petiolata* .... shows probably hybrid introgression of *A. angustiloba*,' the considerations above allow *A. pneumatophora* var. *petiolata* to be accommodated within the variation shown by *A. angustiloba*. We therefore make the necessary reduction as follows:

*Alstonia angustiloba* Miq., Fl. Ind. Bat. 2 (1856) 438. — *A. pneumatophora* var. *petiolata* Mon., Pacif. Sci. 3 (1949) 153; Whitmore, Tree Flora of Malaya 2 (1973) 11; *syn. nov.*

In the case of typical *A. pneumatophora*, no intergradation occurs with *A. angustiloba* in respect of the spatulate sessile leaves of the former and the elliptic to obovate, distinctly petiolate leaves of the latter.

#### KEY TO SPECIES OF ALSTONIA IN THE MALAY PENINSULA

1. Corolla lobes overlapping to the left; seeds rounded at both ends; secondary nerves of leaves numerous (30–60 pairs), relatively straight, 1–5 mm apart; latex exuding freely from cut parts on living trunk and twigs; growth architecture according to Prevost's model . . . . . Sect. *Alstonia*
2. Corolla hairy outside, with suborbicular lobes; tertiary venation distinct on upper surface of dried leaves . . . . . *A. scholaris* (L.) R. Br.
2. Corolla glabrous outside, with ovate to oblong lobes; tertiary venation indistinct on upper surface of dried leaves.
3. Calyx hairy; follicles hairy to subglabrous.
  4. Follicles hairy to subglabrous; leaves elliptic to obovate with petioles exceeding 1 cm in length . . . . . *A. angustiloba* Miq.
  4. Follicles hairy; leaves spatulate and sessile . . . . . *A. pneumatophora* Berger
3. Calyx glabrous; follicles glabrous.

5. Calyx lobes longer than calyx cup; corolla lobes 7–12 mm long; follicles not more than 5 mm wide; leaf margins plane . . . . . *A. spatulata* Bl.

5. Calyx lobes shorter than calyx cup; corolla lobes 2.5–3 mm long; follicles 9–13 mm wide; leaf margins regularly undulate

*A. undulifolia* Kochum. & Wong

1. Corolla lobes overlapping to the right; seeds pointed at one end; secondary nerves of leaves less numerous (10–25 pairs), inarching at the margin, 4–15 mm apart; latex exuding freely only from cut parts on living twigs; growth architecture according to Koriba's model . . . . . Sect. *Monuraspermum* Mon.

6. Corolla tube glabrous; calyx, pedicels and peduncles with scattered hairs; calyx lobes longer than or as long as calyx cup; leaves predominantly in whorls of fours . . . . . *A. macrophylla* G. Don

6. Corolla tube, calyx, pedicels and peduncles dense hairy; calyx lobes shorter than calyx cup; leaves predominantly in whorls of threes . . . . . *A. angustifolia* DC.

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