

REVISION OF THE SOUTHEAST ASIAN GENUS STELECHOCARPUS (ANNONACEAE)

E. C. H. VAN HEUSDEN

Rijksherbarium / Hortus Botanicus, Leiden, The Netherlands

SUMMARY

In the present article a revision is given of the Southeast Asian genus *Stelechocarpus*, in which two species are recognized and described.

INTRODUCTION

Stelechocarpus Hook. f. & Thoms. is a well-defined genus of the lowland rain forests of Southeastern Asia. It is distinguished from other Asian Annonaceae by its imbricate sepals and petals (Fig. 1), unisexual flowers, male and female flowers situated at different heights on the plant, cauliflory in at least the female inflorescences, relatively big fruits borne on (the base of) the trunk and containing two or more big seeds, the glabrous habit, numerous brown to red dots on the lower side of the leaves, and the prominent midrib above. Several of these characters, e. g., the imbricate aestivation, the glabrous petals with ciliate margins, and the glabrous vegetative parts, are shared with *Sageraea* Dalz., the closest relative of *Stelechocarpus*. Moreover, unisexual flowers and occasionally cauliflory are found in *Sageraea elliptica* (A. DC.) Hook. f. & Thoms. *Stelechocarpus*, however, is separated from *Sageraea* by the prominent midrib above, the distinct venation of the leaves, the more shiny leaves, the numerous dots distinct on the lower side of the leaves, and hairy ovaries. The number of stamens and carpels is usually higher in *Stelechocarpus* than in *Sageraea*. Pedicels in female flowers of *Stelechocarpus* can be up to 110 mm long, whereas in *Sageraea* pedicels are up to 30 mm long. The term 'pedicel' is used in the present paper, because it is difficult to distinguish between peduncle and pedicel. Each inflorescence-cluster seems to consist of a number of condensed inflorescences with one or more flowers. Fruits and seeds of *Stelechocarpus* are bigger than those of *Sageraea* (seeds: 20–40 mm long, twice the size of *Sageraea*). The fruits are usually scurfy or only occasionally verruculose in *Stelechocarpus* and smooth or sometimes finely verruculose in *Sageraea*. *Stelechocarpus* also resembles the neotropical genus *Crematosperma* R. E. Fr. Both genera share imbricate sepals and petals, leaves with prominent midrib above, and leaf shape. Moreover, as in *Stelechocarpus*, some species of *Crematosperma* have glabrous petals with ciliate margins. *Crematosperma* has one basal to apical ovule or seed per carpel, and *Stelechocarpus* two or more, always being lateral.

The most remarkable feature of *Stelechocarpus* is the big fruits borne on the trunk (Fig. 1a), especially in *S. cauliflorus* (Scheff.) R.E. Fr. where, according to the specimen labels, it occurs on the base of the thickened trunk. Although *Stelechocarpus* exhibits a spectacular example of cauliflory (illustrations given by several authors, e.g., Fachrurozi, 1980; Koorders, 1902; Menninger, 1967; Van Steenis, 1931), no one knows how the fruits are dispersed. Cauliflory is present in the African genus *Uvariopsis* Engl. & Diels, as well. This latter genus also has the fruits situated below the male flowers along the trunk (Le Thomas, 1969). Nevertheless, there is no direct relationship between *Stelechocarpus* and *Uvariopsis* (Van Heusden, 1992).

Judging from herbarium specimens, the flowers of *Stelechocarpus cauliflorus* seem to be (almost) cleistogamous. The inner petals remain closed at maturity and enclose the stamens or carpels (Fig. 1f). Cleistogamy has been reported in Annonaceae (e.g. Burck, 1890, 1906; Corner, 1988), so it could occur in *Stelechocarpus* also. Unlike *S. burahol*, fragrance is never mentioned on the specimen labels of *S. cauliflorus*. Possibly, the flowers of the latter species open nocturnally as in other Annonaceae (Gottsberger, 1989) and may attract visitors such as beetles. The stamens in ripe flowers of *S. cauliflorus* often appeared gnawed. Field observations on flower biology are lacking thus far. In *S. burahol* both whorls of petals spread at anthesis (Fig. 1b). The stamens in *S. burahol* are chartaceous, whereas those of *S. cauliflorus* are fleshy. Generally, *S. burahol* and *S. cauliflorus* differ in flower colours: usually cream, yellow, or green in *S. burahol* and usually pink, reddish, or purplish in *S. cauliflorus*.

In other characters *Stelechocarpus* agrees with other Annonaceae. For example, the pollen grain is solitary, globose, and inaperturate (Walker, 1971). The chromosome number is $2n = 18$, a common chromosome number in Asian Annonaceae (Okada & Ueda, 1984) and some neotropical genera such as *Crematosperma* (Morawetz & Waha, 1986).

STELECHOCARPUS

Stelechocarpus (Blume) Hook. f. & Thomson, Fl. Ind. 1 (1855) 94. — *Uvaria* L. sect. *Stelechocarpus* Blume, Fl. Javae, Annonaceae (1829) 13, t. 23, 25c. — Type: *Stelechocarpus burahol* (Blume) Hook. f. & Thomson.

Trees up to 25 m high. Twigs (almost) glabrous, lenticels sometimes present. *Leaves* coriaceous to subcoriaceous, occasionally membranous, more or less shiny above, less shiny beneath, (dark) brown to green when dry, glabrous on both sides or sometimes sparsely pubescent beneath, usually with numerous brown to red dots beneath, lamina (narrowly) elliptic to elliptic-oblong, sometimes to narrowly obovate, ovate-oblong, or obovate-oblong, 8–31 cm long, 2.5–9.5 cm wide, base acute, sometimes to rounded, apex (tapering to) acute, caudate, or acuminate, midrib prominent on both sides, glabrous or occasionally sparsely pubescent beneath, lateral veins im-

mersed above, prominent beneath. Petiole 5–13 mm long, (0.5–)1–2.5 mm in diameter, glabrous. Plants monoecious, male inflorescences distinct or not from female inflorescences. *Male inflorescence* ramiflorous or cauliflorous, flowers 1–c. 60 in fascicles from woody tubercles. Bracts 0–6, sometimes one bracteole present. Pedicel 4–65(–110) mm long, pubescent or glabrous. Bud broadly to depressedly ovoid, 2–17 mm long. *Sepals* free or connate, depressed ovate or fused to one more or less orbicular calyx or broadly (triangular) ovate, 1–10 mm long, 1.5–8 mm wide, pubescent or glabrous outside, glabrous inside, apex rounded or acute, rounded at the very tip. *Petals* imbricate in two series, spreading at maturity or only outer whorl spreading and the inner whorl enclosing the stamens and leaving only small openings between the bases of the petals, free, outer whorl broadly ovate or sometimes very broadly elliptic-ovate, 4–15 mm long, 2–10 mm wide, inner whorl 4–15 mm long, 1.5–6 mm wide, glabrous on both sides, fleshy or coriaceous, margins sometimes thin or ciliate, inner whorl sometimes very thick, apex rounded. *Stamens* numerous, crowded into a conical-ovoid to depressed ovoid mass, c. 1.5 mm long, fleshy or chartaceous, anthers extrorse, more or less latrorse, or subapical, apex shield-like or not. *Torus* narrowly conical. *Female inflorescence* cauliflorous, flowers 1–c. 60 in fascicles from woody tubercles. Bracts 2–c. 10, sometimes one bracteole present at about 1/3 of the pedicel. Pedicel 6–110 mm long, pubescent or glabrous. Bud ovoid to depressed ovoid, 2–10(–17) mm long. *Sepals* connate or free, (very) broadly ovate to semiorbicular, 1.5–9 mm long, 2–8 mm wide, (sparsely) pubescent or glabrous outside, glabrous inside, occasionally margin thin and ciliate, apex rounded, rarely somewhat broadly acute. *Petals* imbricate in two series, spreading at maturity or only outer whorl spreading and the inner whorl enclosing the carpels, leaving only small openings between the bases of the petals, free, outer whorl (very) broadly to depressed ovate to elliptic, 7–20 mm long, 5–10(–18) mm wide, inner whorl elliptic (or broadly ovate), 7–12 mm long, 4–7 mm wide, glabrous on both sides (or sometimes pubescent outside), fleshy or coriaceous, margin often ciliate and/or thin, apex rounded. *Stamens* absent. *Carpels* free, numerous (up to c. 40), crowded into a depressed ovoid or (broadly) conical-ovoid mass, c. 3 mm long, ovary densely hairy, stigma sessile, 2-lobed, fleshy, glabrous. *Infructescence* borne on (the base of) the trunk. *Fruiting pedicel* 22–80 mm long, stout. *Fruit* apocarpus. *Monocarps* 1–c. 5, (broadly) obovoid, subglobose, or ellipsoid, 30–70 mm long, 15–45 mm in diameter, glabrous or pubescent with minute hairs, scurfy to verruculose, more or less stipitate when young to sessile at maturity. *Seeds* 2–11, in one or two rows, horizontal, ellipsoid to broadly ellipsoid, often flattened at one or two sides, 20–40 mm long, ruminations lamellate.

Distribution — Thailand, Vietnam; in Malesia: Malay Peninsula, Sumatra, Borneo, Java, and Bali.

Ecology — In primary or disturbed lowland forests, on sandstone or limestone soils, up to 800 m altitude.

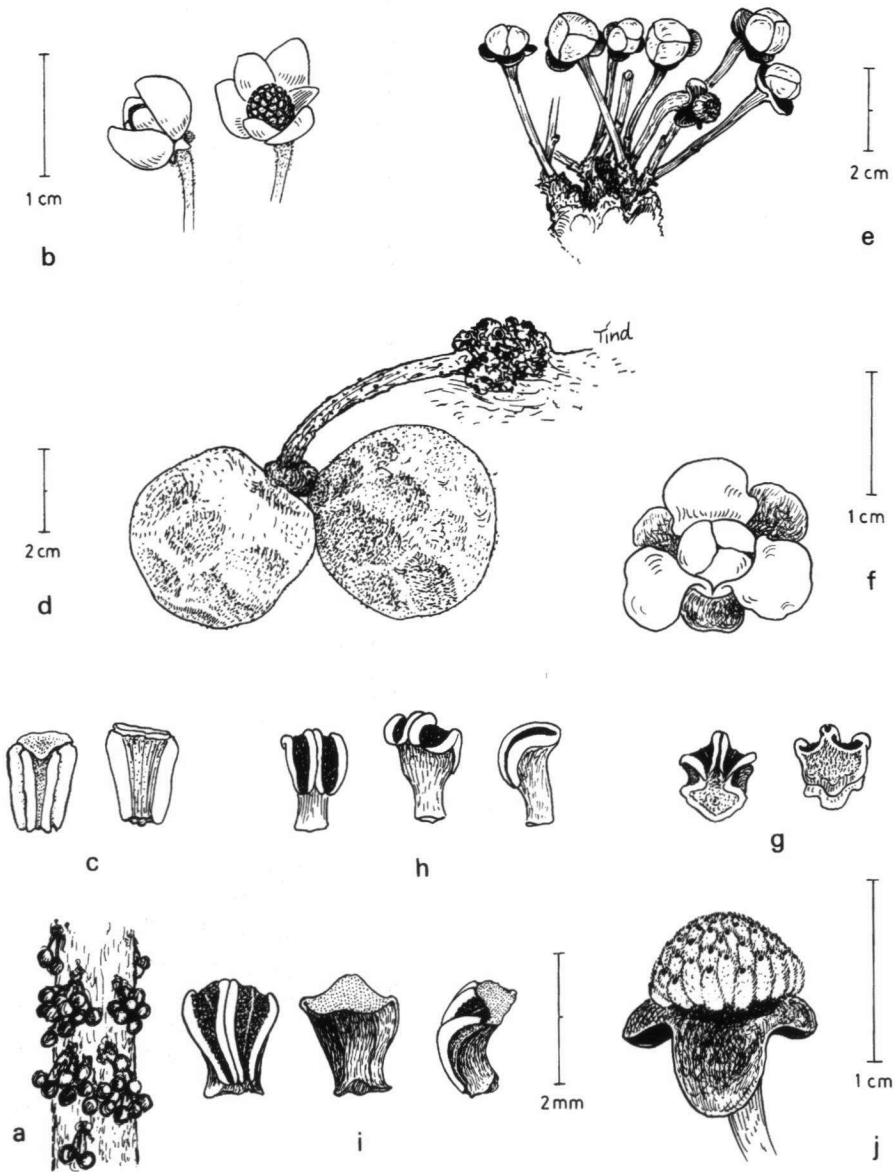


Fig. 1. Morphological characters in *Stelechocarpus*. — a–d. *S. burahol* (Blume) Hook. f. & Thomson. a. Trunk with fruits; b. mature flowers (male); c. stamen, dorsal and ventral side; d. fruit [a: from photograph in Bul. Kebun Raya 4 (1980); b: Lörzing 11332 (L); c: Achmad 1289 (L); d: Laumonier TFB 4052 (L)]. — e–k. *S. cauliflorus* (Scheff.) R.E. Fr. e. Inflorescence; f, g. flower and stamens; h. stamens, dorsal, ventral, and lateral view; i. stamens, idem; j. flower remnant after petals have fallen [e: Henderson 23802 (K); f, g: S (Lee) 40078; h: Kostermans 14062 (L); i: van Beusekom & Phengkhlai 1032 (AAU); j: Kostermans 21249 (L)].

KEY TO THE SPECIES

- 1a. Leaves often pale green when dry; male inflorescences ramiflorous, female inflorescences cauliflorous; male flowers smaller than female ones; flowers usually cream, yellow, or green, rarely purple; buds ovoid; sepals free or sometimes connate in female flowers, in male flowers 1–2 mm long, in female flowers 1.5–2 mm long; both whorls of petals spreading at maturity; stamens or carpels crowded into a (very broadly) conical-ovoid mass **1. *S. burahol***
- b. Leaves often dark brown or brownish green when dry; male and female inflorescences cauliflorous; male and female flowers equal in size; flowers usually pinkish, reddish, or purplish at least outside, rarely pale green; buds depressed ovoid; sepals connate, 2–10 mm long; outer petals spreading, the inner whorl enclosing the stamens or carpels at maturity; stamens or carpels crowded into a depressed ovoid mass **2. *S. cauliflorus***

1. *Stelechocarpus burahol* (Blume) Hook. f. & Thomson — Fig. 1a–d

Stelechocarpus burahol (Blume) Hook. f. & Thomson, Fl. Ind. 1 (1855) 94. — *Uvaria burahol* Blume, Bijdr. 1 (1825) 14. — Type: *Blume s. n.* (lectotype designated here: L sh 898.63-77; iso K, L, P), Indonesia, Java, Prov. Tjanjor, Monte Parang; fl. Aug., Sept.

Stelechocarpus burahol (Blume) Hook. f. & Thomson var. *longiflorus* Scheff., Nat. Tijdschr. Ned. Indië 31 (1870) 5. — Type: *Cult. Hort. Bog. IV-G-35*, origin: Indonesia, Java (holo BO?, n.v.; iso K, L).

Tree up to 25 m high. Twigs (almost) glabrous. *Leaves* (sub)coriaceous, more or less shiny above, greenish or rarely brownish when dry, glabrous on both sides or sometimes sparsely pubescent beneath, numerous brownish to reddish dots beneath, lamina elliptic to elliptic-oblong, sometimes to (ob)ovate, 8–26 cm long, 2.5–8.5 cm wide, base acute, apex acute, acuminate, or caudate, midrib prominent on both sides, glabrous or sometimes sparsely pubescent beneath. Petiole 5–12 mm long, (0.5–)1–2(–2.5) mm in diameter, glabrous. *Male inflorescence* ramiflorous, flowers in few-flowered fascicles. Bracts 0–3, rarely one bracteole present. Pedicel 4–18 mm long, pubescent. Bud (broadly) ovoid, 5–6 mm long. *Sepals* free, broadly (triangular-)ovate, 1–2 mm long, 1.5–2 mm wide, pubescent outside, apex rounded or acute and more or less rounded at the very tip. *Petals* imbricate in bud, spreading at maturity, outer whorl broadly ovate, 4–7 mm long, 2–5 mm wide, inner whorl elliptic or broadly ovate, sometimes inner whorl smaller than outer whorl and not fully enclosing the stamens, 4–7 mm long, 1.5–4 mm wide, glabrous on both sides, fleshy, margins thin and ciliate, apex rounded. *Stamens* numerous, crowded into a (very broadly) conical-ovoid mass, 1.2–1.5 mm long, anthers more or less latrorse, apex shield-like, somewhat broadened, or sometimes truncate. *Torus* narrowly conical. *Female inflorescence* cauliflorous, flowers 1–c. 20 in fascicles from woody tubercles. Bracts absent or 6–10. Pedicel 20–100 mm long, pubescent to glabrous. Bud (broadly) ovoid, 4–8 mm long. *Sepals* free or sometimes connate, semiorbicular, very broadly ovate, or broadly triangular-ovate, 1.5–2 mm long, 2–3 mm wide, pubescent to glabrous, outside, glabrous inside, apex rounded or sometimes acute,

rounded at the very tip. *Petals* imbricate in bud, spreading at maturity, (broadly) elliptic or broadly ovate, 7–12 mm long, outer whorl 5–7 mm wide, inner whorl 4–7 mm wide, glabrous on both sides, fleshy, usually margin thin and ciliate, the apex rounded. *Carpels* numerous, crowded into a (very broadly) conical-ovoid mass, c. 3 mm long, ovary densely hairy, stigma 2-lobed, sometimes flat and orbicular or fused to subglobose with an irregular surface, glabrous, fleshy. *Infructescence* borne on the trunk. *Fruiting pedicel* 30–80 mm long, stout. *Monocarps* 1–3, broadly obovoid to subglobose, 30–45 mm long, (15–)38–45 mm in diameter, glabrous or pubescent with short hairs, scurfy, more or less light brown when dry, stipitate when young to sessile at maturity. *Seeds* 2 or 3, 20–40 mm long.

Distribution— Malesia: Malay Peninsula (Johore), Sumatra, Borneo, Java, and Bali. — Fig. 2.

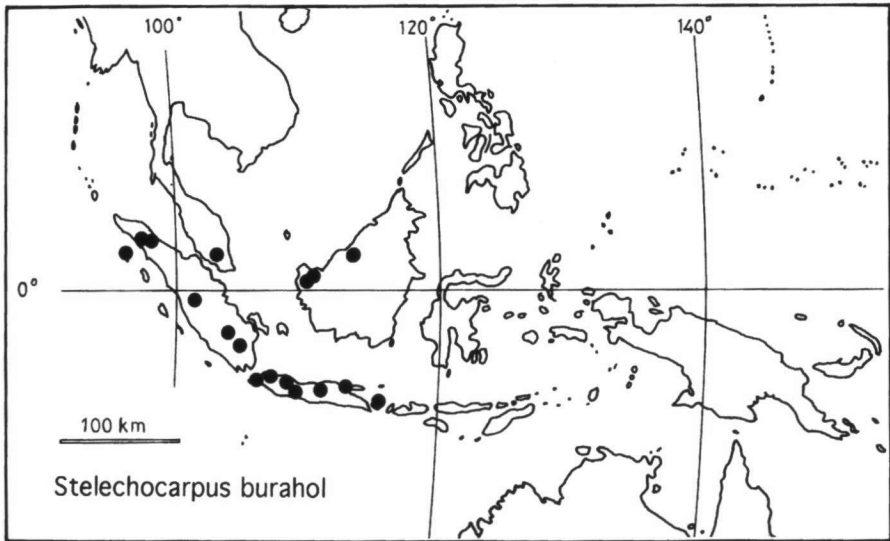


Fig. 2. Distribution map of *Stelechocarpus burahol* (Blume) Hook. f. & Thomson.

Habitat & Ecology— In primary or disturbed lowland forests, on sandstone soils, up to 800 m altitude.

Field notes— Buds green. Flowers green to yellow or cream, rarely dirty purple, often fragrant. Fruit greenish yellow turning brown or chocolate when ripe, pulp sweet.

Note— There are several Blume collections available which seem to be from different trees. Data on locality or other useful information is lacking on the labels of most of these collections. The collection which has been distributed over several herbaria (K, L, P) is designated here as lectotype.

Stelechocarpus cauliflorus (Scheff.) R.E. Fr.

Stelechocarpus cauliflorus (Scheff.) R.E. Fr., Arkiv. f. Bot., 3, 2 (July 1953) 42. — *Sageraea cauliflora* Scheff., Ann. Jard. Bot. Buitenzorg 2 (1885) 5. — *Stelechocarpus schefferi* Boerl., Cat. Hort. Bog. (1899) 12; Icon. Bog. 1 (1899) 199, t. 71. — *Stelechocarpus cauliflorus* (Scheff.) J. Sinclair, Gard. Bull. Sing. 14 (Aug. 1953) 43. — Type: *Cult. Hort. Bog. IV-H-58*, origin: Indonesia, Sumatra, Prov. Lampong, *Teijsmann s.n.* (holo BO?, n.v.; iso K, L).

Stelechocarpus nitidus King, Mat. Fl. Malay Penins. 1, 4 (1892) 254. — *Sageraea nitida* (King) Finet & Gagnep., Bull. Soc. Bot. France 53, 4 (1906) 59. — Type: *King's coll. 7629* (lecto K; iso CAL, n.v.), Malay Peninsula, Perak, in dense forest on low elevations.

Stelechocarpus longipes Craib, J. Nat. Hist. Soc. Siam 6 (1923) 43. — Type: *Native coll. (Herb. Eryl Smith 643)* (Holo: K), Thailand, Khao Rum, 300 m alt., tree 4 m, fruit orange.

Tree up to 21 m high. Twigs glabrous, lenticels sometimes present. *Leaves* coriaceous to membranous, usually shiny above, brown to brownish green, rarely green when dry, glabrous on both sides, usually numerous brown to red dots beneath, lamina elliptic to narrowly elliptic-oblong, (ob)ovate-oblong, or narrowly obovate, 8–31 cm long, 3–9.5 cm wide, base acute to rounded, apex (tapering to) acute, acuminate, or caudate, midrib prominent on both sides (sometimes not in juvenile specimens), glabrous. Petiole 4–10 mm long, 1–2.5 mm in diameter, glabrous. *Male flowers* not or scarcely smaller than female flowers, both cauliflorous or occasionally ramiflorous, female flowers down to the very base of the trunk, flowers 1–c. 60 in fascicles from woody tubercles. Bracts 2–8, usually one bracteole present. Pedicel 7–65(–110) mm long, pubescent or glabrous. Bud broadly to depressedly ovoid, sometimes very broadly triangular-ovoid, 2–17 mm long. *Sepals* connate to almost free, broadly ovate to depressedly ovate, 2–10 mm long, 3–8 mm wide, pubescent or glabrous outside, glabrous inside, apex rounded; rarely buds enclosed by an almost completely connate calyx with only a small opening at the apex surrounded by rudimentary sepal-lobes. *Petals* imbricate, outer petals spreading at maturity, the inner petals enclosing the stamens or the carpels, leaving only small openings between the bases of the petals, outer whorl (very) broadly (elliptic-)ovate, 7–20 mm long, 6–18 mm wide, inner whorl elliptic, probably of same length as the outer whorl, 5–6 mm wide, glabrous on both sides or sometimes pubescent outside?, coriaceous, sometimes margin thin and ciliate, apex rounded. *Male flowers*: stamens numerous, crowded into a depressed ovoid mass, c. 1–1.5 mm long, anthers exserted to subapical, apex truncate, glabrous, or sometimes not prolonged above the anthers. *Female flowers*: carpels numerous, crowded into a depressed-ovoid mass, c. 3 mm long, ovary hairy, stigma 2-lobed or one orbicular lobe, glabrous, fleshy. *Infructescence* borne on (the thickened base of) the trunk. *Fruiting pedicel* 22–65 mm long, stout. *Monocarps* 2–5?, broadly obovoid or ellipsoid to subglobose, 22–70 mm long, 14–45 mm in diameter, glabrous or sometimes pubescent with short hairs, scurfy to verruculose, dark brown to black when dry, dull, sessile. *Seeds* 2–11, in one or two series, 20–35 mm long.

Distribution — Thailand, Vietnam; Malesia: Malaysia (Kedah, Pahang, Perak, Selangor, and Trengganu; Pulau Tioman) and Borneo; type collection reported from Sumatra. — Fig. 3.

Habitat & Ecology — In primary lowland rain forests, on sandstone or sandy soils (Thailand, Vietnam) or limestone (Malay Peninsula, Borneo), up to 400 m altitude.

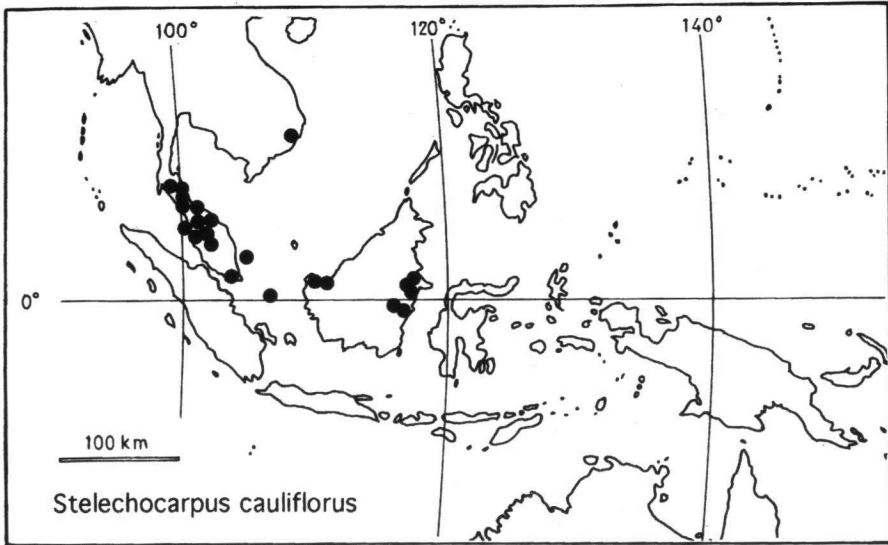


Fig. 2. Distribution map of *Stelechocarpus cauliflorus* (Scheff.) R. E. Fr.

Field notes — Flower buds purplish. Sepals blue-green, light brown, dark brown-blackish, or black. Petals blanc-rose, rose-pink, dirty pale brown, red-brown, or red, or outside pinkish brown, reddish, or dull pinkish-yellowish, inside pink, darkening to pale brown, yellowish, or white; rarely the flowers pale green. Fruits black, dark brown, pale brown, or brownish grey; pulp pink or purple, soft. Sometimes fruits touching the ground or laying in the litter. Sometimes flowers or fruits covered with ants.

Notes — According to Scheffer (1885) the type collection was “growing in their garden”, which presumably is the Botanic Garden of Bogor, and the plant came originally from Sumatra. I did not see the Teijsmann collection. However, there are some collections of Cult. Hort. Bog. IV-H-58, origin Sumatra, which may be isotypes. The flowers of this cultivated plant have long pedicels when compared with other specimens of *S. cauliflorus*.

Within *S. cauliflorus* geographical differences in the morphology can be observed. The collections from Borneo have subapical anthers (Fig. 1h, g). In contrast, the collections from elsewhere have stamens with dorsal anthers (Fig. 1i). The Thailand collections furthermore differ by longer monocarps with a higher number of seeds, greener leaves, and generally paler flower colours. In the two Vietnam collections, *Poilane* 3277 and 6304, the sepals are almost entirely connate with only a very small opening at the apex. Possibly, these flowers probably do not open further at maturity. In contrast, in the collections from elsewhere sepals and outer petals spread at maturity, whereas the inner petals remain closed. Ecologically, there is a difference in soil preference. The Thailand and Vietnam collections, like *S. burahol*, seem to prefer sandstone, whereas the Malaysian and Bornean collections seem to be restricted to limestone. The morphological differences are gradual, however.

EXCLUDED NAMES

Stelechocarpus grandifolia Warb., Bot. Jahrb. 13 (1891) 306. — *Mitrephora grandifolia* (Warb.) Diels, Bot. Jahrb. 49 (1912) 155. — Type: *Warburg 20084* (holo B, n.v.), New Guinea, 'Sattelberg bei Finschhafen', Selillo, 2000 ft = *Pseuduvaria grandifolia* (Warb.) J. Sinclair, Gard. Bull. Sing. 15 (1956) 7.

Stelechocarpus? montana (Blume) Miq., Fl. Ind. Bat. 1, 2 (1858) 22. — *Uvaria montana* Blume, Fl. Jav. Anon. (1830) 45. — *Meiogyne montana* (Blume) Backer, Schooffl. Java (1911) 29. — Type: *Herb. Blume* (holo L; iso B, BM, K, L), Java, Gede, Pangerango; fr. June = *Meiogyne virgata* (Blume) Miq. (see Van Heusden, 1994).

Stelechocarpus punctatus King, J. As. Soc. Beng. 61, 2 (1892) 4. — Type: *King's coll. 7183* (holo CAL, n.v.), Malay Peninsula, Perak.

Note — According to Sinclair (1955) the type of this species (*King 7183*, in Herb. Calcutta) is a mixed collection, which consists of a leaf specimen and detached flowers. The leaves are of a *Pseuduvaria* and do not have the characteristic midrib of *Stelechocarpus*. The flowers belong to *Stelechocarpus cauliflorus*.

ACKNOWLEDGEMENTS

Ivan Nielsen is kindly acknowledged for inviting me to Aarhus (AAU), and for critically reading the manuscript. Paul J. A. Keßler critically commented on the manuscript as well. Robbin Moran carefully corrected the English text. Kirsten Tind made the excellent drawing and prepared the distribution maps. The author also wishes to thank the directors and curators of the following herbaria from which material was studied: AAU, E, K, L, and P. The present study was supported by an EU-grant in the Human Capital and Mobility Program.

REFERENCES

- Burck, W. 1890. Ueber Kleistogamie im weiteren Sinne und das Knight-Darwin'sche Gesetz. Ann. Jard. Bot. Buitenzorg 8: 134–139, pl. 20–22.
- Burck, W. 1906. Die Mutation als Ursache der Kleistogamie. Rec. Trav. Bot. Néerl. 2: 37–164.
- Corner, E. J. H. 1988. Wayside trees of Malaya, ed. 3, 1: 135–146, pl. 15–18. The Malayan Nature Society, Kuala Lumpur.
- Fachrurozi, Z. 1980. Burahol (*Stelechocarpus burahol* (Bl.) Hk. f. & Th.) deodoran tempodulu dan masalah pelestariannya. Bull. Kebun Raya 4: 127–130.
- Gottsberger, G. 1989. Abends wenn die Käfer kommen, Bestäubung der Bedecktsamer. Forschung (Mitt. der DFG) 1989 (4): 22–25.
- Heusden, E. C. H. van. 1992. Flowers of Annonaceae: Morphology, classification, and evolution. *Blumea* Suppl. 7: 1–218.
- Heusden, E. C. H. van. 1994. Revision of *Meiogyne* (Annonaceae). *Blumea* 38: 487–511.
- Koorders, S. H. 1902. Notizen mit Abbildungen einiger interessanter cauliflorer Pflanzen. Ann. Jard. Bot. Buitenzorg 18: 82–91, fig. 7.
- Le Thomas, A. 1969. In: A. Aubréville, Flore du Gabon 16: 1–371. Muséum National d'Histoire Naturelle, Paris.
- Menninger, E. A. 1967. Fantastic trees: 250–252. The Viking Press, New York.

- Morawetz, W., & M. Waha. 1986. Pollen-Ultrastruktur und Systematik bei Crematosperma und Oxandra (Annonaceae). Sitzungsber. Österr. Akad. Wiss., Math.-Naturw. Kl., Wien, Abt. 1, 195: 309–314.
- Okada, H., & K. Ueda. 1984. Cytotaxonomical studies on Asian Annonaceae. Pl. Syst. Evol. 144: 165–177.
- Scheffer, R. H. C. C. 1885. Sur quelques plantes nouvelles ou peu connues de l'Archipel Indien (Annonaceae). Ann. Jard. Bot. Buitenzorg 2: 1–31.
- Sinclair, J. 1955. A revision of Malayan Annonaceae. Gard. Bull. Straits Settlements, ser. 3, 14: 149–516.
- Steenis, C. G. G. J. van. 1931. Schets van de flora van den G. Tjibodas bij Tjiampea. Trop. Natuur 20: 79.
- Walker, J. W. 1971. Pollen morphology, phytogeography and phylogeny of the Annonaceae. Contr. Gray Herb. 202: 1–132.

INDEX OF COLLECTIONS

1. *Stelechocarpus burahol* (Blume) Hook. f. & Thomson
2. *Stelechocarpus cauliflorus* (Scheff) R. E. Fr.

- Achmad 548, 1056, 1289: 1 — Anderson 12519: 2.
- Backer 30419: 1 — Bakhuizen van den Brink 2953, 4930: 1 — van Balgooy 5249: 1 — van Balgooy & van Setten 5689: 2 — van Beusekom & Phengkhilai 1032: 2.
- Clemens 20347: 1 — Chew Wee Lek CWL. 684: 2 — Congdon 196: 2 — Cult. Hort. Bog. IV-G-10 & IV-H-65 156, IV-G-35 157: 1; IV-H-58 158: 2.
- David 8: 2 — Dransfield 995, 1006, 2542: 1 — Dumas 1643: 1.
- Endert 5133: 2.
- Forbes 1299, 1604a: 1 — FRI series: 14117 (Everett): 1; 15377 (Whitmore): 2; 17194 (Singh): 2; 25082 (Chan): 2.
- Geesink et al. 7323: 2.
- Hamzah 12: 1 — Henderson 10721, 21859, 22368, 23802: 2 — Hochreutiner 2315: 1 — Holttum 24707: 2 — Horsfield 642: 1.
- Iboet 34, 402: 1.
- Kerr 7121: 2 — Keßler 616: 2 — Kiew 3643: 2 — King's collector 7629, 8224: 2 — Kochummen 77832: 2 — Koorders 571, 572, 573, 577, 11402, 14818, 38853, 39282: 1 — Kostermans 5219, 13323, 14062, 21249: 2 — Kostermans et al. 354: 1 — Kostermans Unesco 94: 1.
- Lam 2281: 1 — Larsen et al. 30695, 42148: 2 — Laumonier TFB 4052: 1 — Lobb 305: 2 — Lörzing 5585, 11332: 1.
- Maxwell 85-372, 85-710: 2 — Murata & Noboyuki Fukuoka J 400: 1.
- Nasution 80: 2.
- Okada 3256, 3390, 3531: 1.
- Poilane 3277, 6304: 2.
- Ridley 7279: 2.
- S series: 13188 (Smythies): 2; 20272 (Anderson & Ashton): 2; Chai & Lee S 22870 (Chai & Lee): 2; 38292 (George): 2; 40553 (George): 1; 40078 (Lee): 2.
- Shah & Noor 2036: 2 — Sinclair 6614, 8617, 10040: 2; 10041: 1 — Sinclair & Kiah bin Salleh 40832: 2 — E. Smith 643: 2 — van Steenis 5706, 17515: 1 — Stone 6965: 2.
- Teo & P. 800: 2.
- Valeton 797: 1.
- Wasijat 6181: 1 — de Wilde & de Wilde-Duyfjes 20381: 1 — Wirawan 62: 1 — Wyatt-Smith 79267: 2.
- Zollinger 671, 3033: 1.