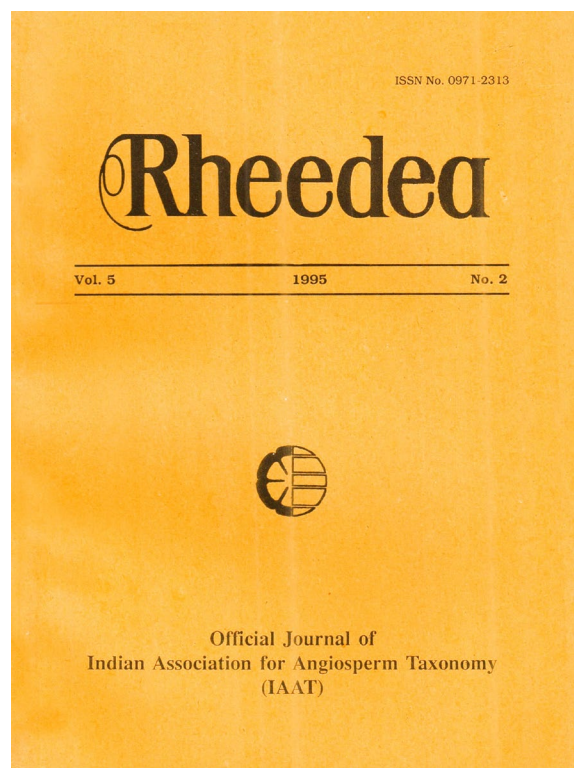




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Susila Rani S.R.M. & N.P. Balakrishnan



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A Revision of the Genus *Claoxylon* Adr. Jussieu (Euphorbiaceae) in India

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Abstract

The genus *Claoxylon* Adr. Jussieu with 5 sections, 9 species and 4 varieties in India is revised. The genus *Micrococca* Benth. is reduced to the synonymy of *Claoxylon*. Keys to the sections, species and varieties, detailed descriptions and illustrations to certain taxa are provided.

The genus *Claoxylon* was first described by Adrien Jussieu in 1824 based on a single species, *C. parviflorum* from Madagascar. The generic name *Claoxylon* originated from the Greek word 'chalo' meaning to break and 'xylon' meaning wood, indicating the easily breakable nature of the wood, due to its hollow stem. In 1826, Blume described the genus *Erythrochilus* with several species, including *E. indicus* from Java. Later Baillon (1858) and several subsequent authors found it to be congeneric to *Claoxylon*. In the meanwhile, Bentham (1849) established the genus *Micrococca*, under the tribe Acalypheae, with a single species, *Tragia mercurialis*. The segregation was mainly based on its herbaceous habit, opposite lower leaves, interrupted racemes, less number (3 – 20) of stamens, plumose style, loculicidally and septically dehiscent capsule and the thinly arillate seeds. While J. D. Hooker (1887) did not subscribe to this view, treated both *Caloxylon* and *Micrococca* as congeneric, Prain (1911) and many others continued to recognise the latter as a distinct genus.

After a critical analysis of all Indian species of these two genera, we have however, found that the character differences made out by Bentham for the segregation of *Micrococca* are not tenable because they integrate with those of *Claoxylon*. Moreover, several shared characters like male calyx of 3 sepals, divaricate anther-thecae (connate at base and free above), the ciliate scales or glands between the stamens, pitted seeds, etc. indicate the closeness of the two. Hence, we have here, followed Mueller Argoviensis (1866) and J. D. Hooker (1877) in treating *Micrococca* as congeneric with *Claoxylon*.

In his classification, Adrien Jussieu included the genera *Acalypha*, *Claoxylon* and *Mercurialis* in the division *Acalypheae*. This was followed and continued by Pax & Hoffmann (1914) and Webster (1975). Spach (1834) also included *Claoxylon* in the tribe Acalypheae and gave detailed descriptions. Webster (1994) in his latest treatment of the family, includes this genus along with *Erythrococca*, *Mareya*, *Micrococca*, etc. in the subtribe *Claoxylinae* under the tribe *Acalypheae*. Robert Wight (1840) gave detailed notes and descriptions of

S. R. M. Susila Rani and N. P. Balakrishnan

Claoxylon digynum (which is *Mallotus digyna*) and *C. muricatum* (*Mallotus muricatus*) supplemented by excellent illustrations. Hasskarl (1844) listed three species, *C. indicum*, *C. minus* and *C. longifolium* in his catalogue of plants being grown in Bogor Botanical Garden. Thwaites (1859) included *Claoxylon* under the tribe Uniovulatae and included *Micrococca* in *Claoxylon*. Kurz (1873) discovered the new species *C. longipetiolatum* and *C. leucocarpum* from Myanmar. Prain (1911) transferred the species *C. beddomei* and *C. wightii* to the genus *Micrococca*. Airy Shaw (1978) described the new species, *C. rostratum* from Andaman and Nicobar Islands, which is now treated under a new section *Rostratae* in this paper.

The genus is paleotropical in distribution, spread over Africa, Asia and Australia, extending eastward to Pacific up to Society Islands and belongs to the tribe Acalyphae (Pax & Hoffmann, 1914, Webster, 1975 & 1994). About 70 to 80 species are included in this genus, among which 9 species occur in India. Among these, three species *C. anomalum*, *C. beddomei* and *C. wightii* are endemic to India. *C. anomalum* is endemic to the southern parts of Western Ghats, *C. beddomei* to Kerala and Tamil Nadu and *C. wightii* to Tamil Nadu. There are 4 varieties under *C. wightii*. They are var. *angustatum*, var. *hirsutum* and var. *wightii* which are endemic to Tirunelveli District, and var. *glabratum* to Kuridimalai hills in Coimbatore District.

Most of the species of *Claoxylon* are wild in evergreen or mixed forests. *C. mercurialis*, closely related to *Acalypha*, is widespread in wastelands, waste heaps and roadsides and shows disjunct distribution in peninsular India, West Bengal, Rajasthan, Myanmar, Sri Lanka, Arabia and tropical Africa. *C. indicum* is also widespread in evergreen or mixed forests from India eastwards to S. China and southwards through Malesia to New Guinea. *C. longifolium* and *C. longipetiolatum* are closely related species, distributed in NE. India, Andaman & Nicobar Islands and Myanmar. *C. rostratum* is found in evergreen inland and beach forests of Andaman & Nicobar Islands and Myanmar.

CLAOXYLON Adr. Jussieu

Adr. Jussieu, Euphorb. Tent. 43. 1824; Endl., Gen. Pl. 2 : 1112. 1836 – 40; Baillon, Etud. Gen. Euphorb. 391, t. 20 – 24. 1858; Muell. –Arg. in DC., Prodr. 15(2): 775. 1866; Benth. in Benth. & Hook. f., Gen. Pl. 3 : 309. 1880; Pax & Hoffm. in Engler, Pflanzenr. IV. 147. VII (Heft 63): 100 – 131. 1914; Webster, Ann. Missouri Bot. Gard. 81: 88. 1994. Type: *C. parviflorum* Adr. Jussieu.

Erytrochilus Reinw. ex Blume, Bijdr. Fl. Ned. Ind. 614. 1826. Type : *E. indicus* Reinw. ex Blume.

Micrococca Benth. in Hooker, Niger Fl. 503. 1849; Baillon, Etud. Gen. Euphorb. 436. 1858; Benth. in Benth. & Hook. f., Gen. Pl. 3 : 309. 1880; Pax in Engler & Prantl, Pflanzenfam. 3, 5 : 48. 1890; Pax in Engler, Pflanzenr. IV. 147. VII (Heft 63): 131 – 137. 1914; Prain, Ann. Bot., London 25: 628. 1911. Type: *M. mercurialis* (L.) Benth. (syn. *Tragia mercurialis* L.).

Revision of *Claoxylon* in India

Claoxylon sect. *Micrococca* (Benth.) Muell.-Arg., *Linnaea* 34: 166. 1865; Hook, f., *Fl. Brit. India* 5 : 412. 1887.

Trees or shrubs, rarely herbs, dioecious or monoecious, evergreen, glabrous or sparingly pubescent with short appressed hairs. Leaves alternate, lower ones rarely opposite, oblong, entire or sinuate-toothed, often scabrous above, penninerved, rarely 3-plinerved at base, usually long-petioled; stipules small or minute. Flowers small or minute, in axillary or lateral spikes or racemes, solitary or 2 together, shorter or longer than leaves. *Male flowers* 1 – many in each bract; calyx subglobose, closed in bud, splitting into 3 – 4 valvate segments; petals and disc absent; stamens 3 – 60 or more, free, narrow, inserted on or around a central flat, convex or elevated receptacle, often intermixed with interstaminal glands or long linear scales or hairs; filaments free, short; anthers erect; thecae distinct, connate at base, free above, extrorsely dehiscent; pistillode absent. *Female flowers* mostly solitary in each bract; sepals mostly 3, shortly connate at base; disc absent or as petal-like hypogynous scales, glandular, enlarged, 2 – 3-lobed with elongate liguliform lobes alternating with carpels; ovary 2 – 3-loculed, glabrous or densely strigose hirsute; ovule solitary in each locule; style same number as ovary-locules, rarely long and irregular, entire, spreading, spatulate, coarsely papillose inside, often plumose; stigmas rarely smooth. Capsules 2 – 3 (–4)-locular, deeply or shallowly lobed, fleshy or coriaceous, dehiscent loculicidally and septicidally or indehiscent; seeds globose or subglobose, with a fleshy outer and hard foveolate-reticulate crustaceous inner layer (testa), thinly arillate or not arillate; endosperm fleshy; cotyledons broad, flat.

Palcotropical, spread over Africa, Asia Australia, extending eastwards to Pacific Islands, up to Society Islands, ca 70 – 80 species; 9 species in India.

Key to the sections

- 1a. Stamens (3–) 5 – 12 (–20).....Sect. 4. *Micrococcae*
- b. Stamens 20 – 60 or more.....2
- 2a. Male receptacle elevated, eglandular and glabrous at apex in between the stamens, with a ring of pilose hairs below the stamens.....Sect. 1. *Anomalae*
- b. Male receptacle convex or flat, not elevated, glandular and often with scales or hairs intermingled with stamens, without a ring of pilose hairs below the stamens.....3
- 3a. Capsules flattened, inflated at middle, 2-locular, 2-lobed, cuneate at base, conspicuously beaked at apex.....Sect. 5. *Rostratae*
- b. Capsules globose, 3-locular, 3-lobed, not cuneate at base, nor beaked at apex.....4
- 4a. Interstaminal glands in between stamens on receptacle mixed with minute hyaline scales, not mixed with tufts of hairs..... Sect. 3. *Khasianae*
- b. Interstaminal glands in between stamens on receptacle mixed with hyaline scales and tufts of long hairs.....Sect. 2. *Indicae*

S. R. M. Susila Rani and N. P. Balakrishnan

Section 1. ANOMALAE Pax & Hoffm.

Pax & Hoffm. in Engler, Pflanzenr. IV. 147. VII (Heft 63): 126. 1914.

Claoxylon sect. II. Hook. f., Fl. Brit. India 5: 412. 1887. Type: *C. anomalum* Hook. f.

Plants dioecious; male bracts 1 – 2-flowered; stamens 25 – 40, imbricate, inserted in series at the apex of the naked elevated receptacle with a ring of pilose hairs below the series of stamens; receptacle in between the series of stamens furrowed and wrinkled.

Monotypic.

Claoxylon anomalum Hook. f., Fl. Brit. India 5 : 412. 1887, *emend.* Raju & Mohanan, J. Econ. Taxon. Bot. 5 : 1201 – 1204. 1984; Rama Rao, Fl. Pl. Travancore 368. 1914; Pax & Hoffm. in Engler, Pflanzenr. IV. 147. VII (Heft 63): 126. 1914; Gamble, Fl. Pres. Madras 1327. 1925.

Type: India Orientali, Courtallam, *Wight* 2673 (K).

(Fig. 1)

Shrubs, 1 – 2 m high, dioecious; branchlets compressed, terete, puberulous or glabrous; young parts densely puberulous; indumentum simple, yellowish white on young shoots and inflorescences. Leaves alternate or rarely lower ones opposite, narrowly elliptic to lanceolate or elliptic-oblancheolate, acute or cuneate and equal or occasionally unequal-sided at base, crenate-serrate with ascending and glandular teeth along margins, long-acuminate with straight or bent acumen at apex, 15 – 20 x 3 – 6 cm, membranaceous, puberulous on nerves, more so beneath; lateral nerves 6 – 8 pairs, faint above, prominent beneath, alternate or opposite; upper ones much-arched; tertiary nerves faint to indistinct above, distinct beneath; stipules small, triangular, much hairy near base; petioles up to 7.5 cm long, ridged, narrowly canaliculate above, sparsely puberulous or glabrous, with 2 – 4 petiolar glands at apex. Inflorescences racemose, axillary, ascending, short, stout, simple, shorter than petioles, up to 3 cm long; peduncles 2 – 5 mm long; flowers 1 – 2 mm across, clustered on rachis, continuous, more crowded towards apex, shortly and densely puberulous. *Male flowers* : flower-buds ovoid, acute, articulate on pedicels, puberulous; pedicels ca 1 mm long; bracts 3, with one main and two lateral ones, each carrying 1 – 2 flowers; sepals 3, triangular, apiculate, equal or subequal, 1 – 1.5 mm long, pilose outside, glabrous inside; stamens 25 – 40, clustered in the centre on elevated globose naked receptacle; filaments minute or absent; anthers short, divaricate, sessile, 0.3 – 0.5 mm long; pistillode absent; *Female flowers* 3 – 5 mm across; pedicels ca 4 mm long, stiff, articulated at apex, puberulous; bracts 3, ovate-triangular, acute, 2 – 4 mm long, puberulous outside, glabrous inside, single-flowered; sepals 3, valvate, ovate-lanceolate, 1 – 2 mm long, thick; ovary usually 3-locular, occasionally 2 or 4-locular, 2 – 4 mm across, densely puberulous; ovule solitary in each locule; disc massive, annular, 3-lobed; lobes raised and triangular, adpressed in the sinuses of ovary, pilose throughout or on the lobes only; scales 3, free, 2 – 5 mm long, spreading, plumose-papillose. Capsules deeply 3-lobed, not keeled on sutures, 1.2 – 1.5 cm across, sparsely puberulous at maturity; seeds globose, smooth, ca 6 mm across, arillate; testa foveolate.

Revision of *Claoxylon* in India



Fig. 1. *Claoxylon anomalum* Hook. f.: A. Twig with male inflorescences; B. Twig with fruits; C. Female bracts - inner and outer views; D. Male bracts; E. Male bud; F. Stamens; G. Seed.

S. R. M. Susila Rani and N. P. Balakrishnan

Flowering & Fruiting : January – October

Ecology : Wet evergreen forests, along margins of streams in valleys, occasionally ascending on hills, up to 1500 m.

Distribution : Endemic to southern parts of Western Ghats of peninsular India. Kerala (Idukki) and Tamil Nadu (Courtallam).

Notes : This species is not only rare and endemic, but also appears to be threatened due to large scale deforestation in its natural habitats in Idukki and Courtallam.

It differs from other species in its long-petioled oblanceolate-acuminate leaves, short unisexual axillary racemes, single-flowered female bracts and 1 – 2-flowered male bracts, the extremely short or absent filaments, the absence of interstaminal glands on male receptacle and the presence of a ring of pilose hairs at its base below the stamens.

J. D. Hooker (1887) treated this species in the unnamed section II. Pax & Hoffmann (1914) accommodated it in their new section *Anomalae*.

After examining specimens from Idukki, Kerala, Raju & Mohanan (1984) reported that, contrary to the description of Pax & Hoffmann (1914), the male receptacle in the species is neither naked nor flat at the top and that its 27 – 38 stamens are not arranged serially. Consequently, they have suggested that the correct position of the species is in the Sect. *Khasianae*. We have examined their specimens critically and have found that the authors have not followed Pax & Hoffmann correctly and the species should actually belong to Sect. *Anomalae* rather than to Sect. *Khasianae*. Pax and Hoffmann (1914) in their description of the section state that there are about 40 stamens and that the apex of the male receptacle is naked, but the receptacle is with a ring of pilose hairs below the stamens. The presence of this ring of pilose hairs is probably mistaken by Raju & Mohanan as indicating that the receptacle is not naked. However, by naked Pax and Hoffmann mean that on the receptacle apex the stamens are not mixed with interstaminal glands, scales or hairs as in other sections, excluding the ring of pilose hairs outside the stamens. The only valid amendments in their descriptions are the elevated nature of the receptacle, the number of stamens varying from 27 to 38 and the well-developed disc of the female flowers. Thus the section *Anomalae* is quite distinct.

Specimens examined : INDIA. Kerala: Idukki Dist. Meeanmutti – Kulamavu, ca 700 m, C. N. Mohanan 74545 (MH); *ibid.*, V. S. Raju 7312 (MH); *ibid.*, V. S. Raju 73124 (MH); *ibid.*, ca 900 m., C. N. Mohanan 80168 (MH); Travancore, Bourdillon s. n. (CAL, acc. no. 412752); *ibid.*, Wight 2676 (CAL).

Revision of *Claoxylon* in India

Section 2. INDICAE Pax & Hoffm.

Pax & Hoffm. in Engler, Pflanzenr. IV. 147. VII (Heft 63): 107. 1914.

Type : *C. indicum* (Blume) Hassk.

Plants dioecious; indumentum simple; male bracts 1 – 12-flowered; stamens 20 - 40, rarely up to 60 or more; interstaminal glands on receptacles pilose, developed near among the stamens.

Three species in India.

Key to the species

- 1a. Petioles glandular at apex; male racemes 20 – 40 cm long; stamens 20 – 40, rarely fewer or more.....*C. indicum*
- b. Petioles glandular at apex; male racemes 8 – 18 cm long; stamens 35 – 60.....2
- 2a. Capsules shallowly 3-lobed, thinly puberulous, smooth.....*C. longifolium*
- b. Capsules deeply 3-lobed, covered with soft hirsute prickles.....*C. longipetiolatum*

Claoxylon indicum (Blume) Hassk., Cat. Pl. Bogor. Alter. 235. 1844; Muell. –Arg. in DC., Prodr. 15(2): 782. 1866; Hook. f., Fl. Brit. India 5: 410. 1887; Pax & Hoffm. in Engler, Pflanzenr. IV. 147. VII (Heft 63): 108. 1914; Parkinson, For. Fl. Andaman Is. 244. 1923; Corner, Gard. Bull. Str. Settlem. 10: 292. 1939; Airy Shaw, Kew Bull. 26: 233. 1972 & Euphorb. Borneo 71. 1975; Balakr., Fl. Jowai 2: 431. 1983; P. Chakrab., Bull. Bot. Surv. India 21. 13. 1979; T. Chakrab. & Balakr., J. Econ. Taxon. Bot., Add. ser. 9: 39. 1992.

Erytrochilus indicus Blume, Bijdr. Fl. Ned. Ind. 615. 1826. Type: Java, Blume s. n. in Herb. Lugd. Bat. 903. 155 – 561 (L – Photo !).

Erytrochilus minor & *E. mollis* Blume, l. c. 615.

Croton halecum Roxb., Fl. Ind. 3: 683. 1832.

Claoxylon parviflorum Hook. & Arn., Bot. Beech Voy. 212. 1841.

Claoxylon minus (Blume) Hassk., Fl. Jav. Rar. 251. 1848; Kurz, J. Asiat. Soc. Bengal 45 (3): 148. 1876.

Claoxylon polot sec. Merr., Interpr. Rumph. Herb. Amboin. 200. 1917; Backer & Bakh. f., Fl. Java 1: 480. 1963; Thothathri et al., Bull. Bot. Surv. India 15: 256. 1973; Thothathri, Indian For. 101: 179. 1975 (non Burm. f., 1768).

(Fig. 2)

S. R. M. Susila Rani and N. P. Balakrishnan

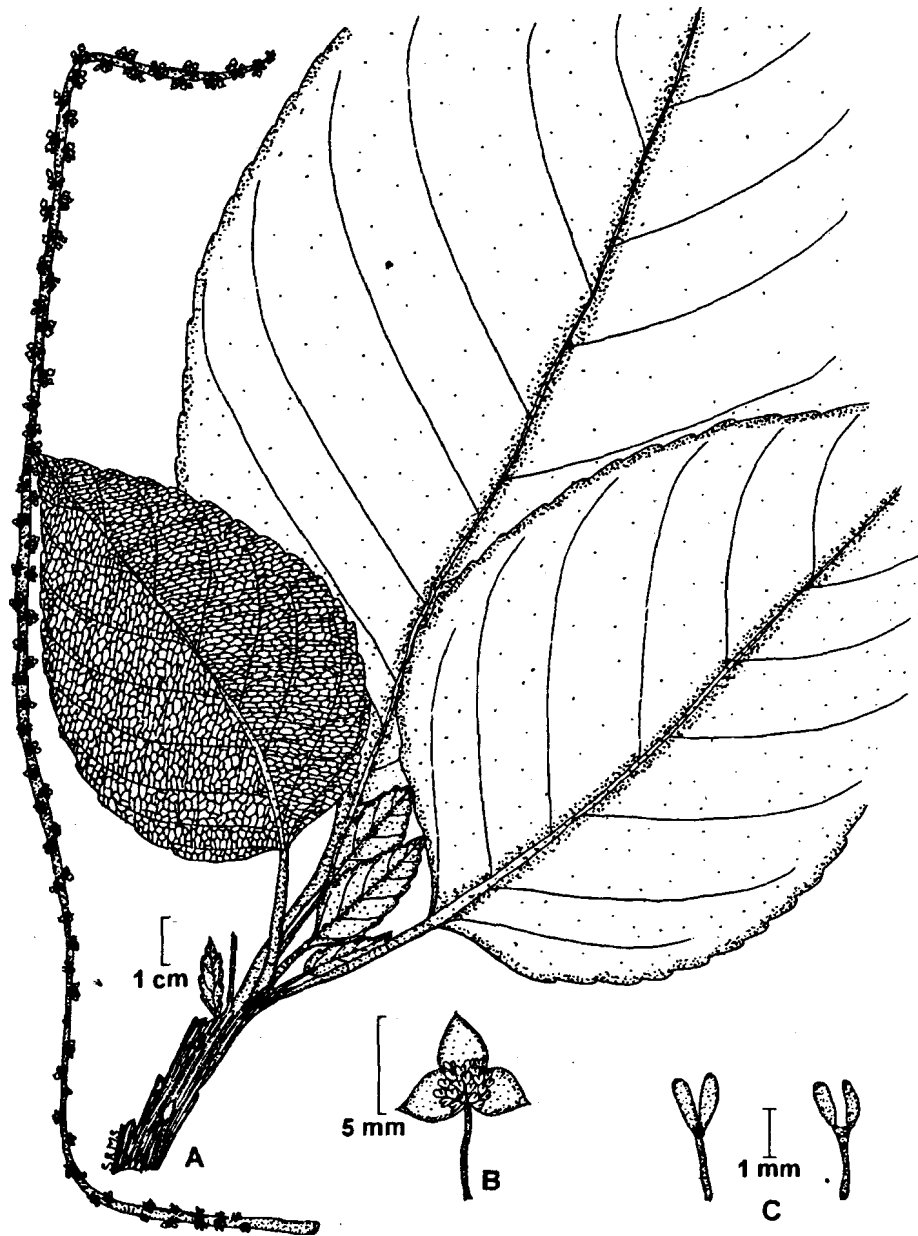


Fig. 2. *Cloaxylon indicum* (Blume) Hassk.: A. Twig with male inflorescence; B. Male flower; C. Stamens.

Revision of *Claoxylon* in India

Shrubs or small trees, 8 – 15 m tall; branches stout, woody; branchlets hollow, yellow or whitish, glaucous, hoary, puberulous, whitish pubescent or shortly tomentellous throughout; bark brownish with white spots. Leaves alternate, broadly ovate to elliptic-ovate, lanceolate to oblong-lanceolate or suborbicular, cuneate, acute, truncate, obliquely rounded or subcordate at base, nearly entire, sinuate or manifestly crenate-dentate or crenate-serrate and irregularly glandular along margins, acute, broadly acute to shortly acuminate at apex, (12–) 15 – 35 (–45) x 8 – 15 (–25) cm, membranaceous to chartaceous, glabrous or minutely pilose above, soft pubescent or stellate beneath, penninerved; midrib flat above, raised beneath; lateral nerves 6 – 12 pairs, faint above, prominent beneath; tertiary and minor nerves obscure beneath, eglandular; petioles 3 – 12 (–18) cm long, slender, glandular-pubescent; stipules minute, early caducous. *Male flowers* in scattered clusters or fascicles, arranged on axillary or terminal elongate pendulous 20 – 40 cm long racemes, densely whitish pubescent; bracts minute, ovate-lanceolate, rounded at base, acute at apex, 1 – 1.5 mm across, in axils of bracts; pedicels 2 – 4 mm long, hirsute; calyx subglobose in bud, splitting valvately into 3 – 4 segments; sepals ovate to lanceolate, rounded at base, acute at apex, entire, 2 – 3 mm across, densely pubescent; stamens 20 – 40 or rarely more, inserted on a central receptacle, intermixed with glands and linear-oblong, rounded or blunt, 0.4 – 0.9 mm long scales, with a tuft of white villous hairs; filaments free above, connate at base; anthers 2-loculed, extrorse; thecae free, divaricate. *Female flowers* solitary in axils of bracts on elongated 5 – 15 cm long racemes; bracts ovate-lanceolate, united at base, acute at apex, entire, 1-1.5 mm across, densely hirsute; flowers 2 – 4 mm across; pedicels 2 – 3 mm long, elongating in fruits; sepals 3, spathaceous, ovate-lanceolate, united at base, acute or blunt at apex, 2 – 3 x 1 – 2 mm, densely yellow-hirsute; disc lobed; ovary subglobose, 1.5 – 2 mm across, 3-locular, hirsute; hypogynous scales 3, attached to ovary, alternating with sepals, oblong-ligulate, 1 – 2 mm long, feathery, plumose, fringed with a tuft of hairs, persistent in fruits. Capsules globose to subglobose, 3-lobed, 7-10 mm in diam., bright red, finely softly grey-tomentose or yellowish pubescent; cocci 2-valved, dehiscing by raised sutures; sepals and hypogynous scales persistent, closely embracing the fruits; seeds globose, 3 – 4 mm across, dark brown, wrinkled, shallowly pitted.

Flowering: January — April; *Fruiting:* March — September.

Ecology: Common in evergreen or mixed forests, and beach forests on sandy or clayey soil.

Distribution: India (Andaman & Nicobar Islands), Myanmar, S. China and throughout Malesia to New Guinea.

Notes: The leaves of *C. indicum* show considerable variation in size and shape, which prompted many authors to segregate them into varieties. The hyaline scales in many flowers are very short when compared with other species. The staminal filaments and anther-thecae are finely hairy, showing wide variations in the indumentum. The ligulate scales, sepals and styles are persistent in fruits and the scales are closely covering the fruits, showing depressions along the sides of sutures over the fruits.

T. Chakrabarty & Balakrishnan (1. c. 1992) reported two variants of this species from Andaman and Nicobar Islands, though they do not deserve varietal ranks: (i) a markedly soft-pubescent (except upper surface of leaves) form which is less common,

S. R. M. Susila Rani and N. P. Balakrishnan

and (ii) a less pubescent common form with glabrous branchlets and thinly pubescent undersurface of leaves especially on major veins. The less pubescent form closely approaches *C. longifolium* but is distinct in its conspicuously raised sutures of the capsules.

Specimens examined: INDIA. Andaman & Nicobar Islands: Andamans, *Prain* s. n. (CAL, acc. no. 412803); Betapur, *Parkinson* s. n. (CAL, acc. no. 412690); Great Cocos Island, *Prain* s. n. (CAL, acc. no. 412697, 412698); Interview Island, *Laurie* 11852 (DD); Porlob Island, *Kirat Ram* 3769 (DD); Near Manglutan village, *Parkinson* 240 (DD); S. Andaman Island, inland forests, *Premanath* 6131 (CAL); Myomyo, inland forests, *Balakrishnan* 532 (CAL); Katchal Island, *P. Chakrabarty* 2223 (CAL, PBL); Katchal Island, coastal forests, *P. Chakrabarty* 1117 (CAL, PBL); Kamorta Island, *N. Bhargava* 3079 (CAL, PBL); Great Nicobar Island, Campbell Bay, *Balakrishnan* 3079 (CAL, PBL); Great Nicobar Island, inland forests near Galathea river, *D. K. Hore* 6793 (CAL, PBL); Laful, inland forests, *D. K. Hore* 7559 (CAL, PBL); Great Nicobar Island, coastal forests, *Balakrishnan* 5732 (CAL, PBL); MYANMAR. Tenasserim, *Geo Gallatly* s. n. (CAL, acc. no. 412765); Thaton Dist., Kilathalong, *Bals* 4754 (DD). MALAYSIA. *Maingay* s. n. (CAL, acc. no. 412716). INDONESIA. Java, *Forbes* s. n. (CAL, acc. no. 412717).

Claoxylon longifolium (Blume) Hassk., Cat. Pl. Hort. Bogor. Cult. Alter. 235. 1844; Muell. –Arg. in DC., Prodr. 15(2): 781. 1866 (ex parte); Kurz, For. Fl. Brit. Burma 2: 395. 1877; Hook. f., Fl. Brit. India 5: 411. 1887; Pax & Hoffm. in Engler, Pflanzenr. IV. 147. VII (Heff 63): 117. 1914; Holth & Lam, Blumea 5: 200. 1942; Airy Shaw, Kew Bull. 26: 234. 1972 & Euphorb. Borneo 72. 1975.

Erytrochilus longifolius Blume, Bijdr. Fl. Ned. Ind. 616. 1825. Type: Java, *Blume* s. n., Herb. Lugd. Bat. No. 903. 155–532 (L – Photo !).

Claoxylon papyraceum Airy Shaw, Kew Bull. 23: 77. 1969.

(Fig. 3)

Shrubs or small trees, up to 9 m tall, evergreen; stems hollow; branches and branchlets terete, glaucous white, nearly glabrous or puberulous; young shoots silky puberulous. Leaves alternate, elliptic–lanceolate to elliptic–oblanceolate, narrowed at both ends, broad at middle, attenuate, acute, obtuse, truncate or rounded at base, acute to caudate at apex, crenate–serrate, nearly entire, irregularly shallowly toothed with glands along margins, 12 – 25 x 5 – 10 cm, chartaceous or subcoriaceous, nearly glabrous, finely pubescent on young leaves, more or less minutely puberulous beneath, finely scattered pubescent on nerves; midrib flat, raised beneath; lateral nerves 6 – 12 pairs, faint above, prominent beneath; cross-nervules and minor nerves slender, faint above, obscure beneath; petioles 1.2 – 6 cm long, slender, terete, with 2 glands at apex, near the base of leaf-blade, finely pubescent. *Male flowers* 3 – 4 mm across, terminal or axillary, pendulous; racemes slender, 8 – 20 cm long, white, greyish or densely brownish pubescent or puberulous; flower–buds subglobose to ovoid, acute, 1 – 1.5 mm across; flowers

Revision of *Claoxylon* in India

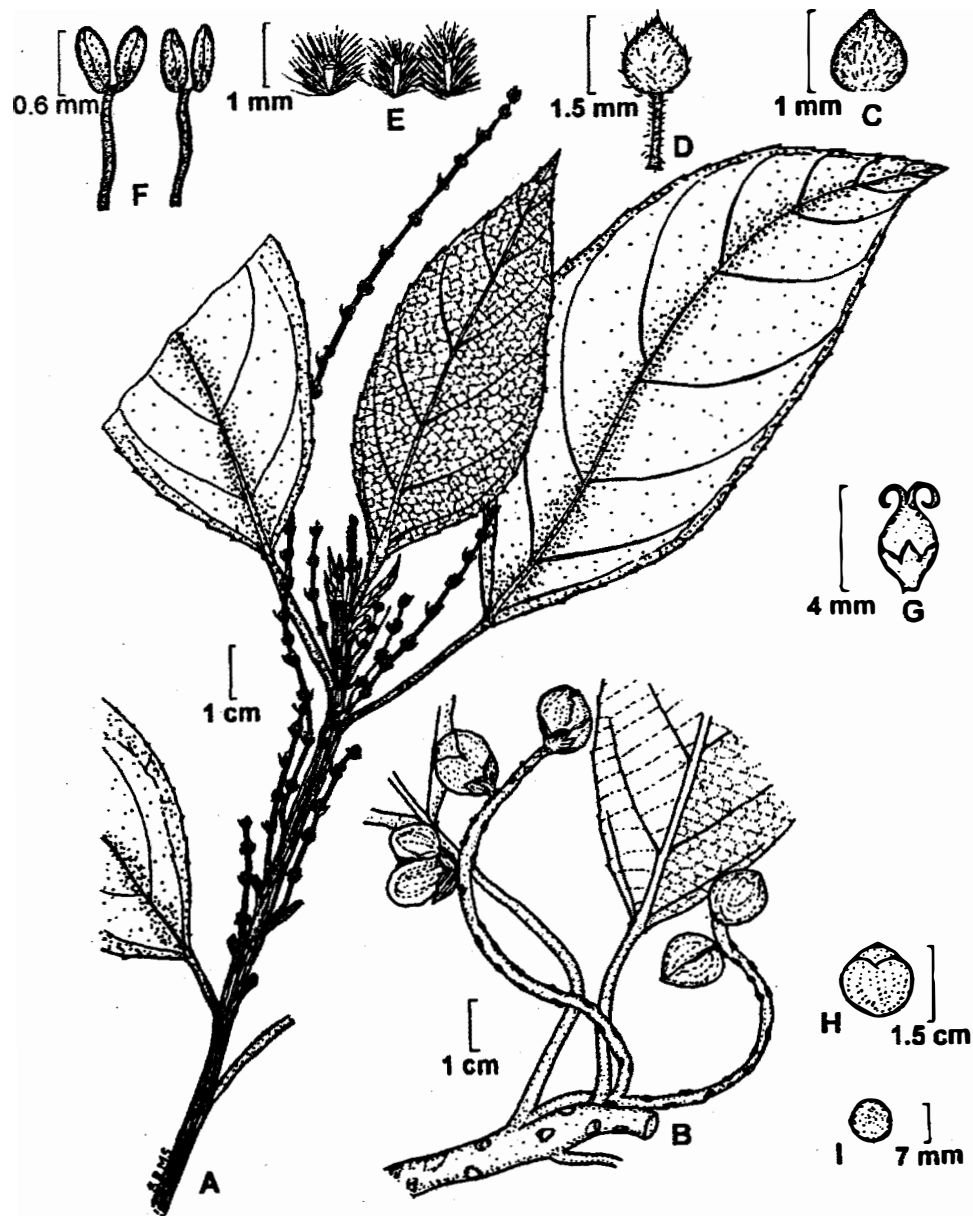


Fig. 3. *Claoxylon longifolium* (Blume) Hassk.: A. Twig with male inflorescences; B. Twig with fruits; C. Male bract; D. Male bud; E. Interstaminal glands; F. Stamens; G. Female flower; H. Fruit; I. Seed.

S. R. M. Susila Rani and N. P. Balakrishnan

clustered in axils of bracts; bracts ovate, rounded at base, bluntly acute at apex, up to 1 mm across, densely pubescent; pedicels 3 – 4 mm long, densely pubescent; sepals 3, ovate, rounded at base, acute at apex, 2 – 3 mm across, densely pubescent outside; stamens 35 – 50; filaments free, slender, 1 – 1.5 mm long, clustered in the centre with 0.5 – 1 mm long hyaline interstaminal hairy scales or glands; anthers 2-loculed, globose, 0.5 – 0.6 mm across; anther-thecae free above, connate at base, extrorsely dehiscent. *Female flowers* solitary in axils of bracts, arranged in short 3 – 8 cm long racemes, finely pubescent; bracts ovate or subovate, rounded at base, acute at apex, 1 – 1.5 mm across, densely pubescent; calyx spathaceous, 4 – 5-lobed; lobes ovate, acute, 2 – 3 mm across, densely pubescent; ovary 3-loculed, 3 – 4 mm across, densely pubescent; styles 2, plumose, fimbriate-fringed, recurved, 1 – 1.5 mm long, with dense hirsute hairs. Capsules tridymous, 1 – 1.5 cm across, contracted at base on a 3 – 5 mm long pedicel, very smooth, thinly and closely ochraceous tomentellous, densely and minutely greyish puberulous; sutures not conspicuously raised; seeds globose, 5 – 7 mm across, smooth.

Flowering & Fruiting: April – December.

Ecology: In dense evergreen primary or secondary forests, at low levels up to 500 m above m. s. l.

Distribution: India (Andaman & Nicobar Islands), Myanmar, Indo-china, Malesia to New Guinea.

Notes: Leaves show considerable variation in size, shape and texture. The Calcutta garden plant is rightly referred to this by Mueller, but it is suggested that it came from Penang and not from Khasia Hills. On the other hand, the Khasia plants collected by Hooker and Thomson referred to this species by Mueller-Argoviensis, actually belong to *C. khasianum*, differing in the very short scales among the stamens. During this study, no fruits or seeds could be seen, and the description of these parts given above are taken from Kurz (l. c., 1877).

In Malaysia and Philippines, the young shoots are used as vegetable.

Specimens examined: INDIA. Andaman & Nicobar Islands: Great Nicobar Island, Kurz s. n. (CAL, acc. nos. 412723, 412730, 412733, 412735, 412736, 412738); Car Nicobar Island, Kurz s. n. (CAL, acc. no. 412723); South Andaman Island, 1875, Kurz s. n. (CAL, acc. no. 412807). MYANMAR. Tena Dist., Biswas s. n. (CAL, acc. no. 412764, 412766, 412767); Irrawaddy Dist., C. G. Rogers s. n. (CAL, acc. no. 412776). INDONESIA. Java, Lalak, Kantri Arsin s. n. (CAL, acc. no. 412786); Talak Tijapoes, Halliet s. n. (CAL, acc. no. 412789). MALAYSIA. Mumarie, Ahmed s. n. (CAL, acc. no. 412731). THAILAND. Trempek, Henderson 80118 (CAL).

Claoxylon longipetiolatum Kurz, J. Asiat. Soc. Bengal 42(2): 244. 1873 & For. Fl. Brit. Burma 2: 396. 1877; Hook. f., Fl. Brit. India 5: 413. 1887; Pax & Hoffm. in Engler, Pflanzenr. IV. 147. VII (Heft 63): 128. 1914; Kanjilal et al., Fl. Assam 4: 210. 1940.

Revision of *Claoxylon* in India

Type: Myanmar, Pegu, *Kurz* s. n. (CAL, acc. no. 412761).

(Fig. 4)

Shrubs or small trees, (3-) 5 – 10 m tall, finely pubescent throughout; stems fistulose; branchlets whitish glaucous, minutely pubescent to puberulous; young shoots adpressed pubescent. Leaves broadly lanceolate, broadly elliptic, oblong-ovate to oblong-lanceolate, acute, obtuse, rounded or subcordate at base, subcrenate, toothed with glands along margins, abruptly and shortly but finely acuminate-cuspidate at apex, 16 – 40 x 7 – 18 cm, thin-papery, chartaceous or rough on both sides, nearly glabrous or pilose above, softly pubescent on nerves beneath, brown on both sides, pale green above and brownish green beneath when dry, eglandular; midrib flat above, raised beneath; lateral nerves 6 – 10 pairs, faint above, prominent beneath; cross-nerves faint on both sides; petioles slender, (4-) 7 – 12 (-14) cm long, straight, terete, puberulous or finely pubescent, eglandular. *Male flowers* clustered on elongate filiform 10 – 20 cm long spikes, adpressed greyish hispid, densely tomentose or densely yellowish hirsute; bracts minute, subulate, oblong-ovate, rounded at base, obtuse at apex, up to 1 mm long, densely hirsute; flowers 4 – 6 mm across; pedicels 4 – 7 mm long; flower-buds globose, ca 3 mm across; sepals 3, ovate-lanceolate, rounded at base, acute at apex, 1.5 – 2.5 mm across, densely hirsute beneath; stamens 35 – 60, clustered and inserted on a central receptacle, intermixed with glands or scales with a tuft of up to 0.5 mm long hairs, sometimes elongate, up to as long as the filaments; filaments free, slender, 0.5 – 2 mm long; anthers 2-loculed, oblong to subglobose 0.5 – 0.6 mm long. *Female flowers* almost sessile; ovary subglobose, ca 1.2 mm long, hirsute. Capsules deeply 3-lobed, ca 1 cm long, covered with soft hirsute prickles, crowned by the simple fimbriate styles, the cocci of the size of a pea.

Chromosome numbers: $n = 54$, $2n = 108$ (Mehra & Hans, *Taxon* 18: 310 – 315. 1969).

Flowering: February — May; *Fruiting:* May — July (-December).

Ecology: Frequent in forest clearing and open places, at low altitudes.

Distribution: India (Sikkim, Meghalaya and Andaman Islands?) and Myanmar.

Notes: This species resembles *C. longifolium* in its habit, leaf shape, etc., but differs in the deeply 3-lobed capsules with soft hirsute prickles. In the male flower, the central receptacle is quite large and fleshy. Except for the record of *Kurz* (1873) there is no subsequent report from Andamans.

Specimens examined: INDIA. Meghalaya: Khasi hills, *Kanjilal* 6143 (ASSAM). MYANMAR. Insein Dist., *Kau* 272 (DD); *ibid.*, *Babu* s. n. (DD, acc. no. 46885); Pegu, *Kurz* 2470 (CAL); Zoukyenghat, *Kurz* 1551 (CAL); Irrawaddy dist., Zagagyristream, *Rogers* 661 (DD).

S. R. M. Susila Rani and N. P. Balakrishnan

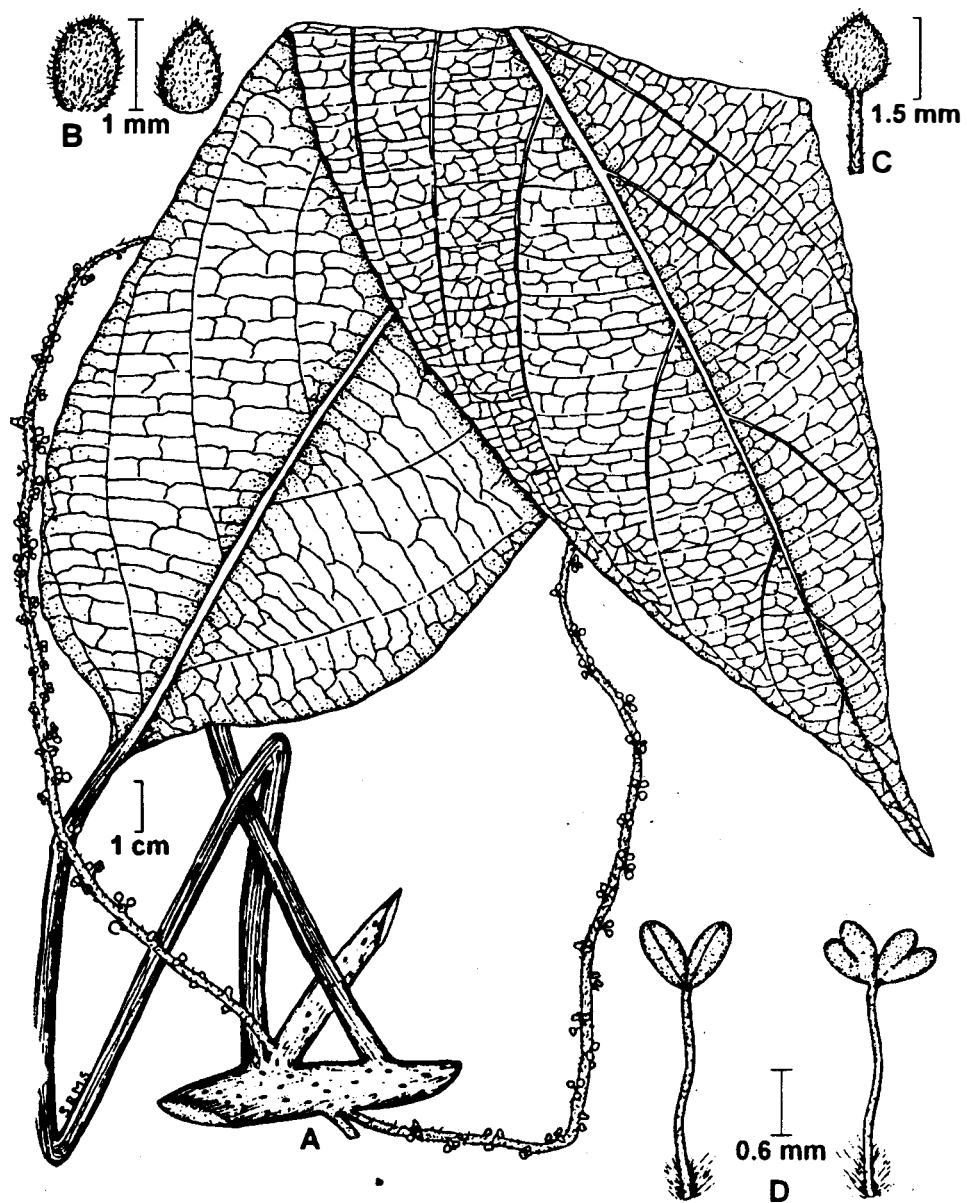


Fig. 4. *Claoxylon longipetiolatum* Kurz: A. Twig with male inflorescences; B. bracts; C. Male bud; D. Stamens.

Revision of *Claoxylon* in India

Section 3. KHASIANAE Pax & Hoffm.

Pax & Hoffm. in Engler, Pflanzenr. IV. 147. VII (Heft 63): 125. 1914.

Type: *C. khasianum* Hook. f.

Plants dioecious; male bracts 1 – 3-flowered; stamens 35 – 40 or about 50; glands very minute, up to 0.5 mm long, located near stamens; indumentum simple.

Monotypic

Claoxylon khasianum Hook. f., Fl. Brit. India 5: 411. 1887; Pax & Hoffm. in Engler, Pflanzenr. IV. 147. VII (Heft 63): 126. 1914; Kanjilal et al., Fl. Assam 4: 210. 1940.

Type: Khasia Mountains, *J. D. Hooker* s. n. (K – Photo !).

C. longifolium ssp. *glabrum* Muell. –Arg. in DC., Prodr. 15(2): 781. 1866, ex parte, quoad specim. Khasiae.

Shrubs or small trees, 7 – 12 m tall; branchlets terete, yellow, glaucous, finely pubescent or puberulous in young parts. Leaves linear-lanceolate, elliptic-lanceolate or oblong-lanceolate, acute, cuneate-obtuse or rounded at base, crenate-dentate, obscurely serrate or sinuate-toothed, each tooth ending with glands along margins, acute to acuminate at apex, 7 – 20 (–25) x 3 – 13 (–19) cm, membranaceous, subchartaceous, scaberulous when young, nearly glabrous on both sides, pilose to minutely pubescent in young leaves, finely pubescent on nerves beneath, pale green above and brownish beneath or green on both sides when dry; midrib flat above, raised beneath; lateral nerves 6 – 12 pairs, faint above, prominent beneath; cross-nervules remote, more or less parallel, faint above, distinct beneath; minor nervules indistinct; petioles terete, slender, 3 – 15 cm long, nearly glabrous or finely hairy. *Male flowers* 3 – 5 mm across, clustered in elongate filiform 5 – 10 cm long densely yellow-pubescent or hirsute spikes; flowers at axils of bracts; bracts minute, ovate, irregular in size and shape, rounded at base, obtuse or sometimes acute at apex, 0.5 – 1.5 x ca 1 mm; flower-buds globose, acute, ca 2 mm long; pedicels 2 – 3 mm long, finely hairy; sepals 3 or rarely 4, ovate, rounded at base, acute at apex, ca 3 x 2 mm, rough, densely clothed with yellow hirsute hairs; stamens 35 – 40 or ca 50, clustered on a convex receptacle, mixed with hyaline ca 0.5 mm long scales or glands; filaments free, up to 3 mm long; anther-locules distinct, divaricate, 0.5 – 0.7 mm long, extrorse. *Female flowers* 3 – 7 mm across, solitary, in 3 – 9 cm long panicles, yellow, glaucous, pubescent; ovary 5 – 8 mm across, white pubescent; styles 3, entire, 3-5 mm long, plumose. Capsules 3-lobed, 2-valved, globose, rounded, 1 – 1.8 cm across, clothed with minute hirsute hairs or finely soft yellowish or whitish pubescent, thinly crustaceous; seeds rounded or globose, 6 – 8 mm across, dark brown; testa crustaceous, with shallow pittings on seeds.

Chromosome number: $2n = 96$ (Sarkar et al., Taxon 25: 649. 1976).

Flowering & Fruiting: February — November.

Ecology: Mainly in hills and mountains, 1000 – 1600 m.

S. R. M. Susila Rani and N. P. Balakrishnan

Distribution: India (Assam, Meghalaya and Nagaland) and Bangladesh.

Notes: In habit and leaves, this species resembles *C. indicum* and *C. longifolium* but differs from both in the larger fruits and seeds and by its small male flowers. The scales on glands among the stamens are very minute and villous and are entirely different from other species.

Specimens examined: INDIA. Assam: sine loc., *King's Collector* s. n. (CAL, acc. no. 412748); *ibid.*, *G. Mann* s. n. (CAL, acc. nos. 412744 – 412748). Nagaland: Babigan, *Prain* s. n. (CAL, acc. no. 412742); Runging – Abor expedition, *Burkill* s. n. (CAL, acc. no. (CAL, acc. no. 412768). West Bengal: sine loc., *S. K. Mukerjee* s. n. (CAL, acc. no. 559002); sine loc., *V. Narayanaswami* 1006 (CAL); Garopa, *C. R. Das* 1372 (CAL).

Section 4. MICROCOCCAE Muell. –Arg.

Muell. –Arg. in *Linnaea* 34: 166. 1865; Hook. f., *Fl. Brit. India* 5: 412. 1887.

Micrococca Benth. in Hook., *Niger Fl.* 503. 1849.

Type: *Claoxylon mercurialis* (L.) Thw. (syn. *Tragia mercurialis* L.).

Annual herbs or perennial shrubs; racemes unisexual or bisexual. Male flowers: glands often developed near the stamens or rarely lacking; stamens 5 – 12 or more.

Three species in India.

Key to the species

- 1a. Male receptacle without glands near stamens.....*C. beddomei*
- b. Male receptacle with glands near stamens.....2
- 2a. Annual herbs or sometimes perennial subshrubs; racemes bisexual, equal to or longer than leaves.....*C. mercurialis*
- b. Perennial shrubs; racemes unisexual, shorter than leaves.....*C. wightii*

Claoxylon beddomei Hook. f., *Fl. Brit. India* 5: 413. 1887; Rama Rao, *Fl. Pl. Travancore* 368. 1914. Type: India, Tamil Nadu, Anamallais, *Beddome* 7304, 7306 (BM – Photo !).

Micrococca beddomei (Hook. f.) Prain, *Ann. Bot.*, London 25: 630. 1911; Pax & Hoffm. in Engler, *Pflanzenr.* IV. 147. VII (Hef 63): 136. 1914; Gamble, *Fl. Pres. Madras* 1328. 1925; Chandrabose in Henry et al., *Fl. Tamil Nadu* 2: 235. 1987.

(Fig. 5)

Revision of *Claoxylon* in India

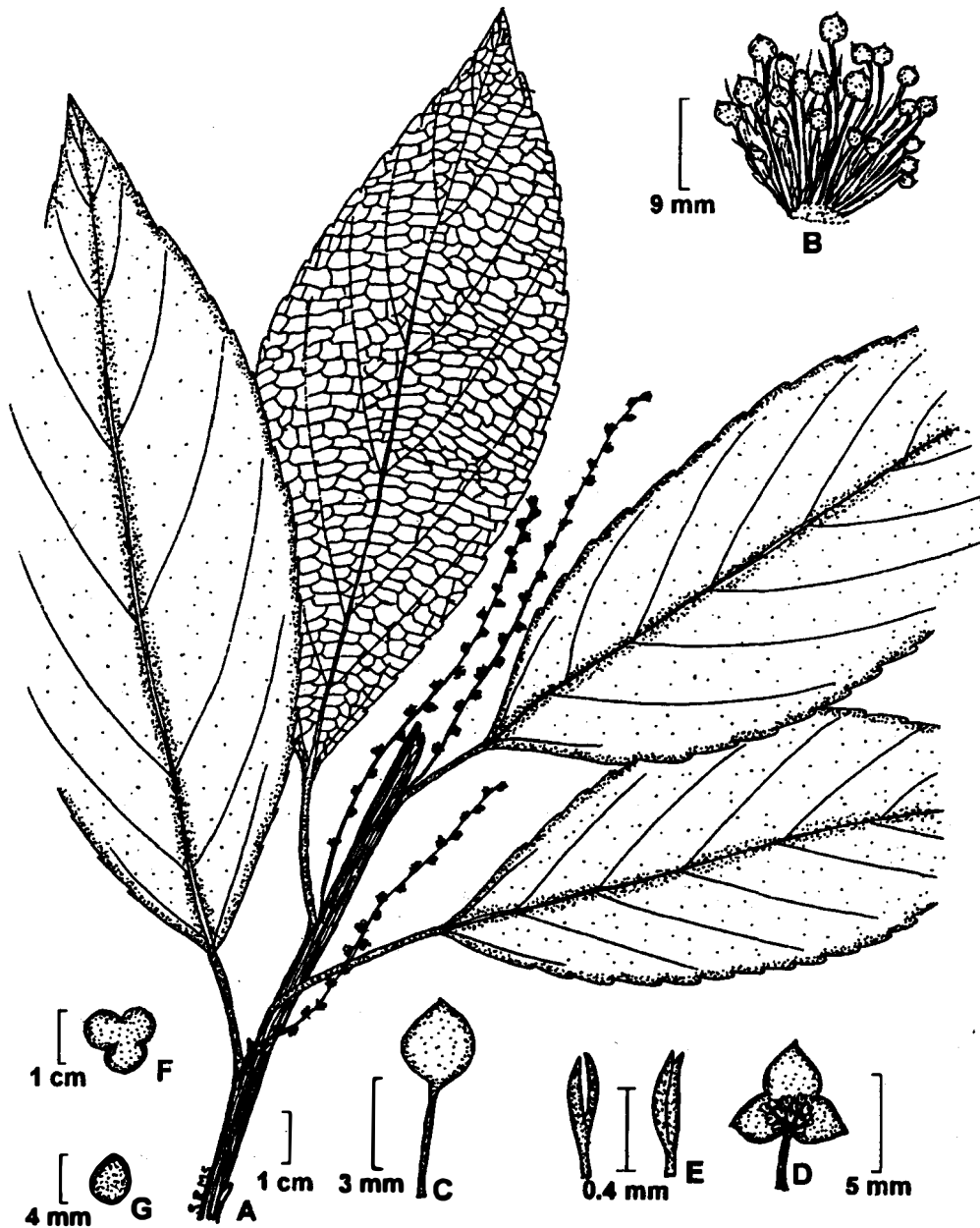


Fig. 5. *Claoxylon beddomei* Hook. f.: A. Twig with inflorescences; B. Cluster of flowers; C. Male bud; D. Male flower; E. Stamens; F. Fruits; G. Seed.

S. R. M. Susila Rani and N. P. Balakrishnan

Shrubs, dioecious, 2 – 3 m high; stems glabrous; branches terete, woody; young shoots hispid. Leaves elliptic–lanceolate, cuneate or slightly narrow-rounded at base, acuminate at apex, coarsely dentate to entire or serrate along margins, 5 – 18 x 2 – 5 cm, leathery or membranaceous, glabrous, nearly glabrous or pilose; lateral nerves 8 – 12 pairs, flat above, distinct beneath; petioles 2 – 7 cm long, slender, nearly glabrous, sparsely pubescent; stipules minute, subulate, up to 0.5 mm long, finely hairy. Racemes axillary, elongate–filiform, 3 – 15 cm long, nearly glabrous, pilose. *Male flowers* 3 – 5 mm across, in distinct clusters or often in catkin–like racemes with many linear–lanceolate up to 0.5 mm long bracts, each containing a short spikelet of dense imbricate bracteoles from the axils of which the male flowers arise; pedicels 3 – 7 mm long, slightly pubescent; sepals closed in globose bud, splitting into 3 lobes, ovate, rounded at base, acute at apex, entire, 2 – 3 mm across, finely hairy; stamens 5 – 12 or 15 – 20, clustered in the centre of a convex receptacle; filaments minute; anthers sessile, linear, connate at base, extrorse; glands extra–staminal. *Female flowers* 4 – 5 mm long, solitary, in axillary racemes, nearly glabrous, pilose; pedicels 1 – 1.2 cm long; sepals 3, ovate to suborbicular, elliptic, acute or obtuse at apex, 2 – 4 mm across, greenish, hairy or nearly glabrous; ovary 3–loculed, ca 3 mm across, nearly glabrous; ligule scales 3, attached to ovary, alternating with sepals, oblong, acute to blunt, rounded at apex, 1 – 1.5 mm long; styles 3, erect, 1 – 2 mm long, spreading, fringed. Capsules of 3 cocci, trilobed, 8 – 10 mm across, glabrous or strigose–hispid; cocci globose, thinly crustaceous, loculicidally or septicidally dehiscent; seeds globose, 3 – 4 mm across, deeply foveolate, pale brown.

Flowering & Fruiting: June — November.

Ecology: Common on hill slopes, as weeds in estates, along roadsides in forests and other shaded places, between 700 – 1100 m altitudes.

Distribution: India (Kerala and Tamil Nadu). Endemic.

Notes: It differs from its allied *C. wightii* in the presence of elongate–filiform racemes with distant flower–clusters, long petioles, comparatively more number of stamens without scales or glands. The anther–thecae are longer than in other species.

Specimens examined: INDIA. Kerala: Kottayam Dist. Lockhart gap, Devicolam, *Joseph* 44640 (MH); Devicolam, *Meebold* 413068 (CAL); Sankankeri, 1100 m, *Blasco* 37 (HIFP). Thiruvananthapuram Dist. Forest between Adhirumalai and Bonaccord Estate, 975 m, *Joseph* 44640 (MH); On the way to Chemungi, ca 1200 m, *M. Mohanan* 61725 (MH). Travancore, sine loc., *Lawson* s. n. (MH, acc. no. 48137). Tamil Nadu: Coimbatore Dist. Kallar R. F., *Raju* 20319 (MH); Kollegal–Poonachi betta, *Narayanawamy* 19653 (MH); Sholaiyar submergible area, 1050 m, *K. Ramamurthy* 22897 (MH); Thadagam hills, *Fischer* s. n. (CAL, acc. no. 413067); Vadampari, 1125 m, *Chandrabose* 65865 (MH); Valparai, *Joseph* 15582 (MH); Walayar, *Ridsdale* 341 (HIFP). Kanniyakumari Dist. Muthukuzhi sholas, ca 1500 m, *Henry* 70643 (MH). Tirunelveli Dist. Agastyamalai, *Henry* 16323 (CAL); Kakachi, *Sebastine* 4468, 4473 (MH); Kannikatty, *Jacob* 397 (MH); Naterikal, *Vajravelu* 29222 (MH).

Revision of *Claoxylon* in India

Claoxylon mercurialis (L.) Thw., Enum. Pl. Zeyl. 271. 1861; Muell. -Arg. in DC., Prodr. 15(2): 79. 1866; Hook. f., Fl. Brit. India 5: 412. 1887; Trimen, Fl. Ceylon 4: 63, 1898; Woodr., J. Bombay Nat. Hist. Soc. 5: 372. 1899; Prain, Beng. Pl. 2: 947. 1903; Cooke, Fl. Pres. Bombay 2: 609. 1906.

Tragia mercurialis L., Sp. Pl. 980. 1753. Type: India Orientali, *Linnaeus* Microfiche 1103.4 (LINN).

Micrococca mercurialis (L.) Benth. in Hook., Niger Fl. 503. 1849; Baillon, Etud. Gen. Euph. 436. 1858; Prain, Ann. Bot., London 25: 631. 1911; Rama Rao, Fl. Pl. Travancore 368. 1914; Pax & Hoffm. in Engler, Pflanzenr. IV. 147. VII (Heft 63): 133. 1914; Haines, Bot. Bih. & Orissa 1: 116. 1921; Gamble, Fl. Pres. Madras 1328. 1925; Raizada, Indian For. Rec. 5: 228. 1939; Nair, Curr. Sci. 31: 26. 1962; Nair & Nair, Bull. Bot. Surv. India 6: 70. 1964; Bennett, Indian For. 92: 227. 1966; Nair, Fl. Punjab Plains 239. 1978; Bennett, Fl. Howrah Dist. 212. 1979; Airy Shaw, Kew Bull. 37: 31. 1982; Rani & Matthew in Fl. Tamil Nadu Carnatic 3: 1460. 1983; Sharma et al., Fl. Karnataka 254. 1984; Chandrabose in Henry et al., Fl. Tamil Nadu 2: 235. 1987.

Herbs or subshrubs, annual or rarely perennial, 30 – 80 cm high, much-branched; branches stout or slender, delicate, minutely pubescent or with soft long hairs, sometimes nearly glabrous. Leaves ovate, broadly ovate-lanceolate, ovate-rhomboid, elliptic-ovate, elliptic-lanceolate, acute, obtuse, cuneate or truncate at base, crenate along margins, shortly acuminate at apex, 1.5 – 8 x 0.7 – 3 cm, membranaceous, pilose, puberulous or nearly glabrous and minutely pubescent on nerves; midrib flat above, raised beneath; lateral nerves 5 – 7 pairs, faint to prominent beneath; minor nerves indistinct above, faint to prominent beneath; petioles 1 – 6 cm long, slender, finely pubescent, nearly glabrous; stipules minute, subulate, linear, up to 2 mm long, finely hairy. Racemes bisexual, axillary or terminal, filiform, equal to or exceeding the leaves, 2.5 – 10 cm long, hispid; bracts very remote; flowers short to long-pedicelled, few, in distant clusters. *Male flowers* subsessile, 1 – 1.5 mm across; sepals 3, ovate to broadly ovate, rounded at base, acute at apex, entire, ca 1 mm across, nearly glabrous, single-nerved; stamens 3 – 10, mixed with ciliate scales or glands, up to 0.8 mm long; filaments up to 0.2 mm long; anther-locules parallel, linear, ca 0.4 mm long, extrorse. *Female flowers* 2 – 4 mm across, solitary or sometimes 2 female flowers with many male flowers; pedicels 0.5 – 2 mm long, nearly glabrous; sepals 3 – 4, ovate-lanceolate, elliptic to suborbicular, 2 – 4 mm across, hirsute; scales 3, attached to ovary, alternate with sepals, ligulate, oblong, obtuse or subacute at apex, 1 – 2 mm long, whitish, hyaline, transparent. Capsules 3-loculed, tridymous or rarely didymous, globose or subglobose, 0.7 – 1 cm across, depressed, glabrous or sparsely hairy; cocci globose, thinly crustaceous, loculicidally or septicidally dehiscent; seeds globose, 3 – 4 mm across, pale brown, pitted or verrucose; testa pitted, non-strophiolate.

Chromosome numbers: $2n = 20$ (Datta, Taxon 16: 341 – 350. 1967); $2n = 20, 40, 60$ (Champault, Bull. Soc. Bot. Tr. 117: 137 – 168. 1970); $2n = 40$ (Brunel & Laplace, Taxon 26: 557. 1977).

Flowering & Fruiting: August — December.

S. R. M. Susila Rani and N. P. Balakrishnan

Ecology: Usually a weed of cultivation, restricted to moist, shaded gravelly soils, wastelands and in places where city wastes are heaped.

Distribution: India (Andhra Pradesh, Goa, Haryana, Himachal Pradesh, Karnataka, Kerala, Lakshadweep, Madhya Pradesh, Maharashtra, Pondicherry, Rajasthan and Uttar Pradesh). Tropical Africa, Arabia, Sri Lanka, Myanmar and Thailand.

Notes: *C. mercurialis* differs from its two allied species by its annual herbaceous habit, androgynous filiform racemes and rounded leaf-bases.

The number of stamens vary from plant to plant. Normally it shows 2 – 3 or 3 – 5 stamens, but in some plants it goes up to 10. The capsules are usually tridymous, sometimes didymous with a slight projection of undeveloped carpel on one side.

Specimens examined: INDIA. Andhra Pradesh: Chittoor Dist. Satyavedu to Ambakam, ca 125 m, *Chandraboise* 45213 (MH). Guntur Dist. Mellavagu, *Wagh* 36941 (BLATT). Krishna Dist. Nuzuid, *Venkanna* 5216 (MH). Nellore Dist. Nellore, Shiwburg, *S. K. Wagh* 6756 to 6758 (BLATT). Visakhapatnam Dist. Andhra Univ. Campus, *Pullaiah* s. n. (SKU, acc. no. 7328); Anakapalle, W. C. s. n. (MH, acc. no. 85614); Krishnapuram, *Barber* 1966 (MH); Simhachalam, *S. K. Wagh* 4395 (BLATT); Visakhapatnam, *Subba Rao* 22559 (MH); Waltair Univ. Campus, *Santapau* 21344 (BLAT). Goa. Parvorim, *Kanodia* 89814 (MH). Haryana. Karnal Dist., Karnal on hill slopes, *N. C. Nair* 25138 (BSD); Dadri, *N. C. Nair* 25155 (BSD). Himachal Pradesh. Shimla Dist., Shimla, *Shaik Mokim* s. n. (CAL, acc. no. 413072). Karnataka. Bangalore Dist. Basawangudi, *R. S. Rao* s. n. (CAL). Dakshina Kannada Dist. Jahlsur, W. C. 2471 (MH); Naravi, *S. R. Raju* 18111 (MH). Kerala. Alappuzha Dist. Vembanad Lake, R. Block, *M. S. Swaminathan* 88254 (MH). Kannur Dist. Kunnoth R. F., ca 150 m, *Ramachandran* 57558 (MH); Kannur, *Ramachandran* 67028 (MH); Karimbam, ca, 175 m, *R. Ansari* 70924 (MH); Pajiusseri, ca 100 m, *R. Ansari* 64954 (MH); Taliparamba farm, *Barber* 7863 (MH). Kasaragod Dist. Kollam, *Rama Rao* s. n. (CAL, acc. no. 413074); Nilamel, ca 100 m, *C. N. Mohanan* 55772 (CAL). Kottayam Dist. Changanacherry, *Antony* 160 (MH). Kozhikode Dist. Kutiyadi submergible area, ca 190 m, *Naithani* 24164 (MH); Calicut Univ. Campus, *Sivarajan* 1180 (MH). Thrissur Dist. Near Wadakkancherry, *Ramamurthy* 47694 (MH). Thiruvananthapuram Dist. Chirayinkal, *M. Mohanan* 61811 (MH); Vamanapuram, ca 125 m, *M. Mohanan* 63393 (MH). Lakshadweep. Agathi Island, *Wadhwa* 48925 (CAL); Kavarathy Island, *Wadhwa* 68660 (CAL). Maharashtra. Bombay. Azad Maidan, *Almeida* 529 to 526 (BLAT); Goregaon, *Almeida* 530 to 536 (BLAT); Reclamation area, *Santapau* 839 (BLAT). Pondicherry. Auroville, *Rajan* 86260 (HIFP); *ibid.* *Rajan* 88008 (MH). Rajasthan. Nagar Dist. Lohawat, Sept. 1960, *N. C. Nair* 983 (BSD). Tamil Nadu. Chengai-MGR Dist. Gnayiru, Ponneri Taluk, *Narasimhan* 605 (MH). Coimbatore Dist. Dharapuram, *Narayanan* 6133 (MH); Kadamparai, *Chandraboise* 65865 (CAL); Kuridimalai, *Daniel Sunderaraj* 94129 (MH); Nellipatti, *Fischer* s. n. (CAL, acc. no. 413075);

Revision of *Claoxylon* in India

Vijayapatti, *Daniel Sunderaraj* s. n. (MH, acc. no. 94079). Kanniyakumari Dist. Muthukuzhi Sholas, *Henry* 70643 (CAL). Madras, *Barber* 254 (MH); *ibid.*, *Govindarajalu* 2469 (PCM). Madurai Dist. Pannaikadu, near Usilampatti, ca 330 m, *Ravikumar* 2845 (MH). Quaid-e-Milat Dist. Nagapatnam, *V. J. Nair* 57127 (H). Nilgiri Dist. Kutrapatti, ca 475 m, *Subba Rao* 37474 (MH). Ramanathapuram Dist. Mandapam, Sanythoppu, *N. C. Nair* 5313 (MH); Pamban, *Daniel Sunderaraj* 20033 (MH); Rameswaram, *N. C. Nair* 53080 (MH). Salem Dist. Hogainakkal, *Vajravelu* 21922 (MH); Kolli hills, Puliancholai, *Manoharan* 19586 (RHT); Kolli hills, Airadurai aaru, *Venugopal* 15827 (RHT). South Arcot Dist. Chidambaram taluk, Pichavaram to Chidambaram, *Perumal* 181103 (RHT); Mclpat, *Barber* 922 A (MH), Tarakkanam, *Balasubramanyam* 182 (RHT). Thanjavur Dist. Muthupet, *Ramamurthy* 25847 (MH); Point Calimere, *Ellis* 11832 (MH). Tiruchirapalli Dist. Hambarosampatti, *Jegannathan* 30266 (BALT); Mukkombu, *Matthew* 29558 (RHT); Thuralur Taluk, Pachamalai Ghat Road, *Manoharan* 19498 (RHT). Tirunelveli Dist. Pillaivilai, *Sebastine* 13653 (MH). Uttar Pradesh: Agra Dist., *Dakshini* s. n. (BSD, acc. no. 21806).

Claoxylon wightii Hook. f., Fl. Brit. India 5: 413. 1887; Rama Rao, Fl. Pl. Travancore 368. 1914; Susila Rani & Balakr., J. Econ. Taxon. Bot. 16: 733 – 736. 1992.
Type: Tamil Nadu. Courtallam, July 1835, *Wight* 2676 (K).

Micrococca wightii (Hook. f.) Prain, Ann. Bot., London 25: 630. 1911; Pax & Hoffm. in Engler, Pflanz. IV. 147. VII (Heft 63): 133. 1914; Gamble, Fl. Pres. Madras 1328. 1925; Chandrabose in Henry et al., Fl. Tamil Nadu 2: 234. 1987.

Shrubs or undershrubs, woody, up to 1 m high; branches and branchlets terete, nearly glabrous, sparsely soft-hispid or densely hirsute or yellowish tomentose; nodes annulate or not, distant or very close, often much abbreviated. Leaves alternate or subopposite, ovate or oblong-lanceolate, elliptic-lanceolate to linear-lanceolate, obtuse or subtruncate to narrowly or broadly cuncate at base, acute to acuminate at apex, subentire, crenate or serrate, irregularly glandular-serrate along margins, 3 – 10 x 0.5 – 3.5 cm, chartaceous, softly velvety on both sides, nearly glabrous or sparsely white-hairy or fulvous silky on both sides or sparsely villous above, densely yellowish hirsute or tomentose beneath, especially on nerves, dark green above and pale green or glaucous white beneath; midrib flat above, raised beneath; lateral nerves 4 – 6 pairs, more distinct beneath; minor nerves indistinct above, faint to prominent beneath; petioles 1 – 4.5 cm long, slender, terete, finely pubescent or densely hirsute, bearing 2 glands at apex; stipules subulate to linear-lanceolate, 0.5 – 1 mm long, finely hairy or densely hirsute. Inflorescences axillary or terminal racemes, solitary or in clusters, filiform – flexuous, 2 – 8 cm long, finely hairy or densely hirsute; bracts linear, lanceolate, ovate-lanceolate, obtuse at base, acute-acuminate at apex, irregularly serrate or nearly entire, 1 – 3.5 x 1 – 1.5 mm, finely hairy or densely yellowish hirsute or villous. *Male flowers*: buds globose to ovoid-acute, ca 2 mm across; flowers 2 – 3 mm across, clustered fairly close to very close or distantly on the stalk, 1 – 4 fertile male flowers mixed with 1 – 8, up to 1.5 mm long sterile male flowers in each cluster; pedicels 2 – 4 mm long, finely hairy or densely hirsute; sepals 3, ovate, connate,

S. R. M. Susila Rani and N. P. Balakrishnan

rounded at base, acute at apex, entire, 1 – 2 x 0.7 mm, hyaline, subglabrous or densely hirsute outside; stamens 6 – 10, subsessile, clustered at the centre, mixed with unequal hyaline scales or filaments, 0.3 – 0.7 mm long; anthers oblong, ca 0.3 x 0.5 mm, connate at base, extrorse. *Female flowers* solitary in axillary racemes, 3 – 4 mm long, nearly glabrous or densely hirsute; scales 2, ovate, suborbicular, elliptic-lanceolate, rounded at base, acute at apex, ca 2 mm long, greenish, finely hairy or densely hirsute or tomentose; scales 3, attached to ovary, alternating with sepals, ligulate, linear-oblong, obtuse or acute at apex, ca 2 mm long. Capsules 3-lobed, 7 – 10 mm across, hispid or densely hirsute; cocci thin, crustaceous; seeds subglobose, ca 3 mm across, smooth, dotted with shallow white pits with thin aril.

Key to the varieties

- 1a. Plants glabrous or subglabrous; leaves subglabrous; bracts linear-lanceolate; fertile male flowers mixed with 1 – 2 sterile male flowers.....2
- b. Plants densely yellowish tomentose or hirsute; leaves densely hirsute on both sides; bracts ovate-lanceolate; fertile male flowers mixed with 3 – 8 sterile male flowers..... 3
- 2a. Internodes 1 – 3 cm long; petioles 1 – 4 cm long.....var. *wightii*
- b. Internodes 3 – 6 mm long; petioles up to 1 cm long.....var. *glabratum*
- 3a. Internodes 1.2 – 2 cm long; petioles up to 4 cm long; leaves ovate-lanceolate, usually more than 1.5 cm wide, sparsely glandular-serrate along margins; fertile male flowers 3 – 4 in each cluster, mixed with 3 – 4 sterile flowers; bracts dissected or toothed.....var. *hirsutum*
- b. Internodes 3 – 6 mm long; petioles up to 1 cm long; leaves linear-lanceolate, usually less than 1.4 cm wide, closely glandular-serrate along margins; fertile male flowers solitary in each cluster mixed with 6 – 8 sterile flowers; bracts entire.....var. *angustatum*

var. *angustatum* Susila & Balakr., J. Econ. Taxon. Bot. 16: 736. 1992.

Types: Tinnevely hills, *R. H. Beddome* 7300 (Holotype in BM); *ibid.* *R. H. Beddome* s. n. (Isotype in MH, acc. no. 48141). (Fig. 6)

Branches and branchlets terete, often with abbreviated stems; nodes very close; internodes 3 – 6 mm long, densely pubescent in younger parts, glabrous in old parts. Leaves linear-lanceolate, cuneate at base, acuminate at apex, glandular-serrate along margins, 3 – 7 x 0.5 – 1.3 cm, sparsely villous above, densely yellowish hirsute beneath, especially on nerves; petioles up to 1 cm long, densely hirsute. Racemes 2 – 5 cm long, densely hirsute; bracts linear-lanceolate, entire, 0.5 – 1 x 0.2 – 0.6 mm. Male clusters fairly close, with single fertile flowers mixed with 6 – 8 sterile flowers.

Flowering & Fruiting : Unknown.

Revision of *Claoxylon* in India

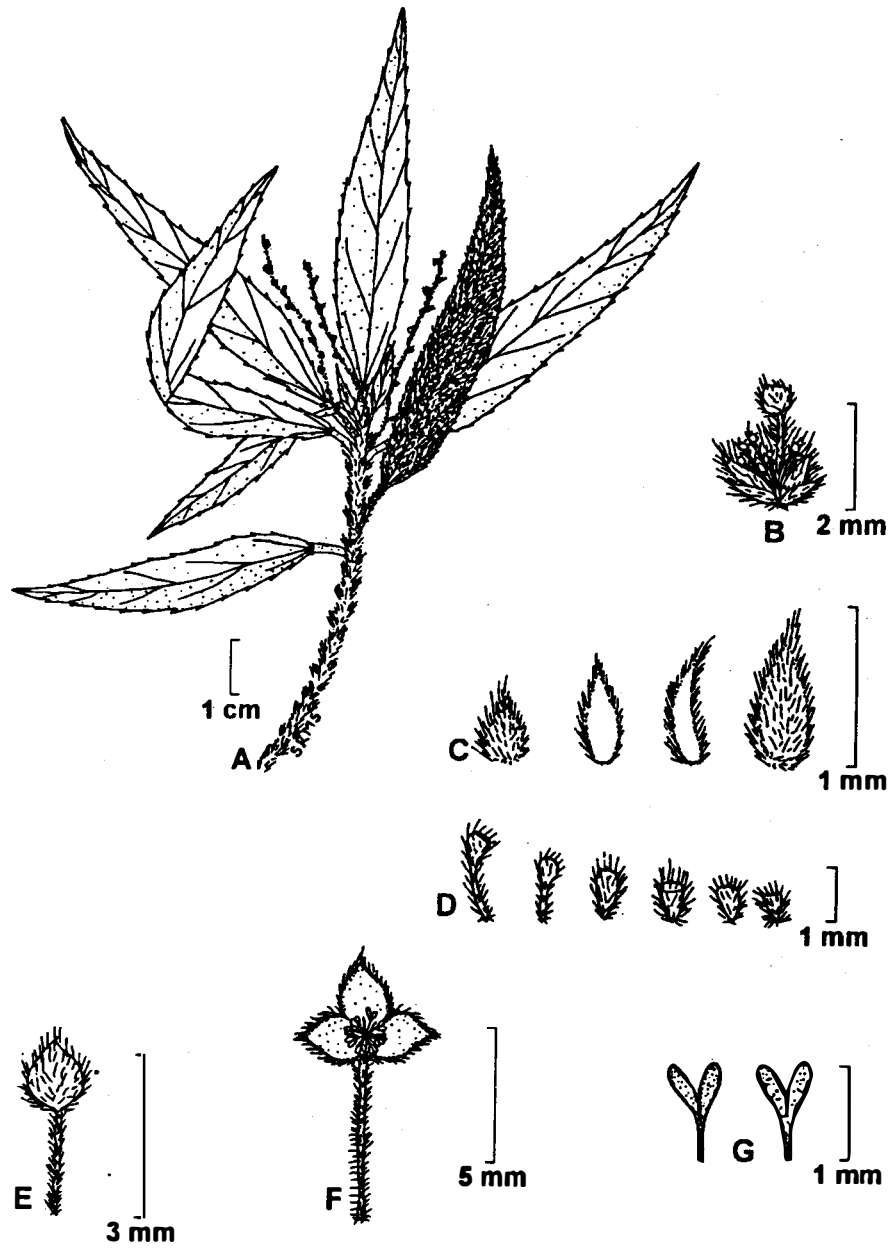


Fig. 6. *Claoxylon wightii* var. *angustatum* Susila & Balakr.: A. Twig with inflorescences; B. Cluster of flowers; C. Bracts; D. Sterile flowers; E. Male bud; F. Male flower; G. Stamens.

S. R. M. Susila Rani and N. P. Balakrishnan

Ecology : Evergreen hill forests.

Distribution : India (Endemic to the Tirunelveli hills of Tamil Nadu).

Specimens examined : INDIA. Tamil Nadu: Tirunelveli Dist., Singampatty forests at Snake falls, ca 1000 m, *R. H. Beddome* s. n. (Isotype in MH, acc. no. 48141).

var. **glabratum** Susila & Balakr., J. Econ. Taxon. Bot. 16: 735. 1992.

Types: *Ellis & Karthikeyan* 31334 (Holotype in MH); *Ellis & Karthikeyan* 31334 (Isotype in MH).

Branches and branchlets woody, with very close nodes, having 3 – 6 mm long internodes. Leaves alternate, serrate, deeply crenate along margins and broadly acute-acuminate at apex; petioles up to 1 cm long.

Flowering & Fruiting : June — November.

Ecology : On hill slopes of evergreen forests.

Distribution: India (Endemic to Coimbatore District of Tamil Nadu).

Specimens examined : INDIA. Tamil Nadu: Coimbatore Dist. Kuridimalai hills, ca 1600 m, *Ellis & Karthikeyan* 31334 (Holotype and isotype in MH); *ibid.* southern slopes, 1270 m, *M. V. Viswanathan* 693 (Paratype in MH).

var. **hirsutum** (Hook. f.) Susila & Balakr., J. Econ. Taxon. Bot. 16: 735. 1992. *Claoxylon hirsutum* Hook. f., Fl. Brit. India 5: 413. 1887.

Micrococca wightii (Hook. f.) Prain var. *hirsutum* (Hook. f.) Prain, Ann. Bot., London 25: 630. 1911; Pax & Hoffm. in Engler, Pflanzenr. IV. 147. VII (Heft 63): 133. 1914.

(Fig. 7)

Branches and branchlets densely yellowish tomentose or yellowish hirsute; nodes distant; internodes 12 – 20 mm long. Leaves lanceolate to ovate-lanceolate, dissected or toothed along margins; midrib prominent, 1 – 3.5 x 1 – 1.5 mm. Male clusters distant, with 3 – 4 fertile male flowers mixed with 3 – 4 sterile male flowers in each cluster.

Flowering & Fruiting : March — November.

Ecology : Evergreen hill forests, 800 – 1500 m.

Distribution : India (Endemic to Tirunelveli District of Tamil Nadu).

Revision of *Claoxylon* in India

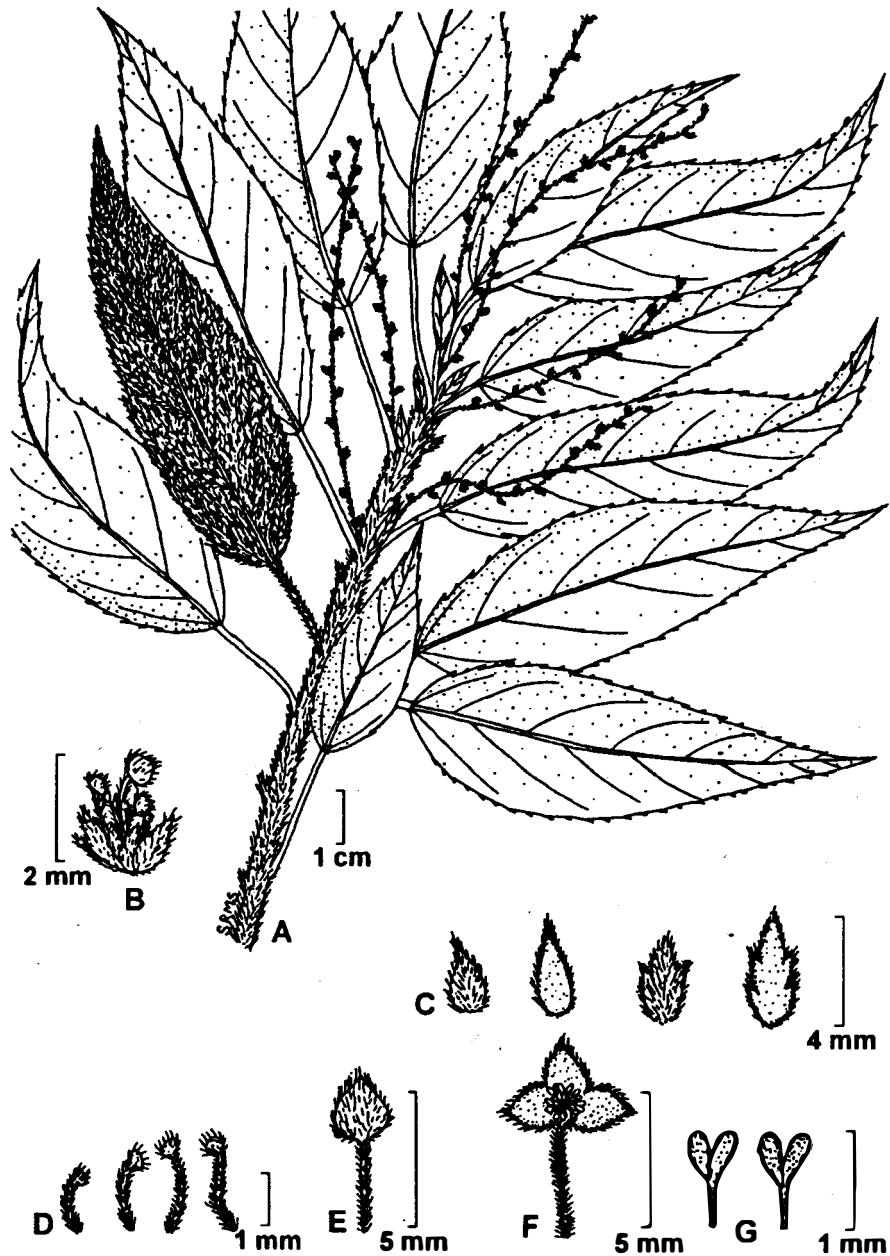


Fig. 7. *Claoxylon wightii* var. *hirsutum* (Hook. f.) Susila & Balakr.: A. Twig with inflorescences; B. Cluster of flowers; C. Bracts; D. Sterile flowers; E. Male bud; F. Male flower; G. Stamens.

S. R. M. Susila Rani and N. P. Balakrishnan

Specimens examined : INDIA. Tamil Nadu: Tirunelveli Dist., Kupandi, via Kannikatty, Gopalan 88626 (MH).

var. **wightii**

Branchlets terete, nearly glabrous; nodes distant; internodes 1 – 4 cm long. Leaves alternate, ovate-lanceolate, elliptic-lanceolate, broadly cuneate at base, acute to acuminate at apex, subentire, crenate or serrate along margins, 6 – 10 x 2 – 3.5 cm, nearly glabrous or sparsely white hairy on leaves, petioles and inflorescences; petioles 1 – 4 cm long. Racemes many, 2 – 8 cm long; male clusters fairly close or distant on stalk; each fertile flower mixed with 1 – 3 sterile flowers in a cluster.

Flowering & Fruiting : June — November.

Ecology : Evergreen hill forests.

Distribution : India (Endemic to Courtallam hills of Tamil Nadu). A rare variety, never collected since the type in 1835.

Specimens examined : INDIA. Tamil Nadu: Tirunelveli Dist. Courtallam hills, July 1835, Wight 2676 (Type in K).

Section 5. ROSTRATAE Susila Rani et Balakr., sect. nov.

Plantae dioeciae; fructus inflati complanati, subglobosi, subpyriformes, mediane bilobati, manifeste stipitati, apice rostrati.

Typus: *C. rostratum* Airy Shaw.

Dioecious; fruits inflated, flattened, subglobose, subpyriform, bilobed at middle, stipitate at base, rostrate at apex. Monotypic.

Claoxylon rostratum Airy Shaw, Kew Bull. 32: 389. 1978; T. Chakrab., J. Econ. Taxon. Bot. 6(2): 451. 451. 1985; T. Chakrab. & Balakr., J. Econ. Taxon. Bot., Add. Ser. 9: 40, f. 9. 1992.

Type: Andaman Islands, *Parkinson* 31 (K-holotype, Photo !).

(Fig. 8)

Shrubs or trees, 2 – 12 m tall, dioecious; bark whitish; branches woody with milky latex; branchlets yellow or whitish glaucous, terete, glabrous or puberulous. Leaves alternate, narrowly broadly elliptic, elliptic-lanceolate, obovate to oblanceolate, cuneate to subcuneate or rarely obtuse or truncate at base, acute to caudate-acuminate at apex, nearly entire to obscurely sinuate-serrate along margins, 9 – 37 x 3 – 17 cm, membranaceous, subcoriaceous, mostly nearly glabrous, finely pubescent or pilose on nerves, glossy green above when fresh; midrib

Revision of *Claoxylon* in India

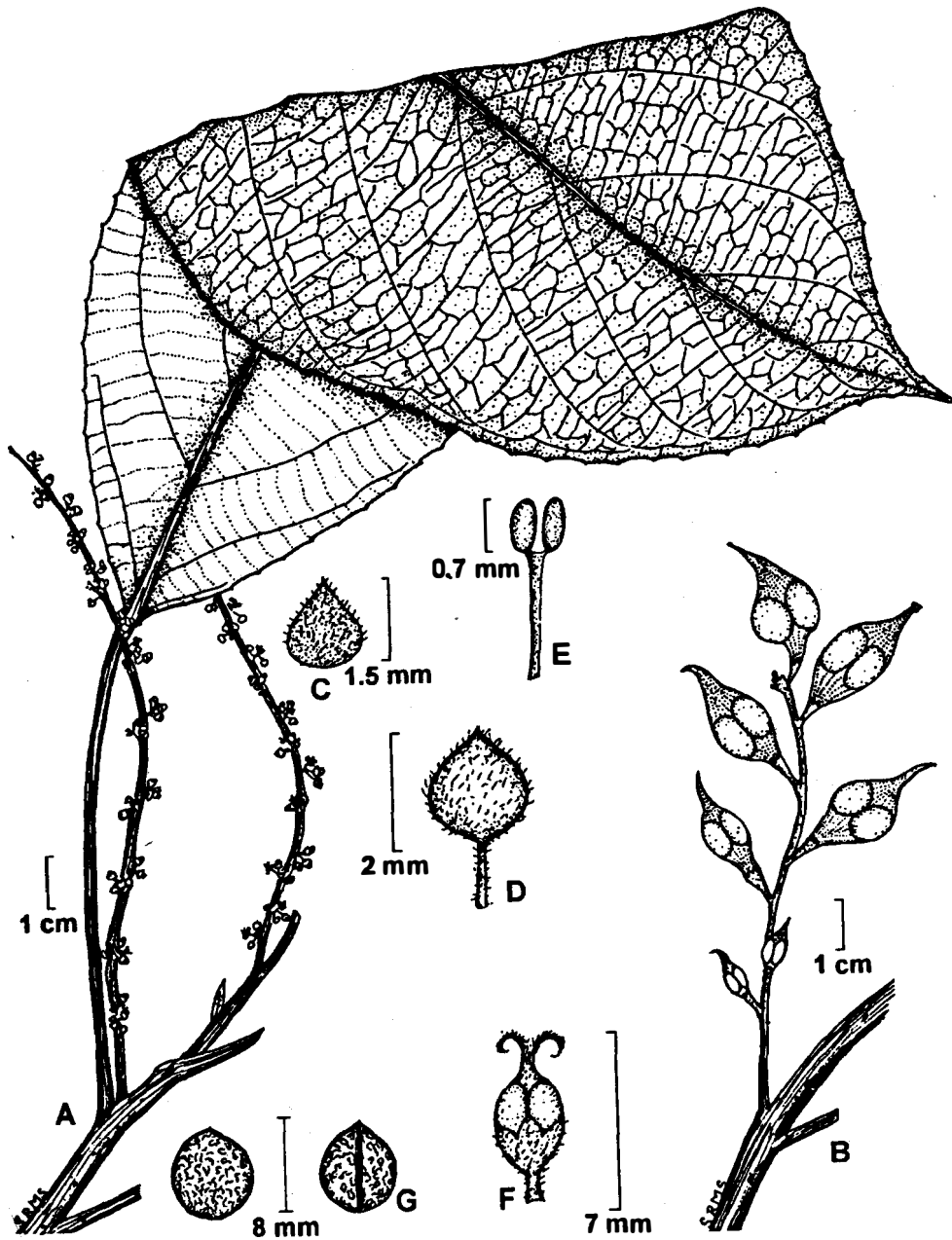


Fig. 8. *Claoxylon rostratum* Airy Shaw: A. Twig with inflorescences; B. Twig with fruits; C. Male bract; D. Male bud; E. Stamen; F. Female flower; G. Seeds - outer and inner views.

S. R. M. Susila Rani and N. P. Balakrishnan

flat above, raised beneath; lateral nerves 5 – 10 pairs, faint above, prominent beneath; cross-nervules and minor nerves faint above, obscure beneath; basal glands 2; petioles 1 – 14 cm long, slender, terete, nearly glabrous or puberulous; stipules minute or obsolete, glandular. *Male flowers* in clusters on axillary or terminal elongate filiform 4 – 25 cm long racemes, nearly glabrous, pilose or puberulous; bracts 1 – 1.5 mm across, densely pubescent; flower-buds ovoid to subglobose, acute, 1.5 – 2 mm long; flowers in axils of bracts, 3 – 5 mm across; pedicels 2 – 4 mm long; sepals 3, ovate, orbicular, rounded at base, acute at apex, 1.5 – 2 mm across, tomentellous; stamens ca 40, clustered on a central receptacle, mixed with a tuft of hyaline purplish scales or glands at apex; filaments free, slender, 0.5 – 1.5 mm long; anthers 2-loculed, globose, 0.5 – 0.7 mm long, free above, connate below; connectives obscure. *Female flowers* solitary in axils of bracts, in axillary or terminal 3 – 12 cm long racemes, finely pubescent; bracts ovate-lanceolate, rounded at base, acuminate to cuspidate at apex, entire, 1 – 1.5 mm across; pedicels 1 – 5 mm long, increasing in length with the development of fruit; sepals 3 – 5, spathaceous, broadly triangular-ovate, 2 – 3 mm across, densely puberulous outside; disc shortly cupular, ca 1 mm long, entire, pilose outside, reddish purple; ovary broadly ovoid, 2-loculed, rarely 3-loculed, ca 4 mm across, densely pubescent; ovule solitary in each locule; styles 2 (–3), filiform, recurved, 1 – 1.5 mm long, hairy, persistent in fruit. Capsules flattened, subpyriform or inflated-subglobose, bilobed at middle, conspicuously stipitate or rarely rounded at base and rostrate at apex, bilocular, rarely with an undeveloped third locule, 9 – 14 mm long (excluding apical beak and basal stipe), 10 – 15 mm across, adpressed ochraceous-puberulous, greenish or dark purple when dry; stipe attenuate to shortly subcampanulate, 3.5 – 10 mm long; apical beak 3 – 18 mm long; straight or curved, scattered or adpressed ochraceous puberulous (often densely so at base), with persistent 2 – 4 mm long recurved style at apex, fruiting pedicels 2 – 10 mm long, ochraceous tomentellous; seeds 2, rounded, globose, 5 – 8 mm across, mottled with orange to dark reddish brown, shiny.

Flowering & Fruiting : February — December.

Ecology : In dense evergreen inland forests, along sides of streams, and also in scrub forests, or rocky sandy loam or red soil, up to 700 m altitude.

Distribution : India (Andaman & Nicobar Islands) and Myanmar.

Notes : Similar to *C. physocarpum* Airy Shaw of Sumatra, in its inflated bilocular capsule, but easily distinguishable by its conspicuously long-beaked capsules. It also differs in the ochraceous (not rufous) tomentellum and the entire (rather than fibrillose-filamentose) interstaminal glands.

Specimens examined : INDIA. Andaman & Nicobar Islands: Andamans, *Prain* s. n. (CAL, acc. no. 412812); Balughat hill jungle, *King's collector* s. n. (CAL, acc. no. 412902, 412919); Gopalkabang and Wimberleygunj hill jungle, *King* s. n. (CAL, acc. no. 412989); New Brookesabad hill jungle, *King* s. n. (CAL, acc. no. 412901, & 412903); North Bay hill jungle, *King* s. n. (CAL, acc. no. 412905); South Andamans, *King* s. n. (CAL, acc. no. 412910 & 412912); Tusonabad, *King* s. n. (CAL, acc. no. 412904);

Revision of *Claoxylon* in India

Great Nicobar Island, *Balakrishnan* 5782 (PBL, CAL); *ibid.*, *Dwivedi* 7887 (PBL); Katchal Island, *Vasudeva Rao* 7520 (PBL, CAL).

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