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THE GENUS *VATICA* L. (DIPTEROCARPACEAE) IN CEYLON

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ABSTRACT

In Ceylon 4 endemic species of *Vatica* occur of which one, (*Vatica obscura*) occurs as a riverine species in the dry zone, the other three are restricted to the wet zone, two of them on well drained soils, one (*V. paludosa*) in marshy places. *Vatica lewisiana* is removed from *Cotylelohium* and again assigned to *Vatica*. *Vatica paludosa* Kosterm., sp. nov. is neither identical with *V. roxburghiana*, an Indian species, nor the same as *V. chinensis* L., a species of unknown origin, to which the Ceylonese material has been referred formerly.

ABSTRAK

Di Ceylon terdapat 4 jenis *Vatica* yang endemik. Satu (*V. obscura*) merupakan jenis yang hidup di hutan tepi sungai di daerah kering, dua tumbuh di tanah berdrainase baik di daerah basah dan satu lagi (*V. paludosa*) ada di tempat berpaya-paya. Yang terakhir ini tidak sama dengan jenis India *V. roxburghiana* ataupun *V. chinensis* yang tidak diketahui asal-usulnya, *V. lewisiana* dikeluarkan lagi dari *Cotylobium* dan dikembalikan ke *Vatica*.

INTRODUCTION

Although the Ceylonese species of *Vatica* have been treated recently by Ashton (1977, 1980), a number of mistakes in references, typification, characters and ecology have crept in, which need correction. For this reason the following is presented.

V A T I C A L.

Vatica Linnaeus, Mantissa Pl. 2: 152. 1771; A. DC, Prodr. 16(2): 618. 1868; Dyer in Hooker f., Fl. Br. Ind. 1: 302. 1874 (sect. *Isauxis*); Trimen, Handb. Pl. Ceylon 1: 127. 1893; Brandis in J. Linn. Soc. 31: 119. 1895; Ashton in Dassanayake

(editor), Revised Handb. Fl. Ceylon 1(2) : 195. 1977 and 1: 420. 1980. — Type species: *Vatica chinensis* L.

Isauxis Arnott in Ann. Nat. Hist. 3: 155. 1839; in Wight, Illustr. Ind. Bot. 1: 88. 1840; Reichenbach, Nomencl. 210. 1841; Benth. & Hook., Gen. Pl. 1: 199. 1862.

Retinodendron Korthals in Verhandl. Natuurl. Geschied. Nederl. Overz. Bezitt; Bot., Batavia 55. 1839; Benth. & Hook., l.e. 192; Brandis, l.e. 119 (submenus).

KEY TO THE SPECIES

- 1a. Leaves very densely, minutely stellate-lepidote underneath; midrib impressed above. Fruit sepals pointing downward 1. *V. lewisiana*
- b. Adult leaves glabrous underneath; only stellate hairs present. Midrib prominent above. Fruit sepals loosely clasping the fruit base or patent 2
- 2a. Lateral nerves 6-8 pairs. 2. *V. affinis*
- b. Lateral nerves more than 11 pairs. 3
- 3a. Leaves ovate to ovate-oblong, base rounded to subcordate; lateral nerves conspicuous on the lower surface. Fruit large, depressed globose, with rather thin, much enlarged sepals adpressed to its base. 3. *V. paludosa*
- b. Leaves lanceolate to lanceolate-oblong, base rounded or acute; lateral nerves very faint on the lower surface. Fruit ovoid-globose, small, with rigid not enlarged patent or reflexed sepals. 4. *V. obscura*

1. VATICA LEWISIANA (Trimen ex Hooker f.) Livera

Vatica lewisiana (Trimen ex Hook, f.) Livera in Ann. Roy. Bot. Gard. Peradeniya 9: 97, t. XI, 1-4. 1924; Lewis, Veget. Prod. Ceylon 49. 1934; Alston in Trimén, Handb. Fl. Ceylon 6 (Suppl.) 25. 1931 (as a synonym of *Vateria? Lewisiana*); Ashton in Blumea 20: 358. 1972 and in Dassanayake (editor) Revised Handb. FL Ceylon 1(2): 167. 1977 and 1: 366. 1980 (as a syn. of *Cotylelobium lewisianum*). — *Stemonoporus lewisianus* Trimén ex Hooker f., in Trimén, Handb. Fl. Ceylon 5: 383. 1900; Lewis, Trees & Fl. PL W. and Sabaragamuwa Prov. 37. 1902; Veget. Prod. Ceylon 49. 1934; E.J. Livera, l.e. 97 (as a syn. of *Vatica lewisiana*); Alston, l.e. (as a syn. of *Valeria? lewisiana*); Ashton, 11. cc. (as a syn. of *Cotylelobium lewisianum*); Kostermans, Monograph of *Stemonoporus*, in press. — *Vateria? lewisiana* (Trimen ex Hooker f.) Alston, l.e. 25; Ashton, 11. cc. (as a syn. of *Cotylelobium lewisianum*); Kostermans, l.e. — *Cotylelobium lewisianum* (Trimen ex Hooker f.) Ashton, 11. cc.; Kostermans, l.e. — Typus: *Lewis s.n.*, Jan. 1893 (K) (PDA, isotype: 2 sheets); syntypus: *Lewis s.n.*, fr. April 1893 (PDA).

Tree, up to 35 m tall and 130 cm dbh. Buttresses none. Bark pale grey, becoming irregularly flaky (Ashton). Twigs thin, densely buff stellate-lepidote (scales very small). Stipules minute, caducous. Leaves rigidly coriaceous, oblong or elliptic, rarely (young trees) subovate-oblong, 2 X 5—4 x 10 (average)—7 x 17 cm, shortly (5 mm) acuminate, arumen with broad base; base obtuse; above glossy, glabrous, smooth, the thin midrib slightly" impressed, the lateral nerves very

obscure; below very densely buff lepidote-stellate haired (scales with minute body and flat thin arms, very minute), midrib prominent, lateral nerves thin, prominulous, rather patent, c. 10 pairs with intermediate, almost as long ones, combined in a thin, wavy marginal vein, in between microscopic reticulation. Petiole slender, densely lepidote-stellate haired, 1—1 1/2 cm long, finely channeled above.

Panicles axillary, erect, lax, many-flowered, densely minutely buff stellate-lepidote (arms more erect), up to 8 cm long. Branchlets few, short. Pedicels nodding, 4—6 mm long, densely stellate-lepidote. Sepals ovate-triangular, acute, densely lepidote-stellate, 2—3 mm long. Petals fleshy, white, broadly elliptic, obtuse, 6—7 mm long, 5 mm wide, the parts outside not covered by the adjacent petal densely buff lepidote stellate. Stamens 15, in two whorls of 10 and 5, inner slightly longer. Filaments 1 mm, base broad, triangular, apex filiform; anthers oblong, appendix half as long, slender. Ovary densely pilose. Style as long as stamens with depressed capitellate stigma with 3 excrescences.

Fruit (immature) sub-globose, densely pilose; the sepals hardened, turned downwards.

DISTRIBUTION: Near Pelmadulla, Kiribatgalle and Hunawalakande.

The species is in its salient characters not different from the other three Ceylonese species of *Vatica*, except the fruit sepals, which are turned downward and the stellate-lepidote leaves. For other notes cf. Kostermans' Monograph of *Stemonoporus*.

Kiribatgalle near Pelmadulla, 750 m, ster., Ashton 2016 (quoted 2116) and 2117 (PDA); Kiribatgalle near Kahawatte, sapling, *Livera s.n.* (PDA); Hunawalakande near Pelmadulla, 600 m, Jan. 1893, fl., *Lewis s.n.* (PDA, 3 sheets); Apr. 1893, fr., *Lewis s.n.* (PDA); Nov. 1891, *Lewis*, sapling (PDA).

2. VATICA AFFINIS Thw. — Fig. 1.

Vatica affinis Thwaites, Enum. Pl. Zeyl. 404. 1864; DC, Prodr. 16(2): 619. 1868; Dyer in Hooker f, Fl. Br. Ind. 1: 303. 1874; Trimen, Handb. Fl. Ceyl. 1: 128. 1893; Ashton in Dassanayake (editor), Revised Handb. Fl. Ceylon 1(2): 195. 1977 and 1: 421. 1980; Maury, Dipterocarpacees, du fruit à la plantule (Thesis): 1A: 63; 2: fig. 116, 228, 241, 473, 474, 587, 633, 678 NC. 1978; — Lecto typus propositum: *C.P. 3416*, Pasdoon Korale, Apr. 1855, young fr. and fls. (PDA); syntypus: Cultura (Kalutara), *C.P. 3416* (PDA).

Isauxis roxburghiana Auct. non Wight, Thwaites, Enum., l.e. 37. 1858 and 404. 1864. — *C.P. 3416* (PDA).

Canopy tree, up to 35 m tall and 70 cm dbh. Bark smooth, grey, hoop ringed, thin. Branchlets apically with microscopical fugaceous indumentum or glabrous. Leaves chartaceous to sub-coriaceous, glabrous (initially with few hairs below), ovate-oblong to ovate-lanceolate, 2 1/2 x 7



FIG. 1. *Vatica affinis* Thw.

— $3\frac{1}{2}$ x 10—7 x 18 cm, acute, base obtuse to shortly acute, both sides minutely reticulate, above the slender midrib and thin lateral nerves prominulous, below midrib prominent, the 4—6 pairs of lateral nerves erect-patent (lower pair more erect), slender, prominent, arcuate; secondary nerves (intercostals) not different from the reticulation. Petiole slender, $1\frac{1}{2}$ —3 cm long, apically thickened or not.

Panicles axillary, erect, many-flowered, up to 10 cm long with few thin main branchlets, up to 3 cm long with sparse microscopic indumentum of stellate hairs, indumentum becoming denser towards the flowers. Pedicels 2—3 mm long. Flowers densely pale, stellate-pilose; sepals ovate, very acute, up to $3\frac{1}{2}$ mm long; petals pinkish yellow, narrow, up to 13 mm long. Stamens 15; ovary densely pilose, style with depressed capitulate stigma with obscure accrescences.

Fruit globose, smooth, glabrous ultimately, 2— $2\frac{1}{2}$ cm diam., the persistent sepals ovate to ovate-oblong, c. 1 cm long, 6 mm wide, loosely clasping the fruit, thickish; pedicel 6 mm long. Fruit completely dehiscent, cotyledons free, epigeal. The first leaves in a whorl.

DISTRIBUTION: S.W. Ceylon, wet, evergreen rainforest: Hiniduma, Kalutara, Hewesse, scattered, indifferent to deep or shallow soils. Not restricted to stream sides.

The leaves are not coriaceous (Ashton) and never elliptic (Ashton), the base is never broadly cuneate (Ashton), the inflorescence is a panicle, not a cyme (Ashton).

The fruit has no grooves at maturity, the fruit sepals are ovate or ovate oblong, not oblong (Ashton), the pedicel not 11 mm long, but shorter.

According to Maury the cotyledons remain within the half opened fruit after germination. In our material the valves drop completely.

According to Trimen the wood is like that of *V. paludosa*, but heavier and of darker colour.

Kalutara Distr.: Boralugodde, s. coll., young-fr., C.P. 3416 (B, K, PDA 2 sheets); Nelunkeliya forest Res., Bajalingam 409 (PDA, n.v.); Galle Distr., Nellowe-Pelawatte road, April, buds, Ashton 2074 (PDA); S.E. margin of Sinharaja forest, ster., Ashton 2083 (quoted as 2082) (PDA); Kanneliya forest, alt. 200 m, Febr., buds, Jayasuriya 1540 (PDA); *ibid.*, April, fl., Waas & Peeris 560 (PDA); *ibid.*, ripe fruit, Balasubramaniam s.n. (L).

3. *Vatica paludosa* Kosterm., sp. nov. — Fig. 2.

Vatica roxburghiana Auct. (non Bl., nee Benth.) Thwaites, Enum. PL Zeyl. 404. 1864; Dyer *in* Hooker f., Fl. Brit. Ind. 1: 302. 1874, p.p., quoad Ceylon; Trimen, Handb. Fl. Ceylon 1: 128, 1893 (exclud. cit. *Vatica chinensis*); Alston *in* *ibid.* 6 (Suppl.): 25. 1931; Worthington, Ceylon Trees 67. 1959; Ashton *in* Dassanayake

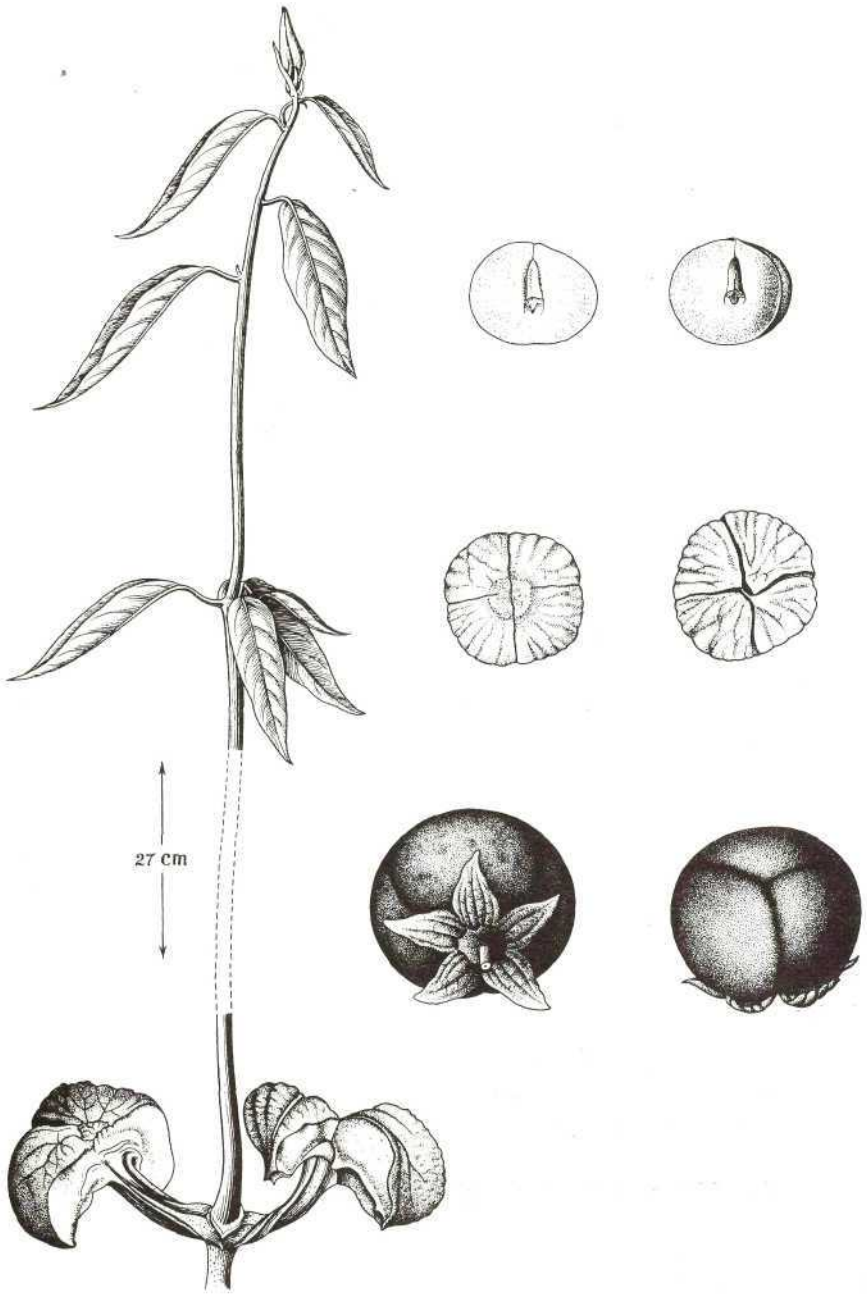


FIG. 2. *Vatica paludosa* Kosterm.

(editor), Revised Fl. Ceylon 1: 422. 1980 (id. 1(2): 166. 1977, exclud. cit. *Isauxis roxburghiana* Thw.). — *Isauxis roxburghiana* (Wight) Thwaites, Enum. 37. 1859, (non *Valeria roxburghiana* Wight), — C.P. 3416 (later C.P. 604) (PDA).

Vatica chinensis Auct. (non L.), Alston, I.e.; Ashton, II. cc.

Arbor, ramulis hornotinis minutissime stellato-lepidotis, foliis sub-ovato-oblongis, basi obtusis, rarissime subcordatis, floribus dense stellato pilosis, sepalis brevis, rigidis ovatis acutiusculis, stigmatate obscure trifidis, fructus magnis depresso globosis dense minutissime lepidotis, sepalis coriaceis incrassatis applantis ovatis persistentibus.

TYPUS: C.P. 604 (PDA).

Tree, up to 15 m tall and 50 cm dbh. Buttresses up to 1 m tall and 50 cm out, concave. Bark smooth, grey, resin plenty, clear, thin. Branchlets densely covered with brown, extremely small stellate scales with short arms, soon glabrous. Leaves chartaceous to sub-coriaceous, lower surface initially finely lepidote, soon glabrous, elliptic to ovate-elliptic, 5 x 12—10 x 25—15 X 30 (epicormic shoot) cm, gradually tapered to an obtuse tip or obscurely, broadly, obtusely acuminate (more conspicuous in juvenile plants), base rounded, very rarely sub-cordate; above smooth, glossy, midrib prominulous, lateral nerves thin, prominulous, secondary veins none or obscure; below paler midrib slightly prominent, lateral nerves 7—11 pairs erect-patent, slender, prominulous, towards margin arcuate, secondary nerves faint, scalariform. Petiole slender, 2 1/2—4 1/2 cm long, apical part thickened.

Panicles axillary on the terminal leaves, densely very minutely stellate pilose, rather few flowered, erect, up to 8 cm long with few, up to 3 cm long branches; pedicel thickish, up to 2 mm long. Calyx lobes thick, ovate, acute, 8—4 mm long, densely stellate pilose, the base forming a 1—2 mm high broadly funnel-shaped obscure tube. Petals rather thick, narrowly oblong 1 cm long, outside (where they are not covered by the adjacent one), densely, microscopically stellate pilose. Anthers with short apiculi. Stigma obtusely 3-lobed.

Fruit depressed globose, up to 5 cm diam. with 3 obscure furrows, densely microscopically lepidote, dehiscing by 3 thick, woody, ovate-acute valves; base with spreading, very thick, wrinkled, glossy, ovate, acutish 1—1 1/2 cm long lobes (at their base a little erect, then bending outwards). Cotyledons thick, each consists of two equal parts.

DISTRIBUTION: Endemic to Ceylon, growing in marshy land of the S.W. lowlands. Almost extinct.

Vateria roxburghiana Wight (Icones t. 26, Sept. 1838 and text sub Explan. of plates no. II) is an Indian plant. In the text to plate 26, Wight made the remark: "I am indebted to the unaided ingenuity of the artist for these analysis who was not at the time of making them

under my superintendence, and I have not since had the means of verifying them myself". In *Illustr. Ind. Bot.*, Wight provided in 1850 a very short diagnosis of *Vateria roxburghioma*.

Thwaites in 1859 (*Enum. Pl. Zeyl.* 37) compared his specimens (*C.P.* 604 from Kalutara, one sheet in young fruit, another in flower, PDA), with Wight's plate of *Vateria roxburghiana* and described it as *Isauxis roxburghiana* Wight (sphalm., it is a new combination of Thwaites), referring it in the Addenda of his book (404, 1864) to *Vatica* (quoting again *Isauxis roxburghiana* Wight, instead of Thwaites, as a synonym).

He made the remark: "I have little doubt of this being dr. Wight's plant, though there is a slight (sic!) discrepancy between my specimens and the figure in the *Icones*, but this is most likely due to a little want of accuracy on the part of the draughtsman".

Actually it was Thwaites who had the little want of accuracy; the plate is in all respects an almost ideal one of the Indian *Vatica roxburghiana*, which is quite different from Thwaites's Ceylonese plant.

The (for me) illogical way of reasoning of Thwaites, that an artist could be inaccurate in depicting a large fruit of *V. roxburghiana*, entirely different from that of the Ceylonese plant; he could be inaccurate in the small analysis of microscopical details.

C.P. 604, the Ceylonese plant has depressed globose, rather immature fruit with very thick, short sepals, whereas in *V. roxburghiana* the fruit are (young and old) ovoid, very long pointed with very long, thin, transparent calyx lobes. There are also, less conspicuous differences in the indumentum, the stamens and the stigma. I have been fortunate to collect the fully mature fruit of the Ceylonese plant.

De Candolle (*Prodr.* 1: 517. 1824) gave a short description of *Vatica chinensis* L. (*Mantissa Pl.* 242. Oct. 1771) and relegating it to Smith, *Icon. Ined.* t. 36 (and Lamarck, *Diet.* 8: 418, 111. t. 397). In DC, *Prodr.* 16(2): 619. 1868 a more lengthy description was presented; here it was kept separate from *V. roxburghiana* (Wight) Bl. (p. 618).

Wight & Arnott (*Prodr.* 84. 1834) stated that *V. chinensis* was not from China and they thought, that it was probably identical with *V. laccifera* W. & Arn. (DC, *l.e.* 619, showed that this was not true).

Dyer (*in* Hooker f., *Fl. Br. Ind.* 1: 302. 1874) accepted Thwaites's viewpoint and included *V. chinensis* in *V. roxburghiana*. Trimen (*Handb. Fl. Ceylon* 1: 128. 1893) followed suit. He made the remark, that plate 26 of Wight might be this species, but the plate was not "characteristic".

Alston (*in* Trimen, *Handb.* 6, *Suppl.* 25. 1931), not going into the

matter taxonomically, logically named the Ceylonese plant *Vatica chinensis* and was followed herein by Ashton (Revised Handb. Fl. Ceylon 1: 422. 1980).

Linnaeus must have seen a specimen of his *Vatica chinensis*, according to the description. Although the description is very poor, at least the "rami subtomentosi" militates against this being the Ceylonese *V. paludosa* or the Indian *V. roxburghiana* and moreover, the latter two species have never ovate—cordate leaves.

It can be concluded that *Vatica chinensis* still might be a species from China.

The tree in the Botanical Garden of Peradeniya is *Vatica roxburghiana* with ovoid, long-pointed fruit. And the Heneratgoda Garden trees might be the same. Ashton collected some sterile specimens. There is still a possibility that the real *V. roxburghiana* occurs in Ceylon, although the chances are remote. Hence I have quoted below the sterile specimens with an interrogation mark. From the leaves alone the two species can not be separated. Moreover, more developed flowers of *V. paludosa* are necessary to make sure whether the Heneratgoda specimens are this.

S.W. Ceylon, Kalutara Distr., Dec. 1854, fl., fr., *C.P. 604* (PDA); Kalutara Distr., Bulathsinhala near Horana, low marshy forest along a sluggish brown-water rivulet, inundated in the wet season, forest rich in *Syzygium cordatum*, *Stemonoporus moonii*, *Areca eoneinna*, etc., 5 Sept. 1980, ripe fr., *Kostermans 28734* (AAU, G, L, PDA); W. Prov., Nurapitiya Hanwelle, near pond, alt. 30 m, ster., *Ashton 2060* (PDA) (?); banks of Kalu Ganga near Kiriella, 50 m alt., ster., *Ashton 2135* (PDA) (?); Heneratgoda Gatdeh, Apr., fl., *Simpson 9419* (PDA) (?).

4. VATICA OBSCURA Trimen — Fig. 3.

Vatica obscura Trimen in 3. of Bot. 23: 203. 1885; *ibid.* 27: 161. 1889; Handb. Fl. Ceylon 1: 129. 1893; Lewis, Trees & fl, Pl. W. & Sabaragamuwa Prov. 35. 1902; Worthington, Ceylon Trees 68. 1959; Ashton in Dassanayake (editor), Revised Handb. Fl. Ceylon 1(2): 196. 1977 and 1: 423. 1980. — Typus; *Vincent s.n.*, E. Province, anno 1882, fls. and fr. (PDA, 2 sheets).

Tree, up to 30 m tall and 70 cm dbh. Bark smooth, grey; no buttresses. Twigs either microscopically buff stellate pilose or glabrous. Stipules very slender, acute, 5-6 mm long, caducous. Leaves chartaceous, glabrous (young leaves initially sometimes with few hairs below), lanceolate to lanceolate-oblong, $11\frac{1}{2} \times 8-3 \times 16-4\frac{1}{2} \times 15$ cm, gradually acute or sub-acuminate, base rounded, sometimes shortly acute; both sides minutely densely reticulate (more conspicuous below); above glossy, midrib prominulous, lateral nerves faint; below more dull, midrib pro-



FIG. 3. *Vatica obscura* Trimen

minent, the c. 12 pairs of lateral nerves (with intermediate shorter ones) very thin and faint, erect-patent, arcuate near the margin. Petiole slender, 1—1 1/2cm, concave above.

Panicles axillary and extra-axillary, many-flowered, up to 8 cm long, microscopically stellate-pubescent, denser towards the fragrant, white flowers with thin main peduncle and branches. Pedicels c. 3 mm, slender, densely stellate-pilose. Sepals ovate-oblong, acutish, 2—3 mm, densely stellate-pilose. Petals thin, up to 1 cm long and 4 mm wide, outside stellate-pilose, except the covered part at base by the adjacent petals. Filaments 12^{mm} with broad triangular base and filiform apical part. Anthers oblong, 1 mm with small appendage. Ovary densely pubescent. Style as long as the stamens; stigma depressed capitellate with 3 excrescences at the top.

Mature fruit ovoid-globose, up to 3 cm. long, smooth, glabrous with 3 faint longitudinal grooves. Sepals hardened, not enlarged, turned downwards. Pericarp leathery, 2 mm thick. Cotyledons red (turning green after germination), each splitting vertically almost completely into two, thick, wedge shaped halves. Germination epigeal, the fruit splits along the grooves into 3 valves, completely, the radicle comes out from the top and bends downward, the epicotyl lifts the cotyledons (which look as if there are 4) far above the ground and the valves drop. Wood hard, heavy, light brown.

DISTRIBUTION: Riverine forest from Polonaruwa and Batticaloa southwards; Devulane forest; also in Bintenne in Uva. Locally abundant.

I doubt whether the trees reach 30 m, I have seen them never more than 20 m high; the boles are as a rule straight. The fruit sepals are well described by Trimen, less accurately by Ashton.

Ashton misquotes Trimen; dummala is a Vedda not a Sinhala name (by Trimen given as dun). The Tamil name is tumpalai. Dummala in Sinhalese means simply resin. The tree produces a clear resin.

Badulla Distr., ster., *Bailey s.n.* (PDA); Kalodai, E. of Mahiyangane, bank of stream, dry zone, ster., *Ashton 2137* (PDA); Mahiyangane forest area, Monaragala Distr., June, fl., *Kostermans 24430* (PDA); Batticaloa, Polukanawa, June 1884, fl., *Walker 5*, 132 Sept. 1885, fr., *Walker s.n.* (on sheet 132 PDA); E. Province, Vincent, 1882, fl. (PDA, 2 sheets); Batticaloa, June, fl., *Livera s.n.* (PDA); Polonaruwa Distr., Yaklawā, E. of Wasganawa Reserve, ster., *Waas 604* (PDA); Maduroya, S. of Polonaruwa, Jan., ripe fr., *Kostermans 28022* (PDA); Devulana forest, Nuwaragala Res., riparian, low, May, fl., *Jayasuriya 2086* (PDA); 18th mile Ampara-Kandy Road, May, fl., *Kostermans 24850* (PDA); E. base Friar's Hood, Nuwaragala Res., May, buds, *Jayasuriya 2102* (PDA).

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