CLETHRACEAE (H. Sleumer, Leyden)

1. CLETHRA

Linné, Gen. Pl. ed. 5 (1754) 188; Sp. Pl. (1753) 396; Sleum. Bot. Jahrb. 87 (1967) 55. — Fig. 1-5.

Trees or shrubs, evergreen (Mal. spp.); leaf-scar large. Leaves crowded towards the end of the shoots, spiral, simple, exstipulate, serrate with glandular teeth, often with an apical gland, more rarely entire; nerves a little decurrent along the midrib, both midrib and nerves ± impressed above, ± prominent beneath. Indumentum of branchlets, leaves and inflorescences consisting of simple, and/or long, fascicled and ± patent, and/or minor, ± depressed stellate hairs. Flowers bisexual, regular, 5(-6)-merous. Inflorescences sometimes simple solitary terminal racemes, but mostly consisting of a terminal raceme and several lower approximate racemes, each of the latter from the axil of a ± reduced or caducous leaf, thus forming together a panicle-, fascicle- or umbel-like inflorescence; bracts mostly caducous during anthesis, rarely subpersistent. Calyx lobes 5(-6), persistent, quincunxially imbricate, united at the base only. Petals 5(-6), generally free, sometimes cohering to some degree, alternate with the calyx lobes, rather early caducous, generally sweet-scented. Stamens 10(-12) in 2 whorls of 5(-6), the outer whorl opposite the petals, the inner one opposite the calyx lobes; filaments adnate to the corolla at the extreme base; anthers dorsifix, overlapped, turned outwards in bud; erect in anthesis, introrse, upper part of cells ± divergent, opening with apical, slit-like pores; pollen grains single, tricolporate, psilate. Ovary superior, 3-celled, with axile placentation; ovules 3, small, anatropous; style simple, mostly shortly, very rarely hardly divided into three apical lobes, sometimes more deeply so and trifid, each lobe stigmatic at the top. Fruit a 3-valved, loculicidal capsule, the sepal of which become loose from the persistent central axis, subtended or ± enclosed at maturity by the persistent calyx. Seeds 3, small, subovoid to irregularly angular or subtrigonous, with a foveolate-reticulate testa (all Mal. spp.). Endosperm fleshy. Embryo cylindrical.

Distribution. A small, monogenic family in the Ericales, of (sub)tropical Asiatical-Malesian, and temperate and tropical American distribution, and with 1 sp. in Macaronesia (Madeira, and formerly in Tenerife).

Of the total of 64 spp., 2 temperate spp. are found in North America (C. alnifolia L. and its var. pubescens Arr., and C. acuminata Michx.), 38 spp. inhabit (sub)tropical America (Cuba-Jamaica-Central America, in S. America in the Mt Roraima area and in Trinidad, in the Andes from Venezuela to SE. Bolivia and NW. Argentina, and a small separate area in SE. Brazil), 10 spp. are found in SE. Asia (Upper Burma, SW., Central and SE. China, Japan, Indo-China).

In Malesia 13 spp., of which 2 in the Malay Peninsula, 1 in Sumatra, 1 in Java, 3 in the Lesser Sunda Islands, 4 in the Philippines, 3 in Borneo, 2 in Celebes, 1 in the Moluccas, and 4 in New Guinea. Fig. 2.

Ecology. Clethra occurs mainly in the lower and upper montane primary (and also secondary) forest. As to climate, the genus prefers the wet montane tropical and submontane zone, though it extends far into the northem temperate zone, in North America to about 45°, in Japan to about 42° N, whilst its southern limit is about 29° S in SE. Brazil. As the majority of the Ericales, Clethras have preference for acid soils. They occur in Malesia from sea-level to about 3000 m; and up to 3800 m in Szechuan and Yunnan, and in the Andes. They are light-demanding, remain sterile in dense forest, and flower in forest borders with open vegetation or exclusively in the latter, also in light secondary plant communities.

Dispersal. Nothing is known about the dispersal of Clethras. The rather small, deeply impressed-reticulate and light seeds of the Malesian spp. point to dispersal by wind.

Anatomy. Den Berger, Determinatietabel van Malesië, Veenman, Wageningen (1941) 31 (hand (139)
Fig. 1. *Clethra pachyphylla* Merr. *a.* Habit, ×$\frac{3}{2}$, *b.* flower, ×4, *c.* petal, ×4, *d.* stamens in bud stage, ×4, *e.* stamens at full anthesis, ×4, *f.* longitudinal section of flower, ×4, *g.* fruit, ×4, *h.* seeds, ×8

(a–f Chew, Corner & Stainton 1845, g–h Sinclair 9082).
Clethraceae

Leaves perfo-
section, and anatomical Medan, introduced nerves shown, to Clethras has C.S. stellate-hairy Clethra symingtonii C. been R. stellate-fascicled (wood); observation intervenium uniseriate partly 7 beneath, of hairs UPHOF, set fruiting the javanica author 250–253 Leaves glabrous. ursolic vascular state with compatible by P. undersurface, be- is from laxly Gardens. ± glabrous (15–)17–20(–23) lit-

The wood shows primitive characters such as narrow solitary vessels with scalariform vessel perforations, fibre-tracheids, apotracheal parenchyma which is diffuse or arranged in short uniseriate bands and heterogenous rays of two sizes. The petiole is supplied with a strongly incurved to closed vascular strand. hairs occur as multicellular stellate and uniseriate types. stomata mainly paracytic. crystals soli-
tary and clustered. secretory tanniferous cells are present in the parenchymatous tissues of petiole and stem. METCALFE & CHALK (l.c.) state that Clethra has many anatomical features in common with Ericaceae. — P. BAAS.

Pollination. The flowers are protandrous. The pollen is shed at least partly before the flowers are open and the stigmas are receptive.

Galls. DOCTORS VAN LEEUWEN (Zooecid. Nath. Ind. 1926, 439, fig. 825 & 826) mentions leaf-galls on C. sumatrana from the Petani ravine near Medan, caused by a Psyllid and a gall mite. On the leaves of C. canescens in N. Celebes (Minahasa) globular galls are found.

Uses. Temperate species of Clethra, mainly from North America, Madeira and Japan, much less from China, are cultivated as ornamentals in many parts of the world. Not a single species from Malesia so far has been introduced in Botanic Gardens.

Phytochemistry. Leucoanthocyanins, caffeic acid, flavonols, taraxerol and ursolic acid are known to occur in species of Clethra (HEGNAUER, Chemotax. d. Pfl. 3, 1964, 432–433; TANABE C.S. J. Pharm. Soc. Japan 86, 1966, 441). This spectrum of phytoconstituents is compatible with the generally accepted relationship between Clethraceae and Ericaceae. — R. HEGNAUER.

Taxonomy. A monograph of the genus has been published by the author (Bot. Jahrb. 87, 1967, 36–175, pl. 1). In this work it was shown, that the North American and the Asiatic-Malesian species of Clethra belong to sect. Clethra by their subovoid to subtrigoonous and impressively reticulate seeds, whilst the Central and South American species and C. arborea in Madeira form a second section, Cuel-

KEY TO THE SPECIES

1. Filaments hairy.
   2. Filaments hirsutulous. Styleolate in fruit (up to 12 mm) .... 1. C. sumatrana
   2. Filaments laxly set with longish hairs. Style a little or hardly elongate in fruit (up to 7 mm).
3. Leaves subcoriaceous, practically glabrous in mature state. Inflorescence dilute rusty-tomentellous in all parts .... 2. C. hendersonii
   3. Leaves coriaceous, still densely stellate-hairy along midrib and primary nerves in mature state beneath. Inflorescence rusty-villous in all parts. .... 3. C. syngongiai

1. Filaments glabrous.
   4. Younger, not yet glabrate leaves (which still show the full quality and quantity of the tomentum) laxly to more densely hairy only on midrib, nerves and veins, and glabrous on the intervenium be-
nath, mature ones glabrescent, or leaves glabrous from the beginning.
   5. Lateral nerves (15–)17–20(–23) pairs, ± approximate to each other. .... 4. C. javanica
   5. Lateral nerves 10–12(–14, rarely up to 15) pairs, more distant from each other. .... 5. C. canescens
   4. Younger, not yet glabrate leaves tomentellous to tomentose all over the undersurface, mature ones but slightly or tardily glabrescent.
   6. Younger leaves ± appressedly tomentellous on the intervenium beneath, i.e. covered there exclu-
sively with minute, ± flatish stellate hairs.
   7. Younger leaves densely covered with minute stellate hairs on the whole undersurface in a coherent layer, and besides more laxly set with stellate-fascicled and darker (generally rusty) hairs on nerves, veins and veinlets .... 6. C. kebarensis
   7. Younger leaves on the undersurface set with dense minute stellate hairs, which form a coherent pale layer, other larger and/or darker stellate-fascicled hairs very few, or mostly absent.
8. Leaves regularly serrate in the upper 2/3, with (15–)17–20 pairs of lateral nerves.
7. C. sumbawaensis
8. Leaves subserrate to entire, with 10–14 (rarely up to 15) pairs of lateral nerves.
9. Petals 2–2.2–(2.5) mm. .................................................. 8. C. tomentella
9. Petals (3.5–)4–(5) mm. .................................................. 9. C. arfakana
6. Younger leaves ± erectly tomentulose or tomentose on the intervenium beneath, i.e. covered there with minute and more coarse stellate (suberect), or with minute stellate and coarse (± erect) fascicled hairs.
10. Racemes generally more slender and elongate (flowers ± laxly arranged), and tomentelloid by minor stellate, rather flattish hairs. .................. 10. C. longispicata
10. Racemes generally more robust and shorter (flowers ± densely arranged) and tomentulose to tomentose by a combination of minor stellate and robust, ± erect fascicled hairs.
11. Pedicels 1–2 mm at anthesis. Style 1–1.5 mm at anthesis, hardly 2 mm in fruit. Lateral nerves of leaves ± inarching before the margin. .................. 11. C. papuan
11. Pedicels 2–3–(5) mm at anthesis. Style 2.5–3 mm at anthesis, 3–4 mm in fruit. Lateral nerves of leaves ± excurrent along the margin.
12. Ovary tomentose by long erect hairs. .................. 12. C. pulgarinensis


Much-branched shrub, or tree with erect or crooked trunk and a dense crown, (3–)5–15 (rarely up to 25) m; bark whitish. Branchlets stoutish, younger parts covered with a rusty stellate tomentum maybe mixed with simple hairs, early glabrescent. Leaves lanceolate to oblong- to obovate-elliptic, apex shortly acutely acuminate, base cuneate, thin-coriaceous, young ones covered with a thick tomentum of rusty to rufous shorter stellate and longer fascicled hairs at least on midrib and nerves, older ones mostly more persistently so by both or but one type of these hairs on the entire undersurface or only on midrib, nerves and maybe veins, generally distantly serrate with callose teeth especially in the upper part of the lamina, rarely subentire or entire, reddish when young, dark green at maturity, 4–11(–15) by (1.5–)2–4.5(–8) cm, nerves in 8–13 pairs, curved spreading, slightly raised beneath as are the transverse veins, reticulation not conspicuous in general; petiole 6–12(–15), rarely up to 30) mm. Racemes elongate, erect-ascendent, 8–30 cm, usually solitary and terminal, more rarely also from the axil of 2 or 3 upper leaves, the latter mostly normal in size and ± persistent, rarely reduced and caducous during anthesis, covered by the same, but generally more dense and more persistent indumentum found in the branchlets and leaves. Pedicels rather slender, 3–10 mm (in fruit 10–20 mm), bracts lanceolate-linear, caducous, 8–15 by 1–2.5 mm. Calyx lobes subovate or ovate-oblong, subacute, rusty-tomentosum or -tomentose in the upper part inside and all over outside, the fascicled hairs few to numerous, (4–)5–6(–8) by 2–3 mm. Petals ovobate, erose-crenulate at apex, glabrous, white-creamy to pinkish, (5–)6–7 (–9) by 4–5(–6) mm. Filaments linear, glabrous at both ends, longish and subappressed hirsutulous between, 4–5 mm; anthers obssagittate, 1.5–2(–2.5) mm, base extended into an acute triangular appendix. Ovary subappressed–hirsute; style slender, glabrous or with a few hairs at the very base, 6–7 mm at anthesis, 8–12 mm in later stages, apex thickened and very shortly trilobed at anthesis, rarely more deeply so in fruit. Capsule subglobose, hirsutulous, 4–5 mm s. Seeds sub-ovoid-oblong or subtrigonom, variously compressed, c. 1.5 mm.

Distr. Malesia: Sumatra (Atjeh, Eastcoast, Tapanuli, in the Westcoast Res. only at Brani near Bukit Tinggi).


Fig. 2. Distribution of Clethra in Malesia and adjacent SE. Asia. The number above the hyphen indicates the number of endemic species, that below the hyphen the number of non-endemic species in each island or district.


Slender, small or medium-sized, few-branched tree; bark rather smooth, greyish, minutely longitudinally fissured. Branchlets rather slender, dilutely rusty-stellate-tomentellous distally. Leaves elliptic-oblung or elliptic, sometimes subovate-elliptic, apex shortly acuminate, base cuneate and slightly inequilateral, subcoriaceous, dark green and dull above, paler and shining below, flush reddish, denticulate-serrulate, 8–10 (–12) by 4–5.5 (–6) cm, young ones stellate-puberulous, early glabrate above, set with sparse simple hairs at midrib and moreover ± laxly with small stellate hairs at midrib, nerves and veins below, mature ones finally glabrous, nerves (10–)11–13 pairs, curved-ascendent, raised beneath, reticulation faint; petiole rather slender, 1.5–2.2 cm. Racemes 2

Fig. 3. Clethra hendersonii Sleum., Mt Berembán, 1720 m, Malay Peninsula, Cameron Highlands (Sleumer 4675) (Sleumer, 1963).
or 3(−5), subdensely set with flowers, up to 22 cm, tomentellous by rusty-brownish simple and paler stellate hairs in all parts. Pedicels rather robust and 3−4 mm (in fruit 6−7 mm), bracts subulate, 3−4 mm, caducous. *Calyx lobes* oblong, 4−5 by 2 mm. *Petals* obovate, apex erosive, spreading, white, slightly fragrant, glabrous on both faces, sparsely fimbriate, (5)−6−7 by (3)−4−5 mm. Filaments laxly set with longish hairs, 5(−6) mm; anthers narrowly obcordate, base acute, 1.8 mm. *Ovary* subsessile-tomentose; style glabrous, shortly trilobed, 5−6 mm in anthesis, 7 mm in fruit. *Capsule* depressed-globose, 4 by 5 mm, subtended by the spreading sepals, *Seeds* oblong-ovoid, c. 1.5 mm.

**Distr. Malesia:** Malay Peninsula (Pahang: Cameron Highlands and Mt Tahan; Selangor: Mt Nuang).

Ecol. Scattered in forest, often on ridges or summits, 1340−1740 m. Fl. April−July.


Shrub. Tips of branchlets and innovations shortly rufous-villous. *Leaves* elliptic-oblong, apex shortly subacutely attenuate, base cuneate, very base sometimes obtuse, slightly inequilateral, coriaceous, young ones early glabrate above, ± densely set with rather large stellate hairs on midrib, nerves and veins beneath as are the petioles, mature ones persistently so, 6−9 by (2.5)−3−4 cm, glandular-subserrate-denticulate in the upper, entire in the lower part, nerves in 9−10 pairs excurrent along the edge, well-raised beneath, veins transverse and prominent beneath, reticulation visible; petiole 2−3 cm. *Racemes* terminal and from the upper 3 or 4 axils (which are mostly defoliate in flowering time) close together forming a panicle, all over with a rusty, almost villous tomentum of numerous longer crisp fascicled and shorter stellate hairs; rachis robust. Pedicels thickish, 2−3 mm (in fruit 5−6 mm), bracts subulate, caducous, 3 mm. *Calyx lobes* oblong, c. 5 by 2.5 mm. *Petals* obovate, apparently cup-like converging, quite glabrous, white, scented, 6 by 3 mm. Filaments laxly long-hairy; anthers narrow-obcordate, base acute, 2 mm. *Ovary* densely set with erect hairs; style subapressly hairy in its lower third, glabrous for the rest, 5 mm (in fruit 6 mm), stigma shortly 3-lobed. *Capsule* subglobose, c. 4 mm s.

**Distr. Malesia:** Malay Peninsula (Perak: G. Kerbau For. Res.), once found.


**var. javanica.**

Small tree, 3−6(−10) m, trunk up to 15 cm φ, often crooked, or much branched shrub, 2−5 m; branches up to 5 cm φ. Branchlets rather robust, covered distally with a rusty hisrule or almost lanate tomentum as are the petioles. *Leaves* lanceolate to oblong-elliptic, sometimes partly obovate in the same specimen, apex shortly acuminate, base cuneate, subcoriaceous, dark green, shining and glabrous above, much paler beneath, and set there still towards the maturity with both longish simple or fascicled rufous and fewer minor stellate hairs on midrib and nerves, whereas the veins bear only scattered stellate hairs and the intervenum is glabrous, finally glabrescent, (5)−6−10 by (2.5)−(4)−6 cm, rather regularly and deeply (1.5−2 mm) serrate, nerves, (15)−17−20(−23) pairs, spreading, ± approximate and subparallel, rather straight from the midrib and partly forked before the edge, ± sharply prominent beneath, veins transverse, ± raised beneath too; petiole robust, 1(−1.5) cm. *Racemes* panicled or subumbellate, rachis and pedicels covered with a floccose and rusty, almost hirsutulous tomentum, 5−10(−14) cm, flowers rather densely arranged, subpatent. Pedicels rather thickish, 3−5(−6) mm, bracts subulate, 2−4(−6) mm, caducous. *Calyx lobes* ovate-oblong, subacute, dorsally a little keeled and stellate-tomentellous, fimbriate, (4)−4.5−6 by 2.5 mm. *Petals* obovate, apex slightly erosive, thin, glabrous, white or pinkish, (5)−6−7 by c. 3 mm. Filaments glabrous, 2.5 mm; anthers obcordate, base subacute, 1.3 mm. *Ovary* shortly rufous-hirsutulous; style glabrous, 3−3.5 mm, apex shortly trilobed. *Capsule* subglobose, 2.5−3 mm φ, pedicel elongate to 10 mm, style slender, 3.5−4 mm. *Seeds* ovoid, subtrigonal or variously compressed, 0.5−0.8 mm.

**Distr. Malesia:** East Java (Mt Jang).

Ecol. In mixed primary forest edges, 1830−2300 m. Fl. fr. April−Oct.


Leaves very similar to those of *var. javanica*, but thinner, young ones on the undersurface sparsely clothed with fascicled hairs at midrib and nerves, and with stellate ones at the veins, becoming almost completely glabrous at maturity, up to 15 by 5 cm, more deeply (up to 4 mm) and more irregularly serrate.

**Distr. Malesia:** Lesser Sunda Islands (Lombok), in montane forest and *Casuarina* bush of Mt Rindjani, 1700−2400 m.


KEY TO THE VARIETIES

1. Racemes and pedicels ± robust. Petals 3–4 mm.
2. Leaves early glabrescent; nerves starting from the midrib at an ± acute angle.
   1. var. canescens
   2. Leaves with more persistent minute rusty stellate hairs underneath; nerves starting from the midrib at ± right angles.

3. Leaves underneath on midrib, nerves and veins more laxly to rather densely clothed with subsistent rather large stellate hairs.
   3. var. elements

3. Leaves underneath on midrib and nerves, rarely on veins, laxly set with fascicled and/or minute stellate hairs, early glabrescent, or young ones already subglabrous.
   4. Racemes generally elongate, rather dense-flowered. Petals 2–3 mm. 4. var. novoguineensis
   Petals (3–)4 mm. . . . . . 5. var. Iedermannii

1. var. canescens.

Tree up to 20 m, bole up to 40 cm Ø, covered with greyish bark; at higher altitudes a shrub, 2–5 m. Branchlets covered with a woolly-floccose rufescent, later greyish tomentum at the tips. Leaves elliptic or obovate-elliptic, apex shortly subacutely acuminate, base cuneate, thin-coriaceous, entire below, regularly serrate with callose teeth c. 1 mm long, younger ones glabrous above, densely set with minute stellate ± rusty hairs on midrib, nerves, veins and veinlets, and with sparse, longer simple or fascicled hairs on the midrib beneath; glabrous on the interveinum beneath, mature ones glabrescent generally (4–)5–8–(11) by (2–)2.5–4 cm, at higher altitudes constantly smaller, (2.5–)3–5–(6) by (1.5–)1.5–2 cm, nerves 10–12 (rarely up to 15) curved-ascendent pairs, which rather distinctly inarch before the edge, veins slightly prominent, veinlets rather inconspicuous beneath; petiole ± robust, 0.6–1.2(–1.5) cm. Racemes few to several, forming an erect panicle, all over covered with a floccose-lanate, ± rusty or finally greyish tomentum, 6–12(–16) cm, the numerous flowers rather laxly set along the thickish rachis. Pedicels robust, (3–)4–5 mm at anthesis, up to 6 mm in fruit, bract subulate, up to 6 mm, caducous. Calyx lobes ovate-oblong, rather abruptly acuminate, long-ciliate, pale rusty-floccose dorsally, 3–4 mm. Petals obovate, crenulate all along the margin, glabrous, white (or suffused with red initially), with a rather unpleasant smell, 3–4 by c. 2 mm. Filaments glabrous, c. 2.5 mm; anthers broad-obovate, base almost mucronate, 0.8 mm. Ovary villous; style glabrous, 3–3.5 mm (in fruit 3.5–4 mm), very shortly trilobed. Capsule subglobose, tomentulose, 2.5 mm Ø. Seeds irregularly ovoid-angular, 0.8–1 mm.

Distr. Malesia: Celebes, Lesser Sunda Islands (Flores); slightly different forms in the Moluccas (Buru, Ceram and Ambon).

Ecol. A tree in mountain forest or forest edge, ascending into more open summit vegetation and shrub-like there, sometimes on volcanic tuff, rather common locally, (1160–)1400–2800(–3000) m. Fl. fr. Jan.–Dec.

Vern. Kaju parang, M. madausip, Ts. (Minahasa), pitjisan djabong, Makassar.


Leaves elliptic, more rarely oblong-elliptic, apex shortly subacutely acuminate, sometimes more obtuse, base broadly cuneate to obtuse, subcoriaceous, younger ones laxly set with minute stellate hairs above, densely clothed with rather small floccose stellate hairs on the prominent midrib and nerves, and more laxly so on the veins beneath, glabrous on the interveinum, moreover sparsely set with longer simple or fascicled hairs on midrib and nerves beneath, mature ones glabrescent first above, tardily beneath, subentire or minutely (rather more deeply) serrate, (3.5–)4–7(–10) by (1.5–)2–4(–5) cm, nerves 10–12(–14) pairs, curved, rather approximate, ± parallel and anastomosing; petiole rather robust, 0.3–1(–1.3) cm. Racemes panicled or almost umbellate, 3–6(–11) cm, covered with a tomentum of small dark-rusty stellate floccose hairs; flowers ± dense along the thickish rachis. Pedicels robust, 1(–2) mm, slightly accrescent in fruit, bract subulate, caducous, 3–4 mm. Petals white or cream, irregularly erose at apex, 3–3.5 mm.

Distr. Malesia: Philippines (Luzon: Mountain Prov.; Isabela Prov.).

Ecol. In montane Pinus insularis, Quercus or Podocarpus forest, also in mossy forest or in shrubby summit vegetation, 1220–2250(–2700) m, rather common locally. Fl. fr. Jan.–Dec.

Vern. Amog, kamueg, Ig., apit, Bon.


Leaves oblong-lanceolate to oblong, apex acutely acuminate, base cuneate-attenuate, thinly subcoriaceous, younger ones first stellate-hairy, early glabrescent above, ± densely set with fascicled and stellate, rather coarse hairs at midrib and nerves beneath, laxly or hardly so at the veins,
intervenium glabrous, mature ones quite glabrous and a little shining above, glabrescent first at the veins, more tardily so at midrib and nerves beneath, subentire or shallowly glandular-serrate, (6)—7—14 by (1.5—)2—3—3.5—4 cm, nerves (10—)12—14 pairs, curved-ascending towards the edge, rather indistinctly inarching there, prominent beneath, veins but slightly raised beneath; petiole slender, 1—1.5—2 cm. Racemes panicked, slender, 10—20 cm, covered with a dilutely russet tumentum of both smaller and larger stellate and/or fascicled hairs; flowers rather densely arranged along the robust rachis. Pedicels slender, 1—2 mm (in fruit c. 3 mm). Petals erose-fimbriate at apex, 3—4 mm.

Distr. Malesia: Borneo.

Ecol. Generally in mountain (also mossy) forest or on forest edges, rarely in lowland (apparently secondary) forest, locally common, especially on Mt Kinabalu, (30—)700—1200—(1830) m. Fl. fr. Jan.—Dec.

Vern. Kalintuhan, mitindike, Dusun.


Leaves lanceolate-elliptic to lanceolate, apex acutely acuminate, base cuneate, thin-subcoriaceous, younger and submature ones glabrous above, set with sparse rather coarse rufescent simple or fascicled and/or finer stellate hairs on midrib and nerves, hardly at veins beneath, intervenium glabrous, mature ones almost completely glabrous, rather sharply serrate in the upper part, 5—8—(11) by 2—3—(4) cm, nerves 12—14—(15) pairs, ± curved, subparallel, rather indistinctly inarching before the edge, prominent beneath, veins ± obscure; petiole rather slender, (0.7—)1—1.5 cm. Racemes panicked, all over covered with a very short tumentum of brownish to greyish stellate hairs, in which a few larger fascicled hairs occur, rather lax-flowered, 5—12 cm. Pedicels rather slender, 2—3 mm (in fruit 3—3.5 mm). Petals erose-crenulate, (3—)4 mm.


Ecol. In mountain (also mossy) forest, and in regrowths, (200—)400—1830 m. Fl. June—Sept.

Vern. Talelli, Wapi (Torricelli Mts).

6. Clethra kebareensis SLEUM. Bot. Jahrb. 87 (1967) 92. — Fig. 4.

Laxly branched shrub or treelet, 2—3—(6) m, trunk often blackish, 4—10 cm φ. Branchlets distally ferrugineous-tomentellous. Leaves obovate-oblong or -elliptic, more rarely oblong, apex ± shortly subacutely acuminate, base cuneate, rarely obtuse or even rounded in the same specimen, subcoriaceous to firmly chartaceous, young ones very laxly stellate-hairy above, subdensely covered beneath with short, fascicled rusty hairs at midrib, and all over the undersurface with very dense minute stellate hairs, which form a pale coherent layer, moreover nerves and especially veins and veinlets set with darker rusty stellate-fascicled, tardily evanescent hairs so to say on top of the pale layer mentioned above, mature leaves dark green above, yellowish rusty beneath, early glabrescent above, tardily so beneath, generally shortly to very shortly sub-serrate- or crenate-dentate, (4—)6—9 by (2—)2.5—4—5.5 cm, nerves in 14—16—(17) pairs, slightly curved or rather straight from the midrib, rather obscurely inarching, prominent below, veins but slightly raised; petiole 9—14 by c. 1 mm. Racemes 3—6, ± fascicled, partly branched below, erect,
dense-flowered, 6–12 cm, covered with a short, almost villous, rusty (finally greyish) pubescence of fascicled and stellate hairs; rachis rather robust. Pedicels thickish, 1–1.5 mm at anthesis, subtending bracts subovate-subulate, 2 mm, persistent for a while. Calyx lobes ovate, subacuminate, 2–2.5 mm. Petals obovate-spathulate, often connate or coherent in the lower part, crenulate, glabrous, white or cream, (2.5–)3–3.5 by c. 1.5 mm. Filaments dilated downwards, glabrous, 2(–2.5) mm; anthers obcordate, c. 0.6 mm. Ovary rusty-tomentulose; style glabrous, 1.2–1.5 mm (in fruit to 2.5 mm). Capsule subglobose, c. 3 mm Ø. Seeds subtrigonous-ovoid, 0.8 mm.


Ecol. In patches of shrubberies within grassland or fern thickets of Gleichenia, or in forest edges, not rarely in periodically burned vegetation, fairly common locally, sometimes forming pure loose stands on sandy or clayey soil, 700–1200 (–1950) m. Fl. fr. Jan.–Dec.


Treelet, 4–8 m. Branchlets distally clad with a rusty rather scabrid pubescence. Leaves elliptic-oblong or elliptic, apex ± shortly and acutely acuminate, base cuneate, thin-coriaceous, younger and submature ones glabrous above, subdensely set with longish simple and fascicled (or stellate) rusty hairs along midrib and nerves, sparsely so

Fig. 4. Clethra kebarensis SLEUM., Kebar Valley, Nertoi, 700 m, NW. New Guinea (VAN ROYEN & SLEUMER 6841) (SLEUMER, 1961).
on the veins beneath, moreover beneath all over the undersurface with a dense thin layer of minute stellate and pale (or here and there rusty), finally greyish hairs, apparently very tardily glabrescent, serratate in the upper 3⁄4, (5–)6–9 by 2–4 cm, nerves (15–)17–20 pairs, rather straight and subparallel, in part forked distally, reticulately or slightly corrugated before the edge, raised beneath, veins transverse, slightly prominent beneath, veinlets obscure; petiole 1–1.5–(2) cm. Racemes rather numerous, condensed to a panicle, 5–8–(10) cm; rachis stoutish, covered with a floccose rusty kind of wool. Pedicels rather slender, with a short stellate pubescence as are the sepals, 3–4 mm, bracts subulate, tomentulose, 8–10 mm, caducous after anthesis. Calyx lobes ovate-acuminate, less hairy at the fimbriate margin, glabrous inside, 3 mm. Petals obovate, thin, white, fragrant, glabrous, minutely fimbriate-crenulate ± all along the margin, 5 by c. 2.5 mm. Filaments glabrous, 2 mm; anthers broadly obovate, base apiculate, 1 mm. Ovary tomentose; style slenderly columnar, glabrous, 4–4.5 mm, shortly 3-lobed.

Distr. Malesia: Lesser Sundas Islands (Sumbawa: Mt Batulanthe; Flores: Mt Ranaka).

Ecol. In forest, (900–)1600–2400 m, on andesite soil. Fl. April, Oct.


Small tree or shrub. Branchlets rather slender, tips grey-tomentellous. Leaves lanceolate to elliptic-oblong, or oblanceolate, apex ± shortly subacutely acuminate, base attenuate, finely chartaceous, subentire or sometimes sparsely very slightly serrate-dentate in the upper part, younger and submature ones glabrous above, appressedly greyish-fimbriate-tomentellous all over beneath, mature ones glabrescent tardily, first on the inter-veinum, finally also almost completely along midrib and nerves, 6–9–(11) by (2–)2.5–3–(3.5) cm, nerves (10–)12–14–(15) pairs, prominent beneath, reticulation visible only in the already glabrate parts; petiole rather slender, (5–)6–10–(12) mm. Racemes several, panicked, laxly or more densely set with flowers, 7–14–(20) cm, covered with a short, greyish or rusty-tomentellate rachis. Pedicels slender, c. 2 mm (c. 3 mm in fruit), bracts subulate-linear, 3–5 mm, caducous in the beginning of anthesis. Calyx lobes ovate-acuminate, glabrous inside in part, 1.5–2 mm. Petals obovate-spatulate, minutely erose apically, glabrous, white, 2–2.2–(2.5) mm. Filaments dilated towards the base, glabrous, 1 mm; anthers obovate, hardly 1⁄2 mm. Ovary tomentellous; style thickish, glabrous, 1 mm, very shortly 3-lobed. Capsule subglobose, 2.5 mm ø. Seeds sub-trigonous-ovoid, 0.7–1 mm.


Ecol. Scattered in thickets or forests on slopes, chiefly on ridges in mossy forest, 600–1800 m. Fl. fr. May–Sept.

Vern. Amog, kamug, kamung, Ig., ayusan, Tag.


Shrub or erect treelet, 2–3 m, much branched. Branchlets slender, tips rusty-tomentellous. Leaves obovate-oblong or -elliptic, apex shortly acutely acuminate, base cuneate, slightly inquilateral, subcoriaceous to firmly chartaceous, fimbriate around, or narrowly so, base more or less glabrous; whitish greyish below, i.e. except the sparsely hairy or subglabrous midrib and nerves covered by a short tomentum of minute stellate hairs, very tardily glabrescent, (sub-)entire or shallowly dentate, (2–)3–4.5 by (1–)1.3–2 cm, more deeply dentate and to 7.5 by 3 cm in not flowering new shoots, nerves in 10–12 pairs, ± straight from the midrib, curved upwards, slightly prominent beneath; petiole 5–8–(10) mm. Racemes several, panicked, 5–7–(8) cm, rather lax-flowered, pale-rusty stellate-tomentellous in all outer parts; rachis slender. Pedicels slender, 2–3 mm, basal bracts early fugacious. Calyx lobes ovate-oblong, long-ciliate, 3 by 1.5 mm. Petals obovate-spatulate, sometimes coherent at the base, glabrous, white, shortly erose-fimbriate all along the edge, (3.5–)4–(5) by 2.2–2.5 mm. Filaments dilated towards the base, glabrous, 2.5 mm; anthers obcordate, about 0.5 mm. Ovary almost hirsute; style glabrous, 1.8 mm at anthesis, hardly acumen in fruit. Capsule subglobose, 2.5–3 mm ø. Seeds oval to subtrigonous, c. 1 mm.


Shrub or treelet, up to 5–12 m, trunk up to 10 cm ø, bark green, with shallow pale brown branches. Branchlets and petioles rusty to greyish tomentellous. Leaves oblong-lanceolate to elliptic-oblong, more rarely elliptic, apex rather strongly acuminate and subacute, base cuneate, rarely almost obtuse, inquilateral, subcoriaceous, younger ones glabrous above, covered all over beneath by a coherent tomentum of minor stellate cinnamomorphic to greyish hairs, and of larger stellate hairs so to speak on top of that layer, mature ones tardily glabrescent beneath, furthermore sometimes with sparse fascicled hairs on the midrib beneath, (4.5–)6–11 by (1.7–)2.3–5.4 cm, calloso-denticulate or subentire, nerves 10–12–(14) pairs, generally starting at an acute angle, curved-ascending towards the edge, a little impressed above, prominent beneath, veins distinctly, veinlets rather inconspicuously raised beneath; petiole 0.6–1.3–(1.6) cm. Racemes panicked, rather slender, (15–)30–30–(35) cm, laxly many-flowered, with a short stellate tomentum, in which also some fascicled hairs may be found. Pedicels slender or almost so, 2–3 mm (to 4 mm fruit),
bracts subulate, caducous. Calyx lobes narrowly ovate-subdeltoid, 1.5–2(–2.5) mm. Petals partly connate at base, broadly spatulate, crenulate, glabrous, white, scented, c. 3 by 1.5 mm. Filaments glabrous, 1.5 mm; anthers obcordate, 0.5 mm. Ovary appressedly hairy; style glabrous, c. 1.7 mm (to 2 mm in fruit), very shortly 3-lobed. Capsule subglobose, c. 2.5 mm. Seeds convex-ovoid, 0.7 mm.

Distr. Malesia: Borneo, Philippines (Palawan) and Central Celebes.

Ecol. Generally in mountain forest, also in secondary vegetation, on clayey ground, (60–) 500–1525 m. Fl. Jan.–Dec.

Vern. Pongo, Toradja, lang, Iban, garapo, Dusun.

Fig. 5. Clethra papuana J. J. S., Kebar Valley, Mt Nettoti, 1900 m, NW. New Guinea (VAN ROYEN & SLEUMER 7449) (SLEUMER, 1961).


var. papuana.

Shrub or treelet, (1–)3–6(–8) m, more rarely a tree up to 15 m, bole up to 10 m by 30 cm. Branchlets at tips rusty subvillous-tomentose. Leaves elliptic or obovate-elliptic, sometimes oblong-elliptic, rarely elliptic-lanceolate, apex shortly subacutely acuminate, rarely rather blunt (more acutely acuminate in sterile shoots), base inequilateral, broadly cuneate to subtruncate-obtuse, coriaceous, firm, younger ones with stellate and fascicled hairs mainly along midrib
and nerves above, clothed all over beneath by a dark rusty subvillose tomentum formed by stellate and fascicled hairs, mature ones glabrate above, dark green in the fresh state there, under- surface rusty- to greyish- or (almost silvery-) tomentulose (the large fascicled hairs having mostly disappeared by then), entire or shortly irregularly serrate-dentate (more deeply and sharply serrate in sterile shoots), 4—5—8—12) by 2—4 (—5.5) cm, variable in size even in the same specimen, sometimes microphyllous, nerves 12—14 pairs, much spreading, ± inarching at or a little before the edge, well raised beneath, veins not much conspicuous beneath, reticulation faint; petiole rusty-tomentulose, (1—)1.2—1.6—(1.8) cm. \textit{Racemes} panicked, erect, all over rusty-tomentose, flowers generally densely arranged, rarely up to 15 cm; rachis robust. Pedicels thickish, 1—2 mm (up to 4 mm in fruit), bracts thickish, subulate, caducous. \textit{Calyx lobes} oblong-ovate, 3—3.5 (—4) mm. \textit{Petals} not rarely connate or coherent at base, obovate-spathulate, edge slightly erose, white. sometimes pale cream or suffused with red, glabrous, slightly splayed, c. 3.5 by 2 mm. Filaments glabrous, hardly 2 mm; anthers ± obcordate, 0.8 mm. \textit{Ovary} almost villous; style glabrous, shortly orif.-5.5 mm (hardly 2 mm in fruit). \textit{Capsule} subglobose, c. 3 mm. \textit{Seeds} ovoid-oblong, irregularly angular, 0.8—1 mm.

\textbf{Distr. \textit{Malesia}:} NW. New Guinea (Vogelkop Peninsula: Kebar Valley and Arfak Mts.).

Ecol. In (mossy) \textit{Nothofagus}-Conifer-forest edge or in open heath vegetation on crest, 1800—2600 m. \textit{Fl. Oct.—Jan.}

\textit{var. trichostyla} \textit{Sleum.} Bot. Jahrb. 87 (1967) 98. Petals (3 mm) laxly hairy along the edge. Style set with a few appressed hairs at base. Otherwise as \textit{var. pappana}.

\textbf{Distr. \textit{Malesia}:} W. New Guinea (Wissel Lakes area), once found.


Low, stunted tree, or shrub-like; branches ascending, rigid, covered with brown bark. Branchlets short, rather robust, short-hairy. \textit{Leaves} oblong to subobovate-elliptic, apex shortly attenuate or subacuminate, base broadly cuneate, the very base often obtuse, subcoriaceous, firm, younger ones very densely shortly subacute-hairy above, covered all over beneath with a tomentum of minor and larger stellate, brownish greyish hairs, large fascicled hairs on petiole and midrib below few or absent, mature ones glabrous and a little shining above, rather persistently greyish tomentulose beneath, finely serrate-dentate in the upper part, tips of the serratures usually calloose, 5—8 by (2—)2.5—4 cm, midrib bold beneath, nerves in 9—11 (—12) pairs, curved, excurrent or divided along or before the edge, raised beneath, reticulation rather faint; petiole 0.5—1 cm by c. 2 mm. \textit{Racemes} panicked, (8—)10—15 cm, covered with a fulvous-greyish tomentum of stellate and fascicled hairs; rachis stoutish. Pedicels robust, 2—3—5 (—8) mm, bracts subulate, caducous. \textit{Calyx lobes} ovate-oblong, 4—5 by (2—2.5) mm. \textit{Petals} obovate-spathulate, minutely crenulate at apex, white, glabrous, (4—)5—6) by c. 2.5 mm. Filaments glabrous, 3 mm; anthers obcordate, 1 mm. \textit{Ovary} longish erect-tomentose; style thickish, glabrous, (2.5—3 mm (3—4 mm in fruit), shortly 3-lobed. \textit{Capsule} depressed-globose, c. 3 mm. \textit{Seeds} oval, 1 mm.

\textbf{Distr. \textit{Malesia}:} Philippines (Palawan), in low woody vegetation on summit of Mt Pulgar near Puerto Princesa, 1200 m. \textit{Fl. fr. May.}

13. \textit{Clethra pachyphylla} \textit{Merr. Philip. J. Sc.} 13 (1918) Bot. 103; \textit{En. Born.} (1921) 460; \textit{Sleum.} Bot. Jahrb. 87 (1967) 99. — \textit{Fig. 1.}

Shrub or mostly small tree, 2—4—10 m high, trunk up to 20 cm, laxly branched, branches obliquely ascending to almost horizontal. Branchlets robust, rufous-ferrugineous-tomentose at apex. \textit{Leaves} oblong or obovate-oblong, more rarely oblong-elliptic or elliptic, apex shortly subacuminate, base cuneate, coriaceous, firm, younger ones subdently floccose- or subvillose-stellate-hairy above, all over beneath with a tomentum of minor pale stellate hairs and a more coarse one of major stellate and fascicled, initially rusty, finally greyish hairs, midrib and nerves mainly with major fascicled hairs, entire or more rarely and but in part irregularly serrulate, 4—9—14 by (2—)2.5—3.5—(4—5) cm, midrib bold beneath, nerves (9—)10—12—13 pairs, prominent beneath, curved and ± excurrent at the edge, veins slightly raised beneath, reticulation more distinct but in ± mature leaves; petiole 1.2—1.5—(1.8) by 1.5—2 mm. \textit{Racemes} panicked, rather dense-flowered, robust, all over villous or almost so by minor and major stellate and coarse fascicled rusty hairs, 5—10—(12) cm; rachis stout. Pedicels thickish, 2—3—(—4) mm, bracts subulate, 4—5—(—8) mm, caducous. \textit{Calyx lobes} oblong-ovate, subacuminate, (3.5—)4—5 mm. \textit{Petals} spathulate to spathulate-oblong, irregularly erose or crenulate at apex, white to cream, scented, glabrous, (3—)4—(5) by 2.5—3 mm. Filaments glabrous, 2—2.5 mm; anthers suboboovate, 0.8—1 mm. \textit{Ovary} short-tomentulose; style thickish, glabrous, 2.5—3 mm (3.5—4 mm in fruit), shortly 3-lobed. \textit{Capsule} depressed-globose, 3 mm. \textit{Seeds} subtrigonal, 1—1.2 mm.

\textbf{Distr. \textit{Malesia}:} NE. Sarawak (Mt Murud area) and North Borneo (Mt Kinabalu).

Ecol. Scattered in \textit{Quercus havilandii} and \textit{Tristania} forest, still not too rare in mossy \textit{Leptospermum-Dacrydium} forest, also in secondary vegetation, (870—)1200—2500—(3050) m, on poor soil. \textit{Fl. fr. March—Oct.}