

FLORAE MALESIANAE PRAECURSORES LX
THE OLEACEAE OF MALESIA
II. THE GENUS OLEA

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SUMMARY

Olea comprises six species in Malesia: two from Malaya, *O. brachiata* (Lour.) Merrill (formerly *O. maritima* Wall. ex G. Don) and *O. dentata* Wall. ex G. Don (formerly *O. penangiana* Ridley); two from Borneo, *O. borneensis* Boerl. and *O. decussata* (Heine) Kiew and two from Java, *O. javanica* (Bl.) Knobl. and *O. paniculata* R. Br., the latter extending to Australia.

INTRODUCTION

The genus *Olea* has had a chequered history in Malesia, the first species (*javanicum*) described for the region was placed by Blume first in the genus *Pachyderma* (1825) and then in *Stereoderma* (1828). G. Don gave a brief description for Wallich's specimens in 1838 and recognised *O. maritima* from Malaya and *O. dentata* from Burma. Clarke's revision in 1882 for the Flora of British India reduced Blume's two genera and their species to *Olea maritima* and did not add any new species for the region. His remains the most complete revision for the area today. King & Gamble's work on the flora of Malaya (1905) led to the discovery of *O. dentata* from Penang which was later treated as a new species, *O. penangiana*, by Ridley (1925). In revising *Olea*, Knoblauch (1895) restored *O. javanica* to the specific level. Boerlage (1899) gave a brief diagnosis of *O. borneensis*, the first record of *Olea* from Borneo. Koorders and Valetton (1902) recorded *O. paniculata*, an Australian species, from Java and a cultivated Indian species, *O. cuspidata* (now *O. ferruginea* Royle; Grohmann, Fl. W. Pakistan 59, 1974: 9 & Fig. 2A, B) and described a dubious new species, *O. graciliflora*. Merrill (1925) in working on the Hainan flora recognised that *O. maritima* of Malaya and Thailand was the same as *O. brachiata* (Lour.) Merrill from Indo China. In contrast, Sumatra, Borneo and New Guinea have received scant attention. As might be expected, further collections have extended the range of many species—*O. paniculata* is found in Lombok, Timor and New Guinea; *O. javanica* in Sumbawa, Flores and Borneo—and has led to the discovery of a distinctive new montane species from G. Kinabalu, *Olea decussata* (Heine) Kiew, which was originally described by Heine (1953) as an opposite-leaved *Ilex*. Species of *Olea* have not yet been collected from either Sumatra or the Philippines.

Several species described as *Olea* belong to other genera of the Oleaceae: *O. capitellata* Ridl. is *Osmanthus scortechinii* King & Gamble, *O. puberula* Ridl. is *Ligustrum confusum* Decaisne and *O. ardisioides* K. & G., *O. platycarpa* K. & G. and *O. pauciflora* Wall. ex D. C. are all species of *Linociera* (now *Chionanthus*; Stearn, Ann. Missouri Bot. Gard. 63, 1976: 355–357.) This confusion illustrates the problem of generic delimitation within the Oleaceae of which *Olea* lies at the centre.

In practise in the Malesian region there is little difficulty in separating *Olea* from *Ligustrum* (which has a shrubby habit, terminal inflorescences and large flowers with projecting stamens) or from the single species of *Osmanthus*, *O. scorcihinii* K. & G. (which is a small montane shrub with rotund leaves with inrolled margins). The real problem arises in distinguishing species of *Chionanthus* from species of *Olea*. *Olea* is a diverse genus displaying a wide range of variation in many characters considered diagnostic at the generic level, *Chionanthus* is similarly variable and suffers in addition from being less well known. Thus length of the corolla tube is often used in keys but, whereas the corolla tube of Malesian species of *Olea* is more or less of the same length as the lobes, species of *Chionanthus* range from the deeply divided corolla with lobes with inrolled margins as in *L. lancifolia* Ridley to species, such as *Ch. ramiflorus* Lour., where the corolla tube is more or less equal to the corolla lobes. Verdoorn (Bothalia 6, 1956: 549–640) suggested that the presence of the endosperm in the seeds of *Olea* and its absence in *Linociera* was a constant difference in South African species. In Malesia, while the seeds of *Olea* species are endospermic, some of the large seeded species of *Chionanthus*, such as *L. elaeocarpa* Stapf are also endospermic. Characters such as pendulous ovules in *Olea* and ones that are ventrally attached in *Linociera*, as stated by Verdoorn, can hardly be assessed in Malesia where such information is lacking for many species of *Linociera*.

Johnson (Contrib. N.S. Wales Nat. Herb. 2, 1957: 395–418) attempted to clarify the generic delimitation within the *Oleaceae* and concluded that the genus *Olea* should be further divided: so that for Malesia, *Olea* would be represented by a single species, *O. paniculata*, the remainder would be placed in *Tetrapilus* Lour. based on the corolla tube being longer than or equal to the lobes, the leaves being dentate to entire and pilose (as opposed to lepidote) and the stigma being shortly bilobed. He comments that then *Tetrapilus* would be much closer to *Linociera* and might be reduced to it. This argument does not solve the problem of the delimitation of the Malesian species of *Olea* and *Linociera*. *Olea paniculata* is certainly discrete from the other Malesian species, if only because of its terminal inflorescence and its conspicuous stellate hairs. However, none of the characters that he suggests to define *Tetrapilus* from *Olea* is clear-cut. The length of the corolla tube in relationship to the lobes is hardly different in the six species described here, and the stigma in most Malesian species is capitate and not bilobed, and a species, such as *Olea javanica*, with entire leaves which he placed in *Tetrapilus* solely by the pilose nature of the indumentum in fact is lepidote and should be put in *Olea s.s.* This division of *Olea* serves only to create further problems without offering any solution to the *Chionanthus* (*Linociera*)—*Olea* problem. The present account will therefore follow the traditional delimitation of *Olea* based on differences in the corolla: *Olea* has a corolla tube longer, equal to or shorter than the corolla lobes, contrasting with *Chionanthus* where the corolla lobes are free to the base or are joined in pairs at the base or less usually are joined into a short corolla tube.

ACKNOWLEDGEMENTS

The completion of this work is indebted to the following: — the Agricultural University of Malaysia for granting me sabbatical leave to work in Europe; the Professor of Botany for allowing me facilities in the Botany School at Cambridge; the Directors of the Herbaria at the Royal Botanic Gardens at Kew, the British Museum, and at the Rijksherbarium at Leiden for permission to work at their institutes, and to the herbaria of the Arnold Arboretum, Bogor Botanic Gardens, Singapore Botanic Gardens, and the Forest Research Institute, Kepong for the loan of specimens.

OLEA

Olea Linn., Sp. Pl. (1753) 8; Gen. Pl. ed. 5 (1754) 18; DC., Prodr. 8 (1844) 284; Bentham & Hooker, Gen. Pl. 2, 2 (1876) 679; Clarke in Hook. f., Flora British India 3 (1882) 611; Knoblauch in E. & P., Nat. Pflanzenf. IV, 2 (1895) 1; King & Gamble, J. As. Soc. Beng. 74 (1905) 269; Lingelsheim, Pflanzenr. 72, 4, 243 (1920) 1; Ridley, Fl. Mal. Pen. 2 (1923) 318; Johnson, Contrib. N.S. Wales Nat. Herb. 2 (1957) 395–418; Backer & Bakh. f., Fl. Java 2 (1965) 214. — *Tetrapilus* Louriero, Fl. Cochinchin. 2 (1790) 611. — *Pachyderma* Bl., Bijdr. (1826) 682. — *Stereoderma* Bl., Fl. Java Praef. 7 (1828) 8.

Shrubs or small to medium trees. *Twigs* whitish or brown, glabrous, sometimes minutely pubescent, exstipulate. *Leaves* opposite, simple, margin entire, toothed in some species, elliptic-lanceolate, coriaceous, sometimes membranous. *Inflorescences* paniculate, axillary (terminal in *O. paniculata*), glabrous or minutely pubescent. Bracts foliaceous, small and caducous. *Flowers* 1–5 mm long, hermaphrodite (in *O. paniculata*), or dioecious, or polygamous, regular and four-merous. *Calyx* small, joined at the base, 4-lobed, divided more or less halfway, valvate, persistent. *Corolla* joined at base, tube short and divided about half way into 4 induplo-valvate lobes, white or yellow, glabrous (or with stellate hairs in *O. paniculata*), sometimes absent. *Stamens* usually 2 (to 4 in *O. javanica*), joined to base of corolla tube, filament short and within the corolla tube, anthers 2 loculate, extrorse. *Ovary* superior, 2 loculate, placentation axile with 2 pendulous or laterally affixed ovules in each locule. Style short or none, stigma capitate or bifid. *Fruits* drupaceous, ellipsoid or subglobose, 0.5–1.5 cm long, generally one-seeded, pericarp thin and fleshy, endocarp crustose or bony. *Seeds* with thin testa and copious fleshy or bony endosperm, radicle superior, embryo straight.

Distribution: A genus of about 30 species: Mediterranean, Africa, Madagascar, E. Asia, Indo-Malesia, Australia, New Zealand and Polynesia. 6 species in Malesia.

Ecology: Open country in north Malesia, and in central and south Malesia usually of lowland forest, except for *O. decussata* which is exclusively montane.

Use: *Olea europaea* L. is an important oil producer; *O. capensis* L. (Africa) and *O. ferruginea* Royle (India) are important timber trees, the latter was cultivated in Java early this century (Backer & Bakh. f., Fl. Java 2, 1965: 214–5); *O. paniculata* R. Br. is used for timber in Australia.

KEY TO MALESIAN SPECIES OF OLEA

- 1a. Inflorescences terminal and axillary. **6. *O. paniculata***
 b. Inflorescences never terminal, always axillary 2
 2a. Leaf margin always entire, veins conspicuous below, lamina not drying pale
 3
 b. Leaf margin toothed to entire, veins inconspicuous above and below, lamina
 drying grey or pale brown. 4
 3a. Inflorescences 2.5–4 cm long; flowers with pedicels 1–2 mm long, stamens 2.
 3. *O. decussata*
 b. Inflorescences 4.5–9 cm long; flowers with pedicels 2–10 mm long, stamens
 2–4. **5. *O. javanica***
 4a. Inflorescences 1–2.5 cm long. **2. *O. brachiata***

- b. Inflorescences more than 2.5 cm long. 5
 5a. Inflorescences 2.5–4.5 cm long; flowers minute, 1 mm long.

1. *O. borneensis*

- b. Inflorescences 3.5–19.5 cm long; flowers large, 2–5 mm long.

4. *O. dentata*

1. *Olea borneensis* Boerlage

O. borneensis Boerlage, Handl. Fl. Ned. Ind. 2 (1899) 332. – Type: *Korthals s.n.* (L).

Small tree. *Twigs* white, glabrous, flattened at nodes. *Leaves* oblong to lanceolate, base tapered, more or less decurrent, apex acute to acuminate, (6.5–)14(–22.5) cm by 2.5–7.5 cm, margin entire or minutely toothed to undulate towards apex, coriaceous, glabrous or minutely lepidote below, drying grey. *Veins* inconspicuous above and below, 6–9 pairs, midrib plane above. *Petiole* 0.5–1 cm long, thickened below. *Inflorescence* an axillary panicle, minutely hairy, 2.5–4.5 cm long; lateral branches thin, 0.5–1 cm long and of equal length. *Flowers* spaced on inflorescence (not in subumbels) with pedicels 1 cm long, buds spherical and minute, up to 1 mm long, dioecious. *Calyx* cupulate with 4 lobes, acute to ovate, margin ciliate. *Corolla* 4-lobed, lanceolate and fleshy. *Stamens* 2, filaments thin and short. *Ovary* 2-loculate. *Fruit* not known.

Distribution: Borneo, Moluccas.

Habitat: Not recorded.

BORNEO. Kalimantan: *Korthals s.n.* (L), *Hallier B2972* (L), *B2973* (L).

MOLUCCAS. Boeroe: *Teysmann s.n. HB. 1834* (L, U).

Remarks: Boerlage's diagnosis of this species appears to have been overlooked but specimens at Leiden leave no doubt as to its validity. Its grey coriaceous leaves resemble those of *O. brachiata* and *O. dentata*; its exceptionally small flowers distinguish it from both these species while its leaves are larger than those of *O. brachiata* and its inflorescence is shorter than that of *O. dentata*.

2. *Olea brachiata* (Lour.) Merrill

O. brachiata (Lour.) Merrill, Lingnaam Agr. Rev. 2 (1925) 127, Lingnan Sci. J. 5 (1927) 147; Corner, Wayside Trees of Malaya 514 & Plate 70 (1940). – *Tetrapilus brachiatus* Lour., Fl. Cochinch. 2 (1790) 611. – Type: *Louriero* (BM).

O. maritima Wall. Cat. 2813 (1831); G. Don, Gen. Syst. 4 (1838) 49; DC, Prodr. 8 (1844) 288; Miquel, Fl. Ind. Bat. 2 (1857) 547; Clarke in Hook. f. Fl. Brit. India 3 (1882) 512–3; King & Gamble, J. As. Soc. Beng. 74, extra no. (1905) 270; Ridley, Fl. Mal. Pen. 2 (1923) 318 & Fig. 104; Kerr in Craib, Florae Siam. Enum. 2 (1939) 416. – *Wallich Cat. 2813* (K).

Notelaea zollingeriana Teijsm. & Binn., Natuurk. Tijd. Ned. Ind. 27 (1874) 33. – Type: *Binnendijk* (K, L).

Olea graciliflora Koorders & Valetton, Meded. Lands Plant. 59 (1902) 254–256; Backer & Bakh. f., Fl. Java 2 (1965) 215. – Type: *Koorders 29339* (BO).

Large shrub or small tree to 10 m, evergreen. *Twigs* pale brown, minutely pubescent. *Leaves* elliptic-lanceolate, base cuneate or somewhat rounded, apex acuminate, (4.5–)8–10(–12.5) cm by (2–)3–5(–6) cm wide, margin entire or toothed on the upper half, drying grey, coriaceous, glabrous. Secondary *veins* obscure below, 7–10 pairs, midrib slender, impressed above and raised beneath. *Petiole* 5–7 mm long, minutely pubescent when young. *Inflorescences* paniculate,

extra-axillary or axillary, 1–2.5 cm long, trichotomously branched terminating in umbels of 3–10 flowers, minutely pubescent. Bracts leafy, narrowly ovate-lanceolate, caducous. *Flowers* dioecious, dull white, 1.5–2.5 mm long. Pedicels 0–3 mm long. *Calyx* c. 1 mm long, tube short, deeply divided to base, lobes ovate-acute, unequal, minutely pubescent, persistent. *Corolla* divided about halfway, lobes rounded or elliptic to obtuse. *Stamens* 1–2 mm long and shorter than corolla, filaments slender, short or sessile, inserted near the base; anthers as long as filaments, reniform. *Ovary* conical, stigma sessile, capitate and bilobed. *Fruit* globose, 0.5 cm long, purple-black when ripe, one-seeded. Pedicel 2 mm long.

D i s t r i b u t i o n: China, Cambodia, Thailand, Malaya, Anambas Is., Borneo and Java.

H a b i t a t: Forest, open country and rocky shore; locally common.

MALAYA. All states. *Ridley 10731* (K, SING), *14933* (K, SING); *King's Coll. 1138* (K, SING), and about 30 others.

JAVA. *Teysmann 1867* (L), *de Vriese s.n.* (L), *Ploem s.n.* (L). *Winckel no. 3* (L), *Binnendijk* (K, L); *Koorders 8045* (BO), *28073* (BO), *29339* (BO), *29341* (BO), *29682* (BO), *39243* (BO).

BORNEO. Sarawak: *Haviland 3040* (K, SAR). – Brunei: *Hotta 13997* (SAR). – Sabah: *Sinanggol SAN 57438* (SAR).

R e m a r k s: Specimens of *Olea brachiata* from China and Cambodia have smaller leaves (5–5.5 cm long), which are less coriaceous than specimens collected from Thailand and Malaya. In this latter area *O. brachiata* is locally common and shows a wide range of variation in leaf size from 5–11 cm long. Although the Thai and Malayan plants are generally more robust, they fall within the circumspection of Loureiro's original description. In Thailand and Malaya it is common on rocky shores and in open country, but in Java and Borneo it is rare. As yet there is no record for Sumatra. The Javanese specimens were previously described as *O. graciliflora*, although in the original description Koorders and Valetton noted its affinity to *O. maritima* (now *O. brachiata*) and recently *Notelaea zollingeriana* was also referred to *O. maritima* (Green, J. Arn. Arbor. 49, 1968: 369). All the Javanese specimens have typical leaves with respect to size, texture and that they dry grey; the majority have entire leaf margins and the typical 1–2.5 cm long inflorescence, but the type specimen of *N. zollingeriana* is distinctive in its more acuminate leaf and longer (3.5 cm long) inflorescence; but these differences do not warrant a separate rank. The Javanese plants are not strand plants but have been collected inland and from mountains.

Clarke (1882) described this species as having an inflorescence 2.5–11 cm long. It seems probable that he had included the Curtis collections of *O. dentata* from Penang, which have characteristically longer inflorescences.

3. *Olea decussata* (Heine) Kiew, *comb. nov.*

Ilex decussata Heine, Mitt. Bot. Staatssaml. München 6 (1953) 209. – T y p e: *Clemens 28986* (K, L).

Shrub or small tree to 17 m tall and 1 m girth. *Twigs* green, drying black, glabrous, older shoots white with scattered lenticels, axillary vegetative buds large and conspicuous with stiff bud scales. *Leaves* obovate, base rounded or cuneate and decurrent, apex acute, characteristically erect, (6–)9(–13) cm long and 3–5 cm wide, margin entire and inrolled, coriaceous, glabrous, punctate below. *Veins* plane

but conspicuous below and indented above, sometimes drying black, 7–10 pairs, midrib plane above and depressed below, drying black. Petiole stout, drying black, 0.7–1.2 cm long. *Inflorescences* axillary trichotomous cymes, 2.5–4 cm long, glabrous, with subumbels of 3–8 flowers. Bracts foliaceous 1.5 cm long, caducous. *Flowers* dioecious, green, yellow or white, 2–4 mm long; pedicels 1–2 mm long, frequently with rotund green galls. *Calyx* 1 mm long, lobes ovate and concave, ciliate. *Corolla* divided less than halfway, lobes elliptic-rounded. *Stamens* with filaments 0.2 mm long, anthers ovoid. *Ovary* 2 mm long, stigma sessile and capitate. *Fruit* ovoid, 3 mm long (immature).

Distribution: Borneo (Sabah and Sarawak).

Habitat: Montane, in mossy forest at 2000–3800 m.

BORNEO. S a b a h: G. Kinabalu, *Clemens 28986* (K, L), *28986A* (L), *40698* (K, L), *51076* (K, L); *Mikil SAN 46522* (K, L, SAR); *Chew et al. RSNB 840* (K, L), *939* (K, L), *5993* (K, L). — **S a r a w a k:** G. Murut Lawas, 5th Division, *Ilias Paie S26497* (K, SAR), *26535* (K, SAR); G. Mulu, 4th Division, *Martin S 37066* (SAR); G. Kalulong, 4th Division, *Pickles S3752* (BM, SAR).

Remarks: Heine (1953) described specimens of this species as a new opposite-leaved *Ilex*, of which there are several on G. Kinabalu. His description was based on male material only. Green (Notes Roy. Bot. Gard. Edin. 23, 1959: 176) re-examined the material which he identified as *Olea* based on the anatomy of the leaves (presence of peltate glands on the leaf and dense idioblasts within, and simple vessel endings) and flower structure (possession of two stamens and a valvate corolla). In addition the plant is exstipulate and young fruits show that the gynoeceum is two-loculate.

4. *Olea dentata* (Wall.) DC.

O. dentata Wall. ex DC, Prodr. 8 (1844) 286; Kurz, Forest Fl. British Burma 2 (1877) 157; Clarke in Hook. f., Fl. British India 3 (1882) 613; King & Gamble, J. As. Soc. Beng. 74, extra No. (1905) 269. — *Wallich Cat.* 2840 (K).

O. penangiana Ridley, J. Fed. Mal. States Mus. 10 (1920) 148; Fl. Mal. Pen. 2 (1923) 318. — **T y p e:** *Curtis 950* (K, SING).

Shrub or small tree to 20 m. *Twigs* light brown, pubescent or glabrous. *Leaves* lanceolate or oblong lanceolate, base shortly cuneate or rounded, apex acuminate or bluntly acute, (5.5–)12–13(–24.5) cm long and (3–)3.5–4.5(–7) cm wide, margin entire or less usually toothed on upper half, coriaceous, glabrous. Secondary *veins* obscure above and below, 8–10 pairs, midrib impressed above, prominent beneath. Petiole 0.5–1.5 cm long, glabrous. *Inflorescence* an axillary compound panicle with 2–6 tiers of secondary branches terminating in subumbels of 3–8 flowers, (3.5–)9–11(–19.5) cm long, densely pubescent or sometimes glabrous. Bracts leafy, narrow-linear or oblong, 0.5–4 cm long; bracteoles minute, ovate-acute. *Flowers* dioecious, white or yellow, 2–5 mm long, pedicels 0–2 mm long. *Calyx* 1 mm long, lobes obtuse or rounded, pubescent. *Corolla* campanulate with rounded lobes. *Stamens* with short filament not extending beyond corolla. *Ovary* ovoid, stigma sessile, capitate. *Fruits* ovoid, 10 × 7 mm.

Distribution: NE India, Burma, Cambodia, Thailand and Malaya (Penang only).

Habitat: Evergreen forest, on sandstone, and in open rocky country.

MALAYA. PENANG: *Curtis 950* (K, SING), 222 (K), 223 (SING), 2267 (K), 3506 (K), 12570 (BM); *Burkill 3378* (BM, SING); *Sinclair 39301* (K, L, SING); *Ding Hou 830* (L).

Remarks: *Olea dentata* is a common tree throughout Burma and is variable in the dentation of the leaf margin, from dentate-serrate to more or less entire. It is readily distinguished from *O. dioica* where the veins are impressed above and the margin is regularly and deeply serrate; and from *O. brachiata* which has smaller leaves and flowers and a much shorter inflorescence. Kerr (in Craib, Fl. Siam Enum. 2, 1939: 418) considered the Thai specimens as *O. salicifolia*, but these specimens fall within the range of variation of the Burmese population of *O. dentata*. It is interesting that Kerr did not identify any specimens from Thailand as *O. dentata*, although several specimens at the British Museum match the type in dentation and flower form. Specimens of *O. dentata* var *salicifolia* (Wall.) Clarke (in Hook. f., Fl. Brit. India 3, 1882: 613) from Silhet and Khasia have much narrower and smaller leaves than Kerr's Thai specimens, which are not willow-shaped at all, being both larger and broader. Malayan specimens of *O. penangiana* fall within this range and these plants represent the most southern limit of *O. dentata*. In general, plants from the south have smaller flowers and the inflorescence is less downy. Ridley distinguished his species from *O. dentata* by the entire leaf margin, though some of the leaves of the specimens he described are in fact toothed. *O. dentata* is not an appropriate name as almost half of the Burmese specimens at Kew are scarcely toothed.

5. *Olea javanica* (Bl.) Knoblauch

O. javanica (Bl.) Knoblauch, Bot. Centralbl. 61 (1895) 134; Koorders & Valeton, Meded. Lands. Plant. 59 (1902) 251–3, incl. vars. *acuminatissima*, *grandiflora*, *grandifolia*, and *laxiflora*; Backer & Bakh. f., Fl. Java 2 (1965) 215. — *Pachyderma javanicum* Bl., Bijdr. (1826) 682. — *Stereoderma javanicum* Bl., Fl. Javæ Praef. 7 (1828) 8; DC, Prodr. 8 (1844) 290; Miquel, Fl. Ind. Bat. 2 (1857) 550. — Type: *Blume 2169a* (K, L).

Small tree 7–12 m (–27 m) with girth 1.75 m. Twigs green or brown, lenticellate, glabrous. Leaves narrowly lanceolate to obovate, base cuneate to rounded, apex acuminate, acumen *c.* 1 cm long, (7.5–)8–9(–14.5) cm long by 2.5–5 cm wide, margin entire and slightly thickened, membranous, sometimes coriaceous, minutely lepidote below, drying reddish-brown. Veins pale and conspicuous below, 5–7 pairs, ascending towards margin, midrib depressed above. Petiole glabrous, drying black, 5–7 mm long. Inflorescence a much branched panicle, axillary, glabrous or finely pubescent, 4.5–9 cm long, terminating in 1–3(–5) flowered subumbels. Bracts lanceolate-elliptic 1–5 mm long. Flowers dioecious, white, small 1–2(–3) mm long. Pedicels 2–10 mm long, buds with flat top. Calyx 1 mm long with acute deeply divided lobes, ciliate. Corolla divided almost halfway, lobes fleshy, scarcely opening. Stamens 2, 3 or 4, filaments short remaining within the corolla. Ovary subrotund 1.5 × 1.3 mm, stigma sessile and capitate. Fruits oblong-obovate, 1.5 × 0.5 cm, green ripening purple-black; pedicel 4–5 mm long and pendulous.

Distribution: Java (common) extending to Borneo, W. Sumbawa, and Flores.

Habitat: Forest, 300–1475 m.

JAVA. *Blume 2169a* (L), 2276 (L), and 20 others.

BORNEO. Kalimantan: *Kostermans 7500* (L), 7535 (K). — Sarawak: *Ilias Paie S24294* (SAR). — Sabah: *Chow & Aban SAN 65047* (SAR).

W. SUMBAWA. *Kostermans 18561* (K), 18778 (K, L).

FLORES. *Kostermans & Wirawan 801* (L), 811 (L).

Remarks: *Olea javanica* is a variable species and Koorders and Valeton (1902) attempted to distinguish the extremes of variation — plants with larger leaves, extremely acuminate leaves, larger flowers, or long pedicels — as separate varieties; however, there is no basis for this as none of these characters shows discontinuous variation. Clarke (in Hook. f., Fl. Brit. India 3, 1882: 216) reduced Blume's *Pachyderma* (*Stereoderma*) *javanica* to *O. maritima* (now *O. brachiata*); Knoblauch (1895) recognised *O. javanica* as a distinct species and also corrected Blume's and Miquel's descriptions that stated the inflorescence was terminal. *O. brachiata* more closely resembles *O. borneensis* and *O. dentata* in its very coriaceous leaves (with scarcely visible veins) which are more or less toothed and which dry greyish, compared with *O. javanica* which has more membranous leaves (with conspicuous veins which dry blackish) which are always entire and which dry a reddish-brown. In these features *O. javanica* resembles *O. decussata*, from which it can be distinguished by its larger (4.5–9 cm long) and much branched inflorescence and long pedicels (2–10 mm); *O. decussata*, in contrast, has inflorescences 2.5–4 cm long and pedicels 1–2 mm long and in addition has characteristic erect leaves and large axillary buds with stiff bud scales.

Johnson (1957) places *O. javanica* in *Tetrapilus* Lour., although it always has entire leaves and the indumentum is minutely lepidote — both characters of his *Olea* s.s. The fact that this species does not fit comfortably into either his delimitation of *Tetrapilus* or *Olea* (the latter being characterised by terminal inflorescences, which *O. javanica* never has) shows that this division cannot be maintained.

Olea javanica is atypical of the *Oleaceae* in possessing 2, 3 or 4 stamens — the only other Malesian member that has 2 or 4 stamens is *Osmanthus scortechinii* King & Gamble.

6. *Olea paniculata* R. Brown

O. paniculata R. Brown, Prodr. (1810) 523; Koorders & Valeton, Meded. Lands. Plant. 59 (1902) 256; Backer & Bakh. f., Fl. Java 2 (1965) 214. — Type: not indicated.

Tree 12–30 m tall with 1 m girth, often buttressed at base in larger trees. Bark brown-grey, wrinkled and pustulate. Sapwood white, turning pink. Twigs grey and lenticellate, flattened at nodes, glabrous. Leaves ovate, elliptic or lanceolate, base rounded, obtuse or acute, apex with long acumen, (5–)10(–13) cm by 2–5.5 cm wide, margin entire, coriaceous, glossy above, young leaves with peltate scales below. Veins visible on both surfaces, 8–11 pairs, midrib indented above and depressed below. Petiole 7–12 mm long. Inflorescence a terminal or axillary panicle with lower branches as long as main axis, 4.5–6.5 cm long, with 2–3 tiers of branches, terminating in subumbels of 3 flowers, minutely hairy. Flowers subsessile

or sessile, hermaphrodite, cream, 2–3 mm long. *Calyx* minute and cupular, 1 mm long with acutely dentate lobes covered by peltate scales. *Corolla* deeply lobed, covered by peltate scales. *Stamens* 2, 2 mm long, anthers exposed as corolla lobes open. *Ovary* globose, stigma sessile and bilobed. *Fruits* oval-oblong or narrowly oval, often oblique, 1.3 cm long × 0.5 cm wide, bluish-black; pedicel 2–4 mm.

Distribution: E. Australia (New South Wales) to N. Queensland, Lord Howe Is., New Caledonia, New Guinea, Timor, Lombok and Java.

Habitat: In Australia in coastal scrub, in N. Guinea in oak and *Araucaria* forest, and in Java in *Casuarina*- and rain forest.

LESSER SUNDA IS. Lombok: *Elbert 1635* (K, L), *1690* (K, L). – Timor: *Ned. Ind. For Ser. bb 27108* (K, L).

NEW GUINEA. *Anderson 21003* (K); *Hartley 11948* (A, K, L), *12092* (A, K, L); *Darbyshire 842* (K).

Remarks: This is the only Malesian species of *Olea* with any commercial importance, in Australia it is used for fine carving, inlays, hard turnery and flooring (Francis, *Australian Rain Forest Trees*, 1970: 362–3, Fig 226 & 227). No other *Olea* species in Malesia has a terminal inflorescence or peltate scales.