

STAPHYLEACEAE (B. L. van der Linden, Leyden)

This smallish family, containing five genera¹, is almost confined to the northern hemisphere in both the Old and New World, overstepping the equator only in Ecuador and Peru in S. America and in Malaysia, where it is found southward to Java and New Guinea.

Among the genera *Huertia* is confined to Peru and the West Indies (Cuba, Haiti). *Tapiscia* and *Euscaphis* are East Asian. *Staphylea* is widely distributed in the subtropical and temperate zone on the northern hemisphere. *Turpinia* is subtropical and tropical, it is the only genus represented in Malaysia. It is remarkable that the distributional areas of the latter two genera seem to exclude one another save for a slight overlapping in SE. Asia.

Ecologically the members of the family may be found from the tropical lowland up into the mountains, in Malaysia up to the upper border of the montane zone at c. 2400 m, but in the Sinohimalayan area they may ascend to c. 3000 m. Latitudinally the northern frontier is found at c. 50° N (Central Germany, South Canada); in S. America the southern border is found in Ecuador and Peru.

The taxonomic position of the family has a chequered history. In the 18th century its place was designated in the affinity of *Rhamnaceae*. A. P. DE CANDOLLE (1825) and MEISNER (1836) referred the family as a tribe to the *Celastraceae*; ENDLICHER (1840) had *Staphyleaceae* as an order next to the *Celastraceae* but placed *Ochranthe* as a separate family near the *Hypericineae*. REICHENBACH (1828) had arranged it near *Sapindaceae* and this position was accepted by BENTHAM & HOOKER, and up to the present day it is referred to *Sapindales* by ASA GRAY, ENGLER, HUTCHINSON, etc.

LINDLEY (1835) kept it as a separate family in the *Hypericineae* together with *Cunoniaceae*. HALLIER *f.* has repeatedly stressed their close affinity to the *Cunoniaceae* (Über Juliania, etc. 1908, 74, 116, 182; Arch. Néerl. Sc. Ex. Nat. III B, 1912, 164).

The affinity with the *Cunoniaceae* seems to be without much doubt and is shown by the fact that *Turpinias* have twice been wrongly described as members of the *Cunoniaceae*, viz as *Ochranthe* and *Kaernbachia*. The vegetative resemblance is large as both families have stipulate, decussate, pinnate leaves and terminal inflorescences. Besides, the differential characters are few, mainly 5 stamens in *Staphyleaceae* and diplostemonous flowers in *Cunoniaceae*, the 3-celled ovary against a mostly 2-celled one, and more vague differences in filaments and fruit. Leaves of *Staphyleaceae* are herbaceous and the articulations of petiole and rachis shrink in the herbarium; leaves of *Cunoniaceae* are generally coriaceous and the junctions do not shrink. In his key HUTCHINSON differentiates *Cunoniaceae* and *Staphyleaceae* by having pendulous and ascending ovules respectively, but the importance and constancy of this character seems doubtful. (KRAUSE, p. 272). The pollen structure of *Staphyleaceae* is \pm similar to that of several other families, for example *Celastraceae* (ERDTMAN, 1952).

The wide separation of *Staphyleaceae* (near *Sapindales*) and *Cunoniaceae* (near *Rosales*) is not only unsatisfactory from a taxonomical standpoint, but also anatomically. Dr. METCALFE, Kew, has made an anatomical investigation as far as available material permitted and his conclusion is that there are marked anatomical differences between *Turpinia* and the *Sapindaceae* and that both *Staphyleaceae* and *Cunoniaceae* show more mutual affinity than either of them with the *Sapindaceae*. In his opinion "an anatomist could not disagree with a taxonomist who wished to 'remove' the *Staphyleaceae* from the 'vicinity' of the *Sapindaceae*" (*cf.* Nova Guinea n.s. 10, 1959, 212).

Plantgeographically *Staphyleaceae* represent a marked northern counterpart to the *Cunoniaceae* which is largely a southern hemisphere family. Such 'pairs' turn up repeatedly as our studies of plant geography advance: *Fagus* and *Nothofagus*, *Dillenia* and *Hibbertia*, *Ericaceae*

(1) GAGNEPAIN has described a sixth genus, *Triscaphis*, from Indo-China (Not. Syst. 13, 1948, 190; Fl. Gén. I.-C. Suppl. 1, 1950, 999, fig. 128 3-8). According to the description this is almost certainly not staphyleaceous through its exstipulate, spiral leaves and 3-merous flowers; it might be anacardiaceous. According to LEMÉE it would be sapindaceous (Dict. Suppl. 10, 1959, 213)



Fig. 1. Details of Malaysian species of *Turpinia*.—*T. borneensis* (MERR. & PERRY) VAN DER LINDEN. a. Habit, $\times \frac{1}{2}$, b. open nerves and venation, $\times \frac{1}{2}$, c. flower, $\times 5$, d. ditto, in section, $\times 5$, e. fruit with cross-section, nat. size, f. stamen, $\times 10$.—*T. montana* (BL.) KURZ. g. Leaf showing its closed nervation, $\times \frac{1}{2}$, h-i. stamens, $\times 10$.—*T. pomifera* (ROXB.) DC. j-k. Fruit and its section, nat. size.—*T. sphaerocarpa* HASSK. l-m. Fruit and its section, nat. size, n. embryo, $\times 4$.—*T. ovalifolia* ELMER. o. Fruit and its section, nat. size.—*T. stipulacea* VAN DER LINDEN. p. Defoliated part of twig showing persistent stipules (a, c-d, f CLEMENS 30070, b, e CLEMENS 28840, i KERR 2527, j-k LAM 2855, o RIDLEY 15906, p SF 27516).

and *Epacridaceae*, etc. The meeting point of the areas of each pair and their overlapping margins are almost always found in the vicinity of the tropical zone. It would seem that the birthplace of these pairs must have been the tropics from where their ancestors have been branched off with a northward and southward directed distribution, respectively giving way to a subsequent development (diversity) in antipodal centres. Other explanations for the phenomenon of these

antipodial pairs of affinity seem less likely, viz if the pairs had to be explained as random parallel development which is extremely unlikely if we take the close taxonomical affinity of each pair into consideration. And the mere suggestion that the phenomenon is due to 'coincidence' seems not worthy to consider.

Vegetatively *Turpinia* shows a marked, structural resemblance with *Sambucus*, both possessing decussate, simply-pinnate, frequently herbaceous, toothed leaves, with stipules and gland-like stipels (though stipules are not always well represented in the latter genus and some *Turpinias* have simple leaves). Properly the sympetaly and inferior ovary of *Sambucus* separates them mainly in the reproductive section, but these two 'characters' are gradually losing their unique value as essentials for natural affinity. Some time the relationship between *Sambucus* and the *Staphyleaceae* should be scrutinized more carefully by modern methods.—VAN STEENIS.

1. TURPINIA

VENT. Choix (1803) 31, t.31, *nom. gen. conserv. prop.*; MERRILL & PERRY, J. Arn. Arb. 22 (1941) 543; J. KRAUSE¹, in E. & P. Pfl. Fam. ed. 2, 20b (1942) 306; BAKH., v. D. LINDEN & VAN STEENIS, Taxon 9 (1960) 57–58.—*Triceros* LOUR. Fl. Coch. 1 (1790) 184, *nom. gen. rejic. prop. non* GRIFF. 1854; SPRENG. Syst. 1 (1825) 947; MORITZ, Syst. Verz. (1846) 15; BAILL. Hist. Pl. 5 (1874) 342, 343, *excl. Euscaphis*; MAZA, Dicc. Bot. Nom. Vulg. Cub. & Puerto-Riq. (1889) 15; *cf.* also O.K. Rev. Gen. Pl. 1 (1891) 148.—*Dalrympelea* ROXB. [Hort. Beng. 1814, 17, *nomen*, '*Dalrympelia*'] Pl. Corom. 3 (1820) 76, t.279.—*Ochranthe* LINDL. Bot. Reg. 8 (1836) t.1819.—*Hasskarlia* MEISN. Pl. Vasc. Gen. 2 (1843) 348; *cf.* WALP. Ann. 1 (1849) 753.—*Maurocena* § *Triceros* O.K. Rev. Gen. 1 (1891) 149.—*Kaernbachia* SCHLTR, Bot. Jahrb. 52 (1914) 151, *nom. illeg.*, *non* O. KUNTZE, Rev. Gen. 1 (1891) 62, *nom. illeg.*; ENGLER, in E. & P. Nat. Pfl. Fam. ed. 2, 18a (1930) 241, fig. 140; *cf.* HOOGL., VAN DER LINDEN & STEEN. Nova Guinea n.s. 10 (1959) 211–212.—
Fig. 1.

Evergreen trees or shrubs with terete, pithy twigs; pith terete. Indument, if present, consisting of simple hairs. *Stipules* interpetiolar, 2 to each node, partly inserted in the axil of the petioles, imbricate, entire, rarely 2-tipped, *early* caducous (except in *T. stipulacea*), leaving a distinct *annular* scar. *Leaves* decussate, simple or odd-pinnate; petiole sulcate. Articulations (base of petiole, nodes of rachis) shrinking in the dry state. Two small glands (sometimes called stipels) on the rachis near the insertion of the petiolules and also 2 near the base of the leaflet. *Leaflets* 3–11 in compound leaves, herbaceous to subcoriaceous, mostly 2–3 times as long as wide, penninerved, midrib prominent, apex acute to acuminate, base obtuse to rounded, sometimes cuneately decurrent, margin glandularly serrate, dentate or crenate. *Panicles* axillary, terminal or subterminal, mostly glabrous. Bracts small. Pedicels with or without 1 or 2 minute bracteoles, not articulated with the flower, apically widened into the short obconical receptacle. *Flowers* regular, bisexual, 5-merous. *Sepals* persistent, free, imbricate, the outer ones broader than the inner ones, ovate, broadly attached at the base, rounded at the apex, fleshy, more or less ciliate at the margin. *Petals* free, imbricate, spatulate or oblong-elliptic, or obovate, equal-sized, narrowly attached, membranous, more or less ciliate at the margin, longer than the sepals, caducous. *Stamens* 5, epi-

(1) KRAUSE, *l.c.*, has cited all subsequent different spellings of *Dalrympelea*, *Ochranthe*, *Turpinia*, etc. and cited them erroneously as synonyms. I have omitted their mention, to avoid a complicated, unnecessary formality.

sepalous, equal; filaments linear, gradually widened to the base, (in Mal. *spp.*) glabrous, inserted close to the disk, caducous; anthers rounded or ovate, with spreading cell-bases, dorsifixed, dehiscing lengthwise, introrse, sometimes distinctly apiculate. *Disk* annular, glabrous and crenate, fleshy. *Ovary* superior, (2-)3(-4)-celled, the three cells and styles closely appressed but not connate, the combined stigmas 3-lobed. *Ovules* 1-∞ in each cell, anatropous, attached on the dissepiment very close to the axis, in 2 vertical rows. *Fruit* up to 2½ cm diam., with a more or less fleshy pericarp (in dry state rather hard), indehiscent, globular, slightly 3-lobed, sometimes crowned by the horn-like conical style remains. *Seeds* 1-∞ in each cell, of various shape, mostly roundish or reniform, or compressed, yellow-brown to dark-brown when dry; hilum large; endosperm present; cotyledons flat, roundish.

Distr. Probably *c.* 30-40 *spp.*, occurring in the continental-Asiatic and throughout the Malaysian tropics (from Ceylon to S. Japan southward to Java and New Guinea) and in the Central and South American tropics (West Indies, Columbia, Ecuador, Peru), in the West Pacific northward to S. China on the continent but to Formosa, Riukius, and S. Japan (Kyushu: Yakushima, at 32° N) in the more mild oceanic climate (Kuro Sjo current). Absent in the Pacific and the Australian continent. Though *Turpinia* is not found in North America the trans-Pacific disjunction belongs obviously to a disrupted, former North Pacific distribution, similarly to that of *Staphylea*.

Some species have a wide distribution, for example *T. montana* (BL.) KURZ, from Java and Sumatra northward to Indo-China, Hongkong, and Yunnan, and *T. pomifera* (ROXB.) DC. in SE. Asia and Malaysia (rare) where it has often been confused with *T. sphaerocarpa* HASSK., a species confined to Malaysia. The other species in Malaysia are all of a more restricted distribution.

The greatest density of species is found in Borneo (among which 2 endemic species on Mt Kinabalu); New Guinea, though situated at the southeastern end of the generic distribution, possesses 2 endemic species. In the Lesser Sunda Islands *Turpinia* is very rare which is probably due to the fact that *Turpinias* avoid countries subject to seasonal climatic conditions. Fig. 2.

Ecol. Obviously all species are constituents of tropical to subtropical rain-forest areas. They are evergreen and frequently of small stature, belonging to the undergrowth or substage. But some species may attain large size, up to 26 m, once noted 35 m with a free bole of 22 m, diam. 50 cm. They shun the areas subject to periodical drought and none has been found in several of the Lesser Sunda Islands or similar areas in South New Guinea.

As to altitude *Turpinia* prefers the montane zone, the highest stations in Malaysia being at *c.* 2400 m in New Guinea and on Mt Kinabalu. In the Himalaya and Yunnan representatives may ascend to 3000 m (and in Yunnan even to 3300 m, *cf.* KRAUSE).

RIDLEY does not cite any records for dispersal of *Turpinia*, but it is most likely that the fleshy, sometimes edible fruits will be devoured by birds and other animals and that the very hard-shelled seeds will be able to stand the passing of the intestinal duct and be dispersed endozoically.

As to pollination nothing is known definitely, but Fyson (Fl. Nilg. Puln. Hill-tops 1, 1915, 91) recorded for *T. nepalensis* that the disk is producing an appreciable amount of honey attracting insect visitors. The flowers lack, it is true, singly, attractive colours and size, but the inflorescences are large and sometimes very many-flowered and the honey scent may be a powerful agent for attracting insects, in a comparable way as is known from the equally unattractive flowers of *Leea*, as I have been informed by Dr M. A. LIEFTINCK. LÖRZING repeatedly noted the flowers of *T. sphaerocarpa* to be sweet-scented.

Morph. *Stipules*. MERRILL & PERRY mention in their key (*l.c.* 545) that the stipules would be connate in some Papuan species, but this rests on erroneous observation.

Characters which are suitable for specific distinction are not particularly showy, but they prove to be very constant; some are unexpected. They are:

(1) Number of ovules per cell, for example *T. montana* has always 2, *T. pentandra* 4(-5), and *T. brachypetala* 8(-7). In *T. sphaerocarpa* the number is less constant.

(2) Size and shape of flower parts (calyx, petals, anthers).

(3) Size and shape of the fruits and the thickness of the pericarp.

(4) Stipules in *T. montana* are very small and hairy and with a bifid apex, in others they are glabrous and entire. Unfortunately in many specimens and even of some species no stipules are available for examination. *T. stipulacea* possesses by exception obviously persistent stipules.

(5) The leaves provide reliable characters in only rather few species, for example in *T. montana* and *T. nitida*, they are simple in *T. simplicifolia*.

(6) Hairiness occurs in a few species but the indument is very short and sparse, it is only typical in *T. grandis*.

The place of insertion of the inflorescences has generally been accepted as terminal and I can confirm

this in a general way. However, there are specimens in which there are 2, or twin pairs of peduncles in anthesis which are only seemingly terminal, but really separated by a small terminal bud visible between the bases of these peduncles. If such a flowering branch starts growing after the anthesis the infructescences become lateral and the central terminal bud prolongs the twig and produces a new flush with some leaf pairs and the same mode of pseudo-apical reproduction is repeated.

Galls. A few zooecidia have been described by DOCTERS VAN LEEUWEN (Zooec. Neth. Ind. 1926, 331, fig.), viz a stem gall caused by a gall midge on *T. montana*; two leaf galls caused by gall midges and a witches' broom caused by a gall mite on *T. sphaerocarpa*.

Vern. The vernacular names have little use generally for the species identity; I have only taken up those which I have found on sheets which I have identified, as in literature taxa have frequently been combined under one name (with all the vernaculars) pertaining to different species.

Uses. The timber is available only in small quantity and dimension and is of inferior quality with a low durability; it is only exceptionally used. By its quick growth *Turpinia* has been tried out as a pioneer for reforestation on devastated mountain slopes in Central Java (Pangentjongan on Mt Galunggung and Klédung on Mt Sindoro) which were promising, according to KOORDERS's report.

Wood Anat. DEN BERGER, Meded. Proefstat. Boschw. 13 (1926) 95, Determinatietabel houtsoorten van Malesië, Veenman, Wageningen (1949) 30; DESCH, Mal. For. Rec. 15² (1954) 524 (hand lens); HEIMSCH, Lilloa 8 (1942) 163; METCALFE & CHALK, Anat. Dic. 1 (1950) 445; MOLL & JANSSONIUS 2 (1908) 416.—The presence of the primitive features: many-barred scalariform perforation plates, fiber tracheids, long-tailed rays, do not favour the position of the family near to the *Sapindales*. JANSSONIUS *l.c.* recognized the large differences between the two families; HEIMSCH *l.c.* p. 182, 189 (erroneously cited by METCALFE & CHALK *l.c.* p. 446) suggested affinity to *Celastrales* but critical studies are necessary; DESCH *l.c.* p. 525 stated that too many genera of the *Celastrales* do not show affinity to *Turpinia*.—C.A.R.—G.

Notes. Practical research with *Turpinia* has proved extremely difficult by the inadequacy of the herbarium material which is often scrappy, in bud, or only bearing either flowers or fruit, bearing witness that collectors do not sufficiently realize the manifest need of collecting complete material for scientific purpose. It is lamentable that this has led to description of new species, and creation of types, on an insufficient basis: the types of *T. parviflora*, *T. simplicifolia*, *T. unifoliata*, and of *T. laxiflora* were described without fruit. Admittedly I am committing myself in this revision, but the two new species proposed here have such outstanding vegetative characters that I feel excused.

The venation of *mature* leaves is rather characteristic in herbarium materials. Leaflets have mostly a rather wide open venation *beneath* with prominence in *various* degree in proportion to the order of the veins (primary, secondary, tertiary, etc.). The upper surface of the leaflets shows mostly no prominence of the small veinlets.

However, in a number of species the veinlets of different order are all about equally strongly prominent on *both* surfaces giving the surface under the lens a reticulation approaching that of a tessellate structure. This is characteristic for *T. borneensis*, *T. nitida*, *T. grandis*, *T. stipulacea*, and *T. ovalifolia*.

The measurements of the flowers given in this revision are based on those of mature ones, boiled from herbarium material.

It is rather remarkable that several specimens of the Euphorbiacea *Bischofia javanica* BL. have in the herbarium been identified as *Turpinias* though having spiral leaves and no annular, stipular scars.

As the vegetative parts offer only occasionally distinctive characters collectors should secure fertile material, preferably with both flowers and fruit. Observations are desirable on the size and shape of the stipules and the mode of regeneration of the flush and inflorescences.

The framing of a separate key on sterile material did not seem of much practical use and has been omitted.

KEY TO THE SPECIES

1. Leaves all and always simple, lanceolate-oblong, 10–15 by 3½–5½ cm, on both sides with prominent venation. Sepals and petals c. 2½–3 mm long. Filaments up to 2 mm. Ovules 2 per cell.
 1. *T. simplicifolia*
1. Leaves 1–∞-jugate, the upper ones under the inflorescence exceptionally 1-foliolate.
2. Stipules large, ovate-triangular, c. 1½ cm long, *persistent*, stout (fig. 1p). Leaflets (7–)9, rather thin, elliptic, c. 9 by 5 cm. Venation on both sides fine-reticulate (tending to be tessellate) and prominent (in the herb.). Petals c. 2½–3 mm long. Stamens c. 2½ mm long; anthers 2/5 mm. Ovules 4 per cell.
 2. *T. stipulacea*
2. Stipules early caducous. Not this combination of characters.
3. Upper internodes, stipules, petioles and petiolules, and inflorescence with a very short (puberulous) but continuous indument (also in fruit). Leaflets 3–1, large, 15–23 by 10–16 cm, ovate to ovate-oblong, sharply dentate; venation on both sides dense and prominent (tending to be tessellate). Leaf-articulations hardly shrinking in the herb.. Fruits globular, without horns, c. 1–1½ cm diam.; pericarp c. ½–1 mm diam. Seeds pale to pale brown, rather large, 10–18 per fruit. (Flowers unknown)
 3. *T. grandis*
3. Such indument absent. Not this combination of leaf-size and venation characters.
4. Flowers small (petals c. 1½–2½ mm long; anthers c. ½ mm). (Mature fruits not crowned by 3± distinct horns).
5. Pericarp (mostly much) thinner than 1 mm (fig. 1e). Stamens 1½–2 mm.
6. Stipules 2–3 mm long, pubescent, shortly bifid at the apex. Ovules 2 per cell (exceptionally 3–4 in a few flowers of an inflorescence). Fruit c. 8 mm diam.; testa 1/5–1/3 mm diam.. Nerves patent and ± straight, connected by regular loops of equal strength and prominence (fig. 1o). Leaflets mostly thin and herbaceous (mostly pale green) in the herb., rather narrow-elliptic oblong, c. 5–10(–16) by 1½–5(–7) cm. Inflorescences delicate
 4. *T. montana*
6. Stipules c. 4½–9 mm long, glabrous, entire. Ovules 4–8 per cell. Fruit c. 8–15 mm diam. Testa ½–1 mm diam.. Nerves curved-ascending, not connected by regular loops of equal strength (fig. 1a, b). Leaflets chartaceous to thin-coriaceous. Inflorescences less delicate.
7. Venation dense and prominent with small areoles and tending to be tessellate on both surfaces. Anthers distinctly apiculate, c. ½ mm long. Ovules 4 in each cell. Seeds large, c. 9 mm *averagely*; testa 4/5–1 mm diam.. Leaflets mostly distinctly widest below the middle, often towards the base
 5. *T. borneensis*
7. Venation rather lax with wider areoles and veins of various degree in prominence, the finest not prominent, not tending to be tessellate. Stamens 1¾–2 mm. Anthers not apiculate, c. 1/3–½ mm long. Ovules 6–7–8 in each cell. Seeds c. 5 mm, testa ½ mm diam.. Leaflets widest in the middle, wide and large, brown in the herb., shallow-dentate. Inflorescences 30–45 cm long.
 6. *T. laxiflora*
5. Pericarp thicker than 1 mm (fig. 11). Stamens (generally) 2–3 mm. Anthers c. 0.5 mm, little to distinctly apiculate. Ovules 6–8 per cell. Seeds c. 5 mm, testa c. ½–1 mm diam.. Leaflets elliptic, not very wide, rather coarse-dentate, upper surface often greyish or metallic, discolored.
 7. *T. sphaerocarpa*
4. Flowers large (petals 3–4 mm, anthers at least ¾ mm).
8. Venation of dried leaves distinctly prominent on both sides.
9. Pericarp thinner than 1 mm. Fruit ± globose, crowned by 3 distinct horns, c. 7–12 mm diam.. Leaflets 3, shining, large (10–20 by 4–8½ cm), with 8–10 very patent, regular nerves prominent on both sides, more or less straight in the lower half, upwards curving and distinctly arching, coriaceous. Anthers 1 mm, apiculate. Pericarp c. 1/3–¾ mm diam.. Ovules 4(–5) per cell. Testa ¾–1 mm diam.
 8. *T. nitida*
9. Pericarp 1–2 mm diam.. Fruit small, oval, globular, crowned (at least when young) with approximate style horns, c. 4–10 mm diam.. Leaflets 3, 4, or 5, mostly not shining on both sides, 7–20 by 4–10 cm; nerves 5–7, prominent below, spreading, ascending from the base, not distinctly looped, chartaceous. Anthers ¾ or 1–1¼ mm, not (or slightly) apiculate. Ovules 5 or 6(–8) per cell. Testa 0.3–0.4 mm diam.
 9. *T. ovalifolia*
8. Venation in the herbarium not distinctly prominent at both sides.
10. Pericarp thick, at least 5 mm diam. (fig. 1j). Ovules (5–)6(–7) per cell. Full-grown fruit large. Plant glabrous
 10. *T. pomifera*
10. Pericarp 1–2 mm diam. Ovules 4(–5) or 8(–7) per cell. Full-grown fruit 10–15 mm diam. Plants often puberulous.
11. Ovules 4(–5) per cell. Fruit with 3 distinct horns, at least when young. Leaflets 2½–4½ (–6½) cm wide
 11. *T. pentandra*
11. Ovules 8(–7) per cell. Fruit without style horns. Leaflets (3½–)5½–8 cm wide.
 12. *T. brachypetala*

1. *Turpinia simplicifolia* MERR. Philip. J. Sc. 27 (1925) 34.—*T. unifoliata* MERR. & CHUN, Sunyatsenia 2 (1934) 37.

Tree up to 4 m. *Leaves* simple, lanceolate-oblong to oblong-elliptic, glabrous, acuminate, decurrent at the base, slightly dentate, 10–15 by 3½–6 cm; petiole up to 4 cm long, glabrous. *Stipules* small, glabrous, 2–3 mm long. *Panicles* axillary, up to 18 cm long. *Sepals* elliptic, rounded, scarcely ciliate, c. 2½ mm long. *Petals* oblong-elliptic, ciliate, 2½–3 mm long. *Stamens* c. 2½ mm long; filaments 2 mm. *Ovary* 3-celled, each cell with 2 ovules. *Fruit* globular, c. 8 cm diam., without style-horns; pericarp very thin, 0.1–0.2 mm thick.

Distr. Hainan; in *Malaysia*: Philippines (Luzon), thrice collected.

Ecol. In forests.

Notes. The type (LOHER 12992) bears an inflorescence and slightly immature foliage. In comparing the characters it seems not specifically different from that of *T. unifoliata* MERR. & CHUN (S. P. KO 52249, NY) from Hainan, which has more mature leaves but an inflorescence which is in bud; the sizes of the floral parts (stamens) are obviously for this reason somewhat smaller than those of *T. simplicifolia*.

Another (fruiting) specimen from Hainan (F. C. HOW 73403, SING) was preliminarily referred by MERRILL to the same species, but from its venation and leaf-shape I conclude this to represent *T. indochinensis* MERR. This seems to be extremely close to *T. formosana* NAKAI which has only 4 ovules per cell, *T. indochinensis* having 8. It might probably be better to reduce the latter as a variety to *T. formosana*.

MASAMUNE (Fl. Kainant. 1943, 178) reduced *T. unifoliata* to *T. formosana* NAKAI, J. Arn. Arb. 5 (1924) 80. In my opinion this is a different species by possessing 4 ovules per cell, larger flowers (petals 4 mm), lesser nerves (7–9 pairs), and hairy stamens. I have not seen the type (WILSON 10130), but TANAKA & SHIMADA 13554 and 11180, which agree with the description of *T. formosana*.

The leaves are astonishingly resembling those of certain specimens of *T. borneensis*, but this species has 5 leaflets, petals less than 2 mm long, and 4 ovules per cell.

Its closest alliance is, as MERRILL & CHUN already remarked, not with other 1-foliolate species (such as *T. arguta*), but with *T. nepalensis* from which it differs by a more regular nervation, finer inflorescence, 2 ovules per cell, and simple leaves.

2. *Turpinia stipulacea* v. D. LINDEN, *nov. sp.*—*Fig. 1p.*

A speciebus omnibus differt stipulis maximis persistentibus lignescentibus. Folia 4–5-jugata, foliolis 6–10 × 2½–5 cm. Inflorescentiae robustae, usque ad 25 cm longae. Sepala 2–2½ × 1½–2¼ mm. Petala 2½–3 mm longa. Stamina c. 2½ mm longa, antheris suborbicularibus subapiculatis. Ovula 4 in utroque loculo. T.: SF 27516 CARR, Sing.

Tree c. 18 m high. *Leaves* 4–5 jugate; leaflets ovate, glabrous, acuminate, rounded at the base, margin denticulate, 6–10 by 2½–5½ cm; petiole up to 8 cm; petiolules of the lateral leaflets 3–7 mm. *Stipules* large, 17 by 10 mm, persistent, woody, glabrous. *Panicles* axillary up to 25 cm long; pedicels 1–2 mm long. *Sepals* ovate-oblong, green, suffused red down to the middle of the segments, 2–2½ by 1½–2¼ mm. *Petals* obovate-oblong, creamy-yellow, 2½–3 mm long. *Stamens* c. 2½ mm long; filaments c. 2 mm; anthers round, slightly apiculate, 2/5 mm long. *Ovary* 3-celled, with 4 ovules per cell. *Fruit* unknown.

Distr. *Malaysia*: North Borneo (Mt Kinabalu, near Tibabah R.), once collected, 2100 m; *fl.* June.

Notes. A remarkable species deviating from all others by its obviously persistent, very large stipules. The large number of leaflets and the 4 ovules per cell remind of the Papuan *T. pentandra*, but this species has another venation and much larger anthers. It is possibly more allied to *T. borneensis* with which it shares the prominent venation and 4 ovules, but this species has narrower, more pointed leaf-shape, smaller flowers, and finer, shorter inflorescences, besides lacking the unique stipules.

3. *Turpinia grandis* v. D. LINDEN, *nov. sp.*

Arbor 10–18 m alta. Internodia ultima, petioli et infructescentiae indumento denso brevi muniti. Folia 1–3 foliolata, foliolis magnis grosse-serratis, 15–23 × 10–16 cm, venulis utrinque prominentibus. Infructescentiae 30 cm longae. Fructus globosus ecorniculatus, 1–1½ cm diam., pericarpio c. ½–1 mm crasso. Semina flavescenti-brunnea, 10–18 in fructo singulo. T.: ENDERT 4669, L.

Tree 10–18 m. Upper internodes, stipules, petioles, and infructescences with a very short (puberulous) but continuous indument. *Leaves* 1–3-foliolate; leaflets ovate to ovate-oblong, acuminate, rounded at the base, sharply dentate, 15–23 by 10–16 cm; venation on both sides dense and prominent; petiole up to 7 cm long; petiolules of the lateral leaflets ½–1½ cm. *Stipules* small, c. 5 mm long. *Flowers* unknown. *Infructescences* axillary, sub-terminal or terminal, up to 30 cm long. *Fruit* globular, without horns, c. 1–1½ cm diam.; pericarp ½–1 mm thick. *Seeds* pale to pale-brown, rather large, 10–18 in each fruit.

Distr. *Malaysia*: Central E. Borneo (W. Kutai: Kiau; Mt Kemul; Long Petah), thrice collected.

Ecol. On forested river-banks and in deep ravines, 450–1000 m.

Note. Superficially somewhat resembling *T. laxiflora* but with 1–3 leaflets. Besides, *T. laxiflora* has a loose, only slightly prominent venation, smaller fruits, and sepia-coloured seeds. It is probably closest allied to *T. borneensis*, but it differs from that species by its indument, leaf-size, and number of ovules.

4. *Turpinia montana* (BL.) KURZ, J. As. Soc. Beng. 44, ii (1875) 182, *α genuina*; KOORD. Exk. Fl. Java 2 (1912) 528; Atlas Baumarten 1 (1913) t. 92; Fl. Tjib. 2 (1923) 149; HOCHR. Candollea 2 (1925)

412, incl. *f. arborescens* et *f. scandens*; MERR. Contr. Arn. Arb. 8 (1934) 93; BACKER, Brittonia 3 (1938) 81; MERR. J. Arn. Arb. 19 (1938) 42; MERR. & PERRY, J. Arn. Arb. 22 (1941) 552; BACK. Bekn. Fl. Java (em. ed.) 7 (1948) fam. 152, p. 1.—*Zanthoxylum* (*Xanthoxylum*) *montanum* BL. Bijdr. (1825) 248; MIQ. Fl. Ind. Bat. 1, 2 (1859) 670, cf. RADLK. Sitz. Ber. K. Bay. Ak. Wiss. 16 (1886) 305–306 (1887).—*Zanthoxylum serrulatum* BL. Bijdr. (1825) 249; MIQ. *l.c.*—*Triceros cochinchinensis* (non LOUR.) MORITZI, Syst. Verz. (1846) 15.—*Maurocenia zollingeri* O.K. Rev. Gen. Pl. 1 (1891) 147, 150, cf. BACKER, Brittonia 3 (1938) 81.—*T. parva* K. & V. Bijdr. Booms. 9 (1903) 249; BACK. Schoolfl. (1911) 272; CRAIB, Fl. Siam. En. 1 (1926) 338.—*Evodia parviflora* CRAIB, Kew Bull. (1915) 425.—? *T. gracilis* NAKAI, J. Arn. Arb. 5 (1924) 79.—*T. parviflora* CRAIB, Fl. Siam. En. 1 (1931) 339.—Fig. 1g–i.

Shrub or tree up to 15 m. *Leaves* 3–7-foliolate, below the inflorescence exceptionally with only 1 leaflet; leaflets elliptic to oblong, glabrous, acuminate, decurrent at the base, dentate, 3–10 (–15) by 1½–7½ cm; nerves straight, very regularly connected by a looped intramarginal vein; petiolules of the lateral leaflets ½–3 cm. Stipules c. 3 mm, puberulous, with a short but sharply bifid apex. *Panicles* axillary, open, up to c. 18 cm long. Sepals ovate, glabrous, ciliate, 1–1¼ by 1¼–2 mm. Petals obovate, glabrous, ciliate, 1–1¼ by 1¼–2 mm. Stamens c. 1½ mm long; filaments 1–1¼ mm; anthers ½–⅓ mm, not or only very slightly apiculate. Ovary (2–)3(–4)-celled, each cell with 2 ovules. *Fruit* globular, sometimes with 3 radial lines from the top, 8–10 mm diam.; pericarp thin, to ½ mm thick; more than one seed developed; testa 0.2–0.3 mm thick.

Distr. Deccan Peninsula (Pulney Hills), Burma, Siam, Indo-China, China (Yunnan, Kwantung, Hainan), Hong Kong, in *Malaysia*: Sumatra to Central and W. Java (most frequent in W. Java).

Ecol. In primary montane rain-forest, 750–2300 m. Fl. Oct.–Jan., fr. March–Aug.

Vern. *Puhun putàg, ki bantjèt leutik, S.*

Notes. By its thin, very regularly looped nerves and delicate inflorescence easily recognized. On the mainland a few specimens have been found with somewhat thicker, shorter leaves and more contracted inflorescences (in drier climate?); venation and ovules are however exactly matching those of *T. montana*. This form has been described as a distinct species *T. parviflora* CRAIB from Siam (KERR 2527, K) and is also found in Indo-China (PIERRE 907, L). The size of the flower parts is slightly smaller than that in *T. montana*, but this is due to the fact that both specimens cited above are in bud. There is no question that this species is ever scandent. The number of leaflets may occasionally be up to 11 (GARRETT 792, Thailand).

A collection from the Pulney Hills (A. SAULIÈRE 115, Bo, K, L) certainly represents *T. montana*; it has the same venation, glabrous stamens, constantly 2 ovules per cell, and 3–4 mm long bifid stipules.

There is a distinct affinity with *T. nepalensis*

which, however, has never only 2 ovules per cell.

T. montana var. *borneensis* MERR. & PERRY I have found to represent a distinct species under that epithet.

Whether the Chinese *T. glaberrima* MERR. (Lingn. Sc. J. 7, 1931, 312; *ibid.* 14, 1935, 27; J. Arn. Arb. 22, 1941, 552) differs from *T. montana* is not certain as several numbers MERRILL & PERRY mentioned to belong to it (TSIANG 2715, How 71654, 73218, CHUN & Tso 43918) represent in my opinion *T. montana*.

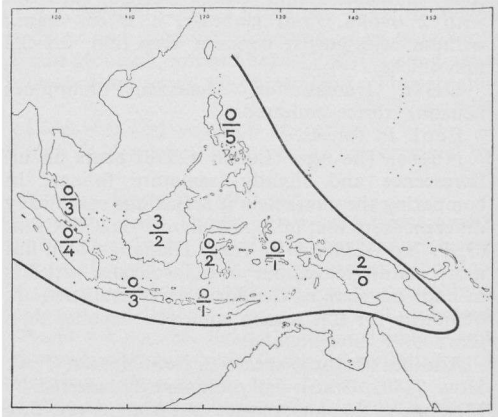


Fig. 2. Demarcation of the Indo-Malaysian part of the distributional area of *Turpinia*, showing also the number of species in each island or island group; above the hyphen the number of endemic species, below it other species.

5. *Turpinia borneensis* (MERR. & PERRY) v. D. LINDEN, *nov. comb.*—*T. montana* var. *borneensis* MERR. & PERRY, J. Arn. Arb. 22 (1941) 553. T: CLEMENS 29391 *bis.*—Fig. 1a–f.

Tree up to 15 m. *Leaves* 3–5(–7)-foliolate; leaflets ovate-oblong to almost lanceolate, glabrous, distinctly acuminate, rounded at the base (in the Philippine specimens sometimes cuneately decurrent), dentate, 7–17 by 2½–6 cm; primary nerves and the reticulating veins distinctly prominent on both sides; petiolules of the lateral leaflets c. ¼–2 cm long. Stipules c. 5 mm, glabrous. *Panicles* axillary, open, up to c. 20 cm. Sepals ovate, ciliate, 2 by 1½ mm. Petals obovate, ciliate, 1¾ by 1¼ mm. Stamens 1¾ mm long; filaments c. 1½ mm; anthers ½ mm long, apiculate. Ovary (2–)3-celled, each cell with 4 ovules. *Fruit* globular, sometimes with 3 radial lines from the top, 8–15 mm diam.; pericarp thin, 0.1–0.2(–0.5) mm diam. Seeds large brown; testa ¾–1 mm thick.

Distr. *Malaysia*: Borneo and the Philippines.

Ecol. In rain-forests, up to 1600 m.

Note. MERRILL & PERRY already remarked that their *T. montana* var. *borneensis* might deserve specific rank. Its venation, prominent on both sides, ovate-oblong leaf, its curved nerves, and 4 ovules per cell (in *T. montana* always 2) remove it distinctly from *T. montana*. The latter is an ex-

clusively montane species distributed from SE. Asia along the Sumatran track to Java.

6. *Turpinia laxiflora* RIDL. J. Str. Br. R. As. Soc. n. 82 (1920) 179; Fl. Mal. Pen. 1 (1922) 512; MERR. & PERRY, J. Agr. Arb. 22 (1941) 553.—*T. pomifera* var. *sphaerocarpa* (non HASSK.) KING; KING, J. As. Soc. Beng. 65, ii (1896) 453, *pro parte*.

Tree, up to 24(–35) m by 50 cm. *Leaves* 3–7-foliolate; leaflets ovate-elliptic, glabrous, dentate, acuminate, rounded at the base, 8–24 by 3½–12 cm; petiolules of the lateral leaflets 4–20 mm, glabrous. *Stipules* 5–9 mm long, glabrous. *Panicles* axillary, lax, long, up to 45 cm, the ultimate branches minutely puberulous. *Sepals* ovate, sparsely ciliate, 1½–2 by 1–2 mm. *Petals* oblong, distinctly ciliate, 2¼–2½ by 1–1¼ mm. *Stamens* 1¾–2 mm long; filaments 1½–1¾ mm; anthers ½–½ mm long, roundish, not apiculate. *Ovary* 3-celled, each cell with (6–)7–8(–9) ovules. *Fruit* globular, in dry state mostly wrinkled, ½–1 cm diam.; pericarp (very) thin, 0.2(–0.9) mm diam. *Seeds* several in each fruit; testa c. ½ mm thick.

Distr. Malaysia: N. Sumatra (also Simalur I.) and Malay Peninsula (Perak; Larut).

Ecol. In rain-forests, at low altitudes, up to 150 m. once at 900 m. *T. laxiflora* has been noted by RIDLEY (n. 6214, coll. a. 1894) to change its foliage with new flush appearing simultaneously with young inflorescences. Young leaflets, when they first appear, are narrow elliptic-lanceolate! As no later similar data have been reported it seems premature to conclude that it is deciduous.

Vern. *Arilan-buluh*, *arilan pajó ètem*, *arilan stobudlung*, (*awā*)*arilan uding*, *awā mātān nanas*, *lahulung*, *matan-nanas pajó*, Simalur, *kaju longgakan*, *k. songgak*, Sumatra, *k. rëbung*, Pasemah (Palembang).

Note. Closely allied to *T. sphaerocarpa* but obviously distinct by a different pericarp, larger inflorescences, and generally wider leaflets which are brown in dry state.

7. *Turpinia sphaerocarpa* HASSK. Flora 25, ii (1842) Beibl. 1, p. 42; MIQ. Fl. Ind. Bat. 1, 2 (1859) 593; RIDL. J. Mal. Br. R. As. Soc. 1 (1923) 58; BAKER f. J. Bot. 62 (1924) Suppl. 24; MERR. & PERRY, J. Agr. Arb. 22 (1941) 548.—*Dalrymplea javanica* HASSK. Pl. Jav. Rar. (1848) 439.—*T. pomifera* [non (ROXB.) DC. 1825]: MIQ. Sum. (1861) 201, 513; K. & V. Bijdr. Booms. 9 (1903) 245; BACK. Schoolf. Java (1911) 272; KOORD. Exk. Fl. Java 2 (1912) 528; Atlas Baumart. 1 (1913) t. 93; Fl. Tjib. 2 (1923) 149; HOCHR. Candollea 2 (1925) 412; BACK. Bekn. Fl. Java (em. ed.) 7 (1948) fam. 152, p. 1; HEINE, Pfl. Kinabalu (1953) 57.—*Maurocena sphaerocarpa* O.K. Rev. Gen. Pl. 1 (1891) 147, 149.—*T. pomifera* var. *sphaerocarpa* KING, J. As. Soc. Beng. 65, ii (1896) 453. *pro nomen, partim*.—*T. latifolia* WALL. [Cat. 4939] ex RIDL. J. Str. Br. R. As. Soc. n. 82 (1920) 178; Fl. Mal. Pen. 1 (1922) 512.—*T. sambucifolia* ELMER, Leaf. 9 (1934) 3217.—*T. nepalensis* (non [WALL. Cat. 4277] ex W. & A.

1834): MERR. Contr. Arn. Arb. 8 (1934) 94.—Fig. 11-n.

Large shrub or tree, up to 20 m high, 55 cm diam. *Leaves* 3–5–7(–11)-foliolate, brownish-red when young; leaflets ovate, oblong or elliptic, glabrous, more or less acuminate, base obtuse or obtusely rounded or decurrent, more or less (sometimes not) dentate, 3–18 by 2–10 cm; petiolules of the lateral leaflets 3–15 mm, glabrous or puberulous. *Stipules* large, 8–9 mm long, glabrous. *Panicles* axillary, open, up to 30 cm long. *Sepals* ovate, ciliate, 1½–2 by 1½–2½ mm. *Petals* oblong to elliptic, thin, more or less ciliate, 2½ by 1½ mm. *Stamens* 2¼–3 mm long; filaments 2–2½ mm; anthers ½ by ½ mm, generally more or less apiculate. *Ovary* (2–)3(–4)-celled, each cell with 5–6(–8) ovules. *Fruit* globular, mostly with three grooves from the top, c. 1–1½ cm diam.; pericarp 1–3 mm thick. *Seeds* brown, mostly several per fruit; testa ½–1 mm thick.

Distr. Malaysia: Sumatra, Malay Peninsula, Borneo, Java, Lesser Sunda Islands (Bali, Flores), Celebes, Philippines, Moluccas (Ceram, Ambon).

Ecol. Frequent in rain-forests, on various soil types, 50–2000 m.

Vern. *Ki bangkong*, *ki bantjèt*, *ki keujeup*, *ki pongpasang*, *ki tjèhai*, *tjawané soré*, S; *godong bantjèt*, J; *langkiang ètëm*, *rëbung*, *tutuh sirawi*, Simalur, *aë*, *kua*, Endeh.

Notes. This species has often been confused with *T. pomifera* but the differences in size of the flowers and thickness of the pericarp make it desirable to distinguish these taxa as two species; their areas overlap. No attempt has been made to unravel all confusions in the references.

In the Malay Peninsula and Sarawak *T. sphaerocarpa* is mostly represented by a slightly distinguishable form described as *T. latifolia* but I cannot find any fitting characters to delimit it against *T. sphaerocarpa*.

A specimen from Ceram (EYMA 2150) shows a remarkable resemblance to the Papuan species but it has small flowers (2½ mm) and constantly 6 ovules per cell. In fruit these species can hardly be distinguished.

In Sumatra some specimens have been found which are shortly but rather stiffly hairy on *both* leaves and inflorescences; they represent a minor variety, var. *pubescens*, *nov. var.* No great importance can be attached to this variety, although it is occupying a geographically coherent area in Central Sumatra. A specimen from Mt Kinabalu (CLEMENS 34462) and one from Celebes (Palu: bb 28283) deviate in having *only* the inflorescence puberulous, besides having stamens 1½–1¾ mm, anthers ¾ mm.

Of MERRILL's record of *T. nepalensis* in N. Sumatra I saw only one cited number (BANGHAM 981) which I refer to *T. sphaerocarpa*. This is a fruiting specimen; the leaf is typically discoloured as in *T. sphaerocarpa*. The ripe fruits are distinctly too large for *T. nepalensis* and may well fit the size and structure of *T. sphaerocarpa*, but they have a distinctly 3-horned tip which is unusual for the latter species. The horns are not widely

spaced as in *T. cochinchinensis* which species has also no discoloured leaves.

8. *Turpinia nitida* MERR. & PERRY, J. Arn. Arb. 22 (1941) 549.

A recumbent treelet, 4½–6 m high. *Leaves* 1–5-foliolate; leaflets coriaceous, oblong to elliptic, glabrous, denticulate, acuminate, rounded at the base, upper surface shining, 11–25 by 5½–10½ cm; nerves prominent, arcuately ascending, then parallel with the margin; petiole up to 6 cm long, glabrous; petiolules of the lateral leaflets 12–20 mm. Stipules small, glabrous, c. 5 mm long. *Panicles* axillary, subterminal (or terminal), up to 22 cm long. Pedicels 2–2½ mm. Sepals oblong-elliptic, ciliate, 2–4 by 1½–2½ mm. Petals oblong, ciliate, 4 by 2 mm. Stamens 2½–3½ mm long; filaments c. 3 mm; anthers c. 1 by 1 mm, distinctly apiculate. Ovary (2–)3-celled, each cell with 4(–5) ovules. *Fruit* globular, with 3 distinct, sometimes closely appressed horns; pericarp ¼–¾ mm thick. Seeds large, two or more in each fruit; testa ¾–1 mm thick.

Distr. *Malaysia*: North Borneo (Mt Kinabalu).

Ecol. Fairly frequent on wet forest ridges, 900–1800 m.

Note. In size of the leaflets resembling *T. grandis* (also occurring on Mt Kinabalu), but differing in the shape of the fruit, the venation of the leaflets, and the absence of an indument.

9. *Turpinia ovalifolia* ELMER, Leaf. Philip. Bot. 2 (1908) 490; MERR. & PERRY, J. Arn. Arb. 22 (1941) 544.—*T. trifoliata* RIDLEY, J. Str. Br. R. As. Soc. n. 82 (1920) 178; Fl. Mal. Pen. 1 (1922) 511.—*T. lucida* NAKAI, J. Arn. Arb. 5 (1924) 80.—? *T. pachyphylla* MERR. Philip. J. Sc. 27 (1925) 33, ex descr.—Fig. 10.

Tree c. 8 m or sometimes higher. *Leaves* 3–5 (–7)-foliolate; leaflets rounded to elliptic, glabrous, acuminate, sometimes with an abrupt acute point, rounded at the base, margin crenate with fine, whitish, callous points, (2½)–4–20 by (1)–4–10 cm; petiolules of the lateral leaflets 4–15 mm, glabrous. Stipules small, 2½–3 mm long, glabrous. *Panicles* mostly short, c. 10–15 cm long (in fruit to 30 cm), rather dense. Sepals ovate, ciliate, 2–4½ by 1½–3 mm. Petals obovate-oblong, thin, ciliate, 3½ by 2 mm. Stamens 2½ mm long; filaments 2–2½ mm; anthers ¾ or 1–1¼ mm long, not (or slightly) apiculate. Ovary (2–)3-celled, each cell with 5 or 6(–8) ovules. *Fruit* with 3 short horns on top, 4–12 mm diam.; pericarp thick 1–4 mm; testa 0.3–0.4 mm thick.

Distr. *Malaysia*: Malay Peninsula (Nyalas, Selangor), Philippines (Luzon, Palawan).

Notes. I cannot well separate *T. ovalifolia* and *T. trifoliata*; the type of the former is extremely poor; the flowers ELMER described are not present in any of the isotypes I have had on loan for study. Though there is a slight difference in the size of the anthers I cannot discriminate the Malayan specimens from those of the Philippines. The species can be expected to occur in Borneo.

T. robusta CRAIB from Siam is habitually very

similar to Malay Peninsula specimens of "*T. trifoliata*" but its flowers are smaller and there are only 4 ovules per cell; it is unfortunately only described after flowering material which in all its characters is extremely close to *T. cochinchinensis* (LOUR.) MERR., all species having 4 ovules per cell. The latter species has much larger fruits (1–2 cm diam.) with spaced horns; *T. nepalensis* has small fruits c. ½ cm diam., also provided with small remains of the style bases.

10. *Turpinia pomifera* (ROXB.) DC. Prod. 2 (1825) 3; WALL. Cat. 4267; KURZ, J. As. Soc. Beng. 44, ii (1875) 182, excl. syn.; HAYATA, Ic. Pl. Form. 1 (1911) 160; ?KING, J. As. Soc. Beng. 65, ii (1896) 453, pro nomen, excl. var. *sphaerocarpa*; KANJILAL & DAS, Flora of Assam 1, 2 (1937) 309; MERR. & PERRY, J. Arn. Arb. 22 (1941) 546; HOLTHUIS & LAM, Blumea 5 (1942) 205; GAGN. Fl. Gén. 1.—C. Suppl. 1 (1950) 993.—*Dalrympelea pomifera* ROXB. [Hort. Beng. (1814) 17] Pl. Corom. 3 (1819) 76, t. 279 (*Dalrympelea*).—*Maurocenia pomifera* O.K. Rev. Gen. Pl. 1 (1891) 147, 149.—*Turpinia* sp. MERR. For. Bur. Bull. (Philip.) 1 (1903) 34.—Fig. 1j–k.

Tree, c. 10–20 m. *Leaves* 3–5–7(–9)-foliolate; leaflets elliptic-oblong, glabrous, distinctly acuminate, decurrent (sometimes a little rounded) at the base, dentate, 12–25 by 6–10 cm; petiolules of the lateral leaflets 3–10 mm. Stipules triangular, 4–5 mm. *Panicles* terminal, subterminal or axillary, 10–30 cm long, sometimes slightly puberulous. Sepals ovate, unequal, fleshy, scarcely ciliate, 2–3½ by 1¼–2 mm. Petals oblong, thin, scarcely ciliate, 3–3½ by 1–1½ mm. Stamens 3 mm long; filaments c. 2½ mm; anthers ¾–1 mm long, mostly subapiculate. Ovary 3-celled, each cell with (5–)6 ovules. *Fruit* globular, mostly with 3 grooves from the top, up to 25 cm (perhaps to 37 mm); pericarp very thick, to c. 5 mm diam. Seeds small and brown, glossy.

Distr. Continental Asia from the East Himalaya eastward; in *Malaysia* rare: Sumatra, Java, Central Celebes (Nuha Distr.: KJELLBERG 2303) and Minahassa, Talaud Is, and Philippines (Mindanao: AHERN 354; Luzon: Camarines Sur: BS 76375).

Ecol. In forests, 0–2100 m; fl. March, fr. Sept.–Oct.

Vern. *Ki bangkong, ki renggang, S, lampasia*, Minahasa.

Notes. *T. pomifera* which is a common species on the Asiatic continent is rare in Malaysia. It is characterized by a very thick pericarp closely enveloping the seeds, and besides it differs from *T. sphaerocarpa*, with which it has frequently been confused in Malaysia, by larger flowers and much larger anthers. In sterile state it is impossible to tell them apart.

The only specimen of the Malay Peninsula which might represent true *T. pomifera* is KING's coll. 4243 (SING), but the material is too inadequate to be conclusive.

In the W. Deccan (Ghats and Nilgiris) and Ceylon the records of *T. pomifera* have been

straightened out by GAMBLE (Kew Bull. 1916, 135; Fl. Madras pt 2, 1918, 241); it appears that two different species are concerned, viz *T. nepalensis* and a new species, *T. malabarica* GAMBLE, which is also the single one occurring in Ceylon, characterized *i.a.* by hairy filaments.

11. *Turpinia pentandra* (SCHLTR) V. D. LINDEN, Nova Guinea n.s. 10 (1959) 212.—*Kaernbachia pentandra* SCHLTR, Bot. Jahrb. 52 (1914) 151, f. 5 H-N; ENGLER, in E. & P. Pfl. Fam. ed. 2, 18a (1930) 241.—*T. papuana* MERR. & PERRY, J. Agr. Arb. 22 (1941) 554.—? *T. papuana* HARMS in E. & P. Pfl. Fam. ed. 2, 20b (1942) 312, *descr. germ., sine typ., homon. illeg.*

Tree, 15–20(–25) m. *Leaves* (1–)2–3-jugate (rarely paripinnate by absence of the terminal leaflet); leaflets oblong or ovate-oblong, glabrous, shallowly serrate, distinctly obtusely acuminate, obtuse to rounded at the base, 6–12(–15) by 2½–4½(–6½) cm; petiole 2–4½(–7) cm, very short-hairy to glabrous; petiolules of the lateral leaflets 3–5(–8) mm. Stipules triangular, glabrous or sparsely hairy outside, 5–7 by 3–4 mm. *Panicles* axillary, open, up to 25 cm long. Pedicels ½–3 mm long. Sepals broad-obovate, ciliate, 3–3½ by 1½–2 mm. Petals obovate, rounded or obtuse at the apex, thin, ciliate, 4–4½ by 1¾–2 mm. Stamens 3½–4¼ mm long; filaments 2½–3 mm; anthers ¾–1 mm long, apiculate. Ovary 3-celled, each cell with 4(–5) ovules. *Fruit* globular, mostly with 3 distinct horns (remains of the styles), c. 1½ cm diam.; pericarp c. 2 mm thick. Seeds mostly 1(–2).

Distr. *Malaysia*: New Guinea.

Ecol. In primary rain-forests, locally frequent, 1200–2500 m.

Vern. *Naun*, Waria (Mt Hagen).

Note. Very close to *T. brachypetala*, but

constantly differing in the number of the ovules, the shape of the fruit (horns), and width of the leaflets.

12. *Turpinia brachypetala* (SCHLTR) V. D. LINDEN, Nova Guinea n.s. 10 (1959) 212.—*Kaernbachia brachypetala* SCHLTR, Bot. Jahrb. 52 (1914) 153, f. 5 A–G; ENGLER, in E. & P. Pfl. Fam. ed. 2, 18a (1930) 241, f. 140 A–G.—*T. versteeghii* MERR. & PERRY, J. Arn. Arb. 22 (1941) 554.

Tree, 4–26 m; bark brownish grey, flaky. *Leaves* (1–)2–3-jugate (rarely paripinnate by absence of the terminal leaflet); leaflets ovate-oblong, serrate, glabrous, obtuse, more or less acuminate, obtuse to rounded at the base, (6½–)8–17 by 4½–8½ cm; petiole 3½–9 cm long, very short-hairy or glabrous; petiolules of the lateral leaflets 4–9 mm long; young foliage glossy brownish green. Stipules triangular, glabrous or sparsely hairy outside, 4–7 by 3–6 mm. *Panicles* axillary, open, up to 30 cm long. Pedicels ½–3 mm long. Sepals ovate, ciliate, white, 3½–4 by 2–2¾ mm. Petals obovate-oblong, spatulate, thin, sparsely ciliate, white, 3½–4½ by 1½–1¾ mm. Stamens 3½–4½ mm long; filaments 3–4 mm; anthers ¾–0.9 mm long, distinctly apiculate. Ovary 3-celled, each cell with (7–)8 ovules. *Fruit* globular, sometimes with 3 radial lines from the top, 1–1½ cm diam.; pericarp c. 2 mm thick. Seeds mostly 3 or more.

Distr. *Malaysia*: New Guinea.

Ecol. In primary rain-forests, locally frequent, 300–2000 m.

Note. We have at present rather numerous collections from various places all over New Guinea from both *T. pentandra* and *T. brachypetala*. They are doubtless closely allied, but there appear to be no intermediates. If only fruiting material is available *T. brachypetala* can hardly be distinguished from *T. sphaerocarpa* HASSK.